ENVIRONMENTAL PROTECTION IN ECONOMIC TERMS IN FOCUS ON EVALUATION METHODS OF NATURAL CAPITAL

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Abstract: The contribution presents the concept of the environment and natural resources protection in terms of different theoretical economic theories with a focus on the concept of neoclassical environmental economics, which are based on the fundamental principles of environmental valuation. The article describes the selected main methods of valuation the environment and natural capital, their characteristics and application examples, incl. the concept of total economic value of the environment.

Keywords: Contingent valuation method, Hedonic prices method, Hessen´s method, neoclassical environmental economics, the total economic value, travel cost method.

1 The environment from the perspective of economic theory

Using of natural resources and environmental protection are often discussed topics not only in the natural but also in the social sciences. It is a general issue that has an influence on many spheres and concerns everyone. Important role in this area is economics, which deals with the allocation of scarce resources and also the behaviour of people in relation to these goods. Within economics, however, there are different theoretical orientations to explain the ecological issues and recommendation connected with appropriate approaches and using of natural resources is different.

Neoclassical environmental economics, market-based approaches to environmental protection, economical ecology, economic and environmental institutional economics can be considered four main economic schools of thought that deal with human behaviour in relation to natural resources. All four theories of environmental protection have a relatively short history. Therefore, they follow historical school of economic thought which preceded them.

Neoclassical environmental economics as a separate a scientific discipline within economics emerged came into existence in the 60s of the 20th century. It is a period when environmental problems began to attribute greater importance to the field of the international political agenda. Using neoclassical models based on the assumption of perfect competition and zero transaction costs, was firstly determined the optimal rate of environmental pollution in the US and then this direction gradually began to influence environmental policy of other countries (Vatn, 2005).

In the same period also gave birth to a number of ecological groups whose common idea became resistance against economic growth. It was considered by most economists as beneficial up to that time. Environmentalists questioned the economic growth, because of exhaustibility of natural resources, as a criterion for the prosperity of society. The main cause was, according to them, the orientation on human preferences and values (eg. Anthropocentric approach) only and also ignorance of internal value of nature. Supporters of these ideas have created an alternative to the neoclassical environmental economics and during the 70s the foundations so called Ecological economics were laid so. Ecological economics sought to define and design tools to achieve sustainable development in intergenerational solidarity.

In the 90s of the 20th century, was created ecological institutional economics based on the ideas of the Austrian school that dealt with determining the right institutions to achieve effective and long-term using of natural resources. Austrian school also had a strong influence on other school of thought - eg. market-based approaches to environmental protection. One of the basic features of the Austrian school is critique of state intervention in the functioning of the market, followers of the Austrian school point out the negative approach of the Government in the field of ecology and using restrictions, taxes and other regulations as well. Natural resources according to representatives of these ideas may not necessarily be in public ownership, if there is a precise definition of property rights. Even natural resources can be traded, since the environmental policy of the state is not a prerequisite for ensuring the quality of the environment (Van den Bergh, 2000).

At the present, the neoclassical environmental economics (environmental economics) is the main direction within disciplines linking economics to environmental protection. Its main recommendations for the protection of natural resources are formulated on the basis of comparison of perfect competition model and the real world. In this way, market failures are determined. By correcting these failures with using of government regulation, the situation is returned to the point of optimum. The concepts of neoclassical environmental economics are also based on the basic principles of valuing the environment, which are the subject of the last chapter of this document (Farský and Ritschelová, 2010).

2 Principles of economic valuation of environmental resources

The valuation of any items, services, goods is comparison with the costs of the farm with the willingness to pay. Much more difficult is the valuation of such goods for which markets do not exist, as is currently the case in nature. Contemporary science is aware that natural resources and ecosystems are a prerequisite for life.

The nature has always been understood as a mean to live and survive. As long as was the sparse population on the Planet, there were not any problems with using of natural resources. The situation began to change dramatically in the 20th century, due to the fact that increasing population density and human activities began to change its character.

The nature and its resources can be divided into two main groups. The first group consists of material resources - soil, forests, minerals and others that are used in economies as objects of market and property relations. In economics, they are comprehensively referred to as natural resources.

In addition, the nature creates conditions for maintaining of life. This includes the atmosphere, oceans, sunshine, plants and animal species and all connections between them. This covers 99% of all plants and animal species that are not economically exploited. These resources, which still remain outside the economic system and are the most often used as free and open resources can be described as so called environmental resources (Moldan, 1997).

The expression economic valuation or economic value is patterned on mainstream economics of the individual's willingness to pay for a good or service, or willingness to pay for the exclusion of certain costs, eg. health hazards resulting from bad environment.

The economic value according to mainstream economics represents valuation of something useful which is either acquired or lost from the perspective of the current generation. This scale resulting from change in environmental quality is called the total economic value of the environment (Šimíčková, 2002).

The authors diverge from terms concerning valuation of the environment very often. Some use term of valuation of environment, the others economic evaluation of nature. Even in the concept of total economic value they are not unanimous. Some of them use overall economic value of environmental goods or total economic value of the environmental quality etc. Economic evaluation is in the concept of contemporary

economic theory anthropogenic method, because it puts only human preferences, i.e. evaluation from human view. Therefore is a process which reveals subjectively-conceived economic value. According to the concept of mainstream economics is not evaluated only the nature itself and its wealth, but people's preferences in relation to changes in state of the environment.

Fig. 1 represents the total economic value that reflects so called Active Values (exploitable) and Passive Values (unexplainable), which together form the total economic value.

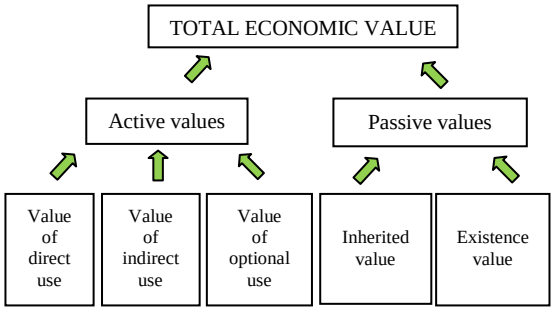

Figure 1: The total economic value
Source: own processing based data**:** SEJÁK, J. et al. *Oceňování pozemků a přírodních zdrojů.* Praha: Grada Publishing, 1999. 251 s. ISBN 80-7169-393-6.

Active values are the benefits derived from the current using of products and services such as wood, berries, fishing, drinking water and hiking as well. Passive values are intrinsic values of the environment, which are not associated with the current using of environmental goods and services, but they are important for future generations.

The active value consists of the value of direct use, the value of indirect use and the value of the optional use. The first group includes industry, agriculture, holiday and tourism, which means fundamental economic activities that the environment has been creating conditions for their actual implementation. An example of indirect use, there are the activities, such as flood control, thus creating measures to improve coexistence with the natural influences. The value of the optional use means a discovery of new using of natural resources (Seják, 1999).

The Passive value means inherited value and existence value. The inherited value is by literature often referred to as intergenerational value and also the value of the link. It is the intention of the present generation to preserve environmental value for future generations. In appreciating environmental goods are determining costs and revenues in the long term. Whether and to what extent in the economy account of the needs of future generations, it follows from the above discount factor of time. The higher the discount rate in a given society towards natural resources applied, the less into account the needs of future generations and can hardly be considered its development as sustainable[1]. Existential value is the value which is known to exist, but has never be used. This includes the very existence of landscape and natural resources, which is necessary for the preservation of ecosystems and a necessary condition for the continuation of life in the form as we know it (Seják, 2002).

The basis of the valuation of environmental goods is by neoclassical environmental economics determine the total economic value of the stock of natural capital and the total economic value of stocks changes. There is therefore the assessment of the present value of environmental resources and there is also necessary to assess the damage, respectively loss amount and quality of the resource[2].

In practical terms, evaluation of natural resources conducts in these fundamental steps:

1) Identification of targets for the economy and the environment.
2) Identification of key users and ecosystem functions.
3) Formulation of relations between functions and use.
4) Use of appropriate evaluation method.
5) Determination of total economic value.
6) Analysis possibilities/alternatives for achieving the objectives.

For the valuation of natural phenomena and goods are used three main ways - the use of market prices, use of expressed preferences and use of observational preferences derived from actual human behavior (Ritschelová, 2006).

2.1 The use of market prices

In the case of using market prices, it is possible use a method of human capital and market valuation method to physical impacts. Human capital method estimates the costs, which come into damage health because of environmental changes[3].

Method of market valuation of physical impacts monitors the differences in prices of goods and services, which are due to physical changes in the environment. Water pollution reduces the number of fish, air pollution can reduce crop. In these cases, environmental changes reduce the market value of the outputs. In other cases environmental changes increase costs eg. cleaning station from mudflats. These changes always cost someone money (Seják, 1999).

2.2 The use of expressed preferences

For the expression of preferences a method is used based on a hypothetical survey of preferences (Contingent Valuation Method - CVM), which is called by literature as well as contingent evaluation method or the method of contingent valuation. It works by the creations of the hypothetical market for environmental goods. Using a questionnaire is drawn up willingness of respondents to pay (willingness to pay - WTP) for the conservation of natural values. There is a process that is similar to the procedure based on the willingness to accept (willingness to accept - WTA), which means determining the lowest amount of compensation that the respondent is willing to accept in exchange for impaired environment. According to the theoretical assumptions, both methods of detection should produce similar results. Although in practice is shown that there are significant differences among them[4].

The whole process is divided into three basic stages. First of all, respondents are acquainted with the issues and relevant information that are provided to them. The following is a questionnaire with the question with an open end or a dichotomous choice of selection. The fundamental question e.g.: How much are you willing to pay…? is then supplemented by more specific questions to illustrate the personality of the respondents. The last phase concerns the evaluation.

This method is often discussed due to the high probability of distortion of the results. This distortion can be of three kinds:

- Information: due to the quality and quantity of information provided to respondents.
- Strategic: respondents can answer their intentionally under- or overestimate in order to influence the real cost of the environmental goods. For example effort to reduce ticket prices to rock cities, reserves, parks, natural swimming pools etc.

[1] A similar discrepancy exists also within one generation. Willingness to pay is based on the ability to pay. Willingness of the poorer to pay for conservation of natural resources will be probably lower than by the wealthier. It is possible this contradiction resulting from income differences eliminates through the application of a more equitable tax system.
[2] In certain cases, the evaluation can be carried out indirectly through damage to health and property.
[3] The economic costs are estimated from changes in worker productivity. This method does not reflect the subjective assessment of health, costs of pain and suffering and other relevant factors.
[4] The causes of this result are psychological.

- Methodology: there can be a wrong formulation of questions or the wrong choice questions. With open questions is danger of extreme values, a dichotomous choice can influence the decision of the respondent (Seják, 2002).

2.3 The use of observational preferences

In the case of observational preferences is used method of hedonic prices and travel cost method. Hedonic prices method assumes the existence of a market for tradable goods which is influenced by non-market goods environment. The economic value of the environmental service is appreciated that directly affects the market price of a product. This method is used in the real estate market. The method is applicable only if it excludes the effect of other factors that determine the price of real estate (utilities, amenities, transportation). If these parameters in both cases are the same, it can be argued that the different real estate price is due to the quality of the environment (e.g. due to contamination of the water source, the load area emissions, noise, access to the park, etc.). The difference in prices can be characterized as a willingness to pay for quality of the environment. The main disadvantage of this method is the limitation of its use and the high demands on accurate information about the real estate market and elimination secondary factors (Seják, 1999).

The second method, which is used in case of observational preferences, is the travel cost method. This method has been used since 1949. This method comments on the value of holiday resorts, such as protected landscape areas, national parks, water levels and other attractions. The award takes into account the financial and time demands of the site - the distance the visitor must undergo, transport costs, visit duration, frequency of visits etc. The basic idea is to use information about transport costs as an estimate people's willingness to pay for staying in a holiday resort.

The procedure begins with the determination of zones at different distances from recreation sites and realization research in these areas in order to get the average number of visitors to the recreation sites from each zone. The second phase is to determine the financial costs necessary for the journey from individual zones to recreational sites and generate demand curve of the recreational area and determination recreational values of the area.

The main advantage of this method is its wide applicability. Distortion result may occur because of the so called multipurpose visit. Visitation of locality may be part of the round trip which includes a visit as well as other locations. The visit may be just turning on the route e.g. stop on a business trip, visiting relatives etc. In this case, it must be observed outcome spread among multiple locations. The principal disadvantage of this method is that it reflects the factors concerning only arrival. The actual recreation and factors associated with residence in a given location are not taken into account, so this method underestimates the total value of resources (Seják, 2002).

2.4 The expert forms of expression values of the environment

Shortcomings of these methods described above led in recent years to use other ways to evaluate environmental goods. One of the so called expert forms of expression values of the environment is a Hessen´s method. Using that no the valuation of by consumers, but through environmentalists who have relatively more knowledge about the life-giving functions valued resource (Seják, 2002). Hessen´s method has been using in Germany for 30 years and is currently steering it into a charge loss and subsidies for improving area, which occurs due to human activities. Hessen´s method is also included in the so called European Commission White Paper (EU, 2011).

3 Conclusion

Increasing human population treats with natural capital as a free good. From generation to generation, people inherit this kind of capital, which have been generating over 3.8 billion years. Over the last century, however, due to economic activities disappeared half wetlands and half of the forests. Only in the Czech Republic has been for the past 50 years dried one million hectares of farmland. Therefore, approximately economic valuation of the environmental value of goods is the first step to include the services that nature provides in planning national policies. And it means change for public behaviour and a prerequisite for sustainable development for future generations.

On various economic aspects of the environment can be viewed from different views. One option is a view in terms of subjects operating in the developed economy, the other one would be from the perspective of developing countries, where focus on environmental protection „is postponed to another track because of logical reasons". In terms of developed countries, there is given the emphasis on water protection, economical use of this resource and its pollution control. From a global perspective, however, 2.4 billion people are not connected to the sewerage system and 1 billion people lacks access to safe drinking water. Hardly in such conditions will be an emphasis on protecting natural water supplies, when the company does not have it (UN, 2015).

Generally, it can say that environmental protection is applied in societies where they are provided basic human needs and where local inhabitants are not in danger of life and health. Afterwards other sophisticated social goals can be observed and checked. Access to natural resources is therefore influenced by many factors, including political influences, access of government, institutional conditions, religion, ethnic, historical and other features of the individual economies. This, however, given the scale of the issue, is not the subject of this paper, which focused economic contexts in a developed economy.

Literature:

1. European Union: *White Paper*. I. issue. Luxembourg: Publications Office of the European Union, 2011. 32 p. ISBN 978-92-79-18270-9.
2. Farský, M., Ritschelová I. et al.: *Makroekonomické souvislosti ochrany životního prostředí*. I. issue. Praha: C. H. Beck, 2010, 201 p. ISBN 978-80-7400-308-0.
3. Moldan, B. et al.: *Ekonomické aspekty ochrany životního prostředí*. I. issue. Praha: Karolinum, 1997. 307 p. ISBN 80-7184-434-9.
4. Seják, J. et al.: *Oceňování pozemků a přírodních zdrojů.* I. issue. Praha: Grada Publishing, 1999. 251 p. ISBN 80-7169-393-6.
5. Seják, J.: Principy a metody oceňování životního prostředí. *Zivotne prostredie*. 2002. vol. 36, nr. 1, p. 10 – 13, ISSN 1335-4175.
6. Šimíčková, M.: *Ekologická politika*. I. issue. Ostrava: Ostravská univerzita, 2002. 126 p. ISBN 80–7042-230-0.
7. Ritschelová, I., et al.: *Politika životního prostředí, Vybrané kapitoly, Environmentální management*. I. issue. Ústí nad Labem: Univerzita J. E. Purkyně, 2006. 232 p. ISBN 80-7044-779-6.
8. Vatn, A.: *Institutions and the Environment.* I. issue. Northampton: Edward Elgar Publishing, 2005. 481 p. ISBN: 1-84376-100-9.
9. Van den Bergh, J.: Ecological Economics: Themes, Approaches, and Differences with Environmental Economics. 2000. *Tinbergen Institute Discussion Paper*. Available from: <http://www.tinbergen.nl/discussionpapers/00080.pdf>.
10. United Nations: *United Nations Peacekeeping Operations: Principles and Guidelines* [online]. New York: United Nations, 2014. [see 10-10-2015] Available from: <http://www.peacekeepingbestpractices.unlb.org/pbps/library/capstone_doctrine_eng.pdf>.

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