Methodological issues of monetary valuation of natural resources

Article · January 2015

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Abstract

In conditions of formation of market relations the active application of economic methods of influence on the use of natural resources and the environment becomes an important issue. This activity is a part of the state regulation of economy and the task of environmental economics is not to reduce the preparation and maximization of economic benefits in this area. Natural environment is an independent value, and in modern conditions the society must use natural resources rationally and efficiently and protect the environment (the so-called existence value).

Keywords: natural resources, rent, value, cost, assessment, environmental management (rational use of natural resources), environmental economics.
JEL Classification: insert please.

Introduction

Economic evaluation of natural resources consists of accounting, measuring of stocks of natural resources and their monetary value. For objectivity, it is necessary to carry out the detailed assessment of resources in physical indicators at the regional level and then to add it to monetary value. As a result, the real situation of the state of natural resources (Gabdrakhmanov, Rubtzov, Shabalina, Rozhko, Kucheryavenko, 2014) which is necessary for the development of effective public policy is formed.

The definition of the number and quality of natural resources with the account of current conditions of demand and supply on the market of the production factors is the basis of the economic assessment of natural resources. At the following stages the assessment is adjusted on the basis of a series of constraints defined by 'proposal': depending on the stock, location, possible mining technology and the environmental condition (Denmukhametov, Zjablova, Shtanchaeva, 2014; Safiullin, Gafurov, Shaidullin, Safiullin, 2014).

The definition of the physical quantity of stock of each type of resources is the main way to measure exhaustible non-renewable resources such as mineral resources. Thus, the quantity of mineral resources is determined by the size of accumulated stocks, namely tons of reserves of coal, oil, metal ores, cubic meters of natural gas, etc. Soil (land) resources that combine the renewable and nonrenewable properties are measured by the size of the territory they occupy with the definition of land (soil) types of different productivity. The latter is based on soil properties which are important for agricultural use. Indicators of content of humus and essential nutrients (N, P, K, Ca) in the soil, depth of humus horizon and acidity are most common among the variety of indicators (Denmukhametov and Zjablova, 2014; Gabdrakhmanov and Rozhko, 2014) that characterize agricultural productivity of lands.

Forest resources are renewable, but with a long cycle of reproduction, namely 50-100 years. That is why they are measured as indicators of accumulated stocks (the size of wooded lands, the size of reserves in cubic meters) and the annual productivity – the stock addition per unit area (in cubic meters per 1 ha per year). According to the economic importance, the maintenance, environmental protection and reserve of forests are highlighted.

Water resources are considered to be inexhaustible, but because of their variation and instability of distribution in space and time, they move into the category of exhaustible in some places. Sources of water resources can be used simultaneously for different purposes – water supply, shipping, hydropower, fishery, recreational and sport purposes. Size of stocks and water quality are characterized depending on the method of use.

1. Method

There main approaches to money value of natural resources are the following:

1. *Cost-based approach* (often known as cost, taking into account the costs of labor that form the cost) is based on determination of labor cost value. It is usually applied when assessing mineral-primary resources as exploration costs (*Ce*), development costs (*Cd*), as well as the cost for

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restoration of the lost or degraded sources (*Cr*) of resources:

$R = Ce + Cd + Cr$.

Thus, the resource value is equal to the labor costs for its exploration, development and restoration (preservation). The drawback is that the worst resources often get a higher score as far as more labor costs – in comparison with better ones – are required for their development.

2. *Rental approach* (from the perspective of the differential rent or the relative value) is based on identification of additional economic benefit (cost impact) resulting from the use of this (better, as a rule) source of resources – in comparison with the other (worse). With this approach, differences in natural properties of the sources of resources (their stocks, quality, mode of occurrence, location) are reflected in the index of evaluation. Additional profit is gained due to these differences. This additional profit is an indicator of economic valuation of natural resources (*Ee*). *Ee* is the difference between costs of the worst areas (*Cm* – marginal costs) and costs of the evaluated source (*Ci* – individual actual costs).

Such a method of assessment is used to select the best option of using the renewable sources of resources that bring maximum profit with minimal costs [6]. The drawback is that the evaluation is possible only on the basis of comparison. Moreover, the worst unprofitable sources of resources are not estimated at all.

3. *Market prices*. While making the monetary assessment, the market-based valuation of natural resources should be considered and, if possible, used in all cases (mineral resources or renewable resources).

However, it is difficult to consider that market prices of mineral resources (and other natural resources) are definite and easy to be applied in the information model of monetary valuation of natural resources. Thus, according to the Russian Finance Ministry, today there is no any mechanism of determination of market prices of hydrocarbons, although the operating procedures of market prices are regulated by Article 40 of the Tax Code of the Russian Federation (TC RF) (Gabdrakhmanov and Rubtsov, 2014; Mingaleva and Bunakov, 2014). According to the TC RF, official sources on market prices and stock exchange quotations are used to determine the market price of goods. In this regard, the auction prices are of particular interest. For example, "Rosneft" buys oil for export in all regions at auctions with the preliminary announcement of the starting price. The state-owned oil (obtained on the conditions of the PSA (Production Sharing Agreement) or in the form of payments for the right of mineral resources (subsoil) use, etc.) can be sold in stocks exchanges. It will allow creating a domestic oil market with economically sound regional differentiation of prices. Thus, the government is able to create a working mechanism for the determination of oil market prices. Such mechanism also could be offered in other branches of natural resources, having created the raw material stock, and get quoted prices of relevant market prices. Publishing the offers with prices and conditions of goods purchase, the regional trade-intermediary companies will be able to develop the mechanism of formation of market prices for natural resources. And then we will not be able to sell resources at reduced prices (including abroad) and use low prices to reduce tax and environmental charges (Gabdrakhmanov and Rubtzov, 2014; Gabdrakhmanov and Rubtsov, 2014; Gabdrakhmanov, Rozhko, & Kucheryavenko, 2014).

4. *Cost-based approach* (from the perspective of the market value of the resource). Exactly this approach should be used for the estimation of mineral resources, as far as it is an attempt to combine cost-based and value approaches. For mineral resources the value of the flow acquires market value at the moment of extraction and it is equal to the world price for the resource minus the cost of extraction. It is necessary to say that the world prices change very rapidly; it is enough to track, for example, the fluctuations of the price of oil or gold. However, net income – price – cost of extraction is the best indicator of the value of the flow of resources for the community. Of course, for the calculation of net income we have to take into account all relevant costs, including the cost of the natural environment.

5. *Value approach*. According to this theoretical approach, the product value in the market is defined by the consumer on the basis of his subjective preferences. Markets for the flow of services – not for stock of resources – are the most common in environmental economics. We mean, first of all, forest resources of the Russian Federation which belong to the state and do not have the realistic market price. The main value of these resources can be expressed in terms of today's value of future rent. It is calculated in the following way. Let us assume that a specific resource is operated at a rate of *X* units a year. The resource price sold in the moment of operation is *P*, and the cost per unit is *C*, whereas the net income in the first period is equal to *R*,

where $R = P - C$. If the resource is operated sustainably, X units can be produced a year. Then the cost of forest area will be equal to V, where

$V = X * (P - C)/d$,

where d is the coefficient of discounting.

The choice of this factor is a problem. Acceptable, real discount rates of discounting are in the range of 2-4% a year. This method can be used to calculate the value of forests, commercial food fish and other renewable resources.

Approaches based on determination of rent and discounting, also have their drawbacks. The task of transferring tax burden on rental income gained by users of mineral resources from the operation of natural resources owned by the Russian Federation, was already officially formulated in 2000. However, in practice, in the result of replacement of resource payments exactly the cost of raw materials produced at a rate of about 10% – not the natural rent at the rate of 70-90% – is taxed on mining operations (which is of an excise – not rental – nature).

6. *Willingness to pay*. The basis of assessment is willingness of existing and future users to pay some natural resource or willingness to accept payment for the loss of this resource. It is used in the evaluation of renewable resources in case of absence of market prices. Here the actual value of use is the most obvious for understanding and determination. It is derived from the existing use of certain natural resource. Fisherman, hunter or landscape painter use environment, obtaining benefit from its value. In contrast, the existence value constitutes more problems, as far as it implies the values that are in the very essence of the phenomenon and that are not related to its actual use (Komarova, Zjablova, Denmukhametov, 2014). This value occurs in case of care, sympathy and respect for the rights and welfare of all living beings, not just of human being.

2. Result

Direct and indirect methods of assessment are used here. For example, the subjective assessment method uses the direct approach. People are asked how much they are ready to pay for this or that benefit. Personal assessment of respondents concerning the increase or decrease of benefits, namely, subjective assumptions on the hypothetical market, should be the result. Respondents say they would be ready to pay or endure, if there was a market of the considered benefits. The value of clean drinking water in terms of money is determined this way. However, the idea of such subjective market is accepted to include not only immediate benefit (improvement of landscape, water quality, etc.), but also the organizational context, and funding to provide this benefit.

The main attractive aspect of the subjective evaluation method is that this technique is technically applicable to all circumstances. The aim is to identify estimates or suggested prices close to those which would be if there was a real market. In this case, the respondent should be familiar with the considered profit. If this benefit is to improve the landscape, good understanding of the benefits can be achieved by showing the photos of the landscape to the respondent in the presence and absence of specific contamination. The respondent should also be familiar with the hypothetical means of payment, such as a local tax or fee for entry.

The person who conducts the survey, bids the starting price (the price of the initial proposal), and the respondent agrees with it or rejects it. Then the procedure is repeated: the starting price increases until the respondent declares that he is not ready to pay such sum for additional increment of the benefit. The subjective evaluation method is widely used to identify the value of improvement of water quality, benefits from reduced air pollution, from the choice and value of the existence of different species of flora and fauna, or plots of land.

Indirect approaches for the assessment of natural benefits are calculatedd not on individual preferences, but the ratio “dose-response” between the source (e.g., deforestation) and the effect (soil erosion). When the loss is identified, it can be measured by market units or by the direct methods of assessment. Examples of relations “dose-response” include the impact of pollution on health, results of contamination of aquatic ecosystems, the influence of soil erosion on agricultural crop yields, etc. But here, it is also necessary to make allowance for the uncertainty: the fact that people adapt to changes in the environment is often not taken into account. For example, other agricultural crops are grown as the state of the soil changes, if not to take this into account, it is possible to underestimate benefits from such changes.

Thus, the monetary value of natural resources can be defined as consisting of market-based and non-market-based valuation. Market-based valuation is the equilibrium price set in the market of production factors as a result of equation of demand and supply. It can be direct (in the existing markets) and indirect (with the account of price of substitute products – substitutes in the markets of substitutes). Nonmarket-based monetary valuation is received on the declared (willingness to pay, for example, to clear up: how much city residents are ready to pay for

ecologically clean water) or identified (e.g., evaluation of significance of the city park for residents) preferences of population.

Conclusions

All existing approaches to the assessment of natural resources have disadvantages, for example, market prices are variable, too approximate and imprecise concerning "willingness to pay", etc. That is why it is necessary to apply various approaches to the assessment of resources. In case of monetary assessment in all cases (non-renewable and renewable resources) it is necessary to consider and use market valuation of natural resources. Such assessment can be applied to produced resources, as well as to "natural" funds. However, some resources (e.g., forest biota) can be rarely considered in market prices, although it is possible in some cases.

Monetary valuation allows assessing the resource potential of the territory integrally (summarily). Monetary valuation allows to choose the direction of the use of particular natural resource more reasonably and determine the strategy of rational use of the natural resource potential of the territory as a whole, with the multipurpose use of natural resources and objects. For many types of natural resources the monetary valuation should be a dynamic stochastic model that takes into account the dynamics of market prices, costs and factors that effect on them.

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