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AUTHORS' APPROACH TO THE TOTAL ECONOMIC VALUE: ESSENTIALS, STRUCTURE, EVOLUTION

Total economic value concept operates as a consistent approach for economic evaluation of natural resources in the context of exacerbation of the ecological crisis and overexploitation of natural resources. However, the essence and structure are still the subject of scientific research. This article determines that along with the existence of subjective, ideal and real values, the subjective values are the most interesting from the point of view of economic evaluation and distribution within the framework of the total economic value concept. The presented genesis of the term of "value", analysis of the total economic value concept development and the theory of ecosystem services contributed to the creation of an author's approach to the distribution of values. We justify the inclusion in indirect value the cultural services as opposed to the direct value; option value takes into account the value in use by future individuals; we remobilize the quasi-option value in the structure of total economic value. The paper provides an improved total economic value model. This model takes into account the time aspect, the understanding of the term "value" and theoretical principles of ecosystem services and author's principle of value evaluation – "based on the best possible alternative". The practical implications of the research is to improve the economic mechanism of government regulation of natural resource management by clarifying and improving the consistent basis for the economic evaluation of the value of natural resources for making managerial decisions on their involvement in economic turnover.

Key words: *total economic value, essence, structure, evolution, ecosystem services, natural resource*
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Introduction

One of the key problems of the international, national and regional economic regulation from the viewpoint of the management ethics is economic determinism dogmatizing self-adaptive "system rationality" cultivated by the ideal liberal economic theory of a "free" market based on shareholder value. In the meanwhile, reproduction of renewable and nonrenewable natural resources in the conditions of the globally exacerbated race for control over mineral wealth and the environmental degradation spotlights the problems of the analysis and appraisal of natural resources not from the standpoint of subsoil assets, or Populism, or a package policy but in the system approach in the framework of socio-ecological-and-economic problematics. Human society starts to realize that the nature and the environment are not simply the sources of exchange value of resources for public production but also have consumption value governing development of the mankind [1, 2]. The ecological-and-economic problematics dictates considering natural resources as a part of ecosystems with regard both to their exchange value and ecosystem functions. To that end, at the current stage of the ecological-and-economic science, the concept of total economic value is highly prevailed as the most complete mineral wealth assessment procedure which allows accounting for natural resources within ecosystems. The system approach is to date the most widespread and promising technique in economic, social [3] and

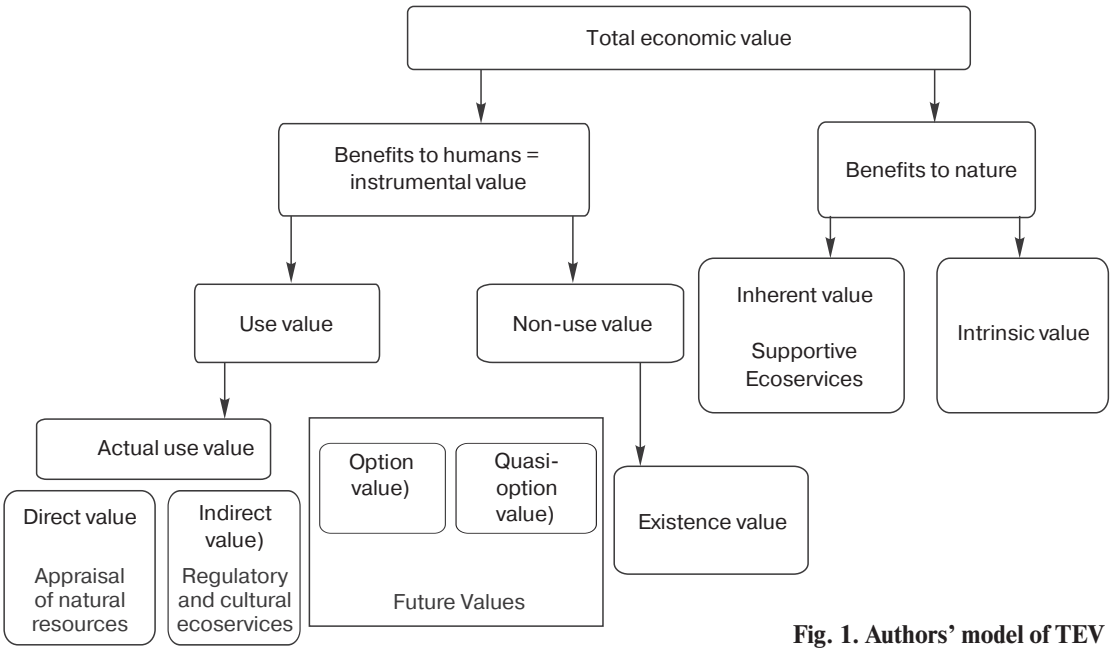


Fig. 1. Authors' model of TEV

ecological sciences [4, 5]. This concept makes it possible to assess all four functions of natural capital: resources, regulation, culture and health. The modern literature offers a number of different variants of Total Economic Value structure. One of the most widely accepted structures described in [6–10] is: Total Economic Value = use value + non-use value. In turn, Use Value = direct use value + indirect use value/ ecological value + option value; Non-Use Value = existence value + bequest value) [8, 11]. Review of the recent researches reveals a methodological inconsistency of the common structure of the total economic value. This article is an attempt to smooth out the inconsistencies by means of the comprehensive analysis of the genesis and key notions of the Total Economic Value (TEV) concept.

There exists a plurality of expert opinions both on the name — Total Economic Value and on the use of the terms "price", "cost", "value" and "usefulness" in economic research. Within the bounds of this analysis, we propose to use the apparatus of categories and notions as below:

- *Cost of goods* — money equivalent of value of goods; the cost of possession of goods is inseparated from the cost of goods;
- *Value* — attitude to goods, owing to which goods become significant to public; realization of Value makes Cost of goods. Thus, Cost is only measured in money while Value can have another, including alternative, expression;
- *Usefulness* — "conditionally constant" part of Value reflective of applied and practical significance of goods; characterizes degree of satisfaction with goods;
- *Price in general* — proportion of exchange of goods, or money equivalent of goods; in the market-oriented or mixed economic system, Price acts as an equivalent of Cost of specific goods in a specific market.

It is also worthy of mentioning that currently the notions of Price and Cost approach as the development in economic relations results in the fact that increasingly more factors defining value can be estimated in terms of money. Nonetheless, Total Economic Value incorporates indexes of money value and indexes of alternative expression. The values composing the Total Economic Value, in turn, have price evaluated in economic research.

Theory of the Total Economic Value (TEV) and the authors' approach

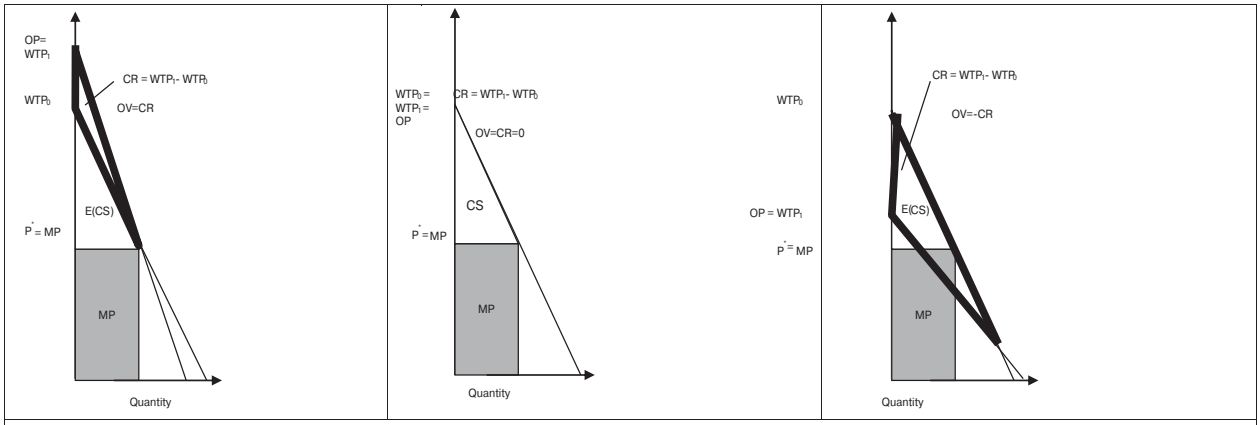
With regard to historical analysis of the definition of value and considering expansion of the Total Economic Value and theory of ecosystem services in [12], the authors put forward a new structure of TEV (**Fig. 1**).

This structure is based on the fact that Value, treated subjectively, can show itself as natural and human benefits composed of such values as:

1. *Intrinsic Value.* Subjective primitive evaluation of anything, either for the sake of itself, or having an unavailable supersensible or a signature value [13, 14], or moral value. Since Intrinsic Value is linked with the assessment object and is sometimes an object of ethics, scientists agree that it cannot be monetized [15–17].

2. *Inherent Value.* Utility directly represented by an estimation object (opposite to moral and physical aspects possessing Intrinsic Value). Inherent Value embodies supportive ecosystem services; for this reason, most scientists subconsciously comprehend that this kind of services is methodologically incorrect to evaluate in money terms [18, 19] but reason this idea by only anxiety that supportive services will be twice accounted within regulatory services.

3. *Instrumental Value* is the value of an object to reach set objectives, functional impression of an object, which, in turn, is identified as Exchange Value and Consumption Value. Within this concept, Instrumental Value is conventionally split into Use Value and Non-Use Value. Direct Value is understood as the evaluation of the resource function of natural capital: appraisal of mineral, earth, water and biological resources. Indirect Value is treated as the evaluation of regulatory and cultural ecosystem services. The Indirect Value includes cultural services as society uses natural resources to satisfy its own aesthetic, educational or vocational needs. Regarding definitions of Option Value, the authors better like the Pearce–Turner interpretation of Option Value as an expression of public



MP — market price; CS — consumer surplus; E(CS) — expected surplus; E(CS) = CS); P* — equilibrium price; WTP_0 — willingness to pay without risk adjustment; WTP_1 — willingness to pay with risk adjustment; OP — option price; OV — option value; CR — correction for risk.

Option Value (Scenario 1)	Option Value (Scenario 2)	Option Value (Scenario 3)

Fig. 2. Option Value

preferences, willingness to pay for the mineral wealth and environment preservation towards future utilization, which is a sum of value in use by the individual, value in use by future individuals (descendant and future generation) and value in use by others (vicarious value to the individual). Pearce and Turner understood the latter as the value of services provided by nature, while the present authors interpret Option Value as the value in use by the present-day society and by future individuals. At the same time, in this case, it is not quite correct to speak about a "sum of values" as Pearce and Turner put it since, mathematically, the estimate of Option Value is a difference between the public willingness to pay for the natural resources of ecosystems, adjusted with respect to risk and future uncertainty, and the current willingness to pay for the preservation of ecosystems and their resources. The authors hypothesize that Option Value fluctuates in a range of $(-\infty; +\infty)$. Put it otherwise, following Pearce and Turner, the authors agree with the definition of the hazard pay as the difference between the willingness to pay, namely, Option Value, which is higher than market price ((WTP — Market Price) or Option Price) and Expected Consumer Surplus, where the latter equals the current Consumer Surplus since human "decision-making is based on expectations about the future" [20]. It is worth mentioning as well that Inherit Value of value for future generations is included by the authors in Option Value.

Thus, estimation of Option Value needs to find WTP adjusted with respect to hazards and future uncertainties and the current WTP and to calculate their difference (**Fig. 2**). The point is to evaluate risk and uncertainty of the future demand and supply of natural resources, which govern adjusted value of WTP variable in the range $[0; +\infty)$. Accordingly, the sign of Option Value is determined based on the conditions compiled in **Table 1**. It should be commented that WTP estimates, which are basically economic estimates of Existence Value multiplied by population of a territory under analysis, are essentially different in the world depending on income level of people and their ecological knowledge governed by economic advancement of a country. For example, citizens of developed countries will to pay for existence of natural resources round USD 10–50/man annually, while population of other countries is ready to pay no more than USD 1/man per year.

According to domestic researchers, willingness to pay in Russia is round USD 1/man per year. This figure is confirmed by the studies undertaken in Moscow to determine willingness of population to pay for the environment protection (1999) and by Stetsensko's investigation accomplished in the Kola Peninsula (1999, Monchegorsk) [6].

4. *Quasi-Option Value* is a value of future profits which can be lost if people choose the modern-stage direct use scenario. The authors reject the assumptions made by Pearce and Warfard that "quasi-option value is always positive" [21]. Introduction of this value in the structure of Total Economic Value is governed by the importance of the lost profit statute in the legal system of Russia (§ 2, article 15, Civil Code of the Russian Federation). The sign or trend of the Quasi-Option Value will depend on usefulness and rarity of natural resources of ecosystems based upon the limited usefulness theory (**Table 2**).

Economic appraisal of Quasi-Option Value requires detailed and comprehensive research. It is only undisputed that the result will make the size of an increase/decrease of the Direct Value+Indirect Value+all values connected with non-use of a resource, which will be lost in case of choosing the modern stage scenario.

5. *Existence Value* is a basis of Non-Use Value. The authors enter into the interpreta-

Table 1. Authors' concept of Option Value calculation

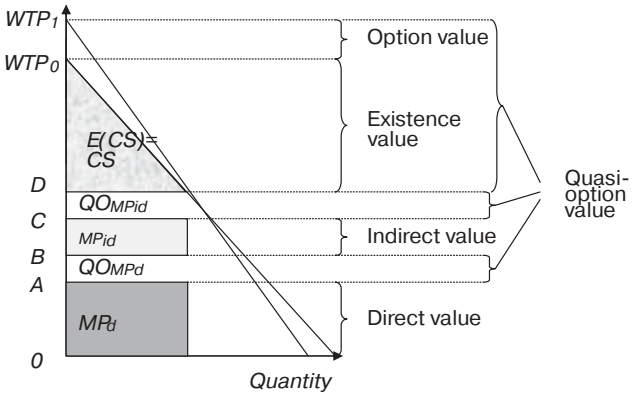
Scenario	Condition	Willingness to pay without correction for risk	Willingness to pay with correction for risk	Option Value OV = Correction for risk CR	Sign of OV
1	$WTP_1 > WTP_0$	$WTP_0 \times Q$	$WTP_1 \times Q$	$WTP_1 - WTP_0$	+
2	$WTP_1 = WTP_0$	$WTP_0 \times Q$	$WTP_1 \times Q$	$WTP_1 - WTP_0$	0
3	$WTP_1 < WTP_0$	$WTP_0 \times Q$	$WTP_1 \times Q$	$WTP_1 - WTP_0$	–
Comment: Q — population of the territory under analysis, men.					

Table 2. Authors' concept of Quasi-Option Value

Future scenarios for resources of ecosystems			
1	2	3	4
U↑R↑	U↑R↓	U↓R↑	U↓R↓
QOV↑	QOV = const or ↓		QOV↓
Comment: U — usefulness of natural resources; R — rarity of natural resources; QOV — quasi-option value.			

tion of Existence Value as human satisfaction with the conscience of nature existence without reference to altruism and any utilization of natural resources [22]. "Reference to altruism" is questionable as "altruism" is, linguistically, an antonym of "egoism". The fact of temporal non-use and conservation of natural resources for the sake of future generations and nature itself is an altruistic deed, thus, the altruistic value by Davidson simply overburdens TEV. The present authors include Davidson's components of TEV in the Option Value (value of satisfaction with the conscience of benefits obtainable by the contemporaries and future generations) and Existence Value (satisfaction with the conscience of benefits obtained by nature). Consequently, definition of Value of Existence reduces to the statement that this is a human satisfaction with the conscience of the nature existence with reference to altruism relative to the nature itself without intention to use it.

Thus, the diagrammatic model of all values favorable for a human being and included in the structure of TEV (under implementation of the first scenarios in determination of Option and Quasi-Option Values, as well as subject to the formed market of ecosystem services) is shown in **Fig. 3**. It should be mentioned that Quasi-Option Value includes a significant part of other values; for this reason, for economic appraisal of Quasi-Option Value solely, in order to avoid double counting, it is required to take into account only the sum of the segments *AB* and *CD.*



MPd — market price of natural resources; *MPid* — market prices of ecoservices provided by natural resources of ecosystems; *CS* — consumer surplus; *E(CS)* — expected consumer surplus *(E(CS) = CS); P** — equilibrium price; WTP_0 — willingness to pay without correction for risk; WTP_1 — willingness to pay with correction for risk; QO_{MPid} — future financial increase due to implementation of ecosystem services provided by natural resources of ecosystems in case of choosing the variant of their conservation at the current stage; QO_{MPd} — future financial increase in case of choosing the variant of actual use of natural resources at the current stage.

Fig. 3. Author's diagrammatic model of TEV

Results of Total Economic Value assessment

Assessment of value of any natural resources of ecosystems should include both the current values and future values [23]. This is required to improve efficiency of governmental control in nature management, which is one way or another based on economic appraisal of values of the available natural resources. The latter, eventually, influences the value and mechanisms of distribution of added value due to direct and indirect use of natural resources of ecosystems [24]. Accordingly, appraisal of value of natural resources in ecosystems can have two variants: (1) appraisal of value for the contemporary generation; (2) assessment of value including interests of the future generations. It is worthy of mentioning that values of different natural resources are highly specific. For instance, mineral resources can only provide supportive and, sometimes, cultural services. Cultural eco-services are possible upon condition that an object holding mineral resources under appraisal is assumed as an object under protection or object of cultural heritage by, first, law and, second, scientific community based on the proven uniqueness, which promotes development of recommendations on assigning legitimate statuses to such objects. In turn, other resources can be used directly and indirectly simultaneously, either these are water, earth, or biological resources. Even forest flora (given the mankind rejects its complete demolition scenario) can be used for getting wood by means of leave-tree cuts, i.e. sound extraction of timber (which, basically, is assumed by the forest industry experts as a synonym of forest reproduction as it prevents risk of fires in summer) and as an object of recreation. This is a benefit of both direct and indirect value. On the other hand, there is a great many variants of direct use of natural resources, and Russian and foreign scientists think that summing-up of all these variants inadequately raises the value of natural resources the more so as only one direct use variant is only possible in reality. For example, it is possible to obtain maximum commercial wood from birch or pine trees and to use wastewood as fuel, or to consume all birches and pines to make fuel wood. Naturally, commercial wood has a higher value than fuel wood. In this case, it is proposed to introduce the authors' principle of evaluating the best possible alternative. The TEV formula is be given by:

TEV = Benefits to human + Benefits to nature;

Benefits to human = Direct Value + Indirect Value;

Benefits to nature = Inherent Value + Intrinsic Value;

Non-Use Value = Existence Value

Scenario 1:
Use Value = max (Direct Value) + Indirect Value;

Scenario 2:
Use Value = max (Direct Value) + Indirect Value +

+ Option Value + Quasi-Option Value.

Results and discussion

The authors' concept of TEV was tested in terms of the Berezovo district in the Khanty-Mansi Autonomous Okrug–Yugra using methodical framework of appraisal of Indirect Value and Direct Value [25, 26]. As a result, the Total Economic Val-

Table 3. Total value of natural resources in the Berezovo district, KMAO, scenario 1

Index		Natural resources					Total
		Minerals	Earth	Water	Biological resources	Ecosystem all in all	
Use Value	Direct Value	11243921,00	33,45	740733,33	622192,32	–	12606880,10
	Indirect Value	0,00	10335268,91	314194,17	50393195,63	246219,54	61288878,25
	Option Value (scenario 1)	48187,50	48187,50	48187,50	48187,50	–	192750,00
	Quasi-Option Value	3694,38	2380806,22	75959,03	11594129,37	56630,49	14111219,50
Non-Use Value	Existence Value	16062,50	16062,50	16062,50	16062,50	–	64250,00
Total Economic Value of natural resources: *variant 1*		11259983,50 (15,42)	10351364,86 (14,18)	756795,83 (1,04)	50409258,13 (69,03)	246219,54 (0,34)	73023621,87 (100,00)
Total Economic Value of natural resources: *variant 2*		11311865,37 (12,95)	12780358,58 (14,63)	880942,37 (1,01)	62051575,00 (71,06)	302850,04 (0,35)	87327591,36 (100,00)
Comment: Indexes in brackets are given in percentage terms.							

ue of natural resources in the Berezovo district in 2016 in case of Scenario 1 of the Option Value assessment totaled 73023,62 MRub in the first variant and 87327,59 MRub in the second variant including future values (**Table 3**). The Direct Value appeared to be 5 times less than the Indirect Value.

Conclusion

These estimates can be used to substantiate instruments of economic mechanism of nature management, as well as in development of subsoil use strategy for any level of control: federation, subjects of federation and municipal government.

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