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ECONOMIC BENEFITS OF BIODIVERSITY CONSERVATION (CASE STUDY OF THE BULGARIAN DANUBE ISLANDS)

Basic components of values of biodiversity have been analyzed. The methods of estimation of various benefits of biodiversity conservation have been exposed with an emphasis on the contingent valuation methods. On the basis of the questionnaire prepared by the author various Willingness-To-Pay (WTP) values have been estimated for the non-use value benefits. Various estimations of the basic components of the value of biodiversity have been commented based on case study of the Bulgarian Danube islands. The results demonstrate relatively high WTP in favor of restoration of natural forests on the Danube islands, which is expected to promote the development of tourism and recreation, commercial and non-commercial fishing and hunting. It is expected that the growth of revenues from activities stimulated by biodiversity conservation as tourism, recreation, etc. will compensate the reduction of revenues from the reduced felling of timber from the poplar plantations.

JEL: Q26; R14

Biodiversity conservation has an increasing economic significance especially in the transition countries due to tendencies endangering wild nature. The estimation of the economic benefits can be regarded as an important element in the decision-making of sustainable use of natural resources and environmental protection in their regional and global dimensions.

Important element in this estimation is the calculation of the value of biodiversity conservation. The quantitative analysis and in particular the evaluation of components of environment made significant progress in the last decades, which reveals wide opportunities of the further development of the economic theory of environmental protection and of finding important practical solutions in this direction.[1]

This paper is practically oriented. It outlines the basic components necessary for estimation of the economic benefits of biodiversity conservation taking into account the present theoretical development and its practical applications. An attempt is being made to illustrate the basic theoretical postulates in a case study of biodiversity conservation on the Bulgarian Danube islands.

Basic economic benefits of biodiversity conservation

No doubt the benefits of biodiversity conservation are of great importance. The economic science has developed a broad spectrum of approaches for their evaluation with alternative methods for identical benefits. These methods allow to

[1] See: *Pearce, D., K. Turner.* Economics of Natural Resources and the Environment. Harvester Wheatsheaf, 1990*; Hanley N. and C. L. Spash.* Cost- Benefit Analysis and the Environment. Edward Elgar, 1993.

reveal a variety of economic benefits as a result of biodiversity conservation and to outline appropriate decisions for the policy in this field.

Various opinions exist about the way these decisions and alternatives are to be produced. Here we follow the opinion that the economic science in its professional not populist application should not restrict economic activity within the hard sustainability, but to allow flexible solutions. In the transition economies, however, there is strong implementation deficit in economic, including environmental policy, which as a result turns a lot of very correctly formulated decisions into desperate results. This is, however, not a problem of the very theory, but of its practical application, which by its side can also be a theoretical problem. From this point of view, when we analyze the benefits of biodiversity conservation we look for those alternative approaches, which allow this conservation to be a source of economic benefits not at the expense of the environment. A task, which is controversial in its formulation, but quite attainable in case of its correct interpretation and a good political will.

The numerous researches in this direction allow outlining a scheme of basic benefits of biodiversity conservation, which despite all conditionality treats biodiversity as a specific commodity. The estimation of these benefits is produced by approaches, which measure various aspects of biodiversity, valuing it as a commodity.[2] The conditionality of the scheme comes from the following features:

- There is no market for most of the environmental goods and thus there is no other pecuniary measuring rod for their estimation in the traditional sense of this word beside the Willingness-To-Pay (WTP) measure.
- The various attributes of value of environmental goods (actually the benefits of them) often are estimated as consumer surplus, which they create. Related to biodiversity it is assumed that these benefits are so numerous than actually it is impossible to measure all consumer surpluses created by them. The research experience concentrates around several basic attributes, which we further analyze.

It is important to note at this stage, however, that as a matter of fact biodiversity is a global commodity, that is, its importance cannot be restricted within the boundary of a region or even continent. It means that this commodity creates consumer surplus both for the direct users (visitors) and for global community. To some degree this surplus emerges even for individuals, who will never visit the places of its habitat, but would be satisfied to know that biodiversity exists (even in a sense of some countervailing mitigating measures against possible apocalyptic consequences of development).

Within these notes we can follow one turned already into traditional division of economic benefits of biodiversity conservation:

[2] We apply here modified scheme used in *Johansson Per-Olov*. The Economic Theory and Measurement of Environmental Benefits. Cambridge University Press, 1991.

Use benefits: direct and indirect use benefits – benefits of development, induced benefits, etc.

Non-use benefits, coming from various attributes of value: bequest value, existence value, etc.

The name *"Direct benefits"* comes from the fact that they can be directly measured. The reasoning of these benefits is that the conservation of given species would allow using it in the future and it can be a source of future as it is of present benefits. Direct benefits of biodiversity conservation however should be regarded in the context of opportunity cost, that is, should a given territory be allocated for biodiversity conservation or would it be more beneficial to be used for other purposes, for example industrial forests, agriculture, stock breeding, etc.

Often when the problems of biodiversity are under discussion, it occurs an already existing use of the territory of a habitat as a source of direct benefits and the problem as a matter of fact is reduced to the restriction of already operating economic activity for prevention of possible negative effects on biodiversity. It is very important to underline here the multifarious effect of biodiversity conservation in which the direct benefits are only part of all benefits, probably not the most important one. We shall discuss this aspect later.

In the context of this discussion we have to indicate as well the indirect benefits of biodiversity conservation. These are benefits, which accrue to the individuals indirectly: development benefits, induced benefits, global benefits, etc. They include tangible and non-tangible benefits, stemming from the biodiversity conservation. It is accepted in the economic literature to divide them into two basic groups; development benefits (indirect effect of biodiversity conservation) and induced benefits (indirect effect for the adjacent territories).

Development benefits are benefits as a result of the progress in development as a secondary effect of conservation work. The estimation of most of them should be an object of separate specialized research. Their inclusion in analysis may substantially increase the total value of biodiversity. Development benefits include:

1. Benefits of R&D in the habitat of a given protected species. The benefits from them are:

- Providing new knowledge about the properties of ecosystem in the habitat of biodiversity. This would give knowledge about their sustainable exploitation and usage.
- Rise of regional research potential. It would create new jobs for the local population both for highly qualified specialists and in the service sector.
- Organizing scientific meetings in the habitat of biodiversity, using the created capacities as a nice venue for discussion. It would create additional revenues for the chalets.

2. Educational benefits. Training of the young generation in various ecological sciences and in particular of the importance of biodiversity. The benefits from them are:

• Increased level of knowledge of sustainable use of biodiversity potentially reduces the relative costs of their protection. It would stimulate sustainable use of some natural resources (wildlife and plants such as medical herbs, mushrooms, etc.).

• Some educational activity not necessarily connected with ecological problems can be organized in or near the habitat of biodiversity. Combined with the recreation quality of the habitat it would increase the educational effect. Such a training would be extremely useful for people with impaired health.

As a whole we should note that these benefits in the transition economies are more than modest. The excellent conditions and the natural beauty of the habitat, where unique biodiversity is located, could be used as a perfect venue of scientific meetings if proper conditions are created. In case of positive transition in the future we can expect significant benefits of development due to biodiversity conservation.

Induced benefits are another category of indirect benefits. These are benefits due to increased demand of goods and services in the adjacent territories as a result of sustained use of biodiversity. They include broad spectrum of goods and services produced as a result of activities connected with visits in the habitat by given species. During these visits the consumption of goods and services: food, beverages, entertainment, etc. in the adjacent territories inevitably increases. Film productions in the habitat of biodiversity is a good example of induced benefits as a result of increased demand for visits and potential benefits of conservation.

Induced benefits of biodiversity conservation in a lot of countries (especially in sites, designated by the law as National parks of global significance) are rather high and they should be an object of separate research. Some of the induced benefits are as a matter of fact forgone benefits of alternative use of resources. As an example of such benefits we can indicate:

• Induced benefits from forests – reduction of greenhouse effect, increased number of tourists, etc.

• Induced benefits of animal breeding – improved health due to consumption of clean food.

• Induced benefits of wild nature – migration of new population of wild animals to the adjacent territories.

• Induced recreation benefits – improved health resulting in increased productivity and reduced mortality.

Following this logic, the global benefits can also be regarded as induced benefits. Despite the relatively small area, which biodiversity uses as a habitat, by and large it is a source of global benefits following from the conservation due to the following reasons:

• It is expected that conservation will result in preservation of the gene resources and biodiversity from depletion, which will help the improvement of the global gene stock.

• The conservation works result not only in biodiversity conservation, but also in a rise of the forest stock and regulation of water supplies, which helps the conditions for carbon dioxide sequestration in the air. This would mitigate the risk of natural disasters and the greenhouse effect.

These arguments can be used as a persuasive motivation of financial support of the conservation projects by international organizations – a fact used in many countries, including the Balkan countries.

Until now the empirical estimation of the global benefits for biodiversity conservation has been carried out on a rather modest scale mainly within some sporadic research publications. In comparison with the other benefits their value is normally not too high mainly due to the fact that the habitats of biodiversity do not cover large territories and one cannot expect high global benefits, provided that they are assumed to be proportional to the territories of the habitat. As a whole, however, the integral effect certainly has a high value.

The problem of cost avoidance has significant importance in the assessment of benefits of biodiversity conservation. This is a substantial part of some benefits. The effect of conservation in terms of cost avoidance can be observed in a lot of activities:

• During conservation work some restoration of the habitat is unavoidable. It can be done in the shape of natural forests restoration, resulting in reduced erosion, sedimentation, down-streams flooding etc.

• Visiting a habitat of biodiversity is an alternative to a reduced cost of medical treatment and avoidance of loss of productivity.

The value of cost avoidance depends on alternative use of resources. For example, overgrazing can be regarded as opportunity cost of land use, which may create pre-condition of loss of biodiversity. It is a question of a given economic policy or result of the deficit in its implementation. This deficit can be the result of deliberate inaction due to some political interests or as ignorance about the ecological consequences of a given decision.[3] In conditions with high market failures as it is observed in the transition economies the loss of biodiversity is a natural outcome.

The benefits presented above are use-benefits, as they directly or indirectly arise from that fact that biodiversity as a commodity is an object of consumption. There are, however, other benefits when we discuss environmental commodities. In our next exposition we stress on these benefits, as they are not sufficiently analyzed in Bulgarian economic literature.

Despite the controversy of valuing biodiversity conservation, the following aspects remain very important. Biodiversity creates one general benefit, that is benefit as a whole ipso facto that it can be used any moment the individuals would

[3] The implementation deficit in environmental policy is analyzed by the author in *Danchev, A.* Environmental Policy and Implementation Deficit in the Transition Economy. - In: The 1999 European Environment Conference. London School of Economics, UK, Conference Proceedings, September 13th and 14th, 1999, p. 69 - 78.

like to. It can be compared to a fruit that can be consumed any time we want and the benefits of it come from the very option that it exists. Naturally in case of biodiversity it does not mean direct consumption, but the opportunity to see it and to "consume" its hedonic attributes. This kind of value is called option value.

This is a clue to receive an alternative assessment of economic benefits of biodiversity by collection of information (mainly from interviewing), which often cannot be obtained in otherwise. The obtained estimates are as a matter of fact a measure of consumer surplus of biodiversity, which absorbs the benefits of it expressed by the real and potential consumers by their WTP.

This is not the whole story, however. Other attributes of value of environmental commodities are also an object of research coming from the so-called *non-use benefits.* It is assumed that a given environmental commodity, and it relates to biodiversity too, generates consumer surplus due to the fact that we may want to protect it for our children or for the next generations or simply to know that it exists (that is different from the option value in which we just postpone the opportunity to consume it in the sense explained above or just want to use some of the attributes later). In this case we distinguish between two kinds of benefits (values): *bequest value* – the individual may not have an intention to see biodiversity, but she may want to protect it for the next generations having in mind mainly her children and their children and *existence value* – benefits coming from the very fact of biodiversity existence (often as we will see later it is treated in the sense of concrete species), understanding or intuitively perceiving its multifarious importance.

The theoretical explanation of these forms of value requires applying more specialized terminology, but the very philosophy put in the core of this approach is very impressive especially if one delves deeper in it. Naturally, it is not accepted unanimously, but was and at present is still an object of severe critics.

Finally there are not reasons not to look at biodiversity as an ordinary commodity, if we assume that it can be treated with the traditional terminology of WTP. This approach is equivalent to the value created by our wish to buy a given commodity and we have some WTP to do it. In his sense we can speak about general economic value, whose measurement is reduced to the traditional question: "How much are we willing to pay to have this commodity?" In case of its consumption it is equal to the cost, which we need to incur to consume it, that is to visit the place of its natural habitat and to receive various benefits, which it generates depending on our preferences. This is a relatively new approach, which despite its essential formulation deserves its place in the economic literature. As a problem we can formulate it as a general economic value, which every commodity has and which is measured directly by the WTP for it. This question should be an object of a separate research.

The presented hitherto approaches can be summarized in the following scheme, which should not be regarded as an attempt to present some integral

value of benefits, but as a conceptual interaction of various attributes of value of the environmental commodity, in our case biodiversity.

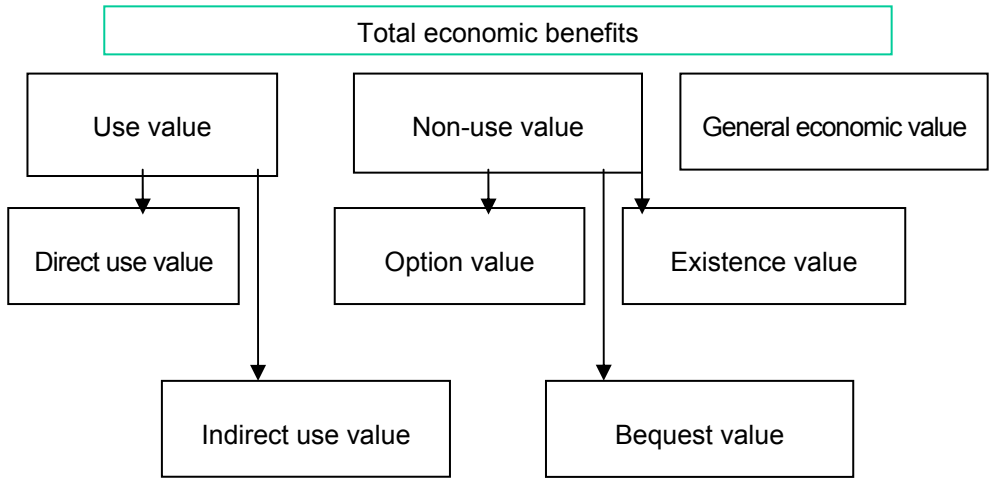

Figure 1. Attributes of value created by biodiversity

It is obvious that related to biodiversity this scheme is rather conditional.

There is an inevitable overlap of values and coincidences between some benefits. Biodiversity conservation is actually a result of forest protection, which can be used for timber production, place for recreation, a source of carbon dioxide sequestration, etc. Besides, there is interdependence in an estimating various values especially non-use values.

Finally, let us remind of the fact that there are no reasons not to speak of biodiversity in the language of a general economic value as expressed by WTP as it exists for any commodity. Biodiversity is not something abstract; it consists of concrete species, some of which are an object of direct consumption and thus can be regarded as a direct market commodity. This general economic value can be measured as consumer surplus created by the ordinary WTP of the commodity (given species). It is something different from the total economic value, which some authors regard as a sum total of all values (we do not support such an integral approach as all the attributes have their specific consumer significance and there is not sufficient reason to integrate them into one single estimation). In our case the general economic value is an expression of the most general value of biodiversity. It corresponds to the banal consumer question: “How much are you WTP for biodiversity conservation in a given region normally over a period of one year?”

Formulated in such a way the question may not be correctly understood and can be interpreted in various ways. The interviewee inevitably includes in her answer travel costs, accommodation, subsistence, and other services, that

exaggerate estimation and creates bias. To avoid it there is a need for an explanation of the features of motivation to visit the habitat of biodiversity and the cost, which would cover it. WTP should be explained to the interviewee rather in the sense of some abstract utility of biodiversity, than in the form of some concrete hypothetical compensation of the cost to meet the implementation of this preference. The importance of this problem should not be exaggerated, however. Finally as there are various preferences to the attributes of a given commodity, so there are various preferences related to protected species. A lot of research in the theory of consumer behavior can be helpful and adapted for valuing these aspects of benefits of biodiversity conservation.[4] We intend to devote more research to them in our future work.

Our observations of the estimations related to biodiversity conservation indicate, that WTP is interpreted by the interviewees mainly as WTP for overnight as in most of the cases it is the basic cost of visiting habitat of biodiversity. The respondents, however, often include implicitly travel costs if they are not implicitly warned about it.

The estimation of the benefits of biodiversity conservation is time-consuming and expensive including: producing professional questionnaire and preparation of the interviewing in a way, which will result in reliable estimation of WTP. The choice of the sample and quota control during the process of interviewing is of paramount importance.

Basic methods of measuring economic benefits of biodiversity conservation

Modern methodology of estimation of the basic benefits of biodiversity conservation uses a broad spectrum of methods. Various criteria have been developed for the choice of an adequate method, which can be organized in several groups. For example, one can use as a criterion availability of a market for a given commodity. This approach reveals interesting possibilities as far as there is not a direct market of biodiversity, but its conservation results in benefits, for which there are good markets. From this point of view we can outline three basic groups of methods:

1. Methods of direct measurement: They are applied in cases, when there is a market of a given commodity and thus benefits are received directly.

2. Methods based on surrogate market. They are applied when there is no market of a given commodity, but a substitute for this commodity is available, which is marketable. The price of the substitute is used for assessment of benefit.

3. Methods based on constructed market. They are applied where there is neither a market for the commodity, nor a substitute exists. In these cases artificial

[4] As a summary of this problem we can recommend *Pearce, D., D. Moran.* The Economic Value of Biodiversity. Earthscan, 1994.

market is constructed and the benefits are measured by the consumer surplus due to the potential demand, measured by means of WTP for the commodity.

This classification comes from the assumption that the link between the commodity and its value is implemented due to so the called attributes of value, for which there is some WTP in society.[5] The choice of method, which is applied depends on the level of explicitly in the market of these atributes. In our case from an opportunity cost point of view the problem is reduced to whether a given territory is used for biodiversity conservation or for other alternative use, which is regarded as forgone benefit.

As a lot of literature is devoted to the basic methods presented above, we further concentrate only on some practical issues connected with their application in the present research. We concentrate mainly on those methods, which are used in the present study and adjusted to the features of transition economy. Finally, we illustrate the application of these methods in a case study of Danube islands on the territory of the Republic of Bulgaria by an inquiry implemented with the collaboration of the non-government environmental organization Green Balkans.

The *methods of direct measurement* are applied in the cases, when all the necessary information is available and can be directly estimated. In these cases the benefits are estimated by simple multiplication of the quantities of the commodity (benefits) times the price per unit benefit. This essential procedure however is not so simple as it may appear initially. It puts several requirements to produce sufficiently reliable estimations.

The basic problem is the price to be used for estimating benefits. As it is well known we need to use prices, which reflect social not private costs. In case of biodiversity this is a very difficult task. As there are a lot of market distortions in the transition economies, it is recommended to use prices of the world markets. It is possible to use such prices for some costs as for example for timber as opportunity costs of land option. Unfortunately, such examples are rare and the estimation of price distortion remains a very serious barrier to produce reliable estimations. It puts to the fore the problem of shadow pricing, whose estimation is connected with a very complicated procedure.[6]

As a starting point we recommend to collect more detailed information about the local prices and the possible deviations from the social costs due to local taxation, monopolistic profits, etc. If such a collection were possible it would allow to calculate the deviation of the price of its "competitive" level and to calculate some shadow price of hypothetical world markets.

The collection of this information, however, is very difficult for many reasons. The impression is that it is more a question of personal approach and intuition than

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[5] *Lancaster, K.* A new Approach to Consumer Theory. - Journal of Political Economy, 1966, N 74, p. 132 – 157.

[6] As a classical work in this field we can indicate *Mishan, E. J.* Cost- Benefit Analysis. Routledge, 1994.

of theory as far as the theoretical postulates are presented in detail in a lot of publications. Whatever the problem was we always tried to interpret the price problem in terms of opportunity costs, that is, of the alternative use of resources. For example, in cases when a land was to be bought for some decision, and we had to take into account its real value, we excluded the revenue collected in case of other alternative use from the price. Land taxes, all mark-ups which caused deviation of the real price in pure competition, were excluded too.

Among the methods recommended for direct measurement of the benefits of biodiversity conservation we can indicate a change of productivity (changes with and without decision), forgone benefits or loss of revenue (in decisions resulted in degradation, which for example may endanger human health or increase environmental risk). Such traditional methods as production function, in which the direct effect of decision on a given activity is measured as a function of capital, labor and other "neoclassical" factors were widely used, as well. [7]

Some of these methods are also used for measurement of indirect benefits. For example the method of replacement cost is very close to the surrogate markets. As we cannot estimate the value of noise reduction, we can use the information of noise insulation materials as an indirect measure of the value of noise reduction.

Our experience in estimating direct benefits allows us to summarize a procedure, which explains the very idea of direct measurement and it seems to be the applicable to most of the methods indicated above:

1. Identification of cause-and-effect relationship. In cases of loss-of-earning method usually the cases of health deterioration are usually registered in clinics, hospitals or epidemiological establishments. When we have to assess ex-ante effect we use the results of laboratory experiments on animals or humans.

2. Measure data to assess welfare loss. To make successful estimation we must accept some level of welfare as a standard (reference level of pollution). Then by means of a monitoring system we have to register the deviation from this level (how much/how many times per year). Using the epidemiological data we find cause-and-effect relationship (loss of welfare leads to increased risk), e.g. given amount of pollutant increases % risk of population.

3. Estimation of welfare loss. First we model affected area, then estimate affected groups of population (children, elderly people, sick people, pregnant women). Using data of duration of illness, we estimate loss of welfare.

Related to biodiversity conservation these methods can be applied in the estimation of alternative use of land of habitat. For example if we discuss its industrial use (in the case of Danube islands production of timber) it is necessary to estimate the revenues from this activity by means of methods of direct measurement.

Drawbacks of these methods are:

- the cause-and-effect relationship often is multifarious and difficult to identify;

[7] *Pearce, D.* Sustainable Development and Developing Country Economics. – In: Sustainable Environmental Economics and Management. Ed. by. R. K. Turner, Belhaven Press, 1993.

- the methods are non-applicable for 'non-productive' people - children, old people, pregnant women, etc.;
- when impact is life threatening, the method is illogical to apply.

The application of *surrogate market methods* is of special interest in estimating benefits of biodiversity conservation. In many cases there is no price for the environmental commodity and if any substitute is found, its price is used for the estimation of benefits of the environmental commodity. The more perfect is the substitute, the closer to the real price is the price used in estimation of benefits of environmental good.

Basic methods used in this case are methods of hedonic prices, travel cost methods, etc. [8] Unfortunately most of these methods are difficult to apply under transition conditions due to many reasons. For example, *methods of hedonic prices* require developed housing markets and normally are used in the USA. *The travel cost method* encompasses rather time-consuming and expensive procedure for which normally there is a lack of finance especially in a transition country. In many countries with developed infrastructure this procedure may be carried out with rather modest finances and produce interesting results. The attempts of the author to use these methods in transition conditions are very modest and the results do not allow formulating sufficiently reliable conclusions.

This, however, does not mean that this method should not be used in transition countries. On the contrary, it would be extremely useful to produce alternative assessments by various methods and compare travel cost results to the others.

The application of these methods needs collection of the following information:

- total number of population in every zone (published in official statistics);
- total number of visitors in every zone (collected by observations);
- income, education, travel costs, opportunity costs of visits (collected by interviewing).

The difficulties come from the last two groups of information, whose collection requires site-visits, a problem, which the economic science in transition countries cannot afford at present due to the existing level of funding. The attempts to attract foreign sources for similar research are not very successful at the moment.

Of course we have to take into account the fact that the travel cost methods have some drawbacks and they put a lot of problems, the most substantial of which are:

- preferences of visitors may be different depending on their income, culture, intellectual level, etc. This often is difficult to identify quantitatively;
- it is important to distinguish between business travel and recreational one. The very travel may also be an element of recreation. It complicates the problem of consumer surplus created during the visit of habitat of biodiversity;

[8] *Rosen, S.* Hedonic price and implicit markets: product differentiation in pure competition. - Journal of Political Economy, 1974, N 82, p. 34-55.

• the methods do not take into account the number of potential visitors, for which biodiversity creates also consumer surplus (as far as they also may have some WTP at least of its existence).

By means of travel costs methods we can make assessment of the benefits of tourism, recreation, supply of some goods (water, firewood, etc.) connected with biodiversity conservation.

In the following analysis we concentrate mainly on methods based on *constructed markets*. The basic method is *Contingent valuation method* (CVM), whose name comes from its origin – to construct artificial markets, as there is neither real, nor surrogate market for the environmental commodity (its attributes) The contingency comes from the hypothetical form of the market. Principally it can be used for all benefits as by means of it we can produce assessment of all values indicated above: use value, option value, existence value, etc. For some non-use values as existence value and bequest value it is at present the only method applied for their measurement.[9]

CVM is used as a matter of fact in two aspects: to ask the respondents how much they are willing to pay for the benefits and (or) they are ready to accept some compensation to tolerate the loss of welfare. The process of estimation is based on the so-called - "bidding game" – iterative approximation to those situations, which would emerge if real market of the commodities existed.

To receive non-biased (minimum biased) results the respondents must be aware of the commodity they are talking about and the method of payment (direct, by taxation, etc.) The bidding game can be constructed in two ways. In case of WTP study the lowest price is indicated and the price (tax, payment, sanction, etc.) is increased until the respondents declare that he/she is not WTP for additional rise of the price. The last acceptable price is as a matter of fact the maximum WTP. In cases of WTA the process is organized in an reverse way – the price is systematically reduced, until the respondent reaches minimum WTA, a compensation, which he would tolerate to accept the decision. According to the theoretical postulates WTP should be equal to WTA, but experience indicates that the latter significantly exceed the former. This feature we have come across in all our research and the biodiversity case is no exception.

In our study we followed a procedure, which as our experience indicated, allowed to received reliable estimation by means of CVM:

1. The choice of representative sample. Definition of the region affected by decision, population and distribution of the effect. Choice of suitable groups as representative sample. The adequacy between the structure of the sample and the structure of the interviewed groups is reached by means of quota control.

2. Organization of the inquiry. Careful preparation of the questionnaire is needed, as its quality is of paramount importance to receive exact and non-biased estimations. It is recommended to pre-test the questionnaire (interviewing of a small

[9] *Cumming, R., D. Brookshire and W. Schulze (eds.)*. Valuing Environmental Goods: An Assessment of the Contingent Valuation Method. Rowman and Allenheld, Totowa, NJ, 1986.

group of people to see how it "works"). In some cases the improvement of methodology is needed and the pre-test saves costs and increases reliability of the estimations. It is recommended to train the enumerators, in case they have no experience in research of this type. In all our studies of this kind it was mandatory for the enumerators to pass special training, in which we discussed in detail the very method and possible problems emerging during its application.

3. Interviewing. Often the questionnaire is distributed among the representative sample by means of direct interviewing, by phone calls or by mail. The quota control is mandatory to receive random data. Due to the features of environmental commodities normally we apply direct interviewing. The attempts to use phone interviewing or mailing simply did not work. We avoided this form of collection of information also because during the interviewing we tried to apply what we call *analytical interviewing*, that is the enumerators are to go beyond the traditional algorithm and to put additional questions depending on the answers. Such an interviewing was applied for the first time in testing our assumption of overlapping values (publication forthcoming).

4. Analyzing primary data. Together with the assessment of the basic categories an analysis is provided of the possible biases and their influence on the final results. In a lot of cases mainly due to lack of financial resources we based our estimation on non-sufficiently reprehensive observations, which gave general idea about the results and could not be used for generalizing conclusions related to the general population.

Several recommendations can be formulated summarizing our experience in application of contingent valuation methods in environmental research:

1. It is recommended to start the estimation of WTP with the open-ended principle. The average value of WTP and standard deviation would give the idea how to apply the discrete choice approach, which as a rule produces better statistical results.

2. Do not overload the questionnaire with too many alternative options, if you can use dichotomy principle. The latter is easier to answer and if the interviewing lasts more than 30 minutes, its efficiency drops down due to too many alternative proposals. The dichotomy answers of the type "agree - disagree" are easier to answer than the alternative choices, but they produce too simplified answers for such a complicated problem as valuing biodiversity. The questions of WTP are extremely difficult for people in transition countries due to the extreme poverty they are experiencing now, which strongly restricts demand.

3. It is recommended to visualize the effects of decision, presenting pictures of expected results with and without decision. It helps the better understanding of the problem and as a result produces better estimations. The visualization should be combined with exact formulation and very careful explanation of the problem to the interviewees. As it was already mentioned, the answers of WTP/WTA are of a better quality, when the interviewing is personal, as such studies are very difficult for people from transition countries and there is always some need of additional

explanations during the process of interviewing. By mail or by phone such an approach could not work effectively.

Estimation of the basic components of value of biodiversity by means of CVM (case study of Danube islands).

The theoretical considerations presented above were tested in a case study of the Bulgarian Danube islands. There are 77 islands downstream the Danube river with a total surface of 110 000 dekars (11 000 hectars). The flora in these islands is represented by floodplain forests of high natural value. They are habitats of rare and endangered species most of which cannot be found in any other place of the world. According to EU laws these habitats and species should be put under special protection.[10]

Instead, a lot of the forests in these islands are felled and poplar plantations are planted instead. The reason for this replacement is that the hybrid poplar cultures grow rapidly and they bring revenues in some 15 – 20 years. Poplar monoculture, however, cannot complete the ecological functions of the rich in biodiversity floodplain forests. As a result the forests and the species using them as a habitat are strongly endangered by depletion. If the process of replacement of natural forests with poplar plantation continues, probably most of the biodiversity in the region will be lost forever.

It is necessary to organize the exploitation of the islands in a way in which the biodiversity will be protected for us and for the generations to come. It is necessary to carry out a research over other options of the land use of the islands not only poplar monocultures. One of these options is to restore the natural forests and as a result to expect return of the natural habitat of biodiversity with the direct, indirect and non-use value benefits coming mainly from the commercial and non – commercial fishing and hunting, tourism and recreation. It would significantly increase the spectrum of shareholders, which at the expense of timber industry, (having very limited economic importance for the country, but otherwise relatively important in regional aspect) would increase the number of tourists, scientists, environmentalists, etc. of national and international origin. These features were underlined in the questionnaire where it was indicated that “You and your children could visit those islands on the Danube river, which you find interesting, but to make them convenient and accessible for tourism, there is a need of financial resources. Your opinion on the problem would help us to mobilize these resources in the most reasonable way to protects biodiversity on one hand, and on the other – to help the socio-economic development of the region of downstream Danube as a whole”.

In such a way since the very beginning it has been indicated explicitly that our conception of biodiversity conservation is not aimed at limitating the economic

[10]. Strategy for the Protection and Restoration of Floodplain Forests on the Bulgarian Danube Islands, MOEW, MOAF, NFB, 2001.

activity in the region at any price, but that we are looking for win-win decisions taking into account as well the interests of the firms, which will suffer losses from the restriction of poplar plantations. Since the very beginning the respondents have been informed that the restoration of natural forests and thus biodiversity conservation with the corresponding measure is an alternative to other land use option, which may have a negative effect on part of the population.

Thus our approach to this target is not as if it were a static economic unit. We consider it as a dynamic ecological system with complicated relationships among ecological, economic, ethical and other factors. From this point of view Bulgarian Danube islands are regarded as a source of multifarious benefits that determines the multiversity of the attributes of their value.

It is not possible to present analysis of a lot of benefits in detail as for example benefits, which are received by the adjacent territories and which may be very substantial. We have to note, however, that a lot of benefits from biodiversity conservation are an important source of benefits for the neighboring areas, as for example the Romanian side of the Danube, which remained outside our research.

In this paper we concentrate mainly on the results of a study carried out under the auspices of the World Wide Fund for Nature International within the framework of Danube-Carpathian Programme and the second phase of Bulgaria Danube Island Restoration Project and the produced due to this research evaluations. Part of this research was accomplished by application of CVM for estimating non-use values by interviewing 609 respondents, which was provided by the assistants of the non-government organization “Green Balkans”. The author prepared the questionnaire and trained the assistants. As a result of the interviewing, valuable empirical material has been collected, which will be an object of further additional research and publications.

In constructing the questionnaire we followed standard procedure. It included questions related not only to WTP/WTA of biodiversity conservation, but also such questions as social attitude to the biodiversity in the Danube islands, the attitude to the government policy of biodiversity protection and the Strategy for the Protection and Restoration of Floodplain Forests on the Bulgarian Danube Islands. We included also broad spectrum of traditional socio-economic questions (age, occupation, etc.) related to the sustainable use of biodiversity.

As the answers not always correspond to the number of respondents (in some cases respondents give answers only on some questions or give more than one answer on a question), statistical characteristics of the answers are based on various numbers of observations.

The following results have been received of the benefits of biodiversity conservation (Table 1).

Table 1

Non-use values of biodiversity conservation in the Bulgarian Danube islands
(in BGL; exchange rate 2,2 BGL/USD)

Parameters of the estimation	Option value	Bequest value	Existence value	General economic value
Number of answers	518	517	516	537
Mean	54,6988	53,7513	49,8663	53,7849
Standard deviation of mean	2,97922	2,86432	3,04341	1,98814
Standard deviation	67,80586	65,12784	69,13296	46,07164
Skewness	3,594	3,572	4,272	2,291
Standard error of skewness	,107	,107	,108	,105

The estimation of *option value* was accomplished on the basis of expectation that the consumer intends to use the commodity in future not defined during the interviewing. The very fact that the interviewee has opportunity to use the commodity in some future period chosen by him creates benefits, whose value is called option value. D. Pearce and D. Moran call it “insurance value”.[11]

This estimation is based on a question formulated as maximum amount a given individual (household) is willing to pay per year for biodiversity conservation of the Bulgarian Danube islands so that he could see and use it depending on his preferences in any time he would like to. Additional explanation was given to the respondents that they may not necessarily be tourists, but they simply must be sure that they always have the opportunity to visit the islands and see biodiversity living there.

From all the answers we could use only 518, including 17 answers with WTP = 0. Statistical evaluation was provided by SPSS and is presented on Table 1. The results may be regarded as relatively high, which is explained by the high motivation of the respondents.

Bequest value was the next indicator measured as a result of interviewing. It is a measure of benefits created by the WTP for conservation of biodiversity for the next generations. Although it is oriented to a wider interpretation of this word, it is interpreted mostly in the sense of the descendants and their children. The question was formulated as: ”Which is the maximum amount of money your household is willing to pay per year to know that your children and their children will be able to see the now existing birds and animals on the Danube islands”. Certainly this is a simplified question of the whole variety of biodiversity of Danube islands. We used altogether 521 answers including 16 zero (three were excluded as too extreme). The obtained

[11] *Pearce, D., D. Moran*. Op. cit., p. 20.

results are indicated on Table 1. The bequest values are very close to option values. We have received similar results in other cases with the application of CVM.[12] It can be explained with the traditional care of the Bulgarians about the future generations.

Existence value is another aspect of the benefits of biodiversity, created by the very fact of its existence. This seemingly rather remote source of benefits appears to be very substantial, when it affect a global community, most member of which have no intention to use the object of estimation, but the very fact of its existence definitely creates a consumer surplus. Similar researches are not rare in the economic literature. They are especially popular in the vast global reserves of biodiversity, but there are also a lot related to less global reserves. A classical example is the research of the London school (CSERGE) related to the benefits of conservation of white whales, elephants in Kenya, etc.[13]

The current methodology allows the preparation of estimation of thebenefits of the very existence of biodiversity. We have to note however that most of these estimations are related to biodiversity in the big tourists sites and we are not sure how much the overlap between the existence value and some hedonic effects created by the very tourism is. This is a question, which deserves a very serious attention, but it is not easy for examination due to the features of the very problem.

Our estimation of the existence value were based on the question: "Which is the maximum amount of money your household is willing to pay per year to know that the biodiversity in the Danube islands is protected despite you not having intention to visit these islands?" From all the questionnaires we used 518 answers including 18 zero answers.[14] Two answers were excluded as extreme. Statistical characteristics of the results are presented on Table 1.

The results are not surprising. The comparison between the non-use values despite the non-representative study allows us to think that we can expect a high WTP by the Bulgarian population for biodiversity conservation of the Bulgarian Danube islands regardless low income and economic crisis. It is the result of many reasons, which remain outside our research, but which stem from Bulgarian history and mass psychology.

The accumulated experience with CVM application under transition conditions allows us to think that in this direction Bulgarian natural wealth can be a source of significant economic benefits including benefits for the global community.

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[12] *Mourato, S., A. Kontoleon, A. Danchev.* Chapter 6. Bulgarian Monasteries. - In: Valuing Cultural Heritage. Applying Environmental Valuation Techniques to Historic Buildings, Monuments and Artefacts. Editors: Stale Navrud and Richard C. Ready. Edward Elgar, 2002.

[13] *Pearce, D., D. Moran*. The Economic Value of Biodiversity, Earthscan, 1994; The Value of Forest Ecosystems; *Pearce D., G. Corin, T Pearce.* A Report to The Secretariat Convention on Biological Diversity, DRAFT, February 2001.

[14] At the moment we are not able to report which of them are genuine zeros and which are really 'protests'.

To reveal more profoundly this source of benefits it is necessary to concentrate efforts on joint projects of assessment of non-use values by the potential users (we could conditionally call them international tourists), who have almost no information about Bulgarian nature and monuments, but who under better conditions could helped by proper advertising visit them in various forms of tourism. The estimation of consumer surplus of such benefits is not in the capacity of a single research unit. It should be implemented with the cooperation of leading research units in this field (as an example we can indicate The Center of Social and Economic Research of Global Environment – CSERGE, where the author had the opportunity to participate in various environmental projects).

Finally, the task comes to the necessity of providing assessment of the costs and benefits of several basic alternatives of land use on which biodiversity is located. In the case of Bulgarian Danube islands it puts the problem of opportunity cost, the most effective use of the land from the point of view of ecological and economic benefits. Naturally, the way the Danube islands are used at present is in a great degree the result of historic trends, but some of them have lately revealed the alternative of a new industrial approach (poplar plantations), which endangers biodiversity. To what degree it will be sacrificed to the industrial need is a question of opportunity costs, but in any case it is clear that to give unambiguous answer in favor of biodiversity would not be at least professional from the economic point of view.

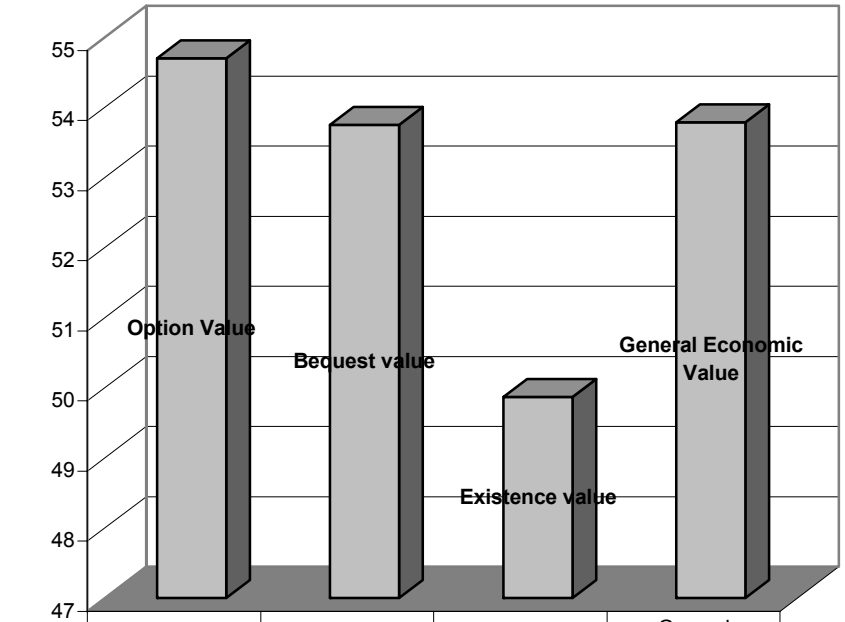
This problem can be solved together with the ecologists, who initially are to give assessment to what degree every single island is used as a habitat of biodiversity and should not be touched for other option. In this case the economic science can only define costs and benefits of biodiversity conservation, but not to argue its relevance. In other cases, however, it is not reasonable to apply other alternative of conservation, if biodiversity is not endangered, but a given land is a source of high revenue from timber production or other industrial options.

Traditionally in the assessment of benefits of biodiversity conservation objects of evaluation are indicated above benefits and corresponding values. We have tried to measure the benefits of biodiversity conservation treating it as an ordinary commodity. Correspondingly, the questions to measure these benefits by the traditional WTP for it, was formulated as: ”Which is the maximum amount of money which your household is willing to pay per year for biodiversity conservation to protect it from disappearance”. As it has already been indicated this measure is regarded as an expression of general economic value, which is important for the environmental commodities, despite the lack of real markets for them.

As it may be difficult to understand this question by the respondents as the previous questions, we explained that it should correspond approximately to the acceptable costs, which household would spend for consuming the

commodity in convenient time and space. We mean a visit to the site depending on the preferences of the consumers (tourism, hunting, fishing, etc.), in which the classic rule of optimality is realized by equality of marginal costs and marginal benefits. To help the respondents to think in terms of opportunity cost it was explained that they should keep in mind also their present incomes and the fact that they may have to be incurred in other payments in the future. It was reminded as well that there are other alternatives of using their money as, for example visiting, the zoo or entertainment games in the park, which may bring similar benefits to the consumers as Danube islands. Finally, the respondents had to be sure that the WTP expressed by them actually was supporting the Strategy for the Protection and Restoration of Floodplain Forests on the Bulgarian Danube Islands (similar reminding was done in the other questions).

From all the answers 537 were used as reliable including 13 zero answers. The statistics of these answers was presented on Table 1. For comparison of the obtained results we illustrate graphically their average value (Figure 2).



	Option Value	Bequest Value	Existence Value	General Economic Value
Series1	54.6988	53.7513	49.8663	53.7849

Figure 2. Basic non-use values (in BGL)

Traditionally in similar researches various values are regressed with corresponding socio-economic indicators as income, education, etc. Normally the method of OLS does not produce correct results, instead Tobit model or Box-Cox transformations are used.

As we had observed high-environmental involvement of the respondents, we expected high non-economic motivation of the WTP answers and strategic biases. Our expectations were confirmed by regressing WTP (option value) with income (ability to pay) and age (time preferences). Although the regression coefficients are logical (have the expected sign), the statistical characteristics of the estimates are rather low. On Table 2 we present some results of linear and logarithmic (OLS) models, Tobit-model and Box-Cox transformation (the two last were estimated due to the kindly presented software by S. Mainardi from Fatih University). There is a need to include in the model more socio-economic indicators and to reveal the role of "non-economic" motivations of the WTP. We are not able to report these results now for technical reasons, but they will be published in broader research on biodiversity conservation.

Table 2

WTP as a function of income and age [linear (WTP = a + b I + cA), logarithmic (logWTP = a + b log I + c log A), Tobit model and Box-Cox transformation]

Parameters	OLS		Tobit model	Box-Cox transformation; λ=0	
	Linear form	Logarithmic form		OLS Starting values	Non-linear regression
A	48,372	50,4415	41.394.	41.3950	3.367
Standard deviation of a	5,944	6,9642	4.964	4.964	0.279
B	1,202I	3,0574	1.861	1.861	0.0354
Standard deviation of b	0,931	4.2208	.05902	0.5902	0.0144
C			-1.368	-1.368	-0.0308
Standard deviation of c			1.249	1.249	-0.0283
t for a	8,139	-	0.0000*	0.0000*	0.0000*
t for b	1,292	-	0.0016*	0.0016*	0.0137
t for c			0.2737*	0.2737*	0.2762
F	1,668	0,52472			
R	0.060	0.03354			
R^2	0.004	0,00112	0.022	0.022	0.999508

* P[|Z|>z].

As it is well known the application of CVM always has some problems with the biases, which theoretically are well presented and defined in the economic literature. Let us remind that we have assumed in advance that the environmental commodity has some intrinsic value, which we cannot measure, but instead we measure some instrumental value, which we accept as a first approximation to the intrinsic value. The problem is to which degree we can estimate the bias of the instrumental value from its intrinsic value. It requires a lot of additional work on the already collected information. In this stage we can express the following considerations:

1. We suspect *strategic bias,* due to the fact that the respondent tries to influence the policy in this field by the assessment he produces. In most of the cases the respondents are either members of environmental non-government organizations with environmental orientation or the respondents are their friends or relatives. Naturally they will present estimation not corresponding completely to their real ability to pay. The measurement of the degree of this bias is a question of further study. It is, however, very important to construct the questionnaire and to control the quota in a way which would avoid this bias.

2. Information also is collected of possible *vehicle bias,* connected with the way the WTP is accomplished. It is expected that these biases are not big, but additional calculations are needed to justify this assumption.

3. Quite possible are *information biases,* connected with the way the information was collected. To avoid *starting point bias* the data was collected on the principle of open-ended questions. It allows preparing a scale of responses, which can be used in repeated surveys. It would reduce to a minimum these biases. Some operation biases are also possible due to imperfections under which the very survey was carried out. Finally the information was collected not by professional enumerators, but by volunteers of non-government environmental organizations, who although have made efforts deserving high grade, they cannot pretend to reach the level of the professional respondents. We assume, however, that these biases are not very high.

4. More substantial may be *hypothetical biases* connected with misunderstanding of the problem. Despite the attempts to illustrate the interview with a lot of pictures, photos, etc. supposed to give visual presentation of the object of research, most of the answers were made “in dark”, that is under not sufficient familiarity with the object of estimation. It certainly will influence the consumer behavior in one or other direction.

A lot is to be done still in the direction of valuing benefits of biodiversity conservation of Bulgarian Danube islands. We have to note that there is a need for checking validity and reliability, as the survey based on CVM as a

rule are to be tested on these two criteria. This is a relatively new approach, which is used in many estimation procedures for checking the quality of estimations.[15]

S. Mourato recommends "to investigate the robustness of the WTP estimates to the bid structure when a dichotomous choice approach is used. This test consists of removing some bids from the bid vector (the highest, the lowest, or some random bids) and then re-estimating the models to check the sensitiveness of the WTP estimates.[16]

In our study we excluded the highest and the smallest bids from the WTP and compared the average WTP with and without correction. We discovered only small differences that can be accepted as a good indicator for the attitude test.

In case different models are used to analyse the data it is recommended to test the consistency of the estimations, that is the sensitivity of the WTP estimates to variations. If the estimations of the benefits do not vary strongly we can conclude that the test has been successful.

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Instead of a conclusion I would like to extend my acknowledgment to all who helped to bring to fruition the idea of valuing economic benefits of biodiversity conservation in the Bulgarian Danube islands. Very valuable information has been collected with joint efforts, which will be used for new theoretical and practical analysis. First of all I have to mention the enthusiastic work of the assistants of "Green Balkan", who impressed me with their critical and responsible attitude to the problem. I cannot help mentioning those enthusiasts, which tried to "smash"me during the training seminar in Plovdid. During the work on this paper I received much valuable advice from my foreign colleagues, whose professional experience helped me penetrate into the jungle of this complicated problem. I also express my thanks to my Bulgarian colleagues, who read this paper and gave constructive proposals. Thanks also to my assistant Berkant Cakır for his patience with which he helped me in processing the questionnaire results. I have to thank also to the administration of the Faculty of Economics in Fatih University in Istanbul, which allowed me to have free time to work on the paper. Naturally it would have been impossible without the financial support of the WWF – World-Wide Fund for Nature, which within the framework of the International – Danube-Carpathian Programme and Bulgarian Danube Island Restoration Project: Phase II, Action Planning and Economic Analysis of Alternative Land Uses provided the necessary financial

[15] *Mourato, S.* Contingent Valuation Study of Bulgarian Monasteries. – In: Measurement and Achievement of Sustainable Development in Eastern Europe, Report to DGXII, CSERGE, 1997.

[16] Ibid.

support. I am deeply indebted to Prof. D. Pearce and my joint work with S. Mourato and the other colleagues from CSERGE – UCL, London, who introduced me friendly and critically to the mastery of contingent valuation. To all of them I express my deep thanks.

Biodiversity conservation is a global problem. A lot of sciences devote time and efforts to it. Due to the cooperation with the leading research institutions an increasing amount of publications on these issues appears in the transition countries. The present paper is one example of the result of this cooperation.

The Balkan region is not only a mix of cultures and economic systems, but also a unique reserve of biodiversity. The Danube islands are only part of it. The biodiversity conservation in these islands is at the moment at a critical point. Its future depends on the land use options selected by the decision-makers. Despite the whole lot of problems, we are optimists not only of the future of biodiversity of Bulgarian Danube islands, but of the whole region due to the wide social support of the conservation initiatives, expressed in many ways and particularly in the various measures of WTP. It is obvious that despite the difficulties, society finds support of its value system in a lot of its tangible and intangible dimensions, to which we have to add without doubt biodiversity and the social attitude to its conservation.

Using more pragmatic language, we can conclude that the economic exploitation of biodiversity at present is far below its potential opportunities. The achievements of economic benefits of biodiversity conservation in the Bulgarian Danube islands depends on many prerequisites, which are defined to a great degree by the future model of economic development under the conditions of the transition process.

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