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Economic evaluation of environmental goods

Causes of Economic Underestimation of Environmental Goods

Adequate account of economic values of environmental goods is the important area of social-economic reforms. An important cause of crisis environmental phenomena is underestimation of actual economic value of nature, natural resources and services. This is due to apparent economic importance in making an extremely sophisticated cost estimate of nature, its functions, interrelationship, considering nature as a part of an integrated system.

There are also unbiased economic prerequisites for underestimation of environmental value. Unfortunately, neither centrally planned economy was able nor present market economy is able to assess the value of environmental goods correctly. There are many reasons for this, among which there can be mentioned, for example, the known in economical theory "market failures", i.e. failures to consider adequately external effects (externalities) in the price, which is of critical importance for economic assessment of environmental damage and degradation of nature. The common case is undercharge of an environmental benefit or even its zero estimate. This results in particular in "over-consumption" of resources, excessive pollution, understated environmental damage, external cost in the price.

Imperfection of the current economic mechanism in the world leads to negative results both for environment and the whole social and economic development. This is admitted by the world community, especially in connection with occurrence of global environmental problems.

Environmental Considerations and Economic Decision-Making

An adequate for the current economic and social situation accounting of economic value of environmental goods is of significant importance for improving the situation in the environmental protection and use of natural resources in the world. This is essential for making correct economic decisions. Such decisions involve determining economic efficiency, calculating profitability and gain of projects and programs.

If we reduce economic decision-making to a simplest formula, we will get a benefits to costs ratio. If the benefits are higher than costs, the project, measure or program are effective and practicable.

The cost-benefit analysis is the major methodological tool. If benefits exceed costs, a project or an activity is considered efficient and worth carrying out:

$$B - C > 0 \quad (1)$$

Environmental considerations are seldom integrated into modern economic analyses for the above indicated reasons. To simplify the analysis let single out the environmental parameter (E) and write Equation (1) as follows:

$$B - C \pm E > 0 \quad (2)$$

Depending on environmental significance of a project/programme, additional environmental/economic effects can be added to the overall benefits or, accordingly, deducted from them if the activity is environmentally detrimental. The latter case is, obviously, most frequent and incurs greater costs. Taking the above into consideration, (2) can be put as follows:

$$(B + B_e) - (C + C_e) > 0 \quad (3)$$

where B_e is the environmental/economic effect of the activity;
C_e is environmental/economic damage (additional costs).

It is obvious that the lack or underestimation of the environmental goods lead to wrong, environmentally unsound decision-making: in discussing various development projects an ecologically sound one loses out in competition with traditional economic approaches for two possible reasons:

- underestimation of benefits from nature conservation resulting in reduced total benefits (this is typical for biodiversity projects);
- underestimation of costs due to under-valuation of potential environmental damage, understatement of negative externalities imposed on society, other economic agents (in the economical theory this problem is called "internalization of externalities", i.e. factoring external effects into prices set by the polluter).

Both of these aspects make environmental projects uncompetitive.

In the world, such a situation is vividly manifested in decision-making in favor of energy, mining, forestry and agricultural sectors.

Consequently, adequate economic accounting of environmental issues often radically changes priorities in economic decision-making, demonstrates an absolutely different economic reality, changes the understanding about "what is good and what is bad in the economy".

Components of the Economic Value of Nature

Environmental valuation involves estimates of at least three nature's functions:

- providing natural resources;
- regulating/ecosystem functions/services, including assimilation of waste and pollution;
- providing environmental services for people, such as recreation, amenities, etc.

Environmental economists attempt to valuate natural resources and environmental functions, raise "competitiveness" of environmentally sound projects *vs*. technogenic based projects. This does not mean that it is possible to make a precise economic valuation of all environmental goods. What is a beautiful landscape worth? What is the precise economic value of a unique flower or a bird? Of course it is impossible to make such estimates. For many environmental goods, there are no real markets, no conventional supply and demand relations. It is important to put an economic value to decisions made, collect the necessary information and use for subsequent decision-making. The higher is the economic value of environmental objects, the higher is the probability that adopted economic decisions in various projects and programs will be ecologically sound, take into account environmental protection considerations and, thus, save natural resources. Environmental degradation will continue if economists fail to reflect its value in analyzing and developing economic policies.

Value and Price

A distinction should be drawn between economic values of natural resources and services and their prices. The proposed priority aimed at growing environmental values does not imply automatic increases of prices for natural resources. The author do not support the motto "The greening of the economy at any costs". Therefore, any price changes should take into account the realistic economic and social situation in the country.

In transitional unsustainable economies, sharp price increases for natural resources can have negative results. In stable market economies, in many cases price increases in regard to natural resources and services lead to their savings and lower consumption. The classic example of such a situation was the oil crisis in the 1970s that triggered off wide-spread energy efficiency and savings measures.

Economic values apply to all the three environmental functions mentioned above. Prices essentially "work" only for the first function of the environment that deals with market values of natural resources. While the first function is assessed by the market, although often it is undervalued, the second and third environmental functions are practically not taken into account in market transactions. But it is values of these regulating functions, such as ecosystems' assimilating capacity and other natural services that are crucial in

determining economic value of many natural facilities, for example, biodiversity, protected areas, etc.

Ideally, prices for natural wealth should coincide with or reflect their economic values; then the economy's functioning, correlation between supply and demand, behavior of consumers will take into account environmental considerations. In this respect, the appearance in the market of new goods and services related to environmental functions not yet priced, is viewed as a positive phenomenon. For instance, let us take such a function as carbon sequestration. The Kyoto Protocol (Japan, 1997) signed by all developed and transition economies to prevent global climate change, provides a realistic basis for creating a new world market for carbon emission quotas. This means that carbon emissions will have a market price, no matter how fantastic it sounds.

In this way in future the economic value of, for instance, national parks, forests may include a quite realistic market price of bound carbon, along with prices on products of sustainable production of timber, fishing, hunting, such forest products as mushrooms, berries, etc.

The Total Economic Value

The concept of total economic value representing an integrated approach to valuing nature and attempting to consider not only direct resource functions but also regulating, assimilation functions, environmental services is the most promising one. This concept, originated quite recently in the 90s, has received recognition in the world both in terms of theory and practice.

The total economic value generally includes two aggregate constituents: use values and non-use values. The former in its turn consists of three items:

- direct use values: natural resources, tourism, sustainable hunting and fishing, etc.;
- indirect use values: global effects, environmental functions, binding carbon dioxide, etc;
- option values: potential benefits from future use (future direct and indirect values).

Of great importance is the non-use value, existence value of nature itself (economic value of nature's very delicate functions, such as social, ethical, and esthetical ones). In developed and developing countries there have been relatively many studies on determining non-use values (existence values) predominantly for rare animals and national parks. These studies are based on opinion polls to define the population's assessment of economic values of unique biodiversity objects, potential willingness to pay for their existence. In the economic theory these investigations are related to contingent valuation method, "the willingness to pay".

All the above additional estimates often drastically change priorities in economic decision-making.

Table 1 shows examples of environmental functions to be taken into account in the total economic value.

Table 1. Total economic value

Category	Use values				Non-use values (existence values)
	Direct use values		Indirect use values	Option values	
	Consump-tive use	Non-con-sumptive use			
General	Means of subsistence, commercial use, drugs, holiday-making, habitats	Recreation, education, research, transport	Material cycles, climate control, protection of catchment areas, human heath function	Potential direct and indirect future use	Ethical, cultural, heritage, wealth

Eco-systems (e.g., wetlands)	Fuel, biological resources of water reservoirs	Bird watching, water sports, amateur fishing	Prevention of floods, rein-forcement of river banks, protection of bird wintering places, etc.	Potential goods and services in future	Observation of migratory species, protection through restricted access
Species (e.g., tree species)	Timber, fuel, fruit, fodder, drugs, construction materials, technical raw materials	Selection work, phar-maceutical, chemical, and biochemical studies	Carbon buid-up, nitrogen fixation, erosion control, habitats	Renewable forest resources and forest services in future	Protection of forests as recreation areas, etc.
Genetic diversity (e.g. kinds of cultivat-ed plants)	Food	Plant selection	Evolutionary value	Species Improve-ment prospects	Protection of gene pools

Economic Value of Environmental Goods and Transition to Sustainable Development

The important problem hampering development of an efficient environmental policy and transition to sustainable development is underestimation of effects resulting from such transition. As noted above, this is manifested in understatement of economic value of natural resources, underestimation of the effect of their possible saving, underestimation of ecosystem functions, underestimation of damage from environmental pollution. In many countries annual losses in degraded land, forest, mineral resources, etc. can be estimated as many billion US dollars. With an adequate economic account of the environmental goods, the economic efficiency of resource-saving appears to be much higher than increasing nature intensity - the fact proved in economically developed countries in recent two decades.

Priority Mechanisms

The priority of increasing economic value of nature, adequate economic evaluation of environmental functions can be realized in the economic mechanism along several lines:

- assessment of "environmental soundness" of economic development proceeding from macroeconomic indicators (GDP, GNP, etc.) calculated with taking into account of environmental considerations. These indicators can be computed both for the countries on the whole and for different regions;
- adequate account of environmental damage, damage to human health and property. A realistic assessment of actual and potential damage is essential in environmental law, environmental review, environmental insurance, project analysis, investments, environmental auditing;
- the greening of the tax system, increase in tax on natural resources;
- improvement and indexation of environmental charges, penalties;
- realization of the "polluter pays principle" through internalization of externalities. This will allow including environmental costs, now covered by the society, by other objects of pollution, in internal costs and price of the polluter's products;
- improvement of competitiveness of environmentally-friendly and resource-saving projects/programs against technogenic projects/programs;
- regular licensing of all types of economic activity with taking into account the growing value of nature;
- integration of rising economic values of nature into economic, social and environmental planning and forecasting, in particular, into (national, regional, local) environmental action plans;
- adequate integration of environmental considerations into privatization and during changes of the owner;
- account of global benefits from the environmental goods.

Of course, the above areas do not encompass all potentialities of realizing priority of increasing value of natural resources and services. This is a very powerful environmental and economic instrument, and only some promising fields of practical application of this tool have been discussed above. Further developments in this field will significantly expand the spheres of application and effect of the aforementioned priority.

The "Green" Dimension of Economic Development

Undervaluation of environmental goods leads to distorted indicators of economic development and progress. The available traditional macroeconomic indicators (gross domestic product (GDP), gross national product (GNP), per capita income, etc.) ignore environmental degradation. Today growth of these indicators can be related to technogenic nature-intensive development. This creates a possibility of future dramatic aggravation of economic indicators in case of depletion of natural resources and pollution of the environment.

If there are no instruments to make the violator compensate for the environmental damage incurred (the "polluter pay principle" does not work), other economic agents and the local community will suffer losses. According to scientists, environmental damage in developed countries amounts to 3 to 5 per cent of their GDP. Estimates of environmental damage in NIS countries put it at 10 to 15 per cent of the GDP, while the level of budgetary provisions for environmental financing is much lower. This proportion shows that actual losses caused by environmental violations are not seriously considered while they result in lower production output and unavoidable costs of redressing consequences of environmental violations.

Integrated ecological-economic indicator at the (national) macro-level would be ideal for decision makers. Such an indicator would be sufficient to judge how sustainable a country is, and how green is its development trajectory. In other words, such an indicator would be somewhat similar to gnp, gdp or the national income which are now frequently considered a measure of success in development and of economic well-being achieved. However, such a generally recognized indicator is not available due to methodological and statistical problems, complexities in its calculation. Nevertheless, many productive efforts in this area have been made. An integrative approach has been quite successful in the un system (a system of integrated environmental and economic accounting) and the world bank (a genuine savings indicator). These international organizations have elaborated guidelines that allow to include environmental considerations in national accounts and national wealth indicators. Many attempts have been made to arrive at integrated aggregated environmentally sound indices. An environmental sustainability index was suggested in a report by a group of scientists from yale and columbia universities. A wide recognition has been given to the living planet index and an index ecological footprint (wwf and iucn).

The use of the genuine savings indicator as a new approach by the world bank to measure national wealth is viewed to be promising for many countries. This indicator is an attempt to adjust gross domestic savings, i.e. gross capital accumulation. It allows to adjust traditional macroeconomic indicators by taking into account natural resource depletion and environmental damage. Calculations made on the basis of genuine savings revealed a significant divergence between traditional and environmentally adjusted economic indicators. This is a very important result in the conditions of incipient economic growth in many countries. These countries, with its natural resource depletion and environmental pollution, can face the situation in which a traditionally assessed economic growth would exacerbate environmental degradation and environmental adjustment could dwarf these growth rates and even turn them negative.

The genuine savings indicator is important if only because it shows the necessity of setting off natural capital depletion by means of additional investments in human and produced capital as well as transferring part of revenues from sales of non-renewables to increase renewable natural capital. In scientific terms, this refers to weak and strong sustainability and substitution of various kinds of capital. In practice this can lead to setting up special funds such as a fund for future generations in Norway, the US and some oil-producing countries. They are made up of fixed charges on revenues from production of diminishing fuels and energy in order to secure future national development.

Generally “green indicators” is based on adjustment of conventional economic indicators at the expense of two values: cost estimate of depletion of natural resources, and environmental/economic damage from pollution.

Practical experience gained by European Union countries in environmental-economic studies is of great importance. The EU has sponsored projects GARP1, GARP2, and TEPI that carried out valuation of environmental damage caused by economic activity. Damage estimation has been made as a percentage of GDP. It included damage to human health, materials kept outdoors, crop productivity, forests, environmental amenities, and ecosystems. The most essential component of the total environmental-economic damage is the damage to human health. It has been found extremely useful that a methodology of ecological damage valuation, especially relating to human health, employed in the above EU projects is very much promising.

For Russia, orientation to traditional economic indicators in the nearest future can have most negative impact. To put it in an exaggerated way, it is possible to attain the fastest growth in these indicators (and in this way formally stabilize the economy and overcome the crisis) through quick pumping out of oil, gas, extracting ore and coal using an open-cut method, cutting out of forests, etc. - what is, much to our regret, the case now. For instance, the power programs adopted, orientation to increasing extraction of minerals, etc. will allow growth in GDP. However, negative environmental effects of such trend for many regions of the country are also evident. Under existing conditions in Russia, a economic growth in the near future - while maintaining the technogenic tendencies of development - will be based on over-exploitation of nature. This means that for in the nearest decades, the tendency of forming unsustainable development will persist.

For Russia, the genuine savings indicator can be very useful. For example, the adjustment of a traditionally calculated GDP growth rate of 9% in 2000 using the genuine savings indicator made it negative and equal to -13%. This can become an essential argument for decision makers to environmentally adjust the country's economic policy.

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