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An Economy-Environment Integrate Statistic System

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1. Introduction

The economy-environment inter-conditioning is so visible that any attempt to fundament this affirmation is useless. The environment furnishes the resources, which represent the nucleus of the supply economic activity. The supply is made for two main reasons: goods and services production and consumption. Both production and consumption create wastes, and these wastes are evacuated in the environment (Fig. 1).

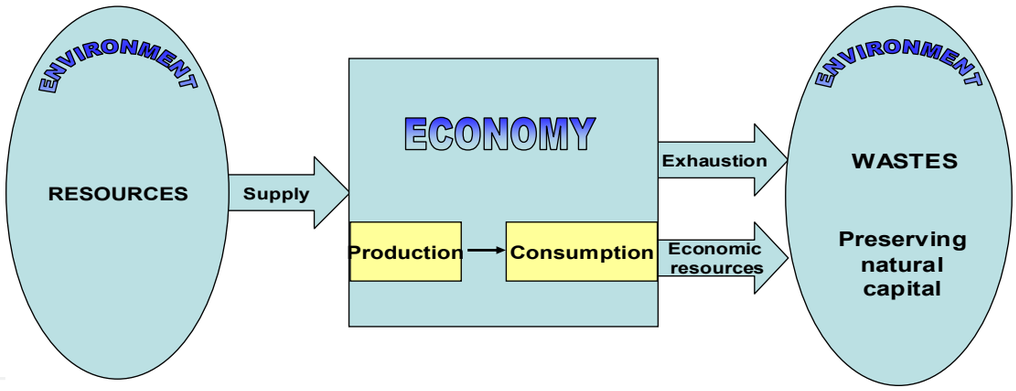

Fig. 1. The economy-environment inter-conditioning

The concept of lasting development doesn't leave any space for a separate discussion on environment economy. The Rio Conference, the 21 Agenda, the Johannesburg summit, scientists' workshops has already established the conceptual basis for creating an environment-economy integrated informational system. No country can be left out because one cannot set boundaries on the environment.

Identifying the information categories relevant for decisions grounding can start the achievement of an informational system concerning lasting development, even before the theoretical and methodological development is fully settled. Thus it can be considered determinant five information categories:

- Highlighting the environment status based on separate environment factors (water, air, soil, biological diversity);

- Emphasizing the environment pressures based on sectors considered pressure sources;
- Estimating the expenses made to avoid pressures;
- Evaluating the size of environment advantages and damages according to the environment pressures;
- Highlighting the standards, which can regulate the pressure.

The first four information categories are so strongly connected to the evaluation problems, that the only problems that may appear are connected to the data collecting methods and the efforts of collecting and processing. On what concerns standards value, there are understandings which count more or less on scientific appreciation, which sustains a higher level of information quality, also generated by the fact that these are decision elements in solving environment problems. An incomplete and uncertain information may influence the consequences of economic activities such as subsequent development.

Achieving the lasting development objectives on a large scale presumes that economic policies are projected according to environment considerations and to the economic functions of the natural resources. For this, the deciding persons need info concerning economic activities and environment status expressed in natural and monetary units. Such information must be built in a manner, which allows an emphasis of the main problem of the lasting development and the inner-generation equity, keeping the environment health for future generations.

The efficiency of the economic reform policies can be evaluated by comparing the traditional synthetic indicators with the ones resulted from integrating the environment data. A simple comparison of these indicators can supply an adequate understanding for introducing the environment parameters in an economic system, reason for that is necessary the use of economic-mathematical modeling.

Because economic policies must be projected in the light of their impact on the environment, the environment policies must take into consideration the economic implications. This integration became nowadays a basic problem in conceiving environment policies, for which the integrated economy-environment indicators can facilitate a coherent wording.

The standard economic indicators, which describe mainly the financial flows in an economy, supply incomplete information concerning the implications of economic activities on the environment. The economic instruments have different possibilities of comparing their results in time and space, but such methods are not developed for environment. The environment informational instruments are usually based on physical parameters, while the economic informational instruments use both physical and value data. As a result, there are significant deficiencies for the quality level of the indicators which must explain the economy-environment inter-dependence, a fact which imposes developing integrated indicators to express the direct connection between the economic activities and environment, in the direction of lasting development request (Fig. 2). In this direction we can define the following priorities:

- The necessity to develop vertical connections between the economic instruments for macro and microeconomic level, respectively between the individual environment indicators (microeconomic level) and the synthesis indicators (macroeconomic level);

- The necessity to develop horizontal relations between the economic and environmental instruments for sector or regional level, respectively including the environment indicators in an economic decisional process;
- The necessity to represent the environment indicators in time dimension, respectively building chronological series for most part of the indicators expressing the economic and environmental performances.

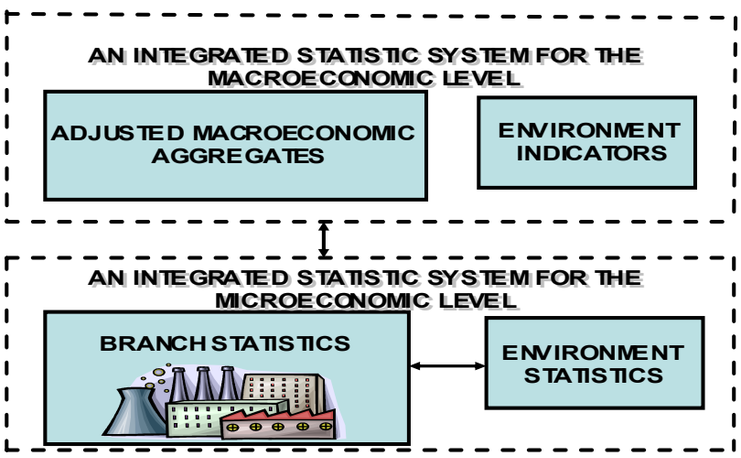

Fig. 2. The economy-environment integration for informational

2. Environment statistic subjects and variables

The statistic base for the economy-environment integrated statistic analysis is complex and perfectible, and this improvement can be achieved gradually. A comprehensive description of the environment requires the integration of a large number of data sources in order to reach a more complete image of the pressure exerted on the environment, of its quality state and of the efforts made to protect the environment. In our country, the present state of these data sources is situated at very low quality level, representing the main obstacle in developing the environment statistic system. The primary data for building the environment statistic-economical analysis system can be improved by developing statistic registers, national accounting revision, doing new statistic researches and improving the existing ones.

Developing the system of environment statistic subjects and variables must be preceded by a clarification of aspect concerning:

- The universal statistic language, the coherence of statistic description being given by the rigorous classification of the statistic subjects, a classification which allows comparison between the information referring to different time periods or different geographical areas (in order to be efficient a statistic language for the economy-environment relation must be systematically developed, so different types of standards to become compatible and establish relations between different information);
- Developing work programs for data gathering and dissemination for subjects such as: emissions, water prevailing and use, waste flow, chemical use, environment protection expenses, available sector statistics for description of environment impact activities etc.;

- Attracting in the environment statistic circuit of those data corresponding to administrative sources, for filling the data fond necessary to comprehensive reflection of the environment problems such as: climate change, air acidification and pollution, exhausting natural resources, exhausting and polluting water resources, urban environment deterioration and waste flow;
- Adopting the European definitions, classifications and unique harmonized naming by the Governmental and non-governmental institutions;
- Projecting and implementing a coherent survey system which would use questionnaires that cover essential domains of the environment statistics;
- Building statistics based on calculus models for those domains, which cannot be informational, covered by statistic surveys or administrative data, such as the case of greenhouse effect gases, chemicals diminishing the ozone layer etc.

When developing the set of environment statistic variables, the present international achievements indicate a preference for combing the environment elements based approach with the one referring to the pressure-status-response and few components from the resource management approach. In Romania, the National Statistic Institute maintains the same conception, a reason for which we would restore a possible draft for developing the environment statistic system of subjects and variables, a draft achieved by combining the three types of approaches mentioned earlier (Fig. 3).

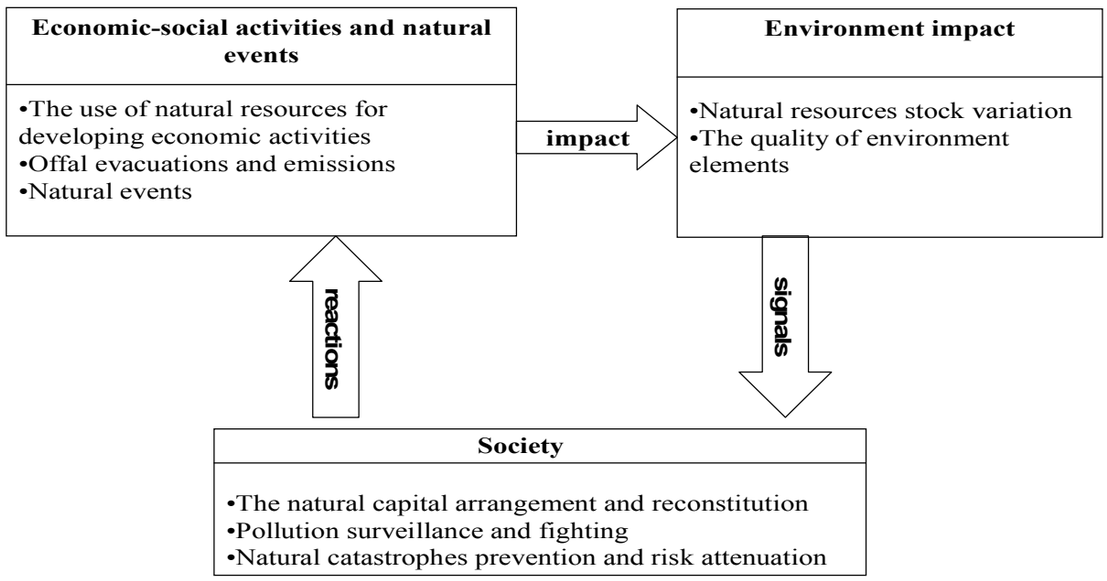

Fig. 3. A draft for developing the environment statistic subjects

2.1 Natural resources use for developing economic activities

Natural resources consumption represents an activity with environment impact generated by the impossibility to restore the consumed resource in a short period. The economic activities with potential environment impact are agriculture, forestry, hunting, fishing, and mining and the extractive industry, energy production and consumption, water use, soil use and landscape transformation.

Agriculture may have environmental incidence by raising the production determined by a growth in cultivated surface or animal effective, either by a growth in agricultural efficiency (Fig. 4.).

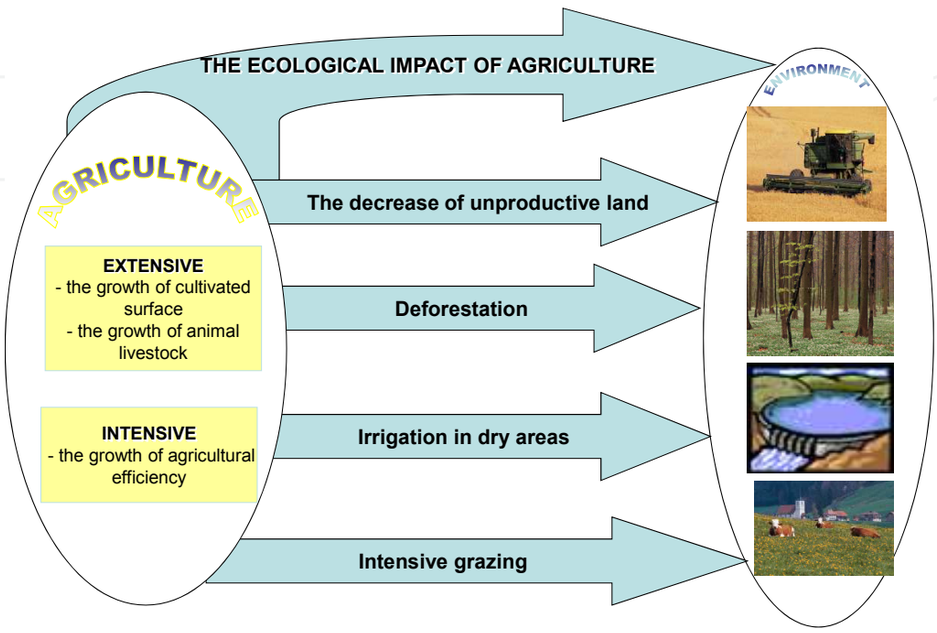

Fig. 4. The ecological impact of agriculture

The statistic subjects which reflect the connection between agriculture and environment refer to a growth of agricultural production (either by extensive agriculture, or intensive) and emphasizing the place of agriculture in the market economy (table 1).

Agriculture	**Statistic variables**
Extensive agriculture	Cultivated surfaces and the production achieved grouped by types of culture
	The animal effective and their density by animal species
Intensive agriculture	The applied quantity of fertilizers and the fertilized surfaces by types of fertilizer substances used
	The fodder quantities consumed by animals grouped by type of fodder
	The agriculture energy consumption by types of energy
	Agricultural practices based on types of works
The place of agriculture in the market economy	The sales volume based on different types of production (physical and value)
	The inputs volume (physical and value)
	The gross capital formation on types of agricultural exploitation
	The exported volume by different types of products (physical and value)
	The volume destined for self-consumer

Table 1. The statistic variables for highlighting the agriculture-environment relation

The forestry activity has a negative impact on the environment because of forest commercial exploitation, but also a positive impact because of forestation interventions (Fig. 5.).

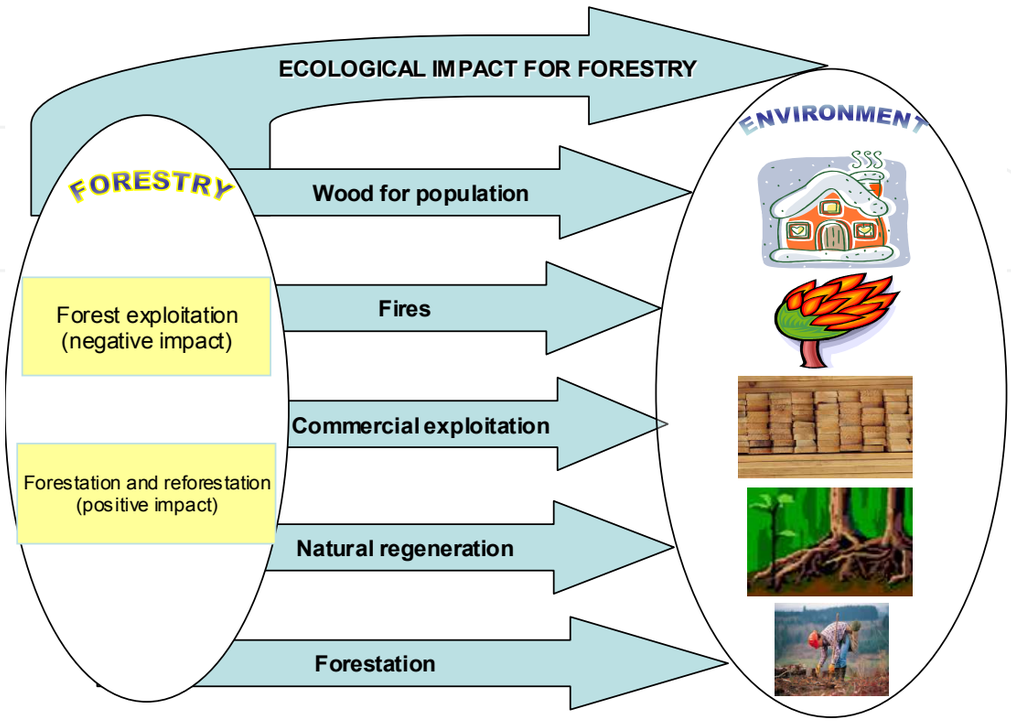

Fig. 5. The ecological impact of forestry

The statistic subjects identified by forestry activity and forest exploitation, connected to environment components consider the commercial exploitation of the forest; wood samples for population, natural loss (fires, diseases, pollution), natural regeneration and forestation (table 2.).

Forestry	**Statistic variables**
the commercial exploitation of the forest	The exploited timber quantity by types of species
	The primary timber production
	Timber exports without any transformation
natural loss	Losses on types of essences
	The deforestation on types of essences
regeneration and forestation	The annual timber growth on wood species
	Naturally regenerated surfaces
	Forestation surfaces

Table 2. Statistic variables for highlighting the forestry-environment relation

The hunting activity may also influence the environment by destroying fauna habitats as a result of over exploitation or by deliberate destruction of the injurious species (Fig. 6.).

The statistic variables that reflect the connection between hunting and environment refer to the hunting harvest and the economic contribution of this activity (table 3.).

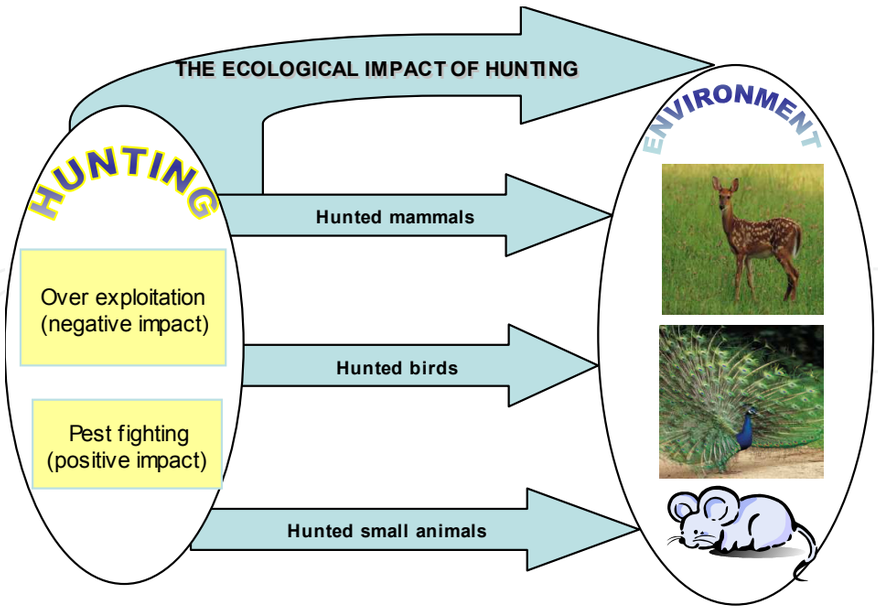

Fig. 6. The ecological impact of hunting

Hunting	Statistic variables
	The hunted mammals effective, on species
	Small animals hunted effective, on species
	Number of hunted birds, on species
The economic Contribution	The venison commercial value, on species
	The income selling specific equipment, hunting permits and the use of tourist infra structure, on types of products
	The export on types of products

Table 3 . The statistic variables for highlighting the hunting-environment relation

The fishing activity can create serious environmental damage by over exploitation and the use of "brutal" fishing methods (Fig. 7.).

In a similar way to the hunting activity, in the case of fishing the main statistic subjects which can be developed refer to the fishing capture and the economic contribution of this activity (table 4.).

The impact of fishing and the extracting industry on the environment can be analyzed by referring to the following statistic subjects, associated to the cycles of mining exploitation (Fig. 8.).

Fishing	Statistic variables
Fish capture	The fish quantity harvested from the sea, on species
	The fish quantity harvested from internal waters, on species
	The fish quantity harvested by sporting fishing, on species
Economic contribution	The export of fish products, on species

Table 4. The statistic variables for highlighting the fishing-environment relation

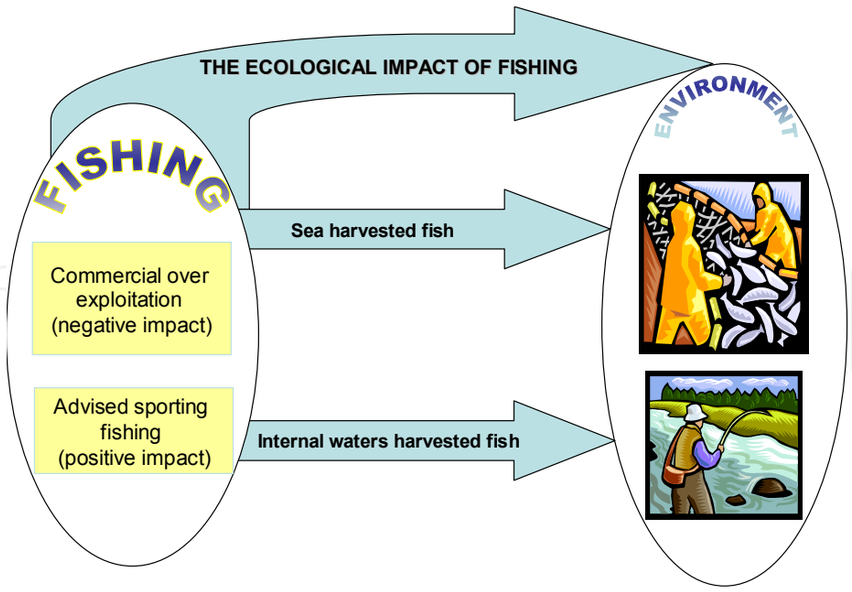

Fig. 7. The ecological impact of fishing

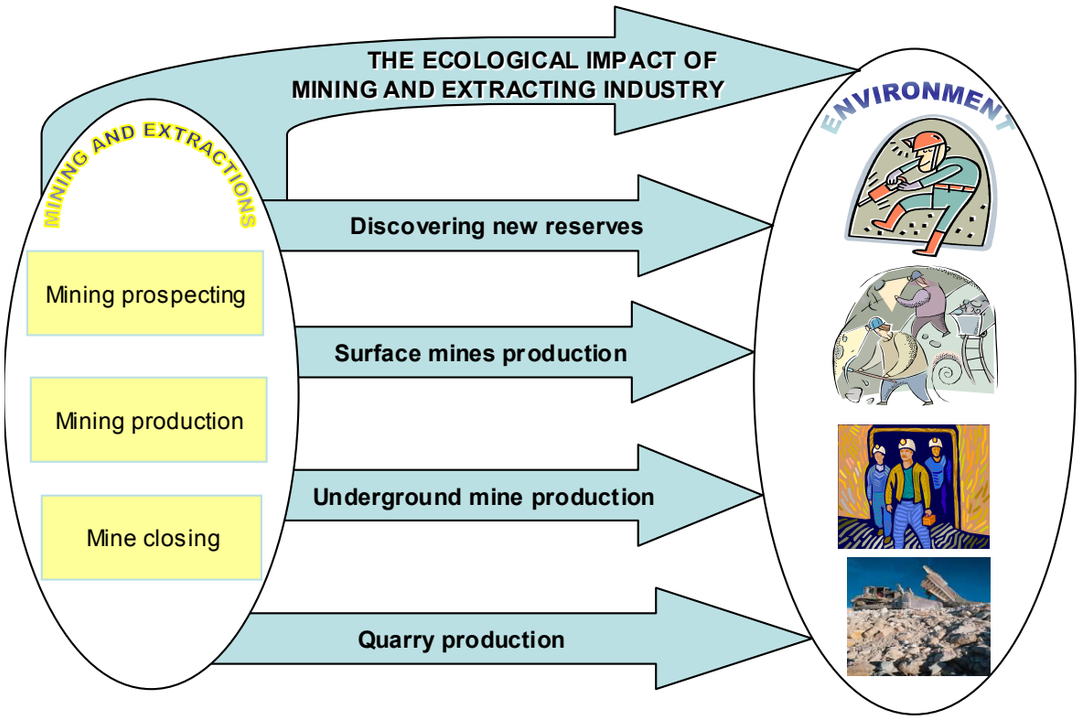

Fig. 8. The ecological impact of mining and extracting industry

The statistic variables, which can be used to analyze the ecological impact of mining and the extracting industry, are presented in table 5.

The energy production and consumption have significant environment impact from the consumer perspective, and also from the pollution perspective. (Fig. 9.).

Mining and extracting industry	Statistic variables
Mining exploitation by mine prospecting	The newly discovered reserves by mineral type
Mining production	The underground mines production by mineral type
	The surface mines production by mineral type
	The quarry production by mineral type
Mine closing	The number of closed mines by mineral type
The role of mineral resources in the economy	The value of mining production by mineral type
	The gross mineral export by mineral type
	The metallurgy consumed minerals by procedure type

Table 5. The statistic variables for highlighting the mining, extracting industry- environment relation

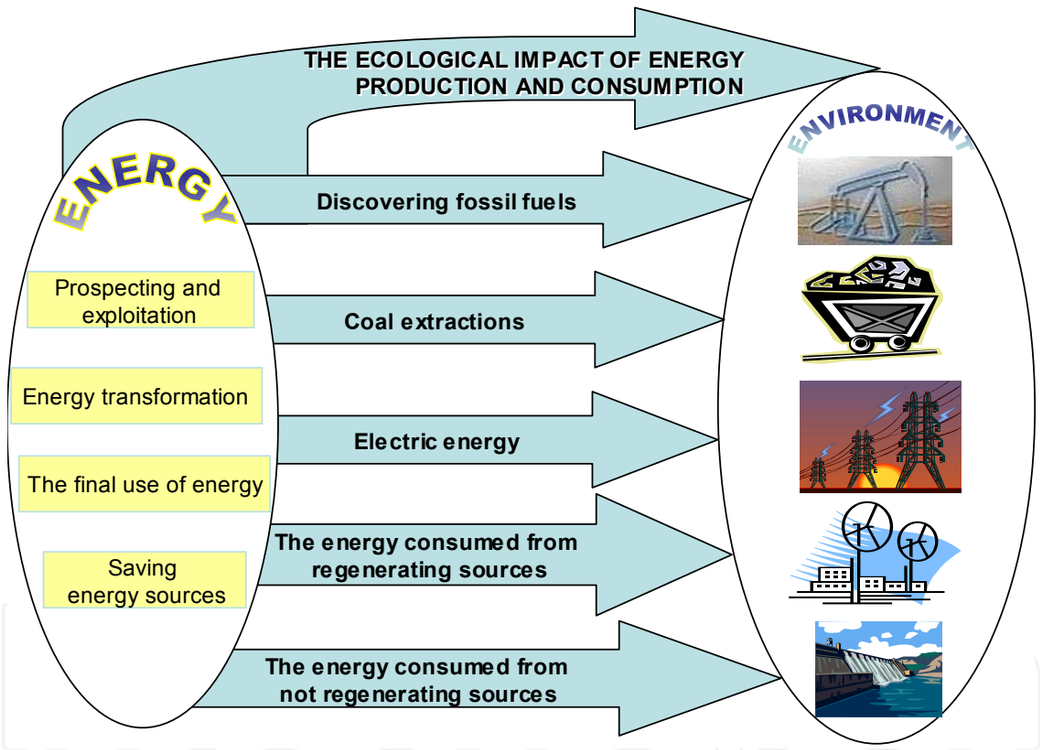

Fig. 9. The ecological impact of energy production and consumption

Table 6 presents the statistic subjects and variables highlighted by the analysis of the impact of energy production and consumption activities on the environment.

The water use is the origin of many environmental problems, especially when the drawings from water bearing formations are made in a rhythm superior to the supply one. In dry areas, the drawing from watercourses may reduce the water quantity at the disposal of downstream users. Another subject of the preoccupation is constituted by the quality of residual water, when it's disposed in water streams, lakes or sea. The statistic subjects and variables, which create the framework of the statistic-economic analysis of water use, are given in table 7.

Energy production and consumption	**Statistic variables**
Prospecting and exploitation activities	The prospecting number (oil resources, natural gas and coal, discovering other fossil fuel prospecting), by resource type
	The volume of natural gas and oil extraction
	The coal volume extraction
Energy transforming activities	The quantity of fossil fuel used to produce thermal energy, by fuel type
	The electricity production based on fossil fuels, by fuel type
	The electricity production based on classic systems, by types of sources
	The electricity and thermal energy production from unconventional, by sources type
Energy final use activities	The intermediate energy consumption by activity type or industries
	The energy final consumption by activity type
Energy administration	The energy consumption/ habitant and by energy type
	The proportion of energy consumption from renewable or non-renewable sources
	The imported or exported energy by energy type

Table 6. The statistic variables for highlighting the relation: energy production and consumption – environment

Water use	**Statistic variables**
Water drawing	Water drawn from surface sources, by types of sources
	Water drawn from underground sources
Water use	The water quantity used in agriculture
	The water quantity used in industry, by activity type
	The water quantity used for energy production
	The water quantity consumed by households

Table 7. The statistic subjects and variables for the water use analysis

The set of statistic subjects and variables which can be used in the soil use and landscape transformation analysis, as distinct aspects of the natural resources use with the purpose of economic activity development, is given in table 8.

Soil use and landscape transformation	**Statistic variables**
Changing the destination	Changes in soil use between activity sectors, by soil use form
	Changes in soil use inside the economic sector, by soil use form
Environment reorganization	The transport network by transport type
	Hydrological structuring by creating dams, accumulation lakes, canals
	Creating residential and industrial areas
	Achieving substructures for: mining, forest exploitation and commerce

Table 8. The statistic subjects and variables specific to the economic activity which imply soil use and landscape transformation

2.2 Waste emission and exhaustion

The statistic analysis of waste emission and exhaustion resulted from economic- social activity consider the air polluting substances emission, the exhaustion of polluting substances in water and generating wastes. The statistic variables used in such analysis are presented in table 9.

Waste emission and exhaustion	**Statistic variables**
Polluting substances air emission	The emitted quantity of polluting substances (nitrogen oxides, carbon oxides, ammonia, organic and inorganic compounds, heavy metals, suspension powders) by type of polluting agents and activities
Polluting substances water exhaustion	The volume of residual water from the public sewage system, by type of polluting agents and hydrographic basins
	The volume of industrial residual water, by type of polluting agents and hydrographic basins
	The quantity of polluting substances resulted from agricultural practices (diffuse pollution due to agriculture)
	The quantity of polluting substances in the rain (diffuse pollution due to acid rainfall)
The amount of wastes	Soil, waters, air waste evacuations
	Other variables can be developed in concordance with the waste classification

Table 9. The statistic variables for highlighting waste emission and exhaustion

2.3 Natural events

These statistic subjects contain variables referring to natural phenomena, which can affect human population production, consumption and welfare. There is a synergetic effect between the natural phenomena and the impact of human activity on the environment. For example, a poor land use during drought may stimulate a deserting phenomenon; building human settlements in vulnerable or seismic areas cause destruction and human lives loss (Fig. 10.).

The variables, which come out of, figure 10 describes the size and intensity of natural events, classified by meteorological geological or biological origin (table 10.).

Natural events	**Statistic variables**
Meteorological risks	The rainfall volume and its variation according to the average
	The temperature and its variation according to the average temperature
Geological risks	The number of earthquakes
	The landslides number
Biological risks	The insect infested surfaces
	The number of epidemics

Table 10. The specific statistic variables for describing the natural events

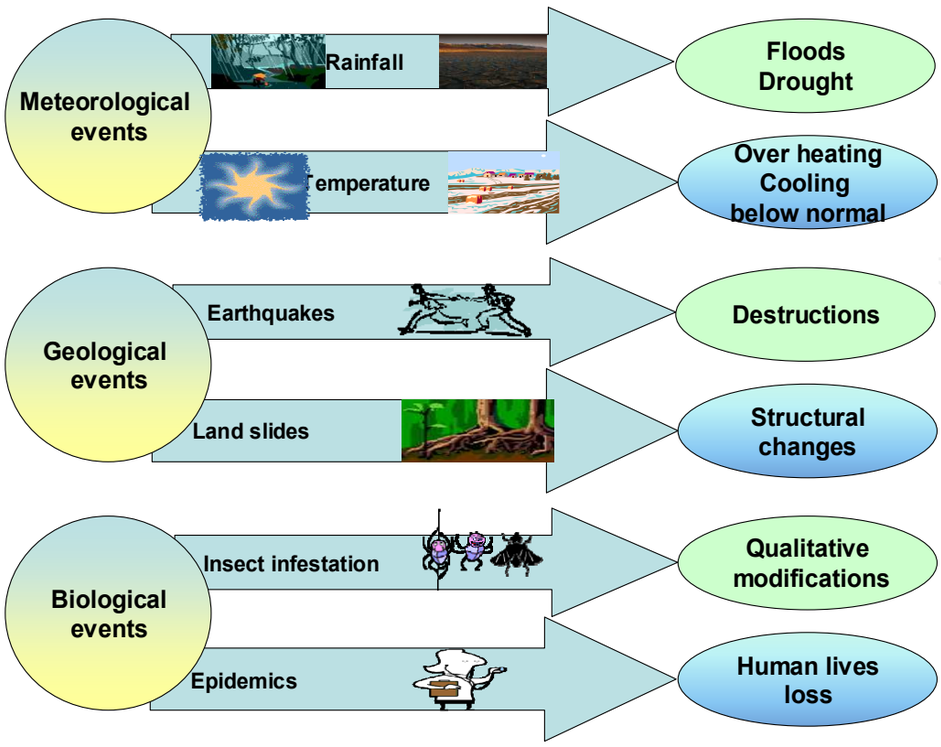

Fig. 10. Natural events

2.4 The natural resources stock variation

The statistics subjects included in this category devolve from the informational system, which considers the lasting resource management. The emphasis is put on growth or reduction of biological resources stock and of cyclic resources (water, soil and minerals). From the environment's point of view, a reduction of the biological resources stock happens when the exploitation exceeds the natural regeneration rhythm (table 11.).

Environment elements	Statistic variables
Soil/subsoil	The net variation of land surfaces
	The net variation of annual cultures biological mass
	The livestock net variation
	The net variation of forests
	The variation of forest biological mass
	The losses of productive soil due to land use changes
	The losses of productive soil due to corrosion
	The initial reserve of mineral resources by mineral type
	The annual production of mineral reserves by mineral type
Water	The variation of the fish population
	The level variation for surface water
	The modification of the average flow of water streams
	The variation of the lakes stocking capacity

Table 11. The statistic variables for the analysis of natural resources stock variation

2.5 The environment elements quality

The level of air, soil and water quality is generally compared to standard quality norms. The statistic variables may express in terms of variation and frequency, the exceeding of admitted standards and the quality degree of each environment element (table 12.). The air quality is mainly determined by environmental pollutant concentrations. In this direction, in order to control the polluting chain and fight its effects must be used in all of the pollutant production and transmission stages the same concepts, definitions and classifications. The notion of water quality is more complex than the one of air quality, because quality parameters depend besides the pollution agents on the water uses. Establishing the statistic variables referring to water quality is necessary because of the preoccupations concerning the contamination of the hydrographic network, due to pollutant evacuations from industrial, agricultural and human settlements units. Soil quality influences the productivity of biological systems, and their degradation reduces the production of biological mass and the capacity to produce services. Natural factors, but also agriculture practices determine the variation in soil quality. In this manner, soil degradation can be connected with wrong work and use practices for agricultural crops, but also with land improvement activities and excessive use of agrochemical products. Also, a certain state of soil quality contributes to acid deposits resulted from atmospheric pollution, the humus loss as a result of chemical fertilizers applications, soil compaction due to agricultural machines use.

Environment element	**Statistic variables**
Air	The maximum effective concentration of pollutants by type of pollutant agents
	The average monthly/annual pollutant concentration by type of polluting agents
	The frequency of exceeding the maximum admitted concentration
Water	The physical and chemical properties of used waters
	The chemical substances concentrations
	The organic matter concentrations expressed by COD (Chemical oxygen demand – the oxygen quantity took from the water organic matter, used as a measurement unit for organic matter in domestic waters)
	The river length by quality classes
Soil	Deserted surface
	Eroded surface
	Toxic substances contaminated surface
	The acid deposits surface
	The surface of irrigation degraded soil

Table 12. The statistic variables for the emphasis of environment elements quality

2.6 The arrangement and reconstitution of natural capital

The improvement of resource consumption in the classical meaning, considers an economic productivity maximization of natural resources for the growth of production units which use these resources, such as: agriculture, forest exploitation, fishing and the extracting industries. A statistic expression for the arrangement and natural capital reconstitution can be achieved with the help of following statistic variables highlighted in table 13.

The arrangement and reconstitution of natural capital	Statistic variables
Nature protection and conservation	The national parks network
	Protected areas
	Protected fauna
	Public expenses for arranging and restoring natural resources
	The personnel engaged in protecting and conserving nature
Reconstitution of degraded environment	Restored agricultural land
	Trees cultivated land
	Protected species of flora and fauna

Table 13. The statistic variables for describing the arrangement and reconstitution of natural capital

2.7 Pollution supervision and control

There are more categories of statistic variables, which can describe the activities of pollution supervision and control (table 14.).

Pollution supervision and control	Statistic variables
Pollution research and environment supervision	The number of researches concerning pollution
	The number of air or water quality supervision stations
Environment restoring and pollution fighting	Pollution fight by pollutant type and ecosystem
	Restoring operation by ecosystem and pollutant type
The means to fight pollution	The number of water treating stations by type of treatment and hydrographic basins
	The mud quantity evacuated by hydrographic basin type
	The quantity of dangerous waste treated
	Public funds allocation for the enterprises pollution fight
Actions started by enterprises	The volume of cleaned residual water
	The necessary cost for managing dangerous waste
	Waste recycling
	Investments for environment protection techniques
	The costs engaged for producing consumer goods which don't endanger the environment
The households' reactions	The modifications in the expenses structure
	Households' waste recycling
	Buying products with low environment impact
	The consumption modalities by type of consumer (Choosing lead free gas, using paper wrappings, choosing the size of the vehicle, etc.)
	Recycling materials
	The population behavior on what concerns the participation to the recycling process

Table 14. The statistic variables for the description of the pollution supervision and control

2.8 Preventing natural catastrophes an risk attenuation

In front of natural forces, the reaction may be scientific, technical, biological, administrative and humanitarian. The variables presented in this category (table 15.) describe the measures took in order to prevent floods, the operation of catastrophes surveillance and foreseeing, emergency measures for reducing their effects (meaning evacuating the population, etc.).

Types of activities	Statistic variables
Prevention	The number of researches by activity type
	The physical substructure for natural catastrophe protection
	Administrative regulations by regulation type
Control	Biological activities

Table 15. The statistic variables for emphasizing the preventing actions for natural catastrophes and risk attenuation

3. Conclusion

The economy-environment integrated statistic analysis can be applied in different stages of the decisional process, such as: identifying environment priorities, identifying the pressure points, projecting environment policy, evaluating the policy's effects. The data can be used to monitor the effects of environment policies in the terms of public and private commercial activities, as well as in terms of positive or negative sector effects induced by different sectors.

4. Acknowledgment

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The technological advancement of our civilization has created a consumer society expanding faster than the planet's resources allow, with our resource and energy needs rising exponentially in the past century. Securing the future of the human race will require an improved understanding of the environment as well as of technological solutions, mindsets and behaviors in line with modes of development that the ecosphere of our planet can support. Some experts see the only solution in a global deflation of the currently unsustainable exploitation of resources. However, sustainable development offers an approach that would be practical to fuse with the managerial strategies and assessment tools for policy and decision makers at the regional planning level. Environmentalists, architects, engineers, policy makers and economists will have to work together in order to ensure that planning and development can meet our society's present needs without compromising the security of future generations.

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