

**Ministry of Education and Science of Ukraine  
Sumy State University  
Economics and Management Department  
Economic Research Centre  
Youth Scientific Community of Sumy State University**

16<sup>th</sup> International Scientific Conference  
**"Economics for Ecology"**  
**ISCS'2010**



***"Економіка для екології"***

Матеріали  
XVI Міжнародної наукової конференції  
**(Суми, Україна, 5-8 травня 2010 року)**

Суми "Видавництво СумДУ" 2010



16<sup>th</sup> INTERNATIONAL SCIENTIFIC  
CONFERENCE  
"ECONOMICS FOR ECOLOGY"  
(ISCS'2010)

May 5-8, 2010, Sumy, Ukraine

**The conference  
organizers:**

- Sumy State University (Economic and Management Department)
- Economic Research Centre
- Youth Scientific Community of Sumy State University
- Sumy Department of Family, Youth and Sports
- Sumy regional youth organization of all-Ukrainian social youth organization «Batkivshchina moloda»

**Support**

**The topics of the  
conference:**

- State Environmental Policy
- Problems of Education, Ecological Education
- Rational Economics and Saving Technologies
- Informational Economics
- Greening Economy, Greening People
- The Mechanisms to Reach Sustainable Development
- Regional Ecology
- Ecological Economics and Marketing in the Context of Globalization
- Interrelation of Economy and Culture
- The Role of NGOs on the Way towards Sustainable Development

**The conference is  
directed to:**

students, young researchers, representatives of youth organisations and NGOs

**Conference  
languages:**

the official conference language is **English**

**Conference place:** Sumy State University

**Please contact Organizing Committee for information:**

*Address:* Ukraine, 40007, Sumy, R.- Korsakova str. 2, Sumy State University, Economic and Management Department

*E-mail:* [iscs@ua.fm](mailto:iscs@ua.fm), [iscs@econ.sumdu.edu.ua](mailto:iscs@econ.sumdu.edu.ua)

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*Address:* Ukraine, 40007, Sumy,  
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*Phone:* +380-542-335475  
*E-mail:* [iscs@econ.sumdu.edu.ua](mailto:iscs@econ.sumdu.edu.ua)  
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*Fax:* +380-542-327844  
*E-mail:* [visa@lem.sumy.ua](mailto:visa@lem.sumy.ua)

*Адреса:* Україна, 40035, м. Суми,  
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## Program of the 16<sup>th</sup> International scientific conference "Economics for ecology" (ISCS 2010)

<b>Wednesday, May 5</b>	Arrivals, Opening & Plenary session
08:00 – 11:45	Registration of the participants
12:00 – 13:30	Official conference opening
14:00 - 14:40	Lunch
15:00 – 17:45	Plenary session
18:00 - 19:00	Departure to the recreation center for settlement
19:00 – 19:30	Accommodation
20:00 – 20:30	Dinner
21:00 – 23:00	Ukrainian party
<b>Thursday, May 6</b>	Conference Working Day
08:30 – 09:30	Breakfast
10:00 – 11:30	Workshops
11:30 – 12:00	Coffee Break
12:00 – 14:00	Workshops
14:00 – 15:00	Lunch
15:00 – 17:00	Debates
17:00 – 17:30	Coffee Break
17:30 – 19:00	Conclusions of the workshops
19:30 – 20:30	Dinner
21:00 – 23:00	International party
<b>Friday, May 7</b>	Excursion Day
08:00 – 19:00	Excursion (Sumy region)
19:30 – 20:30	Dinner
21:00 – 23:00	Farewell party
<b>Saturday, May 8</b>	Departure
08:00 – 09:00	Breakfast
09:30	Departure to Sumy



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# ALTERNATIVE ENERGY TO ENSURE SUSTAINABLE DEVELOPMENT

*Alias Naser Ibraheem*

*Sumy State University, Sumy, Ukraine*

**Alternative energy** sources can produce power without wearing out the source. Sustainable sources are continually renewed. In addition to using sustainable energy forms, people need to practice energy conservation, reduce waste and improve energy efficiency. This will decrease the impact of our energy use on the environment in order to have a future with a clean earth, and to have power whenever we need it [1].

**Solar energy.** Solar power uses the sun's rays to produce electricity and heat. Using Photovoltaics, electricity is made directly from the sun's rays, while in Solar Thermal power the heat of the rays is used. Photovoltaics currently relies on three technologies. Monocrystalline and polycrystalline cells are silicon-based. Thin-film cells use semi-conductor materials. Photovoltaic cells in modules are connected to make arrays. Solar power from photovoltaics has a high initial cost in the production process and in CO<sub>2</sub> emissions, but low running costs and a long life. With improving technology, the monetary cost of solar power is decreasing. Solar energy is sustainable [2].

**Wind energy.** Wind energy makes electrical or mechanical power. Wind moves two or three blades mounted on tall towers to drive turbines that create electricity. Each turbine can produce 600-1000 kW (1 megawatt), of electricity, enough to supply 600-1000 homes. Grouped together, several turbines form a wind farm. New technology has improved power output of turbines up to 2.5 MW. Variable speed turbines increase equipment life. Turbines can be placed offshore to take advantage of ocean winds and to reduce environmental impact. Offshore energy can then be stored in batteries or used to make hydrogen. Wind energy is a sustainable form of energy [3].

**Wave Power.** Compared to other forms of renewable energy production such as wind turbines, the development of ocean and wave energy has barely begun. But there are some operating systems in Europe, and the theoretical potential of this clean, inexhaustible form of energy is enormous - experts estimate that 0.2 percent of the ocean's untapped energy could power the entire world. Wave Power is a sustainable form of energy supply [2].

**Hydropower.**Hydropower uses the energy of falling water to make electricity or mechanical energy. As water falls a vertical distance (the "head"), the potential energy of that fall is released. Hydropower can be made at large dams or small weirs. It can even be produced in rivers using the natural flow of the water [3]. The advantages of hydropower include low maintenance costs.

**Tidal Power.** The tide moves a huge amount of water twice each day, and harnessing it could provide a great deal of energy. A major drawback of tidal

power stations is that they can only generate when the tide is flowing in or out - in other words, only for 10 hours each day. However, tides are totally predictable, so we can plan to have other power stations generating at those times when the tidal station is out of action. Tidal energy is renewable. The tides will continue to ebb and flow, and the energy is there for the taking, tidal power is sustainable [1].

**Geothermal energy.** Geothermal energy comes from the heat of the earth. Radioactive decay in the earth's crust and volcanoes make heat. Deep wells, up to 4500 meters deep, are drilled into hot dry rock, hot water or steam sources. The heat is then used directly, in heat pumps or as steam to drive turbines to make electricity. Some of the problems with geothermal energy include air pollution from radon gas, hydrogen sulfide, methane and ammonia. Mineral deposits also harm geothermal equipment. Geothermal sources are found all over the world and supply reliable, inexpensive power. Depending upon the source and methods, geothermal energy can be a sustainable form of energy [4].

**Biomass Energy.** Biomass power is the process of making energy from plant and animal matter. Industrial wastes such as sugar cane stalks, sawdust, straw and organic material, as well as energy crops like sugar cane, corn and trees can be turned into fuel. The original material can be burned directly, gasified, biologically, or chemically converted to biogas or other fuels. Energy made from biomass often makes less pollution than fossil fuel power. Unfortunately, Biomass energy can not replace our dependence on oil as it is not a sustainable form of energy.

**Hydrogen energy.** Hydrogen energy is made when hydrogen molecules combine with oxygen, producing water and heat in a chemical reaction. Efficiency of hydrogen energy can be up to 80%, especially when the extra heat produced is also used. Whether Hydrogen energy supply can be sustainable remains controversial and it is an area that needs greater research funding [1].

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# ENVIRONMENTAL POLLUTION AND ITS NEGATIVE EFFECT ON THE CORROSION OF METALS

*Alias Naser Ibraheem, Ganna Tkachenko*  
*Sumy State University, Sumy, Ukraine*

There are many types and causes of corrosion and depending on a particular scientist's or corrosion engineer's tendencies to look upon the subject more broadly or narrowly there is no clear and exact total for the number of corrosion types. Most corrosion experts however can agree on the basic varieties of corrosion listed below.

**ATMOSPHERIC:** Atmospheric corrosion and its severity is essentially determined by four variables: air pollution (both man made and natural such as volcanic gases), airborne salt spray or droplets, temperature, moisture.

The presence of industrial pollutants in the polar ice caps demonstrates that even the most remote corners of the Earth are not immune to its effects. Nitrogen and sulfur compounds can form acids when discharged or acidic material may be released to the atmosphere directly by some industries accelerating the corrosion process on metal these substances encounter. Of course urban areas and those areas in close proximity to or downwind from "smokestack type" industries and power plants are subject to the most corrosive effects of airborne pollution.

Salt spray and airborne saltwater droplets introduce chloride ions to metal surfaces with a corresponding deleterious effect on the metal. But one does not have to live on the beach to experience these corrosive effects as it is estimated that airborne sea spray saltwater micro droplets can carry as much as 7 miles inland from the coast. The presence of moisture is an absolute necessity for most corrosion processes and when combined with elevated temperatures and salt or pollutants further enhances the atmospheric corrosion process. Atmospheric corrosion is ubiquitous and is responsible for more metal damage (both on a cost accounting basis and an actual quantitative basis) than any other form of environmental corrosion. After all, everything on the Earth's surface is exposed to the atmosphere be it vehicles, buildings, bridges, etc [1].

**GALVANIC:** When dissimilar metals are connected in the presence of an electrolyte a galvanic corrosion reaction occurs. Both the presence of an electrolyte solution and a bi-metallic coupling is required for this type of corrosion to occur. Electrolytes are electrically conductive solutions such as sea water or road salt spray which contain chloride or rain, mist or dew containing sulfur or nitrogen compounds. The most common sources of chloride contamination are marine and coastal environments as well as winter road salting spray. Sulfur and nitrogen compounds are more ubiquitous being the product of air pollution and industrial fallout.

When two dissimilar metals are connected electrically through an electrolyte or salt bridge one metal will become anodic with reference to the other and the



potential difference will create a corrosion current causing the more anodic metal to corrode.

**UNIFORM/GENERAL:** When corrosion occurs uniformly over a wide area of the metal surface producing a general thinning of the metal leading to eventual failure. The rate of general corrosion is usually relatively predictable.

**PITTING:** Pitting corrosion is quite often evident on metal surfaces where no uniform corrosion is present and is usually highly localized. Pitting usually proceeds fairly rapidly and is accelerated by the presence of chlorides and is particularly common at the base of breaks in coatings. Pitting corrosion takes advantage of the different metallurgical phases present on the surface of most common modern alloys. Generally it is considered to be the product of localized anodic dissolution where the anodic portion of the corrosion cell is dwarfed by the larger cathodic portion [2].

**STRESS CORROSION CRACKING :** Stress corrosion is the product of tensile stress (including residual stress remaining after fabrication) and localized corrosion which combine to produce a brittle cracking of metal under certain conditions. Examples of environments which enhance stress corrosion are high pH amine solutions for most common steels and chloride bearing solutions for most stainless steels as well as certain aluminum alloys.

**CREVICE CORROSION:** Crevice corrosion occurs in sheltered, localized areas such as crevices, joints, bolted and threaded parts and under existing corrosion deposits. It is the result of concentration of salts, acids and moisture which results in the formation of an occluded corrosion cell in such sheltered areas. A small anode is created in the crevice with the remainder of the body acting as a large cathode so corrosion at the crevice is highly accelerated as well as concentrated.

**HIGH TEMPERATURE:** Under very high temperature metals need only the presence of oxygen or other oxidizing gases to corrode. This type of corrosion is referred to as high temperature oxidation, scaling or tarnishing and requires neither moisture nor dissolved electrolytes (salts, acids) to proceed.

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# BIODIVERSITY AND ECOSYSTEM SERVICES

**Baruti Abdala Yussufu**  
*Sumy State University, Ukraine*

Many societies today have technological capabilities undreamed of in centuries past. Their citizens have such a global command of resources that even foods flown in fresh from all over the planet are taken for granted, and daily menus are decoupled from the limitations of regional growing seasons and soils. These developments have focused so much attention upon human-engineered and exotic sources of fulfillment that they divert attention from the local biological underpinnings that remain essential to economic prosperity and other aspects of our well-being. These biological underpinnings are encompassed in the phrase *ecosystem services*, which refers to a wide range of conditions and processes through which natural ecosystems, and the species that are part of them, help sustain and fulfill human life.

In addition to the production of goods, ecosystem services support life through the following: purification of air and water; mitigation of droughts and floods; generation and preservation of soils and renewal of their fertility; detoxification and decomposition of wastes; pollination of crops and natural vegetation; dispersal of seeds; cycling and movement of nutrients; control of the vast majority of potential agricultural pests; maintenance of biodiversity; protection of coastal shores from erosion by waves; protection from the sun's harmful ultraviolet rays; partial stabilization of climate; moderation of weather extremes and their impacts

Although the distinction between "natural" and "human-dominated" ecosystems is becoming increasingly blurred, we emphasize the natural end of the spectrum, for three related reasons. First, the services flowing from natural ecosystems are greatly undervalued by society. For the most part, they are not traded in formal markets and so do not send price signals that warn of changes in their supply or condition. Furthermore, few people are conscious of the role natural ecosystem services play in generating those ecosystem goods that are traded in the marketplace. As a result, this lack of awareness helps drive the conversion of natural ecosystems to human-dominated systems, whose economic value can be expressed, at least in part, in standard currency. The second reason to focus on natural ecosystems is that many human-initiated disruptions of these systems -- such as introductions of exotic species, extinctions of native species, and alteration of the gaseous composition of the atmosphere through fossil fuel burning -- are difficult or impossible to reverse on any time scale relevant to society.

Moving our attention from the moon back to Earth, let us look more closely at the services nature performs on the only planet we know that is habitable. Ecosystem services and the systems that supply them are so interconnected that any classification of them is necessarily rather arbitrary. Here we briefly explore a suite of overarching services that operate in ecosystems worldwide.

Humanity obtains from natural ecosystems an array of ecosystem goods—organisms and their parts and products that grow in the wild and that are used directly for human benefit. Many of these, such as fishes and animal products, are commonly traded in economic markets. The annual world fish catch, for example, amounts to about 100 million metric tons and is valued at between \$50 billion and \$100 billion; it is the leading source of animal protein, with over 20% of the population in Africa and Asia dependent on fish as their primary source of protein. Soil represents an important component of a nation's assets, one that takes hundreds to hundreds of thousands of years to build up and yet very few years to be lost. Some civilizations have drawn great strength from fertile soil; conversely, the loss of productivity through mismanagement is thought to have ushered many once flourishing societies to their ruin. Today, soil degradation induced by human activities afflicts nearly 20 percent of the Earth's vegetated land. In addition to moderating the water cycle, as described above, soil provides five other interrelated services. First, soil shelters seeds and provides physical support as they sprout and mature into adult plants. The cost of packaging and storing seeds and of anchoring plant roots would be enormous without soil. Human-engineered hydroponic systems can grow plants in the absence of soil, and their cost provides a lower bound to help assess the value of this service.

Ecosystem services are being impaired and destroyed by a wide variety of human activities. Foremost among the immediate threats are the continuing destruction of natural habitats and the invasion of non-native species that often accompanies such disruption; in marine systems, overfishing is a major threat. The most irreversible of human impacts on ecosystems is the loss of native biodiversity. Society would clearly profit by further investigation into some of the following broad research questions so that we might avoid on Biosphere 1, the earth, unpleasant surprises like those that plagued the Biosphere 2 project: What is the relative impact of various human activities upon the supply of ecosystem services? What is the relationship between the condition of an ecosystem—that is, relatively pristine or heavily modified—and the quantity and quality of ecosystem services it supplies? To what extent do ecosystem services depend upon biodiversity at all levels, from genes to species to landscapes? To what extent have various ecosystem services already been impaired? And how are impairment and risk of future impairment distributed in various regions of the globe?

The human economy depends upon the services performed "for free" by ecosystems. The ecosystem services supplied annually are worth many trillions of dollars. Economic development that destroys habitats and impairs services can create costs to humanity over the long term that may greatly exceed the short-term economic benefits of the development. These costs are generally hidden from traditional economic accounting, but are nonetheless real and are usually borne by society at large. Tragically, a short-term focus in land-use decisions often sets in motion potentially great costs to be borne by future generations. This suggests a need for policies that achieve a balance between sustaining ecosystem services and pursuing the worthy short-term goals of economic development.

# PROBLEMS OF WATER MANAGEMENT IN TAJKISTAN

***Sharafdzhon Boboev***

*Sumy State University, Sumy, Ukraine*

Problems of water scarcity and use of hydropower resources, prevent and eliminate consequences of natural disasters related to the hydrosphere, the environmental issues associated with the use of water resources should be the determining factor for Tajikistan for sustainable development. At the urging of President Emomali Rahmon at the first Asia-Pacific Water Summit in Beppu in Japan to address these and other problems in Dushanbe on 27-29 June 2008 held the International Conference on Disaster Reduction, associated with water.

In lakes of Tjikistan accumulated 44 km<sup>3</sup> of water, of which 20 km<sup>3</sup> of drinking quality. Groundwater reserves of the republic are 18.7 km<sup>3</sup> of them running 2.8 km<sup>3</sup>. The average water consumption of the population in cities and district centers in 2006 stood at 198.7 liters per day, and sanitation - 82,6 liters per day. Due to limitation in the autumn and winter supply of electricity, more than 180 days a year, water is 5-6 hours a day. In rural areas the consumption of the street or courtyard columns water consumption ranges from 50 to 120 liters per day per person.

The quality of drinking water is low. According to the Ministry of Health of Tajikistan "Most of the plumbing works with serious violations of the rules of technical operation, poor sanitary condition of water supply facilities and systems. Lack of coagulants, chlorine-containing drugs leads to the filing of the population of poor quality, unsafe water".

Over the past ten years has significantly increased the number of accidents on the networks of water supply and sanitation. Negatively on the quality of drinking water affected by faecal contamination of water falling into the water supply system through the destruction of water mains. Such cases are rare and quickly eliminated. Normal wear and tear of water supply systems is 70%. This depreciation is calculated on the basis of accounting, and in fact higher.

According to the Ministry of Health is now the state of the majority of water supply is very poor. Of the 254 water supply systems in the Khatlon region are not working 122, that is 48%, the quality of water supplied to the public, does not meet the state standard "Drinking Water". More than 80% of sewage treatment plants are not functioning because of the moral and physical deterioration, but functioning ineffective. The designed capacity of mechanical cleaning CBS cities Kulyuba is 9000 m<sup>3</sup>/day, actually reaches 15000 m<sup>3</sup>/day. Thus, the 6000 m<sup>3</sup> of sewage each day without pre-cleaning and disinfection are discharged into river. Kulyabko.

The most unfavorable epidemiological situation in rural areas, where inhabitants mainly for household and drinking water supply from rivers and irrigation ditches. The main source of pollution of open reservoirs is the discharge of untreated household and faeces, as well as runoff from fields, which contain chemicals and fertilizers. Thus, the

sanitary epidemiological stations in the analysis of outbreaks of typhoid fever in the Khatlon region was vychvleno that 180 toilets, more than 180 cattle and 70 landfills are located in close proximity - from 0,6 to 5 meters - from the canals, the water that people used for drinking needs.

For disinfection of drinking water for the population of the city planned to build 5 miniplants for the production of sodium hypochlorite. The raw material for this production is salt, which reserves in the country in excess. So far used for this purpose liquid chlorine, which was brought from the Republic of Uzbekistan.

There should be immediate steps to restructure enterprises providing water and wastewater services to their transfer to a commercial basis. Following the government decision, in principle, need assistance in the formulation of detailed policies and the implementation of reforms, including institutional strengthening and legislative review.

Achievement of the global Millennium Development Goals in terms of providing the population of the Republic of Tajikistan water services and sanitation seems to be rather difficult due to initially low level of provision of these services. In particular, in the Republic of Tajikistan coverage of centralized water supply should be increased by 22% to 79% of the total population, the coverage of these services of the urban population should be increased by 5% and make-up in 2015 to 95% of the total urban population, the proportion of rural population with centralized water supply should increase by 27% and reach by 2015 71% of the total rural population of the Republic of Tajikistan. Given the extremely high degree of depreciation of fixed assets of water supply and sanitation, which is quite evident when analyzing the number of accidents on the water and wastewater networks, simultaneously with the construction of new networks will need to overhaul the vast majority of the existing water and sewerage networks.

Government of the Republic of Tajikistan in order to improve the security of the population with drinking water adopted by the "Programme for the Advancement of the Republic of Tajikistan clean drinking water in 2007-2020". The financial cost to 2020 under this program is about \$ 1 billion., One can assume that without substantial financial assistance to the Republic of Tajikistan will not be able to provide its own global goals of the Millennium. Currently, international organizations are cooperating in this direction as partners and doing some work on water and sanitation.

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## **ECONOMY, CULTURE AND ECOLOGY INTERRELATIONS: SYSTEMIC APPROACH**

**Andriy Bondarchuk**, KNUTD  
(Kyiv National University of  
Technology and Design), Kyiv,  
Ukraine

**Volodymyr Nochvay**, NUSTSU  
(National Academy of State Tax  
Service of Ukraine), Irpin,  
Ukraine; Pukhov Institute of  
Modeling Problems in Power  
Engineering National Academy of  
Sciences of Ukraine, Kyiv,  
Ukraine

Nowadays, when the world becomes a “big village”, scientists from different fields of social, technical and humanitarian studies try to cooperate in finding a general scheme of human society’s functioning. In the article, we shall try to combine theoretically two global spheres of people’s life: their common home - the **environment**, and people’s interrelations and communications - the **human society**. So we shall combine ecological and sociological studies using system-based approach through understanding that ecology and society can be seen as one system – “green home where people are happy”.

Ecology, the science about the relationships of organisms with other organisms and with their physical environment, last time has much more meanings, for example: world outlook and cultural significance. Ecology that includes study of the structure and functions of natural systems last times pays attention to technical and social systems, too.

Society is analyzed as a system (Lensky, Sanderson etc.) complying structural and functional approach (T. Parsons). Four functional structures of social system: Adaptation, Goal-streaming, Integration, Latency (AGIL) are analyzed relatively to ecological interrelations. That is transformed to next functions: Adaptation to ecological and climate change; sustainable development Goal-streaming; Integration of ecological aims into some codex or laws and national traditions; Latent pattern maintenance by ecological ethic and culture through understanding the necessity of safe environment for cultural development.

But what is the mechanism how ecological and social systems are intersected? The answer can be found using Parsons’ action theory.

Parsons analyses four subsystems of action system:

1. **The behavioral organism** (or system) serves as a bridge between the material and ideal worlds - norms, values, meanings that make up the world of action. It performs the function of adaptation to physical environment.

2. **The personality system** performs the function of setting goals. It is created in the process of individual socialization and designed to internalize the values and norms. It becomes an instrument to distinguish the order of goals in action system.

3. **The social system** is the set of role-status-driven standards that determine what actions are preferable. It performs the function of integration.

4. **The cultural system** is the set of "historical experience" - ideas, ideals, values, etc. It functions as "latent pattern maintenance" and specifies the ideas in the norms of the social system, internalizing the system identity.

Each of those subsystems should be seen as independent axis of action system elements organization. It means that none of them could be reduced to the other or their combination. Each of the systems presupposes the existence of other, because the social system cannot exist without the personalities and culture.

Now when ecological ethic and culture has been established in the scientific community through the crisis of cultural values of consumer attitudes toward nature initiated by ecological crisis of society, It is necessary to look for mechanism to transfer these values to society functioning. This problem can be solved using general action model, that Parsons called "unit act". It implies a generalized model of any human action and includes:

- actor – person with a desire to act, having defined goals and is able to describe ways to achieve them;
- situational environment - mutable and immutable factors of the environment, against which the action is directed and from which it depends.

In the process of interaction as the individual himself and his environment have systemic effects on each other. As a result of this interaction both, the internal components of the structure of the individual and the state of the environment, may vary. Further development of transformed societies to sustainable growth direction is hardly possible until ecological goals and values, including national-based ones, are formed on personality and actors social systems levels.

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# **IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT SYSTEM AS A TOOL TO INCREASE THE MARKET VALUE OF ENTERPRISE**

***Daryna Boronos, Igor Kobushko***  
*Sumy State University, Sumy, Ukraine*

Environmental management system (EMS) refers to the management of an organization's environmental programs in a comprehensive, systematic, planned and documented manner. It includes the organizational structure, planning and resources for developing, implementing and maintaining policy for environmental protection. It assesses business' strengths and weaknesses, helps to identify and manage significant impacts, saves money by increasing efficiency, ensures comply with environmental legislation and provides benchmarks for improvements. An EMS can also help to manage resources, and improves the reliability and credibility of enterprise's environmental policy. It helps to prove to customers that enterprise is committed to meeting environmental responsibilities by getting EMS certified, such as through ISO 14001, BS 8555, Green Dragon or the Eco-Management and Audit Scheme.

An Environmental Management System (EMS):

- Serves as a tool to improve environmental performance;
- Provides a systematic way of managing an organization's environmental affairs;
- Is the aspect of the organization's overall management structure that addresses immediate and long-term impacts of its products, services and processes on the environment;
- Gives order and consistency for organizations to address environmental concerns through the allocation of resources, assignment of responsibility and ongoing evaluation of practices, procedures and processes;
- Focuses on continual improvement of the enterprise development;
- Increase enterprise value at the market economy system.

For a business to truly have enterprise value, not only does the owner have to create a business that others want to own, but have a business where all systems (environmental management system also) are in a high organizational level. When a business has enterprise value, the number of people who are interested in owning this business will dramatically increase. Implementation of environmental management systems at enterprises is vitally important for a healthy dynamic market economy. And, of course, undoubtedly important for enterprise's development that leads inexorably to an increase of enterprise value. In fact, we will have a business situation, when not only competitors will want to own this business (that includes advanced EMS), but professional investors will also want to own this business.



# **THE NECESSITY OF INNOVATIVE ACTIVITY FOR THE ECOLOGY IMPROVEMENT**

*Olexandr Borovik, Oleksiy Lyulyov  
Sumy State University, Sumy, Ukraine*

Now one of actual problems in Ukraine is prevention of deterioration of the surrounding environment, caused by strengthening of technological pressure upon the nature. The accelerated development of a science and techniques has led to essential change of the habitat, similar on scales of transformation with geophysical processes.

Prevalence of personal corporate interests for the purpose of profit reception over humane ecological principles becomes frequent in industrial sphere the obvious fact. This phenomenon is closely connected with development of technologies. The state as the mechanism of protection of public interests is obliged to develop and introduce numerous tools of influence and restraint in sphere of preservation of the environment.

Contradictions between the nature and a society have become aggravated so that demand urgent decision-making on this points in question. The given contradiction is capable to resolve development of innovative business in nature protection sphere. The basic preconditions of the given development consist that, in Ukraine there is a significant amount of not demanded inventions in the field of protection of a surrounding environment, and also there is a requirement for their application in a national economy as moral and physical deterioration about 80 % of the basic production assets is observed. The intensification of innovative activity in sphere of protection of environment not only will promote environment improvement, but also will allow to overcome technical and technological backlog of branches of the national economy.

The government processes of ecological safety in Ukraine shows the analysis, unfortunately has no desirable level of priority which is caused by available legal base and approaches which have developed in the theory and government practice in activity of the central and local public authorities. It acts as certain stimulus for attempt to consider ecological safety and processes of its maintenance in the country as rather independent direction of researches in a science of the government and in practice of its realisation.

The questions connected with regulation of innovative processes (including in the field of ecology), and also regulation of nature protection activity, in industrially developed countries are deeply worked. In Ukraine the operating mechanism of regulation of process of creation and use of ecological innovations is ineffective and requires improvement. Thereupon working out of recommendations about increase of efficiency of the existing mechanism taking into account conditions of economic development of our country which

prominent features consist in deficiency of budgetary funds and investment resources, inflation, crisis of insolvency of the majority industrial the enterprise is expedient.

I consider that it is necessary for state to develop a series of measures on perfection of the mechanism of regulation of innovative processes in the field of protection of a surrounding environment. For achievement of this purpose:

- the analysis of essence of innovations and definition of possibility of their use for overcoming of ecological instability;
- revealing of the factors influencing realisation of process of creation and use of ecological innovations;
- research of directions of innovative activity on preservation and improvement of a surrounding environment;
- the analysis of foreign experience in area of regulation of nature protection activity;
- working out of recommendations about perfection of the mechanism of regulation of process of creation and use of ecological innovations.

Thus, it is possible to draw a conclusion that for improvement of a state of environment in Ukraine the active innovative policy including radical redistribution of expected investments in favour of innovative sector which functioning is aimed, first of all, at improvement of parametres of structural efficiency (decrease in industrial costs, a waste and harmful emissions on a unit of production, per capita, savings of raw materials and resources) is required.

Practical measures on realisation of innovative projects should be complex, uniting re-structuring and a diversification of manufactures, production updating, decrease in expenses, application of new nature protection technologies, an intensification of researches and workings out, and educational activity. Efficient control ecologically-economic system can be carried out only with use of market mechanisms, the methods of ecological management preferring preventive measures and principles of distribution of responsibility in questions of preservation of the environment and information management, allowing to make active information interchange processes at formation of the mechanism of transition to a sustainable development.

Innovative management as uniform system in each of the components (formation and realisation of bases of a state policy, examination, working out procedures, the estimation of efficiency of innovative projects, the organisation of scientific and technical activity, creation of favorable conditions for attraction of investments into industrial sphere, regulation of commercial risk) represents difficult, constantly developing managerial process by innovations in the country taking into account national features and foreign experience.

## ENERGY COMPONENT OF INFLATION – LESSON FOR UKRAINE

*Maxim Bryukhanov, Sergey Zagorulko*  
*Sumy State University, Sumy, Ukraine*

Relationship between energy policy of government and economical processes in the last time is very interesting topic for research among economists. This interest increased in view of “gas question” between Russia and Ukraine that became aggravated dramatically in the beginning of 2009. Recent events have shown that most of European states both developed and developing sharply depend on imports of energy. In our paper, we decided to investigate robust of this relationship.

The most often investigated aspects in this sphere are oil prices and their influence on consumer prices, and on GDP. Also was investigated reverse relationship – influence of different economical indexes and processes such as aid payments, industrial value added in GDP, import, FDI inflows on energy intensity (total primary energy supply divided by GDP).

Many empirical researches about relationship between energy policy and economy exist in our days. However, our paper differs from counterparts. We investigate the influence of energy structure of country on inflation and use for these goal two kinds of econometric estimation – conventional OLS estimation and Logistic Regression estimation.

As a measure for inflation we took annual values of CIP growth for period 1962-2004 in nine European countries that have deficit of energy. That is inflation comes forward a dependent variable, and data set consists of 387 observations.

As explanatory variables we have used fuel imports as a share of merchandise imports, ratio of energy produced in country to energy used in country, ratio of merchandise imports to merchandise exports.

The main finding of our study is that dependence on external sources of energy positively influences growth of inflation. In addition, we confirmed that high degree of openness of economy raises inflation.

**Policy recommendations:** to decrease growth of inflation government should develop production of energy from own sources and little by little decrease energy imports .

**Directions for future research.** Our study does not maintain data about money emission. In many empirical researches was confirmed that this index significantly influences inflation growth. It will be interesting to unite variables that reflect energy dependence and variable money emission in single research to reveal and estimate their simultaneous influence on inflation.

# **ECOLOGICAL EDUCATION AS ONE OF METHODS OF FIGHT AGAINST ECOLOGICAL CRISIS**

***O.A. Chasnyk, E.N. Chasnyk, Y.N. Chasnyk***  
*Sumy State University, Sumy, Ukraine*

Objective analysis of modern economic situation, reasons and sources of worsening of the ecological state of natural landscapes and environment of Ukraine, worsening of health of people, origins of demographic crisis became possible only as far as years ago, due to declassifying of enormous amount of the archived materials (socially-historical, political, party, socio-economic and others) and helped precisely to define principal reasons, sources, dynamics and directions of development an ecological situation within the limits of our state. Such reasons are:

1. Extensive use of all types of natural resources, proceeding by decades, without the account of possibilities of natural regions to self-restoring and self-wiping.
2. Long administratively-command concentration on the small areas of plenty of super-power chemical, metallurgical, oil-processing and military industrial complexes and other «giants of socialistic industry», speed-up realization of scale plans of interference with a natural environment.
3. Complete ignoring traditions of economic activity, possibilities of nature of regions and interests of native population.
4. Perekhimizaciya of agriculture and inefficient methods of his organization ( for example enormous collective farms and state farms)
5. Providing land-reclamation works in enormous scales without the proper scientific ground and effective technologies, conducted in most cases simply indifferently and short-sightedly.
6. Complete absence of objective long-term ecological examinations of all plans and projects of industrial economy development, power engineering, transport during a post-war period.
7. Use of out-of-date and very obsolete both morally and technically technologies and equipment at large majority of enterprises.
8. Absence of effective laws of the environmental protection and law acts for their effective realization.
9. Absence of information for great masses of population about the ecological state of environment, reasons for its worsening, culprits of contamination and measures, accepted for the improvement of situation.
10. Extraordinarily low level of ecological education not only of great masses of population, and the leaders of enterprises, government institutions, general low ecological consciousness and culture.
11. Sharp acceleration of negative economic, socio-political and ecological processes in Ukraine in connection with the largest technogenic ecocatastrophe of the XX century is Chernobylska APS catastrophe.
12. Absence of effective economic stimulus of resource and energy savings.

13. Absence of effective state control for implementation of environmental protection laws and the system of effective punishment for the caused harm of the environment.

The analysis of the ecological state dynamics of Ukraine proved that for the last five years an ecological crisis has been growing, embracing large territories of Ukraine. The reasons of it are: almost complete absence of assignments on serious nature protection measures in all branches of industry; absence of control and practical impunity of ruining nature activity; growth of amount and power of technogenic accidents due to the total wear of equipment and technologies at the enterprises, and also very low efficiency of cleansing buildings, and those which are in action still have ,however, extraordinary low level of ecological education of Ukrainian population.

It is possible to talk about the necessity of creation of the next supervisory and punitive body which will work out these problems, but, as time proved, such measures are keeping indoors. People will not stop to ruin nature, only because of some inspector prevents them doing it. It is of great importance to promote the essential level of ecological education of population .

Ecological education is a process and result of mastering of the systematized knowledge, abilities and skills of theory and practice of rational usage of natural resources and conservancy, forming of ecological thought and world outlook, which are based on the principles of individual ecological responsibility.

The principle of constant process of ecological education means that it must begin at preschool level and proceed at all stages of formal and informal education: preschool and school; vocational training; higher and middle special; retraining of personal.

It is necessary to notice that each of these stages in modern terms needs certain perfection. It is needed not only to revise ориентиры of ecological education and education but also create their new model, which would be directed on strengthening of ecologically legal education, culture and science. The process of ecological education must have mobile character and be corrected taking into account an up-to-date ecological situation.

For realization of tasks standing before our country on converting of every of its corner into a flourishing garden is necessary in good time to create an ecological culture, aesthetic attitudes toward nature, to develop love to it and carry responsibility for its state.

Nature can not defend it from barbarian, mercenary, indifferently-passive attitude toward it, from hostile actions of man and interference into the natural processes, causing death of many the plants and animals. In moral society a law is formulated on conservancy, which must be executed by every citizen of the country.

A valuable effect will be attained, when ecological consciousness and conduct will become an essential part of general culture of everybody.

# **ENVIRONMENTALLY CONSCIOUS PARTNERSHIP OF ORGANIZATIONS**

***J. M. Chychkan-Khlipovka, N.M. Pugach***  
*National Aviation University, Ukraine*

Nowadays, in market volatility, every company, regardless of size, is trying to preserve and increase their competitiveness. Achieving this objective compels companies to reconsider their priorities. A possible solution to this problem is the interaction with other companies in the supply chain.

Most companies, especially the large one, are choosing the benefits of horizontal integration. Horizontal integration is primarily the prerogative of large companies, since not all medium and small companies have a well-developed information system. Depending on the closeness of relationships, such integration may take the form of alliance, integration, cooperation, interaction, partnership and collaboration. This, in turn, leads to the initiation of integrated logistic chains and networks. These organizational formations practically can represent the whole life cycle of products and usually provide wide variety of additional services.

An integrated structure should become the conceptual basis of interaction and partnership between organizations, which would control the entire value chain – the algorithm of various activities to create value for consumers. Each organization operates under a universal system, which includes, except the company itself, also suppliers, customers, etc. Thus, the final consumer pays for the value created by all elements of the system. Much attention is paid to the analysis of the value chain to determine the real contribution of each element in the system. Here are taken into consideration such factors as: the organization's activities in the value chain, cost factor, with regards to all activities, formation of a viable competitive advantage.

Frequently, the processes, occurring in the final stages of product life cycle are overlooked – salvaging and recycling. Therefore, the logistical operations related to the collection and reuse of served a term products, gain importance, in terms of adverse environmental conditions.

The foregoing consideration of salvaging and recycling processes scoped only on the necessity and costs of these procedures. Brand-new ideas and solutions in economic and managerial fields apply products' end-of-life stages to create an additional value due to different models of organizations' interaction including partnership and integration of enterprises through supply chain.

Modern society requires from the owners to processed (recycle) their waste, and not just overthrown in landfills or destroyed it. Environmental legislation has been initiated to provide with environmentally conscious products' end-of-life processes, enacted by the parliaments of most developed countries. However, large-scale recycling is possible in conditions of appropriate infrastructure, or integrated scheme of processing and recycling.

All this becomes possible with the help of the functional areas of logistics – backward or reverse logistics. It is an effective modern solution of acute problems – recycling and waste management. Partnership and collaboration of organizations in this direction is a successful way to increase competitiveness in the market. Such competitive edges are based on service support of the consumers by providing additional services of reverse logistics.

Increasingly, the concept of "Environmental Security" and "Environmental Responsibility" become a priority for enterprise activity. The leadership of each company must understand and take into consideration the fact that as the higher the environmental effectiveness of the company, as the higher its investment attractiveness, its value in the market, and thus the value of the shares. The integration of enterprises in the field of environmental security is subject to the rules of European law, whereby manufacturers of technical systems (equipment and machines) are responsible for designing their salvaging and recycling that these processes were "environmentally friendly". Creating a "green ideology" of business organizations in the supply chain is possible in condition of:

- 1) the formation of "environmental consciousness" in the enterprise;
- 2) introduction of environmental management system;
- 3) correlation between environmental activity of the company and its market capitalization.

The cooperation of companies is widely used in practice in many industries to improve the environmental situation. Aviation industry also especially strongly addressed the issue. As an example, the formation of the "Single European Sky" – an agreement on unification of flight operation in the airspace of the countries – EU members. At this stage the modernization of the "Single European Sky", by the formation from the European air space of the 9 International Functional Airspace Blocks (FABs) and by implementing a program of modernization of the air navigation system (SESAR – Single European Sky ATM Research) is conducted.

These innovations increase the efficiency of the system by 70%, reduce the average time delay of 1 minute, reduce costs users up to 50% and reduce environmental harm caused by each flight by 10% by 2012 while improving safety.

Ecological response of each company must make its economic contribution to the global solution of the environment protection. Ecologically conscious production and consumption of goods and services can be achieved not only through the development appropriate legal system and adoption different programs for environmental protection and conservation of clean environment. The aim of nature protection also can succeed due to the formation of such supply chains which are able to provide the final stages of product life cycle.

Salvaging and recycling are the key issues for interaction of large industrial enterprises. Solution of outlined problems will enable the companies to take leading positions in their markets. And this can be done more efficiently by cooperation activities and partnership in environmentally conscious supply chains.

# SYNERGISM OF ECOLOGICAL-ECONOMIC SYSTEMS

**Iryna Dehtyarova**

*Sumy State University, Sumy, Ukraine*

Nowadays scientific researches concerning problems of definition of ecological-economic system and stating the principles, tasks and strategies of systems development are very important. Sustainable development goals and strategies are in the centre of national and local government attention. There is the process of new approaches formation concerning solution of ecological problems. These approaches are based on research of regional enterprises and economic branches and their integrated activities directed at solving the whole complex of ecological problems.

Ecological-economic activities can be studied depending on the level of ecological-economic relationships. There is the level of households, economic subjects, territorial production complex and national economy.

We consider that, ecological-economic system is the unity of interdependent and interrelated components of the environment, as well as anthropogenic factors, which provide the function of reproduction of natural factors and conditions of life, as well as production of goods and services and utilization of wastes. Mechanism of functioning is presented in Fig.1.

We consider that synergism, in ecological-economic systems can be in the form of unity of all resources that an enterprise has. These resources are necessary for realization of socio-ecological-economic goals. Among such goals there is reproduction of the natural environment and utilization of wastes. Relationships within the ecological-economic system based on synergetic principles can lead to decrease of ecodestructive pressure on the environment. Besides, it is necessary to incorporate external effects for the sake of stating economic, social and ecological results of economic subjects.

In ecological-economic systems economic synergism is shown as the result of integration processes. As a result there can be a positive synergetic effect and sufficient increase of efficiency functioning of ecological and economic systems.

We consider that development and efficient functioning of ecological-economic systems can be based on synergetic principles. Among them there can be the following principles:

a) *adaptivity* – separate elements of the system must have possibility to react to changes which happen in the environment. It can happen due to in time changes of the character of links inside the system;

b) *coherence* – this principle foresees the existence of conditions (including communication) for realization by the separate element of the system coherent behavior and synchronization of functioning processes of the separate system's elements;



c) *co-evolution* – the main essence of this principle is the following – there must be a concordance of transformation development cycles in different systems elements. It is reflected happens in longtime period;

d) *co-addition* – incorporation of this principle means that links between the system's element must be built on different characteristics of different elements;

e) *interdependence* – changes of some elements state must lead to changes in other elements of the system;

e) *co-beneficence* – mutual functioning of the systems elements must lead to its better state, than their separate functioning.

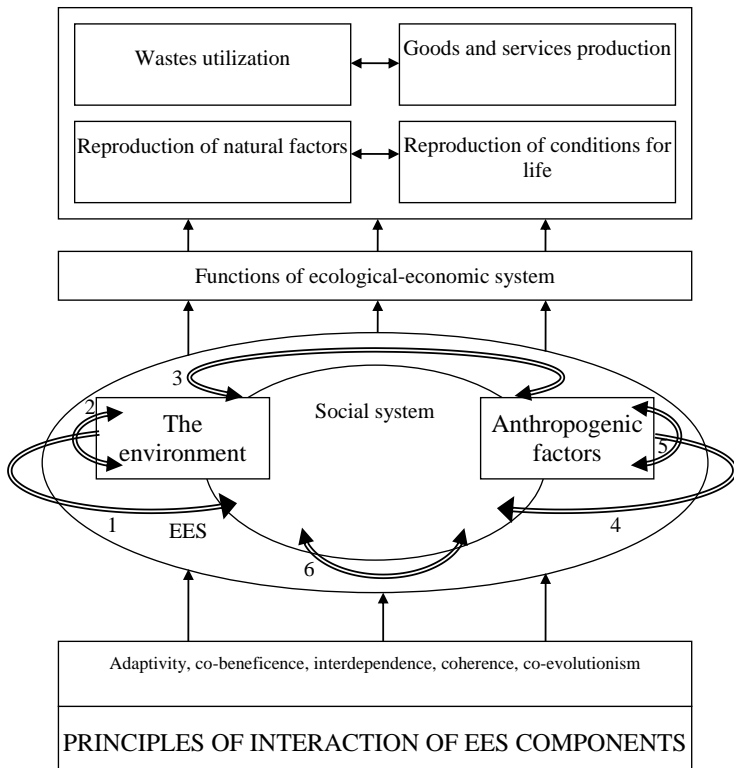


Fig. 1. Mechanism of ecological-economic system's functioning  
 Links: 1 – social-ecological, 2 – ecological; 3 – ecological-economic;  
 4 – social-economic; 5 economic; 6 – social

All in all, the environment and anthropogenic factors must co-exist in such a way that efficiency regimes can be the characteristic features of the links that appear during interrelation of these two systems.

## SOME ECONOMIC ASPECTS OF SOCIAL CAPITAL

**Pavlo Denysenko**

*Sumy State University, Sumy, Ukraine*

Nowadays innovation-oriented development of particular socio-economic system is no longer considered as a result of some individual breakthrough, it was substituted by systematic work of specially created professional networks of different kind and size. Formal and informal interrelations among talented workers, knowledge management, creative environment, social capital, organizational culture becomes the new frontier of competitive advantage. The generalized structure of this process is presented on figure 1.

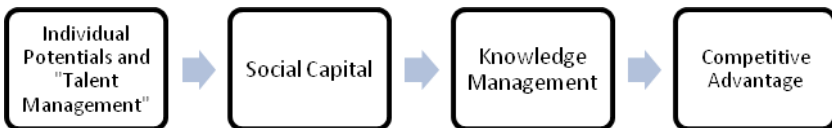


Fig. 1. Elements of Modern Competitive Advantage

Social capital is usually defined as “networks, norms and trust that enable participants to act together more effectively to pursue shared objectives” (Robert Putham). The Word Bank uses the following definition: “social capital refers to the institutions, relationships and norms that shape the quality and quantity of a society’s social interrelations”. Based on these definitions we decided to underline some general elements of social capital concept (see table 1) mostly important for the innovative activity.

Table 1 – Elements of Social Capital Structure

Individuals	Society	Economy
Behavior potential	Institutions and norms	Resource potential
Performance potential	Productive relations	Productive potential
Creative potential	Networks and trust	Development potential

In classical economics, capital is one of three (or four, in some formulations) factors of production. The others are land, labor and (in some versions) organization, entrepreneurship or management. Goods with the following features are capital:

- It can be used in the production of other goods;
- It was produced (in contrast to naturally occurring resources such as geographical locations and minerals);
- It is not used up immediately in the process of production unlike raw materials or intermediate goods.

Speaking about social capital concept, it has all attributes, mentioned above. First of all, collective work on common targets requires the use of interpersonal cooperation, both formal and informal relations, understanding and trust. All these was definitely formed and produced by people by their working together. And as a result, personal professional skills, behavioral patterns and communication become more and more in accordance to their common objectives. The main economic effect here is growth of individual potentials realization. Social capital also can be described as both as a flow of resources, used to form such special professional interrelations and as a stock of gained results of such interpersonal network existence or development.

Special attention we would like to intellectual skills of workers, their creativity and to so-called talent management. It is no longer enough to define personal returns from education and professional skills estimated in wages growth. Organization's ability to create, accumulate, distribute and implement specific professional knowledge becomes crucial factor of its sustainable development. The same is true for the society in general. The social capital intellectual development problem has three main levels:

*Macro-level:* International and state institutions work on stimulation of knowledge-based production with corresponding substitution of nature exploitation. Society development conditions for every citizen.

*Micro-level:* Knowledge systems of enterprise supporting the adaptation to the frequently changeable market situation as well as long-term organization development.

*Personal-level:* Self-explorations with intellectual and health improvement according to life goals, professional field and individual tastes.

As a conclusion, social capital and intellectual potential both at regional and organization levels are closely connected with sustainable development issue. It takes into account three main dimensions: *Social:* Information and Communication Technology availability (as a tool to exchange ideas and collect the experience of others), cultural institutions and heritage (as the way to become connected with experience and gains of previous generations); *Production sphere:* life-long education (as a tool for permanent personal growth), private business possibilities (competitive environment as the creative ideas catalyst); *Environmental:* health care and sports (plus promotion of the life stile without smoking and alcohol), recreational sphere etc.

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# MODERN PROBLEMS OF SUSTAINABLE DEVELOPMENT

**Y. Derevianko, I. Tereshchenko**  
*Sumy State University, Sumy, Ukraine*

The development of modern industrial civilization caused the universal crisis, which involves the different aspects of human's life. One of such approaches is the way of sustainable development. Its ideas, principles, concepts and problems are stated in conferences' decisions of the United Nations Organization, which deals with the environment protection (1972, 1992, 1997, 2001, 2002, 2009).

The level of sustainable development is estimated by the use of correspondent index. It is calculated as a sum of indices for 3 dimensions: economic, ecological and social with relevant weight coefficients. In turn, each index is calculated according to the internationally accepted indices and indicators. Index of economic measuring is formed from two global indices: index of competitive ability and the index of economic liberty. Index of ecological dimensions (ESI) is formed from 21 ecological indicators. They were calculated on the basis of the use of 76 gains about the national recourses' data in the country, the environments level of pollutions earlier and today, the efforts of the country to govern the ecological conditions, abilities of the country to improve characteristics etc. index of social measuring is formed by averaging of three global 2 indices: index of quality and safety of life, index of human's development and society's index, which is based on knowledge's. index of sustainable development is calculated with a formula where the scaled coefficients for securing of identical economic, ecological weight and social measuring in the index of sustainable development are used.

The best examples of sustainable development show Czech Republic, Slovakia. The worst show Ukraine. Almost by all determinative indices and indications of sustainable development Ukraine yields greatly not only to world leaders, but constricts of G8 and all post soviet countries. Depending upon the object of sustainable development, indicators differ on global, national, regional, local and sectoral levels.

Also they differ on the levels of enterprises and centres of populations.

The main factors which hamper the process of transitions to sustainable development in Ukraine are:

- mainly unfavourable and other catastrophic ecological situation on the greater part of Ukraine;
- outdated ineffective technologies not wreck only the agriculture economy and enterprises, but also cause continuous degradation of environment in general and agricultural lands particularly;
- high level of criminality and corruption;
- in perfection of state's legal system;
- the practical absence of influence the non-government organizations on public policy.

# **ENVIRONMENTAL ECONOMICS PROBLEMS OF TRANSBORDER COOPERATION**

*Yuriy Derev'yanko*

*Sumy State University, Sumy, Ukraine*

The problems of ecology and nature use were lately intensified. These questions became actual in relations between transborder regions. Among them: pollution of transborder territories, sharing of water aquatoriums, using and development of natural resources on transborder territories.

This problem is actual enough especially for mutual relations between the countries of European Union and other countries, bordered with EU. Ukraine borders with four countries of EU: Poland, Slovakia, Hungary, Romania. Problems are aggravated by divergences between the countries of ES and Ukraine in legislation, norms of environment pollution, waste payment etc. Today in a transborder cooperation it is possible to select such basic ecological conflicts, actual for mutual relations between the EU countries and Ukraine:

a) water ecological conflicts (Ukraine and Romania, Russia): section of aquatoriums of Danube river and Black sea, water use and water taking;

b) forest ecological conflicts (Poland, Romania): non-regulative felling of the forests;

c) ecological conflicts of resource use (Russia): exterminating sharing of Black see shelf, determination of its owner;

d) ecological conflicts of nature use pollution: pollution of water resources, atmosphere and land resources which can spread on transborder territories.

Intergovernmental conflicts of the transborder resources use can arise up in such cases, when:

1) equal (proportional) access is not provided to the transborder resources;

2) use of transborder resources by one of transborder regions increase ecological tension in other country (region).

As instruments of the effective use of transborder resources can be:

1) creation of coordinating council and their joint work on a resources management;

2) general monitoring and estimation of resources;

3) equal access to information about usage and management of resources, information exchange;

4) participating of society in making decision about directions of the resources use;

5) creation of common legislative base for adjusting of the resources use or approaching Ukrainian normative legislative base to European.

Factors of negative influence:

1) disparity of ecological legislation, contradictions in legislation norms between countries and inside of each country, absence of single approaches and

norms to the ecological problems decision, which can be explained by historical development of the independent states, features of local legislation and jurisprudence;

2) absence of legislative pre-conditions for transborder cooperation in the field of environment protection; on the way of dialog processing between partners absence of legislative base for creation of transborder regions or absence of the expressly prescribed mechanism of relations adjusting between partners;

3) complication of influence degree determination on the ecosystem state from each of countries-partners; it is difficult to define and delimit spheres of responsibility for those ecosystem destruction, that can become as a basis to misunderstanding and conflicts in the countries-partners relations;

4) absence of the proper state support, without regard on the desire of partners to create a general territories of responsibility;

5) necessity of bringing in of the third partner as other state or region for the decision of ecological problems, which directly does not border with a region-partner;

6) a necessity of development of common norms of nature use and ecosystem state of a region; rather often regions are not able to work out independently with such problems or finance them using only local budgets;

7) complication of ecosystem control on a reason of formal borders between the states.

## **ENTERPRISES ACTIVITY ECOLOGIZATION BY BIOCHEMICAL WASTEWATER TREATMENT**

***A. Dichko, Y. Otdelnova***

*National Technical University of Ukraine*

*"Kyiv Polytechnic Institute",*

*Kyiv, Ukraine*

One of the ways of enterprises activity ecologization is their wastewater treatment with the aim to decrease technogenic pressure on environment. Method of water treatment depends on its chemical content, conditions of its dumping to city drain system and so on. But the most natural and economically effective method of organic wastewater treatment is its biochemical aerobic or anaerobic treatment. Biological water treatment doesn't need special chemical reagents, complicated mechanisms and big investments. And methane fermentation of organic wastes allows not only to reduce the level of water pollution, but also to receive the biogas that may be used for treatment process realization and also for other purposes.

Different temperature conditions - from +20 to +60 °C - are used for biochemical treatment of industrial and municipal wastewater. Thermophilic conditions have such advantages as larger rate of process and destruction degree of organic pollution, better characteristics of treated water, disinfection of pathogenic bacteria. Possible imperfections of thermophilic process are additional energy need for wastes heating and a supernatant deficient amount. Thermophilic regime is less stabilized process of methane digestion because of liquid supersaturating by volatile acids at the first stage of cultivation, high sensitivity to temperature changes, possibility of ammonia toxicity because of its large percentage at raw wastes, problems of frothing and odor. Sometimes it is purposeful to use mesophilic and thermophilic regimes combination. But eventually choice of temperature regime depends on nature of wastewater chemical composition.

The aim of the present work was the research processes of treatment and biotransformation of organic pollution of concentrated oiled wastewater (OW) under mesophilic ( $37 \pm 2$  °C) and thermophilic (45;  $55 \pm 2$  °C) conditions of periodic regime to determine the optimal temperature conditions of biochemical water treatment.

The laboratory model of methane tank was used for the research. It consisted of a tight reservoir, lines of wastes supply, treated water outlet, biogas and overflow active sludge. Biogas entered into the gasholder, from which the samples for methane percentage analysis were periodically taken. Active sludge amount was near 30% of a methane tank volume.

The following characteristics of final values of COD, biogas accumulations, dry residue and oil concentrations were received while research the periodic process of methane digestion of OW under varied temperature conditions (*Table 1*).

Table 1. Final values of main indexes of water contamination in result of periodic methane fermentation under varied temperature conditions

<i>Indexes of contamination</i>	<i>Value</i>			
	<i>raw OW</i>	<i>after fermentation</i>		
		37 °C	45 °C	55 °C
Fermentation period, day	-	8	4	6
COD, mg O <sub>2</sub> /l	11 700	1940	3686	1746
Dry residue, mg/l	1200	1370	1460	950
Oils, g/l	6,5	1,88	4,1	2,5

The most decrease of COD takes place in 24 and 48 hours of treatment. Then the process is somewhat slowing down. It is connected with accumulation of metabolites at the cultural liquid that appear as a result of decomposition of oils and their derivatives. Utilization of these matters by active sludge microorganisms is complicated because of their intricate structure.

The maximum biogas accumulation relatively to the amount of fermented matters is various under different temperature conditions, the “peak” points of biogas accumulation also differ. The maximum amount of biogas accumulation - to 0,35 l/g of fermented matters - occurs at 55<sup>0</sup>C on the fourth day of anaerobic digestion. The maximum amount of biogas - to 0,7 l/g of fermented matters - is generated at +37<sup>0</sup>C at the seventh day of fermentation.

The lactic acid concentration as one of the products of metabolism increases at all temperature regimes while a biogas is generated, and then it becomes almost constant, that is confirms the end of the process of decomposition of wastewater organic matters under certain conditions of methane fermentation.

While comparing the final values of the main indexes of wastewater pollution after methane fermentation, it is clear, that the most complete removal of organic matters from wastewater in the shortest period is observed in thermophilic (+55<sup>0</sup>C) process. This fact allows to decrease capital investments in local treatment stations and to decrease the energy expenditures on wastes heating during the methane tank exploitation. Under these conditions at temperature of +55<sup>0</sup>C value of COD goes down to 1700-1800 mg O<sub>2</sub>/l, and oils content - to 2,5 g/l, that makes possible the use of biochemical aerobic processes with the aim of the local deep after-treatment of OW with BOD value in the range of 250 to 300 mg O<sub>2</sub>/l and COD in the range of 450 to 650 mg O<sub>2</sub>/l.

So, the most rational scheme of local treatment of oiled wastewater is their previous processing with thermophilic methane fermentation with the immobilized microorganisms groups for water treatment to the norms of the maximum permissible concentration for water dumping to city drain system.

## **INTELLECTUAL SYSTEMS CREATION FOR MINING ENTERPRISES ACTIVITY ECOLOGIZATION**

**L. Evteeva**

*National Technical University of Ukraine  
"Kyiv Polytechnic Institute",  
Kyiv, Ukraine*

Mining enterprises activity ecologization consists of dust suppression and noise effect minimization to limited admissible values during open exploitation of granite with its further processing into road metal.

Human role in modern mining enterprises management systems is determinative. He creates goals of system and alternative ways of its development, determines real structure of system and forms its behavior. The most difficult and responsible stage of human's activity in management systems and the major factor



of any direction is decision making. In process of looking for the best decision it is necessary to use maximum relevant information (data and knowledge bases). But decision making person often doesn't have much time, enough information and knowledge about object and situation in which it functions. The most important moments in decision making is goals determination, forming decision making problems and choice of adequate alternative. The choice is made on base of advantages of decision making person.

The task of decision making may be formulated in next way: there is a lot of decisions; realization of each alternative results in certain consequences; analysis and estimation of results by effectiveness (criteria) characterizes alternatives. Having considered advantages of decision making person, it is necessary to build model of choice the best alternative.

For successful realization of decision making tasks it is necessary lots of procedures connected with preparation of information, important for reasonable decision making. All routine operations should be given to computer for more intellectual decision making. Specialists won't be distracted from looking for, sorting, data and models estimation, but use worked out information adapted to automatically search with key words and assessed and renewed information.

To make search easier and except with possibility of not getting important facts, that often are difficult to be characterized, automated databanks are used. They have developed memory, central processor with some outside devices, programmer support for searching, renewing or correcting of data, their representation, reliability and fullness checking, estimating, and treatment in order to get new data, or determination of connection between any data sets.

The base of forming of automated databanks is choice of proper data format, i.e. choice of ranking of data representation, key words that help to search facts.

From conception of knowledge the intellectual system may be formulated as system based on knowledge in problem field. It allows system to choose (activate) these or those programs, saved in memory, or even synthesize new necessary programs from some micro blocks saved in knowledge base of system. Intellectual system always provides for person presence to cooperate with it.

This system must be opened principally to support and increase intellectual capabilities of decision making person by logical mathematical thinking apparatus and by reverse influence of person on computer system. This means specifying of goal of system function, correcting results and strategies, accumulation of new knowledge, changing structure of data in automated databanks. Intellectual system is used not for exception of person from decision making, but for transition of all routine, not creative, functions from person to automated system.

Really, search and output of any information from "library" or "guide", processing of this information by indicated algorithm and choice of this algorithm in accordance with problem demands and system possibilities; approximation, smoothing, interpolation or extrapolation of functions, previous estimation, - all these problems are successfully solved by automated system without person

involve. Operator needs only to bring in certain criteria, limits, fields of use, function conditions etc. There are two models of data representation: intentional, when schemes of connection between data attributes are depicted; extensional, when description of concrete objects and events is shown.

Organized in a proper way data and knowledge, and also programs for search, changing, treatment and representation of information, according to tasks and aims of intellectual system, essentially simplify work of decision making person and allow person to concentrate on those aspects of decision making that are more inherent him and that even a powerful computer is not able to decide, or needs for this purpose too much time, that does not allow to solve problem of decision making in reality.

It is worth comparing possibilities of artificial intellectuality and intellectuality of a person of appropriate competence. This comparison is shown in tables 1 and 2.

Table 1. Comparing of artificial competence with person competence

<i>Person competence</i>	<i>Artificial competence</i>
Unsteady	Constant (steady)
Difficultly passed	Easily passed
Difficultly documented	Easily documented
Unforeseeable	Foreseeable
Requires large charges	Requires not large charges

Table 2. Comparing of artificial competence with person competence

<i>Person competence</i>	<i>Artificial competence</i>
Creative	Programmed
Adaptable	Requires prompts
Uses perception of senses	Uses symbol knowledge input
Wide for a scope	Narrowly directed
Uses popular knowledge	Uses specialized knowledge

# FROM GREEN ECONOMY TO THE GREEN SOCIETY

**Viktorija Garbarchuk**

*Melitopol Institute of Public and Municipal Administration  
of the "Classic Private University", Melitopol, Ukraine*

*Research advisor: Polikarpova Yu.O.,  
Candidate of Philological Sciences*

The objective of this research is to consider possible ways of greening the Ukrainian economy by means of greening its people.

Green economy is a new model of economic development based on knowledge of ecological economics that aims at addressing the interdependence of human economies and natural ecosystems and the adverse impact of human economic activities on climate change and global warming. Green economy got its name in contrast to the existing 'black' economic model based on fossil fuels, such as coal, petroleum, and natural gas. The idea of green economy is popular in the developed countries, the number of its supporters is growing rapidly.

Greening the economy refers to the process of reconfiguring businesses and infrastructure to deliver better returns on natural, human and economic capital investments, while at the same time reducing greenhouse gas emissions, extracting and using less natural resources, creating less waste and reducing social disparities.

The key principles of the green economy are rationality and energetic efficiency.

Researchers in the field of green economy state that the main efforts should be concentrated in five critical areas: 1) raising the energy efficiency of old and new buildings; 2) transitioning to renewable energies including wind, solar, geothermal and biomass; 3) increasing reliance on sustainable transport including hybrid vehicles, high speed rail and bus rapid transit systems; 4) bolstering the planet's ecological infrastructure, including freshwaters, forests, soils and coral reefs; 5) supporting sustainable agriculture, including organic production.

It should be remembered that the process of greening the economy should start with greening individuals, societies and the global world. To change the model of economic development from the black to the green one it is really necessary to change the way of our thinking.

The problem is that anthropocentrism dominated as the main idea of philosophy for many centuries. Man was considered to be master of the nature, and the last was supposed to exist with the purpose to satisfy people's needs and wants. Nowadays people should turn to another philosophic paradigm of co-evolution of Man and Nature, both having equal value. People have to see themselves as one of the species existing in the world of nature. As to our nation, Ukrainians should turn back to the traditional attitude to land and nature of our ancestors. It becomes clear that they felt awe towards land, respected nature and loved it; their life philosophy was mostly grounded on taking care of the nature. The Ukrainians used to see

themselves as a part of the nature, calling it ‘Mother Nature’, ‘Wet-nurse’, etc. This is what we have to learn in the 21<sup>st</sup> century.

Unfortunately, pragmatic approach of the mankind to use of the natural resources led to development of selfish, egocentric behavior of people. The growing number of conventional (non-natural) needs led to irrational use of natural resources resulted in their scarcity, trash disaster and ecological crisis not only in Ukraine, but in the whole world. We consider that philosophy of rational and limited consumption for the sake of the nature should be accepted by each person living on the planet.

It is also needed to promote awareness of the green economy concepts. Each person should feel responsibility for the fate of the whole mankind and the nature and certain obligations for the future generations as well as the ancestors.

The ideas of green economy and co-evolution of Man and Nature are to become central in education. This will allow bringing up a new generation – the green one – that cares about maintaining harmony between natural and artificial (social) world. In order to find new green solutions of many ecological challenges, make green innovations and inventions we should encourage and develop creativity, conscious position concerning ecological issues of economy and willingness to save the planet for the future generations.

Moreover, the idea of co-evolution should be promoted in various social activities. Mass media can be very helpful in creating awareness of the new trends.

Experience of such countries as New Zealand, Denmark, Norway and Sweden that are successfully developing green philosophy of economics should be carefully studied by Ukrainian researchers and certain conclusions are to be made concerning possible ways of applying different strategies, methods and technologies. What should be remembered is that any foreign experience must be adapted to Ukrainian cultural specifics and mentality.

## **WATER AND ENERGY PROBLEMS OF THE CENTRAL ASIA AND THE PLACE OF THE REPUBLIC OF TAJIKISTAN IN SOLVING THESE PROBLEMS**

***Higmatillo Goibnazarov***

*Sumy State University, Sumy, Ukraine*

An important feature of Central Asia is the fact that two of its countries, Tajikistan and Kyrgyzstan, are located in the zone of water runoff, and the rest of the republic are in the dispersement zone. For Tajikistan and Kyrgyzstan - is to use water mainly for hydropower development, and for Kazakhstan, Turkmenistan and Uzbekistan - for irrigated agriculture.

In Tajikistan, formed 64 km<sup>3</sup> of water runoff from the total volume of the Aral Sea 115km<sup>3</sup>. Taking into account the flowing river on the territory of the Syr

Darya River runoff is formed in Kyrgyzstan, and the volume of water runoff, which has our republic is 80 km<sup>3</sup>.

Water resource management issues in the region is currently regulated by a number of documents of Soviet and post-Soviet periods. The most important are the Nukus Declaration on Sustainable Development of the Aral Sea Basin (1995) and the Almaty Agreement on cooperation in joint management and protection of water resources (1992). For water resources management in 1992 in Tashkent was established International Commission for Water Coordination (ICWC) with basin water associations (BVI) "Amu" and "Syr". She defined Tajikistan limit of 28% of its own river flow, from which date the republic in a position to use only 11,9%.

The implementation of hydro projects in Tajikistan do not have a negative impact on sustainable development in the region. Tajikistan possesses vast, inexhaustible resources of hydropower, taking 8 th place in the world on their overall size and first or second place on specific stocks (per capita and per unit area). Currently, the Republic of Tajikistan in its hydropower produces an average of 16-17 mlrd.kv.ch. electricity per year. Necessary same need is 22-24 billion kv.ch., ie deficit - 5 mlrd.kv.ch. in winter (in summer the excess amount to 1,5 mlrd.kv.ch.). Tajikistan, 93% of whose territory is mountainous, and per capita accounts for less than the total land of 0.11 ha of which 0.08 irrigated, has no alternative but to development as the base of their economy of hydropower resources of rivers. It is therefore vitally important for the country is set for completion, which was begun in the Soviet era Rogun and a number of other hydropower plants on rivers Vakhsh, Panj Zarafshan and others. Rogun taken into account in the scheme of complex use and protect water resources of the Amu Darya River Basin, developed at the institute "Sredazgiprovodhlopok" in Tashkent. It should be noted that the countries of the region, the undersigned aforementioned Nukus Declaration and the Almaty Agreement and approved the scheme and agreed that the Central Asian states and accept previously signed agreements in force, agreements and other regulations governing the relationship between the Water Resources Aral Sea basin and take a steady performance "ie regulation of water flows in summer and winter, through existing and built power stations.

Tajikistan is clearly understands that its own energy security can not be achieved by reducing the security of neighboring states. The measures for the construction of hydropower facilities are primarily aimed at balancing water and energy problems and mobilize their own resources to achieve stability of the entire Central Asian region.

Many designed and planned constructions in Tajikistan, medium and small hydropower, including Zarafshan, have daily regulation reservoir. They have no negative impact on the environment and safety.

Practice shows that the construction of a cascade of dams and hydraulic structures in the upper reaches is the only way to store water in the autumn-winter season and provide water to the countries of Central Asia in the growing season. In no case does not constitute a threat to the interests of downstream countries. Now

if we had a reservoir Rogun in the river basin of the Amu Darya and the Syr Darya River Kambaratinskaya, the Central Asian countries would not have felt the negative effects of low water. In confirmation of this it is appropriate to refer to the results of independent tests carried out by German scientists of the University of Potsdam (Prof. Frank Schrader) in the management of water resources of the river Zerafshan. Studies have shown that the construction Zerafshan hydropower station in Tajikistan will not have any negative impact on the provision of potable water, irrigation, land and ecology of the neighboring country. Also, it is necessary to refer to the results of objective independent examination of water and energy issues in Central Asia, the Center for Development at the Brookings Institution led Yohannessu Lynn. The main findings of the study is that the region must make effective use of water and energy resources through the infusion of investment in reservoirs and hydropower capacity, as well as through more productive use of water and energy resources, especially for irrigation.

This intensive irrigation, which took place in Central Asia in 1960-1980-s, is responsible for the catastrophe of the Aral Sea. Improvident, intensive use of the waters of the Aral Sea is recognized as one of the examples of short-sighted, irrational attitudes toward nature, which led to an environmental disaster with the consequences of planetary scale. The water that flows into the Aral Sea, just pulled down to irrigate land in the lower reaches of the Aral Sea Basin, and this sea was no more.

Tajikistan in addressing regional water issues is interested in cooperation with the countries of the Central Asian region, as well as the Islamic Republic of Afghanistan. For that purpose, in accordance with the laws of the Republic of Tajikistan should develop interstate water relations by concluding bilateral or multilateral agreements, treaties, legal, institutional, technical, economic and other activities.

## **GLOBAL WARMING**

***Lano Gordon***

*Unique life assurance co. ltd, Ghana*

While some would call global warming a theory, others would call it a proven set of facts. Opinions differ vehemently. Let us consider global warming to be both a premise that the environment of the world as we know it is slowly, but very surely increasing in overall air and water temperature, and a promise that if whatever is causing this trend is not interrupted or challenged life on earth will dynamically be affected.

The prevailing counter opinion is that all that is presently perceived to be global warming is simply the result of a normal climactic swing in the direction of

increased temperature. Many proponents of this global warming ideology have definitive social and financial interests in these claims.

Global warming and climate change are aspects of our environment that cannot be easily or quickly discounted. Many factions still strongly feel that the changes our Earth is seeing are the result of a natural climatic adjustment. Regardless of one's perspective the effects of global warming are a quantifiable set of environmental results that are in addition to any normal changes in climate. That is why the effects of global warming have catastrophic potential. Global warming may well be the straw that breaks the camel's back. It could turn out to be the difference between a category three hurricane and a category four. Global warming as caused by greenhouse gas emissions can lead us to a definite imbalance of nature.

The premise of global warming as an issue of debate is that industrial growth coupled with non-structured methods we as humans use to sustain ourselves has created a situation where our planet is getting progressively hotter. We have seemingly negatively effected our environment by a cycle of harmful processes that now seem to be feeding upon themselves to exponentially increase the damage to our ecosystem.

Most modern attention to the problem of global warming began with discussion of depletion of the Earth's Ozone layer. Ozone (O<sub>3</sub>) is a molecular form of Oxygen. The Ozone layer is a relatively thin strata of these molecules set in the lower portion of the Earth's stratosphere.

Depletion of the Earth's Ozone layer has resulted in a large increase in Ultra Violet Radiation reaching the surface of the earth. Does this increase in UV rays equate to global warming? Not really. In fact most scientific opinion is that depletion of the Ozone layer results in cooling of both the stratosphere and troposphere. So why mention depletion of the Ozone layer as regards to global warming? Because it represents a needed balance between harmful radiation being allowed to reach the earth's surface and our desire to stem the rapid increase in our air and water temperature. Remember, we are viewing global warming as a chain of events.

The primary cause of global warming is Carbon Dioxide emissions. CO<sub>2</sub> is being pumped into our atmosphere at an insane pace; 8 billion tons of CO<sub>2</sub> entered the air last year. Of course some of this is due to natural activity such as volcanic eruptions and people breathing. But the Earth is equipped to easily absorb those into the normal regenerative process. No, the beginning of global warming was caused by fossil fuels being burned and emitting plenty of CO<sub>2</sub>.

Currently in the world 40% of all CO<sub>2</sub> emissions are caused by power plants. These are burning coal, natural gas and diesel fuel. Some power plants burn garbage. Some burn methane made from garbage. And discounting those super green electrical generating plants designed to issue negligible pollutants, all of our power plants let loose into the atmosphere CO<sub>2</sub>.

## **ASPECTS OF NATURAL GAZA ADAPTATION AS ALTERNATIVE MOTOR FUEL**

***D. Gorobchenko, T. Mogilenets***  
*Sumy State University. Sumy, Ukraine*

The ecological situation of the urbanised territories tends to worsen. The main cause of environmental problems is high level of burning high-toxic fuel. The inefficient system of public transport, growing number of private transport, small prevalence of eco-effective types of vehicles and fuel causes the increasing emissions of carbonic gas, nitric oxide, non-flammable hydrocarbons, lead, benzene, carbon oxide, firm particles and so forth.

Alternative kinds of motor fuel adaptation, ecological safety of the transport vehicles with internal combustion engines increase, promotes partial or full solution of urban environmental problems and achievement of sustainable development purposes by separate territories in particular and states as a whole.

The most accessible and widely applied in Ukraine and the world an alternative kind of fuel is the compressed natural gas (methane). Its use as motor fuel has conclusive advantages in comparison with other kinds of fuel.

Economic advantages of natural gas application as motor transport fuel is defined by such factors: practically there is no difference in fuel consumption; the lowest cost per unit of fuel; more simple and cheaper process of fuel purification. Technical advantages: high power-potential of natural gas; profitability of gas engines; durability of the equipment. Ecological advantages: smaller toxicity of exhaust gases; more explosion-proof exploitation; ecological safety of gas engines.

Specific advantage to Ukraine lie in possibility of methane extraction from coal sediments layers, formed as a result of biochemical and physical processes during transformation of a vegetative material to coal. Coal methane leakages cause a numerous accident on the Ukrainian mines as a result of special equipment on its extraction absence. However it can be extracted as an independent or by-product in the course of decontamination of mines and to be used in a national economy.

By the minimum calculations, rough estimation of methane resources in Ukraine is 1.7–2 billion cubic metres, which put Ukraine on the ninth place among the largest coal-mining countries of the world. However, national programs of development of power branch only establish the given fact.

Economic benefit of increase in a share of the transport hydrides can considerably reduce costs for energy resources, increase resource of motor equipment without considerable loss of capacity and improve the general level of traffic safety.

The social and ecological effect can be expressed by reduction of the social and economic losses connected with high level of disease of the population caused by existence in ecologically adverse environment, the accelerated deterioration of



house holds, communal services and other objects of the high social importance; the general improvement of an ecological situation of city territories.

The basic difficulties of alternative fuel vehicles expansion consist in the necessity of filling stations system development, car repair shops with the highly skilled personnel creation; the expensiveness of the established equipment; higher requirements to accuracy of the equipment and its expensive repair.

## **THEORETICAL AND METHODOLOGICAL FRAMEWORK OF AN ECOLOGICAL DEBT CONCEPT**

***D. Gorobchenko***

*Sumy State University, Sumy, Ukraine*

The concept of ecological debt (ED) was developed in 1990th and became the result of studying problems of interaction between nature and society. The precondition of the concept rising are contradictions in social and economic relations, then the achievement of sustainable development by one subjects can be carried out at the expense of such achievement potential by other subjects.

Various researches in this field can supplement one another, or in some cases contradict each other. It is caused by the absence of the standard widespread theoretical, methodological and methodical frameworks of the concept. Furthermore, the concept has been developed by western scientists and scientists from the former USSR independently from each other since the concept rising 20 years ago. Therefore, synthesis of accumulated knowledge into unified theoretical and methodological basis has not been promoted.

Common features of ED definition of western scientists are the following [1]: appropriation and excessive use of natural resources with the best quality by developed countries for satisfaction of their internal demand; extraction and use of natural resources by industrial countries; irrational use of air resources and resources of world ocean; manufacture of chemical, biological, toxic and nuclear weapon; change of information substance of nature; compelling Third World countries the necessity of extensive use of natural resources etc.

The opinion of scientists from former USSR about ED concept content is the same in general. It is the deep crisis in social and environmental relations. However, scientists highlight the problem of ED economic estimation. ED is defined as indebtedness of society to nature expressed in monetary form [2]. It can be calculated as lost of national wealth because of nature state deterioration. Also two approaches are allocated: humanitarian and utilitarian. According to these approaches ED can be paid off only by restoration of the broken natural objects, and also by acknowledging human's guilt of nature degradation [3].

Thus, we have allocated the following essence of “ecological debt” category which does not contradict with other researches and consists in the following. ED reveals in social, economic and ecological relations of various social groups in spatial and temporal continuum when achievement of sustainable development purposes by one social group is carried out at the expense of wrong use of potential of social and economic development by others. Also we offer the following definition. Ecological debt – is conditionally estimated level of changes in a condition of the surrounding environment, caused by eco-destructive activity of economic subjects in the territory of the certain country which should be liquidated (compensated) for achievement of sustainable development purposes.

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## **ECO-ECONOMIC ASPECTS OF RISK MANAGEMENT IN ECOLOGICAL SAFETY**

***Y.A. Goryaeva, A.A. Rubalov**  
Sumy State University, Sumy, Ukraine*

Safety of vital space is the requirement of nowadays. Considerable amount of resources required to provide safety. The question of acceptable safe level appears sharply. Modern control system in the conditions of planetary above constituents and above rapid ecological processes based on the system estimation of risk constituents. Optimization of mechanism of adjusting of safety of ecological space on conception of risk needs improvement of instrument of estimation of risk factor.

Control system in an eventual result reserved on the unique eco-economic space. The base requirement of their mutual relations is principle of safety. The task of providing safety in modern terms dictates the necessity of mechanism creation for dynamic adjusting and development of conception of its optimization which integrates different fields of knowledge methodologically.

The factor of risk of management ecological safety became the object of this research. Determination of system structural eco-economical constituents of risk, analysis of basic aspects of consequences of his influencing, belonged a task on the base of approach of the systems.

Risk is related directly to ecological safety and conditioned them by economic losses. That is why conceptual bases of principles of choice of basic directions, approaches and methods of analysis were taken to measuring of risk degree in the mechanism of management ecological activity at working out ecological problems on the base of criterion of safety of eco-situation.

Risk as a factor of mechanism of management ecological activity with the purpose of providing of national safety needs research and analysis of different types of co-operation of man with nature, namely – elemental human unintentional influence on nature and transformation of biosphere, purposeful large-scale transformation of nature and use of its resources.

The analysis of risk consists of the stages of study of eco-economical constituents of risk, effects of influencing of risk factor on ecological space, creation of adequate models of quantitative estimation of credible threat to the environment at the certain levels of the ecological loading on an environment, development of mechanism of management and optimization of adjusting of safety of ecological space on conception of risk. A risk estimation is for the ecological systems based on the objective estimations of his constituents and introduction of descriptions of hierarchical, non-linear, open and non-neutral approach.

Results are got in relation to the factors of influencing on the basic tendencies of forming of constituents of factor of vagueness and risk allow, in our view, more consciously to form the criteria of seeing and estimation of ecological the issue of the day of modern time.

## **EXPERT EVALUATION OF CONCESSION PROJECTS**

***Larisa Gritsenko, Irina Boyarko***  
*State Higher Education Institution*  
*"The Ukrainian Academy of Banking*  
*Of The National Bank of Ukraine"*

Nowadays state economic policy should be focused on solution of such problems as achievement balance of economic and social development, increase of investment activity, maintenance of ecological balance, rational use of financial, material and human resources, stabilization of the banking system, optimization of foreign economic relations etc.. Today the most important problem of socio-economic development is the elaboration and implementation of socially significant infrastructure projects.

Major infrastructure projects can be financed on a concession basis at the expense of the investment resources of all participants. Thus the decision-making on investing in certain line of business for the financing of the state and municipal property should be based on the developed designing estimates of concession

projects, the results of coordination, effectiveness evaluation and integrated evaluation of projects in accordance with the guidelines on expert evaluation.

Designing estimates (or design materials) is a system of documents containing a description and justification of the project, which covers documents required for the design of capital construction project and additional materials developed by project participants during examination, preparation and project implementation. Concession investment projects are developed on the base of the design of materials after the detailed estimation of the project feasibility and alternative analysis.

The purpose of the examination of concession projects is to identify effective socially important investment projects, which implementation will result in more benefits for the further socio-economic development of countries, regions and cities. In our opinion, concession projects must be exposed to exhaustive expert examination. It should include such main stages as the compulsory comprehensive public examination (investment, sanitary-hygienic, environmental, examination of fire safety, labour safety, energy conservation, examination of nuclear and radiation safety, technical and economic examination) and a voluntary examination that includes estimation of social and economic effects and some other aspects (strategic, technical, manufacturing, financial, economic, commercial, social evaluation, analysis of organizational level of project, patent and legal and institutional examination). The decision on further review and approval of investment projects at different levels should be based on expert opinion.

Evaluation of the concession project effectiveness includes analysis of the following areas:

- establishing the limit values for main criteria for project investment decisions;
- financial (commercial) feasibility evaluation;
- effectiveness evaluation of the whole project;
- evaluation of the project for third-party business entities, which interests are affected by the results of the project;
- evaluation of social and environmental efficiency of the project;
- evaluation of the effectiveness of participation in the project for each participant, namely, concessionaire, investors, lenders, state, local governments, etc..

It should be noted that the main features of concession projects are the high cost, long payback period, low business efficiency, a large number of participants and high project risk. Therefore, in the course of the formation of the main criteria for evaluation concession projects the interests of all shareholders should be taken into account.

Comprehensive project evaluation should be implemented in accordance with guidelines on expert evaluation of concession investment projects. Such guidelines should include project evaluation in the following aspects:

1. Evaluation of investment attractiveness of the region (city) where the concession project should be realizes.

2. Evaluation of conformance to regional socio-economic development strategy.
3. Effectiveness evaluation of the concession project.
4. Evaluation of the fiscal effectiveness of concession project at the regional (local) level.
5. Evaluation of socio-economic efficiency of concession project at the regional (local) level.
6. Evaluation of financial feasibility and potential ability of project to generate effect.
7. Evaluation of the project sustainability to changes of external parameters, including evaluation of possible risks.
8. The multi-stage expert appraisal of concession project.

Infrastructure projects are low effective, so in the course of a multi-stage expert examination considerable attention should be paid to evaluation of the environmental and social impacts of the project, and the degree of its impact on the environment and social sphere of country, region and city. Environmental examination is carried out at the first stage of compulsory comprehensive public examination, social - on the second level of voluntary examination.

Ergo, project examination should be one of the main stages of evaluation procedures for choice of alternative projects and adoption of a decision on financing of concession investment projects. Particular attention should be paid to solving issues related to financing of examination procedures, development of examination's methodology, determining the value of socio-economic discount rate, which should take into account inflation, risks, time etc. Integrated solution of these tasks will lead to increasing the efficiency of investment management and acceleration of socio-economic development of countries, regions and cities.

## **CRITICAL THINKING FOR ECOLOGICAL EDUCATION IN ENGLISH DISCOURSE**

***O.O. Guzovska, M.A. Ryzhenko***

*Kyiv National Taras Shevchenko University, Ukraine*

Development of critical thinking is one of the most important aspects of ecological education for students. This means application of certain question categories for better understanding and learning of educational material and use received knowledge in practice.

At acquaintance with a new educational material you have to pay attention on studied before by recalling facts, terms, main concepts etc. There are used the following key words such as: what, who, when, where, why; to choose, to name, to determine, to remember, to show, to tell etc. They are used in the questions:

- What is ...?

- How can you explain...?
- Can you name three types...?

For example, studying the educational material on general ecology course it's necessary to pay attention on determination of the main studied terms and answer the questions:

- What is ecology?
- Can you name three types of interrelations in biosphere?
- Name the main sources of bio-contamination.

The next stage in studying of bio-contamination is demonstration of understanding facts and ideas by comparison, interpretation, classification, explanation of main conceptions. The key words that are used are: to compare, to paraphrase, to show, to illustrate etc. Next questions must be put there:

- How do you compare...?
- What is the main idea...?
- What statements support the fact of...?

In our case there may be the next questions:

- Can you explain interdependence between increasing of environment waste level and deforesting?
- What is the main idea of Kyoto protocol?
- Paraphrase in your own words the term "industrial ecologization".

The third level of information learning is directed to practical application of received knowledge on the advanced stages of topic studying. In this case use of the following key words is carried out: to use, to apply, to build, to choose, to identify, to organize, to simulate etc. You may use the following questions:

- Demonstrate you own comprehension of....
- How would you apply received information attached to investigation...?
- What facts will you choose to show...?

For example, in studying of certain material on ecology there must be useful the following questions:

- What will ignorance of over the norm of air emission lead to?
- What examples of environment pollution can you give?
- How can they solve the problem of rivers pollution?

The fourth level is analysis of studied material, research, information grouping etc. The key words: to analyze, to classify, to distinguish, to research, to divide etc. There may be used the following questions:

- Can you systemize the following...?
- What connection is found out between...?
- What conclusions may be made from...?

For example,:

- Examine extension of pollution in atmosphere after Chernobyl catastrophe.
- Analyze the level of environment pollution in Ukraine.
- Divide the territory of Europe by degree of lithosphere pollution.

The fifth level may be determined as synthesis of received knowledge and studied material, information resume by connecting elements in new models or patterns. There will be the following key words: to adapt, to formulate, to imagine, to represent, to improve, to propose etc. There may be the following useful questions:

- What changes can you propose to decide ...?
- How can you estimate results of...?
- What must be made to decrease (increase)...?

In our case there may be the following questions:

- Formulate algorithm of pollution income in atmosphere.
- What can you propose for improving of ecological situation in Ukraine?
- Estimate effectiveness of existing technologies of water treating.

Estimation of studied material, presentation of individual thoughts by acceptance or non-acceptance of information, applying of studied material for the following research or investigation must be named as the sixth stage of development of critical thinking. The following key words for this chapter are: to make a conclusion, to recommend, to prove, to highlight etc.:

- Do you agree with the statement...?
- Can you estimate the importance of the following ...?
- What significance do presented data have for...?

For example,

- What methods may be recommended for a rational using of water recourses?

- Do you support Kyoto protocol idea?
- Prove appropriateness of existing standards establishment of immission limit of pollution matter.

Introduced classification allows not only remember informational material but understand the importance of certain questions and their applying in solving of complex tasks under conditions of uncertainty in future practical activity of specialists-ecologists.

## **PEOPLE-CENTERED ECONOMICS**

***Terry Hallman***

People-Centered Economic Development p-ced.com  
Ukraine/England/USA

This conference primarily focuses on environmental economics, economics of ecology. My 2009 presentation to this conference was titled "Economics in Transition: The 'Triple-Bottom Line' of financial, social benefit, and environmental benefits. Among three main areas of economics, the financial sphere remains dominant over social economics and environmental economics. The reason for this

is very simple: in order for any system of economics to be sustainable over time, it must first be financially sustainable. If a system costs more than it produces, it requires infinite inputs over time. Infinite inputs are not available in a finite world, and we live in a finite world. If we pursue a system that costs more than it produces financially, it must and will necessarily collapse. But now, the financial system itself is broken: it costs far more than it produces.

As I learned from conference participation last year, students are most interested in the underpinnings of how and why we are where we are, now. However, detailing that within the limitations of two pages published in this academic journal is quite impossible. In-depth discussions may, as participants prefer, be undertaken during and after the conference. Links will be available on the P-CED website, as last year, for further and ongoing information and education [1].

### People-Centered Economics – A Manifesto

1. The US economy transitioned from hard-asset based (gold, silver) in 1971 to Fed paper notes written solely against the 'good faith and credit' of US citizens.

2. Gold (or silver) is tangible, observable, finite: whatever is on hand, is on hand. That provides a firm, tangible, finite, objective economic anchor. There is no way to create more of it at will. One ton of gold is one ton of gold. Its quantity and value are represented in numbers. Since that time, the US national debt went from near zero to nine trillion dollars in 2008 (~5 trillion in 1996 when these points were first compiled.) That debt is backed by nothing more than paper based on numbers which may or may not even exist.

3. Adam Smith's 'invisible hand' does not mean 'non-existent', nor detached. It means what it says: invisible. That is, not observable.

4. After disconnecting from the gold standard, US economics and capitalism became purely a matter of manipulating numbers. There was no longer a hard, observable, tangible, finite anchor. Numbers are not hard, observable, or tangible, and may not even exist outside the mind of human beings.

5. With US and Western economics and capitalism shifted to manipulation of numbers: are numbers real? That is, do numbers exist independently of the human mind and imagination?

6. Plato claimed numbers exist independently of the human mind, are real, but exist in an ideal, transcendent, unmanifest world. Numbers exist because they are in that ideal world. That ideal world is represented to us by numbers, and by extension, mathematics. Therefore, numbers exist because numbers exist. Circular logic, per his protegé Aristotle.

7. Descartes, mathematician/philosopher, finally got around some fifteen centuries later to further analyzing the questions of what exists, what is real. He went past numbers to the question of whether he himself even existed. He posited that some entity, some manner of consciousness and material world in the form he found himself, must necessarily and logically exist in order to ponder the question to begin with. He concluded "cogito, ergo sum." "I think, therefore I am." Thus



demonstrating that he, and by the same argument other humans, have firm evidence that we exist, and are not mere fantasies or cognitive constructs of an Evil Genius imagining all of us, the world, and the manifest universe. Human beings exist. He was not able to reach a similar conclusion about numbers, nor has anyone else, nor is it possible to reach any such conclusion because it is not possible to separate thinking of numbers by a human being from the human being himself or herself without eradicating the human being. In which case, there would be nothing to speak or think further.

[Numbers are assumed by mathematicians to exist in a real sense for the sake of their day-to-day work six days per week, but not on the Sabbath when they feel more obliged to be honest. (reference "The Mathematical Experience", Davis and Hersh, 1981.) ]

8. Capitalism based on numbers may or may not be valid, according to whether or not numbers are valid, real, existent, independent of the human mind. Positing them in Plato's ideal realm and begging the question of their existence on that basis was and is null and void.

9. Find a 1, or a 2. Not a symbolic representation of one or two, 1 or 2. Not a quantity of 1 of something, or 2 of something, but an actual 1 or an actual 2, tangible, observable, on their own. Next, find a human being. It is possible to find a human being, one human being or two human beings. It is so far not possible to find a 1 or a 2 in this world. There are no instances in recorded history where either of those have even been located and identified as entities independent of the human mind, nor any other number nor any mathematics nor any equation.

10. Human beings are real.

11. If a) the independent existence of numbers is unknown, and unknowable; b) human beings do exist; then c) any system of human economics based on reality can only be based on human beings.

12. Positing numbers as real entities, and basing economics on that unproved and unprovable hypothesis, risks disposing of real entities (human beings) in favor of imaginary entities (numbers.) The only variable needed for that to happen is unscrupulous human beings.

13. Human-based – that is, people-centered – economics is the only valid measure of economics.

14. Manipulation of numbers, represented by currency/money, allows writing "new" money as needed. There is no tangible asset, or anchor. There are only numbers, managed by whomever might maneuver into position to do so. Economics came to be based on numbers, rather than real human beings.

15. On that basis, capitalism trumped people and therefore trumped democracy. Democracy is about people, who since Descartes are considered necessarily real, rather than numbers which are not necessarily real. An imaginary construct, numbers, rule a real construct, people. That arrangement allows for disposal of real human beings, in the name of the imaginary construct.

16. Capitalism nevertheless remains the most powerful economic system ever devised. The problem is not with the construct. The problem is with the output of the construct, wherein imaginary constructs – numbers, and currencies represented symbolically by numbers – are left to control real human beings to the material benefit of relatively few people and to the exclusion of many others. Classical capitalism has reached equilibrium in this regard. However, and consequently, many and growing numbers of human beings are excluded in the realm of finite resources hoarded by those most adept with manipulating numbers/currencies.

17. This is where we find ourselves at the advent of the third age of human civilization – the Information Age, following from the Agriculture Age and the Industrial Age. We are for the first time in human history in position to take note of where we are and what we are doing to and with each other. Or, not.

18. Modifying the output of capitalism is the only method available to resolving the problem of capitalism where numbers trumped people – at the hands of people trained toward profit represented only by numbers and currencies rather than human beings. Profit rules, people are expendable commodities represented by numbers. The solution, and only solution, is to modify that output, measuring profit in terms of real human beings instead of numbers.

19. We can choose to not reform capitalism, leave human beings to die from deprivation – where we are now – and understand that that puts people in self-defense mode.

20. When in self-defense mode, kill or be killed, there is no civilization at all. It is the law of the jungle, where we started eons ago. In that context, 'terrorism' will likely flourish because it is 'terrorism' only for the haves, not for the have-nots. The have-nots already live in terror, as their existence is threatened by deprivation, and they have the right to fight back any way they can.

21. 'They' will fight back, and do.

22. The Information Age can become the pinnacle of human civilization, the Golden Age. Or, it can become the end of human civilization. We get to decide which way to go, and act accordingly.

23. Dismissing people and consciously leaving them to die is probably not the way to go.

24. Economics, and indeed human civilization, can only be measured and calibrated in terms of human beings. Everything in economics has to be adjusted for people, first, and abandoning the illusory numerical analyses that inevitably put numbers ahead of people, capitalism ahead of democracy, and degradation ahead of compassion.

25. Each of us who have a choice can choose what we want to do to help or not. It is free-will, our choice, as human beings.

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1. Subsequent to the 2010 conference, see <http://www.p-ced.com/1/projects/ukraine/sumy/> for ongoing information.

# THE EFFECT OF TECHNOLOGICAL CHANGE IN ENVIRONMENTAL ECONOMICS

*Inumidun B. Iginla*  
*Kharkov, Ukraine*

Within the field of environmental economics, the role of technological change has received much attention. The long-term nature of many environmental problems, such as climate change, makes understanding the evolution of technology an important part of projecting future impacts. In many cases environmental problems cannot be addressed, or can only be addressed at great cost, using existing technologies. Providing incentives to develop new environmentally-friendly technologies then becomes a focus of environmental policy. The goals are to introduce technological change economists to how the lessons of the economics of technological change have been applied in the field of environmental economics, and suggest ways in which scholars of technological change could contribute to the field of environmental economics.

Environmental technologies include technologies like changes in production process, such as improved energy efficiency, that lead to reduced environmental impacts. Because the benefits of environmental technologies tend to accrue to society at large, rather than the adopter of such technologies, market forces alone provide little incentive for developing environmental technologies. Instead, environmental regulation or public funding of research and development often provides the first impetus for developing new environmental technologies. These induced effects of environmental policy on technology may have substantial implications for the normative analysis of policy decisions. Indeed, in many cases, environmental problems cannot be addressed, or can only be addressed at great cost, using existing technologies. As a result, understanding the interactions between environmental policy and technology may have quantitatively important consequences in the context of cost-benefit or cost-effectiveness analyses of such policies. Understanding the environmental impact of overall technological change is also important to assess the long-term sustainability of economic growth. The environmental impact of economic activity is profoundly affected by the rate and direction of technological change. Costs tend to fall, quality tends to improve, and a wider variety of technologies tend to become available as time passes. New technologies may create or facilitate increased pollution, or may mitigate or replace existing polluting activities.

Further, because many environmental problems and policy responses are evaluated over time horizons of decades or centuries, the cumulative impact of technological changes is likely to be large. Indeed, uncertainty about the future rate and direction of technological change is often an important sensitivity in forecasts of the severity of environmental problems. This is best explained by the example of climate change, in which different assumptions about the potential for future

technological change lead to greatly different assessments about both the potential for reducing carbon emissions and the optimal rate at which such reductions should occur. Projections of future technological change are an important driver of these differences, and affect not only the cost of reducing emissions, but also predictions of what emissions levels will occur in the absence of climate policy initiatives. This is a large task, inevitably requiring unfortunate but necessary omissions. In particular, we confine ourselves to the relationship between technology and problems of environmental pollution, leaving aside a large literature on technological change in agriculture and natural resources more broadly. The goal is to introduce technological change economists to how lessons from the study of technological change have been applied in the field of environmental economics, and to suggest ways in which scholars of technological change might contribute to the field of environmental economics.

## **INCONSISTENCY PROBLEMS OF TERRITORY SUSTAINABLE DEVELOPMENT STRATEGY REALISATION AT THE STATE AND LOCAL LEVELS**

***K.V. Ilyashenko***

*Sumy State University, Sumy, Ukraine*

Formation and maintenance of a qualitative mankind inhabitation is the important condition of a sustainable development of a modern society. In this context state regulation of process of mapping out of territory and a regulation of its use at all levels is perceived as the pivotal factor of maintenance of the purposes of the balanced spatial development.

According to [3] purpose of forecasting and development mapping out is creation of long-term, intermediate term and short-term programs of social and economic development.

Unlike development mapping out, territory mapping out has narrower, concrete maintenance and is defined as process of regulation of territories uses. So, territory mapping out represents process by which result are formations of master plans and the other corresponding town-planning documentation [2].

As the land is today extremely important and restrained resource its effective utilisation appreciably influences social development. According to the Law of Ukraine «About planning out and site development of territories» planning out of territories is carried out on nation-wide (the General scheme of mapping out of territory of Ukraine), regional (schemes of mapping out of territories Crimea, areas, neighbouring communes, their groups) and local (the human settlement master plan) levels.

The General scheme of mapping out of territory of Ukraine defines priorities and conceptual decisions of mapping out and use of territory of the country, improvement of systems of moving and maintenance of sustainable development of human settlements, developments of an industrial, social and engineering-transport infrastructure, formation of a national ecological net [1].

At level of regions and local communes territory mapping out has more concrete character and is defined by necessity of creation of the town-planning documentation and schemes of mapping out of territory of concrete area, neighbouring commune, a city, a human settlement. By O.Topchiev's definition territory mapping out should concentrate on such key directions:

- working out of concepts and programs of creation of natural framings of environmental safety of territory of the country and regions;
- working out of thematic series of maps which introduce spatial distribution of anthropogenic development pressures on a habitat;
- substantiation of schemes the agro landscape organisation of a countryside;
- mapping out of territories of cities and residential suburbs, metropolitan agglomerations and urban areals [4].

The legislation of Ukraine fixed obligatory necessity taking into account the General Ukraine territory scheme mapping out by enforcement authorities and local governments in preparation of projects and nation-wide programs of social and economic development of Ukraine, programs of environmental protection etc.

As practice testifies, the General scheme of mapping out of territory of Ukraine actually remains today the declarative, formal document. It is necessary to notice also that the majority multilevel strategies have also declarative character, without a substantiation of means and ways of realisation of certain strategic priorities.

In the process of forecasting and strategic mapping out of regional development the toolkit of mapping out of development of territory today is not enough used. So, in particular, «The Program of economic and social development of the Sumy region for 2010» has no any direct reference, on the State strategy of regional development for the period till 2015, intermediate term strategy of social and economic development of the Sumy area for 2008-2015.

Actually in strategy of regional development questions of real tap of lands for creation of a national ecological net, increasement in the areas of the nature protection territories, corresponding optimisation of land use in regions are not considered.

In our opinion, strategy of regional development necessarily should consider territorial features of region development on the basis of mapping out of its territory use. Such approach creates possibility of definition of optimum ways of long-term objectives achievement taking into account territorial possibilities and features of each region; complex development of territories.

Working out of schemes and models of territory needs to be carried out in two planes on the basis of the mutual coordination and the account of interests: vertical

- from the General scheme of Ukraine territory mapping out to local communities and horizontal - at level of equitable social groups and communities.

The methodology of the spatial organisation and mapping out of regions of Ukraine at level of neighbouring communes and human settlements requires the further working out and improvement for the purpose of creation of the gear, allowing to consider state, public and private interests.

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## **POVERTY, POPULATION, TECHNOLOGY AND ENVIRONMENTAL POLLUTION**

***Kanduru Hussein Ali***

*Sumy State University, Sumy, Ukraine*

Poverty is a major cause and effect of global environmental problems. It is therefore futile to attempt to deal with environmental problems without a broader perspective that encompasses the factors underlying world poverty and international inequality.

There is a big link between poverty and environmental pollution and degradation. Poor people are forced to overuse environmental resources to survive from day to day, and this situation has a direct negative impact to our environment and it puts our mother nature in danger as the days goes on. In developing countries, many people live in extreme poverty and in order to survive they become dependable to their environment. On one side it helps them overcome life difficulties but on the other side it put our environment in a big danger such as draught, deforestation, land degradation, environmental pollution as well as it contributes to climate change and global warming.

Also population growth and economic change contributes a big deal to this problem as we know that most natural resources are in renewable and very scarce, and the growing population tend to exploit these resources to satisfy their needs

and hence causes problems to our environment. Some environmentalists also raise concerns about increasing populations placing excessive burdens on the world's resources as the current major source of environmental problems. The world population has gone up rapidly for the past few years, and therefore, the increase in population means the increase in the consumption of natural resources, therefore, people consume more than our environment can offer which results in our environmental problems today.

Furthermore, the world development and technological improvement has also contributed to environmental problems. Forests around the world face increased pressures from timber companies, agricultural businesses, and local populations that use forest resources. Also, mining companies around the world and the use of small scale mining has contributed a big deal in land degradation and soil erosion; Different oil companies also contaminated a big number of water sources with oil and made water in different places not safe drinking.

Apart from the key points explained above like poverty, population and technology and how they affect our environment, there are still other problems that can't be neglected we are facing today like war, bad government policies and the impact of developed countries over developing countries and how they contribute to environmental pollution especially in developing countries as follows.

Effects of war, over the past years to date, war between countries and among ethnic groups have badly destroyed our environment, the application of chemical weapons and weapons of mass destruction, the destruction of structures and oil fields, tanks, fires, military transport movements and chemical spraying are all examples of the destroying impact war may have on the environment. Air, water and soil are polluted, man and animal are killed, and numerous health effects occur among those still living.

Moreover, some governments lack good policies or emphasis on environmental pollution, Environmental policy is any course of action deliberately taken [or not taken] by government or organization to manage human activities with a view to prevent, reduce, or mitigate harmful effects on nature and natural resources, and ensuring that man-made changes to the environment do not have harmful effects on humans or environment. It is useful to consider that environmental policy comprises two major terms: environment and policy. Environment primarily refers to the ecological dimension (ecosystems), but can also take account of social dimension (quality of life) and an economic dimension (resource management). Policy can be defined as a "course of action or principle adopted or proposed by a government, party, business or individual". Thus, environmental policy focuses on problems arising from human impact on the environment, which retroacts onto human society by having a (negative) impact on human values such as good health or the 'clean and green' environment, so it is vital for all governments and organizations to improve these policies and put a big emphasis on them to save our environment.

Also, the impact of developed countries over developing caused greater impact on environment, a lot of foreign companies like gas, mining, oil and others have invested heavily in developing countries and their operations have great impact on environment like air pollution, water pollution and land degradation especially in developing countries where they operates.

Conclusively, by referring to the problems mentioned above, I would like to suggest some solutions that in one way or another may help to overcome some of the problems facing our environment today:

1. Poverty reduction in both developing and developed countries and the reduction of the big gape between the haves and the have not.

2. Environmental education should be provided to all people so that they can realize the danger we are facing if we don't take immediate actions to preserve our environment.

3. Population control especially in developing countries, so that we can restore the balance in eco-system.

4. To improve methods of farming, fishing, mining, and planting as many trees as we can to replace those that have been cut off.

5. Environmental policies should be improved and world governments should join hands to protect our environment.

6. All government should join hand against the use of weapons of mass destructions and chemical weapons which has greater impact on environment; also war in different places should end so that the world can live in peace and harmony.

And lastly, to use alternative sources of energy that is friendly to environment like solar energy and wind energy.

## **GREENING OF THE ECONOMY**

***Ganna Kharlamova***

*Kiev National Taras Shevchenko University, Ukraine*

Unsustainable environmental practices pose increasing threats to the Earth's climate, water, forests, biodiversity, food and energy supply, and thus to the foundations of human existence and well-being. Ecological crisis and ecological safety became hot topics for scientists all over the world. Developing and transition countries disproportionately suffer the ecological consequences of the exploitation of the earth's limited natural resources by powerful corporations.

Given the magnitude and scope of the current economic crisis, the world is in the experience of a significant economic downturn. Of the many areas that will be impacted by the downturn, the environment stands out in particular. It's closely tied to the tempo of resource consumption, and significant efforts to ameliorate environmental decline will prove very expensive and out of reach for already-stretched budgets.



Ecosystem management is changing rapidly. Command-and-control programs that neglect intrinsic cycles of natural and social systems appear to be insufficient, or even worse than doing nothing (Holling and Meffe 1996). Instead, approaches that involve diverse participants in assessment, learning, and planning may lead to more flexible, adaptive institutions and sustainable outcomes (Lee 1993, Gunderson et al. 1995).

"Greening of the economy" aims to engage stakeholders, scientists, and managers in an ongoing dialogue about the kinds of ecosystems people want and the kinds of ecosystems people can get. Little is known, however, about the fluctuations of social and natural systems that might be created by greening the economy in its various forms. The dynamics of diverse human agents interacting with ecosystems fall between several traditional academic disciplines (Carpenter, 1999). Models that can bridge this greening economy theory to experience in specific, testable ways are lacking, especially in Ukraine.

During prediction of disaster trends in environment systems we obviously meet the dynamic complexity – it's the compulsory attribute of modern world. Usual methods of forecasting, planning and analysis are useless for operating with the dynamic complexity. Dynamic complex situation is a situation when the closest and further consequences of any action are principally different.

As the world industrialize and urbanize with increasing tendency, it is continually creating conditions for more and worse disasters in the future that will contribute further to environmental degradation and hinder developmental programs. The industrialization and urbanization processes, however positive in effects along some lines, will both increase the number of potential disaster agents and enlarge the vulnerabilities of communities and populations at risk.

Problems of preservation of the environment are mainly the topic for investigation for physicists, chemists, biologists. But as one of the main parts of state safety and as a component of a nation's level of development, a country's environmental strategy should be developed also from the position of economic theory – that is point of view for "greening economy".

There are next to no publications concerning economic tools for the evaluation of the impact of environmental risks in the world. The circumstances of shortage of internal capital resources in most countries force these countries mostly to rely on foreign investments to address environment issues.

Investments (by means of their impact on economic growth) in a recipient-state and transfer of new ecologically-safe technologies must stimulate improvements in environmental security. However "the reverse of the medal" is often in fact the "pollution haven". This means that investing companies move operations to transition countries to take advantage of less stringent environmental regulations than in other developed countries. Everybody has to cope with uncertainty and to manage various risks in the world that is changing more and more rapidly clearly stretching the social fabric. One of the dominant driving forces is efficiency, which has led to globalization, increased dependency among more diversified systems, a

reduction in much safety (both technological and social) margins, and other factors which contribute to increased vulnerability.

Coping with uncertainty in decision-making, especially for integrated management of risk, environment risks require the mathematical analysis of various measures of outcomes resulting from applying alternative policy options. In modeling complex socio-ecological systems, the critical nature of many interactions between human and ecology are often unrecognized until the system experiences catastrophic consequences.

This report outlines methodological, social-economic, and technical problems related to the development of novel methods for such social-economic-environment mathematical models – the main skeleton of “greening of the economy”. The objectives of this paper are to (i) point to issues in ecological disaster operations management and modeling, (ii) survey existing literature, (iii) suggest future research directions, and (iv) act as a tutorial for interested researchers.

We suggest a novel perspective on the relationship between the stringency of environmental policies and foreign direct investment (FDI). FDI is found to affect environmental policy, and the effect is conditional on the local government's degree of corruptibility. If the degree of corruptibility is sufficiently high (low), FDI leads to less (more) stringent environmental policy, and FDI thus contributes to the creation of a pollution haven. Our empirical results using panel data from Ukraine and other CIS countries support the model's predictions.

The main issue for the developing of the “greening economy” theory is finding possible models (stratagems) for heading of the Planet to the ecological equilibrium. These stratagems have to be mutually beneficial for economic and ecological development paradigms.

## **CONCEPTION OF VIRTUAL WATER IN INTERNATIONAL TRADE**

***M. Khizhnyak, A. Matsenko***

*Sumy State University, Sumy, Ukraine*

Water provides the most important functions for human life, such as manufacturing food, energy and industrial products, daily water use, satisfying sanitary and hygienic people's necessities, transport and recreational needs and other functions. A problem of lack of water in many regions of the world arised in XX-th century, because of high growth of economy, increasing of population and was accompanied with anthropological pressure on ecological systems and natural water objects.

One more reason of this problem is uneven geographical distribution of fresh water. According to the dates from UN, just a third of planet's population is

providing qualitative water resources. The countries of Africa suffer from this problem most of all. Brazil is the country provided with water resources best of all. 19 % of its world's stocks are concentrated there. Russia takes the second place (10 %). Canada, Indonesia and China take the third place (7% each).

A problem of effective and rational water use is as important as such global problems of humanity as poverty, famine, global warming, since water scarcity in one region influences the economy of neighboring regions.

There is a number of strategies which can help to surmount the growing water scarcity. They include economical water use, converting sea water into fresh water. One more alternative is to import agricultural and industrial products with big water contain, including power. It is the way to minimize the volume of used water.

One of the ways of definitions which indicate water-retaining capacity of the goods is calculated volume of virtual water. This concept is understood as a quantity of water contained in the goods used in the technological process. The goal spent for manufacturing of these goods and other goods, which take direct part in manufacturing process.

The concept of virtual water has been created by British professor of Royal College and school of Eastern and African countries of London University John Anthony Alan in 1993. He offered the formula on which it is possible to calculate a quantity of water necessary for manufacturing of any product. This dependence is applied to rational location of economically active objects, and also helps to solve the problem of possibility of manufacturing goods within the country. With the help of this formula the quantity of the virtual water containing in different products has been calculated.

So, according to the John Anthony Alan's formula agricultural goods have the greatest relative density of the water spent for manufacturing of products among which meat products are the most water capacious. For example, 6100 liters of water are required for manufacturing 1 kg of mutton, 4800 l - for pork, 4000 l - for goat's flesh, and 3500 l - for chicken meat.

It is necessary to notice that the calculation of virtual water includes all its possible expenses, from the birth of an animal and its daily diet to water which the personnel can drink. The quantity of virtual water is computed not only for the goods, but also for the person, the enterprise and the country as a whole. Such category, as "water footprint" is used for the total amount of fresh-water resources used for manufacturing of a foodstuff and providing services, consumed by a person, a enterprise or a state.

The concept of water footprint was offered by the employee of university Twent in the Netherlands, Professor Arjen Y. Hoekstra. According to this theory import and export of agricultural production is import and export of virtual water connected with import of the goods and services as total amount of water used in the country-exporter for their production.

The problem of water resources is directly connected with the global economy. Many countries import different products for its manufacture of which people need big volume of water. Trade of virtual water potentially reduces water consumption, both at country level, and at a global level. At a global level the water economy takes place, when agriculture of the country-importer allows saving water for irrigation.

A trade of virtual water potentially reduces water consumption, both at a country level and at a global level. At a global level the water economy by trade takes place, when agriculture of the country-exporter uses less volumes of water, than in a country-importer that allows saving water for irrigation. So the exporter grows up agricultural production, using only rain water. But the country-importer should apply system of irrigational water supply because of the environmental conditions. For the country-importer this water can be considered as an additional water resource to its own water sources. The country can save national water resources by importing of water capacious products instead of their manufacturing.

Although it seems that saving potential of water is big, we should bear in mind most of the trade is conducted between the countries which don't have water scarcity for reasons which are not connected with water.

Moreover, the reduction of global water use refers to the difference in the performance of importers and exporters, rather than a shortage of water. And finally, trade is influenced not only by water scarcity but also by policy and other economic factors.

So, today such concepts as "virtual water" and "water footprint" are new for our country. Only some publications connected with this concept appeared in Ukraine. The volume of virtual water in production is not considered at its sale in the world markets. In the near future the cost of volumes of virtual water that allows optimizing the water market will be considered in trade.

## **PRECONDITIONS AND ECONOMIC EXPEDIENCY OF OFFSHORE AREAS IMPLEMENTATION IN UKRAINE**

***Igor Kobushko, PhD, Docent of chamber of finance,  
Sergiy Panchenko, 5<sup>th</sup> year student  
Sumy State University, Sumy, Ukraine***

The most important feature of modern economic development is a globalization, which is shown in the increase of dependence between separate countries. Permanent considerable volumes of counter flows of goods, services, capitals and scientific innovations became an external feature of this process. In the middle of XX century in the international practice there was implemented a new

financial instrument, known as international tax planning. Creation of offshore areas in different countries became a precondition of this process.

Offshore area is a kind of free economic area. It refers to free service economic areas, which are characterized by creation of positive financial, cash and fiscal regimes, high level of bank and commercial secrecy, loyalty of state regulation to enterprises. In general these are the countries, which participants of financial and credit operations are non-residents of the country, where contracts are signed and realized. At the same time participants have a special legal and tax status, but an important feature in this process is prohibition by offshore companies for any activity at the territory of registration country [1].

By means of offshore areas there can be reached:

- Optimal financing of own investment projects, creation and development of working capital, also by means of nonproductive expenses decrease (including tax expenses);
- Free international movement of capital;
- Anonymity of ownership and management of property, finances and business in general;
- Implementation of “comfortable flag” principle for business and attainment of optimal conditions, formed by legislation, for commercial operations [2].

Wide use of offshore zones in business leads countries with different level of social and economic development to necessity of formation of firm position concerning this phenomenon. Decisions can be different: from restriction of foreign offshore areas practice to creation of offshore centre at the own territory.

An idea about creation of native “tax paradise” appeared in Ukraine a long time ago. Concerning the place of such an offshore area, there can be chosen some possible regions – Chernobyl (almost the only region in Ukraine, which is known or at least recognized by foreigners, and which has its special “history”), Crimea region (nearness to the sea, in the center of sea routes), Carpathian region (center of Europe).

Thus possible profits from functioning of an offshore area in Ukraine can be the following: state tax in case of registration; state tax from the sum of reported statutory capital; minimal determined income tax; payment for administrative services – secretary, registration office, nominal director (resident of Ukraine), payment for report preparation, etc.

But there also exist problems in the process of Ukrainian offshore creation:

- Firstly, for normal functioning there must be broken distrust of foreign investors, which appeared in the years of Ukrainian independence.
- Secondly, possible owners of enterprises in “Ukrainian offshore” are worried by strict attention of Ukrainian controlling bodies to activity of enterprises’ activity.

Except for mentioned problems of subjective character there exist also objective obstacles for life of Ukrainian offshore in an international economic

space, which are connected with acceptance by national legislation of international right for offshore relations regulation.

Offshore area is a specific instrument of investment activity stimulation and increase of inflows to budgets of depressed territories, which economic effect is based on the phenomenon of state profits increase, owing to enlargement of tax basis (usage of its peculiar profit type, got only from international activity) and minimization of tax pressure size. Profits of offshore business are nearly the half of state budgets volume.

This investigation showed clearly, that an offshore organization is an effective method of increase of international economic operations profitability, as it helps to save considerable sums by means of taxes. Quite this item and also almost absence of state control over the activity of organizations with offshore capital, conditioned their widening in business practice of all countries in the world.

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# **INCREASE OF EFFICIENCY OF PROCESS OF START-UP OF TRACTION ELECTRIC MOTORS OF THE ROLLING STOCK OF CITY ELECTRIC TRANSPORT**

***I. Kostenko***

*Kharkiv National Academy of Municipal Economy*

City electric transport is one of the most important municipal services branch which satisfies needs of the population in transportations. It is a non-polluting type of transport.

Ability to live of the enterprises, the organisations and town establishments appreciably depends on a level of development of a transport network, movement of transport streams and reliability of work of electrotransport.

Throughout last years the tendency to reduction of volume of transportations of passengers and deterioration of indicators of quality and safety of their transport service was outlined in work of city electrotransport.

The electric equipment of maintained trolley buses of series 3iy (TROLZA), got during the last years, does not meet modern requirements on power inputs.

From the economic point of view it is expedient to improve technical and economic indicators of existing structure at the expense of improvement of a traction electric equipment.

Lacks of nowadays existing images of regulation of easing of a field are:

- At regulation of a field with use of switching of windings ТЕД it is necessary to have additional taps from excitation windings. Sectioning of windings provides stabler high-speed and traction characteristics ТЕД because degree of easing of a field is not influenced practically by temperature of windings of excitation;

- At regulation of a field with use of active resistance except resistors and контакторов additional elements - inductive shunts are necessary. Also use resistors leads to a deviation of characteristics of management. Also there are energy losses into a stake.

- In occasions with traction engines it is possible to apply to field easing DC/DC the converter

- Use DC/DC of the converter for easing of a magnetic field of traction electric motors of city electric transport and its advantage.

The scheme of inclusion of the converter for easing of field TED mixed excitation is resulted on fig. 1. On the scheme contactors K1 - K5 are intended for current contraflow in a winding of parallel excitation. Contactor K1 connects increases DC/DC the converter to in parallel consecutive winding. The presented scheme allows to regulate smoothly easing of a field of the engine at the expense of change of size of a current in a parallel winding and thus energy expenses will be absent practically.

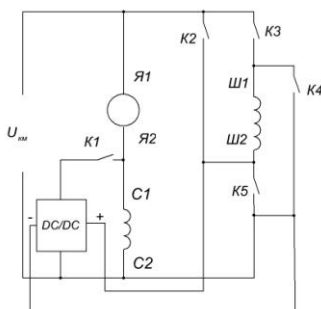


Fig. 1. Easing of a field with use DC/DC of the converter for TED the mixed excitation

Application in design DC/DC of the converter of modern power semiconductor devices (БТИЗ, То - МОИ the transistors completely operated тиристоров) provides the minimum dimensions, weight and device cost. The fulfilled methods of calculations of similar converters, presence of the wide nomenclature of power devices which work on high frequencies of transformation

(10 kilohertz) and integrated drivers of management provide with them efficiency of application of this method.

Application of the offered schemes on city electric transport will allow to reduce expenses of the electric power a rolling stock.

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## **INSTITUTIONAL DECISION-MAKING IN ENVIRONMENTAL MANAGEMENT SYSTEM**

***Nadiya Kostyuchenko, Denys Smolennikov***  
*Sumy State University, Sumy, Ukraine*

Institutional decision is the result of analysis, forecasting, optimization, economic evaluation and selection of alternative variants to establish rules that will affect the future management of social and economic system.

The main feature of institutional decisions is that it is taken to establish certain rules that will be used for decision-making in future.

The legal nature of institutional decision-making is that the system of control for decisions' implementation is needed.

Methods to create institutional decisions include methods and techniques of operations required to develop institutional decisions. They include methods of analysis, information processing, choice of the best alternative, etc.

The optimal institutional decision is the best decision according to the criteria of optimum.

Institutional decision-making algorithm is illustrated in Figure 1.

The implementation of institutional decisions is related to decision-making process under conditions of certainty. In such conditions the decisions are made when the possible alternatives are precisely defined. However, in practice it is difficult to estimate the factors that create conditions for decision-making. That's why there are no situations of complete certainty in reality.



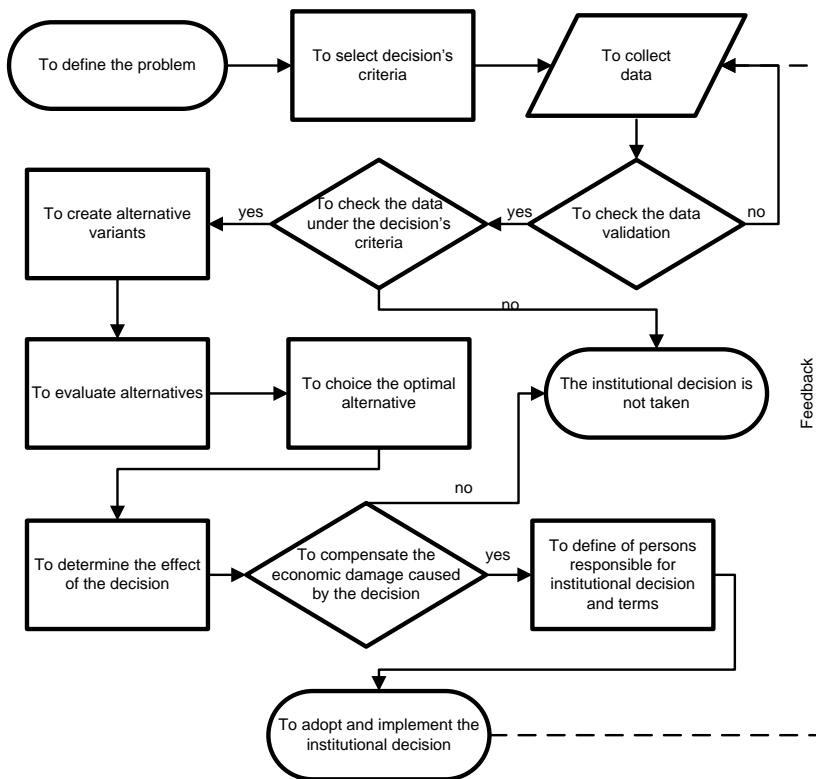


Fig. 1. Institutional decision-making algorithm

Institutional decision-making in environmental sphere allows to estimate the cost value of economic losses from the damage to environment.

## EXPEDIENCY ANALYSIS OF CHANGE OF THE SYSTEM OF APPEAL WITH HARD DOMESTIC WASTES ON THE POLTAVA'S EXAMPLE

**Lesia Kotsyubinska**

*Odesa state environmental university, Odesa, Ukraine*

A problem of collection, accumulation, processing, utilization, moving away, rendering and burial place of hard domestic wastes (HDW) harmless is one of the most painful for functioning of any settlement. HDW, at their accumulation, is the source of substantial ecological danger and social tension. The amount of formed

HDW increases constantly, and their composition changes. Analogical problems are actual for Poltava (table 1).

Table 1. Dynamics of formation of HDW in Poltava on the years ( million m<sup>3</sup> /year) [1]

2000	2001	2002	2003	2004	2005	2006	2007
41986	28838,9	38593,2	40713,7	48347,5	41986	46651,1	46227

A bulk of wastes is potential secondary raw material. From all mass metal folds - 5%, literary garbage - 22%, glass - 9%, plastic - 11%, wastes of building - 16% and food - 36%.

For diminishing the influence on an environment and further use of valuable resources components it is necessary to change the long course of conduct from HDW according to [2]. New HDW control system will allow to stabilize useful properties of valuable resources components of HDW and fully to use them. Also it is possible to achieve the level of "zeroing wastes".

By us the amount of valuable resources components of HDW, which are contained in the annual volumes of wastes, cost of potential secondary raw material, and losses to the environment, were expected.

For an example let's take 2007. From calculations evidently, at a separation:

- ✓ it is possible to get the income of approximately 1548605 mln. hrn. from a metal;
- ✓ literary garbages - 5593467 mln. hrn;
- ✓ glass - 2496258 mln. hrn;
- ✓ the plastic arts - 3559479 mln. hrn;
- ✓ wastes of building - 323589 mln. hrn.

The prevented detriment is 41600,14 mln. hrn.

Thus, improved control system and handling wastes must result in the repeated use of all of the tools of HDW and attain the level of "zeroing wastes" and also to reduce the consumption of primary raw material.

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# FORMATION OF EFFECTIVE SYSTEM OF ECOLOGICAL INSURANCE IN UKRAINE

***E. Kovalenko, T. Poddubnaia, A. Kolontaevskaya***  
*Sumy State University, Sumy, Ukraine*

For overcoming negative ecological events the state covers expenses from the state budget because of unadjusted mechanism of economic responsibility of entities, particularly enterprises with contamination hazard and enterprises - initiators of emergency. Illogical and illegal that facts to vest all expenses on a state, when these enterprises have economic self-reliance, most of them are in private property. That's why should be an effective system of ecological insurance in Ukraine.

Ecological insurance is a kind of insurance of civil legal responsibility of enterprises and sources with high danger for natural environment, for prejudice to individuals and legal entities, because of pollution. Ecological insurance can have binding or voluntary character. Binding ecological insurance are:

- high danger objects insurance;
- insurance of civil legal responsibility of danger cargoes transporters;
- insurance of responsibility of danger waste products exporter and persons who responsible for its utilization.

Factors of importance and necessity of ecological insurance:

- most of enterprises has danger activity for natural environment, it concerns also as stationary objects as entities who transports dangerous cargo;
- results of environment pollution can be disastrous with huge amount of costs;
- For determination incidents, this caused pollution of environment and injured third persons, specified long-term manifestation, which depends on branch of activity and on materials and substances which have been used.

In spite of that insurance of ecological risks is not so popular and effective. One of the factors is legislative. The level of legislative basis is low. There is no a legal assurance of expenses by reason of pollution of environment and degradation of natural resources.

Development of ecological insurance market also stops by:

- weak stimulus of voluntary insurance;
- failure of generally accepted and safe estimation methods of accidents risk;
- low rating of an insurance market which can not take part in dangerous and high level risks.

Some positive moment could be highlighted in ecological insurance:

- juridical knowledge and ecological culture of individuals becomes higher;
- non-stop monitoring of environment;
- formation of unified state system of ecological accidents, disasters, emergencies prevention;
- stimulus of emergency prevention by differentiating of insurance rates;
- assurance of compensation for injured individuals;
- assurance of stable financial position of enterprises;
- anthropogenic accidents database generation;
- foundation of ecological insurance fund.

Integrated development of ecological insurance in Ukraine will:

- reduce budget costs for elimination of accidents and disaster effects;
- make higher financial liability of enterprises, and local authority become interested in minimization of pollution;
- target using of assets for elimination and prevention of accidents;
- Enhancement of inspection of dangerous kinds of activity.

The goal of ecological insurance is prevention of environment pollution with harmful substances by the dangerous enterprises.

The main thing, what should be done now, is to provide a law of unconditional responsibility for damage brought for an environment by any enterprise. It's worldwide trend in legislative branch, concerning ecological insurance. A pollutant shouldn't be charged. An unconditional responsibility forces an enterprise to assure additional assets for compensation of costs, also insurance fund.

## **LABOUR PROTECTION FINANSING**

***P. Kryś***

*Carpathian Institute of Enterprising, Ukraine*

Labour protection is a system of legal, socio-economic, organizational-technical, sanitary and hygienic and medical-prophylactic measures and means aimed at health preservation and work capacity during the working process [ 2, 56].

Insufficient financing, a wrong cost distribution for labour protection may result to considerable material and human losses and irreparable ecological consequences. According to article 21 of the Ukrainian law "On labour protection" it is realized by an owner. A worked is not responsible for any labour protection measures. [1] In accordance with the cabinet of Ministers of Ukraine rules there create labour protection funds at the enterprises in the economic branches and on the state level as well. Such funds may be created by the local and regional authorities for their needs only. At an enterprise the fund costs are used only to realize measures of ensuring the condition and labour protection on the normative

level and its increasing at work. The costs of branch and state funds are used to realize the field and national programmes of labour protection, scientific-research and design works concerning these programmes, to assist the establishment and development of the specialized enterprises, creative bodies, research centres, expert groups and also to encourage working bodies and individuals, who work generously at labour protection problems solving. Labour protection funds are not subjected to taxation.

Labour protection expenses in the state and local budgets are distinguished separately.

Work place condition, safety of technological processes, machines, mechanisms, equipment and other productional means, the state of collective and individual safety ones used by a worker, and also everyday sanitary conditions must correspond to the labour protection legislative acts. [1]

A worker has a right to refuse the work ordered if there is the situation dangerous for his life and health or that of the people around him, and the natural environment. The very fact of the existence of such a situation has to be confirmed by the certain enterprise with the assistance of a trade-union representative and a working body authorized person, and in case of a conflict by a corresponding state body on labour protection with the assistance of a trade-union representative.

A worker also can save his average earning if a work stoppage takes place beyond his fault.

A worker has a right to cancel his labour agreement on his own will, if his owner does not execute the labour protection legislation and the collective agreement conditions. In this case a worker must get a discharge pay according to the collective agreement rate, but less than the three-months earnings.

Workers, who are to be given an easier work because of their health state, have to get it in accordance with their will temporarily or without any time limit by the owner.

The labour payment while removing a worker to an easier less-payd work or the payment of the social assurance help are to be done according to the present legislation.

Workers have a right to save their working-places in case of the enterprise, shop or place exploitation stoppage by a state body or a labour protection service.

People who work at hard and harmful places have to be provided with special medical-prophylactic nourishment milk or other products of equal value, carbonated salt water free of charge; they also have a right for a paid leave on sanitary-curative assignment, shortening of working time, an addition ally-paid leave, a privileged retirement a heightened fee and other privileges and compensations guaranteed by the state. With a delegative character of work a worker is paid money assistance for buying medical-prophylactic nourishment milk or other products of equal value en the collective agreement conditions. An owner has a right to give privileges and compensation at the cost of an owner not foreseen by the law.

During the term of the labour agreement an owner must inform a worker about the changes in the working situation and the rate of: privileges and compensations additional added.

Enterprise workers must be subjected to only privileges for an active participation and initiative in carrying out measures concerning the increasement of labour protection and work condition. The kinds of privileges are accepted by means of collective agreement.

The present tax legislation defines the order of a privileged taxation of the labour protection measures.

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## **WORKING OUT OF A MEDICAL WASTES TREATMENT SYSTEM IN THE ODESSA REGION**

***Ch. Kuzmina, O. Bevz-Biron***

*Odessa State Environmental University, Ukraine*

The problem of medical waste management is extremely urgent. Medical wastes are considered and evaluated as a factor in not only direct but also indirect risk of emergence of infections and noncommunicable diseases among the population through the possible contamination almost of all components of environment – water, air, soil, food, hospital's environment. Potentially infected wastes of medical institutions represent an epidemiological danger.

Today the system of gathering, removing, recycling and treatment of medical wastes is far from perfection in Ukraine. Only very small part of hospital wastes is subject to processing and disposal. And bigger part from them goes to containers with municipal wastes and then they are taken out to the landfill of solid domestic wastes.

Taking to notice all the above-said, I believe that the problem of medical waste management is also urgent for our region, especially in the face of shrinking land taken over by landfills. About 2452 tons of medical wastes are formed every day in Ukraine. Every year hospitals of Odessa region accumulate about 16764 tons of medical wastes of which 25% are dangerous according to statistics.

Besides that, there is no accounting of quantity of medical wastes which are formed in pharmacies, by consumers and other sources.

But the waste treatment problem is displayed not only by their quantity. In this study, we used the method of tree-like clusterization of statistic data for association similar to certain characteristics administrative districts of the region into separate clusters. As a result have been obtained 13 clusters of indicators such as the mass of waste, number of beds in the stationary department of health facilities and the number of polygons in each administrative district.

In conditions of reducing of lands taken over by landfills it is necessary to find another way to waste disposal, which also provide epidemiological welfare of population.

In this research we propose a thermal method to remove the medical wastes of classes A, B, C because it can be implemented centrally. For waste disposal in the Odessa region Ltd. "Green-port" uses an incinerator In-50.4 Russian production. Also recommended for use pyrolysis incinerator "Muller" French production type HP 500.

Mentioned equipment are designed for high temperature removal of any combustible waste. This method of waste treatment ensures the 4th class of danger of ash and total destruction of organic components and viruses.

Considering technological and technical parameters of each of the incinerators, it can be concluded that the main difference between an incinerator "Muller" and the In-50.4 is the principle of waste incineration - pyrolysis (incineration unit with a lack of air in the combustion chamber). This ensures that dioxins will not form, which are superecotoxicants that's why they can't be contained in the air even at concentrations that do not exceed the respective MPC on these substances. At the same time emissions of In-50.4 contain dioxins in the amount of  $0,1 \text{ ng/m}^3$ . It is for this reason, in the choice of equipment preference was given to the incinerator HP 500. This incinerator is highly reliable. If any parameter exceeds current European standards, the system inhibits the loading phase.

In providing conditions of completely removing waste hazard, a choice of optimal technology and equipment is carried out by the criterion of economic efficiency. That's why an indicator of ecological-economic efficiency of the implementation of environmental activities was calculated. This calculation includes the damage that has been defined by the method of determining the damage caused by pollution and contamination of land and violation of environmental legislation because the end product of medical waste treatment provides his placement in the environment which is associated to negative influence on earth surface and soil, especially within the limits of valuable topsoil. Thus, the ecological-economic efficiency indicator was 4,43 when medical waste treatment with the In-50.4, and 4,14 hryvnia per each hryvnia capital investment for incinerator HP 500.

Based on annual productivity incinerator and annual accumulation of medical waste for each district (the number of administrative districts in the region is 26) was found the number of incinerators needed to service the Odessa region, equal to 14.

The main features of placement incinerators is possibility to use one equipment by few districts depending on the mass of medical wastes produced there. According to Sanitarian rules and norms 5179-90 estimated sanitary protection zone HP 500 incinerator is 100 meters from residential buildings. Surface concentration of pollutants taking into account the background will not exceed the established.

The achievement of epidemiological and ecological safety of administrative districts in Odessa region is expected due to implementation the results of this work through complete removal of infected and potentially infected MW from solid domestic waste stream which are placed on landfills and through destruction of pathogenic microorganisms from their volume. Besides, wastes volumes that are formed by medical institutions will be reduced by 98% of now existing what will contribute to conserve lands from growing landfills.

With providing the proper waste sorting or separate gathering in places of their accumulation is possible to recover the heat by production of hot water, electricity, vapor, conditioning of the air what will decrease a term of capital costs absorbtion to equipping the incinerator complex and eventually will bring additional income.

Establishing an effective system of medical waste management in the districts of Odessa region will reduce the level of the epidemiological risk and improve the conditions of environmentally safe existence of the population.

## **MARKET DISTRIBUTION MECHANISM OF ANTHROPOGENOUS LOAD ON WATER RESOURCES OF THE SMALL RIVER BASIN**

*Alina Lavrynenko, Oleksandr Matsenko  
Sumy State University, Sumy, Ukraine*

As experience shows, approaches to Ukrainain water resources management are ineffective and do not carry out function of self-sufficiency of the organizational-economic water use mechanism. The water resources used in the economic purposes do not correspond to necessary quality criteria constantly or periodically.

In Ukraine was set a course for the basinal principle - the modern approach where the small river basin acts as the basic administrative object. The basinal principle of water resources management should correspond to the most effective international practice directed on protection and reconstruction of water resources.

At the same time, the given principle in practical water resources management in Ukraine is not realised. Therefore, there is a necessity of detailed elaboration of water use mechanism, based on basinal management principle.

We offer the new distribution method of anthropogenous load on small river basin. Approach overall objective is to stabilise level of the discharges of



pollutants which would not suppose dangerous anthropogenous influence on a water ecosystem.

In comparison with using MPC (MPC - maximum permissible concentration) and MPD (MPD - maximum permissible discharge), the state at regional level should define the discharges of pollutants ceiling volume for the small river basin, and also to consider volume of the water necessary for diluting of dumps to safe concentration. It is necessary to produce corresponding quantity of licences for pollution, to organise its auction sale, and also to adjust the monitoring system of actual volume of pollution conformity to face value of licences. Destructors can trade in licences both with the state and with other subjects of managing.

For regulation the discharges of pollutants it is necessary to develop also mechanisms of quotas updating for the separate enterprises - «flexibility mechanisms» (trade in quotas, realisation of joint projects on introduction of technologies).

No matter, who had a right in water pollution at the beginning, as a result of purchase and sale acts finally, it will appear at that who can exercise this right most effectively. Accurately the system of the property rights thus should work.

Thus, advantages will have the enterprises which will develop non-polluting technologies, and additional expenses will incur first of all those enterprises at which out-of-date and ecologically inefficient methods of manufacture prevail.

The basic problem consists in responsibility of the enterprises. For successful realisation of the resulted mechanism the strong monitoring system of using the given licences for pollution is necessary. For this purpose a separate state structure which will supervise the given process should be created.

## **A ROLE OF ECOLOGICAL EDUCATION IN FORMING OF MODERN SPECIALIST, PARTICULARLY MODERN MANAGER**

***Helen Levytska***

*The Institute of post graduate education  
Admiral Makarov National University of Shipbuilding  
Nikolaev, Ukraine*

Ecological education as a factor of forming of public ecological consciousness and culture, for the decision of ecological and social economic problems of nowadays is a major direction of education on all levels.

The necessity of ecological education must be perceived as a basis of national safety of country, because it is directed on providing of long-term interests of society.

For any institute the preparation of not only narrow specialist in concrete industry but also competent, with the high level of ecological knowledge, ecological consciousness and culture, highly intellectual man must become the main priority. That's why introduction of ecological direction to the educational process gives it a certain system and contemporaneity.

Nowadays an insufficient level of understanding of the ecological consequences of economic activity in concrete locality, region, country, world accepted by the leaders of enterprises is especially dangerous. According to the statistics, 15% of the ruling elite of the world decides a fate of 85% resources of planet, on a maintenance and renewal or contamination of environment. Insufficiency of ecological knowledge in all of spheres of society is the reason of a greater part of violations of nature protection legislation and of the inactivity of guidance and inadequate reaction of population. That's why the ecological preparation of specialists of administrative vehicle of all levels plays a considerable role. There are already a few specialties of ecological type in state educational standards. But there is no such a specialty as an «ecological management». It resulted in a situation, when requirement in specialists in industry of ecological management already exists, but there is no such a demand.

According to everything mentioned above and leaning to the decision of college of ministry of science of Ukraine №13/6-19 від 20.12.2001 About conception of ecological education in Ukraine, to the tutorial of institute of Institute of post graduate education of the National University of shipbuilding the course on discipline «ecological management» was founded.

The purpose of study of course is forming of ecological consciousness, mastering of knowledge and application of them in practice at acceptance of administrative decisions, taking into account and determining rational bonds of the levels of consumption, development of production and ecological factors.

To achieve the purpose the focus is on the themes that study the essence and principles of development of the ecologically balanced economy, legal and informative material well-being, and also administrative economic and ecological mechanisms and instruments that prevent the destructions of natural environment and inefficient use of the resources directed at the satisfaction of necessities of society; an improvement of ecological situation in the conditions of steady development for health and harmonious life of future generations.

After the study of course specialists-managers:

- Have necessary knowledge in the area of general ecology, rational use of natural resources, ecological aw, able to use the methods of ecological examination and monitoring of environment economic adjusting of use of natural resources.

- Know modern technologies of management on local and regional levels in the branch of environment protection and using of natural resources.

- Know well the norms of contaminations of environment by the enterprises of industry, transport, agriculture, forms and sizes of payments for contamination of environment and environment use of natural resources.

- Know about the methods of forming budgetary and off-budget ecological funds and control methods after their charges.
- Are able to forecast the socio-economic consequences of economic decisions which touch territories and organizations, where a specialist works.

Only permanent, trouble-free and systematic ecological perfection of formation of different levels and directions will give an opportunity to form the ecologically oriented and economically rational modern society in the conditions of steady development.

## **CHINA'S ECOLOGICAL PROBLEMS AND COUNTERMEASURES**

**Li Ming**

*Sumy State University, Sumy, Ukraine*

### **(A) problems**

***Fragile ecological environment.*** China's arid and semi-arid areas, cold areas, karst areas, such as the Loess Plateau region and a fragile ecological environment over 60% of land area, the region's economic and social activities of human are more sensitive, prone to degradation.

***Environment pressure.*** China's per capita possession of resources is less than half the world average, but the unit GDP energy consumption is much higher than the world average, the unit GDP, wastewater, waste emissions much higher than the world average, the rapid development in economic and social situation, China's ecological environment is facing more pressure, a number of ecological and environmental issues will become more prominent.

***Ecological protection policies, regulations and standards imperfect.*** China has promulgated a series of environmental protection and natural resource management laws and regulations, these laws focus on different, yet the formation of the system of ecological protection laws and regulations. The natural resources law are mostly aimed at a specific element in the development, without taking into account the natural environment of the organic integrity and interdependence of ecological factors, lack of comprehensive ecological protection laws.

***Ecological Protection shortage.*** Input current ecological protection and ecological issues facing the incompatible, ecological protection, the task is difficult to implement. Ecological protection less capital investment, input channels, a single, effective ecological control project to be further improved. Ecological protection and information technology support is weak. Involved in a wide range of ecological protection areas, to develop policies and measures need to be a lot of basic data and information, the current ecological research capabilities are limited, especially in ecological monitoring is still in its infancy, lack of adequate information, channels poor, it is difficult for management to provide a

good supporting role of the main **measures** (B)

(1) Establishing a sound ***ecological protection laws***, regulations and standard system Development ***of the ecological protection***, genetic resources, biosafety, soil pollution, legal, development of eco-environmental quality assessment, mine ecological restoration, eco-fragile area assessment, nature reserve management assessment, eco-tourism management regulations and standards. The ecological and environmental protection into national legal management system among the key regions and river basin to increase the major ecological damage investigating and handling cases.

(2) develop and improve ***the ecological protection of economic policy*** Loss of ecological destruction and environmental pollution into the national economic accounting system, to guide social and economic development from the simple pursuit of economic growth to focus on economic, social, environmental, resources coordinated development, the establishment of ecological protection of economic policy system. The establishment of ecological compensation mechanism, downstream of the upstream region of the protected area development, benefiting areas damaged areas, to benefit people and nature reserves on impaired the interests of outside compensation, and actively explore the establishment of access to genetic resources and benefit-sharing mechanism.

(3) ***Construction of ecosystem monitoring system***. Establish and gradually improve the ecosystem monitoring network.

Strengthen scientific research on key ecosystems, the ecosystem vulnerable areas and sensitive areas of monitoring, the establishment of ecological monitoring and early warning network, improve the eco-system monitoring capabilities, in this based on the evaluation of environmental quality. Priority to the establishment of national important ecological functions of the ecological health monitoring system for major ecological damage emergency response systems.

(4) ***increased investment in ecological protection and construction***. Full use of market mechanisms to establish a rational, diversified investment mechanism, ecological protection and construction continued to expand investment and financing channels. Increase government input in the same time, actively guide and encourage enterprises to participate in ecological protection and construction of the community. Establish and improve the eco-audit system, the implementation of the Ecological Engineering, after full argument and evaluation, to ensure the reasonableness of the inputs and outputs and ecological benefits, economic and social benefits of unification.

(5) ***vigorously carry out publicity and education of ecological protection*** Enhance the ecological environmental protection propaganda, promoting environmental culture, promote ecological civilization and strive to create conservation of natural resources and protecting the environment atmosphere of public opinion. Strengthen the decision-makers at all levels of leadership training, national ecological science activities to raise the consciousness of all the people protecting the environment.

(6) *Vigorously promote international exchange and cooperation* Active introduction of foreign capital, advanced technology and management experience, to improve China's ecological and environmental protection technology and management level. Actively involved in climate change, biodiversity conservation, desertification control, wetland protection, ozone layer protection and other international conventions, fulfilled its international obligations, safeguarding national rights and interests of environment and development. Establishment of environmental risk assessment mechanism and monitoring system, strict pollution prevention into the waste illegally imported, alien species invasion and loss of genetic resources.

## **ECOSYSTEM SERVICES**

*Juliana Linnik*

*Sumy State University, Sumy, Ukraine*

Humankind benefits from a multitude of resources and processes that are supplied by natural ecosystems. Collectively, these benefits are known as **ecosystem services** and include products like clean drinking water and processes such as the decomposition of wastes. While scientists and environmentalists have discussed ecosystem services for decades, these services were popularized and their definitions formalized by the United Nations 2004 Millennium Ecosystem Assessment (MA), a four-year study involving more than 1,300 scientists worldwide.[1] This grouped ecosystem services into four broad categories: provisioning, such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and crop pollination; and cultural, such as spiritual and recreational benefits.

As human populations grow, so do the resource demands imposed on ecosystems and the impacts of our global footprint. Natural resources are not invulnerable and infinitely available. The environmental impacts of anthropogenic actions, which are processes or materials derived from human activities, are becoming more apparent – air and water quality are increasingly compromised, oceans are being overfished, pests and diseases are extending beyond their historical boundaries, and deforestation is exacerbating flooding downstream. It has been reported that approximately 40-50% of Earth's ice-free land surface has been heavily transformed or degraded by anthropogenic activities, 66% of marine fisheries are either overexploited or at their limit, atmospheric CO<sub>2</sub> has increased more than 30% since the advent of industrialization, and nearly 25% of Earth's bird species have gone extinct in the last two thousand years [2]. Society is increasingly becoming aware that ecosystem services are not only limited, but also that they are threatened by human activities. The need to better consider long-term ecosystem health and its role in enabling human habitation and economic activity

is urgent. To help inform decision-makers, many ecosystem services are being assigned economic values, often based on the cost of replacement with anthropogenic alternatives. The ongoing challenge of prescribing economic value to nature, for example through biodiversity banking, is prompting transdisciplinary shifts in how we recognize and manage the environment, social responsibility, business opportunities, and our future as a species.

There is extensive disagreement regarding the environmental and economic values of ecosystem services. Some people may be unaware of the environment in general and humanity's interrelatedness with the natural environment, which may cause misconceptions. Although environmental awareness is rapidly improving in our contemporary world, ecosystem capital and its flow are still poorly understood, threats continue to impose, and we suffer from the so-called 'tragedy of the commons'. Many efforts to inform decision-makers of current versus future costs and benefits now involve organizing and translating scientific knowledge to economics, which articulate the consequences of our choices in comparable units of impact on human well-being. An especially challenging aspect of this process is that interpreting ecological information collected from one spatial-temporal scale does not necessarily mean it can be applied at another; understanding the dynamics of ecological processes relative to ecosystem services is essential in aiding economic decisions.[3] Weighting factors such as a service's irreplaceability or bundled services can also allocate economic value such that goal attainment becomes more efficient.

The economic valuation of ecosystem services also involves social communication and information, areas that remain particularly challenging and are the focus of many researchers. In general, the idea is that although individuals make decisions for any variety of reasons, trends reveal the aggregative preferences of a society, from which the economic value of services can be inferred and assigned. The six major methods for valuing ecosystem services in monetary terms are:

**Avoided. cost.** Services allow society to avoid costs that would have been incurred in the absence of those services (e.g. waste treatment by wetland habitats avoids health costs)

**Replacement cost.** Services could be replaced with man-made systems (e.g. restoration of the Catskill Watershed cost less than the construction of a water purification plant)

**Factor income.** Services provide for the enhancement of incomes (e.g. improved water quality increases the commercial take of a fishery and improves the income of fishers)

**Travel cost.** Service demand may require travel, whose costs can reflect the implied value of the service (e.g. value of ecotourism experience is at least what a visitor is willing to pay to get there)

**Hedonic pricing.** Service demand may be reflected in the prices people will pay for associated goods (e.g. coastal housing prices exceed that of inland homes)

**Contingent valuation.** Service demand may be elicited by posing hypothetical scenarios that involve some valuation of alternatives (e.g. visitors willing to pay for increased access to national parks)

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# **ENVIRONMENTAL ASPECT OF TRANSBORDER COOPERATION**

***Olha Lukash***

*Sumy State University, Ukraine*

Transborder cooperation is defined in modern economy as effective tool for regional policy realization. It should be said that environmental problems are substantial for transborder cooperation between regions of bordering countries. And this aspect of transborder cooperation is not yet solved. In many cases of regional cooperation, regional development and particularly in Ukrainian case of regional development unfortunately ecological aspect is not considered to be one of the most important. The efficiency of regional development is calculated without ecological aspect. And to our mind it is a big mistake. Any activity or any regional development cannot be considered efficient if it is not sustainable. But what should be understood as sustainable regional development? What are the strategies for regional development that cause benefits not only from economic but also from ecological point of view? The aim of my research is to suggest strategies of ecologically efficient transborder cooperation that provide benefits for ecological systems of regions of bordering countries and are appropriate form economic point of view.

Thus, my research systematizes regional environmental problems and reveals their connections with economic and environmental territory safety. Also in my research paper original definition for “environmental and economic component of transborder cooperation” is suggested. Scientific and methodical principles for creation of logic-structural framework for implementation mechanism of transborder cooperation are developed. Environmental and economic tools for its implementation in the decision making processes are suggested. Theoretical bases for complex analysis of regional development directions that allow foreseeing

potential environmental and economic consequences was improved and methodical approaches to transborder environmental-economic efficiency estimation based on the integral environmental impact damage index was suggested. Among the suggested tools are: created complex transborder cooperation mechanism that consists of components and connections, which are necessary for such cooperation; CLD (causal loop diagram) method implementation to improve the efficiency of the decisions taking while transborder cooperation; created complex system of environmental and economic indexes that allow to analyze efficiency of transborder cooperation and to suggest strategies to increase it. Improved methodical approaches to the formation of the system of indexes and criteria should allow incorporating environmental component for grounding managerial decisions in the sphere of transborder cooperation. Based on the calculation results of the suggested environmental and economic transborder efficiency indexes strategies for increase of environmental and economic efficiency of transborder mechanisms implementation in conditions of sustainable social, environmental and economic development was elaborated in paper.

## **THE ECONOMIC, SOCIAL AND ENVIRONMENTAL CONTEXT OF SUSTAINABLE AGRICULTURE**

***I.S. Marekha***

*Sumy State University, Ukraine*

Sustainable agriculture integrates three main goals: environmental health, economic profitability, and social and economic equity. A variety of philosophies, policies and practices have contributed to these goals. People in many different capacities, from farmers to consumers, have shared this vision and contributed to it. Despite the diversity of people and perspectives, the following themes commonly weave through definitions of sustainable agriculture.

Sustainable agriculture refers to agricultural production that can be maintained without harming the environment. It can be defined as an integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- Satisfy human food and fiber needs.
- Enhance environmental quality and the natural resource base upon which the agricultural economy depends.
- Make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls.
- Sustain the economic viability of farm operations.
- Enhance the quality of life for farmers and society as a whole.



Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. Therefore, stewardship of both natural and human resources is of prime importance. Stewardship of human resources includes consideration of social responsibilities such as working and living conditions of labourers, the needs of rural communities, and consumer health and safety both in the present and the future. Stewardship of land and natural resources involves maintaining or enhancing this vital resource base for the long term.

Making the transition to sustainable agriculture is a process. For farmers, the transition to sustainable agriculture normally requires a series of small, realistic steps. Family economics and personal goals influence how fast or how far participants can go in the transition. It is important to realize that each small decision can make a difference and contribute to advancing the entire system further on the “sustainable agriculture continuum”. The key to moving forward is the will to take the next step.

Finally, it is important to point out that reaching toward the goal of sustainable agriculture is the responsibility of all participants in the system, including farmers, labourers, policymakers, researchers, retailers, and consumers. Each group has its own part to play, its own unique contribution to make to strengthen the sustainable agriculture community.

## **ANALYSIS OF COMPETITIVE BENEFITS ESTIMATION METHODS OF POWER GENERATING COMPANIES IN ECOLOGICAL MANAGEMENT**

***Kateryna Matsagor, Svitlana Shevchenko***

*National Technical University of Ukraine "KPI", Kiev, Ukraine*

Ukraine’s energy Sector is one of the generating systems industries, but one of the most technologically outdated and economically inefficient. The basic principle of policy in the energy sector is to ensure its sustainable and effective development (that meets the needs of the country in energy) conservation technology with the integrity of the Unified Power System and energy assurance of Ukraine. The analysis shows that the energy sector is the most promising in terms of policy innovation and is the main carrier of the competitive energy development strategy of the country.

The term "competition" is one of the most important and most frequently used in economic literature. It is worth noting that proponents of the theory of general equilibrium and welfare economic theory allocate two concepts of competition:

1. competition as the final state of the rivalry between sellers and buyers (state of equilibrium, competition among market participants is eliminated);

2. competition as a process of rivalry, which may or may not turn into a final state (the analysis of equilibrium stability, speed of adaptation to new market conditions).

Appraisals competitiveness of enterprises is a complex and time-consuming task, which involves the use of a large database of information, the implementation of complex calculations and expert estimates.

The essence of expert prediction is that the predictive decision is based on a finite set of several alternative projections developed by various experts, and qualifications and their authors - experts forecast[1].

According to different classification attributes created on the basis of these approaches, methods of simulation and prediction of a subset of different types:

Signs	Models and forecasts
by procedure of creating	– expert – computational and analytical
by target orientation	– situation – parametric
by type of prognostic statement	– contingent – categorical
by form presentation	– deterministic – probabilistic

Expert models and forecasts - the use of various conceptual ideas about nature and natural process, as well as statistical analysis of these experts, the numerical results of the dynamics of the state parameters of the objects, the possible features their change.

Computational and Analytical models and forecasts are based on the use of formal, formalize, causal models. Formal mathematical models are abstract mathematical expressions, which provide formal resemblance of various features of the models. Formalized mathematical models are a particular interpretation of the content, which increases confidence in the correctness, efficiency of their practical use. The most reasonable and effective are the causal predictions (built on the mathematical description of certain regularities and causal relationships).

Situation models and forecasts aimed at the description of sequences or implementation scenarios of events or phenomena in the test facility, and parametric - the definition of numerical values and characteristics of the dynamics of the important parameters of the state of the object.

Categorical models and forecasts allow for only one possible value of the estimated parameters. Contingent models allow several possible meanings of forecast or scenario development (their purpose is to specify and minimize the diversity of options for the future to facilitate the objective selection uniquely predictive decisions about that future).

The result of the implementation of the above methods and models can be either deterministic or probabilistic statements and predictions about the dynamics of the properties, functioning, behavior or development of the simulated object.

By deterministic sequences are unambiguous statements. By the probability - multiple statements and projections of possible developments with the assessment of the credibility of their actual implementation, or probabilistic assessment of possible numerical values of the parameters of the state of the object in the form of the distribution functions of these values in a specific numeric range.

situational expert forecasts are reduced to predicting the implementation of any events (incremental, scenario forecasts), and parametric can be reduced to the award of economic or other indicators of specific forecast numerical values. The probability of each alternative methods of forecasting is associated with a certain probability.

To implement the forecasts system using special methodology and techniques, such as Delphi, Perth and others.

The above methods are directed to study the probable basis for the introduction of innovative reforms aimed at overcoming the technological backwardness of the main branches of material production. Accelerating the development of high-tech industries, is possible only if a state of active innovation and investment policy.

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# **THE ROLE OF INFORMATION SYSTEMS IN THE MODERN ORGANIZATION MANAGEMENT**

***Hanna Mazyr***

*Carpathian Institute of Enterprising, Ukraine*

Today the information computer systems play rather a great part in the field of management, though far from decisive, as management itself is more connected with a human, but not machine, factor.

Thus, computers give an opportunity to analyze and compare millions of informational units in a few seconds; using certain programmes you may trace the dynamics of various data, the very information collection occurs nearly instantly (especially in case of a certain enterprise), the link between employees or customers becomes simpler. The management personnel (managers) potential increases.

Besides, one should mention such a global computer network as Internet, by means of which you can either sell or buy raw materials, finished production or choose personnel you need and professional information on every problem.

The marketing concept changed a lot for many years. Nowadays the most popular is the model of “marketing management”, i.e. long-term planning and forecasting based on market research, customer’s habits and manners, the use of complex methods of dealers demand formation and stimulation, satisfaction of certain purpose-oriented customer groups’ needs. A consumer is in the centre of the modern marketing concept. And if lately its “X-ray picture” is practically impossible, now the dreams of “a transparent purchase” become true due to the formation of interactive channels.

Modern society grants more and more its members a right of choice while buying goods and services. In the first place this choice is based on the service quality. A consumer has already estimated the advantages of the interactive contact with a seller, the main of them being quick reaction for requests, high rate of executing orders, convenience of almost non-limited information receiving.

The distinct feature of Internet as a new marketing and sales infrastructure present ineffectiveness of the main principle of the market economy: a demand bears supply. The experience of many countries shows that it is not a consumer who determines the amount of digital services. On the contrary, suppliers and producers will come to the conclusion that they must get on the express-train departing Internet. And this is not only a question of prestige, but a fear of the idea that the best places at this perspective market will be occupied by others.

The “population” of cyberspace now consists mainly of man (by various estimates, up to 70-90%) due to it, for example, the automobile suppliers are in better position than the food and clothes sellers, because the latter are mainly women who do not like personal computers (PC) very much. The promoted goods have to be of interest for the 18-40 aged group, because it is them who form 70 % of the cyberspace “population”

Model using allows to take decisions concerning all factors and alternatives arising in the complex conditions of industrial economic activity. That’s why modelling is regarded as the most effective method of management optimization. A model is a scheme (formula) reflection of the object characteristics under investigation. It is a simplified real life (management) situation, in other words, models to some extent reflect real events, circumstances etc. and it is the information computer systems themselves that can now efficiently and in full value reproduce various models, based on specific figures and facts from the virtual world.

Nowadays the efficient and most authentic forecast is impossible without the computer equipment support (we mean the method which uses all the accumulated experience from the past and the current assumptions aiming and future determination ). Today they use more often such forecasts as: economic, social, of competition development, of scientific-technical progress, of technological development, of social development, of agricultural development, etc.

We can distinguish the following forecast methods:

1.) Informal ones:

– Forecast based on the verbal information from radio, television, conversations, telephone messages, etc.

– Forecast based on written information from newspapers, magazines, bulletins, reports, etc.

– Forecast as a result of industrial espionage.

2.) Formal ones:

a) Quantitative methods of forecasting:

– Analysis of the past. Coming out from the fact that the past may repeat in the future;

– Cause and effect (causative) modelling. It is used in management for forecasting such situations, which depend on more than one variables. In statistics such method of forecasting is called correlation;

b) Quantitative methods of forecasting:

– a jury opinion. Being the combination and average expert opinions- members of juries (boards, commissions, etc.)

– a joint idea of suppliers. Based on demand forecast made by a group of experienced trade agents;

– a model of consumer waiting. Based on the consumer questioning results;

– a model of expert opinion. Being a procedure of common expert decision-taking.

Information systems are the combination of information, equipment-software and technological means, telecommunication devices, data computing, personnel management, which carry out the functions of data collection passing on, computing and accumulating for preparing and taking effective management decisions.

The quality of management and decision-taking in economics is closely connected with a use of modern computer devices and information technologies. The main approach for it is a creation and application of information systems (IS) in management.

From the example cited above we can clearly see the nowadays importance of information computer system in management, to begin with a manager's working place arranging, a certain enterprise, concluding with the Internet global network access external relations support with market and management phenomena and processes.

Nowadays a qualitative management is impossible without computer knowledge, the use of modern software and useful data proposed by virtual space for a management case.

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# CLASSIFICATION APPROACHES TO ECOLOGICALLY SOUND GOODS

**Dr., prof. Leonid Melnyk, Iryna Burlakova**  
Sumy State University, Sumy, Ukraine

The strategic problem of ecologically sustainable development consists in that vigorous growth of production of the goods and services was not accompanied by the same increase in influence at environment. This problem requires search of directions of decrease in ecological losses. These directions can be differentiated on some groups: not capital-intensive actions within existing base structure of economy and a base pattern of consumption; capital-intensive actions within existing base structure of economy and a pattern of consumption; the actions directed on transformation of base structure of economy within the existing pattern of consumption; the actions directed on transformation of base structure of economy with simultaneous change of the existing pattern of consumption; the actions directed on development and sale of ecologically sound goods.

Ecologically sound goods are one of forms of high technological and information goods. Any material, information or material-information goods which assists removal of the reasons of ecodestructive influences, can be considered as the ecologically sound goods (ESG). It can be the environment protection equipment and technologies, educational services, the ecological literature, administrative technologies, etc. Answering fundamental economic questions, which consists an ethical imperative, it is possible to assume that ESG production will promote ecologically sustainable development that will allow to create necessary preconditions for prosperity of future generations. The analysis of the world ecological markets has allowed to develop classification signs of ESG (Table 1).

Table 1 – Classification of ecologically sound goods

Classification signs	Types of ecologically sound goods	Examples
1	2	3
Purpose	Consumer goods	Filters for potable water, counters
	Industrial goods	Energy-saving equipment
	Organizational technology	Computers, phones, faxes, modems
Economic life	The goods of short-term use	Ecological washing-up liquids
	The goods of long-term use	Electro mobiles, software
Consumer demand	The goods of daily use	Organic food, hypoallergenic means
	The goods of a preliminary choice	Non-polluting doors, window blocks
	Specialty goods	Rare species of animals, plants
	The goods of passive demand	Ecological insurance

1	2	3
Industrial structure	Equipment	Energy saving machine tools
	Knots and units	Ecologically effective elements of technological systems
	Ecologic raw materials and materials	Raw materials without arsenic
	Industrial services	Services in installation of ecologically effective equipment
	The intellectual goods	Ecologically focused techniques of realization of technooperations
The stages of product life cycle	Mono-functional	Ecoeffects on the one stage only
	Poly-functional	Ecoeffects on the several stages
Positive influence on the environment	The goods reducing use of natural resources	Resource-saving technologies, recycling
	The goods improving the environment quality	Toxic wastes utilization, sewage purification
	The goods positively influencing on population	Life safe systems, organic food
	The goods positive influencing on the Earth ecosystems	Ecological researches and monitoring
Market appointment	System forming goods	Ecological management, audit
	Technologic goods	Ecoengineering, ecomodernisation
	Financial goods	Ecological crediting, insurance
	Consumer goods	Non-polluting furniture, medicine
	Savings goods	Energy-saving technologies
	Communicative goods	Trading in ecological technologies
	Driving goods	Ecological marking, certification
	Reproductive goods	Forestry, ground recultivation
Information goods	Ecomonitoring, ecoresearches	

The increase in production and consumption of ecologically sound goods is capable to ensure achievement of such purposes: production of the means directed on these or those forms of softening of ecological pressure on the environment; restructuring of economy by replacement "difficult" (material-intensive and energy-intensive) kinds of primary processing of natural resources by sectors of economic activity on final consumption production; solving of the problem of investment sources (after all ecologically sound goods are first of all the goods for sale which are paid by the consumer instead of investing in the nature protection means subsidized largely from the budget).

# ECOLOGICAL AND ECONOMIC CONVERGENCE OF REGIONAL DEVELOPMENT

*Prof. L.G. Melnyk, asist. O.V. Kubatko  
Sumy State University, Sumy, Ukraine*

Effective implementation of environmental and economic policy at the regional level involves the provision of significant power to local authorities and NGOs. In particular, it is necessary to estimate processes of ecological and economic convergence regions in order to develop effective influence measures. To our opinion, it is very crucial to development the ideas of sustainable development in view of convergence within economic, social and environmental areas. Under the ecological and economic convergence of regions we understood the alignment of economic and environmental potentials, based on the redistribution of financial resources to promote sustainable development.

Aligning environmental and economic potentials of regional development could be done only due to external intervention, for example, regional development program in economically weak regions. In our view, the ecological-economic convergence is fully consistent with the goals of sustainable development, since significant territorial disparities of regional development are not associated with sustainable development.

The principal motto of sustainable development: "Think globally – act locally" does not exclude the trend of regional decentralization. Effective regional development is possible only under the financial and economic independence of the territories, and achieved through instruments promoting environmental-economic convergence. The sustainable development within a country is a balance of social, environmental and economic performance of individual regions, which determines the stability and balance of the entire national economy. We believe that a necessary but not sufficient condition for sustainable development is to balance socio-ecological and economic potential of regions.

It is difficult to develop the concept of sustainable development, where some regions prosper and other others are in decline. In economic theory it is believed that in the long run, regions within a country must reach a certain level of equilibrium state (steady state) in the economic, environmental and social fields. The possibility of achieving an equilibrium state means that the regions with less economic potential must develop their economies more rapidly to match the leaders. Similarly, should change and quality of life. Convergence does not mean the same structure of production, landscapes, social infrastructure, however it is expected to align the quality of life of the population and environment.

Within a single country the process of economic convergence of regions is estimated as follows

$$y_{it} = e^{-\beta_0\tau} y_{it-1} + (1 - e^{-\beta_1\tau}) y_{it}^* + u_{it} \quad , \quad (1)$$



where  $y_{it}$  – per capita income in the  $i$ -th region in the  $t$ -th year;  
 $e$  – base of natural logarithms;  
 $u_{it}$  – standard deviation of regression (error term);  
 $\beta_0$  – parameters to be evaluated.

Taking the logarithm and performing the linearization of relation (1), we obtain an equation which can estimate the package of applied economic programs such as Stata and Matlab.

Linearized equations (2) considers only the influence of basic indicators (economic growth, the level of pollution), and allows to ignore the less relevant factors:

$$\ln(y_{i,T}/y_{i,0}) = \beta_0 + \beta_1 \ln(y_{i,0}) + u_i, \quad (2)$$

where the indices respectively means, the final period (T), and the initial (0, null).

From equation (2), we find that if  $\beta_1 < 0$ , economic ( $\beta$ ) convergence is present, initially rich regions increase more slowly, and vice versa. Otherwise, when  $\beta_1 > 0$  convergence is absent and the regions that initially had greater economic potential, develop more quickly. Initially depressed regions are behind the leaders, both in absolute and relative terms.

Models such as "logarithm – logarithm" are widely used in economic modelling, as they allow easy interpretation. The obtained results of the "log-log" model are treated in the form of elasticity. Thus, affecting factors show the percentage change in the dependent variable (growth rate of real per capita income or rate of growth of emissions for environmental convergence) due to the dependent variable change by one percent.

From the perspective of sustainable development, economic and ecological convergence of territorial units contributes to a balanced socio-ecological-economic growth. The carried out research for the Ukraine, shows that over time rich regions are equilibrate with poor both in absolute and relative terms. The model of economic convergence can be used to estimate the effectiveness of administrative and financial mechanisms for balancing the economic development of regions of Ukraine.

However, the study revealed the lack of ecological equilibrium of the regions. The lack of direct links between the initial and future values of pollution across regions is also confirmed by statistical data. In particular, in order to align the environmental capacity of regions of the country, we recommend that economically strong territories spend more financial resources to improve the quality of the environment.

# **ABOUT NECESSITY OF TRANSITION TO ECONOMICS OF SUSTAINABILITY**

***I.V. Minakova, O.N. Marganova,  
V.V. Kovarda, A.V. Drantusov***  
*Kursk, Russian Federation*

Currently, environmental, economic and social problems made mankind to understand its vulnerability to new age challenges such as worsening environmental condition, rejuvenation of disease victims and incidence rate, periodicity of economic crises, social disruptions etc.

In connection with the above facts, international-level proposals for negotiation of consequences of industrialization and economic growth “at any price” emerged. These proposals resulted in development of the economics of sustainability concept (it was introduced at World Summit in Rio de Janeiro in 1992). It was due to tendency of all the mankind to join forces to enable the environment for development to future generations.

However, these problems fell by the wayside due to the necessity of negotiation of consequences of the financial and economic crisis now. Thereby, long-range goals are substituted by short-range ones. The world crisis has multiple reasons and it gives a cross-light on long-range outlook. This situation must be used to review of basic ideas of modern economics to the transition to the economics of sustainability.

Basic universal laws must be use in analysis of economic processes to integral assessment of opportunities for development of social and economic systems. First of all, it is necessary to consider the economics as open system with its inherent functions and continuous interaction with the environment [1]. It means that in management decision making, it is necessary to assess its environmental consequences because it indirectly affects people living environment, various funds state, and frequency of man-caused and natural catastrophes.

Thus, social and economic system developing within natural-resources potential of Earth is the open stationary system. It obeys to general rules of functioning and development of such systems therefore base of balanced social and economic development management must be built up in consideration of these rules [2].

According to generally recognized definition, sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It is necessary to use feed-forward and feedback mechanism for that.

It is possible to use the feed-forward mechanisms as well as the feedback ones regarding the social and economic system. The first ones are designed to reduce environmental load from the social systems. Along with the negative feedback mechanisms, positive feedback mechanisms must obtain universal circulation.

They involve alteration of homeostasis of the social and economic systems (decrease in material consumption and power intensity of production systems with simultaneous increase in their capacity for meeting the needs of population). It can be only in increase in information component of industrial processes. All of the foregoing is due to the transition to innovative development with following application of cost-saving technologies, increase in standard of knowledge and qualification of labor resources.

At that, consideration must be given to some degree of uncertainty in social and economic processes. It is important to pay careful attention to entropy of the system and consider the possibility of self-organization and self-development in the analysis of endogenous factors and internal environment as a whole.

Thus, the analysis of endogenous growth factors and developing conditions of synergy effect is currently backbone of the economics of sustainability. Just the endogenous factors and environment-oriented intensive external factors allow qualitative growth of world economics and transition to the sustainable development.

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## **PROPOSED ADAPTIVE MEASURES COUNTERING DEPLETENG UNDERGROUND WATER LEVELS IN PUNJAB, INDIA**

***Soumavo Mukherjee***

*Lugansk State Medical University, Ukraine*

The issue

The state of Punjab, located in the northwest part of the country, is known as the bread-basket of India. Punjab produces 20% of the nation’s wheat, 11% of its rice, and 11% of its cotton, from only 1.5% of its geographical area. However, groundwater rapidly decreasing, Punjab is in deep crisis. The levels of underground water have dropped 10 meters since 1973, and the rate of decline is accelerating.

The Indus Valley civilization (2600-1900 BC), thrived and perished in Punjab. Today, as we ponder the potential impacts of climate change, the region which has

Punjab at its core faces a water challenge again that may have profound implications for the food security of the larger Indo-Pakistan region. Just as human modification of climate through greenhouse gas emissions poses a global challenge to sustainability, in this region profligate use of water may lead to a potentially catastrophic depletion of the region's water resources, and reverse India's story of prosperity. The dug wells that were the traditional source of village water supply are dry or contaminated; the hand pumps have been replaced by tube wells with intermittent supply, and electricity is so constrained that growth in industrial development in the region has been low despite government efforts to attract high technology enterprise to the region. The future is bleaker still as groundwater continues to deplete, melting glaciers threaten to reduce the long term surface water supplies, the frequency of climate extremes is projected to increase, and storage capacity in surface water reservoirs is progressively reduced by sedimentation.

#### Present solution

To restore the original crop mix and thus save water, a mechanism for providing an attractive and stable price for crops other than rice needs to be developed.

#### Changes in irrigation technologies.

Reformation in the electrical subsidy plan for pumping for promoting metered.

Finally, awaking farmers to address the long term crisis and to forego some short term gains cannot be underestimated and encouraging progressive farmers who are trying to develop and implement water saving technologies even for rice.

#### Proposed secondary solution

Rain water harvesting is one of the most practical methods to aid to the recovery of the fast depleting under-water resource. Roof catchment system is the best suited method of such a harvest in this region because of two major reasons:

Average rainfall annual ranges between 96 cms sub-mountain region and 46 cms in the plains. The minimum practical measure necessary for such a harvest is 20cms.

High population density, which result to closely packed urban housing complexes.

#### Impact of this solution

1 millimeter of rain on a 1 square meter surface yields 1 liter of water. Considering a rooftop of 64 square meters, the yield may result up to 3000 liters from every household every year.

# THE NIGERIAN GOVERNMENT AND THE MANAGEMENT OF NATURAL RESOURCES

*Nataliya Mogilna, Jonathan Emeka Nwosu*  
*Sumy State University, Sumy, Ukraine*

This paper appraises the role of government in the management and conservation of natural resource in Nigeria with particular reference to biodiversity degradation and environmental pollution. The paper also examines some causes of these degradation and pollution.

Nigeria is a nation endowed with large and diverse natural resources which has considerable potential with respect to economic development. This is because these resources are abundantly available to be utilized. Natural resources are material source of wealth made up of biotic and abiotic resources which in summary include forest and its product, water and the marine organisms, air, land, material deposit that occur in a natural state which has economic value and are useful and necessary to human being. Biodiversity degradation, environmental pollution and depletion of natural resources have been issues of growing concern in Nigeria hence these resources are the main source of economic growth and sustainability.

**BIODIVERSITY:** Biodiversity otherwise known as biological diversity encompasses the variability of all organisms from all sources and the ecological complex of which they are part of. The term includes not only living organisms and their interactions but also interactions with the biotic (non living) aspect of their environment. It is the totality of the environmental resources and all the processes that sustain it. Some notable threats to biodiversity in Nigeria include: 1. Population Pressure. Nigeria has a population estimate of about 150 million people. This invariably means increase demand of natural resources. The resultant effect is the destruction of natural habitat for shelter, plantation, livestock production, grazing, food and other personal purposes. 2. Genetic Erosion. A substantial loss of species diversity in Nigeria has been as a result of land clearance for various uses, forest exploitation, oil spillage, desertification, drought etc. 3. Shifting cultivation farming system. This farming system remains the most common among peasant farmer who produce over 80% of the total food supply in Nigeria. This system however poses threat to biodiversity in that it is characterized by vegetation destruction, short fallow period, logging and felling of trees.

**POLLUTION:** Pollution is the introduction of substance into the environment that alters its physical, chemical and biological properties in such a way that it is harmful to living organisms. In this circumstance, the substances are termed as pollutants. There are two sources of pollution. The point source pollution, - pollution that result from definite source that is identifiable, and the non point source, - diffused pollution source that are not identifiable such as run offs. Pollution could be air, water or land. Air pollution: Main cause of air pollution in

Nigeria and many other parts of the world include gaseous discharge from industries, indiscriminate open burning of waste, gas flaring, emission from automobile engines etc. Apart from constituting health hazards, air pollution threatens the existence of natural resources. Water pollution: Could be under ground or surface water pollution. Main causes include, partially treated industrial effluent discharges, indiscriminate dumping of sewage agricultural runoff (pesticide, residues fertilizer etc.), acid deposition on water channels, oil and grease, nitrogen, contaminated land etc. Water pollution reduces the aquatic life and significantly affects the society. Land pollution: Causes include indiscriminate dumping of industrial, municipal and hazardous solid waste, industrial effluent and domestic sewage discharge, tailings from mining and mineral processing industry. Land pollution militates against natural resources and cause problems such like land scalping, desertification, deforestation, erosion and extinction of wild life.

**ROLE OF GOVERNMENT:** The federal government of Nigeria in an effort to conserve biodiversity and minimize environmental degradation passed a legislation which provides the legal framework for the implementation of polices on environmental protection, natural resource conservation and sustainable development. Some of these policies include the command-and-control approach. This involves direct regulation with monitoring and enforcement system that makes use of regulatory instruments such as standard permits, licenses and capital punishment. The government also established reserves in different parts of the country. In this arrangement, large portions of land were set apart by the government with the objective of conserving biotic resources like wild plants and animals from extinction and to produce timber on sustainable basis. The natives were paid royalties on the reserved areas and were allowed some portions for burial purposes and worshipping of their gods. (Adeyoju, 1975). Similarly, the government welcomed partnership with stakeholders towards establishing and developing game reserves and national parks where biological diversities were kept and reared. This effort saw the emergence of some large game reserves in Nigeria like the Yankari Game Reserve, Nekede Zoo, Oyo National Park etc. Taxes were waved off for individuals in this venture. Again, indiscriminate burning of bush, vegetation destruction and pollution of water was made a capital offence by the Nigerian government. All these were geared towards safeguarding biological diversity and natural resources.

Pollution is a threat not only to natural resources but also to human being and the society at large. Thus, the Nigerian government through the established agencies had made frantic efforts towards the management of pollution in the country. For example, the government introduced measures to reduce, if not eliminate air pollution from gas flaring. Combustion devices as a matter of necessity were required to be installed by industrial companies. This device would prevent methane from reaching the atmosphere. After burning, gas is converted to heat, water and Co<sub>2</sub> which reduces pollution effects. Other industrial companies

were demanded to install pollution abatement and waste regulation facilities in such a manner as may be determined by the Federal Environmental Protection Agency of Nigeria (FEPA). These facilities will take care of gaseous particles, liquid or solid untreated discharge. There were also tax policies aimed at averting pollution. For example, value added tax (VAT) exemption is granted by the federal government to Oil and Gas companies in respect of plants and equipments that are capable of re-injecting gas into the reservoirs. Again machinery, equipment or spare parts imported into Nigeria in connection with the processing and conversion of gas into electric power is exempted from custom duties. There were also emission charges for industrial companies. The higher level pollution attracts higher financial penalty and zero pollution level receives financial rewards. These were aimed at minimizing industrial pollution.

The government of Nigeria has made frantic effort to manage and protect their natural resources from degradation and pollution, yet 'much is left to be desired'. The federal government should embrace the idea of exchange of information, assistance and experience in natural resource management with advance countries of same ecological conditions. The outcome of this would be good policies and ideas that would make for effective management of natural resources in the country. Furthermore, management and conservation of natural resources is not only a government business. Therefore, the authorities and departments concerned should engage in extensive mass awareness and training for the people and resource users. This agrees with the UN conference on environmental development (UNCED) held in June 1992 in Rio de Janeiro, Brazil where the role of indigenous knowledge and local people were recognized as being vital and indispensable in the management and conservation of natural resources. Also, the use of integrated resource management should be adopted. This means that in altering one element in the system for the purpose of deriving advantage, care should be taken to assess the impact of that alteration upon the remaining components of the system. In this way, other natural resources could be conserved. Finally corruption should be checked among government institutions and personnel. Often, good government policies and efforts are thwarted due to corrupt personnel running for the government.

# ENVIRONMENTAL EDUCATION IN TANZANIA

***Nataliya Mogilna , Fundisha Mayombola***  
*Sumy State University, Ukraine*

Since gaining independence from Britain in 1961, Tanzania has made a concerted effort to protect its abundant natural resources. At the same time, the country's 500-mile coastline and numerous national parks, conservation areas, and game reserves are critical to its economic development. Tanzania's ongoing challenge, therefore, is to create new economic opportunities that are also environmentally sustainable.

**Mangrove Restoration.** In one district south of Dar es Salaam, a village faced coastal erosion because protective mangroves along its shorelines had been cut down. A group of women proposed a project to replant the mangroves to stop erosion and reestablish the natural fish nurseries they provide

**Seaweed Farming.** Several women's groups in coastal districts found that seaweed farming was an environmentally sound way to earn income.

**Tree Nurseries.** One of the most popular activities for schools that participate is the establishment of tree nurseries. Students collect seeds from local trees and plant them in seedbeds that are made and maintained on school grounds. The seedlings are later sold or given to parents of the schoolchildren to plant around their own homes or fields.

**Conservation Clubs.** A secondary school student in Tabora participated in one of conservation club workshops. One of the clubs became a finalist for the Volvo Adventure Environmental Award, which gives young people a chance to present their grassroots environmental activities to the United Nations Environment Program.

Conservation clubs such as Roots and Shoots government officials in the pursuit of common goals for natural resource management.

Nature conservation courses the leading conservation organization working around the Tanzania to protect ecologically important lands and waters for nature and people.

**Wildlife habitat conservation.** Tanzania has built a successful tourism around its plentiful wildlife such as Mount Kilimanjaro National Park, Mikumi National Park, Serengeti National Park, Lake Manyara National Park, Arusha National Park

**Soil conservation education.** Soil conservation is a set of management strategies for prevention of soil being eroded from the earth's surface or becoming chemically altered by overuse, acidification, salinization or other chemical soil contamination.

Most Tanzania earnings come from its soils which yields coffee,tea,cotton,cashew nuts,tobacco.

**Forests Reserve Programs.** Is not t allowed to cut tress or to do activities because the forest is reserved for national Such as usambara forest , protected and



communal miombo woodlands of eastern Tanzania ecology of a miombo site Lupa north forest reserve and Uzungwa Mountains of Tanzania

Education has a fundamental role play in solving environmental problems. A WORLD WILDLIFE FUND WWF Tanzania program is helping teachers, students and community Leaders take active part in decision and action that will contribute to successful Environmental management.

Over 70% of Tanzanians live in rural areas and rely on agriculture for their income. Growing crops and keeping livestock are central to the Tanzanian economy.

However traditional teaching methods do not give children the opportunity to learn practical agricultural skills at school. With so many communities reliant on livestock and crop production FARM-Africa is working with the Tanzanian Government to change this. They are training teachers in ‘discovery learning’ which focuses on practical teaching, and equipping schools with the seeds, tools, equipment and livestock. This is giving pupils the opportunity to learn practical farming skills that they can take home and share with their families.

It is hoped that the benefits and increased productivity that can be seen in the wider community will encourage school attendance, particularly amongst pastoralist communities where there are high levels of absenteeism.

- Teachers are being trained in ‘discovery learning’ so that they are better equipped to offer practical, interactive learning to pupils.
- Children are discovering how to care for chickens, what to feed them to increase egg production, simple drip feed irrigation techniques and crop cultivation by keeping chickens, setting up tree nurseries and growing crops and vegetables.
- Home working groups set up with help from FARM-Africa are just one way that children are sharing their new found expertise with their families.
- Energy - saving stoves are being loaned to families by schools so that they can demonstrate the benefits to their friends and neighbors, all contributing in a reduction in demand for firewood.
- Schools benefit from the crops children grow and the eggs their chickens lay – they are either the basis for nutritious school lunches or sold to cover costs like feeding the chickens.
- Parents are better able to see the practical benefits of school meaning attendance rates rise and children have better long term prospects.
- We’re developing training materials and building a model of good-practice. The Tanzanian Government and other organizations can then use our knowledge and expertise to reach many more teachers, schools and pupils.

#### Conclusion

Environmental education play big role for developed for people in Tanzania due the above point and also increase the opportunities for employment the environmental sector .

# **ECOLOGICAL RATING AS THE INSTRUMENT OF QUALITY EVALUATION OF THE LIFE IN REGION**

***Nataliya Mogilna, Vitaliy Omeljanenko***  
*Sumy State University, Sumy, Ukraine*

Almost everyone is aware of impending ecological catastrophe, but it might happen that, one may not have information on possible ways of solving the ecological problem, and more importantly, very few people makes efforts (with exception of making the Greenpeace and "green") to solve the questions of preserving the social-natural balance. The proposed theory of zero growth restriction requirements and production with the purposes of ecological balance preservation is almost impossible. As alternative, the theory of quality of life which becomes more and more popular in scientific and political circles acts.

The term "quality of life" appeared in the mid 1950's when it became apparent that, the category of "standard of living" does not reflect comprehensively well-being of the population. The fact that the growth of material well-being of the population caused by stable economic development, has caused simultaneous number of the new undesirable phenomena, such as aggravation of ecological conditions and strengthening of social intensity. There was quiet a persistent view that economic growth cannot serve as a unique criterion of progress and well-being of the population, it is necessary also to ensure the establishment of good social and ecological medium. Quality of life represents complex structure of interrelations of its components: the quality of environment, the quality of health of population, the spiritual quality, the quality of education, etc.

According to the independent commission of UNESCO on the population and quality of life, this concept also includes such elements as an adequate nutrition, ecological dwelling, safety, self-realization, etc.

In our country, majority of the population lives with a lot of problems. According to the fund «Democratic initiatives» among the greatest threats to Ukraine for the next 10 years, 67 % of the population recognized ecocatastrophes of local and global scales, 51 % - as the consequences of global warming. Among the environmental factors, the greatest concern in the population and experts is caused by the quality of potable drinking water, possibility of poisoning with harmful substances in a foodstuff.

To solve these problems is possible by ensuring the quality of life, considering its three constituents (qualities) in a complex (fig. 1).

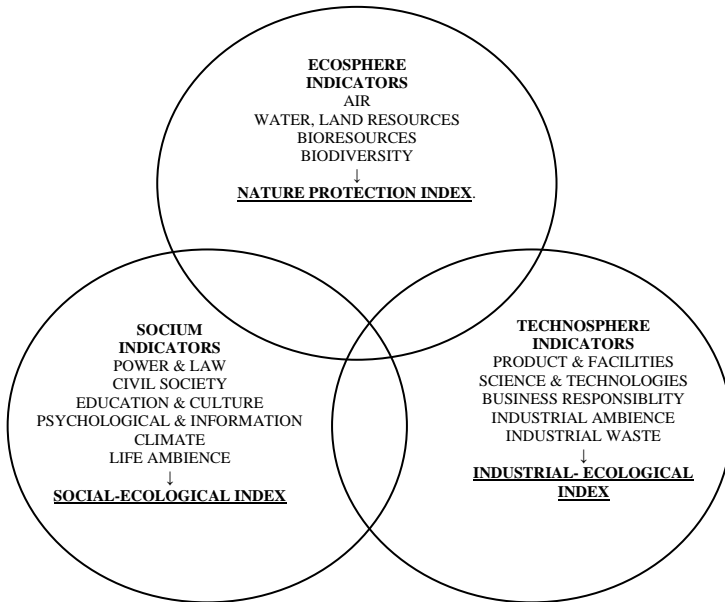


Fig. 1. Graphic model of factors of an ecological rating

The technique of drawing up an ecological rating is based on the use of quantitatively measured indicators united in three blocks. Accordingly, the ecological ratings can be quite used not only for an estimation of a state of environment, but also quality of life in region. So, indexes which characterize a rating of states behind different criteria, including ecological which are used further for account of investment indexes are regularly published in the USA; and the general ecological rating of regions, a rating on level of effect of the person on environment, a rating of regions on an environmental control rate of activity have been made in Russia.

The drawing up of ratings consider traditional indicators: a state of environment, water pollution, air, loss of ecosystems; and specific which reflect level of attention of business, the authorities and citizens to ecological problems.

Thanks to ecological ratings there is a possibility of updating the standard indicators of an estimation of region since ecological trouble of territory has an essential effect on the health of the population, promoting prevalence of diseases, worsening quality of life of the person and its adaptable possibilities.

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## **POLITICAL INSTABILITY AS A CURRENT PROBLEM OF ECONOMIC GROWTH TO SOME COUNTRIES – NIGERIA**

***Nataliya Mogilna, Emmanuel Onyeonu**  
Sumy State University, Sumy, Ukraine*

This paper shall give a brief history of Political Instability as a current problem of economic growth in Nigeria, how political instability tends to divert the attention of the government from development projects to the maintenance of law, order and security, leading to heavy expenditure on them.

Also foreign and indigenous entrepreneurs are discouraged from investing in productive ventures since the safety and profitability of their investments are not guaranteed during period of political instability.

Economic growth can be either positive or negative.

Positive growth. Positive growth can be referred to the increase level of economic activity in a country from one year to another, this shows the level of economic development or economic growth of a country.

Negative growth. Negative growth can be seen as economic recession and economic depression of a country. In this case, the economy is not favorable.

### Shot History

The federal republic of Nigeria have a vast potential of natural resources and mineral wealth, it is noted that Nigeria exports some of these natural resources to other parts of the world, yet the economy development of Nigeria has been negative due to some political instabilities.

The government of Nigeria have be experiencing frequent crises which has drastically contributed to the poor economy of the country.

Statistically the current economic growth of this country is not favorable.

Current Account Balance (% GDP) for Nigeria in year 2009 is 6.939 %

This makes Nigeria No. 19 in world rankings according to Current Account Balance (% GDP) in year 2009. The world's average Current Account Balance (% GDP) value is %; Nigeria is 6.94 more than the average.

In the previous year, 2008, Current Account Balance (% GDP) for Nigeria was 20.41 % Current Account Balance (% GDP) for Nigeria in 2009 was or will be 65.99% less than it was or will be in 2008.

In the following or forecasted year, 2010, Current Account Balance (% GDP) for Nigeria was or will be 13.79 %, which is 98.76% more than the 2009 figure.

#### Causes of Political Instability

Let us look at some frequent crises which diverts government attention, internal religious uprising, civil wars and got fatherism.

#### Conclusion

Nigeria need creation of more stable political climate. Political stability will lead to the direction of efforts towards Projects which will help to stimulate economic development.

## **TOOLS FOR ANALYSIS OF ECOLOGICAL CONDITIONS OF GROUND PLOTS AND THEIR IMPACT ON ECONOMICAL VALUE**

***Viktorii Nezdolii***

*National Technical University of Ukraine "KPI", Kyiv, Ukraine*

Land is one of the most universal natural resources that is essential for all fields of economy. Its particular qualities are the inability to be replaced with any other natural resource, and the requirement to utilize it at its geographical location. In this regard, land can be classified as a territorial resource and the base of evolution of society.

Under modern conditions, the problem of economical evaluation of ground plots can be considered both in the view of solving the normative-governed problems in accordance with legislation, using official directive and methodical documents and standards, and in the view of independent expert assessment based on scientifically proven approaches and principles, that define consumer value of ground plots in the market.

Economical assessment of ground plots is made of a number of social value characteristics, expressed in cost units. Ineffective and irrational utilization prevents realization of economically significant functions and lowers the pecuniary valuation of a ground plot. Thus, it is important to take ecological state characteristics of the environment into consideration when developing a method of complex economical assessment.

Taking ecological state characteristics into account is accomplished via the method of correcting the basic pecuniary valuation of a ground plot using a system of corrective coefficients:

$$Pr = Pb * S * K1 * K2 * K3 * K4 * K5,$$

where Pr – resulting ground plot price;

Pb – basic ground plot price;

S – ground plot area;

K1 – coefficient that takes account of atmospheric air pollution;

K2 – coefficient that takes account of polluting the soil with residual chemicalization wastes, heavy metals, and other chemical elements;

K3 – coefficient that takes account of ground erosion;

K4 – coefficient that takes account of noise pollution;

K5 – coefficient that takes account of effect of an electric field.

A software product for analysis of ecological conditions of ground plots has been created, using Java programming language, NetBeans IDE and JavaDB DBMS.

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# **THE USAGE OF THE ENERGY EXCISE TAXES FOR STIMULATING THE INVESTMENTS IN TO THE ENERGY SAVING TECHNOLOGIES AND REDUCING GREENHOUSE GAS EMISSIONS IN UKRAINE**

***Tatyana Panchenko***

*National University of «Kyiv-Mohyla Academy»,  
Kyiv, Ukraine*

The problems of environmental pollution, usage of comprehensive resources, and the solutions of those problems start to gain more and more importance in the politics of different countries. Daily increasing in carbon dioxide gas in the atmosphere affects Climate Change, and those methods, which are used on the large power plants for reducing carbon dioxide emissions, are not valid in the case of transport vehicles. The high Ukrainian economy energy intensity consumption

level, which nowadays in 2.6 times exceeds world average level – is the another big problem.

Therefore, the necessity to create an additional mechanism for regulation the Ukrainian environmental policy has been appeared, the usage of which would assist to decrease the greenhouse gas emissions; stimulate the economical usage of the energy, at the same time would assist to decrease energy capacity of the GDP and provide us with the opportunity to increase investment into the energy saving technologies.

Tax system - the most active tool of the governmental social-economic development regulation, investment activity, foreign economic activities, structural changes in production and accelerate the development of the priorities sectors.

Using the experience of developed world countries, we can conclude that excise tax takes one of the prominent places in the tax system. Thus, in Poland, Czech Republic and Hungary the excise income is equal to 10-15% from all tax incomes; in Canada - 9.9; in Japan - 7.3; in the USA - 6.8 %. In the European Union countries, particularly in Belgium for the last four years period the excise tax was 5% of the all country budget income; in Greece - 22%; in the UK, Ireland, Finland and Portugal this figure was at 12,2%-13,3%; in Germany and France - respectively, 8.4% and 6.4%. The most important source of income for those stays excise tax on energy.

General European countries tax energy products system is based on Council Directive 92/81/EEC and Council Directive 92/82/EEC, but, taking into consideration that fact that the Directives were accepted in 1992, in the practice excise rates are higher than it was proposed and they are differs between countries.

The analysis of the Ukrainian existing excise taxation system shows a significant distinction between the practical approaches which are applied for excise duty and theoretical bases of it's operations in the tax systems of the countries with the market economies, which is the main reason of permanent destabilization of the markets excisable goods due to random and frequent changes of the correspondent legislative field.

In Ukraine, excise rates are determined by the Law of Ukraine "The excise duty rates and import duty on some goods (products)" dated from 11 July 1996 N 313/96-V, projects of the Tax Code, developed by deputies of Ukraine M. Katerinchuk and K. Lyapina and Tax Code of the Ministry of finance of Ukraine dated from 31.05.2007. Both of them consider 2 areas for taxations, which are related to environmental policy, - excise on petroleum products and excise on vehicles. Mentioned codes have different rates of excise duties on some petroleum products.

In accordance to the all mentioned above, the main aim of the research is to investigate the possibilities of usage of the excise taxes on the energy sources for the further investment stimulation into the energy saving technologies, reduction of the greenhouse gas emissions volumes in Ukraine.

In the energy sector the priority directions are: fuel combustion (called sectoral approach) and indirect costs. The indirect costs (expenses) impose tax on the emissions of carbon dioxide. In the fuel combustion the excise duty is imposed on the following industries:

- Energy:

- 1) production of the heat and power;
- 2) oil purification process;
- 3) production of solid fuels and other energy products.

- Transport.

Taking into consideration that fact that the rates, which have been proposed in the projects of the Ukrainian Tax Code, are low, and also examining the experience of the European countries, the increasing of the tax rates on the energy resources and oil (petroleum) products could be recommended.

The proposal to increase the excise rates was brought forward by Interpolation method, which should bring Ukraine closely to the recommended rates by the EU Directive till the 2030 year.

The excise duty implementation was proposed and the next excise rates were recommended and approved for the next energy sources till the 2030 year: natural gas (0,15 Euro / gigajoule), oil (15 Euro/tons), coal (0,15 Euro/gigajoule); in addition, the new excise rates for those energy sources, the collection of which have been foreseed by the Ukraine Tax System: petrol (359 Euro/ton) diesel fuel (302 Euro/ton), jet fuel (302 Euro/ton).

Having all those proposed increasing of the excise rates and also the quantity of the each energy sources, which is consumed by the certain field according to proposed excise duty, the hypothetical potential incomings for the government budget could be calculated. Potential incomes from the usage of petroleum excise rates, which are proposed in the project Tax Code are (in percentage of GDP): 0.8% in 2005 year, 1.09% in 2010 year, 0.99% in 2020 year, 0.63% in 2030 year, and are low in comparison with incomings from petroleum products, the excise rates of which were proposed in our research in accordance with EU Directives (2.47% in 2010 year, 5.04% in 2020 year, 5.05% in 2030 year in percentage from GDP). The potential incomings to the government budget from energy recourses as a percentage of GDP are following: 0.09% in 2010, 0.19 in 2015, 0.22% in 2020 and 0.11% in 2030.

After receiving the results, we saw that the potential incomings from energy sources excise duties to the government budget are pretty significant. But, it is important to noted, that the excise rate is too high as for Ukraine, that's why the compensation system is justified and necessary. Therefore, the money refund may be realized as grants for further modernization of the current technologies. Under current situation the businesses will be stimulated to develop plans for upgrading technologies or launching innovations in order to reduce carbon emissions. Introducing the privileges (benefits) on the consumption, for instance in thermal energy, will allow stimulating the customer on its own to conduct energy saving



actions in his (her) apartment or even in the whole house. In addition it is proposed to attract the government investments (funds) into the development of the infrastructure - building and maintenance of roads, bridges, airports, railway lines, development and distribution of the electricity. Also it is possible to use the funds in the form of investments for expansion and modernization of public transport. Introduction of the privileges (benefits) for the high quality fuel consumption will stimulate the consumers for reducing the usage of diesel as a dirty fuel.

Thus, the international experience is a good example for Ukraine in the process of tax system reforming. As it is could be seen from the research, there is possibility to increase the excise tax rates in Ukraine in order to increase the incomings into the governmental budget. As a result of the excise tax usage the new opportunities are opened in order to decrease the greenhouse gas emissions, increase investment into the energy efficient technologies and alternative energy sources in Ukraine.

## **WAYS OF MINING ENTERPRISES ECOLOGIZATION**

***T. Perelot***

*National Technical University of Ukraine  
"Kyiv Polytechnic Institute",  
Kyiv, Ukraine*

Open minerals mineability influences very negatively on environment state. It causes landscape and aerological changes, promoting pollution of adjacent territory, air and water basins. That is why one of the most important tasks of mining science and practice is the establishment of causes and scales of possible pollution of mineral resource regions.

The main polluting components, generated during blasting operations realizing, are: carbon monoxide CO, nitric oxide NO<sub>x</sub> and water solution of ammonium nitrate (AN).

It is known from the practice of blasting operations realizing that water-filled grammonite 79/21 is used at forming of explosive charge (EC) in wet holes. But during present type of EC use the particular qualities of mixing of grammonite 79/21 with water and the impact of consequences of this EC explosion on environment were not considered.

At mixing of grammonite 79/21 with water a part of AN is dissolved in water, and fat solution fills up inter-granule spacing. At the same time charge shrinkage and packing take place.

Process of EC solution and shrinkage, analyzed further, is typical for the way of charging with water admission into measuring apparatus of charge mechanism with subsequent product feeding into a hole.

In dry grammonite 79/21 with mass of 1000 g granules occupy volume of 690 sm<sup>3</sup>, and volume of inter-granule spacing (interstice volume) is 362 sm<sup>3</sup>.

At addition of 20 kg of water to 100 kg of grammonite 79/21 mixed composition of water-filled grammonite 79/21 (17,5 % of trotil, 65,8 % of AN and 16,7 % of water) is formed.

At water-filling a part of AN is dissolved in water, and solution fills up inter-granule spacing. At the same time charge shrinkage and packing take place. At charging and locating of grammonite 79/21 in hole the additional AN dissolving takes place, corresponding to its solubility at environmental temperature.

Receipt composition of water-filled grammonite 79/21 with AN particular dissolving is presented in *Table 1*.

Table 1. Mixture receipt composition

Components name	Trottil (granulotol)	Ammonium nitrate	Water solution of ammonium nitrate
Mass part of components, %	17,5	40,7	41,8

So, in translation to 1 kg of water-filled grammonite 79/21 we have 418 g of 60%-e AN solution, 407 g of insoluble ammonium nitrate and 175 g of trotil. The volume, occupied by granules of trotil and insoluble ammonium nitrate, is equal 582 sm<sup>3</sup>. Therefore, the shrinkage of EC example forms 470 sm<sup>3</sup> or 45 %, and inter-granule spacing of interstice is 181 sm<sup>3</sup>.

Density of 60%-e AN solution is 1,27 g/sm<sup>3</sup>. Therefore, 418 g of 60%-e AN solution occupy volume equal  $418/1,27 = 329$  sm<sup>3</sup>.

So, 181 sm<sup>3</sup> or 230 g of solution is among granules, the rest part (148 sm<sup>3</sup> or 188 g) is contained above the charge.

AN dissolving process happens quickly only in the beginning. For complete solution saturation it needs 3-5 hours. But during carrying out mass explosions this time is quite enough (if small open-cast mines, where explosions are carried out in 1-3 hours after charging beginning, may be excluded).

In final result we receive the charge of water-filled grammonite 79/21 (lower part) with components correlation on mass: 67,1 % of AN; 21,6 % of trotil; 11,3 % of water.

Water-filled grammonite 79/21 keeps 81,2 % of mixture mass, and average weighted density of such charge is 1,4 g/sm<sup>3</sup>.

Above water-filled grammonite 79/21 there is 60%-e AN solution that was not put in inter-granule spacing, in amount of 18,8 % of mixture mass.

It is necessary to get into account, that oxidizing agent solution, located above explosive charge, is not exploded separately without solid phase with trotil, except of solution column, adjoining to the charge directly.

Amount of AN water solution in average statistic hole that is not decomposed under influence of explosion, composes nearly 160 kg, in which there is 96 kg of ammonium nitrate.

In conclusion, the use of grammonite 79/21 by technology of water-filling may influence considerable negatively on environment and, as consequence, health state of working people and inhabitants of settlements. That is why it is necessary before introduction of some type of explosive to realize careful research their ecological "clearness".

## **FOREIGN EXPERIENCE OF ECOLOGICAL MANAGEMENT AND AUDIT ADAPTATION**

***T.V. Pimonenko***

*Sumy State University, Sumy, Ukraine*

At the present stage of market economy development it is impossible to stay aside economical problems. It is obvious that development and adaptation of traditional approaches for existent and potential ecological economical problems solving and new reserves of society development searching.

In connection with ecological problems extension specialists are more interested in approaches, which allow complex solving of existent problems. Among such mechanisms are ecological management and ecological audit, great hopes are pin on their practical realization.

Ecoaudit as a separate management element developed at the beginning of the 70s abroad. The first companies, which worked out their own ecoaudit programs, were US Steel, Occidental Petroleum (USA) [1]. Nowadays majority of international organizations take part in ecoaudit. European countries experience indicates that environmental protection is not only ecological issue, but economical as well.

Will bring experience over of introduction of the system of ecological management and audit (EMAS) of the German company CWS Lackfabrik

The company currently produces lacquers, powder coatings and synthetic resins. The industrial site stretches over 136,500 m<sup>2</sup>, 70% of which is an open green area, so that is possible to refer to the company as a "green company". In 1996, following the company's green aspirations, EMAS registration was achieved.

The protection of the environment receives increasing attention in all activities and from all employees of the company through integrated environmental management. Continuous training of the employees, the organizational integration of environmental protection into the aspirations of the enterprise and constant internal and external audits guarantee that CWS acts according to the guidelines set out by the management. These guidelines are based on 4 principles:

1. Adherence to the valid legislation as well as constant improvement of environmental protection
2. Quality and product responsibility
3. Work and health protection
4. Plant/equipment and transportation safety

The company is continuously improving its daily activities and processes with regard to the environment - in various ways and through different initiatives, such as:

Special training of the company's workforce to avoid losses and wastes in production (Info-hours)

Regular meetings and discussions on the topic "environment" in order to create an increased sense of responsibility among workers (e.g. in case a new heating system is needed, each worker is trained to use energy from renewable sources as a first option rather than installing a new gas line)

Constant extension of accident prevention measures: in the last years notifiable accidents were reduced by more than 50%

The company gives particular attention to a direct dialogue with customers, neighbors, public authorities, etc.: as a member of the VCI (Chemical Industry Association) it takes part in the world-wide initiative "Responsible Care"

The company's purchasing department makes sure that its suppliers and contracting parties take into account the company's desires in regard to environmental protection

The company invests in the most up-to-date equipments in order to assure the costumers pollution free products (e.g. powder coatings and synthetic resins)

At the time of the company's registration, the EMAS regulation was still relatively new and there was no environmental audit Act in Germany. The main challenge CWS encountered, therefore, was to correctly interpret and implement the EMAS Regulation. Since no one was familiar with the system and no guidelines or examples of environmental statements were available, the company had to deal with the understanding of the system by itself. Another small difficulty was to provide proof of compliance with the laws by means of the scheme implemented. Nobody, indeed, knew exactly how to deal with this issue and how evidence could be provided. The issue was solved thanks to efficient cooperation between the internal environmental audit team and the competent external authorities.

The company's care and attention for the environment started before it implemented EMAS. However, since 1996, the year of EMAS registration, CWS increased even more its efforts to improve its environmental performance and reduced the impacts of its production on the environment, which can be seen clearly from the fact that the company succeeded in:

- 1.Reducing emission of harmful solvents (33% less solvent used per t of product: the quantity of solvents since 2005 has been at a maximum of 0.05 t per t of product

2. Reducing of the quantity of energy used by 0.28% from 1.35 MWh in 1994 to 1.07 MWh in 2007 due to improvements of both the insulation system and the efficiency of the machines
3. Reducing the use of water by 1.63% from 2.06 t in 1994 to 0.43 t in 2007
4. Reducing production of dangerous waste from 179.1 t in 2002 to 70.8 t in 2007 [2].

Therefore, thought of environmental protection costs are unprofitable is old-fashioned. European countries experience indicates that enterprises, which adopted ecological management and audit system (CEMA), not only decreased negative influence o environment, but also obtained economical effect. Assignment, per se, is an effective interference, which leads to environmental improvement and economical profits as well.

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## **PRINCIPLES OF CONSTRUCTION INFORMATIVELY-ANALYTICAL SYSTEM ECOLOGY-ECONOMIC TERRITORIAL'S DISTRICTING OF UKRAINE**

***Nataliya Pinchuk , Ivan Varava***

*National technical university of Ukraine "Kiev polytechnic institute", Kiev, Ukraine*

On this stage of development of economy as sciences are needed developments of modern informatively-analytical systems which simplify monitoring of indicators of steady development.

Working out of strategy, plans, sustainable development programs at all levels of management should lean against full and adequate display of dynamics of development ecology-economic system in each separately certain unit (set of units) administrative-territorial device against corresponding integrated indicators (indicators) on the country. It provides necessity of target supervision and the comparative analysis of a significant amount of factors and indicators by working out and realization of strategy of a sustainable development of regions. Sustainable development indicators are necessary to provide well-founded criteria of decision making at all levels, guaranteeing firmness self-regulation ecological-economic system.

Ranging of a condition of territories behind a level of development allows us to form system of effective actions of the management directed on maintenance of a sustainable development of the state. Mathematical methods of monitoring of indicators are necessary for working out of modern information systems of the territorial analysis and distribution of territories behind a level of development.

Territorial's districting on the level of development, as we can see on figure 1, passes the next stages:

- user must choose the indicators of steady development for an analysis;
- cross-correlation analysis by means of which we determine the presence of intercommunication between indicators.

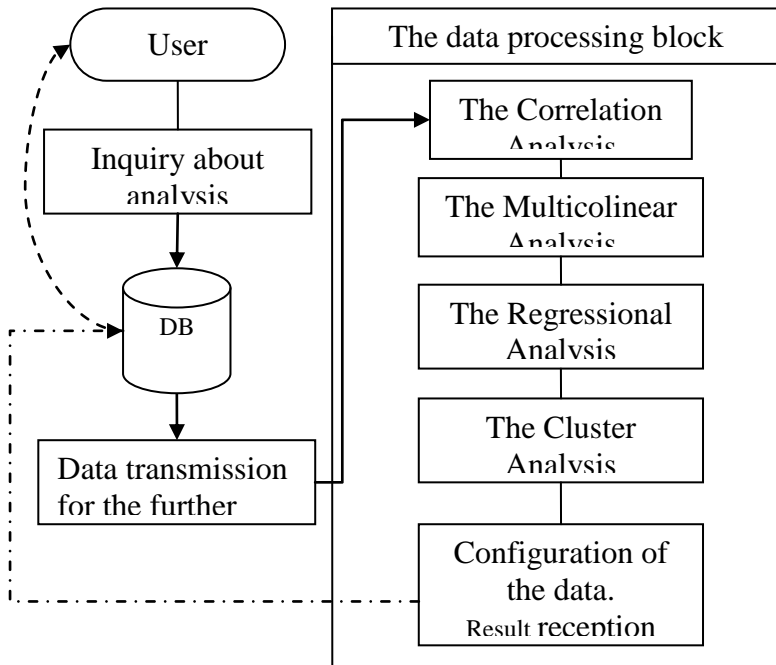


Fig. 1. Structure informatively-analytical system

The coefficients of correlation settle accounts on a formula:

$$r_{ij} = \sum_{i=1}^n \frac{(x_{ij} - \bar{x}_i)(x_{ij} - \bar{x}_j)}{S_i S_j (n-1)},$$

where :  $x_{ij}$  - conformable element of indicator;  $\bar{x}$  - arithmetical mean elements of indicator;  $S$  - sum of indicator's elements;  $n$  - amount of all elements;  $i, j$  - indexes of indicator's corresponding elements .

- data which we investigate can be arcwise dependent. By means of multicollinear analysis we it will eliminate.
- regressive analyst's essence consists of influence's determination of separate independent variables on a change dependent.
- a cluster analysis is needed for territorial's dividing by groups (clusters) on general signs.
- on the basis of the conducted analyses, we can divide Ukraine by cluster after the levels of development.

Above-mentioned informatively–analytical system can be used as a "adviser" of person which makes decision, for the grant of maximally objective information at planning and realization of organizational decisions in the field of management the territorial systems, sent to the active management the parameters of both the actually controlled territory and by parameters, for example, of the normatively-legal adjusting, that set on higher, in relation to territorial education, hierarchical levels.

## **ECOLOGICAL DISASTER IN SOLOTVINO**

**A. Poklad**

*Sumy State University, Sumy, Ukraine*

Solotvino is situated in Tyachev region of Carpathian Ukraine. Many millions of years ago the Carpathian Sea was here. That is why Solotvino is situated on a huge piece of salt, which stretches for kilometers.

Salt was produced here since the times of the Roman Empire. The first salt mine “Cunegunda” appeared in Solotvino in 1790. In 1908 the mine was flooded. A hollow, filled with water, was formed in mine working place. The lake was named Cunegunda. Later other lakes started to appear near by. Nowadays their amount equals ten: with fresh, salty and iodized water. Lakes water helps to treat locomotor apparatus, fractures, radiculitis, and skin diseases.

A unique allergologist hospital, the biggest in the world, has been going here since 1976. The main treatment mode is speleo-therapy – long-term stay in salt mines with special microclimate. Salt saturated air, bacterium free, does its work – 85% allergic adults and 90-95% allergic children get better. People get rid of rough bouts of asthma.

### **SALT+WATER=DISASTER**

It is bad when water gets into a common mine. But when it gets into salt mine, it is a disaster. Water gradually destroyed 7 out of 8 Solotvino mines. Since old times dozens of pump stations worked round Solotvino, they pumped water out of the ground and poured it to Tisa. But in Soviet times “economically unviable” mines were closed and filled with ground. New times have brought more problems. There were not enough money for water pumping, mine repairs and other needs.

Pump stations stopped working. And flood in 1998 struck a crushing blow to the salt mine.

At the beginning of 2000 ground started to collapse in the village. Since 2004 such downfalls have become systematical phenomenon. In 2005 another downfall buried eight cottages and one house. On the 1<sup>st</sup> of February 2008 one more 30-40 meters diameter karstic hollow was formed. Salt mine and salt factory have not been working for two years, 600 persons lost their job. Two mines, where salt was produced, were flooded by underground water. Solotvino gradually becomes dead village.

76 millions of grivnas are necessary for repair works. It is planned that moisture will be pumped to Tisa. And that is why it is necessary to repair central sewage. Then, probably, lakes will dry.

Nowadays cascades of pump units are used for underground water pumping from mines. In such cases pumps are installed in different levels and pump water from level to another, until water won't reach ground level. Generally drain line pumps are used for such purposes.

Drain line pump helps to pump liquid, i.e. to raise it from depth to surface and drop it to another place. Drain line pump is adopted for water-submerged operation.

Table 1. Drain line pumps characteristics

Model	AP	Drenag 900/1800	DRWA , DN	TS	TP	TP 40S
Power, kW	0,4-2,2	1,38-2	0,55- 1,55	10	14	19
Capacity, m <sup>3</sup> /h	33-85	3-8	17-25	18-60	60	60-100
Maximum head, m	16-21	10,5-24	20	10-25	15-21	40
Maximum size of solid particles (discharge nozzle diameter), mm	12-50	12-24	8	10, 35	44	-
Maximum liquid temperature, °C	40-50	50	35, 50	35, 40	35	40
Price, US dollars	310- 360	420-760	180- 510	345	420- 840	1570

Salt lakes can bring profit for Ukraine. There are many investors, who want to develop treatment – and - recreation course in our country. The price of therapeutic mud equals \$5-6 on world market. That is why it is necessary to start looking for investors, who will invest money in salt resort development, and then in a few years they will bring profit in means of taxis. It is evident that it will be easy to do



it: it is necessary to monitor salt lakes and determine possibilities of their economic use.

If not absence of control will lead to total destruction of salt lakes: as it will impossible to renew lost opportunity, because saving of these natural resources lasted during centuries.

Local government is sure that it is possible to develop technologies, which allow stopping mine floods, karstic processes and regulating ecological situation in Solotvino, which threaten to become a disaster.

## **PROSPECTS FOR A GLOBAL SYSTEM OF ENVIRONMENTAL TAXATION**

***Antonina Popovich***

*Institute of legislative prevision and law evaluation, Ukraine*

Environmental problems are transnational in nature. That is why efficiency of environmental protection is impossible without coordination between different countries, separated by political and administrative boundaries. The European Union is working hard on signing a global agreement to reduce greenhouse gas emissions.

Effective economic instrument to address issues of current environmental problems is taxation. Intensive use of taxes in different areas of environmental policy both at the EU and national levels of the member states is stipulated in the EU 6th Environment Action Programme (2001), the renewed Sustainable Development Strategy (2006), the renewed Lisbon Strategy for Growth and Jobs (2005) and the Green Paper on market-based instruments (2007). These documents define the modern approaches of the European Union to expand environmental protection activities with countries in different regions of Europe and newly independent states.

Nowadays there is a need to discuss the prospects for a global system of environmental taxation. However, the international body that have a power to levy ecotaxes doesn't exist. European Union also doesn't have such authority. The proposal to introduce similar tax, such as carbon taxes, should be supported voluntarily by each of the member states. Another example - the taxation of aviation fuel, the introduction of which still causes much debate in view of the likelihood tax avoidances (including so-called "tanking tourism", passengers switching between carriers if not all are taxed and passengers changing destinations). Unilateral action at the EU level will not have the desired environmental effects. The positive effect for environment may be achieved by levying taxes on all flights in all directions. However, national tax systems of different countries vary, there may even lack the term "environmental taxes". For

example such situation exist in Ukraine because the term ecotaxes for the first time is used only in the draft Tax Code of Ukraine, which is not approved yet.

The most likely is the introduction of global system of environmental taxation on the based of socially oriented economy. The chances for political recognition has another scenario that provides a global environmental taxes, coupled with commitment to use revenues for a specific purpose, such as using them to promote economic development.

Existing prospects for a global system of environmental taxation is now considered as sufficiently pessimistic and uncertain in time. However, development of environmental taxes and charges in Europe is optimistic trend.

Regarding environmental protection as one of the key European values, at the EU level is developed a clear policy objectives in energy and climate change, which provides energy saving, reducing of greenhouse gas emissions and deploy renewable energy sources by 2020.

Energy community treaty (2006) signed 34 European countries. Since 2008 Ukraine also is negotiating with the EU on accession to this treaty.

The EU has adopted the Council Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity. The main obstacles to agreement was the conviction among some of the member states, including Britain, that taxation issues should be resolved at national level, not at the EU level, and considering the existing demand for unanimity among the member states in making decisions that govern changes in tax legislation. EU enlargement was a pulse for the completion of lengthy negotiations and appropriate action. The practical importance of the Directive 2003/96/EC on the harmonization of rates is provided so that countries could not reduce rates below the minimum level.

The EU has an extensive system of air pollution taxes, acquire distribution taxes and fees for the use of pesticides. There are many taxes and duties on a wide range of pollutants: batteries, plastic bags, disposable containers for beverages, tires, oil and petroleum products. Many member states have taxes on landfill, in some countries exist taxes on hazardous waste. Fees for water use are in all member states, the Balkans and Eastern Europe. In addition there are already or seriously are proposed taxes and fees on: air transport (noise charges); chlorinated solvents, disposable tableware, light bulbs, PVC crashed mail; damaged equipment (already operating in Norway, Slovenia and Sweden), electronic and electrical waste (already in force in some EU countries), nuclear waste and air polluting waste incineration plants.

Ukraine's European choice leads the increased interest in the prospects of global environmental taxation.

Ukraine was involved in the European environmental cooperation under the Agreement on Partnership and Cooperation, which operated for years 1998-2008. PCA paid attention to the quality of legislation through its rapprochement with the EU standards and developed cooperation with key issues, including global

warming. Signed between Ukraine and the European Union Memorandum of understanding on energy cooperation (2005) reflects only the political intentions and does not imply any legal obligations. However, it is important that both parties have identified the need for action to address climate change, including emissions from power plants operating on organic fuel and the use of joint implementation mechanism under the Kyoto Protocol.

Implementation of Ukraine's international obligations to protect the environment requires the implementation of key elements as the *acquis communautaire* on energy and the environment, and indirect taxation.

## **STRATEGIC PLANNING WITH ENVIRONMENTAL COMPONENT**

***Tatsiana Reutsionak***

*Belarus State Economic University, Minsk, Republic of Belarus*

Strategic planning with environmental component is a function of management. It is the process that can help to put ecological goals as well as to achieve them.

Nowadays, planning of ecological factors assumed to be a basis for all management decisions.

The main purpose of this research is the formation of environmental and economic strategy of organization that corresponds to the principles of sustainable development.

During this research the forecast model has been created, that illustrates the main negative environmental impacts. These calculations were made on the basis of information provided of Joint Stock Company "Mozyr Oil Refinery".

The regression analysis was used for the forecasting factors calculation. This method allows to reveal the level of dependency of the environmental factors (the amount of the sewages, waste, specific factor of emissions into the atmosphere (per ton of processed raw material)) from factors of production activity (the volume of the raw material processing, deterioration of the active part of the fixed capital stock, share of the diesel fuel with sulphur content of 10 ppm in general volume, share of the high-octane petrol in general volume of the petrol).

factor  year	the amount of the sewages, cubic meter	waste, tonne	specific factor of emissions into the atmosphere (per ton of processed raw material), kg / tonne	the volume of the raw material processing, thousand ton	deterioration of the active part of the fixed capital stock, %	share of the diesel fuel with sulphur content of 10 ppm in general volume, %	share of the high-octane petrol in general volume of the petrol, %
	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>
2007	7300	29000	3,38	10070,5	49	4,2	83,7
2008	6900	34000	3,2	10569,1	58,2	6,3	81
2009	7200	71000	3,03	10657,3	62,8	3,7	84,9

The regression analysis allows to exclude from the further research such factors, as deterioration of the active part of the fixed capital stock and share of the diesel fuel with sulphur content of 10 ppm in general volume, as the factors of correlation is rather insignificant (below 0,01) and both these factors are interdependent.

	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>
X <sub>1</sub>	1			
X <sub>2</sub>	0,981309	1		
X <sub>3</sub>	0,200191	0,007909	1	
X <sub>4</sub>	-0,0786	0,114708	-0,99246	1

The general look of the regression equation is following:

$$Y = AX + B$$

where Y – value of predictable factor;

A – coefficient of correlation;

X – level of influence;

B – value of predictable factor when AX = 0.

So, the regression equation for each environmental factor will have the following type:

$$Y_1 = 3671,47 - 0,34X_1 + 84,7X_4 ;$$

$$Y_2 = - 1212418 + 54,7X_1 + 8250X_4 ;$$

$$Y_3 = 11,37 - 0,00053X_1 - 0,03156X_4 ;$$

where Y<sub>1</sub>, Y<sub>2</sub>, Y<sub>3</sub> – the amount of the sewages, waste, specific factor of emissions into the atmosphere (per ton of processed raw material), respectively;

$X_1, X_4$  – the volume of the raw material processing, share of the high-octane petrol in general volume of the petrol, respectively.

The forecast of main environmental factors of the plant for last two years was made on the basis of the calculated dependencies.

the environmental factor	year				
	2007	2008	2009	2010	2011
the amount of the sewages, cubic meter	7300	6900	7200	7250	7124
waste, tonne	29000	34000	71000	56750	48320
specific factor of emissions into the atmosphere (per ton of processed raw material),kg/tonne	3,38	3,2	3,03	3,28	3,18

Therefore, it can suppose that future production activity of the plant will reduce of the negative environmental impact.

For the present-day strategic planning with environmental component is generally used by big companies. However, it may be suggest that situation will change and more and more companies will start to use forecasting models to control environmental activity.

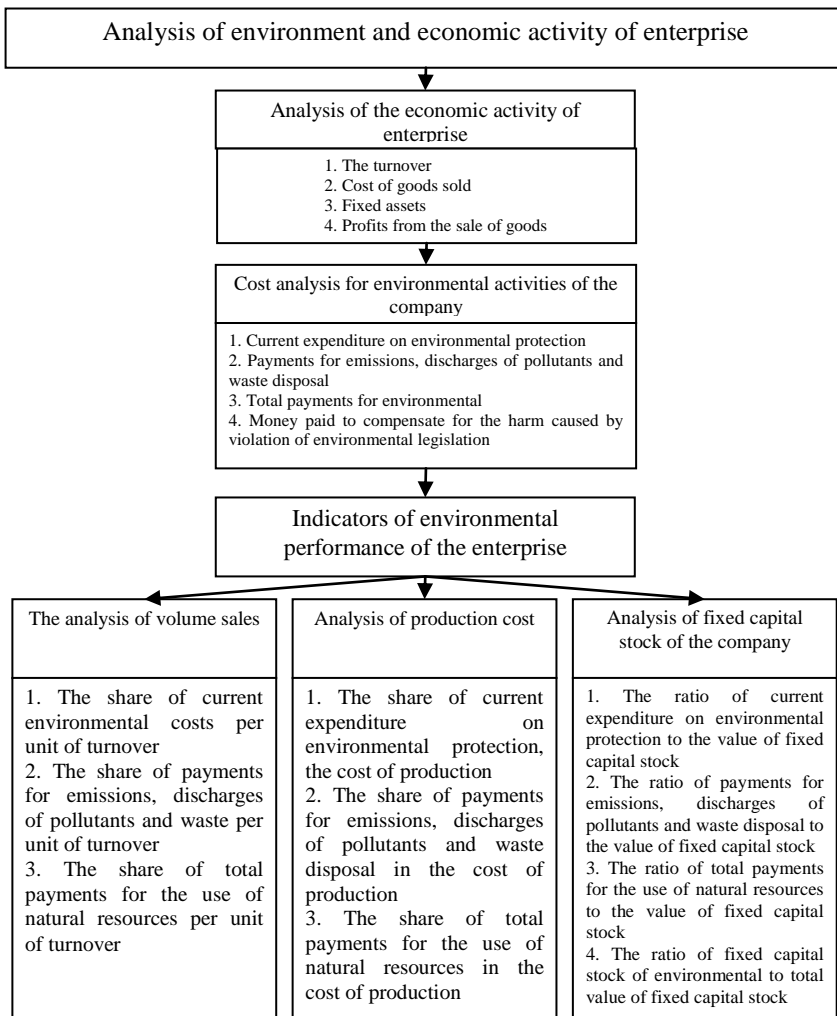
## **ENVIRONMENTAL AND ECONOMIC ASSESSMENT OF THE ACTIVITY OF ENTERPRISES**

***Volha Rahulia***  
*BSEU, Minsk*

Any business entity, regardless of the activity has an impact on the environment. Saving the environment and reducing impact to it can be achieved through economic mechanisms for managing the business. In this case the introduction of the system management subsystem of the environmental management processes will be efficient.

Environmental protection and economic spheres are equal in rights components of activity of the enterprise. However frequently environmental significant characteristics are separately considered from economic parameters of functioning of the enterprise in spite of the fact that environmental costs directly influence the cost price and on profit of the enterprise. During the analysis all is necessary for considering aspects of activity of the enterprise in aggregate, in interrelation; only it allows to reveal the reasons significant economic and environmental problems, their possible consequences and variants of decisions for the enterprise.

The general view of the environmental and economic analysis of the activity of enterprise and definition of the system of parameters of environmental and economic assessment is presented in the figure 1.



The environmental and economic assessment forms the information base facilitating decision-making in the field of operation of business, both concerning use of financial resources, and concerning environmental management. The most important tool for environmental and economic assessment of activity of the enterprise represents the system of the environmental and economic indicators, which is a combination of quantitative characteristics that define and compares the results of the economic activities of enterprises with its impact on the environment.

At carrying out of the analysis of parameters of financial and economic activity first of all it is necessary to pay attention to parameters of economic productivity: to proceeds from realization of production, profit, to the income, their dynamics and structure, and also possible ways of their improvement. Also dynamics of the cost price of production, its structure is analyzed, directions of its decrease are outlined; parameters of profitability, use of the basic means, number of workers, a level of charges on a payment.

The analysis of dynamics and structure of payments for environmental pollution allows to define a direction of the most negative influence of the enterprise on an environment so that at development of plans of nature protection actions to pay to this direction primary attention. If the increase in a payment for pollution depends on quantity of the thrown out harmful substances, dumped sewage or formed waste at planning environmental protection actions the administration should make a decision on economic feasibility of further use of sources of pollution, reequipment, change of technology with the purpose of decrease in weight of polluting substances. If the increase in payments for pollution is connected with high rates of the environmental tax it is necessary to pay attention to change of structure of waste, emissions, dumps of polluting substances with the purpose of decrease in their class of danger which causes the high rate of a payment. Economic efficiency of these actions will be shown in decrease in tax loading and by that in decrease in the cost price of production.

At the analysis of the basic means of environmental protection purpose their share in a total cost of the basic means, a share of payments for environmental pollution in costs of the basic means of nature protection purpose, the attitude of current expenses for preservation of the environment to cost of the basic means of nature protection purpose is considered. These parameters are necessary for considering in dynamics that will allow to make the conclusions about technological condition of the basic means of environment protection purpose. Reducing of these parameters can be connected with their overload, reduction of productivity and decrease in quality of work.

## **ECOLOGICAL TRAINING OF MANAGEMENT STUDENTS AT THE ENGLISH CLASSES OF PROFOUND STUDYING**

***N.V. Rokosovyk***

The formation of market economy and democratization of social life determined the change of aims and orienting of professional education.

The important role in this situation belongs to the profound studying of economical education and economical up-bringing of young generation, training of specialists that are able to be managers. [2]

New educative the so-called planetary – individual paradigm acquired significance nowadays.

This direction of up-bringing, which also includes the ecological one, is based on the V. I. Vernadskyi's doctrine and modern world tendencies.[1,136] The main

role belongs to the educated person equipped with knowledge the newest achievement of the mankind.

Up-bringing plays the important role at all stages of physical and spirit power of personal development as natural process the foundation of which is the interaction of natural physiological peculiarities and the surroundings.

The development of student's personality is in progress as the natural mental operation which is to be directed. It is indissolubly connected with educative process in the widest notion.

The physical and spirit powers and qualities which are necessary to the future specialist are formed and developed in the goal-seeking activity of the educational and educative processes.

Management students are young people with the inherent age and individual peculiarities which are characterized by research work, technical and creative mode of thinking. At the English classes of profound studying they study "Some current economic problems" which include the environmental problems and environment protection.

The necessity of socially active personality formation, the educational and educative processes directed to his/her development stimulate the appearance of new non-standard forms of pedagogical interactions.

One of the forms of student's ecological up-bringing is the play as the means of development of creative potential, professional abilities of future managers.[3,181]

Playing the definite situations, attraction the participants of the play to the situation of choice is the real way of alternativeness of mode of thinking, the ability to see the chain of variants, the ability to transform the knowledge, experience to the new nonstandard situations.

We distinguish the following groups of creative plays: with insufficient information; with insufficient conditions; with definition of the very plot, with contradictions in a content; with planned plot and conditions when marks and results are determined by the very participants.[4]

We suggest the following succession of the work with the creative play; the determination of the creative potential of play; attraction of participants to the process of its establishing and carrying out; the determination of manager's functions; the defence of personal dignity, comfortness of every participant of the play; the goal-seeking widening of participants' rights; it is not necessary to attract all members of the group to the play; watching the play stimulates the creative activity too.

The thing that is also of great consideration is the working out the students' ability to choose and systematize the playing material.



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## THE RESTRUCTURING OF RAILWAY INFRASTRUCTURE IS A CURRENT NEEDS OF THE PRESENT

***H.I. Rybina***

*Sumy State University, Sumy, Ukraine*

Rail transport is one of the most important basic industries of Ukraine, which provid internal and external transport links and economic needs of the people. The activity of rail transport as part of a unified transport system, which promote normal functioning all branches of social production and economic development.

Rail infrastructure is one of principal components which promote implementation rail transport. In common aspect, rail infrastructure - tracks, engineering, construction, alarm system, electricity, and blocking of traffic control devices, telecommunications, and rolling stock - locomotives, wagons, electric and diesel trains.

Note that the total length of railways in Ukraine is 22 kilometers (42.7% of them electrified, 60.8% - are equipped with automatic train control) our Railways has 126 railway stations, 2 container paragraphs and 1669 stations. System maintenance and repair of rolling stock includes a 68 locomotive, 48 wagons and 20 passenger depot. However, the overall level of depreciation of fixed assets is 78%, including the active part of 84.4%. The state of the technological base and technological level of traffic may become a brake to further socio-economic development. The main problem of this crisis is generated discrepancy amount of funding regulations process simple reproduction of fixed assets and lack of investment. Although rail the leading type of transport, the pace of it`s development may be slowed due to increased competition in the transport market, technological progress, significant capital intensity. Recoupment capital costs of railway construction is heavily dependent on the power possessed of cargo and passenger on a new line.

The main ways of restructuring of the railway infrastructure:

- 1) realignment of existing and construction of new railways in accordance with the economic development strategy of Ukraine;
- 2) gradual reduction unnecessary and low extensive areas of railway network;
- 3) improving the technical level of the travel industry by increasing the volume of all types of renovations, the introduction of new technologies for their implementation;
- 4) organization of high-speed and high-speed network of trains at stations along the lines of international transport corridors and roads that connect major cities in Ukraine.
- 5) gradual convergence towards international standards and requirements;
- 6) promotion of maximum safety of moving;
- 7) implement on resource-saving technologies;
- 8) re-depot according to the maintenance and repair of modern traction and trailing rolling stock;
- 9) extending the range and increase drive transportation services, including the different types of insurance, international tourism, the trade and catering, road service, while improving their quality;
- 10) development and improvement system of transport services.

Thus, the development of railways in Ukraine is possible with account, maintaining and building the capacity of the national railway network; development and realization programs which to increase the efficiency of activities of rail transport.

## **MODERN ECOLOGICAL PROBLEMS IN THE UKRAINE AND THE POSSIBLE METHODS OF THEIR SOLUTION**

***Saady M. Abaas***

***Leader: Chigrin E.U.***

***Sumy state university, Sumy, Ukraine***

The existing ecological and economic situation of the Ukraine causes serious fears. In spite of the significant decrease in the production in the industry and agriculture the general ecological situation in the country remains at the unsatisfactory level. Such indices as resource expenditures per unit of gross national product and pollution per unit of output are several times higher in the Ukraine than in the industrially developed countries. The negative aspects of ecological situation are manifested of reduction in the quality of the living environment of man, degradation of natural ecosystems, exhaustion of natural resource potential, increase in the number of ecologically caused diseases.

The basic problems of ecological safety of the Ukraine can be classified as follows. The actual problems connected with the state of living environment and providing of ecological safety of the population:

- the pollution of atmospheric air of cities;
- the unsatisfactory quality of drinking water;
- the danger of food products (content of pesticides, etc);
- the pollution of living environment by dioxins, wastes of production and consumption (dust-heaps of dangerous waste products);
- the radioactive contamination of a number of territories (regions of Chernobyl);
- the appearance of the technogenic catastrophes on the background of the critical level of the worn out of basic productive capital.

The actual problems in the sphere of the conservation of the natural resources:

- the reduction in the specific variety of animal and plant peace, the decrease of woodiness;
- the complex damage of the earth;
- exhaustion and contamination of the surface waters;
- the exhaustion usage of a natural raw base.

The system menace of ecological safety of the Ukraine consists of the realization of economic increase on the obsolete engineering, technical and organizational - administrative base, what will unavoidably involve the profligate and destructive usage of natural resources. The problem of effective ecological management is a composite system problem, which is solved taking into account the interrelation of all basic components: state ecological policy, normative lawful base, the structural and functional organization of the management, administrative and economic methods of administration and measures of public nature.

In the Ukraine there is a definite system of measures for the protection of environment; however it is distant from its perfection.

Breaking directions in the sphere of management of natural resources usage and possibly also for the entire Ukraine economic can be the precise and substantiated differentiation of property of the natural resources between central, regional and local organs of self-government, physical and juridical persons, the reorientation of tax system to the priority position of natural-resource rent in comparison with the taxes to inserted labor and capital. This will allow solving a question about the creation of financial, material and technical base for the valuable activity of state and business including for ecological management.

The most important elements of any system of organizational processes management are persons who make decisions. In our opinion the ecological education of administrative staff can become one of the most effective directions of the solution of ecological problems in the country. Contemporary leaders in their time were deprived of the possibility to obtain the ecological knowledge. In the secondary school program “ecological” objects was absent wholly, at the same time in Institutes of Higher Education “ecological” disciplines was present as the

secondary subjects and bore either biological or technological nature. It was formed the surprising situation, when decision making for the most important in the administrative activity problematic direction is based not on the knowledge of administrators, but on the partial data obtained from the newspapers, periodicals and telecasts. The existing ekoinformative vacuum can not be filled as a result of the action of the existing post educational system, which is weak and narrowly specialized, since it is oriented, first of all, to the specialists-ecologists. Therefore in our view introduction into the Ukrainian educational system the teaching process adapted for the administrative activity and which places the tasks of the training of administrators-ecologists of wide profile, which possess by principles and methods of management of ecological development would be effective. This system of the ecological education of administrative personnel must include fundamental training with obtaining of diploma about second higher education, complex professional retraining.

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## **THE NATIONAL EMISSION TRADING SCHEME IN UKRAINE AS A MITIGATION TOOL TO COMBAT CLIMATE CHANGE**

***Olga Semkiv***

*The Council for Productive Forces Study of Ukraine of National Academy of Sciences of Ukraine, Ukraine*

The climate change has been identified as one of the major threats the human kind faced over the last decades. For a while, a number of developed countries have combined the efforts of state and private sector, developing the additional mechanisms and instruments for reducing greenhouse gas (GHG) emissions. Although Ukraine is actively using the mechanisms of the Kyoto Protocol to the UN Framework Convention on Climate Change, the national economy still faces a lack of initiatives to attract private sector into the programs aiming at GHG emission reductions.

The recent Ukraine's position at the climate negotiations proved that the country is not ready to take on the stringent GHG emission reduction targets. Even though the country still need a room for increasing emissions resulting from a GDP

growth, the most sectors of Ukrainian economy can easily evolve without GHG emission on a rise. At the latest Conference of Parties to the UNFCCC serving as a Meeting of Parties to the Kyoto Protocol, the countries agreed that a global temperature should not increase more than 2° C from the pre-industrial level. This has been reflected in so called Copenhagen Accords, with almost 80 countries associated with it. The target of 2° C will likely be translated into the ambitious commitments to reduce GHG emissions for all countries, which are involved into the climate negotiations, including the large emitters from the developing world. That is why private companies are an important part of a global plan to reduce GHG emissions as the governments cannot rely only on their own. Therefore, the possible future commitments seem to be uneasy to fulfill without well developed national action plans, where the private sector plays a role.

Moreover, a motivation to curb the GHG emissions in the current period remains a serious problem for Ukraine. Having an AAU surplus of approximately 2 billion tCO<sub>2</sub>eq, the country has no need to introduce some additional tools in order to reduce GHG emissions at the national level. Importantly, the lack of ambitious plans to reduce emissions for the next period retains the development of private initiatives. The main question of business sounds like “Ukraine enjoys the huge surplus of AAUs and therefore easily meets its target in the Kyoto period. Why is the country to set any binding targets for industry and energy sector as there is no need to decrease emissions at all?” We will look at this question closely further on, but now focus on the current state of play in Ukraine and other countries, where the private sector is already involved into mitigation actions through the national emission trading schemes (ETS).

In 2008, the National Environmental Investment Agency - the governmental agency being on charge of the Kyoto Protocol and UNFCCC implementation in Ukraine – added the development of national ETS to its annual action plan. The task has not been completed though. The draft law on ETS development has been submitted to the Parliament quite recently and expected to be reviewed over the forthcoming several months. Therefore, the ETS is frequently perceived in Ukraine as one of the most effective tools to achieve the actual emission reductions in the private sector. However, a move from idea to operational system can take another several years.

At the same time, another tool is widely used in Ukraine - charges for pollution. This is very often mentioned by the critics of the ETS to demonstrate that Ukraine has already launched relevant measures for the environment. Certainly, this instrument enjoys a couple of advantages. However, a direct regulation can be deemed as the most effective tool only if the emitters are passive enough to use the market mechanisms. This eliminates an idea of the cost effective emission reductions, when the emitters, having the least marginal abatement costs, implement the mitigation projects and contribute to the aggregated emission reductions in a sector or country. Therefore, the charges do not minimize aggregated costs at the state level, but impose the penalty system to all emitters

regardless their technological maturity. This may materialize into the unreasonably high aggregated costs. However, if the county strives to involve the largest emitters, which tend to be more active in using market-based instruments, the emission trading is still one of the most cost-effective solutions for GHG emission reductions.

While Ukraine has only started ETS, the European Union Emission Trading Scheme (EU ETS) is already the first and the largest system of GHG emission trading in the world. Many countries refer to the knowledge and hands on experience of European member states while developing and launching their own national systems. Among them are two mandatory ETS in the North America, as well as Swiss, Australian (trading starts in 2010), and New Zealand ETS. Moreover, the US also plans to introduce a federal trading system, even though its development temporarily delayed due to a number of political and financial reasons. The United States currently operates a Regional Initiative to reduce greenhouse gases (RGGI) launched in January 2009, which covers the private companies in 10 eastern states. Canada surprisingly started trading even earlier than the US in 2007. It is very likely that all major ETS will be consolidated into one a global system within a decade or two.

Since the major emitters in Ukraine are the energy companies, in particularly power plants, and mining industry, with 83% share out of the total emissions (450 MtCO<sub>2</sub>eq in 2007), these sectors shall be certainly covered by the ETS. Taking into account an existing EU ETS model and the GHG emission structure in Ukraine, the future ETS can also cover cement companies as well as glass and paper producers. Alike EU ETS in its 3<sup>rd</sup> phase, Ukraine can go further and involve not only CO<sub>2</sub>, but the other GHG gases as well. Moreover, effective from 2012, the Ukrainian international aviation is to become a part of the EU ETS. This may be the first step towards the market mechanisms implementation.

Looking into the major characteristics and experience of existing ETS, the possible strengths and weaknesses for future Ukrainian ETS are provided below.

**Strengths:** - a strong institutional and legal climate change framework; - understanding at the highest levels of a need to introduce new market mechanisms; - significant potential for emission reductions in industry and energy sector; - relatively low marginal abatement costs; - the large number of potential market players with different technological capabilities; - developed system of monitoring and environmental assessment; - many companies - the largest emitters – have some experience of emissions trading under the Kyoto Protocol (JI); - existing ETS in the region (EU ETS).

**Weaknesses:** - unstable political situation; - weak support by industry and energy sector; - the reluctance of the private sector to spend additional costs in the short run due to a lack of awareness of future benefits and leader's position in the market; - strong industrial and energy lobby, which may delay ETS development; - temporary decline in production output in the key sectors due to a global economic downturn; - many installation in the energy sector are still state-owned; - low

tariffs for electricity and heat; - the largest emitters of GHG are often subsidized by the government.

At the same time, there are a number of positive factors that can boost the ETS development in Ukraine. First of all, Ukraine enjoys a sufficiently developed institutional framework. In the most cases, the hands on experience and understanding of market instruments at the highest level could bring forward more private companies to the emission trading scheme. Moreover, the national inventory scheme and reporting to the UNFCCC also serve as a basis for accurate GHG accounting, which is a top requirement for the national ETS. The NEIA and the Ministry of Environment are to be strongly involved into the ETS process, which has already started. Even though the legal basis is not approved yet, a couple of draft laws framing the ETS structure sends a clear signal to the large and some of medium business that the business environment in Ukraine will likely be strongly changed in a couple of years.

In addition to well developed institutional background, Ukraine also owns some practical experience with mechanisms of the Kyoto protocol. The volumes currently traded under joint implementation (JI) are far from what expected to be allocated and traded under the future ETS in Ukraine though. To date, 166 JI projects with the reduction potential of 145 MtCO<sub>2</sub>eq over the Kyoto Protocol period. This corresponds to almost 40% of total projected emissions from Ukraine in 2010. However, only 12 MtCO<sub>2</sub>eq is planned to reduce through JI projects in the sectors that may potentially be covered by the national ETS. This corresponds to only 4% of projected emissions in these sectors in 2010 year.

The lack of mitigation actions at the most large emitters reflects their unwillingness to implement costly energy-efficient technologies, which is another equally important goal of JI mechanism. For the potential ETS installation it would be extremely useful, if the installations have already implemented JI projects. This would give them so much needed experience in a field of the GHG mitigation. However, the companies do not see any motivation to go forward with voluntary projects yet. We can only assume what resistance the companies can show for the mandatory system. Nevertheless, the fact that such large carbon-intensive companies like DTEK, Metinvest, and many others are already involved into the mitigation projects, which are not only Kyoto-related, may mean that their long-term business plans features a possibility of market mechanisms in Ukraine. In that case, the ETS implementation is only matter of time.

# OPTIMIZATION OF FUEL CONSUMPTION AND DECREASE OF TRANSPORT VEHICLES EMISSIONS

*N.K. Shapochka, A.V. Lyamtsev*  
*Sumy State University, Ukraine*

Solving the task of decrease of toxic emissions of auto-transport complex (ATC) it is necessary to take into consideration that the most significant reserves for decrease of fuel consumption and toxic emissions are established in the rational organization of transportation and stimulating driving transport vehicles that have low toxic level. Unlike organization-technical tasks, when technological problems of distribution of transport flows are analyzed, developing economic methods of regulation it is necessary to incorporate correlation between demand and supply for transport services. Development of transport policy the basis for prognostication of different strategies efficiency is searching of conditions for equilibrium situations in which the cost of transport services match demand. In general this equilibrium situation is described by demand for transport services and cost functions

$$D(P) = S(P) \quad (1)$$

where D – demand for transportation;

S – supply on transport services market;

P – price of transport services

Solution of the equation can be obtained during the iteration calculations, through finding consequent values  $P_0, P_1, P_2, \dots$ ,

$P_{k-1}$  for the next expression:

$$D(P) = S(P) \quad (2)$$

Concerning the task of defining the volumes of transportation at minimal consumption of fuel and value of toxic emissions there is a need for demand function elaboration. First of all, there is a need to consider that transportation are exercised on different kinds of transport. For huge cities there can be an assumption that the main volume of transportation is due to necessity to satisfy the needs for population mobility. That is why for characteristic of the level of emissions especially in the centre of the city one can consider only passenger automobiles and route taxes. It is grounded by the assessment of the transport vehicles park structure in big cities and intensity of traffic on high ways. Passenger cars and route taxes in the majority of cities hold 87 % of the park. On high ways especially in the centre of the city there are 95% of passenger cars and route taxes. That is why it is well grounded to reduce this optimization task to two-product task meaning transportation on passenger cars and route taxes.



Besides, there is a need to consider constraints linked to budget subsidizing of city passenger transport and allowable costs for driving passenger cars. Taking into account these additions the cost of transport services can be presented in the following equation:

$$P_x = \sum_{i=1}^n P_i x_i \leq R \quad (3)$$

where  $x$  – the volume of transportation and traffic;  
 $R$  – budget constraints.

For two-dimensional case we can apply the following variant for finding optimal solution. This optimal solution refers to the tangent dot of budget constraint indifference curve (Fig. 1).

Different variants for assessment of trip costs  $x \in R(P) \subset R^{n+1}$  have various utility on satisfying demand in mobility of population. That is why utility function can be interpreted as associated with fuel use and emissions. Since the utility function is usually maximized it is rational to express it as the level of decrease of fuel consumption and emissions on basic variant

$$U(x) \rightarrow \max \quad (4)$$

$$x \in R(P)$$

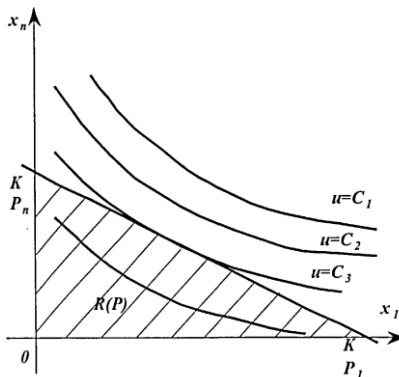


Fig. 1 Economic interpretation of equilibrium price finding process

So, optimization task is in defining the conditions for satisfaction of demand for transportation in such a way that to provide maximal decrease of fuel use concerning the existing situation.

## **RECYCLING RESOURCES: EXPERIENCE OF FOREIGN COUNTRIES**

***T.I. Shevchenko***

*Sumy State University, Sumy, Ukraine*

Experience of foreign countries in the area of the domestic waste control system is of substantial interest for perfection of this system in Ukraine.

In 1980th all efforts in the field of domestic waste management in most world countries were oriented to their incineration and burial. It was considered that a method of incineration was more economic advantageous than processing of waste, as the first method allows to examine it as a renewable energy source.

In the middle of 80th a policy in area of waste management was directed on control after contamination of environment. In the countries of the European union hard standards appeared on waste incineration that forced mass closure of combustion plants or to establishment of expensive cleansing equipment

After the awareness of ecological unacceptability and economic pointlessness of incineration and burial of waste in many countries the new stage began in a waste management. Its strategic vector was extraction of resource components from waste and its repeated use. In addition to mass public dissatisfaction with combustion plants and dumps of waste, government control were the factor of starting the new stage in waste circulation.

Among the aggregate of instruments of economic stimulation in the field of waste handling as recycling resources most distribution among foreign countries were got:

- 1) preferential tax treatment of enterprises, carrying out recycling;
- 2) crediting of recycling enterprises on preferential terms;
- 3) establishment of mortgage cost on a container, domestic technique, cars etc.;
- 4) direct financing of the programs of scientific researches in area of replacement of primary materials by recoverable ones;
- 5) a special purpose grants on financing of researches in area of resources recycling;
- 6) subsidizing and grants for the enterprises that carrying out waste processing;
- 7) tax collection from enterprises for processing of the used container and packing;
- 8) tax collection from combustion plants;
- 9) additional taxation of all types of container and packing, processing of which is impossible;

10) accelerated depreciation of capital assets for enterprises that processing waste.

The efficiency was shown by the instruments of direct government control, namely:

- 1) establishment of the state of the regulated level of waste processing for regions;
- 2) establishment of stake of the recycled raw material contained in wares that bought in a state sector;
- 3) prohibitions of placing on the dump organic waste and not processed waste;
- 4) standardization of the production of containers from glass and plastic.

So, according to world experience, achieving high indexes in the field of repeated use of resources requires to use an economic tools and methods of direct government control. And it is necessary to state that high level of waste processing is possible in Ukraine moreover without the substantial changes of the existent waste control system.

## **ACTUALITY OF CLIMATE CHANGE PROBLEM**

***Sergei Shevtsov***

*Sumy State University, Sumy, Ukraine*

The Earth's climate has always varied, so the term climate change is now generally used to describe the changes caused by human activity - specifically, greenhouse emissions such as carbon dioxide and methane, which build up in the atmosphere and trap heat. As human activity increases the concentration of these gases in the atmosphere far beyond their natural levels, much more heat is trapped. Hence, the term climate change is often used interchangeably with global warming

Measurements at the Earth's surface show that average temperatures have risen by some 0.4C since the 1970s. Scientists are confident this change can be blamed on human emissions because the increase is too big to be explained by natural causes.

Natural factors such as changes in the sun and large volcanic eruptions are known to have warmed and cooled the planet in the past, these effects are not powerful enough to explain the rapid warming seen recently. Only an increased greenhouse effect caused by higher amounts of heat-trapping gases in the atmosphere can explain it.

Water vapour in the atmosphere produces the strongest greenhouse effect, but it has been in balance for millions of years. Human emissions, though relatively small, tip that balance. Carbon dioxide is the chief greenhouse gas produced by human activity. It is produced when we burn fossil fuels: oil, gas and coal. The level of carbon dioxide in the atmosphere is measured in parts per million (ppm).

Before the industrial revolution, the carbon dioxide level was about 280ppm. It is now 386ppm and rising by 2-3ppm each year. When other greenhouse gases such as methane are included, the total level in the atmosphere, known as the carbon dioxide equivalent, is closer to 440ppm.

There are uncertainties, though - for example, the planet's oceans, forests and soils could release their massive stocks of carbon as the world warms, leading to much greater temperature rises than human emissions alone would cause.

Most plants and animals have evolved to live in a fairly narrow ecological niche. Some will move to find their desired conditions, others will be able to adapt. Those that cannot move or adapt will perish. Some animals, such as the polar bear, have nowhere to move to.

A warmer climate will affect agriculture and water availability. Increased temperatures are also expected to limit rainfall in some regions and bring more extreme weather events such as storms to others.

Sea levels will rise - gradually at first as the extra warmth works its way into the oceans and makes them expand; more quickly if the gigantic ice sheets in Greenland and west Antarctica start to break up. Scientists say the only realistic way at present is to reduce greenhouse gas emissions. How to do that - and where - is a political hot potato.

Because it takes time for the heat to build up in the atmosphere, and because carbon dioxide stays in the atmosphere for a long time, there is a lag in the system, which means the effect of any changes will not be felt for decades. Put bluntly, we are headed for about another 0.5C of warming whatever we do.

The world's only existing treaty to limit emissions, the Kyoto protocol, has had limited success, and expires in 2012. Politicians are working to develop a replacement that would include countries excluded from Kyoto, such as China, and those that refused to join, such as the US.

From December 7, environment ministers and officials will meet in Copenhagen to thrash out a successor to Kyoto. The two week event is being seen by many environmentalists as a crucial diplomatic opportunity to create an international agreement on meaningful cuts in emissions that will prevent the worst consequences of climate change.

The United Nations Intergovernmental Panel on Climate Change has said that we already have most of the technology we need to bring down emissions significantly. These include renewable energy sources such as windmills, geothermal and solar panels, as well as more efficient cars and power stations.

Carbon trading is a market mechanism to achieve cuts in emissions. Countries or groups of countries (such as the EU) first agree a cap or maximum emissions level. Individual companies are then either given or must purchase carbon credits - the right to emit a certain amount of CO<sub>2</sub>. If they exceed their allowance they must purchase permits from another company that has fallen short of its cap. If the cost of buying carbon credits is high enough it incentivises companies to invest in measures to reduce their emissions.

To date, the EU's emissions trading scheme has been heavily criticised for failing to reduce emissions. In the first phase, the number of permits issued was too high, sending the carbon price crashing and so removing any incentive for companies to spend money reducing their emissions.

Offsetting is controversial because some people see it as an excuse not to change our behaviour. There are also concerns about whether it delivers the promised savings, as much of the market is unregulated. One technology that would allow us to continue burning fossil fuels such as coal and oil without increasing CO<sub>2</sub> levels in the atmosphere is carbon capture and storage (CCS). This involves extracting CO<sub>2</sub> at power stations then pumping it underground. Critics argue the technology will prove expensive and is several years away from being proven.

A more drastic approach is so-called geo-engineering. These are major technological fixes such as seeding clouds to bounce some of the sun's radiation back into space or stimulating the growth of algae in the oceans to soak up CO<sub>2</sub>.

## **ECONOMIC ASPECTS OF ENERGY SAVING IN THE HOUSING COMPLEX**

***E.V. Shkarupa, V.V. Parkhomenko***  
*Sumy State University, Sumy, Ukraine*

Large budget expenditures of the country spend on heat and energy consumption in the residential sector. The growth of these costs is less connected with the growth of housing stock as increase the loss of heat energy in housing and utility networks due to their wear. Along with these processes is the process of environmental degradation and pollution of the environment.

Let's examine the problems of energy efficiency of housing stock and their possible solutions and select the most cost-effective energy efficiency measures in housing and communal services (HCS).

### **Electricity saving**

Saving of electricity on the one hand the easiest way: in most cases there is metering, and ongoing low-cost events provide an immediate economic effect. If we take into account the inevitable increase in electricity tariffs in the near future, investing in energy efficiency can be regarded as one of the most lucrative sources of investment.

The significant effect for residents in modern conditions makes installation of multi-tariff metering.

The special light modes require house territory, canopies porches, parking lots and parking, stairs, porches, platforms, warehouses, hallways and other common areas and utility.

Because these objects do not require constant illumination, the most effective option for saving these sites is to install utilities floodlights with motion sensors and to set the corresponding regimes. Energy saving from the use of halogen floodlights with motion sensors up to 70% [2].

#### Savings on heating

Heating costs are the largest paper in the payment of municipal services. And at the same time, the heat, is the most wasteful using and providing with the worst quality of all supplied to us resources. In this situation, the introduction of accounting systems can monitor and manage the receipt and use of thermal energy. And what is more important provides economic leverage in the relationship with the supplier.

The main task of heating the housing stock is to provide a comfortable temperature in the house. Along with those who suffer from cold, there are those who suffer from heat. These typically include the people who are closest to the source of heat. A practical solution to this issue is to set regulatory systems heat. Because of the conditions of the central heating is hard to do. Substations are derived outside the home and serve several homes.

The main reason for creating the central heating was the lack of low-noise pump. Which were capable to provide the desired mode works without violating the comfort of living.

Modern technologies are already prepared to offer enough low-noise pumps, which allow organizing individual heating units (ITP) in every residential building.

This will reduce the cost of heating water, implement regulation of thermal energy consumed and, ultimately, significantly reduce the cost of heating homes. With the problem of subcooling is much harder to fight because of it expensive.

The reason for the low temperature in the apartments is not a bad quality heating, this is just a consequence, but a tremendous heat loss of dwelling houses. Generated and supplied to the house heat is lost through:

- Window and door openings: 40-50%;
- floor attics and cellars: 20%;
- Exterior walls: 30-40%. [3]

Energy efficiency measures derived from the existing problems, it is necessary to improve the place of heat loss.

#### Water saving

Survey of water supply systems with high specific water consumption shows that the excess consumption consists of the sum:

- leakage of water into the system in-house water leaks from plumbing in homes, in networks hot and cold water;
- over-pressure after the economic pump;
- unrecorded tenants;
- errors in accounting populations.

Thus, identifying the main problems in the country's housing stock, possibly the introduction of energy saving measures to achieve budgetary savings and to ensure the necessary level of comfort of living.

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## ENVIRONMENTAL CAR LEASING

***Y. Shkodkina***

*Sumy State University, Sumy, Ukraine*

Nowadays, the necessity of sustainable development is recognized worldwide. One of the main ways for implementation of it is greening of different life spheres. However, it appears to be difficult long-term task due to limited amounts of money needed. Different investing and credit mechanisms, such as leasing, might provide a solution.

We refer to leasing which ensure reduction or elimination of environmental footprint as green or environmental lease. There are such directions of green leasing in Ukraine:

- technology and equipment lease, which maintain moderate natural resources utilization;
- technology and equipment for control, cleaning and recycling of pollution-intensive derived products;
- ecofriendly car leasing;
- green building leasing;
- others.

Ecofriendly car leasing is one of top priority.

Most cars produce greenhouse gases, primarily CO<sub>2</sub>. CO<sub>2</sub> emissions are the largest contributor to global warming and climate change. The amount of CO<sub>2</sub> produced by a car depends on type and the amount of fuel the car consumes.

In Ukraine there are three main fuels used in vehicles - unleaded petrol, diesel and Liquid Petroleum Gas (LPG). Of these, petrol is the most expensive per litre, followed by diesel and, the least expensive, LPG. From the table below LPG appears to be the clear leader when it comes to CO<sub>2</sub> emissions.

Fuel type	CO <sub>2</sub> emissions
Petrol	2.3 kg/L
LPG	1.6 kg/L
Diese	2.7 kg/L

Fig. 1. CO<sub>2</sub> emissions by fuel type

However, vehicles running on LPG require more litres of fuel per km than their petrol equivalents. Then diesel engines are generally more economical than petrol engines, thus producing less CO<sub>2</sub> emissions. Petrol engines generally produce more CO<sub>2</sub> emissions than their diesel counterparts due to lower efficiency.

There are two major factors that contribute to a vehicle's fuel consumption: engine efficiency and weight.

The weight of a car directly affects the amount of fuel it needs. Lighter cars on the whole consume less fuel than their super sized counterparts. Therefore, selecting smaller vehicles with lighter parts and less materials can decrease a vehicle's impact on the environment.

Although not available in Ukraine, there are number of alternative-fuel vehicles waiting in the wings. Their producers promise significant cuts in or the elimination of fossil fuel consumption and/or greenhouse gas emissions. Of course, they are not cheap, but owing to leasing mechanism ecofriendly cars can be affordable.

30% of Europe's demand for new cars is controlled by the Lease sector. This kind of buying power directly correlates with the European Union's goal to emit no more than 130gr/km of CO<sub>2</sub> for new cars sold in 2015. In response to it Netherlands Society for Nature and Environment has initiated the Cleaner Car Contracts program, which is aimed at mobilising Europe's largest lease companies and fleet owners to accelerate the introduction of fuel-efficient cars [1].

This kind of buying power, if applied to more ambitious goals what is legally required by EU law, can greatly speed up the much needed fuel-efficiency improvement of car fleets.

But what prevents Ukrainian drivers from buying more eco-friendly cars through lease?

According to [2] there are such common misapprehensions about car leasing in Ukraine:

1) leasing is more expensive than a credit, whereas in fact loan and lease-payments appear to be absolutely compareable, taking into account expenditures connected with registration, insurance, tech inspection, transportation tax and other expenses to do with lease or credit;

2) the car is not in ownership of lessee. In reality, according to financial lease terms, after all payments in a part of recoupment of lease object cost are paid off a car might pass into ownership of lessee;



3) in case of bankruptcy of leasing company lessee will forfeit a car, when in point of fact, leasing company cannot be closed until all commitments under contracts, including transfer of cars to clients, are met.

Therefore, one of the main reason for low demand for ecoleasing is unaware of possibilities and advantages of leasing services. Thus, leasing companies should stimulate the demand for eco-friendly cars. But not only leasing companies might do that. Government and environmental organizations must take active part in it as well. Through adopting laws, which stimulate ecoleasing development, and investing money in scientific research into finding ways of CO<sub>2</sub> emissions reduction, government will do really contribute to improvement of ecological situation and speed up the process of environmental leasing popularization.

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# **PRIORITY WAYS FOR IMPROVEMENT OF ENVIRONMENTAL REGULATION INSTRUMENTS WITHIN A PRODUCTION PROCESS**

***Iullia Shyshova***

*Sumy State University, Sumy, Ukraine*

According to the calculations of domestic specialists, which were presented on the World Summit deal with steady development which took place in Johannesburg in the 2002 year, energy content of national GDP exceeds a world average value in 14,31 times, electric power content - in 8,8 times, water content - in 2,83 times. The receipt of GDP unit in Ukraine is accompanied by such amount of CO<sub>2</sub> emission, which in 15,25 times exceeds an analogical index in the world. As the analysis shows, declining of the materials capacity of resource streams (known as the strategy of dematerialization in economic theory) during production acquires significance in order to solve the problem of resources capacity for mine-out products.

Essence research of concept of productive activity dematerialization that is successfully used in the developed countries allowed us to formulate determination of this concept taking into account outlook of its further introduction and use in Ukraine. Thus, we understand the strategy of production dematerialization as the declining of materials capacity of products, on condition of conservation its qualitative descriptions at all stages of productive process. The declining of materials capacity of products must take place at the stage of preparation materials for the production by diminishing the volumes of input material streams in a production. It

will facilitate liquidation of possible contamination reasons instead of diminishing actual losses, inflicted to the environment as a result of consuming considerable amounts of resources during productive activity.

Successful realization of dematerialization strategy at the level of national economy depends on its effective implementation at the microlevel that is at the level of enterprises during their production process. Embodiment of dematerialization in production is carried out by means of direct or indirect influence:

- direct influence foresees the decline of material (circulating assets) use during the production and their replacement by easily extractive materials which are highly demanded by consumers;

- indirect – can be realized through replacement of out-of-date equipment (capital assets) by the newest resource-saving technologies and sewage facilities.

Capital assets are subject to dematerialization at the stage of preparation the equipment and materials to the productive process, directly during updating the equipment, technologies. Unlike them circulating assets are object of embodiment production dematerialization at all stages of productive process.

Introduction of production dematerialization foresees using of effective financial instruments aimed at nature protection activity depending on the stage of production process. Circulating assets pass consistently three stages: preparation, or purchasing materials that form inventories; direct production that is transformation inventories into outgoing inventory or output; distribution, that is a receipt of profit after selling output. The conducted research shows that different ecological regulation tools operate effectively according to the level of their influence on consumer's behavior on the production stage they are used in.

At the preparatory stage of the production incentive instruments of environmental management, such as: ecological subsidies, tax deductions, nature protection investments, paying for contamination, - make the desired splash. Using of incentive instruments of the ecological regulation has long-term character that allows taking into account these instruments during development the medium- and long-term strategy of enterprise and in a process of business-planning. It motivates producers to do early and systematic modernization of productive process by investing own or raised funds in nature protection projects. The final goal of using incentive instruments in productive activity is maximization of financial results by means of:

- updating equipment by the newest sewage facilities and resource-saving technologies;

- declining of products materials content.

It will assist diminishing of both productive and non-productive charges, in particular through diminishing of eco-payments and pecuniary penalties for contamination.

Regulative or administrative instruments are used at the stage of direct production depending on the level of materials content of products which are produced and externalities of productive activity for environment. Regulative tools are good at realization a legality control of using natural resources after the norms of ecological

law. They are environmental subsidies, tax incentives, environmental investments and environmental guarantee loans. Administrative instruments are used if the productive activity results in the considerable losses of environment. They are pollution permits trading, environmental taxes, quotas on extraction of natural resources, environmental insurance, environmental pollution quotas.

At the stage of production distribution or consumption we suggest to use such instruments of the ecological regulation as obligatory withholdings from producer profits share in order to make a further reinvestment in nature protection projects in the spheres of production, where material streams are extraordinarily large.

It does not mean that the noted groups of financial instruments do not influence on the behavior of commodity producers at the other stages of productive process. The proposed mechanism of their use will allow attaining the best result.

In order to solve the problem of high-level recourses contain in output production we propose such priority line of forming an effective environmental policy as implementation of production dematerialization strategy in economic activity of market participants. Successful implementation of the production dematerialization strategy is possible thanks to the creation of a mechanism for effective use of financial instruments of environmental regulation according to the level of influence on the behavior of producers at all stages of production.

## **BIOECOLOGICAL PECULIARITIES OF CAPRIFOLACEAE JUSS. FAR EASTEN ORIGINATION AND PROSPECTIVES OF ITS USAGE IN LANDSCAPE GARDENING OF THE CENTRAL PODILLIA**

***V.A. Silchuk, G.A. Biletska***

*Khmelnytskyi National University, Khmelnytskyi, Ukraine*

Nowadays landscape gardening is one of the components of architectural aesthetical projecting of territories.

It also takes an important place in the process of creation of individuality and peculiarity of architectural territorial complex.

Green plantings give possibility to underline valuable architectural decisions, buildings, objects of culture, help hide unsuccessful elements of construction and relief faults. Recreational function of green planting in the condition of intensification of human industrial activity, acceleration of pace of the urban life and arising of psychological overloading with simultaneous decrease of physical loading in cities. Besides, one should admit that landscape gardening facilitates the development of the aesthetic component of young generation outlook.

Adequate choice of plants plays an important role while greening territories. They should have decorative and aesthetical properties, be resistant to the

influence of the urban environment. Biological ecological peculiarities of the plants play an important role as well.

One of the families representatives of which can be used in landscape gardening is the family of honeysuckles (*Caprifoliaceae* Juss.). The family has approximately 15 genera and about 500 species, which are mostly spread in the north hemisphere, moderate and subtropical zones. All representatives of the family are evergreen shrubs, sometimes climbing plants, rarely small trees or grass.

Most honeysuckles are forest plants. They are peculiar to the deciduous and mixed forests, plains and middle rocky relief, species of some genera can be found in coniferous forests, in subalpine and alpine zones of mountains where they grow on the slopes and cracks of rocks.

Bushes of the honeysuckle family are famous for their decorative characteristics, a lot of them are grown in the gardens, parks, near buildings. They are species and garden sorts of Tatar honeysuckle (*Lonicera tatarica*), Middle Asian Korolkov honeysuckle (*L. korolkowii*), Japanese honeysuckle (*L. japonica*), goat's leaf or honeysuckle the most odourous (*L. caprifolium*), Etruscan honeysuckle (*L. etrusca*), white snowberry (*Symphoricarpos albus*), and species of East Asian genera of weigela with big pink or red flowers.

Opposite leaf aestivation characterizes honeysuckles. The leaves are usually conjoint or blade shaped sometimes fleecy- or three-folded. The stipules are absent or have a shape of a leaf, scales, hairs, glands. The upper leaves on the top of the shoots often grow together and create a flat wrapping around the stem.

The flower has a cup with a short tube which grows together with ovary. The corolla is a tabular, bell, wheel or funnel shaped three or five bladed often two lip turning back. As a rule they have 5 stamens sometimes 4 (species of honeysuckle) or 2 (carmelania). The ovary is lower or semi-lower, one- or five-cluster with one or a lot of seeds in each cluster. The fruit is a berry with a bone (one- or many-boned) or a boll which opens with the help of leaves which are on the top. The ovary and fruits of some honeysuckles are co-grown.

All honeysuckles are pollinated by insects. A lot of species release nectar. Fruit of honeysuckles can be spread by birds and air flows.

With the aim of selection and amateur gardening honeysuckles are bred with seeds, while in landscape gardening it is better to bred the plant with the help of vegetative method.

Most of honeysuckles prefer light and open sunny plots. They usually grow and blossom in the lighted and partly shaded places. However forest species can bare shadow and grow under trees.

Representatives of honeysuckles family have wide range of adaptation to the soil conditions and grow on any type of soil. The best soils for these plants are soft, moderately wet with light alkali reaction of soil solution. Forms of weigela genera prefer wet soil. On hard, heavy and too wet soil honeysuckles grow bad. Poor sandy soil and dry plots are bad for growing honeysuckles.

In the Botanical garden of the Khmelnytskyi National University there are 15 species and forms of honeysuckles family 6 of which are of Far Eastern origin among them the most odorous honeysuckle (*L. fragrantissima* Lindl. et Paxt.), Girald honeysuckle (*L. giraldii* Rehd.), Japanese honeysuckle (*L. japonica* Thunb.), glittering honeysuckle (*L. nitida* Wils.), cap shaped honeysuckle (*L. pileata* Oliv.), weigela (*Weigela florida* (Bge) A. DC.).

Representatives of the honeysuckles family of the Far Eastern origin which grow in the Botanical garden of the Khmelnytskyi National University are brought to the city from botanical gardens of the Chernivtsi National University named after Ivan Franko, Sofiiivka National Dendropark of Ukraine, the seed plot of the Volyn Regional Department of Forest farming.

The experience of breeding and growing species and forms of honeysuckles family in Ukraine on the territory of Podillia, Bukovyna, Galychyna and Volyn in particular witness the good adaptation of the representatives of this family to the climatic and ground conditions of certain areas and prospective of their usage in landscape gardening of the Central Podillia as a whole and Khmelnytskyi region in particular.

## **PAYMENT FOR THE NATURAL CAPITAL USE AS AN INSTRUMENT OF NATURE USE MANAGEMENT**

***Iryna Sklyar, Mykola Kostel***  
*SumDU, Ukraine*

The question of development of the scientifically-methodical approaches to establishment of payment for the use of natural capital acquires the special significance in the decision of task of forming of effective mechanism of nature use management. Establishment of the payment for the natural capital use is to start with a necessity of implementation of key task - - stimulate of natural resource users to effective use of present natural resources in a production and consumption.

In addition, payment for the natural capital use is to become the effective instrument of adjusting of sphere of nature use in direction of the gradual diminishing of level of loading on an environment, introduction of the raw material complex use technologies, secondary processing of wastes, providing of optimal proportions of exception and use of natural resources and their distribution between different generations, to be adequate to the modern queries of the social - ecological - economic system and to concentrate administrative influence on near-term tasks which faces the system nature use management.

We offer to determine the size of payment for the natural capital use from individual natural resource user coming from the size of economic evaluation of natural capital and corresponding rate, which characterizes requirements to the

profitableness of its use. Economic maintenance of such rate can be interpreted as a certain percent for using a capital, in this case natural.

The theoretical basis of such approach is related to the theory of percent of I. Fisher, which examines a capital as some universal category - as stocked riches in cost and naturally-material forms. Such approach allowed to ground the common nature of all types of profits. A percent is examined not as separate profit in this theoretical model, but mostly as description of all profits, as an interlink between a capital and profit.

Moreover, there is a possibility of concordance of ecologic and economic interests providing in establishment of pay for the natural capital use, as certain rate of percent on this capital, because traditionally a percent is examined as an indicator and simultaneously universal instrument of concordance of economic interests.

Rate of payment for the use of natural capital might be examined as minimum acceptable rate of profitableness of the use of natural capital, which includes two constituents :

- general (general system), which represents requirements to the profitableness of the natural capital use, due to general conditions and the state ecological and economic progress trends;
- individual, which depends on individual descriptions of ecological and economic activity of individual natural resource user.

The first constituent forms due to general requirements - coming from the minimum acceptable level of profitableness of insetting of investment capital and determined by the size of risk-free rate, corrected on the amount of rate of efficiency of intertemporal allocation of resources [1].

The second constituent depends on the individual ecological and economic parameters of activity of individual nature resources' user, its branch belonging and is determined coming from the middle level of profitability of economy. The individual ecological and economic parameters of activity are taken into account by determination of coefficient of relative level of the economic loading on assimilatory potential of environment. This index characterizes correlation of changes of aggregate of indexes of loading on the natural environment of concrete production and changes of the same indexes of select base of comparison. In the calculations of this index is taken into account the scale of economic activity by the subject of ménage. Advantages of his application is dynamic (ecological and economic parameters considered not for separate period, but for the row of previous periods, also these indexes are correlated taking into account deviation from a middle level), relativity (comparison of tendencies of change of ecological and economic performance of natural resources user and control group of enterprises indicators), motivation to rational nature use [1].

Payment for the natural capital use in the system natural use management must execute the following functions:

1. An assistance to the use of the limited amount of natural resources with maximal efficiency.
2. Distribution of the use of natural resources in time.
3. Optimization of the territorial placing of production.
4. Stimulation of the effective use of present natural resources.

The size of payment for the natural capital use on a certain territory directly depends on high-quality descriptions of natural resources and natural environment of such territory, that determine its economic evaluation.

Offered approach to determination of payment for the natural capital use considers the negative consequences of inefficient nature use and stimulate natural recourses users to diminishing of negative influence on an environment.

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## **THE DEVELOPMENT TO ECOLOGICAL DIRECTIVITY OF THE OPERATION ENTERPRISE**

***T.V. Sviridova***  
*DSMA, Ukraine*

In recently particularly actual is a problem of the entering the Ukraine in world community as its enjoying full rights partner. In condition of the economic crisis on the first plan are brought forth problems of the global economic nature. The ecological problems leave on the byplay though they have a significant negative influence upon factors of the operation economic subject.

The imperfect system of the management of the Ukraine decennial event was formed disregarding need of the population and ecological possibilities its concrete territory.

Excessively high rates of the economic development technogenic type on base exhausting principle nature of the use has brought about origin integer row of the ecological problems, which include negative change the climate, degradation of the lands, breach of the circulation and deficit of water, loss of the biovariety and other, which in one or another measure have covered all regions.

The intensification to ecological situation becomes particularly sensitive in condition of the crisis phenomena's in economy, as exists in economy of the Ukraine.

The crisis condition surrounding natural ambience becomes one of solving factor social-economic development. What notes prof. E.V.Girusov, "increasing influence society on natural ambience brings about growing of the influence by changed people of the nature on development most society. In modern condition in much greater measure, than earlier, reveals itself the dependency a society from condition of the natural ambience".

The ecological crisis - a critical condition of the relations society with nature, which is characterized discrepancy of the development of production power and production relations of the separate way production resource-ecological possibility surrounding ambiances. So theoretically and practically necessary to approach to decision ecological and economic problems simultaneously and mutually.

In Ukraine quip and depth of the manifestation both crisis phenomena's vastly escalated that that they occur simultaneously.

The Ukraine is a country of the Europe with constantly increasing factor technogenic loads on surrounding natural ambience (table 1).

The data are indicative of small improvement of the situations with technogenic by load on surrounding natural ambience, however ecological situation in natural surrounding ambience, as vitally important ambience for existence of the person, still remains rather complex. At period with 2000 before 2007 exists the constant growing of all factors of the influence upon surrounding natural ambience, as follows on 25% in comparison since 2000 increased the amounts a surge polluting material, on 16,3% increased the unsets of the polluted sewages in surface water objects. On length of the period, which is analysed, exists the reduction of the formation departure I-III classes to dangers, but in places of the salvaging departure is saved 21,0 mln.t. these departure. Simultaneously with this exists the constant growing of the volumes of the internal gross product, which is indicative of close-fitting intercoupling of these factors.

Table 1 - a Factors of the influence upon surrounding natural ambience (on Ukraine as a whole)\*

the factor	years				
	2000	2005	2006	2007	2008
The Internal gross product, mln. UAH	170070	441452	544153	720731	949864
The Costs on guard surrounding natural ambience, mln. UAH	3224,3	7089,2	7366,6	9691	12176
The Surges polluting material, thous. t.	5908,6	6615,6	7027,6	7380	7210,3
Unsets, mln m <sup>3</sup>	3313	3444	3891	3854	2728
Formation departure, thous. t.	2613,2	2411,8	2370,9	2585,2	2301,2

\* Given State committee of the statistics of the Ukraine



The situation changed in small degree in 2008: exists the reduction a surge on 2,3% in contrast with previous year, unset - on 29,22%, formation departure - on 10,99%.

Positive also is a trend to constant increase the costs on guard surrounding natural ambience, which in comparison since 2000 increased in 4 times nearly.

Considering speaker of the brought factors possible to draw a conclusion that in Ukraine exists the eco-economic crisis, which destroys the traditional system to livelihood nations and is one of the main of the reasons to degradations ukrainian society. So, accordingly Environmental Performance Index, which was accepted on Worldwide economic forum in Davose, Ukraine in 2008 has occupied 75 places with 149 countries.

Thereby, urgent need in development economic efficient mechanism nature and improvement ecological politicians state. The Complex decision of the ecological problems on macrolevel possible when undertaking politicians only, directed on achievement of the firm development of the Ukraine.

## **SPATIAL FORMATION OF WATER PROTECTION ZONES BY GIS**

***T. Tairova***

*Kharkiv National Academy of Municipal Economy, Ukraine*

In the most of the river basins of Eastern Europe including Ukraine, the freshwater contamination level is testified to an environmental situation in crisis and to the incapability of vital environmental systems for natural self-regulation. [1]

In Ukraine for the past 25 years, it is the small river is most felt the pressure of human activity, these being the most changed, and some have even completely disappeared.

Direct factor of influence on the small rivers is the presence of flow (treated and untreated): municipal, industrial, agricultural. They are particularly dangerous, because in some cases the runoff volume can be the same or higher than the small rivers runoff. [2]

Surface runoff from agricultural land contains erosion products, chemical fertilizers remnants, pesticides and bacteria. [3]

The main legislative regulating act of using, water protection, state management and control of water use and protection, water resources restoration is the Water Code of Ukraine, promulgated by Decree of the Verkhovna Rada on June 6, 1995.

Water protection zones are established to create a favorable regime of water bodies, preventing pollution, clogging and depletion, plants and animals destruction.

The upper boundary of water protection zones are defined by specialists in specific developed projects on the basis of normative and technical documentation. [4;5]

The problem is that the "regulation" defines only the general principles of water protection zones are not fully take into account the environmental load on the water body as a result of economic activities and natural conditions (topography, composition of the ground etc.). On the design of water protection zones is necessary to perform complex operations of spatial analysis and process a large amount of heterogeneous information.

The more river management, the more should be the size of protection zones.

In such conditions, traditional environmental protection measures based on available technical and technological solutions may be limited.

The most blatant contravention of standards and requirements include [1]:

- soil ploughing up to the waterline or shore (bank) ledge;
- location of agricultural activity directly in the waterside zone;
- omission of simple biotechnical measures, such as bank forest shelter belts, etc.;
- herding of animals in the area close to the banks which causes deterioration in landscape stability through destruction and disturbance of the vegetation cover;
- waterside dumping as a result of the fertilizer storage, uncivilized recreation and other negative environmental consequences of local economic and social activity

Geographic information technology provides a detailed description of the structure and surface features to evaluate soil and land use, creates the necessary conditions for adequate representation of the spatial variation of erosion damage factors and other processes that occur in natural landscapes and agrolandscape system. [6]

Thus, for the problem solving of the water protection zones must be specified under not on economic development of land but according to natural and geographical conditions of this territory.

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## **APPROACHES TO THE ESTIMATION OF RECREATIONAL LOADING ON OBJECTS OF NATURAL-RESERVED FUND**

***J.N. Tomashpolskaja***

*Odessa state environmental university, Ukraine*

Preservation of environment and acceptance of administrative decisions, recreational use of natural resources of natural-reserved fund (NRF) territories demand certain regulating actions. Regulation of recreational loading is one of preservation methods, rational use and reproduction of natural-landscape complexes (NLC), their plant and animal life, cultural and aesthetic value of objects and territories of NRF. Such regulation is impossible without an establishment of the scientifically-proved and weighed specifications of recreational loading on natural complexes of NRF. Nevertheless, modern specifications, which define level of recreational loadings on natural complexes, do not make uniform system. We have analyzed: techniques of definition of recreational capacity of the territories, developed by M.V.Kopach, I.M.Jakovenko; the techniques used in grants on recreational geography of A.S.Kuskova, V. L. Golubevoy , I.T.Tverdohlebovoy; «Criteria and methods for an estimation of optimum recreational loading on water objects» by Kenneth R. Porter; «The quantitative estimation of loading at unorganized recreational activity» by Andy Johns etc. But the most comprehensible to Ukrainian regions are «Methodical recommendations for definition of the maximum recreational loading of natural complexes and objects in borders of natural-reserved fund of Ukraine using zonal-regional distribution [1]. According to the type of separate NLC or NRF object methodical recommendations provide definition of its stability degree and a

digression stage, as the maximum recreational loading depends also on these indicators. The matrix table of size change of the maximum recreational loading on natural complexes and objects in borders of NRF depending on a recreational digression stage and stability degrees is resulted in methodical recommendations.

On the basis of the given methodical recommendations the analysis of the maximum recreational loading for territories of Nizhnednestrovsky national natural park (NNP), which is a part of a steppe zone where there are neither wood nor wood types of a landscape, had been carried out. The considered reserved territory can be carried to not wood type of NLC [1] where hygrophytes prevail, and on firmness degree to recreational loading can be carried to the first degree. The vegetative cover of inundated meadows is damaged on the considerable area, the quantity of meadow grasses has decreased, there are weeds and meadow vegetation not typical for the given region. But layering of a inundated meadows vegetative cover is still kept that allows us to appropriate to the territories of Nizhnednestrovsky NNP the 3<sup>rd</sup> digression stage, and recreation factor (k) = 11-30 %. For Nizhnednestrovsky NNP we had calculated capacity of an ecological track or a route under the formula:

$$P_{dn} = (T-L/V) \cdot G \cdot V = T \cdot G \cdot V - (L \cdot G \cdot V)/V = T \cdot G \cdot V - L \cdot G,$$

where  $P_{dn}$  – quantity of people;

T – time of an open route, ч;

L – length of a line, km;

G – density, foreheads/km;

V – speed of movement, km/h.

Thus,  $P_{dn}$  is 15 people.

Final definition of the maximum recreational loading according to the tables resulted in «Methodical recommendations for definition of the maximum recreational loading of natural complexes and objects in borders of natural-reserved fund of Ukraine on zonal-regional distribution» became a following stage. As Nizhnednestrovsky NNP is a part of Pravoberezhno - Prichernomorskaya area, taking into account firmness and digression stage, degree of the maximum recreational loading should be 7-9 people - day/hectare. On dry meadows the maximum loading should be 1 / (0-2) people - day/hectare, on low-lying, wet and other meadows – 9 people - day/hectare, on coastal, opened, easy soils – 7 people - day/hectare, on heavy soils – 9 people - day/hectare. Fishing from coast is authorized for 50 people - day/hectare, from a boat – for 20.

# **ECOLOGICAL TOURISM AS THE OBJECT OF THE REGIONAL MANAGEMENT**

***Anna Vartanian***

*Odessa State Environmental University, Ukraine*

The management problem in tourism consists not only in revealing the general tendencies and laws of its development, but also in finding its specific features.

In the tourist industry it is a lot of enterprises and organisations which anyhow should be entered in a uniform regional control system where the purpose is maintenance of long competitiveness in the market. The strategy should be developed by means of management as for the all region, so for the separate tourist organisation.

In this abstracts the regional problems of ecological tourism's formation are considered, because this kind of tourism is necessary for developing in our state for attraction of the tourists' stream. For development of this kind of tourism it is necessary to generate system of the ecological tourism's management, thus considering specificity of each separate region of the country.

Management in classical understanding is an ability to achieve objects in view, using work, intelligence, motives of other people behaviour. Management of the ecological tourism unites system of classical management with specific actions which are peculiar to ecological tourism. As the cores among such actions are considered:

- preservation of a biological variety of recreational territories;
- maintenance of their sustainable regional development;
- formation of ecological outlook of tourists and local population;
- management of mutual relations with local residents.

The gathering of the special information should precede the planning in the ecotourism in case of creation the tour product, and in case of intention to make ecological travel. Special information about:

- the features of recreational territory;
- the climate of the region;
- flora and fauna;
- the representative of the endemic kinds presence;
- the traditions and customs of local population.

An indispensable condition for the organisation and carrying out of ecological rounds is preservation of a biological variety of recreational territories. Realisation of this major function of ecological tourism is based on the nature protection legislation, behaviour principles in protected territory, a reasonable finance administration.

Financial investments to a great extent define efficiency of nature protection actions. Ecological tourism cannot successfully develop, if a certain part of the

means received from it, does not come back for maintenance of recreational territories.

The ecotourism is the kind of sustainable tourism based on the nature, and usually following an accurate set of principles or good an expert. The pivotal problem for all enterprises of the real ecotourism is the practice which is called like **“greenwashing”**. This term use concerning the enterprises which position itself as **"sustainable"**, **"ecological"**, **"green"**, **"responsible"**, **«ecotouristic»**, but actually mismatch the standards and even worse, are with them in the open contradiction. For those who really try to correspond to all ecotouristic standards, such enterprises which are false covered with the term **«ecotourism»**, cause a notable loss and undermine trust to all industry of steady tourism. One of ways to establish what of the enterprises, actually, is engaged the ecotourism is the certification.

Certification is the one of ways to guarantee, that activity or products answer certain standards. In the tourism industry the various organisations have already developed programs on certification which estimate various aspects in tourism: quality for all industry of tourism, stability - also for all branches of tourism and the ecotourism - for sustainable tourism which is spent in natural, protected and fragile ecosystems and can include radical communities and answers the definition resulted above.

In sphere of functioning of the ecological tourism's market in Ukraine the system of certification has no accurate treatment. The given system should be developed on the international examples and is accepted at legislative level.

For today the majority of the organisations, establishments and the enterprises which are engaged in tourist activity, realise importance of wildlife management, maintenance of the counterbalanced development of tourism in various regions as the destiny of tourist sector depends on existence of these regions. The role of ecological tourism in economy of Ukraine cannot be underestimated, as development of this branch allows to increase incomes of local budgets and to create workplaces that promotes the decision both economic, and social problems.

# CONSEQUENCES OF THE 'GREEN REVOLUTION' IN THE PUNJAB

***Oleksandra Vasylevs'ka***

*Research advisor: Polikarpova Yu.O.,*

***Candidate of Philological Sciences***

*Tavrida State Agrotechnological University, Melitopol, Ukraine*

The world crisis made all us think about the future. To solve different ecological problems and cope with socio-economic challenges people have to change their attitude towards the nature and transfer from the 'black' economic model to the 'green' one. We have to choose the path for further development of Ukraine. But experience of other countries has to be taken into account.

The objective of our research is to analyze consequences of the 'Green Revolution' in the Punjab.

The Punjab is a cultural region straddling the border between Punjab (Pakistan) and Punjab (India). It pioneered in 'Green Revolution' in 1960s. In 1961, the Ford Foundation launched its Intensive Agricultural Development Program in India intended to introduce modern intensive chemical farming in the country. Other agencies (the World Bank, the Rockefeller and Ford Foundations, the US Agency for International Development, etc.) looked towards the intensification of agriculture as a means of "stabilizing" the countryside – and in particular of defusing the call for a wider redistribution of land and other resources. Besides, the USA wished to avoid other Asian countries' following in the revolutionary footsteps of China. Another reason for promoting 'Green Revolution' in the Punjab was pressure from western agrochemical companies who wanted higher fertilizer consumption overseas. Since the early 1950s, the Ford Foundation had been pushing for increased fertilizer use by Indian farmers with some success. By the mid 1960s, India's agricultural policies were geared to forcing the introduction of the new "miracle" seeds (high-yielding varieties of wheat) developed by Borlaug, awarded the Nobel Peace Prize in 1970. The program came to be known as the New Agricultural Strategy. It concentrated on one-tenth of the arable land, and initially on only one crop – wheat. By 1968, nearly half the wheat planted came from Borlaug's dwarf varieties. The problem was that the "miracle" seeds as high-yielding varieties of wheat were just a myth. The distinguishing feature of the seeds was that they were highly responsive to certain key inputs such as fertilizers and irrigation water. In the absence of additional inputs of fertilizers and water, the new seeds performed worse than indigenous varieties.

As a result, the 'Green Revolution' in the Punjab has been a failure. Nowadays the state is witnessing serious consequences of intensive farming using chemicals and pesticide. The most disastrous of them are [1]:

1) *reduced genetic diversity*: 'Green Revolution' has reduced genetic diversity, because it replaced mixtures and rotations of crops like wheat, maize, millets,

pulses and oil seeds with monocultures of wheat and rice; the introduced wheat and rice varieties came from a very narrow genetic base and the food supplies of millions are precariously perched;

2) *increased vulnerability to pests*: because of their narrow genetic base, high-yielding varieties of wheat are inherently vulnerable to major pests and diseases, large-scale monoculture provides a large and often permanent niche for pests, turning minor diseases into epidemics; in addition, fertilizers have been found to lower plants' resistance to pests; the result has been a massive increase in the use of pesticides, in itself creating further pest problems due to the emergence of pesticide-resistant pests and a reduction in the natural checks on pest populations;

3) *soil erosion*: over the centuries, the fertility of the Indo-Gangetic plains was preserved through treating the soil as a living system, with soil-depleting crops being rotated with soil building legumes, but the consequences of 'Green Revolution' are that marginal land or forests have been cleared to make way for the expansion of agriculture; rotations have been abandoned; and cropland is now used to grow soil depleting crops year-in, year-out; since the start of the 'Green Revolution', the area under wheat, for example, has nearly doubled and the area under rice has increased five-fold. During the same period, the area under legumes has been reduced by half;

4) *water shortages*: traditionally, irrigation was only used in the Punjab as an insurance against crop failure in times of severe drought, the new seeds, however, need intensive irrigation as an essential input for crop yields, although high-yielding varieties of wheat may yield over 40 per cent more than traditional varieties, they need about three times as much water, so the result of the Green Revolution has created conflicts over diminishing water resources;

5) *reduced soil fertility*: as a result of soil deficiencies, the productivity of wheat and rice has declined in many districts in the Punjab, in spite of increasing levels of fertilizer application;

6) *micronutrient deficiencies*: increased fertilizer use has not compensated for the over-use of the soil, high-yielding varieties rapidly deplete micronutrients from soils and chemical fertilizers (unlike organic manures which contain a wide range of trace elements) cannot compensate for the loss, micronutrient deficiencies of zinc, iron, copper, manganese, magnesium, molybdenum and boron are thus common;

7) *soil contamination*:

8) *reduced availability of nutritious food crops for the local population*: the 'Green Revolution' has decreased food security for a large number of people, the unfavorable shift of subsistence-oriented cropland to cropland oriented towards production of grain for export or animal feed was made (for example, the Green Revolution replaced much of the land used for pulses that fed Indian peasants for wheat, which did not make up a large portion of the peasant diet);

9) *health impact*: the Punjab is turning into a cradle for cancer and congenital defects due to the large scale and indiscriminate use and abuse of chemical



pesticides (infertility, cancer related deaths increasing, childhood cancers, mental retardation, etc.); the Green Revolution has also led to a change in dietary habits, as less people are affected by hunger and die from starvation, but many are affected by malnutrition such as iron or vitamin-A deficiencies (almost 60% of yearly deaths of children under age five in developing countries are related to malnutrition);

10) *the displacement of vast numbers of small farmers from their land*: the transition from traditional agriculture, in which inputs were generated on-farm, to Green Revolution agriculture, which required the purchase of inputs, led to the widespread establishment of rural credit institutions; smaller farmers often went into debt, which in many cases results in a loss of their farmland; the increased level of mechanization on larger farms made possible by the Green Revolution removed a large source of employment from the rural economy; the beneficiaries of the 'Green Revolution' have been the agrochemical industry, large petrochemical companies, manufacturers of agricultural machinery, dam builders and large landowners;

11) *rural impoverishment and increased tensions and conflicts*: because wealthier farmers had better access to credit and land, the Green Revolution increased class disparities; the rich-poor gap widened due to that; because some regions were able to adopt Green Revolution agriculture more readily than others, interregional economic disparities increased; many small farmers are hurt by the dropping prices resulting from increased production overall; the worsening lot of the peasantry in the Punjab has undoubtedly contributed to the development of Punjab nationalism. Many complain that the Punjab is being treated like a colony in order to provide cheap food for urban elites elsewhere in India [2].

As a conclusion, Ukraine should choose the ways of its further development. Global trends are connected with 'greening' of the economy. The case of the Punjab demonstrates that the idea of 'greening' has to be grounded on the idea of organic production. Poor experience of the Punjab has to be thoroughly studied by the Ukrainian researchers in order to prevent negative consequences of agricultural development.

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# **EFFECTS OF INCLUDING THE AVIATION SECTOR IN EU ETS FOR UKRAINE**

***Nataliya Vasylyeva***

*National University of "Kyiv-Mohyla Academy", Kyiv, Ukraine*

In 2003 the European Emissions Trading System (EU ETS) was implemented. But despite the fact that this scheme imposed tough duties on European industrial enterprises, it was blamed for supporting such polluting areas as maritime and aviation sectors which were not included in the EU ETS [1, 2]. Today the aviation contributes only about 3% of overall greenhouse gas emissions but it is important to take into consideration the fact that aviation is developing rapidly. The report Reducing the Climate Change Impact of Aviation forecasts that emissions from all international flights from European airports will increase by 150% since 1990 until 2012 [1].

In our research we have analyzed the potential effect of the including aviation sector into the European Union Emissions Trading System for Ukraine.

In order to reach 20% decrease of greenhouse gas emissions reduction within EU it was decided to include aviation into the Community scheme for greenhouse gas allowances trading. A new document was issued in 2008: Directive 2008/101/EC (the Directive), that was an amendment to Directive 2003/87/EC, which established a scheme for greenhouse gas emission allowance trading in EU. In 2009 the EU Directive 2008/101/ EC was adopted and lead to the implementation of the EU ETS principles in the aviation area. It was considered that aircraft operators have the most influence and control over the aviation operations and types of planes used. Therefore, they should be responsible for imposed obligations and such actions as preparing monitoring plans and monitoring greenhouse gas emissions according to submitted documents.

Under the rules of the Directive, from the year 2012 all commercial flights departing from and arriving at EU airports will be included in the European Emissions Trading System [2]. There are some exceptions such as commercial operators which perform fewer than 243 flights per year or with total annual emissions lower than 10 000 tonnes [2]. Each aircraft operator is to be regulated by a Member State in questions of all their activities and operations to, from and within the EU. At that it is important to mention that each Member State is responsible after a number of aircraft operators whose emissions in a base year were the most attributable to the EU Member State.

The quantity of allowances for aviation is counted on the base of the mean average of the annual greenhouse gas emissions from the aviation activity within the EU in 2004, 2005 and 2006 years. Two periods of ETS are indicated: the first one refers to the last year of the first Kyoto's protocol commitment period, 2012, and next period will begin from 1 January 2013. Consequently, for the first period there will be allocated 97% of the historical aviation emissions; whereas, for the

next periods the amount shall be 95% of the historical aviation emissions multiplied by the number of years in the period [2]. Though, in the future the total quantity of allowances is supposed to be diminished, at least the Commission saved its right to review the percentage. The allocation of allowances for aviation will be done through auctioning: in the first period there will be auctioned 15% of allowances (this amount can be substituted with CERs and ERUs in 2012) and in the next periods the percentage of allowances may be increased and almost for sure will be. Another 3% of allowances constitute a special reserve for specified objectives, such as new players and large increase in aviation activity.

Another important step for aircraft operators is to apply for allocation of free of charge allowances through submitting the verified information for the monitoring year. The monitoring plan should have been submitted until 31 August 2009. There is a large probability that small Ukrainian operators failed to submit documents on time as some part of the European aircraft operators did. To avoid too complicated situation with late monitoring plans Member States' authorities put off deadlines to give another chance to aircraft operators who were late.

More than 40 Ukrainian aircraft operators are to be involved in EU ETS, unless some of them could prove that their activities fall under allowed exceptions. Thus, Ukrainian aviation will also have to comply with the Directive 2008/101/EC and participate in the EU ETS.

From the 1<sup>st</sup> January 2010 a monitoring period has started. Therefore, aircraft operators had to start monitoring according to the submitted plan. Results of specialized interviews conducted for this study, showed that the effects of the introduction of Ukrainian aviation sector to the EU ETS will be the following:

- Update of the Ukrainian aircraft fleet;
- Improvement of the greenhouse gas emissions monitoring system;
  - Increase of flight efficiency within aircraft operators flights (raise of number of passengers per flight);
  - Raising up the amount of interline agreements between different aircraft operators;
  - Some raising up of prices of flights and consequently of ticket prices;
  - Decrease of number of flights to EU airports;
  - Growth of number of international flights in the Ukrainian airports as intermediary stopping for long distance flights.

Therefore, introduction of the aviation sector in EU ETS will significantly effect Ukrainian aviation sector and requires today attention not only from the business but from the government as well.

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# **EFFECT OF COMPOSITE MATERIALS USED IN THE MANUFACTURE OF AIRCRAFT PARTS ON ENVIRONMENTAL POLLUTION AND THE ECONOMY**

***S.M. Vereshaka, E.T. Karash***

*Sumy State University, Sumy, Ukraine*

We have investigated and compared energy use and production of emissions when various aerospace materials are used in aircraft. Computer-based models were prepared to compare lightweight composites with the traditional heavier aluminum over their whole lifetime which is termed a “lifecycle assessment”. This included raw materials, production, useful life in the aircraft and disposal at the end of the material’s useful life. The information provided by this work is independent of industrial influence and so provides an objective view of potential savings in energy and emissions [1].

Lightweight composite materials such as carbon fiber-reinforced epoxy resins and glass-fiber reinforced laminates are increasingly finding application in aircraft to replace traditional heavier metal structures. In commercial aircraft, this is driven largely by the high cost of aviation fuel and the introduction of legislation setting limits on the emission of greenhouse gases. Already the Airbus A380 is constructed of around 25% composites while the Boeing 787 “Dream liner” uses about twice this amount [1]. Composites are especially adept at achieving overall weight reduction but also facilitate the construction of novel aerodynamic aircraft shapes such as the blended wing-body thus providing additional routes to improved fuel efficiency [2].

However, the production, manufacture and final disposal of high performance composites and similar materials for use in aircraft requires considerably more energy than metal components such as aluminum alloys. For example, aluminum can be recycled at about one 20th the energy that it takes to refine it from ores. This energy saving, when aluminum is recycled, provides a significant reduction in the energy use of aluminum over its whole lifetime. This illustrates that it is vital to consider the energy and raw materials used and waste products produced at all

stages of the lifetime of the material. A more accurate view of the total savings in aviation fuel use and emissions achieved by using the lighter materials can be obtained. Lifecycle assessment (LCA) has been employed to ascertain the effect on the environment in terms of fossil fuel use and emissions of potentially hazardous products when different aerospace materials are used. Aluminum alloy (AlCuZnMg, aerospace grade 7075), the laminate GLARE (which is used by Airbus and consists of layers of glass fiber-reinforced epoxy resin sandwiched between aluminum foil), and carbon fiber reinforced epoxy resin composites were chosen for comparison. The choice of these materials had the additional advantage of facilitating the evaluation of the software and currently available data bases for the LCA. The LCA takes into account all the stages of the material lifetime: raw materials, production and manufacturing, useful life in the aircraft and waste management at the end of the component life [3, 4].

The results of our LCA modeling contain data concerning the use and production of literally hundreds of chemicals and raw materials. The exact number of items depends on the particular material and the nature of the processes involved in its overall lifetime. The huge amount of data that is concealed within the LCA model provides a challenge to present it in a meaningful way. For the purposes of this short study, items of current interest have been extracted from the LCA model for further analysis, airborne emissions of substances which influence climate change (known as radioactively active substances<sup>6</sup>) such as carbon dioxide, sulphur and nitrogen oxides and particulates have been initially selected.

From time to time it is discovered that a chemical, previously considered to present no risks to human health or to adversely affect the environment, is actually hazardous. This could be that it adversely affects the climate or causes global warming or perhaps that it is toxic to global environment in other ways. As another example, chemicals that were previously thought to be harmless are often found to be carcinogenic or otherwise damaging to human health. Emissions of particulate materials, for example, can affect both the environment, contributing to climate change and are hazardous to human health. Particulate materials can be particularly damaging to human health if they are produced in the lower part of the atmosphere, around airports for example. When such particulate matter is produced in the atmosphere during flight of aircraft, they become radioactively active and affect global warming. Similarly, aircraft contrails (consisting of mainly water) are thought to be radioactively active and thus influence climate change.

At the present time there is a lot of uncertainty about the effect on climate change caused by water emitted by aircraft. This illustrates the potential of our LCA model as it contains information on many materials and emissions that are likely to be of great importance in the future.

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## **ORGANIC AGRICULTURE DEVELOPMENT IN UKRAINE**

***Olha Vlasova,***

***Research advisor: Polikarpova Yu.O.,***

***Candidate of Philological Sciences***

*Melitopol Institute of Public and Municipal Administration  
of the "Classic Private University", Melitopol, Ukraine*

Current conditions of Ukraine’s development prove that it is time to change our attitude to nature, otherwise it will definitely turn into ecological disaster. In our opinion, the only way to prevent the catastrophe is to start ‘greening’ the economy today. It is well known, that Ukraine has a great agrarian potential which is used inappropriately nowadays. Thus, we are sure that one of the principles of ‘greening’ an economy – organic production – is to be of crucial importance in Ukraine.

The objective of this research is to prove the necessity of organic agriculture development in Ukraine.

Organic agriculture means the one that produces organic food. The term ‘organic food’ has become popular only recently, although it appeared in 1939 in *Lord Northbourne’s* book *‘Look to the Land’*. Originally it was used to describe a holistic, ecologically-balanced approach to farming in contrast to the so called ‘chemical farming’.

Current understanding of organic food is more deliberate. "Organic" is a labelling term that denotes products that have been produced in accordance with organic production standards and certified by a duly constituted certification body or authority. Organic agriculture is based on minimizing the use of external inputs, avoiding the use of synthetic fertilizers and pesticides. Although organic agriculture practices cannot ensure that products are completely free of residues (due to general pollution of the environment), the methods it uses are to minimize air, soil and water pollution. It should be noted that the term 'organic' is mostly used in English-speaking countries as well as Ukraine. In other countries 'Bio', 'Oko' or 'Eco' are more usual.

The primary goal of organic agriculture is to optimize the health and productivity of interdependent communities of soil life, plants, animals and people.

Organic food is the one produced according to the most important ethical principles of organic agriculture. Such principles are:

1) *the principle of health* means that organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible;

2) *the principle of ecology* emphasizes that organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them;

3) *the principle of fairness* means that organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities;

4) *the principle of care* states that precaution and responsibility are the key concerns in management, development and technology choices in organic agriculture.

The organic movement in the world started in the early 1970s with creation of the International Federation of Organic Agriculture Movements (IFOAM). It is the worldwide organization for the organic agriculture movement created in 1972 and uniting more than 750 member organizations in 108 countries. In many countries organic agriculture is already well developed. Currently organic agriculture uses vast lands worldwide (Europe – 5,1 mln ha, Northern America – 1,5 mln ha, Southern America – 4,7 mln ha, Australia – 10,6 mln ha).

In Ukraine organic agriculture is only at the beginning of the long way (270 thousand hectares are only certified as ‘organic’). The analysis shows that the ‘organic movement’ has already started in Ukraine. There are such non-government organizations as Federation of organic movement in Ukraine, Federation of organic producers of Ukraine, Ukrainian Association of organic food consumers, the Club of Organic agriculture, Association of participants of bioproduction ‘BIOLan’, etc.

But a lot has to be done to promote organic agriculture development in Ukraine. The first thing to do is changing the way of thinking of Ukrainian people. It is necessary to provide some assistance to organic producers from the government.

One of the problems of organic producers is that people often don’t know them and, thus, can’t trust them. The organic food traceability has to be provided and seen as one of the prior tasks. Traceability defined as the ability to trace and follow a food, feed, food-producing animal or substance intended to be or expected to be incorporated into a food or feed, through all stages of production, processing and distribution. "Know your farmer, know your food" can be the motto of this process. Besides, the concept of ‘terroir’ – buying food primarily from the local producers – has to be introduced to the public as well as promoted.

As a conclusion, recent years have seen dramatic changes internationally in the organics industry. Demand for healthier, safer food is increasing and organically

grown food absolutely satisfies this need. Organic production is now a commercial alternative but for growth to take place it must be viable for all participants, namely growers, marketers, etc.

## **THE ASSESSMENT OF ECONOMIC RESULTS OF ICT IMPACT ON ENVIRONMENT**

***Olga Volk***

*Sumy State University, Sumy, Ukraine*

Information and communication technologies (ICT) application, supporting the economic development, provides also positive and negative environmental effects. Therefore the problem of taking into account economic results of ICT impact on environment is rather topical.

The integrated social-ecological-economic effect of ICT implementation and use can be presented by (1).

$$E_{ICT} = \sum_{t=0}^T (R_{ICT,t}^{econ} + R_{ICT,t}^{soc-econ} + R_{ICT,t}^{eco-econ} - C_{ICT,t}) \cdot (1+r)^{t-T}, \quad (1)$$

where  $R_{ICT,t}^{econ}$ ,  $R_{ICT,t}^{soc-econ}$ ,  $R_{ICT,t}^{eco-econ}$  – economic, social-economic and ecological-economic results of ICT implementation and use in  $t^{\text{th}}$  year, monetary units;  $C_{ICT,t}$  – ICT implementation and use costs in  $t^{\text{th}}$  year, monetary units;  $r$  – discount rate;  $T$  – period of social-ecological-economic effect of ICT implementation and use appearance, years.

The ecological-economic result of ICT use is a part of ecological result, that appears when using ICT, consists in reducing environmental pressure and can be presented in economic activities.

The annual ecological-economic result of ICT use, in our opinion, can be calculated by (2).

$$R_{ICT,t}^{eco-econ} = D_{prev,t}^{ICT} - D_{caus,t}^{ICT}, \quad (2)$$

where  $D_{prev,t}^{ICT}$  — economic damage of environment pollution, that can be prevented by ICT use in  $t^{\text{th}}$  year, monetary units;  $D_{caus,t}^{ICT}$  — economic damage of environment pollution, that is caused by production, operation and disposal of ICT equipment in  $t^{\text{th}}$  year, monetary units.



In our opinion, the main components of economic damage of environment pollution that is caused by production, operation and disposal of ICT equipment are:

- 1) the economic damage of environment pollution that is caused by production of ICT equipment, accompanying resources and means of production;
- 2) the economic damage of electromagnetic environment pollution (health impairment);
- 3) the economic damage of environment pollution caused by production of electricity, that is used by ICT equipment;
- 4) the economic damage of environment pollution that is caused by ICT waste;
- 5) other economic damage of environment pollution that is caused by production, operation and disposal of ICT equipment.

In our opinion, the main components of economic damage of environment pollution that can be prevented by ICT use are:

- 1) the economic damage of environment pollution that can be prevented by resource saving (dematerialization, moving from products to services etc);
- 2) the economic damage of environment pollution that can be prevented by travel replacement (telework, video- and audioconferences, e-commerce);
- 3) the economic damage of environment pollution that can be prevented by using ICT for disaster monitoring;
- 4) other economic damage of environment pollution that can be prevented by resource saving, dematerialization etc.

The table 1 shows the results of calculations of the ecological-economic result of ICT use in Ukraine. We calculated the prediction of these indicators taking into account the growth rate of ICT users as at the present time ICT use is low in Ukraine. Table 1 shows that the growth rate of prevented economic damage is much higher than the growth rate of caused economic damage, so that positive ecological-economic result of ICT use in Ukraine can be achieved in 2016. In this case the annual prevented economic damage will be higher than economic damage of environment pollution caused by production, operation and disposal of ICT equipment.

The research results shows that efficient ICT use can be a driving force in the achievement of sustainable ecological development.

Table 1 — The ecological and economic results of ICT use in Ukraine, million USD (prediction)

Indicators	2010	2011	2012	2013	2014
Caused economic damage	799,56	800,87	802,37	804,07	806,02
Prevented economic damage	81,42	122,13	183,19	274,79	412,18
The ecological-economic result	-718,14	-678,75	-619,18	-529,29	-393,84

The proposed approach for taking into account economic results of ICT impact on environment can be used during forming the directions of ICT sector development, measures of environmental policies, preparation of regional and national environmental programs.

## **FEATURES OF MATHEMATICAL METHOD'S APPLICATION IN THE ECONOMIC REGIONAL POLICY**

***Katerina Volkova, Nataliya Karaeva***

*National technical university of Ukraine "Kyiv polytechnic institute", Kyiv, Ukraine*

Presently to time for a decision ecologically-economic problems development of the informative systems which unite regions by the indexes of steady development and help in a territorial management became actual. Perfection of mathematical models of the systems is needed, because we cannot use the only analytical system. Thus use primary and derivative (settling) indexes which a quantitative estimation is possible for. At these terms of one of major problems, which must be decided to Ukraine, there is determination of her positions and going near development informatively-analytical providing of effective policy.

Now for the estimation of world concord's development is worked out more than by 1 thousand indexes, after which it is difficult enough to make decision, judge constancies of territories about a degree. It is necessary to range the system of indicators after the levels of priority. The example of such approach is methodology of Commission of UNO on steady development (1996, 2001). Four areas of indicators were forming in 1996 by Commission: social, economic, ecological and institutional and it was recommended to use 134 indicators farther this list in 2001 was diminished to 57, and classification was added on themes [1].

Mathematical model such analyses are the basis of as: cross-correlation, cluster, multicolinear, regressive. A cluster analysis requires most attention.

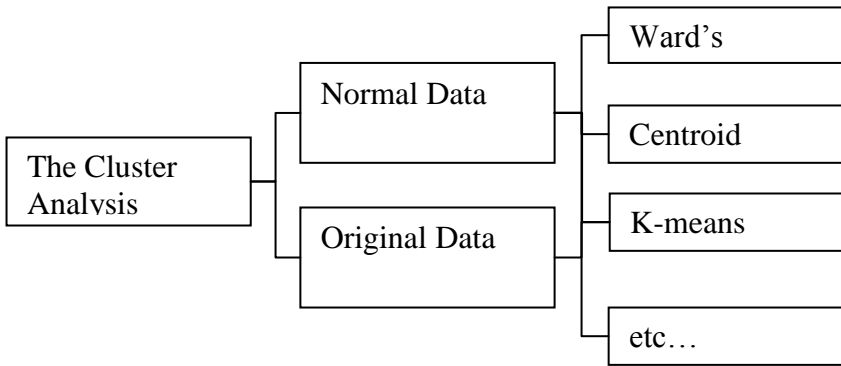
Construction of mathematical model cluster depends on results which must be got as a result of analysis. There are many methods of cluster analysis, which on the sign of necessity of removal of influence of scale of classification signs on results it is possible to divide into two groups: 1) methods of cluster analysis at setting of norms of parameters; 2) methods of cluster analysis without setting of norms of parameters.

Distance between regions can be certain variously in the cluster analysis. Euclidean distance which settles accounts on a formula is mostly used:

$$d = \sqrt{\sum (x_i - x_j)^2}$$

where:  $x$  -value of corresponding parameters.

At the choice of method of cluster analysis, we can lean against a figure 1.



**Fig. 1. Informatively-analytical model of cluster analysis**

The result of territorial's grouping can depend or not depend on data normalizing. It is explained by the different mathematical models of methods.

Most methods of cluster analysis are contained by certain assumptions, those results in appearance of different variants of clusterization even within the framework of one method.

When we use Ward's method, for example, we get different results. That means that in this approach we can use only rationed data. At the use of such methods as: method of next-door neighbor, distant neighbor, centroid method results are almost identical. It enables us to use identifiers in any form.

In our informative system I used the method of counts and rationed data. The mathematical model of this method consists in the following:

- 1) expect Euclidean distance;
- 2) choose "r" - a variable for comparing to the values of Euclidean distance;

3) separating regions, between which  $d > r$ , determine belonging of region to the cluster.

The amount of clusters can be regulated, changing a value of  $r$ .

In a conclusion, for the groupment of territories after the signs of steady development, we can use the different mathematical models of the informative systems, taking into account that, what results we must get. Different approach in ecologically-economic policy needs for different territories.

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# ENVIRONMENTAL AUDIT OF RECREATION ZONES

**O. Zaychenko**

*Kharkiv National Academy of Municipal Economy, Ukraine*

Ukraine has the considerable natural-resource potential which competent use can become one of factors of improvement of state economic well-being.

Realisation of this potential provides using of various economic and administrative tools. One of such tools, finding the increasing application in practice of EU countries, is the environmental audit (EA), which objective – prevention and reduction of negative influence of economic activities to environment.

EA – documentary issued system independent process of estimation object the environmental audit, including gathering and estimation of proofs for an establishment of conformity of certain kinds of activity, measures, conditions, systems of ecological management and the information on these questions to requirements of the environment legislation of Ukraine about protection of and to other criteria of environmental audit.

The primary tasks of environmental audit [1]:

- Gathering information about ecological aspects of industrial activity of object of environmental audit;

- An establishment of conformity of objects of environmental audit to requirements of the environment legislation and other criteria of environmental audit;

- An estimation of efficiency, completeness and validity of measures which are applied to protection of environment.

Objects of environmental audit are: enterprises, organisations, systems of ecological management; others objects, provided by the law. What others objects, provided by the law? As we can see, the answer to this question is not present in the given law, that is it is necessary to search for it with own hand.

Recreational zones – sites of a land or the water space, the population intended for organised mass rest [2]. Recreational zones can be objects of EA because economic activities on them influence to environment.

In spite of the fact that the law «About environmental audit» has been accepted for a long time, procedure EA is turned out somewhat only for the industrial enterprises, for environmental management systems there is an international standard ISO 19011 (In Ukraine – ДСТУ ISO 19011: 2003). For a category of “other objects”, such, for example, as territories (a various special-purpose designation), methodological base of environmental audit has not been developed.

Recreational zones are specially organised territories in cities or other settlements, taken out on a general layout as the zones intended for rest of the population. Specificity of recreational zones as object of environmental audit is that economic and recreational activity on these zones has specific ecological aspects. (The ecological aspect – any aspect of activity concerned with production and services on RZ which affecting to environment).

As it has been told earlier, gathering of the information on ecological aspects of environmental audit object is one of tasks of EA. Definition and an importance estimation (allocation of the most powerful) ecological aspects of recreational zones represent novelty of this research.

At revealing of ecological aspects it is necessary to consider a recreational zone by the system approach. It represents territorial geoecological system with set of interrelations between economic and natural subsystems of RZ and with environment.

Problem of environmental audit of territories in Ukraine has been treated such scientists as Pozachenjuk E. A, Zavalnjuk I.V. They have developed the approach to environmental audit of territories on an example of flat Crimea. But the given approach is not optimum for recreational zones for some reasons:

First, instead of an anthropocentric position on the foreground there should be an estimation of ecological aspects RZ from positions of the environment, a damage put to it. (Proceeding from special-purpose designation RZ);

Secondly, for an estimation of an ecological condition of territories authors used so-called  $K_{lep}$ , factor of landscape potential. At all it is not clear, how was made calculation of anthropogenous loadings and the most landscape potential.

Thirdly, the given approach to EA has been approved on such difficult multicomponent system, as territory of flat Crimea that has not allowed to consider to the full features of territories of a various special-purpose designation entering into this object. And, thereof, specific ecological aspects have not been revealed.

Thus, the aim of treatment is to develop recommendations about environmental audit of the recreational zones considering features of concrete types of similar territories and specificity of their ecological aspects both combining geoecological and system methods of research.

For achievement of this purpose it is necessary to solve next tasks:

- The analysis of legislation in environmental audit and recreation sphere;

- Definition of basic types of recreational zones;
- The system analysis of recreational zones as objects of environmental audit;
- As a result definition of ecological aspects for RZ (different types);
- Working out of aspects ranging technique and definition of significant ecological aspects for RZ different types;
- Working out of methodical recommendations about environmental audit of recreational zones;
- Approbation on real objects.

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## **MECHANISMS OF ECO-LABOR TAX REFORM IMPLEMENTATION IN UKRAINE**

***Vsevolod Zhovtenko***

*National University of Kyiv-Mohyla Academy, Ukraine*

Ukraine is now in need of new effective policy instruments of environment protection. Present tax system requires reform with taking into account ecological challenges. Ukraine experiences decrease of able-bodied population. Present system of fiscal pressure does not contribute to ecological problems solving. Ukraine has highest in the region tax pressure on labor, while ecological taxes are non-existent.

Research in the field of eco tax reform implementation had shown that it is possible to achieve double dividend phenomenon, which implies that while introducing eco taxes harmful for environment activities would decrease, relieving of tax burden on labor would stimulate employment, as work force becomes cheaper (D. Helm and D. Pearce, 1991; D. Pearce, 1992). Study of Ukrainian peculiarities in context of eco tax reform resulted in proposal of implementation of eco-labor tax reform, as Ukraine has employment problems due to high labor taxation (O. Maslyukivska, 2006). Possible income from introduction of eco taxes, on CO<sub>2</sub> emissions in particular, in Ukraine was calculated (O. Veklych, O. Maslyukivska, 2008). Possible ways for implementing such reform in Ukraine were not proposed.

Goal of this research was to suggest mechanism of eco-labor tax reform implementation in Ukraine.

In this research method of mathematical prognosis was used, with the help of MicroSoft Exell software. Pension fund collection rate was calculated using own developed formula. Population stratification was also calculated using own formula. Data used for calculations was mainly taken from annual reports of State Statistics Committee of Ukraine.

Results of research were following: implementation of eco-labor tax reform requires redistribution of taxes in manner that would leave total tax pressure unchanged. Implementation of eco taxes requires relief in other taxes and collections, social in particular. Collections to the Pension found could be halved as they compose largest part of social taxes and collections. This could be achieved if pension reform is conducted simultaneously with tax reform.

Pension reform implies that till 2020 pension age of Ukrainians would be 65 years for men and 60 years for women. This is supported by the fact in developed countries with average life span lower, same and higher than Ukrainians have higher pension ages. Analysis of Ukraine population stratification shows that in future we will face decrease in able-bodied and pre able-bodied population while pre-pension and pension age population will remain the same, this would mean that social collection would inevitably rise. See fig.1.

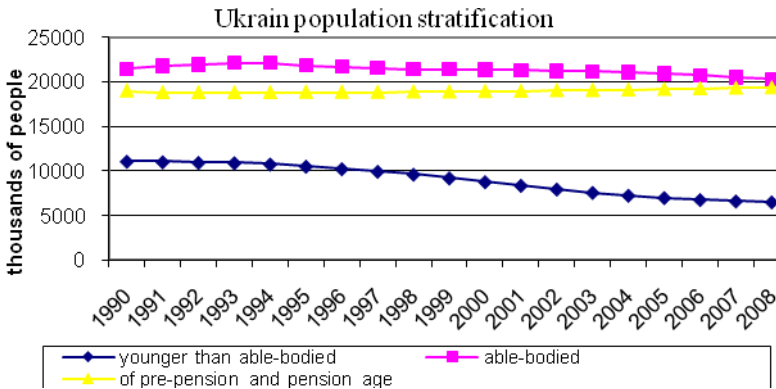


Fig.1.

Implementation of pension reform would decrease collection to pension fund to the 16,6%, which is two times lower than existing. This relieve would allow to implement ecological taxes.

Possible income from tax on CO<sub>2</sub> (O. Veklych, O. Maslyukivska, 2008) was used to determine amounts of acquisition from eco-taxes. According to these calculations income from CO<sub>2</sub> tax in 2015 would equal 1,7% of Ukraine's GDP which equal to state expenditures on environmental protection activities. Surplus from eco-tax could be used on programs of employment stimulation, When this

number double tax income would be divided 1:1 between environment protection and employment stimulation founding. In 2020 income from CO<sub>2</sub> tax would reach level of 11,5% of Ukraine's GDP, so 5,75% of GDP could be directed to environment protection, which is 3 times more than present amount.

Scenario for eco-labor tax reform is following:

1. 2010 First phase. Introduction of eco-taxes. Environmentally unfriendly industry would be forced to decrease negative influence on the environment\$
2. 2012-2020 Second phase. Pension age limit is raised to 60 years for women, and then to 65 for men. This would lead to decrease of population on pension, and increase able-bodied population, allowing significant decrease expenditures on pensions, and thus decrease in pension collections. Saved money could be used to fund industry modernization.
3. 2020 Third phase. Eco-taxes income fund environmental protection activities and employment stimulation. Double dividend is achieved: employment is stimulated, while harmful for environment activity is discouraged.

Implementation of eco-labor tax reform is possible in Ukraine using mentioned above mechanisms. This reform would allow to simultaneously solve problems of unemployment, pension financing, industry modernization, environment protection founding, and decreasing harmful for environment activities.

## **ECOLOGICAL ECONOMIC ACTIVITIES OF THE ENTERPRISES'**

***Khan Abdul Arif***

*Lugansk national agrarian university, Ukraine*

### **Abstract**

The necessity to follow the rules of sustainable development in the everyday industrial practice has led to the formulation of the concept of an industrial ecosystem mimicking the natural ecosystem. Following this analogy, the conceptual model of an eco-industrial park, which is an organised form of the industrial ecosystem, was presented in this paper.

The model comprises of (1) the structure of the ecosystem, (2) the classification of the enterprises as producers, consumers and decomposers, (3) mass and energy flows and (4) types of interactions. The classification of the enterprises introduced here as well as the analysis of mass and energy flows indicates that the diversity of the enterprises in eco-industrial parks is desired. Furthermore, the minimal condition to create the symbiotic relationships between the enterprises is established, claiming that at least one industrial producer or decomposer must be involved in the eco-industrial park.



The application of this model will facilitate the design and development of eco-industrial parks and enable the identification of symbiotic relationships between the entities of such a park and other types of industrial ecosystems. In order to show the applicability of the proposed model and its potential for the practical implementation two case studies are presented.

In essence, social production and reproduction is a material transformation process between mankind and nature.

The social economy system and the ecosystem interweave and interact mutually in this process, thus coupling a multiplexed system of ecology economy.

In this paper, enterprises' ecological-economic activities refers to enterprises' productive, operational and management activities in the multiplexed ecological-economic system. Under the market economic condition, the dominant motive of enterprises is the pursuit of profits.

But its exterior constraints are the country's environmental legislation and policies, the public's consumer psychology and culture, as well as the public's environmental awareness and action.

They may maintain performance of an extreme selfishness by totally disregard the productive conditions of ecological and economic relationships, or of mutually beneficial activities which pay proper attention to the productive conditions of both ecological and economic relationships, or of a state between the above two.

In reality, the motive and mode of enterprises' ecological-economic activities presents diversity and complexity under certain social constraints. Generally speaking, it can be divided into three basic types:

(1) Enterprises adopting ecological environmental strategies positively. In the short term, ecological protection expenditures may increase enterprises' costs and reduce their profits, but in the long run, they are conducive to the creation of a good image on economical, social and cultural aspects so as to gain the favor of consumers, government and social welfare associations. These potential benefits are extremely advantageous to enterprises' long-term development. Main ecological environmental strategies enterprises may take include: reducing the waste of production and changing from pollution-control to pollution-prevention; improving technology and implementing eco-production; changing the traditional operating mode and advocating green consumption and green services; investing to the natural resources.

(2) Enterprises adopting green management strategies passively. In the field of environmental protection, enterprises are supervised by so many units such as media, government, non-governmental organizations that their social images may seriously affected for any of their negligence. Therefore, enterprises do not dare neglecting environmental protection policies. But their environmental strategies are often strategically.

Some for subsidizing public's criticism, some for setting up an “environmental friendly” image and prestige. All those efforts are to obtain lenient punishment in case of environmental accident.

(3)Enterprises ignoring or resisting environmental protection policies for their own sake. Typical cases of this kind include US Carbonization Company's ecological disaster, as well as US government's resistance to the "Kyoto Protocol" under the pressure of US industrial organization, and so on.

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Рецензенти:

*С.М. Ілляшенко* – доктор економічних наук, професор Сумського державного університету;

*Є.В. Мішенін* - доктор економічних наук, професор Сумського національного аграрного університету

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Для студентів, аспірантів, молодих вчених економічних та екологічних спеціальностей вищих навчальних закладів освіти і широкого кола читачів.

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Стиль та орфографія авторів збережені.

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