

**ECOLOGICAL
INNOVATION**

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ECOLOGICAL INNOVATION

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PREFACE

“Creativity is thinking up new things.

Innovation is doing new things.”

Theodore Levitt

Ecological innovations are a method of ensuring of society's balanced development. They facilitate the ecologization of all spheres of human life. Ecological innovations enhance the competitiveness of companies because there is a strong correlation between the market activities and the creation of new environmental products. Modern innovative technologies help strengthen the market position of enterprises, improve the quality of the products, and increase profits in the markets.

Environmental technologies not only preserve the natural environment, improve the quality of public life, but they also are a competitive sector of the world economy that is growing rapidly. To date, the segment of environmental technologies in the world market makes up about 1,000 billion euro a year and it is an important factor of the global economy development even today. Innovative solutions in the sector of technology take up 45% of this segment. Economic growth of the market segment of environmental technologies is about 5.4% per year to an estimated 2,200 billion euro per year in 2020.

Today such technological areas as energy production and storage, economic use of raw materials, energy conservation, bioplastic and polymers, solar cooling, environmentally friendly transport, rational usage of the natural resources can be called the most promising ones.

The new model of economic growth, which is based on the innovational type of the development, involves changes in the scientific

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and technological development. The new priorities, such as well-being, intellectualization of production, usage of high and information technologies, ecological compatibility, appear today. This model demands a new financial and credit policy, the effective stimulation of innovations, development of knowledge-based industries and reduction of nature-exploiting ones - at the macro level; changing of the type of the entrepreneurial activity, active involvement of small and medium private businesses in production - at the micro level. The main subjects of innovational activities are the entrepreneurs as they take on all the challenges and risks of practical implementation of innovations. It is impossible to make innovative ecoeconomical society without the active mass entrepreneurial development.

World experience of the leading companies indicates that the corporations that are constantly introducing innovations are successful in current economic environment. Creating of basic innovations (a fundamentally new product) is an extremely labor-consuming process that requires significant financial and time expenditures (from 3 to 7 years according to the international experience). For the efficient use of existing scientific and industrial potential the dialogue of the science, business and the authorities is needed. It implies:

- Introduction of the effective mechanism for the attraction of foreign and domestic investments for ecologization of innovational activities, investment insurance, protection of investors' rights;

- Combination of industrial and financial assets of integrated scientific and industrial companies that will ensure the development of basic industries, technologies, etc;

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- Ensuring of tax, credit and depreciation incentives for the enterprises and institutions that implement new technologies and export science-intensive products;

- Ensuring of public funding for the innovative scientific and technical projects on the competitive base;

- Development of infrastructure of innovational activities (technoparks, technopolises, innovative exchanges, consulting centers, certification firms that carry out scientific and technological and innovational activities).

Scientists of Khmelnytsky National University promptly react to global trends in needs of science-consuming products, solve pressing scientific and industrial issues of the present. The University activities involve active communication of the scientists with the representatives of the business and manufacture. The joint scientific and practical seminars of the scientists and the manufacturers have become traditional. International conferences and exhibitions where the participants exchange their opinions and ideas, discuss the prospects of cooperation and implementation of the scientific developments in the manufacture are held.

The university scientists have been fruitfully collaborating with the Polish scientists in different fields of science for a long time, in particular with University of Technology and Life Sciences (Bydgoszcz), AGH University of Science and Technology (Krakow), Rzeszow University of Technology (Rzeszow), Kielce University of Technology (Kielce), Lodz University of Technology (Lodz), Silesian University of Technology (Gliwice), Association Integration Europe – East AGH (Kielce). Due to cooperation between Polish and Ukrainian scientists 8 scientific projects were put into practice; the Ukrainian and Polish center under Khmelnytsky

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National University was founded; co-education and co-trainings in the universities of Poland and Ukraine, exchange of scientists, implementation of scientific developments at the enterprises etc. were arranged.

This monography was prepared by the authors from Ukraine and Poland. Some of the articles were prepared in the international cooperation. The book is aimed at the specialists in the various fields of production and at the creation of resource-saving and environmentally friendly technologies for different purposes. The publication will also be of high demand among students, university teachers and researchers in their respective areas of applied science and technology.

We would like to thank all the authors and all the people for the efforts they made to contribute to this monograph. It is a pleasure to cooperate with you. We are grateful to you for your innovative and valuable contributions.

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SOCIO-ECONOMIC BACKGROUND FOR ENVIRONMENTAL INNOVATIONS MARKET CREATION AND DEVELOPMENT

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Introduction

The economic and political stability are usually considered to be the criteria of the country and its economy successful development. Some drew attention to the social sphere. But few relate the environmental component to these criteria – it's expensive and not profitable. Today the industrial damage to the ecosystem of Ukraine is 3-5 times bigger than it was last decade.

The current ecological situation of Ukraine and its trends of change are largely determined by the production processes and economic human activities. Despite some success and achievements, the overall picture continues to deteriorate, leading to the further development of the ecological crisis not only inside the country but also in the whole world. The main reason for this is the low efficiency of existing mechanisms of environmental management and control of industrial production, based mainly on one the hand on hard administrative methods of coercion, and on the other hand on a deliberate disregard of environmental problems, "not to hurt business."

The analysis of recent research. It is necessary to identify a number of authors who paid attention to the problems of greening the market in their works – they are N.N. Andrieieva, I.Z. Dolzhanskyi, S.M. Illiashenko, N.V. Pakhomova, A.V. Prokopenko and others.

The fact that the domestic economic mechanism of nature

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management has triggered the negative environmental result is generally accepted now. It is more profitable for the domestic producers to carry out various environmental fiscal payments than to spend money on nature protection measures or initiate implementation of environmentally safe methods and forms of management.

The environmental market formation management is particularly important for the enterprises that are focused on environmental innovations. The enterprise can influence the ecological products customers, creating a market of ecological innovations through advertisement, promotion, sales promotion etc.

The main components of Ukraine's system of economic instruments for environmental regulation are numerous fees / payments for resource usage and pollution , tax factors, environmental violation penalties.

Nowadays Ukraine (and the planet in general) is facing a prolonged and deep ecological and economic crisis. The most highly developed countries have overcome the energy crisis, by the accelerated introduction of scientific and technical progress achievements and significant investments for the economy restructuring and somewhat stabilized the environmental situation and entered into the information society.

These countries, having drained their own natural resources, show a growing interest in countries with transitional economies to obtain raw resources practically free and create a market for their outdated and environmentally unacceptable products.

The best option to solve the existing environmental and economic problems of Ukraine is the production and consumption of environmental goods.

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Discussion

The environmental goods are everything that can satisfy environmental needs and is offered to the market for consumption, acquisition, use or to attract attention. Environmentally neutral and eco-designed products should be included into the environmental goods. The environmentally neutral products are those the production and consumption of which do not destroy the environment. The eco-designed products are those the production and consumption of which contribute to the environment.

There is such a notion as environmental needs that is the need for the environmental goods. S. M. Illiashenko, proposes three stages of the environmental needs evolution:

1. The production and use of the environment protection means against its violation processes (pollution).
2. The replacement of environmentally adverse products and services by those that are more environmentally perfect or help to reduce material and energy intensity systems.
3. The production and consumption of products and services that contribute to sustainable system development.

Thus, the goods of the following types are going be produced and consumed on the first stage of the environmental goods market formation:

- Eco destructive type prevention means (cleaning equipment, soil protection technology);
- Liquidation means of environmental violation consequences (soil decontamination, recultivating soils technology);

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- Human, technological and natural systems protection means against the harmful effects of Eco destruction (prior water filtration, air conditioning, protective coatings);

- Improvement means of human immunity or resistance to the Eco destructive factors negative effects.

On the second stage:

- the goods (including information services), which allow the replacement of the "contaminated" products and processes by the "clean" one;

- the goods, thus saving material and energy resources;

- technologies that reduce resource intensity of the goods;

- facilities that promote waste recycling.

On the third stage:

- education and information service (environmental education, consulting);

- means of maintaining biodiversity and ecosystems sustainability;

- means that increase the information contact of the person with natural systems (creation of national parks, green areas, eco-tourism);

- means of facilitating spiritual and physical human development.

Thus, we can say that environmental innovation is a means of solving environmental problems. The creation of economic conditions for business development in the environmental protection sphere and expanding the environmental goods and services market are among the other factors of solving environmental problems and achieving sustainable development of any country economy. Today environmental enterprise is being developed mainly within the following areas:

- production, installation and operation of cleaning facilities;

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- development and implementation of ecologically clean technologies;
- production of environmentally friendly products;
- products lifecycle management;
- environmental propaganda and education, etc.

The following can verify the expediency of the environmental goods market formation:

1. The environmental goods production and consumption will solve the contradiction between economic growth and environmental preservation.

2. Ukraine has the unique potential in the field of design, development and production of ecological technologies and equipment.

3. High level qualifications of many professional categories of workers, while maintaining relatively low wages.

4. The producers of environmental technology and equipment face vast opportunities in the field of foreign trade due to the growth of the European market of environmental goods and services.

5. The production of environmental goods is a noble, recognized in the world goal, the realization of which can be supplied by means of different international foundations from many countries.

6. The international community is prepared to environmental goods perception, it is possible even to mention their expectancy.

7. Due to the increased demand for environmentally acceptable products, the positive environmental effects are registered: the environmental load reduction along with the cost decrease of pollution damage elimination.

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Therefore, the formation of the environmental innovations market will contribute to the solution of socio-economic and ecological-economic problems in Ukraine [1].

The use of "cell concept"

While describing the process of environmental restoration, it is necessary to distinguish two levels of pollutant emissions. The first one – the current level of emissions (CLE) – is the level that actually formed within a separate enterprise or a whole region. The second one – a socially optimal level of emissions (SOLE) – is the level when the individual enterprise emissions or the total emissions of all enterprises in the region do not exceed the maximum allowable amounts. Moreover, while CLE is considered to be more or less objective, SOLE is largely subjective and can be influenced by both economic factors and the political situation of a certain region or even the whole state. In many countries scientific and technical problems of the study and evaluation of maximum permissible concentrations of pollutants, which often served as the basis for SOLE were replaced by purely economic alternative – to risk the health of citizens and save money or to incur substantial expenses for the environmental recovery. American experts point out the minimum required level of health protection is the protection from death and recognize the choice of the population health protection level above the acceptable minimum to be a policy matter.

Experts do not recognize the existence of technical problems on the reduction of anthropogenic pollution of the environment (APE). This is purely economic problem caused by the high cost against polluting activities. Therefore, under the modern conditions, maximum attention

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should be given to the optimal use of limited resources that can be focused on anti-polluting goal.

The pollutants transportation from their source is the reason why APE is of regional nature. Correspondingly, the environmental protection activity can be of regional nature too. The formation of cost-effective program of measures for environmental recovery in the region is possible due to the usage of so-called "cell concept", where while solving the issue of reducing pollution emissions not only environmental, but also economic side of the problem is taken into account. According to this concept, the enterprises that are the sources of APE and localized in a certain area ("cell"), are treated as one source. Moreover, since the contaminants "do not pay attention" to the administrative or political boundaries, the unit of division for combating APE should be, rather, geographical and meteorological than administrative.

Within such a designated area ("cell") the minimization of environmental protection costs is possible on the basis of their optimal allocation between enterprises-polluters. There are several enterprises in each region ("cell") that act as the environment pollution sources and for a number of reasons (first of all because of various production technologies, operation scale, the production equipment lifetime, etc.) have different diagram according to the level of marginal expenditures (LME) per unit of pollution emission reduction. For example, according to the U.S. Census Bureau, the marginal cost of preventing hydrocarbon emissions (pounds per day) range 80-3300 dollars. [9], i.e. the ratio between the values LME within various companies is more than 40 times.

In such a situation, it is expedient to implement the emission reductions primarily for enterprises within the "cell" 'cos it's cheaper

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where, but not to exceed the specified allowable level of emissions in the region. Thus, economically efficient (optimal) allocation of a total reduced emission fixed volume among individual pollutant sources is characterized by the fact that the easier (cheaper) it is to implement environmental activities on the enterprise, the greater part of the total emission reductions in the region, is taken by it.

It is obvious that the "cell concept" implementation will lead to a percentage reduction of individual enterprises CLE, the result will be dramatically different from the result of so-called "lump-sum environmental policy concept" implementation, according to which all enterprises have to reduce emissions by the same percentage. Due to the "cell concept", enterprises can either reduce CLE relatively intensely or even completely (enterprises with low LME) or reduce CLE comparatively slightly within the specified region ("cell") level or not to reduce it at all (enterprises with high LME).

It is also clear that the "cell concept" implementation as opposed to the "lump-sum concept" implementation (which activities are much more expensive) brings greater economic benefits. According to one of the studies, the expenses of achieving 85 % reduction of hydrocarbon emissions at all factories of "DuPont" company (USA) were estimated according to three alternative directions [8]:

- 1) each source at each company needs to reduce emissions by 85%;
- 2) every company must reduce its total emissions by 85%;
- 3) the total emissions of all enterprises should be reduced by 85%.

In the first case, the reducing emissions expenses were 105.7 million dollars, in the second 42.6 million, and in the third - only 14.6 million. A number of other studies confirms the fact that the total reducing emissions

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expenses within the same "cell" can vary over a wide range depending on environmental protection measures.

"Cell concept" efficiency grows with the increase of its territory. Nevertheless, the tendency to increase the area of the region ("cell") is limited by the need to comply with the criterion of not exceeding the maximum permissible pollutant concentrations. The "cell concept" introduction cannot cause a weakening of the air quality standard in any place or cause significant differentiation in the APE level. This imposes certain restrictions on the geographical territory of "the cell" partners. The necessity of environmental sanitation management (ESM) of certain pollutants within the macro and mesoregions is unquestioned, but the basic territorial level of environmental regulation should be recognize as the area with a diameter of 20-25 km, which corresponds to a settlement with the surrounding areas, medium-sized town or a separate part (district) of a city. About 80% of the pollutants emitted by the enterprises within these areas are concentrated there.

ESM in the region calls for the need of paying attention to the circumstances of:

- pollution "import" from outside the region ("cell"), because of which the environmental quality there can be determined not only by the implementation of anti-polluting activities in "the cell";
- the necessity for an integrated analysis of different environments, that is, the simultaneous assessment of the level of negative impact (pollution) on soil, air and water. After all, reducing the pollutants emission, for example, into the atmosphere, the enterprise can increase emissions into other sectors of the environment (water or soil).

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"Imported" pollution ought to be taken as a constant value that is not the subject of ESM in this region ("cell"). "Cell" does not only "imports" but also "exports" a pollution. This means that the pollution sources emissions reduce should be somewhat bigger to achieve the desired APE reduction in the region.

As to the problem of complex analysis of pollution in different environments, the solution should not be carried out using complex methods, which are based mainly on conditional expert factors of conversion pollutants from one type to another (for example, coefficients of air pollutants into the emission factors of water pollutants). It is a dead end. An approach is considered methodologically correct if, it is based on the following concept: anti-polluting activities to reduce pollution in one area of the environment should be implemented under the condition of avoiding of other (the other two) spheres pollution growth. Taking into account the current institutional, technical and economic difficulties, we propose a softer concept for the integrated analysis of different environments: decrease and no further increase of the atmosphere and water pollution taking into account the possibility of solid waste volumes growth. According to this concept, the cost of anti-polluting activities includes:

- relevant activity implementation expenses (air- or water protection);
- expenses provided not to allow the pollution increase in other environment areas (atmosphere or water bodies) in consequence of the mentioned activity realization;
- expenses associated with the removal and storage of solid waste increased volumes.

An important ESM task in the region is the organization of verifying the emissions of the enterprises. A new method built on the tax declarations

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analogy, tax audits and disclosure of tax violation cases is suggested to limit such expenses [50].

Due to the unreasonable cost of the movement "short dashes" from the previous to the next SOLE, is it appropriate to implement a 10-15-year period between the moments of SOLE toughening. During this period, the APE reduction can be achieved only at the expense of cost-effective anti-pollution activities.

ESM in the region must adhere to the following general conditions:

- all innovations in environmental policy must first be discussed with industry representatives;
- long term environmental policy planning;
- internationally harmonized environmental policy.

The Kyoto Protocol

On 4 February, 2004 Verkhovna Rada of Ukraine ratified the Kyoto Protocol (KP) which gives the government a real opportunity to use the KP market action mechanisms – participation in joint implementation (JI) projects and quota trade on industrial gases emissions – and actively promote the new kind of financial-economic activity deployment by the international community – the formation of a quota market on industrial gases emission – primarily through the creation of relevant national market. In accordance with approved international standards, Ukraine had to submit necessary documents to the Secretariat of the Framework Convention on climate change (UNFCCC) before September 1, 2005 to permit active participation in KP action mechanisms in 2008-2012.

Another pressing problem in the context of globalization is a scientific justification and support of innovative development of the national socio-oriented market economy with the purpose of reproduction

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of the Ukraine economic potential to the level of 1990 and its transition to a postindustrial society. The importance of foreign direct investments large in size and not repayable, being granted in exchange for quotas on the industrial gases emissions according to KP market action mechanisms, arises in the face of limited domestic financial resources.

According to the foregoing, it is essential to determine the predictive Ukraine potential for these mechanisms implementation and national market establishment.

In Ukraine the first forecast of industrial gases emissions is given in the First national notification on climate change [4]. The calculation of Ukraine predictive potential regarding the JI projects implementation for energy saving undertook E. V. Hahurin and V. Y. Laskarevskiy, for afforestation – M. M. Vedmid, for renewable energy sources – H. H. Pletukha, for quota trade on GHG emissions with the usage of different domestic and international economic models of their predictions evaluation – G. Brunello and B. Kostyukovskiy.

The aforementioned studies were conducted by power engineers, foresters, ecologists, including specialists of transnational broker companies engaged in quota sale/purchase transactions on industrial gases emissions. National economic literature illuminates questions of innovative economy development, improvement of investment climate in Ukraine and ensuring the increase of foreign direct investments, creation of economic and legal bases of state regulation of environmental protection management of the natural environment, including international cooperation, in particular coverage of the issues of Ukraine's commitments under the UNFCCC and KP. However, the questions of determination of the predictive potential of Ukraine with introduction of KP market action

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mechanisms were not considered.

The KP provides the implementation of three "flexible" (market) mechanisms to facilitate the completion of countries (Parties of the UNFCCC) commitments to reduce industrial gases emissions of anthropogenic origin. These activities are:

- quota trade on industrial gases emissions between countries, given in annex I of the UNFCCC, or similar annex B of the KP (art. 17);

- joint implementation of projects by the Parties identified in annex B of the KP (article 6: to perform its obligations under art. 3 of the UNFCCC, any Party designated in the annex I can transfer to any other such Party or purchase its emission reduction units gained in the result of implemented projects aimed at reducing anthropogenic emissions of industrial sources or enhancement of absorption of industrial gases in any sector of the economy);

- application of the clean development mechanism – similar cooperation between the Parties, marked and not marked in annex B of the KP (art. 12), which provides the implementation of joint projects in countries that are developing.

The final introduction of the KP action market mechanisms and the creation of a global market of industrial gases emission are to be held in 2008-2012 (the first period of the KP).

According to the article 3 of the UNFCCC one of the principles that the countries – Parties of the UNFCCC – should be guided by to achieve the objectives of the UNFCCC and KP, is the necessity to take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects.

These measures should be cost-effective to ensure global benefits at

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the lowest possible cost. Therefore, appropriate policies and measures should take into account different socio-economic conditions, be comprehensive, cover all relevant sources, sinks, and storages of GHGs, and adaptation measures in all economic sectors. The efforts to respond to climate change can exert Parties through joint activities.

The obligations of the Parties are established in article 4 of the UNFCCC. In particular, all of them, including common but differentiated responsibilities and their specific national and regional priorities, objectives and development circumstances, should contribute to such actions:

- cooperation for the development, application and dissemination (including technology transfer) of methods and processes, which provide the ability to limit, reduce or terminate anthropogenic emissions of industrial gases by the enterprises of all economic sectors;

- rational use of sinks and reservoirs of all GHGs, including biomass, forests and other ecosystems with their protection and quality improvement.

The development of fundamental basis of the motivational mechanism for ensuring coordination of long term and short term goals of national economy development, economic decisions at all levels of management in the conditions of specified loads in natural systems is allocated among the main problems of increase of innovative activity of different ownership forms enterprises in the field of greening the economy.

This mechanism should provide such incentives that would ensure the identity of business entities self-motivation with principles of eco-innovation development, the focus of their scientific, technological and economic activity for the satisfaction of not only material but also spiritual needs, the most important of which is the need for clean natural

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environment in its balance.

In General, the mechanism of production sector greening in the region is presented in Fig.1.

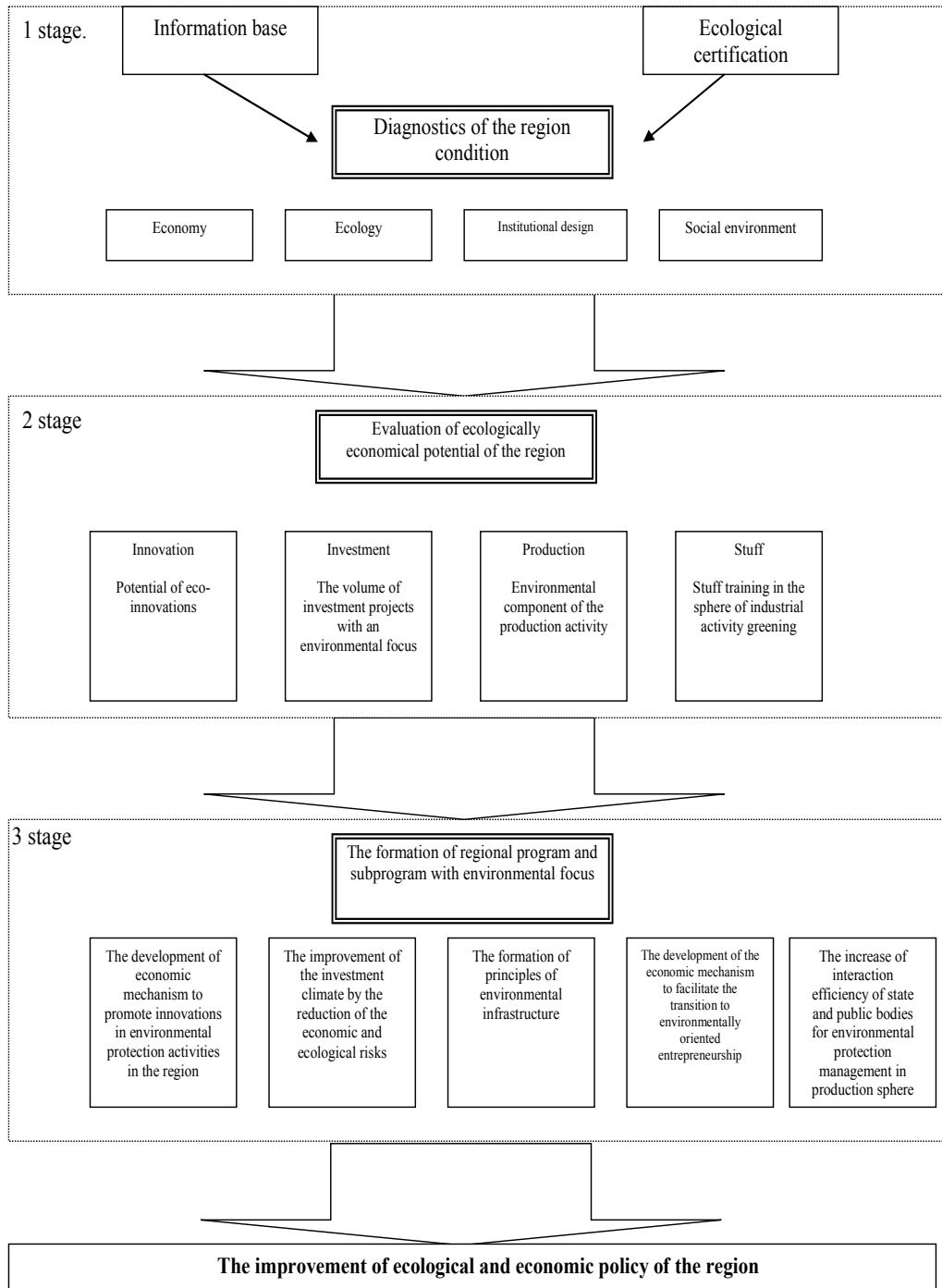


Fig. 1. Economic mechanism of organization of production sphere greening in the region

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-Unlike the traditional tendencies of environmental regulation, including air and water protection, disposal of production wastes and consumption, environmental education, it is appropriate to allocate additional directions of regional policy within the greening process in the production sphere;

-facilitating the development and implementation of eco-innovations;

-the improvement of the investment climate in the region, primarily due to the reduction of environmental risk;

-the improvement of environmental infrastructure of industrial areas;

-the transition to a system of environmentally oriented entrepreneurship;

-the organization of interaction of state management structures and research organizations with environmental focus in the direction of prior environmental-economic projects and initiatives implementation.

Speaking of economic instruments, these are the most commonly cited as an example: taxes, loans, payments, subsidies. However, it is only the "tip of the iceberg" of those extremely complex mechanisms that provide the action of the instruments in the economic system.

Here arises the urgent need to implement innovative technologies that will contribute to the reduction of negative impact of industry on the ecosystem. Innovative component ought to be entirely focused on the improvement of environment-friendly technologies.

Innovations and innovative activity are associated with significant risk, as innovations mean changes that are considered to be a source of income, and the processes and results of those changes contain a significant proportion of the elements of uncertainty and the resulting risk. Here the rational behavior is not to ignore the risk, but to consider it to justify

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measures aimed at its prevention, reduction or compensation.

Environmental innovations risk is the threat of resources loss (reduction of income or expenses increase) in the innovation process due to its eco-destructive impact.

Let's consider the main types of environmental innovation risks on the basis of the following table 1 proposed by S.M. Illiashenko.

Table 1. The main types of environmental innovation risks

The nature of risks	Types of environmental risks	The main signs
Reverse reaction of nature	Natural and ecological	The environmental balance disappearance, extinction of certain species of flora and fauna, resources, climate changes, flora and fauna changes, resource quality, soil structure, violation of the landscapes integrity
	The risk of catastrophes	Pollution and other environmental changes due to manmade or natural disasters, accidents
The development of technosphere	Technological	Pollution and other environmental changes due to human activities (space research, military test)
Legal field within the state	Eco-regulatory	Changes in the legislative and regulatory framework, the adoption of more stringent environmental requirements
Society	Socio-ecological	Environmentally oriented public activity
International community	Eco-political	The adoption of state and regional environmental programs
Population	Eco-demographic	The increase of diseases number, deterioration of health, increased mortality
Country economy	Ecological and economic	The resource situation deterioration in the country or its regions the, the problems of environmental financing, the deterioration of the economic situation

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Natural ecological risk. Nowadays the economic and human activity is influenced by the climate change (e.g. global warming) caused by transportation systems emissions, technological systems recycling and use of natural (hydrocarbon) fuels. Possible losses for the innovator company, for example, efforts for additional cleaning of raw materials.

Technological risk. It is mainly associated with the constant leakage of ammonia, chlorine, sulphur, and leads to further pollution of the natural environment. The losses for the innovator can be caused by reduced sales of their products due to rise of consumers' environmental charges, which causes equipment operation inefficiency.

Risks of technological environmental disasters. These include the breakdown of seals, which can lead to accidents at nuclear power plants.

Ecological and regulatory risks. Tough ecological norms and standards are set for the environmental balance. And that requires better equipment and technology which makes it difficult for enterprises, forcing them to buy new, more expensive equipment to get rid of environmental fines.

Socio-ecological risks. Environmentally oriented public actions are intended to protect nature, environmental parties and movements affect producers to reduce their ecologically destructive impact. They can stimulate the development and implementation of environmentally friendly equipment, and can hinder innovations, which in the opinion of the public, do not meet environmental requirements.

Today the majority of scholars explores the ecological and political risks. The adoption of new environmental state and regional programs due to the political considerations can dramatically change the market conditions and make the market entrance difficult or impossible for the innovations that were developed for other conditions.

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While exploring ecological and demographic risks it was noted [5] that even a small continuous leakage of toxic or harmful to human health liquids and gases through the seals of pumps and compressors can lead to increased morbidity among the population, poor health, reduced life expectancy. Possible compensation payments to the population may lie on both consumers, developers and equipment manufacturers.

Aleshynskiy R. Y. explored the ecological and economic risks. He suggested the correct idea that the deterioration of the ecological situation in the country could exacerbate the economic situation because of the need of funding resisting this [2]. For example, water environment pollution requires additional costs for cleaning, even when used for technical purposes.

Summary

Therefore, the premise of the output from the ecological-economic crisis is the development and implementation of innovations with a high degree of environmental friendliness and economic efficiency (hereinafter we call them environmental innovation).

Thus, the basis of ensuring the economic independence of the country, the transition of the economy to economic growth should be the transition to innovative development based on market principles. The feasibility of the state transition to innovative environmentally oriented development is defined by the following assumptions:

-orientation to innovation way allows the domestic enterprises to stay on the market for a long time even for various changes of management conditions (which is typical for a transition economy) and to function more effectively than during the production of traditional products;

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-traditional methods of environmental protection are not effective enough, which causes the necessity of certain conditions creation for search of new ideas, principles, revolutionary transformations;

-analysis of the Ukraine economy processes shows that as a result of the transition delay to innovative development the existing lag of economically powerful countries continues to deepen and threatens the system separation of the national economy due to incompatibility of technologies, the low capacity of the domestic economy to investments and innovations through the structural-sectoral, institutional and socio-cultural incompatibility. If one misses the time, it would be practically impossible to bridge this gap.

Thus the following conclusion can be made, the development of the Ukraine economy and resolution of current environmental and economic problems should be based on environmentally oriented innovation.

Therefore, the environmental risks of productive innovations can influence the efficiency of the processes of their development and market promotion and need proper assessment and consideration in the justification of the relevant innovative projects.

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