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Russian Chapter (ISEE/RC)



**NATURE AND SOCIETY  
OF THE NEXT MILLENNIUM:**

*Globalization  
and Regional Ecological Economic Problems*

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**ABSTRACTS**

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- 1st International ISEE Russian Chapter Conference on "The Role of Information Sciences in Regional Development", Moscow and Pereslavl-Zalessky, Russia, July, 1993.
- International Ecological Expedition on "Preservation and Recreational Usage of Lake Baikal and its Basins", Irkutsk, Lake Baikal, Russia, July-August, 1993.
- 2nd International ISEE Russian Chapter Conference on "Socio-Ecological-Economic Systems: from Information and Simulation to Practical Solutions", Pereslavl-Zalessky, Russia, July, 1995.
- 3rd International ISEE Russian Chapter Conference on "Integrating Environment and Economy. Accounting, Policy, Business", Novgorod, Russia, July, 1997.

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# **ABSTRACTS**

## **Promotion and Extension of Sustainable Agriculture**

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The improvement of peoples living conditions for the present and future generations in the whole world and in every region depends in many cases on the sustainable development of agriculture. There are a lot of regions in the world, including the states of the former USSR, which are not sustainable from the points of view of most common criteria. Such situation contains a danger for welfare of future generations in all countries, including developed ones. Moving towards sustainable world demands an active environmental policy which must include promotion and dissemination of the understanding, knowledge, technologies, rules and economic mechanisms of recourses distribution between consumption and reproduction of natural productivity factors.

Sustainability of the agriculture at the global level includes several aspects, after the beginning of the Kyoto process the new purpose is the participation in the mitigation of the greenhouse gases emission and in their sequestration. The Report «Climate Change 1995» shows that world agriculture accounts for one-fifth of annual increase in antropogenic greenhouse warming. Most of this is due to methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O); agriculture produced about 50 and 70% of their anthropogenic imissions [2.P.747]. Natural resources of agriculture (especially land) could be required for mitigation of greenhouse gas emissions. Nearly 7-14% of carbon emission with CO<sub>2</sub> could be sequestered worldwide in agricultural soils. New combined practices could reduce CH<sub>4</sub> emissions from agriculture by 15-56%. N<sub>2</sub>O emissions from agriculture could be reduced by 9-26 % by improving agricultural management with available techniques [1. P.747].

The technologies which help to mitigate greenhouse gases emission is the same ones that are used for the maintenance of a land fertility and purity, so we can say, that land conservation, as part of improving agricultural sustainability, has at least the two main effects:

- 1) a growth of agricultural production's potential;
- 2) the mitigation of the greenhouse gases emission and their sequestration. The departing of the second effect is important for the attraction of worldwide financial recourses for the promotion and extension of the sustainable agricultural development.

In our case we understand extension as an expansion of available technologies, seeds, knowledge for every farm. *Promotion* is a movement to a complex solution of the economic problems, essential to a maintenance of the process of a transformation of the unsustainable regions into sustainable ones. If we look at the sustainability as the target, we ought to outline the criteria of it. From the environmental positions at the farm's level we can use criteria of the permanent exploitation of the ecologically friendly technologies and crop rotations, of the nondeclined equilibriums of nutrition's and organic matter's stocks in the soil.

At the regional or state levels sustainable agriculture is not a simple sum of sustainable farms. The non-declining purity and productivity of natural recourses can permanently exist only in a combination with the social and economic sustainability. At this level we can use the following criteria:

- 1) the stable and increasing production of safety food;
- 2) the non-declining of productivity and competitiveness factors;

- 3) the fulfillment of the local pollution's limits;
- 4) the non-declining greenhouse gas sequestration and the fulfillment of the limits of the greenhouse gas emission.

At first sight, global sustainable agriculture can be presented as a combination of sustainable countries, but it is an unreal purpose - to do an agriculture in every country sustainable one. More realistic are the following purposes to achieve:

- 1) Maximum number of countries with a sustainable agriculture;
- 2) Stable food supply to most of population as a base of more secure, world;
- 3) Ecologically based diversification of agriculture in every country, which leads to less impact on demand side of world markets of potentially monoculture products;
- 4) the maximum participation in the mitigation of the greenhouse gases emission and in their sequestration.

#### *Reference*

Climate Change 1995. Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analyses./Contribution of Working Group II to the Second Assessment Report of the Intergovernmental Panel of Climate Change. - Cambridge University Press. -1996.

### **Noospheric Principles of Sustainable Development**

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Theoretical foundations of sustainable development were formulated by academician Vernadsky V.I. (1927).

I elaborated new paradigm of noospheric sustainable development noospheric social-economic formation, the foundation of which is made up by deep knowledge of humanity, laws of nature and possession of wide spectre of professions to process its objects (Adamov A. K., 1995-1999).

Sustainable development of humankind is provided by noospheric organization of human activities and their cooperation according to the laws of environment, with nature.

Having achieved a large quantity of population and having spread noospheric construction, humankind, during the last three centuries, by the products of its activity made a huge load upon the Great natural circulation objects, but the main thing that brought humankind on the brink of ecology catastrophe - are people, who, possessing great knowledge and methods of processing objects, began, according to the ideas of their intellect and with the help of their labour, to produce in large number new, earlier non-existent in the Universe, objects, called noospheric objects. These objects, as well as natural (live and non-alive objects), exist for some time, realizing functions, programmed by man, they get worn out and thrown away and they enter then the Great natural circulation of objects.

Variety of types of noospheric objects is already larger in number than biodiversity, which includes more than 10 mln. of live organisms. Humankind spread noospheric objects on the main part of the land (about 60%).

To preserve their environment people use different methods: preserve the environment from pollution by waste products, create ecologically safe technologies, apply wasteless modes of production, recreate the environment distracted by men, but all these are not measures sufficient. To avoid ecological catastrophe systemic approach is needed, adequate to forming noosphere, this approach includes the organization of Great noospheric circulation of noospheric objects.

It must function under the management of people according to noospheric laws: each noospheric object is produced, exists and being worn out is utilized with the help of special

ecologically safe resource-saving technologies. Each noospheric object must be provided with ecologically grounded production technology, technology of exploitation and technology of utilization.

Great noospheric circulation of noospheric objects includes local, regional global, cosmic circles of noospheric objects and their components. It must function alongside with Great natural circulation of substances.

### **Regional Environmental Politics: State of Art and Prospects**

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Karl Marx remarked that «Politics is the concentrated model of economy» and its goal is «to transform the interest of social group or class into a law». So the life quality of all the social groups depends on the environment quality, environmental policy has to represent the interest of society as a whole.

The paradox is that the policy serving to realize the clan, ethnic and party interests is much more intensive than the activity for the environment protection. Economy, elections, social activities show a lot of examples.

There are some reasons of such situation: shifting the value priorities of the main part of the society to just survival; egoism of elite; unwillingness of the citizens to spend money on the environment protection; absence of administrative and legal mechanisms which could assist in getting the benefit from the environmental politics.

Improving the economic, social and psychological basis of environmental politics we should focus the attention on environmental problems.

There have been started some successful initiatives in the Saratov Region, which have brought up a significant sanitary effect: construction mercury lamp utilization plant, prohibition to use the benzene with plumbum addition, etc.

The cost of these actions is naturally very high. Under the conditions of limited finances the priority should be given to the programs which can have the larger economic efficiency.

We mean first of all industrial wastes utilization. That could solve two major problems cleaning and new product development.

There is much foreign experience to confirm its expediency.

Ecological education is the principal component of environmental policy. The next decade must be a turning point to form a society dedicated to the environment protection in everyday activity.

### **Environmentalism in the Modern Youth Activity: Saratov Region**

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Nowadays there are a lot of different youth organizations and movements attracted by environmental ideas. But there are few that consider real environmental problems. First of all,

it happens because of the financial crisis in Russia, long-term goals of the environmental protection are neglected.

Modern environmental movements can be divided into two streams: scientific and emotional. The representatives of the first stream participate in different research programs, their activity is based on the real economic and environmental situation in the region. The representatives of the second stream prefer the striking actions to attract the public attention. Politics dominates over economy and economic risk assessment distortion usually takes place when they choose objectives.

«Ecology XXI» is the youth society organized by students of the Saratov State University and sponsored by the State Committee of Environment Protection of the Saratov Region. The principal part of the Society's members are the students specializing in environmental studies. Society aims at participating in different research programs including sociological investigations to assess the public attitude to environmental problems.

### **Ecological-Economic Rating of Enterprise**

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The process of transition to sustainable development brings into necessity the introduction of a complex system of environmental accounting, evaluation and analysis of natural resources utilization and protection of environment at various levels of management. Introduction of the suggested ecological-economic rating of enterprise (EERE) may contribute a lot to the fulfillment of this task..

EERE aims at the increase of efficiency of the management of environmental protection activity at enterprises and at the development of natural resources utilization system control at the regional level.

In short, EERE presents a technique of ecological safety evaluation and competitiveness of an enterprise, and also the efficiency of environmental protection activity based on the suggested system of parameters. The EERE calculation is offered to make use of a hierarchical system of parameters (particular, generalizing and integrated), reflecting various sides of ecological-economic operation of the enterprise, and also the scheme of enterprises grouping according to the suggested six classes depending on the received parameters.

As particular parameters of EERE evaluation there are suggested specific costs of environmental protection activity; coefficient of fulfilling the norms of natural resources utilization; coefficient of safety of production process; ecological level of products, raw material and materials; specific consumption of materials of production and other.

The composite stages of the technique of EERE evaluation are:

1. Collection and analysis of initial information used for the evaluation of absolute actual parameters, describing separate parts of the process of natural resources utilization and environmental protection activity.

2. Calculation of actual particular parameters (relative and specific) on the basis of the absolute actual ones and elaboration of standard specific parameters.

3. Determination of the ratio of actual particular parameters to the standard ones.

4. Determination of the generalizing parameters and the integrated parameter.

5. Determination of the class (rating) of each concrete enterprise according to the

suggested scheme of classification.

The suggested system of EERE provides the information basis for creating a reasonable policy of sustainable development of a region based on the ecological-economic ranking of the enterprises functioning on its territory.

At the enterprise level the system of EERE evaluation allows to determine «the aching points» in the management of natural resources utilization at an enterprise and, relying upon it, to elaborate a complex of measures, including the funding of environmental protection measures, in order to find a way out of the current situation.

The information obtained through the EERE evaluation can be used by state institutions for the realization of environmental protection policy in the region, and also by insurance companies, investors, population in order to determine the condition of ecological safety, competitiveness and investment attractiveness of the enterprise.

### **New Achievements in the Sphere of Technogenic Waste Application Technology**

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The chair of Chemical Technology of the Saratov State Technical University for more than 30 years has been developing the technology of utilization of technical waste of different industries. At the same time some problems are being solved in raw materials economy, ecology and quality of materials produced on the base of these waste. The waste is polymeric, organic and inorganic substances.

The authors developed compounds based on epoxy resin and containing pyrite residue - waste of sulfuric acid production, and wood waste of tanning matter production, in the amount from 20% to 40%.

The compounds having chemical resistance, antistatic properties, are more stable to combustion and have higher shock resistance compared to analogous ones. Such compounds are necessary for electronic, chemical, motor car, oil refining industries.

The phosphor-gyps, multitonnage waste of mineral fertilizers production is a valuable filling material for building materials. Phosphoric acid contained in this product activates the process of solidification of urea-formaldehyde resin which is, the polymeric binder of such compositions. Construction partitions made of such compositions fully meet the requirements of multifunctional building products (№ 1778090, 1994).

Waste of copolymer ABS, widely used in machine building, in a result of modification with corresponding components, acquire new properties at a level of primary product. The commodities made of these materials meet the required standards. The technology of processing fibrous waste into glued canvas is developed. These materials have antistatic and airproof properties and completely meet the demands of electronic industry. The waste of thermoplastics and cyclooligomers compete effectively with conditioned polymeric binder while producing the resin bonded magnets.

The developed technology is based on the formation of needed structure in a material with an application of physical-chemical approaches for the regulation of interaction degree and ordering macromolecules. The established regularities of formation of structure and properties of composite materials allow to solve the problems of using technogenic approaches for



obtaining composites with the desired properties.

The usage of the developed technology in respective manufacture will allow to formulate recycles of raw material and fabrics flow. These technologies can be used as completed stage of industrial process. All this allows to solve the problem of creation of wasteless production and to decrease the amount of harmful waste thrown into environment.

### **Control of Ecological Situation in Saratov: Realities and Problems**

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Seven, years ago leaders of 120 countries assembled in Rio-de-Janeiro for the conference on the sustainable development, where they approved the list of perspective measures for environment protection, called «XXI Century Agenda». In the past 7 years no global progress was reached, ecological situation is getting worse in general. The volume of fresh water on the Earth has decreased, productivity of arable lands went down, whereas the level of atmospheric, water and soil pollution has increased. The gap between what was done at the present moment and what has to be done keeps getting bigger.

Ecological situation remains tense. The recession of industry continues and those efforts, which have been undertaken by environmental protection organizations helped in some way to stabilize separate types of pollution. However this is not the reason to be optimistic.

The growth of industry which will eventually take place poses a great threat to environment under present conditions of worn-out cleaning systems of the majority of enterprises.

The City does everything it can for improving the health of environment. The economic mechanism of nature use is being improved, the basis for scientific organizations of ecological profile and medical institutions is being strengthened. Financial support is provided to enterprises which develop and implement zero-discharge, resource-saving, and ecologically clean technologies. Many resources are used for planting trees in the city, struggle against noise and electromagnetic sources of pollution, car exhaust. The following actions are actively supported: order keeping works, storage and utilization of industrial and everyday waste, works for cleaning drinking water and dropping of surface waters into the Volga river. Ecological militia was created, parks and squares have been restored. Inventory and reconstruction of springs in Saratov area are conducted. A lot of attention is paid to ecological education of young people, extension activities for the population, work with NGOS and green movements. Memorials of historical-cultural nature heritage are supported.

However it is obvious that the resources available to City Ecofund are insufficient for radical shift of ecological situation in the positive direction. And it is not money that matters, but the approach to the solution of these problems. The threat of ecological catastrophe does not come just from plain pollution of environment. It mostly comes, perhaps, from the abuse of extracted natural resources, which cannot be restored.

That is where topical problems arise:

1. Decrease of natural resources consumption, which means that all technologies should be resource-saving.

2. Consumption of resources should be reimbursed adequately by the consumer, along with the damage caused to nature by pollution of various kinds.

That is why the main present-day tasks (perfection of nature use mechanisms) lie in the following:

- creation and passing of legislative basis for the use of nature;
- scientifically substantiated approach to payments for used resources and damage, caused to the environment;
- organization of universal control and registration for use of natural resources.

The approach should be economically substantiated - those who pollute should pay the full fare. For instance, an owner of private automobile uses natural resources for his private purposes when the reimbursement of damage is distributed on the population in general. Introduction of gasoline tax could solve several problems: transportation would be used more rationally, shift to less harmful fuel types would be stimulated, and it would compensate not only direct expenses from environmental pollution, but indirect too, such as losses of agricultural lands and green areas of the city, breach of landscapes, destruction of buildings, stress phenomena, etc.

Ecological education and formation of ecological ideology among people of new generation has great significance for the environmental protection.

The concept of sustainable development cannot be realized if new people, who will take the steering wheel of power and information facilities in the near future, do not understand the global challenge of Nature to the humanity.

### **Sustainable Regional Development and Rationalization of Nature Resource Use: System Management**

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Under the present crisis condition of Russia the continuing policy of the separate non-system operations, even if they have local economic effectiveness, have no perspectives. Sharp differences in the level of development of regions and absence of the programs for regional socio-natural-economic complexes development and absence of conceptions of their management, in the end, leads to the deepening of social, ecological and economic regress. The revival and the following dynamism of development of Russia as a Country integrated in the world economy and organically included into world civilization processes are possible only while the cardinal re-orientation in the structure of priorities and criteria when realizing the governing of the country as an integral system. Such a re-orientation should include as the first and the main aim priority the providing of the progressive dynamics in forming the human potential in each region - Subject of Federation - within the bounds of regional long-term system programs of the sustainable development. Regional programs, as they are, stipulate the regional reproductive processes in such interdependent subsystems as «society», «social sphere», «industrial sphere», «environment as resource productive sphere and the place of living». It is necessary to develop this programs on the basis of common for Russia geopolitical, geo-economical, geo-ecological purposes with the realization, with all these purposes, of the complex of the principles of essences of «global morality» that are being formed in the modern world .

Just on the base of fundamental understanding of the principles of global morality, that

includes as a necessary (but insufficient) condition the realization of the positions of the World Charter of Human Rights in all the countries and regions for each person, there should be mastered economic mechanisms and low potential that regulate all vital and development processes. And a Human Being and the first and the main institution in the Society that forms a Person - a Family should be considered as an absolutely epicenter aim objects of the development in all the processes. Hence, in connection with the presented first priority the second priority naturally appears: education, culture, science, because they form the qualitative parameters of the Human Being himself on the one hand and, on the other hand, they provide all the creative modern and future functions of human vital activity including technical progress, creation of industrial and social potentials; reproduction of the whole complex of resource providing on the principles of its optimal rationalization with leading human economic activity to the autonomous regime; and, at last, the maintenance and possible improvement of the environment quality. The essences and hierarchy of the whole complex of the rest priorities and criteria of value are taken structurally and functionally depend on the first two ones and should be formed in each region by global deep diagnostics of regional complex with the revealing of the system of its interests, necessities and possibilities. And it will have an effect on the regional programs and on the management of their realization.

### **Methodological Aspects of the Conception of Ecological Optimization and Agrolandscape Sustainable Development Elaboration**

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The south of Russia is the largest agricultural region, in which agrolandscapes and their components-arables, pastures because of the overpasture, ploughing up and technogenetic disturbances became degraded to some extent or another. Therefore, optimization of an environment and creation of ecological balance, working out principles of sustainable development is actual. However, these problems in many respects have not been solved, especially in the methodological aspect. The method, including the system, historical and ecogeographical approach is necessary for the definition of an optimum ratio of land units. The method consists of the following stages.

1. To perform ecological monitoring of the given territory, taking in to account the changes from the time of the beginning of the existence of landscapes, for example for the south of Russia it was 5-6 thousand years ago, taking in to account all historical and other sources, by creating a sample-model of the site before the change.

2. On the basis of analysis of the cartographic, statistical material, materials of expeditions, available data of general land surveying and other data (for the region it is 17-19 century) to reveal the dynamics of change in the 20th century – of the materials of air-and cosmic survey, determine the changes, which have taken place for the given territory from the time of disturbance, having determined the digression stages.

3. Depending on the degree of disturbance the given landscape is optimized by introducing particular changes into transformation of land units. The sample is not infringed model of the given landscape.

4. The parameters of the landscape - three-dimensional (height, linear dimensions, lower boundary), temporary changes of energy reserves, time of maximum and optimum accumulation of energy and productivity of landscape are analyzed.

5. The estimation of stability on the morpholitogenic basis, of soils to destruction,

vegetation to renewal and the whole landscape to its self-cleaning is performed.

6. The time of stability loss and landscape structure (for example, for the region – the end of the 19th century) is revealed and on the basis of this structure up to the stability loss is taken as minimum.

7. On the basis of received data on optimum ratio of ecosystems, data of conditions of landscapes- analogous ecological-economic model is made by a method of optimization, taking into account ecological parameters and the variant adequate to the greatest ecological-economic effect is selected.

8. The ecological prognosis of change is carried out at optimum ratio of land units for 25-50 years on the basis of optimum variant of prognosis the necessary structure of land units of agrolandscape is calculated.

## **The Environmental Ethics and the Business Activities**

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The interaction of the environmental economics, jurisdiction, ethics and trade gave rise to a new scientific and practical discipline - the environmental ethics. It manifests itself in new relationships in the business sphere, including trade, which are correspondent to the long-term objectives of sustainable development and enhance the producer and consumer responsibilities in respect of the environment. The environmental principles of the business activities have been formulated in the Business Charter of the ICC.

From this point of view the environmental ethics is based on: 1) the corporate responsibilities for the environmental consequences of the economic activities provided by the system of the environmental management, 2) the environmentally sound personnel behavior, upgrading their skill level and raising their environmental consciousness, 3) anticipatory assessment of the effect of the economic activities (projects, investments) that is the environmental impact statements.

In the 70-80-s the environmental strategy of the world business was based on the conformity with moral requirements and judicial and economic responsibilities for the use of the environment through raising the consciousness. At present the priority is given to transformation of consumer policy, consumer market, including the environmental dimension.

This principle is reflected in the development of production and supply of goods and services to the market which storage and treatment would contribute to less negative effects and lead to saving primary natural resources.

The distribution of data and consulting of the producers, suppliers and consumers on environmental aspects of goods and services in the form of environmental marking and certification, which is based on environmental and economic studies.

The major criteria for the assessment of the business activity concerning the environmental ethics can be proved through the procedure of the environmental auditing. The volunteer approach is in itself the component of the environmental ethics.

At present the environmental ethics is not confined to the industrial enterprises which are the major source of pollution, but to the commercial sector - trade, public supply services, recreation facilities and transport.

## **Structure of Nature Use of the Great Watershed (by the example of Transbaikalye)**

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In regard to territorial division, Khilok-river basin includes three districts - Petrovsk-Zabaikalsky, Khiloksky and a part of Chitinsky district.

A Transbaikalian portion of the Great watershed is covered very largely with larch, pine-larch and grass-shrub forests. Areas covered with birch forests are used as pastures and mowing, are taken for grubbing and plowing, and in the future they will form the main stock of lands for agricultural development. At present forest areas are not used in full measure. Increase of the forestry development of the area is to manifest itself in formation of new districts of wood felling and gathering medical and technical resources in taiga, in fulfillment of comprehensive measures for restoration and protection of forest resources. The development of agricultural production must envisage restricted influence on the forest for the purpose of upgrading soil-conserving, field-protecting and recreational functions of the forest.

Left bank of Khilok-river is occupied by pine steppe forests in combination with fescue, forb, and coarse-grassy steppes. Here the main areas of mowing and pastures are located. At present their productivity is low. It is caused by absence of care for these lands. Productivity of natural forage lands can be increased by sowing more productive field cultures, irrigation and fertilization, additional sowing grasses. Dry and lowland meadows are met here.

During the agricultural development of the area the most affected are plant cover and soils. Natural vegetation is either completely replaced by cultural or undergoes largely the anthropogenic effect. Soils are subjected to plowing and irrigation. All this leads to instability of anthropogenic landscapes. It is possible to impart stability to them due to proper uses of meliorative techniques, placement of fertilizers, etc.

### **Questions of Safety Statement and Liability Insurance for the Saratov Hydro-Electric Power Station (HEPS)**

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Many highly-risky industrial objects and product pipe lines including structures of power industries are in operation in the Saratov Region. Saratov hydro-electric power station, a branch of RAO «EES Rossija», is among them.

Introduction of the safety statement of this plant is stipulated by the Resolution of the Government of Russian Federation of July 1, 1995 №675 and Administration of Saratov Region of 04.05.95 №137, and also by the more recent Federal laws regulating safety of hydro-technical structures.

Safety statement of HEPS is a document, which defines possible type and scale of emergency situations at the main hydro-technical structure and measures for their prevention and liquidation.

It should characterize: the safety of this industrial object (complex of HEPS structures) during all phases of its life cycle, risk of emergency situations of natural and man-caused character at HEPS, including definition of initial events (accidents with destruction of dam's body, wash out of river bank joints, flooding, etc.), evaluation of development conditions and

possible consequences of emergency situations, including large scale floods, destruction, death of people, damage to property.

Already gained experience of safety declaration by specialists of Saratov branch of the Russia Environmental Academy allows to regard the information contained in the statements of this type (considering the need for its periodical renovation every 5 years) absolutely necessary for current safety management of HEPS in the region, especially considering the close distance between Saratov HEPS and Balakovo nuclear power station and the operation of Saratov HEPS in the series of large Volga HEPS.

Safety of dam's primary hydro-technical structure is investigated using several current acceptable methods, the results of which are compared later: method of point evaluations, method of criteria evaluations, based on indications of transforming sensors implanted in the dam's body, etc.

Statement of HEPS preparation for localization and liquidation of emergency situations has great organizational and information value (section 3).

Section 3 of the Declaration «Securing Readiness of Saratov HEPS for Localization and Liquidation of Emergency Situations» contains: description of notifying systems for emergency situations; description of means and measures for protection of people; way of organizing medical provision.

Experience shows that full execution of the Resolution of the RF Government of 1.03.93 №178 «On Creation of Local Notifying Systems in the Regions Where Potentially Dangerous Objects Are Located» poses significant difficulties for HEPS because of large potential area of flooding incase of dam's destruction. In this and other cases decisions are made which are based on step-by-step execution of required measures under strict control from region's CD and ES committee.

The following difficult questions which find solutions at HEPS are: certification of emergency-rescue crews, rational way of acting on the side of forces and measures for prevention of emergency situations, their interaction with forces and means of region (city) and other objects.

#### *Reference*

Safety Declaration and Insurance of Civic Responsibility of Potentially Dangerous Enterprises of Saratov Region: Organizational-Methodic and standard materials. /Edited by A.I. Popov. Saratov: Saratov State Technical University, 1996, 172 pages.

### **Ecological - Economic Substantiation of Complexes for Processing and Salvaging Industrial Wastes**

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For the last years in the field of environmental protection in Russia there were essential positive modifications. However, many ecological problems are not solved yet. Especially acute is the situation with neutralization, processing and burial place for industrial wastes.

The problem of decreasing the volume of industrial wastes of the enterprises is decided by curtailment of production of scraps, i.e. the use of more pure and complex technologies,

secondary processing of scraps inside the enterprise, waste utilization as raw material, extraction from scraps of useful substances, erasure of scraps and their burial place. At the same time, all enterprises are «destined» to process scraps and, therefore, are compelled to address the services of the specialized companies - complexes designed processing and waste utilization.

In conditions of absence in Russian Federation of sufficient quantity of specialized polygons on salvaging industrial wastes there occurs their accumulation in temporary storehouses and on industrial grounds of the enterprises. It is an unfavorable ecological factor, as the objects become secondary sources of contamination of an environment.

In the correspondence with the decree of the government of the Saratov Oblast in 1995 the development of technical - economic substantiation (TES) of a complex on processing, neutralization and storage of industrial wastes was begun. However, the given project requires more careful ecological-economic study.

The broad realization of such projects would mean the appearance in Russia of the industry on processing industrial wastes.

Ecological - economic substantiation of the projects of complexes on processing and salvaging industrial wastes should happen because of the applications of criteria and parameters which are taking into account the necessity of maintaining ecological safety of the complex, increasing economic efficiency of its operation; meeting the conditions and requirements of the enterprises - suppliers of wastes, production of economically profitable, competitive and sold in the market products.

The fulfillment of these requests will allow to ensure its efficient activities with allowance for the above indicated factors.

One of the main problems is the consideration of industrial wastes as raw materials, which can be used for manufacturing rather competitive products.

Distinctive feature of the enterprises processing and utilizing the wastes, lies in the fact that their productions should be oriented not only at actual demand of the consumers in secondary production, but also at the needs of the enterprises -suppliers of scraps. It means, that a potential and structure of a complex should correspond to the volume and structure of industrial wastes.

It is necessary to consider processing of scraps, in this context, as production - commercial activity on rendering specialized ecological services to the enterprises which have scraps. In their turn ecological organs, with the help of economic mechanisms (payments and fines), should be stimulated by the enterprises to search for the ways of decreasing the volume of industrial wastes, and also their processing and salvaging.

### **Mathematical Modeling of Ecological Bargains between the Enterprises**

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The situation is analyzed, when the construction of the new enterprise in some region results in inadmissible growth of contamination of an environment. One of the possible methods of an exit from such situation is the realization of the ecological bargain between the new enterprise and one (or several) operating (old) enterprises.

The essence of such bargain is, that the new enterprise  $P_1$  pays to the operating enterprise  $P_2$  the costs for the decrease of emissions to such magnitudes, that, with allowance for the exhausts of the new enterprise, the ecological situation in the region meets necessary standards.

Such bargain should be ecologically allowable and also economically favorable both for  $P_1$ , and for  $P_2$ . Thus for the determination of good bargains it is necessary to make sure that

significant parameters of the product are ecologically allowable and economic set of bargains is favorable to both partners.

The analyzable model is based on the data on thermal coal power stations and includes: a) ratio between a mass of emissions and near ground concentration of ashes; b) regressive ratio between the costs of prevention of contamination and mass of exhausts for electrofilters of coal power stations; c) ratio for determination of a net profit of the enterprises and its dependence on mass of coal which has been burned. Besides it was supposed, that it is possible to present emissions both of  $P_1$ , and  $P_2$ , as exhausts of dot sources.

To ratio b) and c) correspond to the smooth curve on a plane of masses of emissions, which is easy to calculate. To a ratio a) there corresponds a piecewise linear curve, for determination of which the method of statistical tests of Monte-Carlo, realized on the personal computer, was used. Also Monte-Carlo method was applied to find the product of an ecologically allowable set and economically good bargains set.

The method of stochastic optimization was applied to find the optimum bargain, to which there corresponds a maximum of a net profit. It is shown, that the optimum bargain is on the boundary of ecologically allowable bargains area. To the optimum bargain there corresponds a case, when the enterprise  $P_1$  combines its own measures on the decrease of emissions with conclusion of the transaction with the enterprise  $P_2$ .

The possibilities of statistical modeling on personal computers allow not only to decide the considered here problem about the bargain between two enterprises, but to give the recommendations relating to all region, and also to take into account influence of such mechanisms, as payments for contamination of an environment and purchase of the rights on ejection's.

### **The Problem of Protection of Environment in Transitional Conditions of the Russian Economy**

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Human attitude towards environment is a measure of social and technical achievements of the human society, one of the characteristics of civilization level. Russian Constitution guarantees the citizens right to have the favorable environment, reliable information about its conditions and to have the restitution of damages to his health or property due to some ecological crime (article 42).

It is necessary to create a good system of relations between the economy and ecology, which could provide the industry development without ecological damage, using ecology for the further human development.

The main goal of the society is to make economy more ecologically concerned, to decrease the industrial burden to the Earth, to support the nature and the regime of the natural process on the planet.

Today it is characteristic for the transitional Russian economy to change permanently structures of the property forms and laws and also a permanent process of changes of the property objects. As a result of state property privatization in The Russian Federation, we can see a new class of businessmen, which is based on the diversity of the property forms. And for the representatives of this class, the concern about environment, as well as making profit and provision of industry development must become the main goal in their business.

In the present time we have an objective necessity to establish the interconnection between the result of economic activities and the extension of ecological influence to the



production methods. Therefore the major interest of the society, state, businessmen and people activity is to provide a unity of actions concerning the environment.

The structural economy changes in Saratov Oblast encouraged the creation of the small enterprises, which are flexible and competitive on the one hand, and which can at the same time with use of a new environment-friendly technologies, make their contribution to the betterment of environment. According to statistics, the ecological situation in Saratov Oblast has improved: water pollution has decreased from 500,5 million m<sup>3</sup> in 1994 to 280,4 million m<sup>3</sup> in 1997, air pollution at the same time has decreased from 200,8 to 127,5 thousand tons.

This result was achieved not only due to the fact that the production volume has decreased, but it is a result of peoples awareness of environments importance as well as of application of new ecological technologies.

Today the government role in providing the unity of societal and business goals in environment becomes more important in comparison with the past period. In this case, the state can use both traditional and know-how methods of the regulation and state monitoring over the ecological technologies in industry.

The traditional methods are divided into two groups: administrative and economic, which use fines, approvals and different kinds of tax deductions for the attraction of businessmen attention to the environment.

Today, the modern methods of the regulation of the environment just begin to develop and we need to find a new methodological approach for their elaboration.

At present while, solving the environmental problems, we also need to use all opportunities of the public opinion, all market economy methods that could regulate environment. Competitive market economy makes us use more environment-friendly technologies in production to decrease and put an end to harmful effects of the industry to the nature, to support the environmental stability and to improve the environment.

### **Integrated Environmental Protection Concept**

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To be able to implement the concept of integrated environmental protection we have to know the costs of environmental protection. In the years 1995-1997 the environmental scientists in Poland developed the methodology of studying the costs of environmental protection accounting for their division into capital outlays and current costs.

This paper presents the results of studies of capital outlays and current costs of environmental protection in Polish industrial enterprises.

### **Basic Data for the Calculation of Sustainability Indicators**

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In 1996 the European Commission started the EPIS - project (Environmental Pressure Information System) which will provide a system of coefficients related to environmental impacts of industrial production. The environmental impacts will be identified as total emissions of air pollutants, of wastewater with specific ingredients and various types of waste

per industry sector in the NACE classification. The industrial production will be determined according to production statistics. The coefficients will relate these emissions to individual product categories as given in the PRQDCOM - system (PRODUCTION COMMUNOTAIRE) of the European Communities. A major part will play the so-called Technology Database in which information about resource consumption and emissions of various production processes used for various products are stored. The demarcation procedure of relevant production processes is outlined, and variations of these processes in individual European countries are described. The data sources and estimation methods are outlined. First results for processes of basic metal industry, cement and bricks industry, leather and food industry, electricity generation as well as for selected processes from chemical industry are presented. Problems of this approach are discussed and possible and expected results are outlined. The use of this information for the calculation of specific indicators in the EPIS project is presented in several examples. A further application where this type of information may be used is traditional input/output analysis especially if effects of substitution of individual base materials are discussed.

### **Reducing Sulphur Emissions: Assessing the Role of the Sulphur Protocols**

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The relationship between economic growth and environmental degradation has been assumed to take on an inverted-U shape implying that after certain income levels, rising incomes may be associated with improvements in environmental quality. This has been called the Environmental Kuznets Curve (EKC). The reasons why this may occur are however not entirely clear and have not yet been effectively investigated in empirical research.

Sulphur emissions have been recorded as following a genuine EKC. The income level after which emissions start to decline range in between 5000 and 10000\$ per capita. This paper shows that the EKC-relationship is probably misspecified for sulphur emissions, as emissions tend to decline at much lower income levels than reported in the literature. However, this does not imply that economic growth benefits the environment. On the contrary, for a sample of 27 countries, it is shown that higher economic results in a less distinct decline in emissions. Reasons for the decline must be found mainly in the following two (frequently mentioned) determinants: environmental policy induced by higher incomes and changes in the composition of economic output (structural changes).

The influence of structural changes are assessed with the use of decomposition methods and show that structural changes are not an important determinant for the reduction of SO<sub>2</sub> emissions in developed economies, but do play a role in Central and Eastern European economies. For West-European economies, environmental policy, fostered by international agreements, has been the main determinant of the reduction in emissions. A regression analysis on the determinants of the non-uniform reductions agreed under the Second Sulphur Protocol makes clear that higher income countries indeed have a more ambitious environmental policy but there are other factors at stake as well. Especially the state of the environment gives important explanatory power because countries with a poor state of the environment have agreed upon stricter environmental policies.

The neglect of this variable in previous studies implies that the per capita income levels beyond which sulphur emissions start to decrease (the turning points) are higher than previously estimated. It can therefore be expected that emissions will continue to rise in most countries worldwide, but that a correction will be undertaken for those areas that suffer from a poor state of the environment.

## **Investigation of Influence of Gas Industry's Enterprises on the Environment of Saratov Region**

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Saratov district is one of the first regions of Russia where the construction of gas industry enterprises was started in post-war years. It is obvious that to-date most facilities, in particular at underground gas storage's have become outdated. This is a reason of numerous hydrocarbon and other emissions into atmosphere which lead to equipment operation risk including ecological one.

Elshano-Kurdyumovski Stepanovski and Al-Gaiski UGSs have been investigated that allowed, to reveal their impact on environment. The influence of natural geographic and climatic characteristics of the above facilities on distribution of pollutant emission in all biosphere components is shown.

Pollutant concentrations in atmosphere were calculated for different distances from emission sources, while dispersion of emissions in industrial and inhabited zones were plotted.

In order to evaluate the possibility of pollutants fixing in soils and thus to predict possible pollutants migration beyond the UGS territory physical and chemical - properties of soils within the territory of UGSs were analyzed.

Industrial aquasystems study allowed not only to evaluate the quality of intaken and discharge waters but also to offer methods for treating discharge waters to permitted norms, and in some cases to recommend them for re- usage (recycling).

Many substances, released into atmosphere are exposed to different chemical transformations thus causing so-called secondary pollution. Chemical models of such transformations are proposed.

Changes which depend on many factors, including initial pollution of environment components, and which are dictated by different physical and chemical and biological processes are also highlighted in the work.

### **Environmental Management Systems: A way Towards Increased Co-operation at the Local and Regional Level**

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Due to the complex character of environmental issues there has been a call for change towards integration and co-operation on the environmental management scene.

This have had, and will further have consequences for environment-related work in Swedish municipalities; which have got an increasingly important role in the overall work for a healthy environment, and ultimately for a sustainable development. Due to cultural differences between different professions in municipalities, it may however be hard to reach co-operation among different actors in municipal environmental management.

From this perspective, we have been studying the implementation of environmental management systems in all municipal organisations of Västerås town, a Swedish municipality. Our study confirms the existence of cultural gaps between different actors, and initially the

implementation of EMSs may actually widen these gaps. As the implementation proceeds and experiences are being discussed among the actors, the gaps seem to narrow.

Based on results from our study we argue that municipal-wide implementation of EMSs may help to bridge cultural and language barriers. It creates a common platform and structure for environment-related work in different municipal authorities and companies, and thereby facilitates communication and co-operation among the actors in municipal environmental management.

## **The Object of Ecological Monitoring**

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Russia started development of monitoring by the branch principle. This way has no future. It does not take into account properties of ecosystems: closeness, independent functioning, interrelation of natural processes and phenomena, bioproductivity. It is impossible to save, for instance, forests polluting soil or bracing historically developed air and water regimes.

Analyses of geostructural, geohydrochemical and geomorphological peculiarities of central type morphostructures (CTM) revealed their important role in the formation of the earth crust. The matter-structural complexes and endogenously caused geomorphologic surface are the integral properties of CTM as autonomous geological body with conformable, uniform and similar landscape surface.

Hence, ecogeosystem (in a geological meaning) is a central type complex autonomous natural morphosystem with its own typical interacting vegetable and animal worlds and microorganisms, geo-hydro-bio-atmosphere and society labour forces located within its limits.

Isostasy is the planetary universal regulating mechanism of the Earth development. This mechanism provides keeping the Earth's share as a figure of hydrostatic equilibrium and distribution of the Earth's substance in layers according to its density.

Exogenous processes lead to landscape planation and crust formation which results in formation of mineral complex stable under hypogeous conditions (clays, oxides, salts). Soils, which are a complex function of rocks, organisms, climate, relief and time, are formed in a process of biochemical weathering. These soils characterize stable relation of soil formation with the flora and atmosphere.

Stability of ecogeosystems is defined by interaction of endogenous, exogenous and anthropogenous forces. Violations, in particular, of water-salt regime in a reclaimed (water-active) layer lead to degradation of top-soil and then of vegetation cover without which organic life is impossible.

In view of the above-said it is necessary to develop planned, special purpose approach to organization, management and control of human activity directed at creative use of nature and ecological-lawful regulation of interrelations of society and nature.

Firstly, it is necessary to conduct geocological division into districts and pick out representative objects of complex observation - central type morphotectonic structures.

Secondly, it is necessary to define directions, intensity and regularities of the main processes going on in lithosphere, hydrosphere, biosphere and atmosphere in natural and anthropogenously violated conditions within representative objects (CTM).

Thirdly, it is necessary to develop criteria - indicators of ecogeosystems stability and maximum permissible loads.

And finally, it is necessary to work out models and software for ensuring stable and ecologically rational development of national economy in ordinary and extreme conditions, to conclude international and inter regional agreements on maximum permissible loads, because

several regions and even states may be situated on a territory of ecogeosystem.

Such complex monitoring can ensure full and reliable information for taking objective decisions on Russia's shifting to the model of sustainable development.

### **Consumption, The Endogenous Structure of Time and Sustainable Dynamics**

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This paper combines a time-allocation approach with a model of economic dynamics based on the accumulation of human capital. Consumption is modeled as an activity having a time-dimensional output (enjoyment time). The accumulation of knowledge improves both the efficiency of production and consumption activities and technical progress is therefore extended to the realm of consumption. This implies that consumer preferences become dependent on the level of knowledge and technology and that the endogenous determination of the structure of time significantly affects the dynamics of the economy. The paper contains a critique of the notion of leisure and a discussion of the problem of dematerialization. Since dematerialization is a fundamental precondition for sustainability, the paper suggests to consider the endogenous structure of time as a main reference in the design of sustainable economic policies.

The paper is purely theoretical and has no empirical reference and is related to the following areas: 1) Growth, Globalization and Internalization 4) Environment, Institutions and Society 3) Social Factors of Sustainability and Health of Population.

### **Productivity and Sustainable Development: Micro-Fundamentals**

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Sustainable Development (SD) is first and foremost about equity while. Neoclassical Economics (NCE) is about efficiency. Empirical evidence shows a decoupling between real income per capita, a NCE concern, and well-being, an SD concern.

NCE aims at maximizing GDP per capita, a flow, while SD focuses on the value of capital including amenities. However, both NCE and SD are interested in increasing total factor productivity. SD requires a new «industrial revolution» which acknowledges natural capital as the scarce factor of production and emphasizes eco-efficiency (cradle to cradle management at the firm level) while knowledge is the scarce factor for NCE (high-performance workplace).

The new industrial revolution (including information technologies) will aim at increasing the rate of natural-capital saving (mission-oriented) innovations and services.

While efficiency is not explicitly part of the SD agenda, increasing the scarcity of natural capital, the assumed widespread availability of no-regrets solutions, and capital-saving innovations improve overall economic efficiency. SD emphasizes the systemic complementarity among the four forms of capital (e.g. in closing material, and production and

product liability loops) while NCE moves in that direction (e.g. recent emphasis on social capital) except for natural capital. NCE is market-based while SD requires both top-down and bottom-up approaches. SD favored top down mechanisms are voluntary environmental instruments (e.g. covenants), the Porter Hypothesis, eco-taxation, procurement and education; favored bottom-up instruments are eco-labeling and ISO 14,000.

The NCE goal of developing knowledge intensive commodities is likely to be natural capital saving.

While the ethical value systems of SD and NCE are far apart on equity grounds, there is likely to be pragmatic convergence on efficiency ground.

### **Individual Health Index**

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Three approaches are usually applied in modern evaluation of human health:

- a) general health is estimated and not the health of a single individual;
- b) the state of health is judged upon its loss, which is expressed in the indices of the loss of ability to work and others;
- c) the change in the length of human life shows the loss of health within a certain group of population.

We suggest another approach to evaluate individual health, that is, not by the fact of its loss (illness or death) but before some bad consequence occurs.

We suggest an index of individual health and calculate it by means of methods applied by the United Nations Organization. Into the basis of the calculation of the suggested index of individual health (IIH) we put the method used by UNO on calculating the index of human development (IHD). A different economic model was applied there and the focus was made on a human being.

IIH as well as IHD are considered as an average sum of the four fixed indices, each of which does not exceed one unit.

We suppose that it is necessary to introduce one more item into IHD – it is the item of ecological well – being (IEW) which shows the relation of the expenses on the environment protection, to science, education and health services per capita, fixed according to the world level. Then IHD will also be measured by 4 estimations. IIH, in our opinion, is composed of the index of the social well - being (ISW), IEW, index of physical well – being IPW, which corresponds to the definition of health given by the UNO  $IHI=f$ .

CW is estimated by the real income per a family member EW – by the above expenses, PW – by the indices of physical development, by genealogical and adapting features of a concrete individual, PW is estimated by psychological and intellectual qualities of a human being.

## **Forecasting of Supposed Damages of Forest Plants Caused by Destructive Insects**

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The great importance of forest in all spheres of human activities is well known. However, forests experience great oppression from human business activities. At the same time favorable conditions for reproduction of the great number of destructive insects are created, which damage foliage and needles of trees, cause abrupt reduction of growth and stability of trees. The fight with destructive insects becomes effective only when it is based on precise data about population density and defoliation degree of tree crowns.

The proposed forecast system of the assumed plant damages is based on the data of researches in Saratov Region, these data being received as a result of adaptation of mathematical models. It was detected that the size of damages from destructive insects is proportional to their number and degree of injuries in assimilation apparatus. Mass registrations of forest pests with simultaneous evaluation of the degree of eating away of plants allowed to find out the relations between indicated qualities. They are of curved character and are well described by model function. The application of the discovered model permits to detect the threat of the forthcoming eating away of plants by the number of winter reserve of insects. To get precise estimation of the number of winter reserve of insects, projects of successive registration were made as well as specific formula for detecting the necessary volume of selection. To use indicated model in different plants, the obtained estimation of number is turned into unified unit of calculation equal to 100 sprouts. As a result the regional table was made up, which allows to evaluate the threat of the forthcoming eating of plants by the number of phases of winter destructive forest insects.

It was discovered that planning of forest protective measures is useful at 50% of eating away of plants. Thus the application of the suggested forecast will allow to timely plan and hold measures on forest conservation.

## **Methodological Principles of Building up Relation in Cooperative and Integrated Organizations of Agro - Industrial Complexes**

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At present a great interest of the agrarian science and practice to cooperation and integration tends to raise as these trends are adequate to market conditions. It is necessary to follow the principles of expediency, evolution, balanced interests for farming subjects, operationality of production economic processes, complex, social principles and orientation in the market situation.

Organizing branch associations, it is important to be guided by expediency principle for raising production potential usage of agricultural manufacturers and processing enterprises by means of integration ties development.

Evolution principle envisages stage rapprochement of economic interests of agro - industrial production links. At first it is possible to use simple forms (joint - stock company without a legal status). Then one can use more complicated forms (associations, agricultural consumer cooperatives, etc.) with deeper interaction between agro - industrial complex subjects. The principle of balanced interests of acting subject means restoration of destroyed production ties and disproportion shift in the relations of integration forming partners. In its turn, organic combination of economic interests of agricultural manufacturers and processing enterprises provides the principle of raising operationality in production - economic management processes in product sub -complexes that promotes effective usage of the resource potential. Complex principle envisages quantity and quality parameters in the development and placing of raw material suppliers and processing enterprises with vertical integration organization.

For instance, when agricultural consumer cooperative of agricultural production processing and realization at the administrative region level is being formed, it is necessary to take into consideration farm numbers, their specialization and production volume, organization of the legal forms of farming and relations between them, infra - structure presence (warehouses and others), rational models of agricultural enterprises, optimum correlation between production volume and its processing capacity, rational correlation between small and big structures, level of the local food market satiation level and supplementary post creation.

The latter is directly connected with social principle, as employment level of the region population and its economic conditions raising depend on the profits of integration and cooperation formations. Practically all-monopolistic private enterprises work for «themselves» without taking care about social needs of village and region. That is why it is important to have the mechanism of economic cooperation between enterprises of one territory (region, district) because their functioning will provide a social level adequate to economic development level.

It is necessary to mention, that social level will depend not only on the production and processing work of enterprises, but on the work results of the trade organizations.

Orientation principle of integration and cooperation organization in the market situation is the key trend of its action and it assumes marketing development and constant monitoring carried out on the food market for providing effective subcomplex work.

We consider that economic necessity of integration and cooperation organizations must result in the system of integration and cooperation formation. There must be created in agrarian sector and it will unite all the farming subjects of multi - structural economics into unique agro -industrial complex and raise its efficiency.

## **Environmental Management System in Polish Enterprises**

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Large Polish enterprises more and more often apply pro-ecological management systems in accordance with the principle of sustainable development.

Implementation of environmental management systems is hindered due to the lack of a clear methodology of evaluation of costs and benefits of such undertakings. This is true especially of small and medium size enterprises with limited financial measures.

In this paper the authors evaluated the implementation in Polish enterprises of the Cleaner Production programme, the Responsible Care programme and the implementation of environmental management system as recommended by ISO 14 001. The authors proposed



the classification of benefits of pro-environmental activities. The classification emphasises the benefits to the very enterprise and its employees, as well as the benefits to the society as a whole. The authors divided the benefits to the enterprise into the benefits which can be measured and into those which cannot be measured. The analysis proved that the problems with evaluation of the benefits which cannot be measured should be solved through evaluation of their impact on the enterprise's profitability.

In paper author improve that environmental management systems (EMS) is efficient way to promote international trade.

### **Competitiveness of Production From Positions of Logistic Approach as a Factor of Market Stability of an Enterprise**

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In the conditions of total crisis of the Russian economy and cruel competitive struggle on the markets every producer should constantly analyze properties of production; these properties determine a degree of consumer preference to the production in comparison with other similar products or services, satisfying the same needs as the considered production. These properties express the parameters of competitiveness of examined product.

Analyzing a problem of competitiveness from the positions of logistic approach we take into account material flows of considerable production and similar products of other producers. Besides we consider production both at a micro-level - inside the enterprise, and at macro-levels (country, group of the countries, legislation limits of income flows of production to various segments of the market, competitors, international competition). And the analysis of competitiveness is based on the logistic principles taking into consideration optimal material, information and financial flows.

The models of logistic systems (which use marketing paradigm of logistics) describe and explain the relations between logistic system and opportunities of a firm in a competitive struggle. Synthesized logistic system should realize the strategic purpose of a firm, strategy of a competition on the market of production, that requires the decision of such marketing tasks, as market researches, positioning the firm on the market, forecasting of demand and so on. Thus, providing competitiveness of production requires the synthesis of such logistic system, which could realize the above named strategic purpose of a firm. So we can tell, that providing competitiveness of production can be completely considered within marketing paradigm of logistics. But the models of logistic objects using this paradigm, are mostly abstract; they have large dimension and qualitative character. That is why it becomes difficult to make simple analytical decision. The mathematical base of marketing paradigm consists of the probability theory, mathematical statistics, methods of operation research. And these mathematical tools can not provide effective decisions while processing the qualitative information. This fault can be passed by the application of an original technique offered at the present report. It is based on consecutive processing of the information received by comparison of expert statements with the subsequent hierarchical synthesis of results. This technique helps to make crucial administrative and management decisions in situations, when it is necessary to choose an optimum variant from probable alternatives. It is characterized both by quantitative, and qualitative (non-numerical) parameters. Both specialists in the field of producing of considered production, and customers can act as experts. The named features of the technique provide an opportunity to make an optimum decision and as a result to achieve real competitiveness of production. And competitiveness of goods leads to competitiveness of an enterprise and allows to achieve strong and stabile position of its production at the market.

## **Organizations as a New Field of Practical Application of Ecology**

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The development of the society may be methodologically considered in a «challenge-response» paradigm. One of these challenges is ecological. Only the adequate response to this challenge running through all spheres and institutional forms of human life makes the sustainable development of the society possible. As organizations are not the exception, a new and prospective field of knowledge-organizational ecology-came into being.

Organizational theory discourse is to a great extent «captured» by terms and concepts taken from ecology. Organizations are considered as integral purposeful systems adapted to the environment; they have to survive, keep their identity and at the same time change and develop. While designing ideal and typical organizational structure which could be used as a pattern, ecological and neurophysiological data are used. It is also connected with the study of organization-environment correlation. The so-called environmental sociology strives to apply the universal ecological laws to the society and its units.

Organizational ecology studies the role of a technical kernel of an organization in its adaptation to environment. It is also shown that in case of unsuccessful and complicated situation of adaptation the organization forms turns to be recursive to the variety of environment.

Organizational ecology considers organizations as complex formations involving several social groups as the bearers of definite activities. They are not only the bearers of their own purposes but of the definite social patterns as well, making it possible to exercise activities in cooperation with other organizations. Environmental type often defines optimal forms and design of the organization which restricts random social changes.

From the point of organizational ecology the organization should not only choose actions for self-alteration but forecast the consequences of these changes. Organization should have and constantly widen a set of action patterns. It makes the organization (its head, personnel and often the consultancy firm) to develop the strategies of behavior which consider not only rational but existential, vital sides of organizational life as well. Organizational ecology begins treating organizations as living beings having their history and fate, their life-cycle, points of birth, acme and leaving «the organization map».

An important for organizational ecology link «organization-environment» has its internal aspect as the organization itself is the environment for its divisions and members and the same relations as outside the organization exist in it. Here works the theorem of recursiveness which can be shortly expressed as follows preserve the integrity of the organization in its each separate part.

The study of human resource is an important component of organizational ecology. Here it is closely connected with the humanistic paradigm of contemporary management and requires a clear answer for the question whether people are for the organization or the organization is for people.

Summing it up we may say that it is impossible to study organizations, their behavior, development and culture without considering the main ideas, language and humanistic spirit of ecology. Therefore, ecology like synergetics, cybernetics and general system theory is looked upon as a fundamental level of organizational theory.

## **Coevolution and Spirituality**

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Optimization of the interrelation between Society and Nature is impossible without consideration of the anthropologic constituency of this process and – in a more narrow sense – its spiritual factors. That the mechanical view to nature as a passive object of human forces application is false and limited was proved by all modern scientific and philosophical investigations. In the light of the latest research, universum cannot be considered in the context of the opposition of material and spiritual, because at its in – depth, fundamental level there can be identified an ontological unity, interdependence and even intertransference of the forms of material and spiritual being. From this point of view the role of mental and moral – psychological processes in structuring man’s ecological environment shouldn’t be underestimated.

What we mean here is not only the proper use of Nature’s laws. This interaction is much more complicated: it includes Nature’s «responses» too, and the «responses» are caused by not only industrial technical activities of man but also by his spiritual – psychological intentions too. May be it is high time to start thinking why recently Nature is more often «responding» to the intensification of social clashes (wars, terrorist acts) by natural catastrophes.

It becomes more evident that only technical approach problems is not sufficient, and it is necessary to take into account spiritual determinant in the process of the movement towards coevolution of Society and Nature.

## **Linking Environmental Instruments, Management, and Ecosystem Health**

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Business environmental management motivated by ecological pressures, coming mainly from environmental protection agencies, is under study. The paper defines Environmental Management in Industry (EM) and describes the methodology to assess EM which is specifically induced by environmental policies. Since not for all sectors of industry and sizes of firms the data is available in sufficiency, a qualitative approach is chosen. The so-called Enterprise-Environment Connections Diagram is proposed, which provides a contingency table with classes of business environmental actions in rows and environment pressures (among which are environmental instrument or EI) in columns. Various factor analyses can be performed on such a contingency table. To identify the impacts of EM - and indirectly of EI - on ecosystems health (EH), that statistical descriptive multivariate tool is used with three kind of variables related to ecosystems:

- 1) ecosystem health quality parameters,
- 2) ecosystem boundaries, and
- 3) ecosystem resources used.

A case study describes the hydrological ecosystems, water protection policy, and industries of Wallonia (the French-speaking region of Belgium). The results of five factor analyses are detailed, from which the potential relationship between environmental instruments, environmental management and ecosystems health is identified for Wallonia. Practical recommendations to improve the Walloon water protection policy are drawn.

## **Danger Analysis and Risk Evaluation of Accidents on the Linear Part of Main Oil Pipelines**

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Operation and safety provision of main oil pipelines, running in the Saratov Region, is a serious ecological and economic problem. During the period from 1989 to 1997 9 accidents took place in the linear part of main oil pipelines in Saratov Region.

Six accidents out of this number resulted in the loss of up to 10 m<sup>3</sup> of oil. 2 accidents lead to considerably larger losses of oil. The main causes of accidents were:

- corrosion of pipeline's wall;
- spoilage of construction and assembling works;
- mechanical damage;
- faults of operational staff.

Analysis of conditions for the accidents origination showed that their main causes were corrosion (33%) and spoilage of construction-assembling works (22%). In most cases negative consequences in addition to losses of oil were represented by environmental pollution (pollution of water, soils, atmospheric air).

In order to decrease the environmental impact of possible accidents it seems very effective to define scenarios of likely emergencies, which allow to determine volumes of lost oil, possible spreading, prophylactic measures in order to limit spreading, actions of emergency and ecological services personnel.

Physical-mathematical models and calculation methods are used for danger evaluation. Risk evaluation of possible accidents in linear part of main oil pipelines:

- is defined by likely consequences of accidents and emergency situations with consideration of their probability, and by mathematical methods with consideration of failsafe work and failure probability. Accidents, where losses of oil exceed 10 m<sup>3</sup> are considered in calculations;
- zones of primary affecting and polluting factors are defined in different scenarios of accidents. Pollution zones of environmental components, main physiological and biological affection factors are defined too;
- value of possible damage to environment and to physical and legal persons is estimated;
- flow-chart of evolution of possible scenarios of origination and development of accidents in the linear part of main oil pipelines is created.

The set forth analysis of safety of linear part of main oil pipelines allows to make conclusions about the direction of activity of operational structures from the point of view of stability and their ecologically safe operation.

## **Conservation of Biodiversity and Watershed Management on a Regional Level**

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In 1997 large-scale Project «Conservation of Biodiversity in Russia», supported by Global Environmental Facility had been launched after a long stage of preparation. The Project has a complicated structure with components at national, regional and local levels. Three regional

projects of watershed management in the Lake Baikal Basin are the subcomponents of the Project. In this paper one of them: Khilok river watershed (in Chita Oblast in the Eastern Siberia) is considered.

It is a comprehensive program which contains research, first-step measures of prevention of ecosystem degradation, creation of the incentives for public participation etc. But now we focus on its scientific part which is to provide a conceptual base for a long-term agenda for conservation of biodiversity in the watershed. This part is divided into 2 sections:

- (i) development of environmentally sound land use strategy,
- (ii) the program of a long-term monitoring development.

Scholars who started to work in these issues have faced with a lack of adequate informational flows which are necessary both for scientific tasks and decision-making. The former informational system was oriented to manage of nature use within the centralized economy and now it is not relevant to new situation. For example, all information about forest resources extracting is connected with administrative divisions and ignores a problem of forest ecosystem integrity. Moreover, ecosystem approach and sustainable development requirements almost cannot be taking into account within existing informational flows.

Therefore creation of the concept of informational support for biodiversity conservation was recognized a one of the most important Project objective. Series of partial problems are studied in this connection:

- which impact should be assessed?
- which assessment methods should be used?
- which informational flows should perform different impacts and provide including relevant information into decision-making?

The main owner of natural resources in Russia is the State. But state property without adequate system of legislation in environmental and nature resource sectors leads to uncertainty of the ownership in practice and «almost free access» to natural resources.

It should be mentioned that it is only the part of the problem. There are many stakeholders who are not interested in the transparency of regional environmental and economic policy. So preparation of the tools to reconcile different interests in this field is also a great challenge of the Project.

### **Economic Ecological Substantiation of Agrarian Production**

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Under market economy striving for maximum profit frequently results in neglecting ecological interests. In pursuit of money income with minimum expenses crop rotation structure is disturbed, soil fertility is depleted, which leads to degeneration of natural resources. In some cases people unconsciously by virtue of a habit sow the same crops, breed traditional cattle though sometimes it is not profitable economically and not justified ecologically. Moreover, long-term consequences of this or that measure are not taken into account while determining efficiency. That considerably distorts real economic evaluation.

To draw an objective picture of agricultural production profitability it is necessary to consider ecological consequences expressing them in cost assessment. It could be done if one knows what expenses will be required to restore ecological equilibrium. For example, if soil fertility is depleted as a result of intensive crop cultivation when calculating efficiency it is necessary to consider expenses for application of organic fertilizers which can restore soil

productivity. For this purpose the author worked out calculation formulas and selected proper norms allowing to show change in the content of soil humus in different climatic zones.

In analogous way one can determine ecological consequences in other branches of agrarian production and then convert them into money equivalent. Besides, while substantiating rational production structure it is important to determine bounds beyond which there come irreversible ecological consequences. However profitable crop or cattle production might be achieved, but if the planned production structure results in irreparable losses, it must be rejected. Therefore, while determining production structure it is necessary to set up economic, ecological and social restrictions. Each restriction can be expressed in specific figures, be it a minimum of essential profitability, maximum permissible environment pollution level or providing for working and resting conditions. Optimization problem with the consideration of economic, ecological and social requirements is solved for agricultural production of Saratov Oblast, index of economic ecological efficiency being used as an optimum criterion. This index includes value of economic effect adjusted to the cost of ecological consequences. This problem solution has shown possibility' of combining economic, ecological and social requirements which helps to get necessary effect with long lasting agrarian production stability. Analogous calculations are done for agricultural enterprises that enable to combine economic and ecological interests. The given methods are used in teaching students at the Saratov State Agrarian University.

### **The influence of Quality, Volume and Intensification of Water Feeding on the Degree of Ecological Safety of Irrigation**

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The quality evaluation of irrigation regime in reconstructed and moreover newly built systems is often based on ecological priorities, pushing economical indices into the background. This approach, certainly, should be decisive while analyzing the whole technical policy in the field of irrigation. Besides, the component elements of natural resources are suggested as criteria of ecological evaluation - water quality and quality of soil, including its fertility and the forecast of meliorative situation in the area as well as the factor, fully depending on a producer - watering quality. Each of the above mentioned complex characteristics reflecting the ecological side of irrigation, represents one of the principle arguments to make decisions not only on the efficiency but also on the expediency of watering altogether under concrete conditions. Essentially, the quantitative measure for any of the indicated criteria may become a solid reason for giving up irrigation in principle. The thing is, that environmental and water characteristics indirectly depend on the producer, while watering quality is directly determined by technical level of irrigation system, the construction of vehicles and devices used and the regimes and the technologies of irrigation.

It is well known that irrigation by means of water with a higher level of mineralization and unfavorable chemical composition produces harmful effect on plants and on soil fertility. At the same time it is known that the threshold of admissible mineralization of water for irrigation depends, firstly, on the quality of irrigated soil. Secondly, it is discovered that the level of perceptibility of crops to the quality of irrigation water is reduced as the doses of fertilizers, especially mineral ones, are increased and the yields grow. Consequently, the problem of the admissible level of mineralization and the quality of irrigation water is rather complicated and can't be solved without considering concrete conditions.

Restrictions on the quality of natural waters used for irrigation in Volgograd region are

known. The quality of water-soil resources is satisfactory and doesn't serve as an obstacle for the development of irrigated farming. That's why watering quality is the most strictly controlled index for the given conditions. It is the intensity and the volume of water delivery to the field that influence here the degree of ecological safety of irrigation. It shows that the limits for norms of water intake of natural waters from water sources and norms of water delivery for irrigation and the limits on the intensity of water delivery and norms of watering must be introduced. The aims of limiting is to conserve water-ecological balance characteristic for automorphic soil formation.

The number of overflow pipes depends on the volume of water sources and, according to the admissible minimal expenditure of water in rivers (to protect nature), should not exceed the determined limits. This restriction is minimal. However the maximum norm of the water feeding should not be more than 30 % of the many years delivery of natural water to the irrigated area. Thus, the norm of water intake and the norm of water feeding for irrigation aims should be kept strictly to the established schedule at the period of planning as well as during the regime of exploitation of irrigation systems.

### **Ecologization of Production in the Economy of the XXI century development**

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At the end of the XX century the influence of production processes on an environment acquires not only negative, but also irreversible character. The examples of such influence at the Volga river region are: increase of contaminated by sulfuric acid wastes of fertilizers production at Balakovo city; considerable overflow marginal densities of harmful additives in the air of major Volga region cities; presence of contaminants of bottom sediments with heavy metals and other elements in the Volga river; gradual anabrosis and deterioration of the Volga region grounds, which used to be fertile before.

The processes of an environment degradation affect all levels of human economic activities, including the global one. Therefore the revision of the society and managing structures approach to ecologization of production is needed. This approach should become most essential in the XXI century. Leading particulars (stages) of production, ecologization should become the following introducing into the empirical economics the concept of «ecoresource» and development of the method of its rating application with the use of calculation of the alternate fixed costs; transition to low-waste and wasteless manufacturing processes; realization of the applicable full-range ecological certification of production; reduction of usage of air and water in production (transition to predominantly self-contained /close/ work cycles); harmless utilization of *out-of-date* goods -*which has served the term* (from the ecological point of view), providing ecological education in all fields and at all levels.

### **Ecological Processes in Dynamics of Economic Systems**

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From the position of economic dynamics and according to N.D. Kondratyev's long waves theory it is possible to affirm, that social – economic systems of countries development are now entering the rising phase of the sixth wave of Kondratyev's cycle. The basic component

of the applicable technical-economic arrangement and the defining resource of the development is the information. Directly in production there will be employed only 15-20 percents of a manpower, thus the majority of the workers will be involved in its information supply and services.

In the middle of the XXI century according to the theory of economic dynamics the seventh wave of technical and economic development is expected. Consequently there arises a problem – what is the principal component of this period? From our point of view ecologization of production becomes such a principal component. It is stipulated by a number of the factors, which are already exhibited now.

At first, the population according to the demographic forecasts will reach 11-14 billion, that is, it will reach a boundary, behind which the ecosystem can lose characteristic for the Earth «genetic signs».

Secondly, in connection with strengthening a deficit of vitally needed (indispensable) natural resources in this period many of them, such as pure water, air, ground will gain or essentially increase their cost, which value will be related to national wealth of countries and regions. In this respect, the value of grounds in USA, Canada, Brazil and Russia for example will essentially increase.

Thirdly, the manufacturing processes of the commodity production, the goods and also processes of their utilization should be also ecologized. Otherwise mankind risks losing up to 90 percents of its population and can approach the level of self-destruction. So, those are the essential factors in our which in our opinion will determine the principal component of the seventh Kondratyev's long wave in the XXI century.

## **The Objectives of Economic Evaluation of Natural Resources**

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The basis of the connection of natural-resource policy of the state with economic transformations is the multiaspect use of an economic evaluation of natural resources (EENR) defined on the rent basis. We distinguish several purposes of EENR.

### ***1. Perfecting the national accounts.***

This problem was discussed at the Conference on sustainable development in Rio. The modification of national bookkeeping concerns both macro -, and microeconomic levels. At the economic level the discussion takes place about the modification of accounting. In costs it is supposed to take into account assessing complete ecological and resources saving costs. At the macro-level the adjustment of a parameter GNP with allowance for costs of compensations for economic damage from ecological violations and aggravation of traditional natural resources is required. The realization of this purpose is connected with cardinal reform of the taxation.

### ***2. Protection of national interests of the country.***

***2.1. Definition of a loan value for natural resources.*** It is important to attract the domestic and foreign investments into the development of national economy. It is necessary to develop the acceptable forms of the loans with allowance for the mandatory part of the investment costs on reproduction and protection of natural resources with fixing as the federal property the list of strategic kinds of natural resources. Which could eliminate the possibility of their loan. The use of the loan of natural resources has also opponents who suppose, that the investments under the loan will be used either inefficiently, or not as required. Here it is



important to use EENR for the definition of the real cost of natural resources not to mortgage them for dumping.

**2.2. Differentiation of the property for natural resources.** EENR is one of the key parameters of the differentiation of the property for natural resources into federal, subject of Federation and municipal one. It is especially important to estimate real cost of natural resources.

**2.3. Removal of errors in the inter relations between the state, as the proprietor of natural resources, and other proprietors.** The state authority does not realize in complete volume and proper competence of the proprietor the right to receive the payment for the use by the third faces of its property. For example, the water companies sell the water prepared for the use to the consumers without payment for the rent of initial water resources to the proprietor. As a result the budgets of different levels receive much less taxes.

**Evaluation of a natural part of national riches of the country.** Unfortunately, in Russia natural resources are not taken into account in the structure of national riches. The evaluations executed 10-15 years ago have shown the doubling of national riches with consideration of natural resources. Now, when the significant part of fixed capital assets is worn out, the evaluation of natural resources can prevail above the traditional part of national riches. There are two aspects – the growth in dynamics of the cost of natural resources and their loss from aggravation and depletion. The exceeding of growth rates of losses over the increase in the cost of natural resources would mean the degradation of natural foundation of the growth of the national wealth. In this case the purposes of protection and the reproduction of natural resources would receive social preference to traditional economic purposes. Now rates of use of natural resources exceed their reproduction. In this connection the economic transformations, including solution of the problems of the property for natural resources are actual.

### **3. Inducing rational use of natural resources.**

**3.1. Cardinal tax reform.** The rent income from the exploitation of natural resources was and remains in Russia a major source of the incomes into the state budget. But it is collected mainly by indirect taxation. Immediately as a source of its formation the state withdraws only some percents of the rent income, that distorts interbranch proportions and actually encourages enormous negative impact on the environment. The essence of tax reform consists in gradual transition from the existing mainly indirect taxation to direct natural-resources taxation. The share of indirect taxes now is increasing that results in particular, in their bad collection. The mentality of Russia to a greater extent corresponds to the direct natural-resources taxation with a modification of all structure of the taxes. A role of EENR here is important.

**3.2. Increasing the role of payments for the use of natural resources in a transitional system of taxation.** What is meant here is a gradual modification of the structure of the taxes with the increase of the share of natural resources saving taxes and ecological taxes. Paid use of natural resources, which should objectively reflect in real economic parameters the cost of consumed natural resources, now does not execute this function, as the existing payment for resources remains at the level of one - two orders below EENR. The gradual modification of a structure of the taxes should be based on a principle of «fiscal neutrality».

**3.3. Increasing preservation of natural resources role of some excise taxes.** The excise tax to petroleum and gas is installed from a turn-over from the sold product. With all that, market criteria of the preservation of natural resources are lost. It is necessary to change the order of a taxed turn-over, beginning with a stage of extracting mineral resources with consideration of economic evaluations of deposits.

**3.4. Perfecting the taxation of property.** Now the value of stocks of mineral wealth is not taken into account in the structure of the cost of property of the enterprises, especially during

their privatization. The special interest is caused by the integration of valuations of natural resources and property in developing market of real estate services, because under the Civil Code of the Russian Federation the natural resources are considered as the special kind of property. Without special work on the evaluation of natural resources in privatization processes and auction tenders like «Norilsk nickel», the business will be reduced in essence to the evaluations «of rusty machine tools».

#### **4. Economic substantiation of rational use of natural resources.**

**4.1. Efficiency of the investment projects and programs.** A key parameter of the projects - the pure discount cost (NPV) – must experience a large load on the part of increasing the role of payments on the basis of EENR. It is essential both with the modification of the national accounts, and with the modification of the existing structure of the taxation.

**4.2. Commercial effectiveness of the enterprises exploiting natural resources.** It will be influenced both by increasing payments for using natural resources in the structure of the taxes, and by the modification of the property and excise taxes on the basis of EENR.

#### **5. Specialized purposes of using EENR.**

**5.1. Substantiation of the transfer from one kind of the use of natural resources to another.** For example, transfer of agricultural grounds into construction sites, the choice of a forest exploitation value or mining minerals on the same land.

**5.2. Compensation for the losses of natural resources.** EENR should compose a basis of the amount of compensation to the holders and users of natural resources in connection with their withdrawal from economic use for main purpose.

**5.3. Influence of the risk of large – scale natural antropogeneous violations of EENR.** There is a classification of a number of grounds by the risk of impact of earthquakes, floods, etc. For example, the seismicity is evaluated in grades. The accounted seismicity, in particular for the town of Sochi can be reduced from 9 graded to 8. It will allow to take other town-planning solutions. With allowance for EENR it is possible to justify efficiency of a realization of preventing solutions. And hereby the spectrum of valuations of territory on the basis of indices of such risk is also extended.

**5.4. Insurance of the risky technologies of the use of natural resources.** One of economic tools directed against deterioration of natural resources can become the insurance upon using risky technologies, objects and processes. The economic evaluation of the consequences of large – scale violations can form the basis of tariffs of insurance. And the long-term indirect - consequences considerably exceed direct ones. In our country certain experience of the ecological insurance has been accumulated which has shown that the insurance executes not only preventing and compensating functions, but also the function of engaging free insurance means as sources of financing environmental protection operations. The insurance companies do that to reduce their risks. The insurance, as a source of additional financing, should promote the increase of EENR.

**5.5. Creation of the market of the licenses on the use of natural resources.** Apart from of the markets of insurance it is considered perspective to introduce the market relations into licensing the use of natural resources. The international market of trading the quotas on exhausts of hothouse gases is now being formed. It is perspective for Russia, as there are rather cheap methods of purposeful restoration of the forests under an absorption of carbon dioxide within the program of the carbon credit. Perfecting the policy of licensing of the use of mineral wealth is expedient, attracting at the same time foreign investors and companies, mainly, as partners of the Russian enterprises in consortia and joint ventures. The price of the licenses should depend on EENR.

In the report the dependence of EENR methods on its purposes is shown.

## **Regional Sustainability: Scenarios for the Baltic Sea Region**

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This paper presents integrated scenarios of the Baltic Sea Region. It summarises research conducted for Baltic 21, a region-wide process to identify strategies for sustainable development. The aim is to illuminate the requirements for a transition to sustainability. This touches upon where the region is now and where it seems to be heading if conventional development patterns persist but concentrates on where it alternatively could aim - a sustainability vision. The time horizon for the scenarios is 2030.

In the paper, the Baltic Sea Region is divided into two sub-regions, the Southeast Baltic Region (Estonia, Latvia, Lithuania, Poland and the Russian Federation) and the Northwest Baltic Region (Denmark, Finland, Germany, Iceland, Norway and Sweden).

In the sustainability vision, a high degree of economic equity and full employment are attained, greenhouse gas emissions are sharply reduced, the acidification of soils and waters are kept within safe tolerance levels and the Baltic Sea has returned to ecological health.

Preconditions for realising this future include the diffusion of clean and efficient technologies, reorientation of consumer demand towards less resource-intensive products and services, public support for strong sustainability policies, a co-operative climate between nations. Explorative scenario methodologies are used to scan a range of visions and trajectories to provide a background for analysis and policy assessment.

## **Optimal Timing of Harvest of two Fish Species with Multiple Geartypes**

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In this paper a bioeconomic model is developed for a commercial fishery with multiple gear types in the case of two independent fish species. Where most bioeconomic fishery models focus on either multiple geartypes or multiple species (mostly predator-prey relationships) this model combines both aspects for four geartypes and two independent fish species. The objective of the paper is to find the optimal allocation of four geartypes per period to obtain the highest net benefits while harvesting at a sustainable rate. This is done by developing a discrete time LP-model for a sole owner fishery, given a Total Allowable Catch for the two fish species.

The model is applied to the Chippewas of Nawash First Nation commercial fishery in Lake Huron and Georgian Bay (Ontario, Canada). Sensitivity analyses are performed on price changes as well as on changes in the discount rate.

## **Experience of Safety Statement of Nuclear Power Plant (NPP)**

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According to the Resolution of the Government of the Saratov Oblast all (without exception) risky industrial objects, located and operating in the Saratov Region are considered to be the subjects of the safety statement analysis (further called «Declaration»). This decision is directly aimed at Balakovo Nuclear power plant – an object of power industry of increased danger, producing 4000 MW consisting of 4 generating units, equipped with nuclear reactors of water type VVER-1000.

At the moment of preparation of the «Declaration» there was no experience of creating such type of documents for the objects of power industry because «Declaration» was not included in the list of required documents for internal use, which regulate conditions of safe operation of NPP, stipulated by Rosatomenergoadzor, Ministry of Nuclear Power, and «Rosenergoatom». The authors of «Declaration» (employees of NPP and the Saratov branch of the Russian Environmental Academy) used the structure and contents recommended for general industrial high-risk objects with consideration of particular aspects of nuclear objects.

Safety analysis of Balakovo NPP is certainly the main particular aspect, which should be stated clearly. It should be understandable not only for «narrow» specialists, but for the broadest number of people, interested in this question. Another vital section of «Declaration» is insuring the readiness of Balakovo NPP for localization and liquidation of consequences of any possible (even the least likely ones) accidents at the Balakovo NPP.

Thus questions that are in some way related to ensuring increased safety of the operation of Balakovo NPP in the region take up almost 90% of the text of the «Declaration» (sections 5 and 6).

Section 5 «Analysis of Safety of Balakovo NPP» is devoted to the following questions: principal data on technology and equipment used at Balakovo NPP; analysis of possible dangers and risks with description of conditions leading to an accident and its development; assessment of dangerous substances which can be activated in an accident; risk evaluation of accidents and emergency situations, description of analysis flowcharts of possible scenarios of origination and development of accidents; etc.

Section 6 «Ensuring Readiness of Balakovo NPP for Localization and Liquidation of Accidents» includes: description of the notification system for emergency situations, description of means and measures for protection of personnel and population; order of organization of medical assistance in case of emergency situations and other questions.

Section 4 «General Information» also is of great value. It identifies extremely important productions and technologies at NPP, it describes location of Balakovo NPP with sizes and boundaries of industrial ground of Balakovo NPP, borders of Sanitary-Protection zone. The following information is provided: topographical location of Balakovo NPP, information of

natural and climatic conditions around the NPP, data on personnel and population, living in the supervision zone of Balakovo NPP.

The subsection 4.2 contains formulated general safety measures, including actions aimed at its improvement.

The principal value of «Declaration» lies in the open, convincing and substantiated conformity of technical, organizational, and managerial decisions to current norms and rules in NPP safety, protection of population and territory from NPP-related emergency situations.

### **Tourism as the Basis of Sustainable Development of Unique Natural Areas**

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In the era of implementation of the principles of sustainable development it is crucial that any form of management (while looking for the most adequate methods, courses and forms of economic activity) should combine economic, ecological and social aspects. Sustainable development is the prerequisite of preserving unique natural areas which will allow for both protection of natural values and for economic and social development of the region.

Implementation of eco-development principles in the unique natural areas can be supported by tourism. Tourism, which is by nature closely connected with unique values and resources of natural environment, may not only facilitate protection of the aforementioned values but also create opportunities of cultural and social rise and improvement of living conditions of local communities.

The foreword to the article will focus on the role of unique natural areas in preservation of biodiversity and natural balance. It will present the basic definitions and classification criteria for unique natural areas as well as their characteristics in Poland.

The following chapters will refer to the possibility of utilization of unique natural areas accounting for the limitations of their use due to the necessity to preserve the unique values of such areas. They will focus on tourism (pro-ecological forms of tourism) which, where integrated with development of ecological production, handicraft and trade, may stimulate eco-development of such unique natural areas.

The article will emphasise social aspects of this issue since the restrictions with respect to carrying economic activity in unique natural areas may result in impoverishing the residents of such areas which in turn means prejudice against any protective actions.

### **Using Ecologically Safe Meat from Sow Foetus in Children Diet**

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It is known that ecological safety and high nutrient and biological value of children diet products depend upon raw meat. One of the raw sources with such characteristics is sow fetus.

In this connection the present abstract is devoted to the investigation of morphological meat structure and internal organs of sow fetus to obtain raw meat in diet production for children with allergy.

The group of 7 sow fetus was tested on the 90-th day of farrowing. Every fetus was weighed, the body length was measured morphological and chemical structure of muscular tissue and its hystological characteristics are also presented.

It was found that the flesh content in ninety - day - old sow fetus is 54,4%, bony tissue -

45,6%. Chemical analyses data showed that the water content is 86,3%, protein - 12,2%, fat - 0,97%, ash - 0,53%.

Microstructure tests of muscular tissue of internals showed that skeleton muscles in fetus were light pink, snappy swelling with smooth consistence and clear fiber structure. The hystological structure of muscular fiber was normal.

The gathering of transudate was observed in fiber, cytoplasm of muscular fiber was pink colored and nuclei were oval shaped. Transversal fiber structure was not seen. Experimental meat pasta from sow fetus with the addition of soy-bean protein, olive oil, sprouting wheat grain was obtained at the sausage shop of Saratov State Agrarian University. Organoleptic estimates of pasta meet the requirements of children diet products. They were very attractive, delicate and had homogenic consistence. Changes which caused dystrophy, necrosis and necrobiosis were not found under pathos-morphological analysis.

Flesh and internal organs are quite suitable for people nutrition. Morphological and chemical meat structure analysis, its energy value and microbiological characteristics of meat and pig fetus make it possible to use them as raw material in children diet processing.

### **Solution of the Problem of Sewage Purification by Complex Method**

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One of the global ecological problems of Russia is saving the Volga basin. To implement radical methods of environment protection there arises the necessity of developing new highly efficient materials sorbents in particular, for purification of industrial and home sewage.

Sewage running to city purification plants has a large range of contamination, amount of which sharply changes both qualitatively and quantitatively during 24 hours.

Technological process of purification includes several stages such as:

- technical which is intended for extraction of large mechanical admixtures, damp residue and oil-containing products;

- biological- for the extraction of organic substances.

This stage is most vulnerable because some harmful admixtures (for instance SSAS) are able to reduce considerably the efficiency of purification during biological silt swelling. It makes it difficult to separate it from purified water and increases the general consumption of biological silt, thus complicating stable and effective operation of purification plants. It is possible to avoid this problem by the introduction of chemisorptional additional purification into technological stage.

In case of massive throw-outs this additional stage will carry out the main part of fine purification. Composite ion-exchange fibrous materials (CIFM) developed by the chair of Chemical Technology and protected by Patents of Russia are proposed for application as chemosorbents.

Trial lots of anion and cation-exchange materials were tested on polyacrylonitrile fibre (PANF) of different textile structure. The conducted maintenance tests of the developed composition of CIFM during 30 days demonstrated very effective extraction of admixtures from industrial sewage: SPAV - 90-98%, suspended substances - 15-20%, nitrates -5-10%.

It was observed that CIFM on PAN-cord has better chemisorptional properties (by 20-30%) than its analog on nonwoven material. The comparative analysis of influence of CIFM composition on purification efficiency demonstrated that the best properties are characteristic for CIFM containing both anion and cation - active fibrous materials in the proportion of AFM:CFM as 2:1 (mass. Respectively).

It was defined that microorganisms colonies are formed on chemic-sorptional materials. These colonies do not deteriorate sorptional properties of materials but prolong the life of biological silt.

Basing on the above-said, it is possible to draw a conclusion about the efficiency of CIFM application at a stage of additional purification at city sewage purification plants and the expediency of investigation in this sphere.

### **Aiming at a Balanced Industrial Ecology Equation - Increasing the Share of Consumers**

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Industrial Ecology (IE) applies the operational principles of ecosystems in human economic systems. In ecosystems the outputs of one organism are inputs for another etc. following the basic condition of roundput. This paper focuses on the creation and metabolism of such industrial systems by examining the processes of waste consumption.

Crucial to the functioning of a system, be it natural or industrial, is the presence of all actors in balanced relations. This allows the creation of closed material and energy flows. In industrial ecosystems the abundance of producers with a lacking presence of both consumers and decomposers creates incongruity. Resulting from price mechanisms production is more profitable than consumption.

Environmental value chain management requires that the whole circular value chain of for instance a branch of business is included in the environmental agenda. The position of environmental value chain management is derived from cradle-to-grave approach of environmental life cycle assessment. The conventional linear view of the value chain is challenged as there also exists value related to reuse and recycling. This paper reflects on the balancing mechanisms of after use value for IE producer vs. consumer equation. The role of the SMEs in the value chain and hence in IE formulations is often neglected, because of the perceived minor role of a single SME. The contribution of industry specific SMEs as ecosystem-like decomposers (detritivores) processing and turning waste into usable form is discussed here in the context of industry IE.

### **Transition to Sustainable Development: Economic, Environmental, Social and Political Prerequisites**

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The paper is devoted to the issues of current and future environmental and economic policy on a global scale and particularly in Russia. I am not trying to examine a possibility or probability of transition to Sustainable Development. I am only focusing on the major necessary prerequisites of such transition. They may not be sufficient for Global Sustainability.

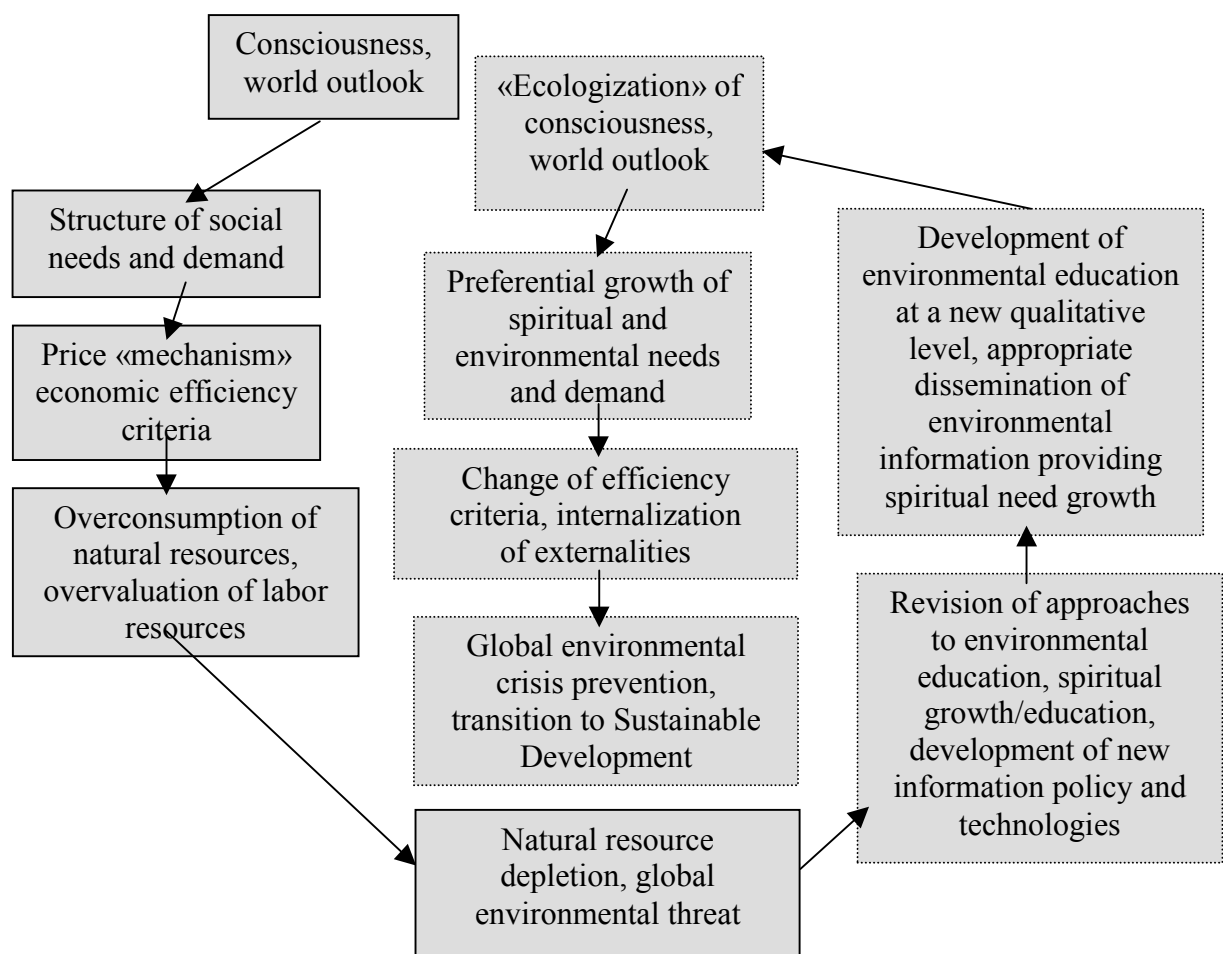
The paper analyses main economic, environmental, informational and social factors of

Sustainability, including social need and demand structures, linkages between informational and educational policy, on the one hand, and world outlook, environmental and spiritual need growth, social demand structure, on the other hand. It also outlines the present status of the relevant strategic State document drafts developed with my active participation and presents a few proposals on an international scale. It emphasizes the significance of an interdisciplinary approach to developing principles and concrete measures for Sustainability building.

It is a modest attempt to integrate at least several rather close scientific, areas and discover new approaches. The paper also stresses the importance of creating conditions for information pressure on the society with the purpose of changing a world outlook and forming adequate social demand for the introduction of efficient instruments and measures in the field of environmental protection management. The information pressure should be brought about through both special educational programs for various categories of students/audience and all kinds of mass media. Since roots of the environmental threat exist in people's consciousness, which is an information structure, the goal of the world-outlook evolution may be achieved by developing and fulfilling special informational strategy and policy

A simplified pattern describing profound causes of environmental problems and a mechanism for their solution (in principle) is presented below:

Note: a continuous line means that the box «describes» actual status of the system, dotted line – the one required.



One can see from the above pattern that information policy is the main driving force of the transition process to Sustainable Development.



## **The Perspectives of Bank Development in the Environmental Protection Sphere**

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The growing role of the banking capital in the improvement of the environmental situation is a worldwide trend. This approach is explained on the one hand, by the growing participation of banks in the environmental investment projects and their support of the environmentally sound activity, on the other hand, by the transformation of the internal strategy of banks aimed at the resource -saving targets (energy, heat, paper, etc.), raising the staff environmental consciousness, establishment of the specialised units with environmental functions and introduction of the system of environmental management.

Under conditions of the budget deficit in Russia and limited financial resources for the environmental objectives, the growing interest on part of the banks in the environmental problems can be considered as an important prerequisite of the sustainable development.

The set of new economic instruments of the environmental protection used by banks for the implementation of their strategy includes primarily the environmental auditing, the environmental controlling, the environmental accounts and information of public organizations through the environmental declaration publication. Since 1994 in foreign countries there has been determined the environmental rating of banks and firms, effecting in the long run their stock market rates value, that provide privileges for receiving credit, also produces a favourable reaction on part of stockholders, and, that is most important, serves as a reason for special treatment of clients on part of bank staff.

For the last years a number of Russian banks and financial corporations have declared their environmental priorities, actually expressed in financial support of environmental projects and programmes, environmental studies and building of environmentally attractive image of a bank. However the financial and banking crisis occurred later handicapped the mentioned activity.

At the same time under present conditions in our country, in spite of financial crisis consequences, the growing significance is given to the development of the environmental auditing and the environmental management, which provides necessary prerequisites for the integration of this activity within the banking sector of the economy.

The important objective in the nearest future is an analytical study of the western banks activities (Germany, Switzerland and Austria and other countries) and on this base to develop an original methodology of assessment of bank activities. And the priority should be given to the opportunities of application of the environmental auditing procedure for developing banking system in Russia under the conditions of its integration into the world economy and international system of the environmental safety.

## **Energy-dangerous Zones and Transregional Pipelines of Saratov Oblast**

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A number of maps and schemes of the geomorphic blocks of the structure of the East-European valley and its mountainous frame were made by the author of the article. Some of these materials were published due to some reasons only in the period of 1995-1998. The author came to the following conclusions having studied fractured limitations of geomorphic

blocks of this territory (scale 1:5000000), territory of Saratov Oblast (scale 1:500000 and larger up to 1:10000).

1. All main energy-dangerous zones are situated along the geomorpho-logically most contrast and geologically long joint geomorphic blocks: the more geomorphologically contrast and geologically long the spaced joint, the more dangerous those zones are from the point of view of geocology, the more dangerous in these zones is the geocological risk for anthropogene structures.

2. Geocological role of such energy-dangerous zones is very significant for the transregional pipelines (gas, oil, ammoniacal), which cross these zones, for technical constructions (such as AES, HES etc.), main lines, large industrial and inhabited complexes. As a rule, energy-dangerous zones are also geopathogenic, they form line and node field structures, which influence negatively many living organisms, man including.

3. Practical usage of the prepared maps and the maps being prepared for the territory of pipelines can help prevent their damage and save in this way millions of roubles. Thus we can prevent different local ecological wrecks.

4. The results of the work concerning prevention of such ecological wrecks and catastrophes the author reduces to the following points:

- studying the already occurred wrecks at pipelines, which are crossed by energy-dangerous zones and nodes; composing data bases;
- pointing out geological-geomorphological structures, which have geocological significance for preventing wrecks and damages at pipelines;
- technical decision for taking pipelines away from potentially energy-dangerous zone;
- preparing prognosis maps of energy-dangerous zones and nodes with the evaluation of the risk of possible wrecks and damages at pipelines;
- ecological-economical calculation concerning the prevention of local wrecks at pipelines.

### **Economic Repercussions of Environmental Regulations in Poland: The Case of the Second Sulfur Protocol**

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This study uses the computable general equilibrium (CGE) modeling to show and analyze the economic consequences of some specific environmental policies. The main question is: will the fulfillment by Poland of commitments resulting from the participation in the Second Sulfur Protocol (SSP) have negative economic consequences for the country as whole? In order to fulfill the commitments required by the SSP, Poland needs to achieve about a 50% reduction of SO<sub>2</sub> emission in relation to 1992 no later than 2010.

Using a CGE model for Poland, likely impacts of taxes on coal and other fuel inputs and SO<sub>2</sub> emission taxes on the Polish economy were simulated. The model has been adjusted so as to reflect certain behavioral and institutional characteristics of the sectors that will play a key role in implementing the Protocol.

Simulation results show possible changes in price and production of different sectors. They indicate that there exist scenarios letting the Polish economy meet the SSP requirements without suppressing the total output excessively. Certain individual industries, however, may suffer which calls for careful remedial actions by the government.

## **Stimulation of Industrial Objects Crediting with the Purpose of Sustainable Development of the Region**

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The problem of attracting bank capital and means of ecological funds as loans for industrial enterprises participating in environmental protection projects is considered in this paper. It is especially important now when a sharp decrease in budget allocations for environmental protection is observed in every field.

The use of non-governmental bank credits for financing environmental protection technologies in interaction with ecological funds allows to simultaneously solve two problems:

First, to use the incentive of the bank capital in additional guarantees on the part of EP organizations. It is expressed in the «returnability» and «payability» of the given money and the confidence in increasing the efficiency of its allocation and decreasing the term of completing environmental protection measures.

Second, to direct the released budget money for financing other projects.

To increase the efficiency of the collaboration between a bank and an enterprise which carries out environmental protection projects, it is advisable to build up a system of crediting in such a way that it could be profitable for the enterprise to conduct such measures and for the bank to lend money for the above purposes. For the enterprise it might be first-turn crediting or even favourable crediting (with a lower interest rate).

But the incentive of commercial bank in favourable crediting can be provided only when ecological funds for example or some other organization compensate the expenses. The compensation of the bank losses for favourable crediting can be realized in the form of favourable taxation and also by giving subsidies from ecological funds to cover the expenses of the banks giving favourable credits for environmental protection measures.

Some budget allocations into commercial banks can also cover the difference in the expenses for normal and favourable crediting.

In this case banks operation in crediting environmental protection becomes equally profitable in comparison with other crediting operations.

Besides, budget subsidies give the bank additional guarantees for the return of its money. Taking into account the great scale of environmental protection problems Federal legislative Organs should adopt a law about budget subsidies for the banks realizing favourable crediting for the environmental protection.

## **The Contradiction of Industrial Ecology- and Management Perspectives in Corporate Environmental Management**

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Industrial Ecology (IE) is a corporate environmental management concept applying the philosophy of ecosystem model in human economic systems. In ecosystems the waste flows of one organism are food for another etc. following the basic principle of roundput. Hence industrial ecology focuses on material and energy input-output flows of industries, companies,

products or regions aiming to make use of the wastes.

The industrial ecology concept is applied here with the regional energy supply system of the city of Jyväskylä in Finland. The waste energy flows are used as resources between the actors of the region. Industrial ecology of the region has evolved with standard process, stakeholder and co-operation relationships aiming at value chain profit maximisation. There has been no specific emphasis on environmental issues.

The case of the energy supply system of Jyväskylä is not in line with the standard IE theory, which highlights the material and energy flows of a process. The concept of Regional Environmental Management System (REMS defined here according to Welford 1996) applies standard environmental management system steps in a regional context. The companies, the public sector, the university and research institutions of a certain region are included in the regional environmental management scheme. Hence REMS is actor, stakeholder and process-specific instead of material and energy flow-specific. The combination of REMS and IE is argued to benefit each other reflecting on the presented case.

The printing paper industry of Germany is a clear case of industrial ecology of an industry with its virgin raw-material base in discards of sawmills and the furniture industry. Also the strong efforts for recovery, recycling and de-inking of used papers illustrate IE. The basic ecological economics position of man-made capital and natural capital as complements is discussed here with the problem displacement tendency of recycling policy.

The problem displacement is evident when strong effort is made for maximal recovery and recycling of papers. Recycling is assumed to bring the best economic and environmental results. The high increase in paper recovery reduces waste paper but increases de-inking sludge and incineration ash, which are more difficult to manage than waste paper. The economic effects of maximal recycling policy are visible as domestic paper production capacity must be established to use the recovered papers. The high recovery rates imply that imports of paper must be reduced.

The results show that man-made capital and natural capital are taken as substitutes in industrial ecology of the printing paper industry. Contrary to the ecological economics position of complementarity the economic and environmental effects are examined separately. There also exists a «blind faith» in recycling. Industrial ecology follows the ecological economics approach by applying ecosystem principles in human economic systems, but it lacks the conceptual basis for implementing the basic principle of complementarity and invest in natural capital. Ecological Industrial Management requires the position of complementarity to be included in industry IE modelling.

### **Methods for Highly Toxic Waste Burial in the Regions of Active Volcanism**

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Project characteristics: The methods proposed here, deal with burial problems of household and industrial waste (radioactive and heavy metals) and chemical weapons in the regions of active island-arc volcanism. Such areas are traditionally considered to be unfit for any waste burial due to high dynamism of all the physical-geologic processes.

According to the methods proposed, radionuclides and heavy metals may be buried and

conserved with either 1) chemical reactions dominating, or 2) sorption processes being more important. The operations go stepwise, starting with making appropriate compositions of the waste, selection of burial sites within the geologic (hydrothermal) systems, revealing the technical peculiarities of the burial processes, predicting and monitoring the transformation of the conserving mineral environment with time.

We suggest that instead of specially constructed waste storages, harmonic techno-genic-natural systems should be created, with the materials being buried to integrate the natural system. In such cases, high reliability is achieved, and storage time may be equal to the durability of the natural system itself (million years).

This constitutes an enormous advantage of the technogenic-natural systems compared to the truly technogenic ones (waste storages), which are generally ecologically unstable, and the consequences of their destruction are disastrous and unpredictable.

The economic efficiency of the method is provided by:

- need in any engineering constructions for waste burial;
- the possibility to predict the structures deep within the hydrothermal systems without any expensive preliminary drilling;
- no power expenditures for storage, etc.

Trends of further development of the Project: Improvement and cultivation of the methods for highly toxic waste burial within the regions of active volcanism.

What has already been done in this direction:

- it was established that sorptional burial of industrial waste should be carried out in the unloading zones of hydrothermal systems, with abundant low temperature (<200°C), low alkaline - almost neutral chloride geyser and nitric and carbon-dioxide thermal waters;
- it was established, that industrial waste conservation with natural chemical reactions dominating, should be carried out in the volcanoes at the hydrothermal stage of activity.

### **Ecology - Economical Substantiation of Forest Rate Cost of Astrahanskaya Oblast**

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The forest economic evaluation is made according to the Forestry Code of the Russian Federation taking into account the modern view on a forest as a combination of forest vegetation, land, animals and other environmental components having an important ecological and social significance.

According to the economic forests evaluation methodology produced by UNILM in 1998, the following of objects must be estimated:

- allotment of forest lands (proper lands);
- lots of forestless lands (proper lands);
- forests, as combination of forests land, forest vegetation, animals offered for needs of hunting farm, for health, tourism, sports purposes, used as a source of forest environmental function;
- forest resources as useful forest functions;
- timber root store, growing on the allotment of forest lands;

- secondary forest resources store;
- by-product store of forest resources (mushrooms, berries, nuts, haymakings, pastures).

Firstly the results of economic estimation of forest must be used for payment levied for changing forest lands into forestless lands for their use which is not connected with running forest farms and making other use of forest.

That is why it is necessary to use such indices as «rate cost of forests» and «rate cost of forestless lands».

It is very important to define the economic evaluation of current forest payment with the use of the current economic indices of some useful functions.

It is possible to use the listed approaches to estimate farm activities of forest users and forest farmers. For these purposes both the indices of current economic evaluation and land rate costs may be used.

As it has been mentioned above we have developed the rate scale of the Astrahanskaya oblast forests. We took into consideration the types of forest environmental conditions, the forest types, features of every timber, standing timber total capitalized forest resources, forest by-products, using forest for hunting, for health, tourism, sports purposes, fish industry.

Forest rate cost (pure capitalized income) is defined as the difference between total income and expenses for forest reproduction.

We used expense norms of forest reproduction established by Federal Forest service for Astrahanskaya forest department.

Consumers prices coefficients of deflater index confirmed by RF Mineconomics were taken into consideration too. For example they were 130,8% in 1999.

Let us point out other norms and initial data of calculations.

Expense norm of felling wood cutting area was appraised at 28 rouble per/hectare, young growth care was appraised as 359 rouble/h.

Forest sowing and planting norm was appraised as 5555 rouble/h (1999 prices).

Thus, for the natural forest reproduction of forest hectare expense norm was 388 rouble, but for artificial - 5942 rouble/h.

Capitalized expenses of forest farm reproduction of 1-th in this type of forest vegetation conditions were defined as corrected coefficient depending on felling forest turn.

At rate scale of the forest lands, depending on plantation bonitas, expenses of forest reproduction are changing according to the coefficients of capitalized total income variation from standing timber delivery.

Rate scale calculation results of forest in Astrahanskaya Oblast are presented in the table.

From this table one can see that rate scale of forest is changed depending on forest types, main kinds of timber, plantation bonitas and taxes category. The range of rate is from 0,5 to 110-th rouble/h.

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Rate cost of forests according to tax categories of Astrahanskaya oblast

Allotment Conditions types	Forest types	Prevalent soils	Main forest races	Felling, forest, tum	Average bonitas	Rate cost of forests according to tax categories,															
						Restricted lines of forests, protecting spawning - ground of valuable fishes. Protected woodland.								State protected forests lines. Anti-erosion forests. Protected forest lines along railroad, road of federal, republic and regional meaning. Forest-park parts of green sons.							
						Tax categories								Tax categories							
						I - coefficient 1		II- coefficient 0,91		III- coefficient 0,77		IV -coefficient 0,59		I - coefficient 1		II- coefficient 0,91		III- coefficient 0,77		IV -coefficient 0,59	
Artificial forest reproducing (AFR)	Natural forest reproducing (NFR)	AFR	NFR	AFR	NFR	AFR	NFR	AFR	NFR	AFR	NFR	AFR	NFR	AFR	NFR	AFR	NFR	AFR	NFR		
A <sub>0</sub>	Kc	Dry sands	Dguzgun, saksaul	12	III	-	-	-	-	-	-	-	-	-	1,6	-	1,5	-	1,3	-	1,1
A <sub>1</sub>	Kcx	Dry sands	Tamarisk	12	III	-	-	-	-	-	-	-	-	-	1,7	-	1,6	-	1,4	-	1,2
A <sub>2</sub>	Lx	Relative dry, salinitive, lanly loams soils.	Loh	30	IV	-	-	-	-	-	-	-	-	4,3	-	4,1	-	3,8	-	3,4	
B <sub>1</sub>	Oc	Gumus sandy loams and dry sands.	Blak poplar	30	V	4,1	6,3	4,0	6,0	3,8	5,6	3,7	5,0	2,8	5,1	2,7	4,8	2,6	4,4	2,4	3,8
B <sub>2</sub>	Og	Deep sandy with silt layer, fresh.	Blak poplar	30	IV	5,5	9,1	5,5	8,8	5,5	8,3	5,5	7,6	3,3	6,9	3,3	6,6	3,3	6,1	3,3	5,4
B <sub>3</sub>	Ocy	Sandy - silt, moist.	Blak poplar	30	III	8,7	15,0	8,5	14,6	8,2	14,0	7,5	13,2	4,5	10,8	4,3	10,4	4,0	9,8	3,2	9,0
			Ash	35-45	I	139,9	151,8	127,3	138,1	107,7	116,9	82,5	89,6	91,7	101,4	83,5	92,3	70,6	78,1	54,1	59,8
C <sub>2</sub>	Бсв	Meadow - carbonate, damp.	White wellow	25	V	15,0	23,3	13,6	22,8	12,9	22,0	11,5	21,0	6,9	16,3	6,6	15,8	5,8	15,0	4,4	13,9
C <sub>3</sub>	Бср	Strong silt with sand layer, damp.	White wellow	25	IV	17,1	27,0	16,7	26,5	16,0	25,6	14,5	24,5	8,8	18,7	8,4	18,2	7,7	17,3	6,2	16,2
C <sub>4</sub>	Внр т	Silt with sand layer, wet.	White wellow	25	III	25,3	38,4	24,8	37,7	23,8	36,6	21,8	35,1	13,2	26,2	12,6	25,5	11,6	24,4	9,6	23,0
C <sub>5</sub>	Тос	Young silt soils, layed by sand, wet.	Purple	3	IV	-	4,7	-	4,4	-	3,9	-	3,3	-	4,2	-	3,9	-	3,4	-	2,8
D <sub>1</sub>	Взн	Light - chestnut & brown soils, dry. Soils, dry.	Small leaf elm. Upland elm.	30	IV	-	-	-	-	-	-	-	-	5,8	11,0	5,8	10,6	5,6	10,0	5,2	9,2
D <sub>2</sub>	Дп	Granular, loamy soil, fresh.	High trunk oak.	110-150	II	74,4	80,0	73,5	78,6	72,2	76,5	70,5	73,8	32,6	37,5	32,1	36,5	31,2	35,0	30,1	33,0
			Low trunk oak.	60-75	IV	70,0	78,0	69,5	76,7	68,5	74,7	67,4	72,1	40,7	47,6	40,1	46,4	39,2	44,5	38,1	42,1
D <sub>3</sub>	Взн	Compactive, flaky sandy loamy, moist.	Small leaf elm.	35-45	IV	12,7	18,0	12,6	17,6	12,5	16,9	12,2	16,1	7,1	11,4	7,1	11,0	7,1	10,4	7,0	9,6

**Ecological-Epidemiologic Peculiarities of Especially Dangerous  
Natural Focal Infections at the Territory of Saratov Oblast**  
The center of the state sanitary-epidemiologic supervision in Saratov Oblast

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The Saratov Oblast with its natural-climatic conditions is a propitious region to show such zoonotic infection diseases as brucellosis, leptospirosis, Siberian ulcer, tularemia, hemorrhagic fever with renal syndrome (HFRS).

Anthropometric influence and especially the impact made by land-reclamation measures upon region geographic conditions are great. The area of irrigated and sprinkled lands exceed 500 thousand ga ( $1\text{ga} \cong 2.5\text{acres}$ ) until recently, that stipulates a lot of changes in formed natural biocenosis structure and leads to the formation of antropogenic centers of infection.

The last circumstance leads to developing the epizootics through small mammals at the territories, that used to be considered rather safe with regards to zoonotic infections (HFRS, tularemia).

At present the natural HFRS foci are found in 29 regional districts and in forest zone of Saratov town; the natural tularemia foci are detected in 24 districts. Combined HFRS and tularemia foci are found in 17 districts.

Through the last decade (1986-1996) II new focus areas are detected in the Oblast where the tularemia stimulator was not detected earlier.

With the ability of animals to durable carrying the leptospirosis and with the their high receptivity leptospirosis is constantly registered in Oblast.

The brucellosis presence in the agricultural districts of Oblast is stipulated by epizootic trouble and by non-observance of sanitary higienic standards of cattle breeding keeping. The number of farms troubled with brucellosis was more than 6.

Actuality of Siberian ulcer problem in Oblast is stipulated by the existence of more than 3 thousand soil foci of this infection in all Oblast districts. The foci steadfastness determines the threat of animal diseases that are registered almost annually.

From the example of people morbidity with HFRS the relation of sickness rate with social phenomena in society, economic activity of people is clearly traced that is the result of man is cooperation with nature.

The most activity through all the time of HFRS registration in Oblast since 1964 the natural HFRS focus had revealed in green zone of Saratov (Lyssye Gory forest tract) in 1986 when 2102 persons had become ill (sickness rate was 231,5 per 100 thousand of population) in period from June to November. The forest type of infection (40-45 %) connected with intensive visiting the city green zone by population dominated; the garden type of infection was on the second place - 28%. The great number of biotic, abiotic and social factors influence the worsening of epidemiologic circumstances. It is necessary to take into account that worsening in economic situation in the country leads to the mass attraction of population to garden and other agricultural works thus increasing the risk of people infection.

With the purpose of rational planning of anti-epidemic measures it was suggested by us to divide all Oblast districts to three groups depending upon the average year level of the HFRS sick rate:

1. Population sick rate is higher than 10 (to 100 thousand of persons) - 6 Oblast districts - they are refereed to as high activity focus territories.
2. Population sick rate (to 100 thousand of persons) is within 2 to 10-8 Oblast districts.



They are attributed to focus territories with mean activity.

3. Population sick rate (to 100 thousand of persons) less than 2 - 17 Oblast districts with low focus activity.

Hemorrhagic fever with renal syndrome is related to as natural focus infection which specific prophylaxis is absent at present. In connection with this the nonspecific prophylaxis measures acquire the general meaning:

- complex settlement and field deratization, building disinfection;
- maximally possible prevention of population contacts with the source of infection by transforming the forest tracts adjoining the large settlements that are places of small animals nature carriers of hantavirus residence into park-forest zones and places of population organized rest.

These measures will demand large economic expense but they will be repaid undoubtedly by safe epidemiologic situation, lowering the expenses for patients treatment and wastes because of disability. The treatment cost of one HFRS case is more than 2500 roubles.

### **Priority of the Non-Material Values as a Condition of the Sustainable Development of the Society**

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Today the fate of civilization depends on understanding the natural and cultural algorithms of human existence, which have a deep meaning and are connected with the fundamental laws of the world development.

In accordance with the antropogenic principle the World is managed by the constants. Nature of numbers is defined not only by physical but by mental: «semantic» substances it is connected not only with physical world but with the consciousness too. Because the number is included in the world structure it is connected with the consciousness of holotrop World (Nalimov V.).

Substantial anxiety, crises of meanings, presentiment of catastrophe are the main characteristics of contemporaneity. They doubt a question about the actuality of the civilization sustainable development. The sustainable development is immanent to the cosmic order. That development is characterized by the correlation of the potential and actual, opening the mental potentiality of the society in the process of its co-evolution with environment.

But today it is the person who is the main obstacle on the way to the sustainable development, because he is an egoist who can not be responsible for the humanity fate. Human selfishness nourished by the instinct of self-preservation destroys a mentality. Synergy of such human behaviour makes the society's behaviour suicidal.

The west model of development based on the priority of material production exhausted its own potential and possibility. The non-material values (time, information, creativity) must become best priorities for the society of sustainable development.

Falling cultural «crush» must be connected with the comprehension of the fact that the sustainable development is the mental evolution of society. Therefore the model of the sustainable development is similar to the intention of Buddha's world-conception and Russian cosmism. That is why now Buddha's words «I will come to the people to treat them from the knowledge which is not aware of Love».

## **The Technique for Registration of Industrial and Ecological Safety with Technical-Economic Substantiation of Highly-Risky Objects of Technosphere**

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Enterprises of raw material and fuel-energy industry branches (oil and gas processing, chemistry, railway and pipeline transportation of gas and carbon dioxides, storage of dangerous explosive, flammable and toxic products, etc) are categorized as potentially dangerous, and their operation is related with social-ecological and economic risk.

Operation experience of such enterprises shows exceptional importance of questions of technical-economic substantiation of design and technological solutions, with consideration of objective criteria of enterprises' safety. In order to obtain the criterion of solution's comparison and optimization, a method of comparison is proposed. It is based on comparison of several variants, differing in capital costs, variable expenses and insurance payments in case of accidents and emergency situations. The technique has been developed for finding optimal solutions, which provide acceptable safety level, based on extraction of two components: declared expenses, essential for achievement of required solution, and summarized payments in case of accidents and emergency situations (integrated risk). The value of second component (integrated risk in value numeration) is researched in detail.

The model of integrated risk of potentially dangerous enterprises of technosphere is examined (as a superposition of risks of social, material and ecological damages, possessing random nature and dependent on potential risk). For determination of social risk of lethal outcomes the human life is assessed in value expression. Life saving cost (LSC) is used in place of this value. Probability characteristics of potential risk of toxic, demolition and heat affection are studied in detail. Results of real affections are approximated by standard functions of random values distribution in Weibull laws. Considerable amount of attention is paid to questions of risk mapping. Mapped risk allows to see well enough the character of potential risk distribution and zones of increased danger on the map.

This basis can be used for making effective engineering and managerial decisions for minimization of banning influence by way of comparing economic efficiency of reviewed variants. Stated approaches were tested in real conditions of functioning of large potentially dangerous industrial enterprise, producing organic synthesis products. They allowed to conduct technical-economic substantiation and optimization of engineering solutions in placement of propylene and ammonia storehouses.

### **Methodological Peculiarities of Integrated Risk Evaluation in Pipeline Transportation Accidents**

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Methods of analysis and quantitative evaluation of integrated risk of Togliatti-Odessa Transcontinental ammonia pipeline, situated in 5 regions of RF, are considered. Analysis and

quantitative evaluation of integrated risk are carried out in connection with industrial safety declaration of OAO «Transammiak».

The main risk factor of ammonia pipeline operation is the existence of certain probability of accident with emission of ammonia into the environment and possibility of toxic contamination of the object's personnel and population of towns and cities, situated along the main pipeline.

The index of ammonia pipeline safety level is integrated risk of full damage  $R_{\Sigma}$  (D), inflicted on population and environment from the whole complex of possible accidents on a section of main ammonia pipeline. Considering the peculiarities of ammonia action, two components of integrated risk are extracted: social risk and ecological risk.

The quantitative evaluation of integrated risk consists of three stages.

**First stage.** With a help of analysis of the sequence of events, which transform danger into an emergency situation, and using the database on known accidents at the investigated object and those analogous to it, possible reasons for origination and development of a certain class of accidents are discovered.

**Second stage.** Quantitative evaluation of risk of accidents and emergency situations on the adjacent territory is performed. The frequency of danger realization is determined using methods of engineering approach to risk evaluation. The probability of formation of certain levels of fields of affecting factors is calculated along with the probability of the fact that the above mentioned field levels will cause certain damage: death of people, breaking equilibrium conditions of ecosystems. Non-projected accidents, caused by external destructive influences and leading to guillotine rupture of pipeline with considerable ammonia leaking form the main class of accidents on the reviewed ammonia pipeline.

**Third stage.** Safety provision and risk reduction measures for population and adjacent territory are analyzed.

## **Population Ecology and Theory of Organization Development on the Boundary of the XXI century**

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Ecological system of biosphere has been demonstrating its vitality within 5 milliard years. Modern civilization can survive only as a system part of biosphere, if it is able to obey the principle of natural equilibrium, violation of which causes loss of energy; depletion of mineral resources; change of environment conditions and structure of soil; necrosis, disappearance of biological structures; fight against circumstances instead of prevention of violations.

On the boundary of new millenium people's economic activity has assumed a planetary character, making business a global pursuit. People's neglect to the diverse exchange connections in nature more and more evidently turns into enhancement of negative effect on environment, thus actualizing problems of ecologization and biologization.

It seems to us that their solution will be consistent and efficient when we succeed in joining problems of rational, and thus not bringing the disbalance to the environment, management of purposeful complex-organized systems (enterprises, firms, concerns, etc) with the questions of proper organizational research.

Within many years the solution of problems of rational activity and search for its acceptable forms was related to economical direction, but in recent years there becomes more apparent reorientation of search towards evolutionary direction, based on population and ecological approach to solution of management problems.

Principles of evolutionary theory incorporating ecological component, went off successful approbation within the frames of widely used in German-speaking countries a new progressive system of organization management-controlling. Efficiency of this system is due to provision of self-regulated feedback in a biocybernetic contour of regulation with taking into account parameters of energy and environment existence of favorable energy balance that guarantees thrifty use of bioforce, formation of favorable balance of environment that make investments into environmental protection rational. Foreign experience gained in the area of controlling system application must be thoroughly studied and adequately taken into account by a Russian party in the process of reorganization of management systems on economic subjects thus that basic principles of biocybernetic self-regulation: symbiosis, recycling, etc will become important elements of philosophy of Russian companies, their economy and organization of production.

In the near future the population-ecological approach may become real innovation for the theory of organization. Thus of principal importance for the change of business «geography», can be developed by representatives of evolutionary macrodirection a concept of «human environment search » having a social context and enabling an organization to occupy a favorable position and rely on success.

On the conceptual plane, it is important to refuse putting direct analogies between a biological organism and social system (organization) to achieve fruitful implementation of conclusion of population ecology on a metatheoretical level.

### **Diagnosis of Environmental Damage in Relation to the Mercosur Economic Process in Cyrdoba Province, Argentina**

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The economic conditions established in the Southern Cone of South America by the globalisation and particularly by the MERCOSUR, favour the exploitation of natural systems and involve the environmental sustainability. Five years after the signature of the Asunciyn treaty in 1991, industrial exportations -for example- increased six times in MERCOSUR countries. This process revolutionised also the province of Cyrdoba which industrial, agricultural and livestock products exportations grew 120 to 130% in the same period, representing 32% of its world exportations in 1997. The growing of exportations implies greater demand of goods, services and energy: the increase of related activities as transports and storing of products: and of infrastructure, especially for communications. All of these changes mean environmental impact affecting life population quality. The main goal of this research was to obtain a diagnosis of the environmental damage caused in Cyrdoba province in Argentina by productive activities related to the MERCOSUR, and to make evident the environmental externalities derived from the «benefits» of that common market. Ecological variables were analysed: climatic, geomorphologic and biogeographic regions, soil, erosion: and economic activities such as: livestock breeding, agriculture, miners, transports and communications, tourism and social-cultural aspects. Thematic maps were elaborated on the basis of bibliographic information and official censuses and statistics. Economic activities listed in the Provincial Register of Industry and its environmental impacts were considered in all the 26 provincial departments, including the municipal level. Variables were interrelated in activity-effect matrixes. An index was calculated on the relative importance of environmental problems produced by different economical titles at the provincial level. Industries with

major volumes of exportations to MERCOSUR: food, chemicals, machinery and metallic products, agricultural and livestock products including extractive activities, have also more important impacts on the environment. Energy consumption, contamination of superficial and phreatic water, industrial wastes, air and soil pollution and health problems were relevant effects. A map of the environmental damage in Cyrdoba province was obtained. Environmental problems appeared concentrated in poles of development, generally coinciding with departmental capitals with higher population density, as well as with communication routes and commercial exchange of MERCOSUR. Also rural territories -that lie beyond control in the present jurisdictional organisation- suffer impacts. Results show the necessity of reordering both, administration and production in Cyrdoba province; as well as the importance of improving the environmental policies in the MERCOSUR agreement.

### **Ecological Policy for Rivers Basins**

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The concept is aimed at the stabilization of the environment under conditions of limited resources and authority degradation. The main idea behind the realization of this goal is the dislocation of the most active social part of the local population in the key areas of river basins.

Ecological aspects based on the selection of six main criteria for the boundaries establishment for ethno-natural protected territory:

- the whole basin is managed according to highest water priority;
- the controlled territory is the floodplain as the key element of the basin;
- biodiversity indicator is the most vulnerable species of the river ecosystem (sturgeon for the Azov Sea basin);
- the whole migration route for the selected species is restored from the places for living and feeding to the spawning ones;
- the life cycle is protected by special status of the territory limited by the most possible area of floodplain;
- the traditional (sustainable) usage of natural resources with elimination of pollution sources is established on the whole ethno-natural territory.

Social aspects based on the introduction of real self-government of local population in the questions of the restoration of traditional, that means rational, usage of natural resources and style life on those territories.

- the most active social part of the population in the given basin is chosen (Cossacks in the Azov Sea basin);
- the traditional Cossacks' self-government is restored on the mentioned territories.
- the structure of Cossacks community is defined by the natural pattern of the river stream;
- the relationships with other parts of the basin are based on the principle of the ecological domination and the economic regulations;
- all nature-protected agencies and ecological funds are reorganized into the one basin management agency governing all protected territories;
- the relationships in transborder regions of the basin are constructed similarly.

From the international perspective there could be solved the following problems:

- the sustainable region development;

- biodiversity rescue;
- transborder problems within one watershed and basin;
- the restoration of the traditional style life of the local population;
- providing the most active and destabilizing part of the society with the employment and duties useful for the whole society.

### **Methodology of Assessment of Ecological Danger of Power Engineering and Other Technogenic Objects**

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It is essential to combine the assessment of work of different technical objects (systems) in which the transforming of thermal energy into mechanical work takes place in the process of air-fuel mixtures combustion, with the analysis of harmful substance discard (HS) which exert negative ecological impact on the environment and, first of all, on the atmosphere.

For the first time in Russia, possibly in the world the new technoecological paradigm was created which has to unite all these systems into the group of ecologically dangerous technological objects or the base of «technoecological semblance of the objects» characteristic. The influence of them on the atmosphere goes in the same way: the mixing of the fuel with the air (mixture) → the discard exhaust gases into the atmosphere.

The universal integral criterion of technoecological similarity which was called  $K_{ed}$  - the criterion of ecological danger was approved for different technological objects (BTO).

It represents the following analytical dependence for example for TO:

$$K_{ed}^{to} = K_{mix} \cdot \frac{\xi_{comb}}{\alpha} \cdot K_{sp}, \quad K_{hs} \leq [K_{ed}^{to}],$$

Where  $K_{mix}$  - specific energy of air-fuel mixture which is used in concrete TO (thermal machine-engine, furnace, boiler...),  $\eta_{comb}$  - coefficient of used heat or individual case, the efficiency of combustion,  $\alpha$  - neutral coefficient of air abundance in the air-fuel mixture; fuel: ge-seons, liquid, solid or their combinations and also waterfuel emulsions,  $K_{sp}$  - specific productivity (capacity of concrete TO: engine, car, tractors, tank, airplane, ship, furnace, thermalelectrostation, thermoelectrocentral and so on);  $K_{hs}$  - the specific harmful substances discard from TO or BTO (HS: toxically, carcinogenic, dust pitch and so on...),  $[K_{ed}^{to}]$  - permissible (rationed) numerical value of specific  $K_{ed}^{to}$  which is regulated by competent echelons (instructions): committees of ecology of regions and towns, organizations of Power Engineering and Ministry of Defense, organs of public health and so on.

### **Integrated Ecological and Economic Accounting**

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Current ecological situation in Russia requires the introduction of new methods allowing to analyze economy at a qualitative level and to receive results as the practical recommendations. At some absolute reduction of number of waste emissions in some regions of the country, their size related to GDP has changed a little in the last years. The relative data on waste emissions is precisely linked with a level of industrial output.

From our point of view, one of the new approaches promoting ecological improvement of economy is the ecological-economic accounting.

The ecological-economic account allows, roughly speaking, to express deterioration of natural environment, and to subtract from net GDP the size of such deterioration in the same way as in case of «usual amortization». This procedure automatically requires ecologically oriented transformations of national riches. In this case national riches receive some expansion because of obvious account in it natural actives and changes in these actives per unit of time (i.e. per year). Moreover, changes in natural actives require a construction of the physical accounts for the appropriate actives.

The transformations of central macroeconomic parameters with accounting of ecological factor do not buffer these parameters in their non-ecological forms. In order to prevent logical infringement of national accounting it is necessary to consider ecological GDP, «usual» GDP and national riches with taking into account natural actives and without taking these actives into account etc.

The research of ecological payments in the frameworks of SEEA may enable us to discuss a formation of negative impact on nature from each branch of national economy. It also makes it possible to compare and to analyze ecological payments with expenses for protection of nature and cost parameters of changes in actives, and even more - to investigate budget problems on the basis of interbranch analysis.

For realization of state ecological policy, in our opinion, it is necessary to:

- Develop methodology of accounting of ecological factor in GDP and in evaluation of national riches.
- Develop methodology of a cost evaluation of natural resources.
- Develop normative legal base on the field of the property rights on natural resources.
- Define structure and volumes of income sources of payments for usage of natural resources and for pollution and other kinds of negative influence on environment.

### **Empirical Support for People's Participation in Forest Management in India**

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Forests used to be an important source of revenue for the government of India, which is no longer true, because of large-scale deforestation. Proper forest management is called for to regenerate degraded forests.

The government is powerless when people refuse to participate. This paper draws lessons from practical settings where people do participate. Participation was initiated either by government employees, a local leader, or it emerged through a strong community.

A comparative analysis between three institutional settings in different states of India demonstrates the importance of empowering people in forest management. There is a clear role for the state, which is to facilitate the people. Fieldwork was carried out in about 10 villages per state. On average 13 households were interviewed in each village. The by this means created data set is analyzed in this paper by two techniques.

A factor analysis is employed on 10 participatory indicators of each household. In each institutional setting, social indicators turn out to be the main consideration in participation. Economic indicators follow as the second most important consideration. A regression analysis is carried out using the primary data. The main conclusion is that a high dependence on the forest and a good quality of the forest enhances voluntary people's participation.

## **State as an Important Subject of Social Partnership Relations**

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The social partnership relations are the relations between the employers and the employees. These relations touch upon the problem of the employment, the payment and the representation of other social and economic goods. These relations may exist at the level of a single unit such as an enterprise, a firm or an organization. But the state role may be different in the social partnership relations.

In the heads of the report the formal character of the state participation in these relations is considered which is expressed in common terms for the employers and the employees such as the single minimum earnings and the united table of rates. Formally the state takes part in the social partnership relations. Within the frames of non-state structures the social consensus is reached without direct and even indirect participation of the state. It reflects logic and aims at the self-development of these structures. It is difficult to model a situation when the state may control, regulate or take an active part in the social partnership relations in commercial banks, non-state pension funds, financial and insurance organizations, etc.

The change in the Russian economics and the restructure of the property forms require the absence of the state control. The changes in the Russian economy are essential and sufficient conditions for getting alternative forms of an income (for example, a profit, a rent) apart from the state salary. There are three main cases of the state participation in the system of the social partnership. At first, it is obligatory for the state structures. In this case the state is an employer which hires the employees. Secondly, the participation of the state is necessary for so-called joint ventures with different forms of the property. In these structures the corporate capital operates. There the state is present in any form to regulate the social partnership relations. The example of this structure is «Gasprom» where the state quota in the corporate capital is about 40%, the foreign quota is 9%. In the third place, the participation of the state is obligatory to regulate the social partnership relations at the macro level. It is the Federation level, the level of the Federation subjects, the territory level and the branch level. The state may control and regulate these relations determining the living minimum wage, the single minimum earnings, the table of rates; working out complex ecological programmes, measures for protection of labour etc.

The main purpose of the state participation in the social partnership relations is to guarantee the consensus, to coordinate economic interests of the social partners. But the problem is wider. Because the social partnership relations include such aspects which can't be decided only by the employers and the employees. The aspects are:

- guaranteeing the employment on a scale of a region, province, city, town, or district;
- development of the industry and other branches of public productions ;
- development of the private business as one of the form of the employment;
- organizing the essential living conditions and supporting requiring living standard;
- guaranteeing the constructive cooperation and social partnership. Thus, the state is an important and equal partner in the system of the social partnership relations.

## **Accounting of Ecological Costs**

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The interaction of natural forces and society is a main problem of society socio-economic development. But, as the world experience shows, this problem has not been solved yet.



Expanding and forcing the technical pressure on nature make the society face the following effect: the nature distraction leads to the economic social detriment. The nature can not restore the violating ecological balance and reconstruct by itself confiscated goods.

The ecological degradation processes acquire the character of the deep ecological crisis. The question of the nature preservation is transformed into a question of the humanity survival. The economic growth, based on traditional principles, becomes dangerous. If during preceding period of time the society has tried to make the nature to its needs and purposes now the society must adjust itself to the nature, and the manufacture must ensure the ecological balance in the world. There is no political system in the world, which can guarantee the state ecological well-being.

The environmental contamination by manufacturing enterprises is increasing. That is why there must be a state regulation mechanism helping to decrease the environmental pollution, to reimburse the expenses on the environmental pollution compensation.

In our days an enterprise must pay costs for the nature protection depending on its damage scale of the environmental pollution. Depending on the extent of the dangerous exhausts payment can fall under costs. Fines and payments under supernormal exhausts and wastes are paid from the enterprise profit.

The ecological payments analysis in the enterprise «Gasapparat», Saratov, shows that the ecological expenditures included in costs increased two fold in 1996 in comparison with 1995. In 1995 the enterprise «Gasapparat» lost nearly four million roubles of its profit by paying the fines for environment pollution. After that the managers of «Gasapparat» decided to repair manufacturing installations (such as galvanic department), which had polluted the atmosphere. All these expenditures are included in costs.

So the accounting of ecological costs is very important in taking management decisions. Such measures contribute not only to the profit increase but also to creating ecologically safe manufacturing.

### **Improving Ecological Safety of Gas Processing on Stepnovskaya Station PHG in Saratov Oblast**

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During operation of underground reservoirs it is very difficult to find alternative for antihydrate reactant methanol, which is effective, but highly toxic. This fact is explained by high cost and «salting» and also by arising difficulties of their regeneration. Presence of methanol in gas negatively influences gas quality during carrying out of glycol drainage, at which «salting» intensity is vitally lower.

For indicated reasons it is important to ensure methanol rational using with simultaneous achievement of reliable hydrate-free conditions of work of PHG with optimal gas processing technology and with reducing ecological impacts of using the given inhibitor to a minimum.

Relying on the results of carrying out this work, there were determined the consumptional measures by methanol for hydrate-free operation of Stepnovskaya SPHG on the different stage of gas extraction at minimum concentration of this toxic substance in utilized flows.

From this point of view prevention of hydrate formation on Stepnovskaya SPHG collectors GRP work under the «hardest» conditions, for which demanded maximal reducing hydrate-forming temperature is 11°C (in the early stage of gas extraction). In the absence of salts in liquid water, which is present in gas, it is necessary to use aqueous solution of methanol with concentration of not less than 21% mas. Since mineralization of bed water on

Stepnovskaya SPHG is 235...250 g/l, so its presence in gas affects hydrate-forming temperature decreasing it appreciably. The following ratio was obtained for the quantitative evaluation of this influence:

$$\Delta t = 0,055 M / (0,5 + (0,5 + 0,000752 M)^{1/2}),$$

where  $\Delta t$  - hydrate-forming temperature decreasing, °C;  $M$  - mineralization of bed water, g/l.

In the range of bed water real quantity, which is carried away with gas on Stepanovskaya SPHG (2...5 kg/1000 m<sup>3</sup> of gas),  $\Delta t$  accounts for 6 to 11,5°C.

Based on the fulfilled accounts, which are collaborated for the operation practice of Stepanovskaya SPHG, serious problems connected with hydrate formation can take place only in early period of gas extraction and when bed water is not available or its quantity is minor (less than 0,5 kg/1000 m<sup>3</sup> of gas). If carrying-over bed water is 5 or more kg by 1000 m<sup>3</sup> of gas, hydrates are not formed even at the «hardest» conditions of gas processing (at temperature - 4°C). As is evident from the calculated data, the hydrate formation is improbable by the end of December in any section of gathering systems and gas processing on Stepanovskaya SPHG through the increasing of bed water carrying-over and rising the temperature. The specific norm of methanol consumption for «hydrate» period of gas extraction accounts for 0,25... 0,4 kg by 1000 m<sup>3</sup> of gas according to the concrete conditions. In the following period the necessity of methanol using is minimum (less than 50 g/1000 m<sup>3</sup> of gas) or does not exist at all.

### **Ecological Policy and Management under Market Conditions**

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The incursion of a great number of ecological problems into the life of the society has become a characteristic feature of the last decades of the XX century. Its solution is based on the formation of the new federal ecological policy, which corresponds to the adopted recommendations of the UN Conference on Environmental Protection and Development that took place in Rio de Janeiro.

The ecological situation in Saratov Region can be characterized as complicated and tense. The anthropological load on existing ecosystems is great. There are 650 potentially ecologically dangerous objects in Saratov Region with a total area of more than 800 km<sup>2</sup>. Every year 150 thousand tons of pollutants are discharged into the atmosphere, more than 400 million m<sup>3</sup> of sewage are dumped, more than 1,5 million tons of dangerous waste are accumulated.

Three federal oil pipelines, 18 major gas pipelines, main ammonia pipeline, 3 stations of underground gas storage are located on the territory of Saratov Region. Large parts of pipelines have been in use for 25-40 years. More than ten pipeline breaches occur annually. As a result of these accidents soils and subterranean waters are polluted.

Problems of processing, utilization and storage of waste are critical for the region. At the moment there are 19,4 million tons of industrial waste of various danger classes accumulated in the region. The situation with collection and neutralization of solid household waste is complicated. There are about 2 thousand dumps in the region. The situation with rural dumps is unsatisfactory too. Unusable and prohibited pesticides are contained in 21 districts of the region. Their total mass is equal to 2600 tons.

The condition of regional land fund is alarming. Degradation processes are occurring as a result of irrational usage of naturally and artificially irrigated lands, destruction of soil-vegetative layer when building industrial and other objects, development of extraction sites,

breaches in pipelines, etc. As a result of the conducted inventory 205 unused extraction sites were discovered with a total area of 1104 hectares.

Destruction of banks of Saratov and Volgograd reservoirs continues as well as its pollution with toxicants of industrial origin (heavy metals, oil, oil products, etc.). Littering of lands keeps taking place. Thus, there are many problems to overcome in the creation of worthy environment. And above all their solution depends upon correctly chosen managerial decisions. First of all it is the creation of economic mechanism for paid nature usage in the conditions of market economy. Its main elements are:

- procedure for issuing permits to all enterprises, where corresponding limits for discharge and dumping of pollutants and for placement of industrial and consumption waste are stated,
- payment for discharge and dumping of polluting substances which do not exceed limits and payments for over-limit pollution;
- formation of ecological funds system at the expense of resources obtained from payments for dumping of polluting substances, fines, law suits and other sources;
- formation of economic liability system for ecological violations and damage done to the environment and to the health of population.

Introduction of payment for pollution allowed to solve a number of such problems as the conduction of inventory of sources of dumping and discharge. Enterprises started paying serious attention to the ecological and economic substantiation of their activities. Even with the decrease in centralized capital investments, enterprises implement environmental protection measures with a help of their own funds.

Currently the main sources of funding environmental protection measures are ecological funds. Taking that into consideration the committee pays a great attention to the increase of incoming resources to the ecological funds, which amounted to (in different years):

1995- 11,3 million roubles	1997-21,4 million roubles
1996 – 18,6 million roubles	1998 - 26,4 million roubles

Unfortunately, the sources from ecological funds do not allow to finance urgent, capital intensive environmental protection projects, such as construction of cleaning installations in Atkarsk, Volsk, Marx, and other places. At the same time the volume of financing is sufficient for annual formation of priority environmental protection measures and Programs, based on proposals made by the administrations of cities and districts, and by enterprises.

Besides, the committee is searching additional sources for ecological funds.

The committee is planning to introduce the following payments in the region, with a purpose of reduction of a negative influence on the environment, its economic assessment, and increase of receipt of resources to ecological funds:

- noise impact on the environment;
- electromagnetic pollution;
- dumping of harmful substances into the atmosphere by vehicles;
- usage of regional roads by vehicles, not registered in Saratov Region;
- some other payments.

The corresponding legislative projects for the regional Duma have already been prepared. On the 19<sup>th</sup> of January, 1999 the regional Duma already passed a legislative decree for levying payment for electromagnetic pollution in Saratov Region.

The strategic goal of environmental activities of all enterprises, environment protection bodies and all of us-is the improvement of the environment for Saratovites. It will allow to achieve a sustainable and prudent development at the regional level and will contribute to sustainable development of Russia.

In order to achieve it, the actions of all subjects of environmental protection should be coordinated. That is why the State Committee on Ecology of Saratov Region, as coordinator of the activities of special plenipotentiary government bodies of RF in environmental

protection, has recently started developing regional plan of measures for protection of the environment for 1999-2001. Its financing is stipulated at the expense of various sources; regional and district budgets, resources of enterprises, ecological funds and other.

Development of market relations should lead to significant increase of technical and technological level of production, stimulation of resource and energy savings, structural rebuilding of economics, which ultimately should reduce pollution of the environment.

### **Ecological Problems of Bazarny Karabulak District and their Solution**

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Living conditions of the population of Bazarny Karabulak District are affected by negative environmental factors, connected with pollution of air, soil, quality of drinking water and general man-caused load. Due to the absence of detour road, all transit vehicles for Samara-Moscow route go through the center of the district. Car exhaust, noise, dust, and vibration to a certain degree affect the health of people, especially those living along the main street.

The current situation with town's drinking water, which does not correspond to hygienic requirements in its chemical composition, causes anxiety. High content of iron ( $2,2 \text{ mg/dm}^3$ ) affects the health of people to a certain degree. Scientists assert that nearly 80% of all illnesses are related to off-grade water.

Unfavorable influence of environmental factors, nutrition, and water supply leads to deterioration of the health of population.

Sanitary-hygienic situation in the district remains unfavourable. The growth of disease rate from malignant new formation among the population continues. In 1998 there were 344,5 cases of illnesses for every 100,000 people, which means that the rate grew by 24%.

Condition of significant portion of used land in the district continues to deteriorate: erosion processes are developing, the contents of humus in soil is decreasing, re-cultivation of lands is insufficient, vegetative cover is not being improved.

According to the data collected by Agricultural Research Institute of South East through many years, 300 to 400 kg of humus is lost annually from every hectare as a result of erosion.

The contents of humus in the district decreased by 0,7% in the past 10 years as a result of organic and mineral fertilizers use. Under-gathering of harvest is occurring due to the reduction of fertility.

In order to survive in modern conditions of market economy, it is necessary to learn to manage our activities, relying on the knowledge of ecology and optimal nature use, in accordance with nature's requirements, regarding its laws. The Administration of the district has analyzed this situation, and in collaboration with the Saratov Branch of the Russian Environmental Academy it had developed measures for improving the ecological situation of the environment. For concrete solution of this problem a district office of the Saratov Branch of the Russian Environmental Academy was established under the leadership of the Head of Administration, academician V.I. Malyshev. This program is included into one of the sections

of the district's social and economic development program for 1997-2000.

The following particular measures are stipulated:

- for preserving the purity of reservoirs all cattle summer camps and fuel tanks were removed from the bank areas of small rivers and ponds;
- the discharge of non-cleaned sewage was stopped;
- the unloading site for particular mineral fertilizers and gypsum at Karabulak station was closed;
- mineral fertilizers and poisonous chemicals are used wisely.

It has become a rule in the district to plow and sow only across slopes in order to reduce the influence of water and wind erosion. Flat-cutters and other non-blade tools are used for tillage, especially on light soils. Optimal periods for sowing and processing of soil are observed. Winter tillage is plowed in August-September, black fallow is plowed in September-October.

Forest melioration measures are conducted in order to protect soils against erosion. In addition to existing 40,000 hectares of forests, field protecting and other forested tracts, 150-200 woods are planted by forest farms every year. Improvement and forestation of district continues. 23180 trees and bushes were planted in district's towns only in 1998.

Obligatory inspection and control for toxicity is conducted for controlling discharge of automobile exhausts.

A special water cleaning plant was installed at the main water pump (filter with floating load) for improvement of drinking water quality. In addition to this 6 drinking water cleaning and disinfecting devices are in operation in the central district hospital. Water is cleaned through the processes of oxidization and restoration, which help destroy and neutralize all toxic compounds. High performance and long durability make this device stand out in the row of similar ones.

The construction of detour road for transit vehicles 5 km away from the district center will allow to unload traffic flows in town and reduce the volume of exhaust and noise level.

Serious attention is paid to ecological education in schools and ecological instruction of the population.

### **Medical-Demographic Criteria of Labour Potential Losses and Rehabilitation Measures Estimation**

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Estimating health as a component of living standard, it is necessary to develop new concepts and methodology. As health is the condition and the result of the society development effectiveness, economical aspects monitoring of people health, requires a special attention.

To solve many practical problems of mankind surviving, biosphere and antroposphere research, creation of inter-disciplinary ecological-medical-social economical branch of science will be of great help.

The concept «health» as «wealth» promoting material values reproduction should be renewed. Progressing spread of ecology-dependent pathology at the Russian territory is accompanied by unfavorable tendencies of medical-demographic processes. The best integral indicator is complex estimation of labour-potential expressed by man/year of labour-life. It allows to estimate economic damage caused by temporary invalidity, disablement and premature mortality.

The most part of all losses (60%) is invalidity, 70% of which falls at the age of 25-45. For the last decades invalidity life duration has increased for the account of young people and comprises average 3,7 years. Due to these data medical-demographic invalids rehabilitation level increase is of great importance. The results of sociological research made by E.G. Yacubina were used in the development of rehabilitation quality indicators system based on «the function of the preference» by Harrington; it allows to take into account separate quality indicators, their meaning and at the same time required selection of common estimation criterion of the target index oriented at final common results of medical-social rehabilitation.

Social-economic and social mode of life respondents status, duration and life limit degree and the opinion of rehabilitation quality and its economical accessibility were analyzed.

The data obtained have defined further research trends providing labour potential reduction. Method of getting informative medical-demographic indicators comprising conception base of the Russian regions sustainable development is involved.

### **Economic Problems of Extension of Agricultural Forests Environment Protection Functions**

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One of problem facing agro-industrial complex is to increase environment protection functions of forests and to attract international investments to solve the problem. Its actuality was confirmed by the decisions of International ecology conference of 1992 in Rio-de-Janeiro and the following ecological forums that took place in Germany, Denmark, Belgium, Great Britain, Japan and Argentina during last two years.

The ecological potential of forests that can have a great influence on improving ecological situation on the planet has got not only the scientific ground, but also a wide recognition among specialists.

For the first time in Russia the decisions of the conference in Rio-de-Janeiro were developed and realized with the participation of American scientists and the U.S. Environment Protection Agency in the form of the project «Carbon Credit». Professor of Oregon State University Ted S. Vinson and Kenneth Andrasko from U.S. Environment Protection Agency participated in the project implementation representing American side.

The researchers of the project studied the ways of decreasing harmful industrial emissions making use of the forests ability to absorb carbon dioxide from the atmosphere. Thus they disclosed the potential of the forest ecological-economic functions.

The research showed the ecological-economic efficiency of that approach and proved that the creation or new offset stands in the climatic conditions of the Saratov is possible and

expedient.

The authors of this paper were active participants in the development and realization of the international project «Carbon Credit».

During the process of research that was made before the beginning of the project, the methods of substantiating forests environment protection functions were devised and economic-ecological indices, which characterize the effectiveness of chosen directions and activities for improving economic development of forestry were suggested. During this work there were obtained indices of resources and possible carbon dioxide absorbing by separate tree species, taking into account their age and phytomass corresponding to climatic conditions of Povolzhie.

In particular, experimental offset stands in Lysogorsky and Dergachevsky districts of the Saratov Oblast were economically based and practically created on the area of 500 ha, where at present time systematic monitoring of their growth and development is taking place.

Specific parameters and indices of carbon stock and carbon dioxide absorbed by growing trees in Saratov Oblast in general and every forestry farm separately have been estimated.

The indices of carbon dioxide emissions from industry and transport of the Saratov Oblast depending on fuel and parameters of emissions absorbed by forests at present time present certain interest for further research.

An ecology-economic ground shows the expediency of scale expansion of Saratov project «Carbon Credit» in Forest service of Povoizhie, Urals, and other regions. The most important in this project is the international level of joint work and attraction of international investments.

The practical importance of research is that using calculations of forest ability to absorb greenhouse gases and carbon dioxide in particular, it is possible to conduct wider and more substantive project works in creating new forest stands by specialists of research institutes, «Rosgiproles» and «Rosgiprozern» and their subdivisions in various regions and also to use obtained recommendations in adjoining branches of agriculture, municipal economy, construction, and transport.

Besides, using concrete indices of carbon dioxide stock and annual absorbing by main tree species, managers and specialists of forest farms can do their professional job more objectively and more efficiently at different levels.

Putting ecology-economic indices and mechanism of the project «Carbon Credit» realization into operation may improve financial and economic conditions of not only forest farms, but also of the region as a whole.

Volzhsky Regional Branch of International Forestry Institute (IFI), with direct participation of the authors, together with a laboratory of forest biosphere functions of Russian Academy of Science (RSA) have made calculations of forests ecology potential of Uliyanovsk, Penza, Samara, Orenburg, Saratov, Volgograd, Astrahan Oblasts, and Tatarstan and Kalmikiya Republics.

The analysis was based on the criteria and indices that take into account the distribution of forest fund general area into land categories, the distribution of area covered by wood into main tree species and age, stock of stem timber of main tree species, general stock of timber phytomass, shrubs and grass on all land categories of forest fund, general stock of carbon in trees, shrubs and grass on the territory of forest fund and the average annual phytomass difference of trees and shrubs and the amount of annually absorbed carbon dioxide by forest.

The results of calculations are shown in Table I.

From Table I one can see that in nine regions of Povolzhie and Urals the area covered by forest is 4.5 min. ha and the phytomass is 519 min. ton, carbon absorbed is 257 min. ton, and the annual absorbing of carbon dioxide is 5.7 min. ton.

Table 1. Ecology-economical potential of forests of Povolzhie and Urals

Republic, Oblast	Forest fund area, Thous. ha		Forest stock, mln. m <sup>3</sup>	Phytomass, mln. ton	Stock of carbon, mln.ton	Carbon dioxide absorbing by Forests, mln.ton/year	Indexes			
	General	Covered by forests					Stock of stands, m <sup>3</sup> /ha	Phyto mass, t/ha	Carbon stock, t/ha	Carbon dioxide absorbing, t/ha/year
1	2	3	4	5	6	7	8	9	10	11
Republic Tatarstan	1120	986	145	121	60	1.2	147	108	53	1.1
Oblasts:										
Uliyanovsk	946	856	141	117	58	1.3	165	124	61	1.4
Penza	862	784	121	106	52	1.0	155	123	61	1.1
Samara	564	483	61	55	28	0.6	126	91	45	0.9
Orenburg	521	401	43	40	20	0.3	107	76	38	0.6
Saratov	510	423	43	48	24	0.4	102	115	57	0.8
Volgograd	519	356	22	25	12	0.3	63	48	24	0.6
Astrahan	178	78	5	5	2	0.3	27	27	13	0.2
Republic Kalmikiya	134	88	1	2	1	0.3	10	10	5	0.1

Forests of Uliyanovsk, Penza Oblasts and Republic Tatarstan have the best indices of stands stock and carbon absorbing stock and volume.

The younger the stands is the more is its absorbing capacity.

Table 2. Ecology-economical characteristics of individual species of forest stands in Povolzhie and Ural regions

Republic, Oblast	Carbon absorbing by age groups tC/ha <sup>-1</sup> /year <sup>-1</sup>						Carbon absorbing by different species, tC/ha <sup>-1</sup> /year <sup>-1</sup>						
	Young of first age class	Young of second age class	Middle age	pre old	Old	Over old	Pine	Spruce	Tamarack	Oak high stem	Oak low stem	Birch	Aspen
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Republic Tatarstan	2.2	2.6	0.6	0.3	0.3	0	2.0	1.5	2.5	0.7	0.5	0.8	1.5
Oblasts:													
Uliyanovsk	3.0	4.0	0.6	0.2	0	0	2.0	1.5	2.4	1.6	0.4	0.9	1.6
Penza	2.6	3.3	0.6	0.3	0.1	0	1.7	2.4	1.9	0.9	0.5	1.1	1.2
Samara	2.1	3.3	0.5	0.1	0	0	1.9	1.0	1.2	1.7	0.4	1.0	1.4
Orenburg	1.4	2.4	0.6	0.3	0.2	0	2.0	0.9	2.1	2.5	0.6	0.6	1.0
Saratov	1.7	1.9	0.5	0.5	0	0	1.3	-	2.6	2.7	0.6	0.5	0.9
Volgograd	1.2	1.9	0.4	0.4	0	0	1.3	-	1.4	0.9	0.8	0.5	0.6
Astrahan	0.7	1.4	0.7	0.3	0.1	0	-	-	-	0.7	0.6	-	0.6
Republic Kalmikiya	0.2	0.4	0.2	0.1	0	0	1.3	-	-	0.1	0.4	-	1.0

The volume of their annual absorption practically on all territories under research is about or more than 2 t/ha. The degree of carbon dioxide absorption by old and over-old stands is the lowest.

Such species as tamarack, pine, oak high stem, aspen and birch have the biggest capacity of absorbing carbon dioxide.

The economic efficiency and ecology indices in this work are defined according to international norms of payment for carbon dioxide emissions. Generalizing all data from various literature sources one can estimate it as 20 US dollars per ton of carbon.

Thus, in the Saratov Oblast, where forests of federal forest fund every year absorb 354 thsnd. ton of carbon dioxide, agricultural forests - 103 thsnd. ton, general volume of absorbing



is going to be 614 thousand tons annually.

If we transfer the volume of carbon absorbing into the cost, it would be  $614000 \times 20 = 12.28$  million U.S. dollars every year.

If at least the tenth part of absorbing cost was allocated for the Oblast development of forest farms, they could get additional 24 million roubles every year (with currency rate 1:20).

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### **The ecological Adjustment Models: Evaluating Social-Economic Effectiveness and Applicability**

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The objective logic of Ecological Economics development nowadays requires the transition from researches in which environment is considered as exogenous factor for social-economic system towards researches where ecological and economic factors are equally significant and sustainable development is recognized as the only alternative to global ecological crisis.

One of the conditions for such transition is the correct choice of the ecological adjustment model from the view of its social-economic efficiency and applicability in certain regions. We define an ecological adjustment model as the regulation system of interrelations between environment and economics which includes the following elements:

- the methods and incentives of environment protection;
- management organizing structure of environment protection activity;
- financial mechanism.

We distinguish between four types of these models:

- direct regulation via the command-and-control instruments realized by the government administrative bodies;
- indirect economic regulation with the help of financial incentives and economic stimulus;
- market regulation via functioning the market for pollution rights and the one for environmental services;
- institutional model which is based on institutional perspectives on environmental policy (as an alternative to neoclassical approach) and emphasizes various ideological standpoints

and social changes in the society.

To evaluate the effectiveness and applicability of various regulation models the system of indicators has been elaborated and approved. These indicators allowed us to measure the following aspects:

- improvement of the environment quality in the result of implementing the new regulation model;
- the necessary period of time to reach the desirable environment quality;
- the level and structure of required environmental costs;
- social-economic consequences of implementing the new ecological regulation instruments.

Based on such analysis of different social-economic models some propositions on how to improve the economic mechanism of environment protection in Russia have been done.

### **Technogenic Risk Management in the Policy of Providing Industrial and Ecological Safety**

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The possibility of power objects emergency situations and their effect on the natural environment, on a man, on economic strategy of productions and on a region as a whole requires an attentive and systematized approach to the problem of safety, to the questions of analysis and forecast of a technogenic risk.

Taking into account technical, ecological and economic risks is necessary both at stages of designing and construction, and at the stage of operating dangerous processes.

The tendency of increasing production safety dictates the necessity for a risk management. The management should proceed from the managers of enterprises, design organizations, administration of a region, regional branches of Gostechnadzor and the Ministry of Emergency Situations (MES), insurance companies, public organizations.

The following methods of the technogenic risk management are possible:

- an optimization, construction, technical and technological solutions, organizational measures;
- an insurance of the enterprises responsibility;
- a development of normative acts, approved by the regional administration;
- a development and realization of the training courses plans on Civil Defense and Emergency Situations;
- a development and realization of strategy of repair works and diagnostic studies.

SJSC «VNIPIGASDOBYCHA» developed and adapted for specific objects the system of optimal designing gas production enterprises with allowance for the technogenic risk.

The importance of the problems related to a risk evaluation and management, requires the special control executed by the administration of a region. From these positions it is also necessary to execute the special control of financial reserves of high ventures, insurers, organs of MES.

The report presents a complex approach to the problems of risk management, special methods of management and analysis by way of examples of designing high ventures elaborates by the institute «VNIPIGASDOBYCHA».

## **Concept on Sustainable Development in Gas Industry as a Contribution to Global Ecology**

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The impurity of the natural environment does not know boundaries. The admission of this fact has resulted in the fact that the World Community began a joint struggle with the rising impurity of natural environment. At the UNO conference on the environment and development that took place in 1992 in Rio de Janeiro the concept on the sustainable development was formulated.

The gas industry is referred to as a number of the most ecologically «clean» industries. The increase in gas use in various industries will allow to reduce essentially their negative impact on the nature. At the same time, the increase of the volumes of gas production involves the necessity of putting into operation new gas production, transport and processing objects, that in turn results in the increase of negative environmental impact of the gas industry itself.

Understanding the necessity of development of the nature-oriented activity, «GASPROM», makes much in the field of development, acceptance and realization of programs of the elimination of a negative environmental impact. The gas industry has all necessary prerequisites for its future development: the richest natural gas resources, economic and scientific and technical potentials. Understanding, that the duty of the present generation is to preserve a worthy world, where our children and grandsons will live, «GASPROM» constantly and sequentially follows the way of decreasing environmental impact.

«GASPROM», was the first of the Russian companies to enter the World Businessmen Council for sustainable development. In 1995 there was accepted and approved the ecological policy of OJSC «GASPROM». In 1997 there was developed and accepted the Concept on scientific and technical policy of OJSC «GASPROM» up to 2015. «In the Concept... » there have been reflected the strategic goals of the company in the field of environmental control. Now, «GASPROM» is developing the branch program of sustainable development.

OJSC «GASPROM» is one of the founders of the nongovernmental ecological fund by V.I. Vernadskiy. Main problems of the fund are as follows: supporting leading scientific schools of the Russian Federation in the field of ecology at the expense of off-budget sources and forming ecological view of the population.

Being a subdivision of OJSC «GASPROM», SJSC «VNIPIGAS-DOBYCHA» is following the nature-oriented policy in the gas industry and also solving the ecological problems at all stages: designing, construction and operation. The institute has a wide experience in works at large fields. It carries out works related to a small fields construction.

An example of realization of nature-oriented policy and fruitful cooperation in the regions is the mutual cooperation agreement between the Government of the Saratov Oblast and OJSC «GASPROM» signed in the year of 1997. On the basis of this agreement the institute is developing «The General Plan of development of the oil-gas complex of Far Saratov Zavoizhie». The main problems of this work are: the substantiation, definition and evaluation of the development of small hydrocarbon fields on the basis of the perspective process equipment, taking into account all ecological requests.

The global ecology problems cannot be solved without using ecologically acceptable technologies at all levels, from the small enterprises to the giant enterprises of the industry. The Concept of sustainable development should be transformed into a reality.

## **Legislation on Ecological Monitoring and Sustainable Development in Russia**

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One of the principles of modern society is sustainable development. In accordance with the spirit of the Rio-de-Janeiro Conference, this means sustainable and harmonic development of nature and economy. State-of-the-art technology makes it possible to harm the environment in a global sense and consequently to threaten civilization as such.

Technologies connected with raw oil-gas materials are especially dangerous in this connection. Russia has a wide net of oil-gas pipe-line of local, regional, federal and trans-Europe importance. Potentially, they represent substantial ecological danger. Regularly, this danger emerges as technical accidents which often develop into serious tragedies with many victims.

In this connection, new legislation on obligatory ecological monitoring of all oil-gas pipe-lines in Russia is essential.

The legislation should have a matrix structure to reflect both regional and production aspects. It must state rules of the pipe lines usage based on regular control and certification of pipe line technical conditions and obligatory preventive measures. Anti-corruption measures must be built into the certification procedure. Certification may serve as the basis for pipe-line insurance and a federal data bank.

## **The Economies in Transition as Part of the Climate Regime: Do Efforts Go Beyond Hot Air?**

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Since the adoption of the Climate Convention in 1992 at the latest, formerly communist countries have been following the political negotiations closely in spite of their overwhelming economic problems. Indeed, this region has contributed most to curbing the problem of climate change, albeit accidentally, through the sharp decline of their emissions in parallel with the decline of their economies. This paper reviews what role the economies in transition have been playing in the climate negotiations so far, especially in the light of the recent Kyoto Protocol. It considers emission trends and scope for further emission reductions. Subsequently, the potential benefits of the «Kyoto Mechanisms» for the East, which include emission trading. Joint implementation and the «Clean Development Mechanism», are discussed and an outlook to what regime is likely to emerge is given.

The paper finds that there is significant scope for actions, which could enable emissions to remain low even if economies start to grow again. But the realization of the potential varies significantly across countries. In this context it is likely that those countries that have already been nominated to accede to the EU, will take active measures to keep emissions low, because they will have to meet EU standards. Other countries, mainly located in the former Soviet Union, may even reduce their emissions further. This, however, is a result of a still lasting downward trend of their economies, which in some cases may go along with countries falling into anarchy.

Design of the Kyoto Mechanisms thus needs to consider explicitly under which condition countries are eligible to partake in the activities surrounding the Kyoto Mechanisms. As it is likely that the working of the mechanisms will be finalized by the end of the year 2000, Parties to the Convention need to identify such conditions with considerable speed. In the context of the economies in transition issues such as compliance, a ceiling to emission trading, and liability for emission allowances are of particular importance. In view of their physical contribution in alleviating climate change, the economies in transition would have a strong potential of becoming advocates for the cause of climate. Given the current economic developments, however, they are unlikely to take on such a role.

### **Economical Aspect of Ecological Security for the Population of the Regions**

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The solution of any practical ecological problem comes to its economical ensuring. These insistently demand the development of the ecological economics, as a relatively independent study. Economical ensuring of the solution of ecological problems depends on a series of economical subjects: State, region, firms, social organizations, private persons. Means are needed for the development of Ecological-economic information systems, environment managing systems, for environmental protection, health services, development of new nature-saving technologies, improvement of law mechanism, reducing ecological risk etc. Means must be provided in budgets of all economical subjects, which requires the necessity of the distinction of the ecological problems according to the subject. The solution of the problems depends on the economic ensuring of subjects. Human ecological security is ensured not only by normative condition of the Environment (purity of air, water and soil), but also by what and how a person eats, cares about the protection of health and how it is assisted by the existing system of health services, system of sport and recreation objects. All this requires systematization of all factors, which determine human ecological security and evaluation of the costs for ensuring the safe life activity of every person, taking into consideration all economic factors, and special features of the regions. According to all this a special scale of danger-levels must be developed to all factors, we need to determine: the cost of measures, which can provide reliable ecological security from the influence of these factors, ways that provide ecological security at different levels.

We can take for example provisional security providing by itself the ability of a State (region) to satisfy the public needs in necessary food products independently of any circumstances. Though it looks strange for the Market Economy, there is a view, that the realization of this condition provides the necessity in producing of 75% of provisional products in the state sector of the economy. However in Saratov region 70% of meat, more than 60% of milk and 50% of vegetables are produced in private sector. Proprietors in this sector decide by their own, where and to whom to sell their production (in Saratov region or in other regions). Naturally, first of all, it is determined by the price level in different regions and by the conditions of the product realization. Hence, the administration of our region with the purpose of providing provisional security, must solve the problem of creating conditions of selling the products in a less complicated way, look after the prices in the neighboring regions and stimulate production sale in their own region.

Regions are sharply different by the number and character of ecological problems facing them and necessary to be solved. In this aspect Saratov region is distinguished by an

abundance of such problems as: destruction of dangerous chemical substances, creation of factories which recycle atomic wastes, preserving secure functioning of the Balakov Nuclear Power Plant, Scientific and Research Institutes, occupied in genetic engineering, etc.

This shows, that we need the gradation of regions by the degree of their ecological security (danger) for the population, More ecologically dangerous regions must have more allocations from federal budget for providing ecological security. In their turn regions must negotiate their functions in this aspect with the center and enterprises.

In the conditions of Market Economy there particularly grows the necessity of distinct delimitation of producing functions between subjects, solving different problems, referring to ecological security, but also between their economic insurance. Regional structures must guarantee the realization of services of separate enterprises, they must not admit allocation on the region's territory of those enterprises and organizations, which activities increase the level of ecological danger especially in the regions where this danger is already at a high level.

### **Economic Valuation of Mineral Potential of Saratov Region Based on the Principles of Integrated Accounting**

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Stock and resources of minerals are one of the main elements of natural potential of the region, that is a subsystem of its industrial and economic potential.

In this connection, the problem of valuation and account of mineral resources as basic constituents of national wealth in the system of national income accounts is becoming more actual.

Application of construction principles of the system of national accounts in the regional scale along with the realization of the basic approaches of complex ecological-economic discount makes it possible to evaluate the role and the significance of processes of reproduction and assimilation of mineral resources in the regional economy.

The juxtaposition of the mineral resource structure of Saratov region and of the indices of pace of its assimilation testifies the fact that the building industry of the region is sufficiently provided with its own resources, and the necessary condition of its economic stabilization and development is the assimilation of its hydrocarbon resources and agricultural mineral resources.

These conclusions are proved by calculations and analysis of such index of evaluation of mineral resource potential of the region as gross potential value (GPV): 84% of GPV fall on oil and gas resources, 15.5% - on resources of building materials, and only 0.5% - on agriore resources. However, only 6% of GPV fall on industrial hydrocarbon resources.

It is known that the reinvestment of rent from mineral resource exploitation, sufficient for the conservation of real consumption in time (so called «rule of capital constancy») is the basic criteria of sustainable development. That is why, according to the principles of integrated discount, it is necessary to include the indices of amortization (depletion) of mineral resources into the number of indices of regional mineral resource evaluation, that influence generalized indices of gross regional product. However, today the index of depletion in Saratov region is not sufficient and may not be considered in making decisions about introduction of deposit into economic turnover.

## **Ecological Perspective of Melioration Condition of Soils in Zavolzhje and Problems of Drinking Water Quality**

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Irrigation on the dry territory of Russia is an important thing for rising the productivity of agricultural crops. There are unfavourable processes of solinization, rising of ground water level, worsening of productivity of soils, intensive water pollution. Zavolzhje's soils have unfavourable water physical qualities. There are flirtation losses of irrigational water. Irrigation erosion, which leads to the losses of productivity of soils and deformation of landscape with the norm of irrigation and heavy rain.

On the places with slope declivity of more than 1° degree alluvial soils are formed. Corpulence of humus layers is from 25 to 65 sm. It contains humus from 2,1 to 3,5%. The main thing is to predict irrigation erosion from heavy rains and to observe the qualities of soils during and irrigation with small norms and in due time.

These recommendations are created on the basis of our research with the use of special device. Our research of the regimes of irrigation with the help of computer method is based on a mathematical model and parameters.

With the strongest regime of irrigation we observe infiltration loosing from 5 to 15% of the sum of the rainfall and irrigation. Filtering water provides advancement of solinization into deeper soils and into ground water. That is why all questions of providing the population of Zavolzhje with normal quality drinking water are becoming more and more actual from year to year. Almost all fresh water of surface springs and subsoil water became polluted with xenobiotics. Often xenobiotics are decaying to more toxic materials than initial ones in the process of biotransformation.

We have to use different things for .cleaning drinking water. It is based on the method of filtration and sorbtion.

Drinking water cleaned with the help of filtration or absorption doesn't allow to detain harmful elements and to preserve useful ones. It is impossible to separate all harmful elements with the help of filtration and absorption.

«Isumrud» is the machine by SPA «Ecran». It is the most interesting creation because in the machine water cleaning is based upon the process of oxidation and reduction. With the help of this device the toxicities are neutralized and destroyed. Natural process in «Isumrud» is accelerated with the help of straight electrochemical reactions and participation of reagents in this process.

In Marksovsky and Bazarno-Karabulaksky Districts of the Saratov region these machines are used. The level of ammoniac, imagnesium, calcium and other metals in drinking water has become lower. Our practice shows that not all the possibilities of these machines have been used. «Isumrud» is comparatively more efficient and ecologically safe than other machines.

## **Regional Ecological Centre in Central Asia**

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### 1. Ecology and the new world order

Military, financial and ecological mechanisms compose the most powerful part of the united complex of mechanisms of building and future operations of the new world-wide community. At present, military and financial mechanisms are dominating. After the completion of forming a new world-wide united mankind system, functions of management and regulations will basically be entrusted on ecological and financial mechanisms.

### 2. Global calling and responses

Biosphere as an autonomous self-organising system tends to restore a condition of balanced unstability, violated by the influence of general anthropogeneous load. Off-balance increasing anthropogeneous load enlarges a system unstability factor, for neutralisation of which biosphere realises processes of global negative succession, i.e. degradation of ecosystems. Land desertion is the final stage of degradation of ecosystems.

Educational and propagandistic functioning of such organisations as Club of Rome, Greenpeace, and other have brought about forming of notion of the ecological threat by world public. This in turn, has stipulated need of development and realization of complex of actions, directed at ensuring ecological security and further ecological sustainable development of mankind.

### 3. Collapse of the Central Asia - a beginning of the end of the world?

Dynamic degradation of ecological systems of the Central Asia and incapability of the local governments generates a number of serious threats, as global security of the world community, and national security of developing countries of Western Europe and America.

On forming of given process also render an active influence Islamic fundamentalism, drug-business and other power, that are interested in destabilisation of situation in the Central Asia Region (CAR).

Main sales markets of narcotics are rich countries of the West Europe and North America. Possibility of quick increase of drug-stream (up to 1000 tons of heroin per year) in these countries requires undertaking preventive measures by their governments.

Besides that, a danger of selling weapons of mass destruction or technologies of their fabrication in third countries and use by its international terrorism exists.

### 4. Findings and proposals

There are two alternative ways of further development of the countries of the CAR:

The First way is independent «development», which has a tendency to making an area of military conflict on the territory of the whole CAR, with the further destabilization of the situation in the whole world;

The Second way is participation in the development and realization of international project to create an international NGO «Regional Ecological Centre». It will help stabilize the situation in the CAR and create real preconditions for the further sustainable development as of countries themselves, as well as the region as a whole.



## Realization of the Concept of the Economy Growth in Russia

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Economic growth under conditions of sustainable development presupposes large-scale inculcation of energy- and resource-saving technologies changing the structure of economy and the structure of personal and industrial consumption, with a goal to preserve favorable environment, good potential of nature resources and to ensure vital activity for existing and future generations.

While elaborating the conception of economical growth in the conditions of transitional economy we need to distinguish long-term, middle-term, short-term goals and tasks.

The gist of new socioeconomic strategy and the base of the conception of economic growth in Russia lies in its gradual step by step movement to the variant of society of postindustrial type. This strategy considers world tendencies of transformational changes, geopolitical, historical, national peculiarities of Russia, its strong potential of resources, predetermines the base vector of social and economic development of our country for the foreseen perspective (35-40 years). Originating from all that, within next 10-15 years (until 2010) we need to:

- Ensure high rates of economic increase, first of all in scientific branches and in processing industry, with the condition of creating the utmost benefit for domestic producers.
- Realize structural shift to the resource-saving manufacture, renovate the system of country's basic funds.
- Lead out the country from the row of low developed countries with unstable financial, credit and monetary systems with high level of investing risks.

All these form the system of basic long-term strategic goals of economic growth, realization of which must be done by formation of market relations of modern type, creation of equivalent forms of political and social regulation, improvement of market infrastructure, transition to the mixed economy model with efficient public and private sectors.

Alongside with the above, while developing the conception of economic growth, we must consider middle-term goals and criteria of social and economical development, which do not always concur with the goals of long-term character.

The base task for developing short-term program is the activation of consumers demand, based on the growth of population's real profits and investing resources. For example in the period of 1992-1996 chronicle decrease of aggregate consumer demand was caused, primarily by sharp deficit of active monetary mass. In 1996 the coefficient of monetarisation in Russia was only 12%, whereas in 20 European countries with developed market economy, according to the data of 1995, it was within the bounds from 37,5 % to 146,2%. Rigid monetary limits for enterprises of real sector of the economy continues to grow.

Besides, the effectiveness of investing capital into financial sector was sharply overestimated in relation to profitability of real sector of the economy. So, in 1996, credit rate for direct loaners was twice as much as the average level of profitability. The coefficient of that overestimation is decreasing (in 1995 it was 2,5), but this process is going on very slowly, because banks put into the loan price all possible risks. Negative impacts were rendered by the deficit of turnover capital and payment crisis.

To stop the decrease of industry and ensure existing economic growth it is necessary to eliminate negative influence of the above-mentioned on the consumer's demand.

Steady growth means the transition of the economy into the state when there exist not only separate examples of success or temporary stabilization and raising of separate branches, but a stable, dynamic development of the economy in general. It includes not only the rates, but

also flexible reaction to appearing requirements of science, engineering and social sphere. That is what we consider to be an effective and intensive type of economic growth with all components of saving resources, inculcation of high technologies and ensuring ecological safety. Steady increase is impossible in the conditions of contradiction between social, natural and technological processes.

However, before speaking about stable economic growth, we need to stop industrial decrease, which has been going on for 8 years. We can start moving towards steady increase only if we have industrial decrease stopped, start the correction of accumulated deformations in sectoral structure of industry and struggle constantly with the growing wrecking of basic means of production.

### **Synergistic Approach to Professional Orientation in the new Course of «Ecological Chemistry» in Saratov State Vavilov Agrarian University**

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Economic systems and production relations have reached the high level of impact on the environment in the contemporary society, under the permanently increasing needs of the people. However, the economy integration has to guarantee not only the increase of standard of living, but also the safety of natural ecosystems. This is impossible without the general continued ecological education, especially in higher schools.

In SSAU the systematic ecological approach is planned to be realized during the study of some subjects as one of the bases of high professional education. Within the frames of this education the ecological-economical consciousness of 21-century specialists is formed. The synergetic approach to professional orientation and ecological education facilitates, the appearance of such consciousness during the study of general and inorganic chemistry, physical and colloid chemistry, analytical and organic chemistry as well as the study of new course of «ecological chemistry» at Timber Department of SSAU.

The following ideas form the basis of the program:

- the environment in its natural development is the system in dynamic equilibrium;
- the change of the chemical composition of environment components, that leads to the ecological unbalance is the direct result of human impact on the nature;
- the chemical knowledge is an essential part of the knowledge about environment protection, rational use of the nature and change of the environment.

The ecological education according to this course is oriented at the chemical aspect of interaction between a human being and nature. The educational aim of this approach consists in the formation of the system knowledge that is necessary for understanding vital functions in natural («forest») and urban («town») ecosystems. This aim is realized on the basis of fundamental chemical knowledge.

The connection of this course with future profession of the student is reflected in the fact that the special attention is paid to the composition, structure, chemical properties and processes proceeding in ecosystem «forest» and new ecosystem «town».

It is important to show to specialists in timber industry, that the life development and support on earth proceeds together with the various compounds circulation's in the nature. Plants, microorganisms, animals and human interact with the environment, they contribute to the existence of other organisms satisfying their own needs. The water, the air and the surface of earth are self-cleaned and self-renewed continuously, utilizing the waste and renewing the resources.

The chemical processes in the atmosphere, hydrosphere and lithosphere are considered in

a detailed way during the lecture course. The peculiarities of circulation, transformation and accumulation of chemical substances in the environment are analyzed. The specific attention is paid to natural chemical processes in various ecosystems, especially in forest and town systems. The effect of substances of anthropogenic origin on the equilibrium violation is shown, the general chemical interactions in forest and town systems are considered.

The aim of the practical studies in the course of «ecological chemistry» is acquisition of new skills in the work with natural objects. The various education methods are used in this course, that train independence and creative approach to the future professional work of the students. The new course is built up to show the main ideas about biosphere, the human in biosphere and problems related to the modern technological civilization in towns, about the role of forest as «lungs of the planet».

After the completion of this course the students should have a notion of the structure of some ecosystems of biosphere, their properties and processes going on under the evolution of biosphere, interaction between the organism and nature, the factors affecting human's health, the global and regional ecological problems, professional ecological ethics and responsibility. Students should have an idea of the approaches to modeling and estimation of the state of ecosystems, they should be able to forecast the result of their professional work from ecological point of view.

The monographs, articles as well as the results of original research were used during the program preparation.

### **PR Projects in Solving Environmental Protection Problems**

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Taking into account difficulties in the financial support for the environmental protection acts in the conditions of economic crisis and transition period in the economy of the Russian Federation it is expedient to consider the possibility of providing the environment and natural resources protection by using financial resources which do not refer directly either to the spheres of budget financing or to special-purpose non-budget foundations which established are within the subjects of Federation for the above purposes.

At present federal legislature does not sufficiently reflect economic mechanisms of protection and recreation of the environmental and natural resources.

That is why subjects of federation consider it expedient to elaborate their own normatives – legal basis to regulate economic mechanisms of environment protection measures.

In accordance with the agreements about the divisions of the authorities between the federal center and subjects of federation there has been created a unique possibility of introducing completely novel for the region mechanisms of attracting material and financial resources into ecological activities to solve vital problems of the society.

Environmental protection activities do not always require significant expenditures of finances. PR project can play a definite role in solving ecological problems. However one should state that up till now neither in Russia as a whole nor in the Saratov Oblast as a subject of Russian Federation there was created an efficient system of ecological propaganda which might be able to involve various level of the Oblast population into the environmental protection activities.

Just as an example we could speculate about such large – scale projects as cleaning the territories from trash, waste products, greening the territory, planting trees, etc.

Implementing such projects the society can go two ways: to make an agreement with some organization for conducting some environment protection jobs, which will certainly lead

to serious financial expenses, or to apply special methods of public opinion formation for activating all social resources of the society, making use of the combined activities of ecological NGO and other unions of population.

The second way at first sight seems to be more complicated and unrealistic and definitely requires a special approach toward its implementation, but having compared economic expediency of both you find it more beneficial and quite accessible.

Propagandist campaign requires some financial contribution at the initial stage of work, but later on the population and NGOs once moved and stimulated would keep going, thus supporting the ideas and implementation of ecological projects.

Sufficiently simple financial calculations show that application of modern methods of public opinion formation followed by PR projects allow in 8-10 months already to decrease expenses for some kinds of environmental protection activities up to 50%. The second way was chosen by some countries which can allocate more budget money for ecological projects but still this way there is not neglected.

### **Methods of In-Depth Studies of Ecological Economic Information in the System of Civil Servants Training**

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Civil service is considered to be an important chain in developing and implementing ideas of sustainable development as a whole and putting ecological economic knowledge into practice in particular. Many mistakes have been made in this sphere concerning environmental issues due to formalized, so-called «logical» approach to solving problems vitally significant for the society. The results are too painful for people to neglect them.

That is why if we want to change the situation for the better we find it expedient to start with civil servants training policy. The best use should be made of all available teaching methods to get future decision - makers emotionally and intellectually involved into environmental protection activities.

Their education must be aimed at perfecting students' conscious and unconscious comprehension of corresponding ecological information.

Environmental protection and ecological economics are included into the curriculum of the Volga Region academy for Civil service as major subjects. However methods of their teaching do not allow to reach deeper levels of information reception and production and very often tend to restrict the requirements for students' proficiency to the level of information reproduction only.

But if we consider environmental protection and its technical scientific representation – ecological economics – as a very specific branch of knowledge which might and must influence the normalization of interrelations between man and environment we have to do something to improve the whole approach to education at least for the students majoring in the above subjects.

The focus of attention in our view should be turned to new means of «interiorization» (in-depth study) of ecological economic knowledge. Two types of knowledge are discussed in our work: logical and extralogical.

Logical approach only which is observed through most civil services proved to be not sufficient when optimal solutions to serious problems are searched for. Such solutions and

real discoveries in this sphere as a rule originate from unconscious level, as some «insights», «creative illuminations» which occur after preliminary conscious work.

In the world practice there are many methods of getting at deeper levels of world comprehension: from meditation – direct addressing the continuous streams of consciousness – hypnosis, dreaming to even psychedelic intoxication. Those are not the ways to be used in formal education. But the altered state of consciousness does not always occur as an extraordinary phenomenon.

Such a state can be reached just by the use of special sequences of intellectual actions, special exercises, special suggestopedic devices which of course are hard to imagine as inherent elements at the lectures where students do their best to write down the delivered material, or at the seminars where the same material is retold or sometimes discussed. We claim here that foreign language teaching where all necessary methods and devices have already been developed and applied can become a proper subject for the «interiorization» of ecological economic knowledge.

All scientific texts here can become objects for activating students' unconscious level. With the proper use of psycho-linguistic, psychological, pedagogical and other theories while working at the text information we can form certain psychological sets towards that information. According to the sets theory, the acquired sets to comprehend ecological economic information at deeper levels of consciousness are believed to contribute much to future civil servants professional activities.

### **Ecologic-Economic Substantiation in Business - PLAN**

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In conditions of formation and development of business plans measures, directed at the prevention of environmental pollution become one of the most urgent activities. Really the opportunity of adverse influence on nature grows. Many from well known measures of nature saving can not be realized for the economic reasons. Businessmen planning the activity frequently ignore the necessity of prevention of air, water, ground pollution.

World (global) experience of business planning of business shows, that by development and estimation investments for industrial, transport projects business - plans include, alongside with accounts of productive and economic parameters, quantitative and qualitative estimations of the impact on physical and social environment . The methodology of such estimation is based on summation of parameters of the prevented damage. Accounting for this index can be made by summation of all given economic losses in business spheres of material and non-material production, services and personal consumption. The damage can be expressed in diverse indices, and for business, from our point of view, in target strategic parameters of the concrete project of business - plan: losses of a share of the market, profit, volume of sales, others.

Definition of local prevented economic damage in business - planning is carried out, as a rule, in the branch of economy, in which it is supposed to implement the project: an industry, transport, agriculture, municipal services, public health services, wood facilities (economy). According to branch classification, local damage is expected from the raised (increased) deterioration of basic Funds, erosion of agricultural grounds, destruction of wood resources etc. There is also another approach to classification of local economic damages: arising in branches of material manufactures and non-productive branches. According to this classifications, in business of material sphere it seems to be useful to allocate the following

characteristics of preventing economic damage: increase of costs per unit of raw material; additional growth of current and lumpsum expenses; losses of production. Each of them is connected with particular kind of local damages.

In the business of non-material sphere (municipal economy, public health services) prevented damage is expressed as additional expenses of these branches, arising when the means for liquidation of consequences of pollution of an environment (for example, expense on establishments of public health services), are necessary. Degree of detailed estimation of research of impact of a certain business on environment is determined by its features, sphere, intensity of business, and also by prospective technology.

Estimation of the projects business - plan and acceptance of investment decisions will be carried out by all-round consideration of technical, socio economic characteristics, peculiarities of environment of the concrete project. It is important to define real costs on resources and benefits, caused by businesses influence on the ecological situation in the region, to include them in a general economic estimation depending on degrees of the importance for the acceptance of the final decision on financing the project to increase not only ecological, but also social benefits.

### **Effect of Transaction Costs on the Performance of Markets for Pollution Control**

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The idea of using transferable discharge permits to allocate the pollution-control burden among firms or individuals was developed more than two decades ago by Crocker and Dales. In this connection, the rigorous assertion was suggested by Montgomery that in theory a tradable-permit system could provide a cost-effective policy instrument for pollution control. He supposed that the equilibrium allocation of control and hence the aggregate of cost of pollution control are independent from the initial permit allocation.

However, there are several authors who have commented this statement and taken into account the potential importance of transaction costs in tradable permit markets. In particular, Stavins claims that, in general, transaction costs are ubiquitous in market economies and can arise from the transfer of any property right because parties to exchanges must find one another, communicate, and exchange information. It is necessary to inspect and measure goods to be transferred, draw up contracts, consult with lawyers or other experts, and transfer title.

Taking into account who provides these services, transaction costs can take one of two forms, inputs of resources - including time - by a buyer and /or a seller or a margin between the buying and selling price of a commodity in a given market. In the presence of transaction costs, total expenditure on pollution control generally will exceed those that would be incurred in the absence of transaction costs. This suggests that transaction costs reduce the overall economic benefits of permit trading not only by absorbing resources directly but also suppressing exchanges that otherwise would have been mutually and socially beneficial. (Stavins, 1995). That is why, transaction costs may be crucial in reducing trading levels and increasing abatement costs. It makes the equilibrium permit allocations and hence aggregate control costs sensitive to initial permit allocation.

This conclusion brings us to reconsider the question: can the initial allocation of permits

affect the post-trading allocation of pollution control responsibility? «It depends» - Stavins gives the answer in all his publications considering this issue. In this connection, a two-source model of a potential permit seller and a potential buyer is considered in this report on the bases of common transaction function. This model proves that in the presence of transaction costs, the initial distribution of permits does matter and can affect the efficiency of pollution permit markets.

### **Combining Ecological Economics and Corporate Environmental Management Valuation Methods**

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The basic ecological economics position of man-made capital and natural capital as complements lacks an empirical application in industry environmental policy and in the theory of corporate environmental management. The ongoing debate of the issue culminates around the value of natural capital. This paper reflects on the theory of natural capital valuation with an application to Finnish mechanical wood industry.

Traditional economic discussion refers only to labor and capital, excluding environment, natural resources, pollution and depletion from for example Input-Output tables. Neoclassical position assumes man-made capital and natural capital as substitutes. It is suggested here that it is necessary to transfer the physical units of environmental material flows to comparable monetary form to include environmentally relevant contributions into economics and policy making.

Natural capital valuation depends on preferences and choices of individuals or society. Various subjective valuation methods, like willingness to pay (WTP) and willingness to accept (WTA) questionnaires, have been used to evaluate the monetary value of environmental goods and services. In objective methods, like hedonic prices method or travel expense method, the implicit value of quality of the nature is derived from the observed prices of a market good. Still these methods are unable to include the environment in usual market transactions.

Corporate environmental management valuation methods used in industry environmental issues include for instance Environmental Life Cycle Assessment (LCA). LCA evaluates the industry or process generated environmental impacts according to internationally defined standards of weighting and prioritizing provided by SETAC and ISO. The ecological economics position with the definition of natural capital and the effort to value the actual ecosystem services is however practically non-existent in corporate environmental management.

The Finnish mechanical wood industry is examined here with an input-output matrix. The matrix takes the ecological economics position of capital complementarity as a starting point and includes environmental, economic and social input-output variables in the formulation. The inventory identifies the physical quantities of the variables. The second phase defines the value of a variable, which is based on societal preferences of politicians. The third phase combines inventory with valuation and the results provide a basis for policy making.

## Global Ecological Monitoring of Oil-Gas Pipe Lines

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New approaches to monitoring oil-gas pipe lines are proposed by expansion of the navigation technique of the defectoscope.

*Problem.* The length of the oil-gas pipe lines of CIS countries alone is 800,000 km. Many of them have been under ground for dozens of years. Practically, every month accidents take place. They result in terrible damage both to nature and the society. Repair of the whole pipe line is out of question due to the enormous cost.

*Traditional solution.* A special capsule-defectoscope is launched into the pipe line. This capsule moves along with the fluid (oil or gas) and carries out detection along the way. Afterwards, the information received is fed into a computer and analyzed. It shows possible places where accidents might occur, their physical and linear coordinates. Such an approach allows prevention of accidents or repair of the most dangerous parts rather than waiting for an accident to occur.

*New features of the project.* The device proposed has the following new features in comparison to its domestic and foreign analogues. It calculates the geographical (physical) coordinates of the pipe line-whereas the current devices detect only the linear coordinates of the pipe line. Developers used a special navigation technique and software from the «Topol» missile complex.

### *The main results*

1. The device does not need any information on how the pipe line is situated in the ground. It simply calculates its physical coordinates. It is very important in the NIS where there is often a big difference between technical documentation and the actual position of the pipe line.

2. The device detects the position of the pipe line in 3-dimensional space, its curvature and its changes over time. This feature is extremely important when shifts in the ground take place. Even when there are no defects in the pipe, an accident might take place because of increasing the curvature of the pipe after the subsequent shifts. The current devices are not able to detect such effects.

*Technical data.* The device is composed of four blocks:

- Ultra wave block - detects cracks and other defects
- Magnetic block - detects corrosion and the thickness of the pipe
- Navigation block - calculates coordinates of the pipe line and defects
- Energy block - provides energy (electricity) to all blocks

The length of the pipe line under investigation - 320 km (four times bigger than the current devices). The precision of the coordinates  $\pm 5$  meters (not only along the pipe line). There are two modifications: defectoscope for oil, and defectoscope for gas

All modifications differ only in terms of internal equipment for gas and oil. The device may be used for systematic global monitoring of all oil-gas pipe lines. It provides the technical basis for new laws on obligatory monitoring and testing of all oil-gas pipe lines in Russia.



## **Disequilibrium Ecology and the Foundations of Ecological Economics**

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Much of contemporary environmental ethics (notably «the land ethic» and «deep ecology») is based upon such long-cherished concepts as «ecological stability», «equilibrium», «balance» and «integrity». Yet each of these foundational concepts is under attack by respected ecologists and conservation biologists such as Michael Soule, who writes that «the idea that species live in integrated communities is a myth... Living nature is not equilibrial...». The implications of this «new ecology» for environmental policy is profound.

(a) Gone is a justification for wilderness preservation and restoration, for if ecosystems are in constant change, then attempts to «preserve» «pristine states» of wilderness are contrary to nature.

(b) There is no «biodiversity crisis», since nature can not in any meaningful way be «banned» by the lost of component species in ecosystems.

(c) If there are no identifiable indexes of «ecosystemic health» or «integrity», the significance and validity of «environmental impact assessments» are significantly devalued.

I reply: (a) many of the «challenges» of the New Ecology are found, on close examination, to be trivial truths that are not and need not be disputed by traditional ecologists.

(b) Some criticisms of the new ecologists are plainly false: namely that traditional theory is non-falsifiable, non-predictive, and devoid of an operational classification system. Furthermore,

(c) traditional ecologists did not claim that «equilibrium» and «balance» are perfectly exemplified in nature,

(d) Because ecosystems are sensitive to natural selection among their components, they exhibit the sort of structure, integrity and resilience that is found among organisms. Moreover,

(e) because virtually all «deconstructive ecologists» accept the theory of evolution, they must presuppose some degree of design, order, constancy and resilience in ecosystems.

Thus, (f) ecosystems CAN be recognized to be, in some non-normative sense, «better» or «worse» than others.

Finally, (g) the ultimate inscrutability of ecosystems, suggested by the new ecologists, far from undermining ecological morality, serves to strengthen it.

### **Utilization and Fire Neutralization of Oil Slime**

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Modern technologies of oil extraction and refining are impossible without considerable amount of slime, which is a mixture of oil heavy residue, water, mechanical impurities and is considered to be an industrial waste. At oil fields and oil processing plants slime goes to special storing ponds.

The amount of slime in such ponds continuously grows and, for example, at oil fields of OAO «Saratovneftegas» at present it is about 10000 m<sup>3</sup>. Oil slime in open storing ponds poisons air with its vapour and is harmful for the environment. Besides the ponds occupy large areas and are fire dangerous.

The most common method of oil slime neutralization is its combustion in special furnaces. In this method hydrocarbon component of slime, making up to 60% and more, is not usefully utilized but is completely burnt away.

Scientific center OAO «Saratovneftegas» developed a project of the installation for the utilization and fire neutralization of oil slime from storing ponds. The installation peculiarity is that from thin slime film formed on a special heat-transferring surface, by evaporation, hydrocarbons are partially evolved, condensed and may be used, for example, as engine fuel.

The remaining portion of slime in a form of liquid goes to barbotage bath, supplied with primary air (barbotaging agent). In a space above the bath combustion and neutralization of remaining slime occurs.

To control temperature in neutralization zone the settled water from the pond is supplied to the bath. To insure complete combustion of waste, current of secondary and tertiary air to combustion zone is foreseen. Heat evolved during the combustion is used for the evaporation of hydrocarbons from the slime film and supporting heat processes in barbotage bath.

The installation project is based on several new technical findings which insure high efficiency of utilization and fire neutralization of oil slime. According to our calculations the repayment time of installation will not exceed 6 months.

### **Interaction of Railway and Environment**

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In recent years, much attention has been developed to environmental problems resulting from the snow-storm activity.

One of the global ecological problems in the organization of the ecologically nonpolluting environment is to protect the natural world from the snow-storm activity with a great number of its negative factors on the railway and mechanical transport systems.

This aspect is extremely important not only on the territories of Russia where railroads come from Vladivostok to Arkhangelsk, but it is also important for Finland, Sweden, Norway, Canada, USA and other countries.

To organize the effective snow protection of the means of transport and snow regulation, it is necessary to have a notion of physical and mechanical processes responsible for wind transfer of the snow and the snow-blocked roads.

The main condition on the snow-storm development is that the supplies of deflated material (snow) located at the nearby railroad territory (snow collector basin) and the wind of the corresponding speed as in Fig. 1.

The principle quantities for the investigation of the snow-storm are:

a) weight concentration of the hard phase of the snow-storm,  $j_b = \delta \cdot \xi_s \cdot q$

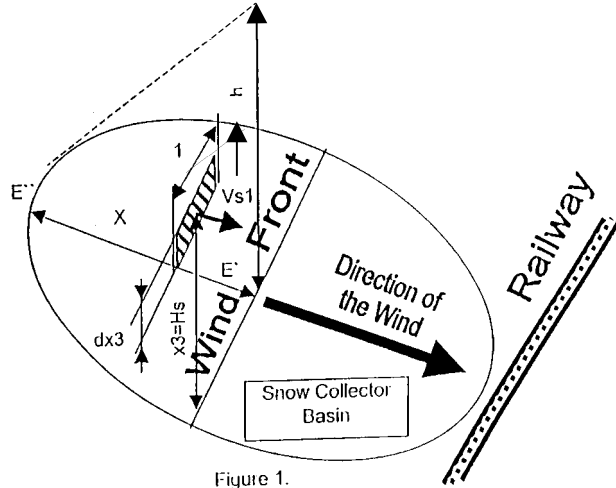
where  $\delta$  - volume concentration of the hard phase of the snow-storm;  $\xi_s$  - mass density of particles  $\text{g} \cdot \text{sec}^3 / \text{m}^4$ ;  $q$  - acceleration of the free-falling  $\text{m} / \text{sec}^2$  ;

b) Loads of the snow-storm are determined by integration  $j_b$  with respect to  $X_3$  (Refer to Fig. 1).

$$c) \quad j = \int_0^{H_s} j_b \cdot dx_3$$

The quantity  $j$  is equal to the weight of the whole mass of the snow lifted into the air at a given moment related to the area unit of the riding surface.

- c) hard expenditure of the snow wind flow  $\bar{g} \cong \bar{v}_s \cdot \delta \cdot \xi_s \cdot q$   
 where  $v_s$  - the speed-average of the particles, m/ sec.  
 d) total expenditure of the snow  $Q'_H = j \cdot v_{s_{cp}}$



A.K. Dyunin had got a formula for the definition of the total snow expenditure of the following form:

$$Q_H = \frac{\pi \cdot \eta_1^2 \cdot \eta_2 \cdot \eta_3 \cdot l_B^2 (v_h - v_{kh})^3 \cdot \alpha_s \cdot \eta_4}{8 \cdot \left( \frac{1}{\xi} - \frac{1}{\xi_s} \right) \cdot \delta^2 \cdot \ln \frac{h}{\delta}}$$

where  $\lambda_b$  - the thickness of the vertical layer;  $v_h$  - the limited speed of the wind flow;  $v_{kh}$  - the critical speed of the wind preceding the beginning of snow movement, measured at height  $h$  (Refer to Fig. 1);  $\alpha_s$  - coefficient depending on  $S$  and  $X_3$ ;  $\eta_4$  - coefficient expressed by the degree of saturation of the snow-storm with hard particles;  $\delta$  - surface irregularities;  $\eta_1, \eta_2, \eta_3$  - certain of coefficients.

Consequently, the total expenditure of snow is proportional to the quantity,  $\left( \frac{v_h}{v_{kh}} - 1 \right)^3$ .

In this connection it should be noted that wind transfer of the snow is very sensitive to the smallest changes in speed of the wind.

Positioning the barriers in the surface layer of the wind flow the reduction in surface speed  $v_R$  is achieved.

The main function of the snow kept barriers is the conservation, collection of snow.

Accelerated surface speed gives rise to intensification of deflation, that is why the snow blowing-out mechanisms are operated on the same principle transferring the snow over protected object.

The collection of a large snow-storm mass closer to the means of transport when collecting snow by the snow kept barriers (standing forests, fences etc.) as a whole has negative influence on the condition of the roadside zones (breaking of standing forests by the snow, heightened moisture saturation). Because of this it is more efficient to prevent the snow transference from the saturation). That is why it is more efficient to prevent the snow transference from the snow collection basins.

## **Influence of the Trans-Siberian Railway on the Economy and Environment of the Siberian Region**

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In the second half of the XX century interests in the east territories development caused strengthening of Russia's influence in Asia-Pacific region, reinforcement and enlargement of Siberia's functions.

The Trans-Siberian railway connected earlier isolated districts, promoted the intensification of processes of the natural resources development and exploitation, made possible the successful development of all economy branches, making Siberia a major power base of the state.

At different stages of the railway transport development various types of fuel were used. That was the reason of the extent to which it affected the environment.

During the first stage the coal was used (steam traction).

The next stage was related to the transition to diesel traction and utilization of diesel fuel. Volumes of discharge reduced, but they became more toxic.

Nowadays, electric locomotives are energy saving and ecologically pure kind of transport.

Impact of the railway on the environment has reduced. However, electrification can not solve all ecological issues.

The main sources of discharge polluting atmosphere are boiler houses for heating depot, dwellings, industrial buildings, and roundhouses. For solving this problem, stricter standards for tolerable discharge, equipment of stationary sources by dusters and gas purifiers are to be introduced.

There is also a problem of contaminating the way and soils adjacent to it by different toxic matters transported along the railway.

For the reduction of these wastes and, therefore, reduction of the degree of biosphere contamination the following measures are to be taken: to enhance requirements to services on wagons' keeping, to perfect constructions of the rolling-stock.

Keeping all measures will allow not to disturb the ecological balance of nature in the areas along the railway layout, to confirm the railway transport as one of the most efficient and ecologically safe.

### **Ecological and Energy Audit of Industrial Enterprises**

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Improvement of management of energy processes with consideration of ecological requirements allows to achieve significant economic and social effect in society.

Questions of ecological and energy audit of industrial enterprises in Russia emerge for the first time in the practice of organizational-economic and financial management. In relation to this, principal goals, problems, criteria, objects, stages, and procedures of ecological and energy audit are reviewed in this paper.

Ecological and energy audit is a systematic study of information about the object of audit, based on independent complex examination of industrial enterprise's conformity to certain criteria, characterizing its level of energy and ecological development.

Ecological and energy audit demonstrates how ecological and energy effectiveness of enterprise or firm contributes to its high profitability and attraction of investments.

When executing and improving ecological audit, it is important to determine analytical links of technical, ecological, and economic indices of industrial enterprise which affect maximum allowed ecological loads, its excess, and consequently financial payments and fines.

In this case particular attention should be paid to technical-economic substantiation of engineering measures for optimal realization of achievements of ecological requirements standards for industrial enterprises.

Energy audit should be directed at systematic evaluation of economic losses due to the excess use of fuel, heat, and energy at industrial enterprise in modern market conditions, with consideration of influence of international standards in ecological requirements.

The solution of this problem demands an establishment of analytical links between parameters of working bodies, technical characteristics of energy-producing and energy-consuming equipment, and volume of energy losses.

New methods and procedures for stimulating decrease of fuel, heat, and energy losses in modern market conditions are stated in this paper.

### **Insurance and Stability of Territorial Economic-Ecological Systems**

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In this paper the main stages of work have been stated, which are related to the realization of complex program of the Saratov Branch of the Russian Environmental Academy in creating the bases for the sustainable development model for the Saratov Oblast and creating the conditions for the transition to the program implementation.

Major success was achieved in the development of the criteria and indicators of sustainable management of ecological and industrial safety in the Saratov region.

Questions of safety statement of highly risky objects of power and chemical industries, pipelines, etc. are set forth. Particular attention is paid to liability insurance of industrial and power objects to third parties for banning life, health and causing damage to property and environment during emerging accidents and catastrophes.

The Federal law of the Russian Federation «About Industrial Safety of Production Objects» acted as a special impulse in this work. The law requires the development of safety statements and obligatory liability insurance in case of accidents and emergency situations.

The law is important and highly topical. It poses the questions of ecological and industrial safety in the Russian Federation, raising them to the international level. Scientific side of insurance lies in modeling the processes of emergency situations, scenarios, affected zones, damages to risks of insurance tariffs, responsibility for payments, etc.

The current moment in Russia is characterized by the initial stage of formation of liability insurance market for accidents and emergency situations.

The liability of assurer is not always connected with the real risk of potentially dangerous enterprise.

One of the reasons for the enterprise to work this way is article 15 of the law «About Industrial Safety» which gives the minimal size of insurance sum of liability insurance for causing damage.

At the same time we believe that a sufficient liability sum must be defined for each

particular object. Consequently, in the insurance process considerable attention should be paid to the work of independent expert and audit organizations. Also attention should be paid to the participation of the government in reaching the set goals, according to the indicated documents.

## **National Policy of Sustainable Development in Poland**

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The foreword to the article will present the definitions of state policy, ecological policy and the policy of sustainable development as well as interdependencies thereof. Sustainable development is presented as social and economic development respecting the need to protect natural environment.

The article shall focus on the following issues:

1. Objectives of eco-development policy;
2. Principles to be observed by eco-development policy;
3. Implementation stages of eco-development policy;
4. Eco-development policy in official state documents;
5. Tools for implementation of eco-development policy in Poland and abroad;
6. Post-ecological social awareness as a prerequisite of attainment of the desired objectives.

The article is to prove that eco-development policy allows for harmonious (not revolutionary) implementation of civilising changes and real - and not only announced - joining the group of the countries deciding on what our world will look like in the nearest future.

## **The Environmental Auditing as an Instrument Contributing to the Sustainable Development**

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Based on the worldwide practice the environmental auditing has proved to serve as an effective procedure of acquisition of data and assessment of a company environmental characteristics. The introduction and development of this procedure in Russia as well as in foreign countries is promoted by raising the strictness of the environmental legislation, the unification of environmental requirements and standards in the trade, financial and monetary policy. The environmental factor has gained its importance in the market competition.

The environmental auditing has been developed within recent concepts of the environmental policy. It comprises the administrative approach as well as the economic instruments - natural resource charges, total assessment of natural resources, environmental taxation, environmental insurance, environmental indemnity, etc.

By the December 1998 the System of Environmental Management and Auditing (EMAS) had about 4000 enterprises as its members. 2600 companies and organizations introduced the environmental management system in conformity with the international environmental standards ISO 14000 series. That is more remarkable that this procedure is widely used not

only in industrial sector, but also in the commercial sector (banking, trading, hotel services, municipal services). The Ministry of the Environment of Bavaria had in 1997 a good experience of environmental auditing procedure.

The activities on environmental auditing in Russia have been performed by foreign specialized firms and their affiliations. Since 1997 in Russia there has been implemented the Programme on promotion of the environmental audit aimed at the development of the appropriate legislative and methodical documents, a transfer to the international standards in the sphere of environmental auditing of ISO 14000 series, organization of the educational courses in eco-audit, research studies, etc.

At present 200 Russian experts have taken those courses and received a certificate. The auditing licenses have been issued for more than 30 firms. The Register of auditing firms and that of enterprises adjoined to the international system of the environmental auditing are under preparation.

The actual potential of further development of the auditing in Russia can contribute a lot to the expansion of the market economy and achievement of the sustainable development objectives, formation of the specialized market of auditing services. The development of the international links in this field for the reconciliation procedure can play a great role in this process.

### **Conceptual Basic of Ecologically Safe Sprinkler Irrigation**

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Irrigation causes damages in ecologically balanced functioning of the system water-soil-plant system. These damages result in deterioration of water-physical properties of soil, reduction of their fertility due to the humus loss, compaction, salting, erosion.

Unfavorable soil-ecological conditions can be observed on 15-45% of irrigated territories in steppe zone in Russia.

Interaction between man and plant environment should be organized so that to make natural landscapes preserve their ability for reproduction of biomass, soil fertility, formation of fresh water resources, cleaning from pollution matter.

Analysis of irrigation efficiency in black and chestnut soils causes the necessity to prove ecologically safe irrigation.

Overwatering and washout irrigation regime, compaction impact of cars, erosion, lack of long-standing grasses in crop rotation, insufficient use of fertilizers and use of irrigation water with higher mineralization, close deposition level of mineralized ground water can be referred to as anthropogenic-irrigation factors which influence negatively the regime of irrigated soils.

The admissible meaning of rain intensity and watering norms are indices of ecologically safe sprinkler irrigation.

The meaning of admissible rain intensity depend on the type of soils and their granulometric structure, subsoil, slope, kind of vegetation, energetic parameters of rain. Average diameter of rain drops shouldn't exceed 1,5 mm when the height of fall is no more than 3-4 m.

Ecologically safe irrigation is possible only if the system of agro-, forest- and hydromeliorative measures is applied.

Hydromeliorative measures include optimization of irrigation regimes, technologies and schemes of watering corresponding to outline, soils, vegetation in order to provide admissible watering norms.

Admissible rain intensity for black and chestnut soils must be 0.06-0.22 mm/min.,

admissible watering norm - 15-50 mm (at larger meanings discrete access of water).

Agromeliorative methods (the agrophytocenosis of structure, introductions of fertilizers, the use of green manure crop, the artificial structurization and mulching of soil) are necessary to improve water permeability and the increase of antierosion stability of soils.

Forest zones allow to do watering at the speed of the wind more than 7-10 m/c and to lower water expenditure for maintaining microclimate up to 7-10%.

Being a component of landscape and an object of melioration soils place a leading part in changing hydromeliorative-meteorological phenomena into hydrological processes.

### **Evaluation and Risk Management of Extreme Situations on the Territory of Saratov Region**

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Saratov region is the territory where dangerous natural activities and technological breakdowns caused by different reasons take place. Towns of Saratov region are «stuffed» with dangerous industrial objects.

Most dangerous for the inhabitants and the territory of the region are the objects where radioactive, chemical, fire, explosive and biological substances are being used, produced, processed, stored or transported.

Three oil-pipe-lines of federal importance by total length of 1000 km, Middle Asia gas-main, main ammonia-pipe-line Tolliatti-Odessa by length of 541 km cross the territory of Saratov region. Most dangerous are the junctions where the above mentioned pipe-lines intersect, thus creating additional sources of extreme situations. In consequence of the fact that transition to the market puts the enterprises into hard economic conditions, the exploiting security of economic objects has been decreasing. Basic funds of industry are getting older and are not being renewed, security services are being reduced. All this influenced much the amount of extreme situations. In comparison to 1997 their number increased by 2 times.

These conditions made Civil Defense and Extreme situations Committee of Saratov region government take corresponding measures to prevent and to eliminate the extreme situations in the region.

Organization measures have been taken: in 1997 Extreme Situations Commission of the Region government possessing wide authorities for undertaking the decisions of the administrative guiding the economic objects and officials was created. For more thorough Scientific studying of the Saratov region extreme situations preventing Scientific and Technical Council consisting of leading scientists and the security authorities representatives was established.

Other measures including organization of monitoring and prognosis of extreme situations on the territory of Saratov region, investigation of extreme situations risk origin, organization and holding of state supervision and control in the sphere of inhabitants and territory protection from extreme situations, organization of independent verification and evaluation activities in the sphere of extreme situations preventing and eliminating and insurance of the responsibility for the damage in course of the accidents on the dangerous industrial objects were taken.

In spite of the difficulties in the region the financial and material resources for extreme situations evaluation have been created. The practice of complex verification of dangerous industrial objects together with supervising authorities accomplished by anti - accidental drills where the measurements on the elimination of extreme situations, the consequences of which range out the object's territory limits is introduced.



According to the results of arranged complex verifications, target and operative control is being held, which totals are reviewed by the Extreme Situations Commission of Saratov region government.

The great work on stating the safety of more than 10 dangerous industrial objects is carried out. We need those statements not only to license the objects, but also to give them calculated risks to let them figure out possible value of permissible risks.

Carrying out the above mentioned measurements gives us the possibility to plan and to carry out a complex of preventive measures to reduce the risk and the consequences of extreme situations. We work out the target program on the risk elimination of the consequences of extreme situations until 2005.

### **Health of Schoolchildren as the Reflection of the Economical State of the Socium**

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The authors regarding the category of health dwell on the health of an individual (a school child) and the health of the society under contemporary conditions of the Russian Federation. The economical crisis and re-organization of the Russian society had an essential impact on the health of schoolchildren. The age is important for both the formation of a personality and for its socialization. The sociological development and puberty of schoolchildren being ecologically sensitive factors may be considered as the basic indicators of the quality of the medium, as the «sensitive indicator of the state of society» or the mirror reflection of the processes taking place in the society (Bushuyeva K.A., Sluchankol.F.,1974).

Physical development reflects the common level of social, economical and hygienic conditions of life of different groups of population especially of the growing child's organism, very sensitive to any changes of these conditions (Lisitsin Y.P. and others, 1996).

Regarding socium as a system where economy plays an important role in present-day conditions of reforms in Russia the authors studied the health state of the junior schoolchildren for the late ten years and the main tendencies of its development.

Multi-level approach taking into account the health state on biological level (diseases and somatic development), some factors of mental development (general mental development, intelligence, psychical and motor reactions, emotional and volitional sphere of a child), the indicators of social adaptation for school was accepted as a criterion of health.

The studies were conducted in the industrial area of Saratov which is one of the most unfavorable one judging by economic conditions. Present -day tendencies of the health state change in schoolchildren are closely interrelated with the worsening conditions of life both of economic and ecological character. We traced the dependence of the worsening of health state in children on the level of parents income and access to spiritual and cultural values.

Considering all said above it is appropriate to speak about state and individual regulation of health condition. The most required sections of the population feel a great necessity of stabilization and further development of the country's economy, solution of ecological problems, support of the social and cultural process of the development of a personality. All these factors have a strong influence on the health state of schoolchildren and our future.

## **Ways of Reconstruction and Reproduction of the Bioenergetic Potential in Agricultural Ecosystems of the Volga Region**

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The assessment of the resource's conditions and energy capacity of the landscape can be accomplished by analyzing the results of the bioenergetic potential of the given territory. The major part of the bioenergetic potential of Volga Region is composed of soils that are used in the agricultural production. With the agricultural utilization of the soil unavoidably occurs its transformation and changes in its permanent properties.

Unfortunately in the majority of cases such changes deteriorate the agricultural properties of soils. The results of the research emphasized that the fertility of the employed soils of the Volga Region is lowering. The descending maintenance of humus along with the lowering of the bioenergetic potential of landscapes leads to the decline of the agrophysical, aquaphysical and other properties of the soil. Not all of the cultivated plants leave the abundant quantity of the energetical material that is represented by the root and stubble's remnants to compensate the detriment. The replacement of energy resources can be done by the root and stubbles remnants of plants, by improving soil with organic fertilizers (dung, compost; etc), by using the «green fertilizers». But the major role in the increasing of fertility of soils and their bioenergetic potential is played by root's and stubbles remnants of perennial grasses.

According to the results of research work of VoljNllgiM 1995-1996 that was accomplished under the author's leadership in the health zone of the Volga Region some of the agricultural plants leave in the soil the abundant quantity of the stubbles and roots remnants. As for example, lucerne, clover, cereals grasses etc, amass up to 15-20 tons/ hectare stubble and roots remnants. The cultivating of perennial grasses (lucerne, clover, cereals grasses and their combinations) on the black earth in Orenburg Region led to the amassing of the underground organs the average ranges from 10.2 tons/hectare to 13.4 tons/ hectare (A.P. Budilov, 1997). Under conditions of the forest-health zone some agriculture crops amass up to 17.7 tons/ hectare of the underground biomass, lucerne up to 11.5 tons/hectare (S.M. Nadezhdin, A.N. Kshikatkina, 1998).

Analogous facts of the amassing the stubble and root's remnants can be observed in the variety of other research materials. The given values can be easily confronted with the productivity of the natural plant cover of different zones of Volga Region, and that fact points out the possibility of the ecological reconstruction of soils and their bioenergetic potential.

### **Ecological Aspects of Burning Gaseous Fuel**

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Burning of any fuel is connected with a definite amount of ecologically unfavorable and dangerous substances contained in a product of burning. And gaseous fuel is supposed to be the most ecological. But while burning gaseous fuel products of burning besides H<sub>2</sub>O and CO<sub>2</sub> have oxides of nitrogen and carbon - NO<sub>x</sub>, CO, polycyclic hydrocarbons - PAU, - amount of which depends on many factors.

Mechanisms of formation of these compounds are well known. Depending on the types of gas-burning devices, ways of burning and construction of thermal unit, quantitative output of these compounds differ substantially. One should bear in mind that most of them are carcinogens. That is why burning of gaseous fuel with minimum NO<sub>x</sub>, CO and PAU is a very

actual task.

A lot of methods of suppression of oxides of  $\text{NO}_x$ , CO and PAU are known, but their effectiveness is different.

The author suggests two directions which reduce substantially the content of harmful compounds in products of combustion: controlling and regulating process of combustion for ultraviolet radiant intensity of flame and gas burning in burners of infrared radiation.

Allotment of ultraviolet area of spectrum of flame's radiation allows to fix radiant intensity of a torch itself, as red-hot elements of heading's brickwork become a source of ultraviolet radiation only when the temperature is  $1600^\circ\text{C}$  or higher. Research showed that intensive formation of PAU (1,2-of benserpin) happens if the coefficient of air excess is  $L = 0,7-0,8$  and of oxides of nitrogen is  $L = 0,9-1,2$ . The choice of combustion regime by changing L allows to minimize the content of harmful compounds in the products of combustion in boilers and other thermal units.

With burning gas in gas radiant burners - GRB - it is established that with changing specific heat from  $95 \text{ kWt/m}^2$  to maximum (corresponding to a jump of flame) the content of CO is not higher than 0,15 of volumetric % with  $L = 1,05$ .

With optimal thermal load  $200-250 \text{ kWt/m}^2$  and  $L = 1,05$ , the temperature of radiation  $1150 \text{ K}$  emerge  $\text{NO}_x$  in recount on  $\text{NO}_2$  is not higher than  $14 \text{ mg/m}^3$  that is approximately 20 times less than at burning gas in boilers DKBP - 10-13. Content of PAU is very small (traces).

GRB can be used in heating systems and units of industrial and agricultural buildings, with a substantial economic and ecological effect.

### **Modeling Impacts of Mobility on Urban Air Quality: Scenario Analysis for the Brussels-Capital Region**

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Aggravation of transportation intensity and air pollution in urban areas in the last decades is urging the studies on strategic environmental assessment (SEA) of transportation networks and the integration of transport-environment concerns with land-use planning.

This paper tackles the environmental aspects of mobility, induced by major policy options in the Brussels-Capital region. The assessment is based on the Regional Plan of Land Use ("P.R.A.S") and the Regional Plan of Mobility (Plan "IRIS"), and focused on residential areas and office relocation and expansion, development of transportation networks, modal shift, parking, and other urban policies. Substantial presence of European and international organisation and businesses in the city and its heterogenous population structure are also taken into account.

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For the purposes of such analysis the system of models is being developed, including:

- 1) Forecasts of population and employment dynamics, in accordance to different economic and urban development scenarios. Such forecasts are based on:
  - indicators of economic development by main sectors of activities and respective demand for labor resources;
  - general birth rate and population dynamics;
  - trends and shifts in population and labor resources structure (e.g. from workers to executives, from permanent residents to foreigners and migrants, from town to periphery; growth of the share of middle-age population, etc.);
  - spatial distribution of the population in the region.
- 2) Mobility model, providing scenarios of public and private traffic in the region, according to different origin-destination matrices, generated on the basis of the stage 1 calculations and office stock modeling. For transportation network analysis the TRIPS software package is used, which provides powerful tools for assignment and graphical presentation.
- 3) A model linking mobility and air pollution. The focus is on emission of CO<sub>2</sub>, CO, NO<sub>x</sub>, SO<sub>2</sub>, VOC, particulate matter, and on consumption of non-renewable fuel. COPERT II methodology is used for emissions calculations from traffic, taking into consideration new European/Belgian regulations on vehicles.

Possible scenarios for improvement of the policy making in regional and urban planning in order to reduce the ecological pressure are discussed.

### **Evaluation - Lessons from the Drafting Process and First Applications**

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After some five years of growing international awareness and participating countries all over the world this forthcoming ISO 14031 standard was finished by the Subcommittee 4 (SC4) of the ISO TC207. According to ISO-rules, the new standard in the whole ISO 14000 family will be released in summer 1999. Thus, for the first time ever, organizations might be guided by this document how to evaluate their environmental performance.

The standard follows a «plan-do-check-act» model and in its appendix, a whole set of indicators are supplied for users: first two kinds of «performance indicators», the so called MPIs = Management Performance Indicators, and the OPIs = operational performance indicators on the one hand, and the ECIs = Environmental condition indicators on the other.

The standard includes also guidance for taking into account the concerns of the interested parties («Stakeholders») and entails already some paragraphs on internal and external communication and reporting.

The release of this new standard will be accompanied by a Technical Report (TR) ISO 14032, including some 17 examples of practices of organisations all over the world how they are practicing already an EPE-process.

On the basis of a pilot-project of 6 SMEs (small and medium size companies) in Germany, results of a first application of the new standard will be given, showing benefits and difficulties of the new standard.

## **Providing Ecological Safety of Bowels and Environment During Liquidation of Wells in Fields With the High Content of Hydrogen Sulphide**

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In 1995-1998 in Nizhnevolzhsky Research Institute of Geology and Geophysics we conducted works on the project «Development of ecologically reliable technology for well liquidation». As a result of conducted scientific, research and experimental works there have been created a patentable technique and technical devices (patent of Russia # 2074308 «A method of well liquidation»).

The technique of well liquidation solves the problem of ecological safety of bowels and environments in the fields with high content of aggressive components (H<sub>2</sub>S and CO<sub>2</sub>) in layer fluids.

The most dangerous and labor consuming complications for searching, prospecting and exploiting well are intercolumn pressures, because any horizons penetrated well with high content of hydrogen sulphide is potentially dangerous in ecological sense. And the intercolumn pressures in such a well make the danger real. Outcome of the layer fluid onto surface may lead to ecological disaster.

Currently only at the Astrakhan gas condensate field which is unique in the content of layer fluid (content of H<sub>2</sub>S - 24%, CO<sub>2</sub> - 16%), there are dozens of wells with intercolumn pressures. During well liquidation by traditional technique the well itself stays as a technical construction with intercolumn pressures dangerous for environments. Such a construction requires constant technical maintenance.

The created technique of well liquidation under conditions of aggressive layer components is the most optimum because it allows to join the process of well liquidation with the process of liquidation of intercolumn pressures.

During the usage of a developed technique a reliable isolation of productive layers is achieved by the fact that in a well section under productive layers we develop an interval of highly plastic rocks and within the boundaries of the interval cut a part of casing. Then we achieve communication with a rock massif and because of energy of the massif arrange natural impenetrable isolating bridge of rocks (salt, mud).

Liquidation of wells with this technique will provide a reliable isolation of productive horizons for million years and completely exclude ability of penetration of hydrogen sulphide and carbonic-acid gas into upper layers and environments.

Moreover, because of the economy of resources for liquidation of intercolumn gas and oil showings there is an economic effect of hundreds of millions US dollars.

### **Primary Multiple Cancer as the Social and Economic Problem**

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During the last years we can see the growth of the number of primary multiple tumors which are not unusual now. Among them there are many malign tumors of head and neck- from 10 to 35%. Frequency and localization of the second tumor depends on the localization of the first tumor. In the case of larynx cancer the second tumor localizes more often in respiratory system, in particular, in lungs. At the same time, head and neck tumors growing in

alimentary organs, are often combined with cancer of stomach or intestine.

The common causes of primary multiple tumors of alimentary and respiratory systems in the region of head and neck are smoking and alcoholism which are the strong carcinogens.

We have studied 321 cases of primary multiple tumors localized in the region of head and neck and also 214 cases of large intestine cancer. In the first group 90,9% of patients had 2 tumors. The number of men was twice as much than the number of women.

All men had been smoking more than 15 - 20 cigarettes during one day. 23,7% of women were smokers too. In the second group the number of smokers was half as much than it was in the first group.

So the popularization of the healthy mode of life, without smoking and alcoholism, is necessary for prophylaxis of primary multiple tumors. For early exposure of primary multiple tumors it is necessary to examine the upper sections of respiratory ways and alimentary tract not more rare than once in two years. The cost of control X-ray examination of lungs is nearly 20 dollars, but this method is dangerous for patients, and also does not bring enough information. It is better to use endoscopy with cytological examination.

### **The Utilization of Biofilters for Purification of Industrial Emissions from Organic Compounds**

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The industrial development results in the increase of emissions of organic matters into the atmosphere. The necessity of purification of industrial emissions from organic matters stimulates research and development of effective and economic installations for this purification.

In contradistinction to inorganic matters with ionic type of bond, which can easily undergo different reactions under ordinary conditions, organic matters have some special peculiarities - their molecules are formed up with covalent type of bond, which is hard to destroy.

Low-power-intensive processes, which are not connected with the whole destruction of molecules, are not effective, because they lead to another organic compounds, which are also contaminants. The process, that brings to the whole destruction of molecules, requires elevated temperatures and increased pressure. All these factors cause great expenses for providing technical facilities and for the prevention of emergencies. Under conditions of thermic neutralization a great number of gaseous inorganic contaminants is formed: nitric oxide, carbonic oxide, sulphur oxide, soot, and also there is a probability of forming dioxine supertoxicants of cumulative effect, which are much more dangerous than original organic matters.

Emissions of organic and chlorine-organic matters into the atmosphere create the possibility of forming dioxines in the environment. Since at present it is difficult to neutralize dioxine toxicants, it is necessary to prevent their forming and reduce the emissions of dioxine predecessors into the atmosphere.

The traditional physical and chemical methods of purification from organic compounds (profound freezing, methods of absorption, adsorption and hemosorption, apart from aforementioned thermal methods) in most cases result in forming liquid and pollution aqueous wastes. Besides they require great capital investments, and great fuel and energy consumption.

Those methods are complicated service and besides very expensive too. The most economic, effective and safe from dioxide method of neutralization of organic compounds is

the method of biological purification. Microbiological destruction of organic matters takes its course at ordinary temperatures and pressure and results in ecologically pure products: carbon dioxide and water. Owing to utilization of organic compounds, biomass increases which activates the process of purification.

Structurally this method can be realized as a homogeneous bioabsorber, where two flows, the one of purifying air and the other one of biosolution, which are opposite in direction, contact with each other. And the method acts also as a biofilter, when the gas is filtered through the layers with bioculture. In Russia bioabsorbers are not yet used, and the constructions of biofilters, which have been used before, were cumbersome and not economically beneficial, because they required replacement of biomass twice a year.

Biofilters, which are manufactured and introduced by «Sfera», are successfully used for purification from vent emissions of furniture, varnish-and-paint and chemical manufacturing in a number of Russian cities. The technology of purification is based on the application of specially adopted monoculture or artificially selected consortiums of bacteria, fixed on synthetic carrier. The unit is equipped with the device for irrigation of biofilters by nutrient solution. The maximum permissible hydrocarbon load amounts to 3 g/m<sup>3</sup>. The effectiveness of purification forms 86-95% depending on the type of organic matters.

Biofilters, as the practice shows, can work during more than 8 years without replacement of the biomass.

There are no other analogues of biofilters in Russia, which have been put into operation and run so successfully on a large-scale industrial level. The purification of industrial emissions from organic contaminants with the help of biofilters will give an opportunity to improve the environment to a great extent.

### **The Ways of Improvement of Ecological Situation in Russia**

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The study of production processes on the factories of Saratov and Saratov Oblast, having been carried out by «Sfera» for ten years, displayed, that in connection with the further development of industrial production, the emissions of some contaminants, the general pollution of the atmosphere, of water basins, and also accumulation of toxic solid wastes on the territory of Saratov Oblast are considerably increasing.

At the same time, the credits, which are directed at ecological goals, are very slight and they do not solve the problem of practicable guarantee of achievement of safe levels of the maximum permissible emissions of such contaminants as wood dust, abrasive, inorganic dust from asphalt-concrete factories, mineral oil, organic matters and a number of other contaminants, which deteriorate the environment. The existing purifying installations and dust-catching installations cannot fundamentally change the situation yet.

Therefore, the search of ways, on the one hand, of prevention and reduction of forming the contaminants, on the other hand, of perfection of the systems of dust-catching and gas-purifying equipment, is very actual.

The first trend is connected with the search and introduction of new nonwaste technologies, with the complex treatment and utilization of raw materials, with the substitution of toxic reagent for the less dangerous (for instance, the substitution of chlorine-organic compounds, which are the predecessors of dioxine supertoxicants), with the application of new forward-looking, more effective lubricating-cooling technological agents, which can function for a long time, instead of traditional lubricating-cooling liquids. All that will give an opportunity to cut down the wastes of lubricating oil considerably. The second

trend is connected with the modernization of the existing dust-catching gas-purifying equipment, with development and introduction into production of new types of cyclones; with utilization of the highly effective filtering materials and fabrics, which allow to produce modern compact bag filters for a number of branches of industry. The degree of purification of such dust-catching installations from dust emissions amounts to about 99%. That fact will allow to prevent the further pollution of the atmosphere and reach the level of the maximum permissible emission on the condition that they will be installed on the factories of our city. The models of such dust-catching installations are produced in «Sfera» and are introduced in a number of productions in Russia.

On industry productions on a large scale organic solvents, plasticizers are used, while emissions into the atmosphere amount to several hundreds tons a year. As compared with inorganic matters, which are formed with the ionic type of bond, it is more difficult to catch and neutralize organic contaminants. Besides, their high-temperature decomposition leads to forming other contaminants: nitric, carbon oxides and soot. The probability of forming dioxine toxicants of the cumulative effect is created. All that is able to deteriorate the environment in Saratov for a long time. The utilization of biofilters for purification of industrial emissions from organic matters can be an answer to the problem. The certain cultures or consortiums of bacteria utilize organic contaminants with their decomposition to ecologically safe products - water and carbonic acid gas. The process is accompanied by grafting of biomass, that is by activation of biopurification. «Sfera» produces and introduces some models of such biofilters in a number of cities in Russian Federation.

Spreading ecological knowledge and scientific and technical achievements among practical workmen on the factories of our city will show advantages of utilization of modern technologies, materials, of application of new decisions and constructions of dust-catching and gas-purifying installations. All that will give an opportunity to improve the ecological conditions of the atmosphere, hydrosphere and lithosphere considerably.

Ecological problems are global and can be solved only by taking concerted actions. The aim is the guarantee of ecological security in the country and in each region.

### **Ecologically Pure Cap for Oil Gas Combustion**

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At oil and gas fields during oil and gas extraction preparation a large amount of low-pressure oil gas is formed. At present compression and transportation of this gas is not profitable. The majority of oil fields are not equipped with torch installations, so combustion of excessive oil gas is carried out in very simple installations which can not ensure complete and effective combustion of gas.

The main purpose of a cap for torch installation is to provide inleakage of excessive amount of air and qualitative mixing this air with combusted gas. This is necessary in order to avoid incomplete chemical combustion, to reduce smoke formation and torch temperature.

In a great majority of torch cap designs gas combustion takes place in a diffusion regime, i.e. gas and air are mixed in a combustion zone. Thus, the way of air supply to the torch and its mixing with gas are very important for increasing efficiency of oil gas combustion.

Lack of water steam or high-pressure air at oil fields makes torch caps using unreasonable.

We developed ejection type cap which makes it possible to direct additional air to torch base along the current axis. To improve mixing and gas combustion efficiency the flow is



turbulized by twisting gas current. Such design peculiarities allow to transfer gas combustion process into the regime very close to kinetic, to eliminate chemical incomplete combustion and thermal decomposition of hydrocarbons, to reduce greatly smoke and nitrogen oxide formation, to prolong life of the cap and to improve flame stability under a strong side wind. The cap design is protected by the Patent of RF № 2035663 cl. 6F23G7/06.

## **Main Types of Agricultural Landscapes of Povolzhje**

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The erosive processes together with droughts create agroecological problems when using nature of Povolzhje areas, promote increase of the areas with inconvenient desert soils, and sharply reduce the efficiency of crops and stability of grain production. In such conditions it is necessary to go over to adaptive-landscape agriculture permitting to increase a level of agricultural systems adaptation, to coordinate them closely with natural and microzonal division into districts, relief and landscape of the region.

The relief has a dominating influence on the formation of soil cover and vegetative associations (biocenosis) and serves as a main integral indicator for singling out of landscape structures of the first level. Six main types of agricultural landscapes with a regulated level of antropogenic load (maximum percentage of arable) are singled out:

1. Plain-flat field (plateau, watershed slopes with a steepness up to 1°). The arable area can achieve 80%.

2. Slope-hollow soil-protected (flat slopes with a steepness of 1-3° with hollows, without ravines). No more than 70% of arable.

3. Slope-ravine buffer-stripped (slope ravines of large sizes, slopes of 3-5°). The arable area is up to 60%.

4. Gully-ravine contour-meliorative (gullies and riverside ravines, slopes of 5-8°). No more than 50% of arable.

5. Steep slope forest-meadow (steep slopes are more than 8°, dense net of ravines and scours). The arable area is no more than 20%.

6. Bottomland-water keeping (valleys of rivers, lagoons and dry dales). Partial recultivation with ploughing of no more than 20% is assumed.

Agrobiocenosis, correlation of farming lands, composition of cultures, specific features of their cultivation and economic use on the landscapes of the same type determine the second level of the characteristics of an agricultural landscape type: forest, steppe, field, fodder, soil protected, meliorative.

When forming the main types of agricultural landscapes, their essence and name are determined by first two gradations, i.e. area relief, agrobiocenosis and nature-protected measures, and the subtypes are specified by features of the third level of adaptation: slope exposure (sunny, shady) and biology of leading group of crops in crop rotation (grain, tilled, grassy, vegetable, garden). For example: plain-flat field grain; slope-hollow soil-protected sunny; bottomland-water keeping fodder grassy; steep-slope forest-meadow shady etc.

In Povolzhje plain-flat and slope-hollow types of agricultural landscapes occupy, accordingly, 49.3 and 38.9% of arable area, slope-ravine agricultural landscape -9.1%, gully-ravine -2.1%, steep slope - 0.6%. On the right-bank side the slope types occupy more than 60%, that determines the correlation of farming lands and specific features of economic management and arrangement of crops and plants varieties.

The assimilation of adaptive agriculture according the types of agricultural landscapes improves the ecology and increases land efficiency by 1.5 times.

## **Political Economic Persons and Political Economic Organisations: A Conceptual Framework for Business Environmental Policy**

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Environmental problems can be observed as degradation of land, air, water and more generally at the ecosystem level. The same problems can be traced back to human activities of various kinds such as industry, agriculture and transportation. Today we understand that «end-of-pipe» thinking is not enough in relation to such activities. Life-cycle analysis has become a popular tool to trace a whole set of environmental impacts of specific industrial and agricultural products «from cradle to grave». Next step in this chain of reasoning is perhaps to focus on the life-styles or other behavioural patterns of individuals. What are the material flows connected with an individual's current life-style, or perhaps the material flows that can be attributed to the individual from cradle to grave?

But our interest in material flows should not stop with material flows. The behavioural patterns of individuals are somehow related to the flows of thoughts and emotions of the same individuals. Our «from cradle to grave» perspective may lead us to a questioning of thinking patterns of individuals in Western countries. And such thinking patterns may in turn have something to do with science and ideology, e.g. social sciences such as economics and business management. The dominating conceptual framework and theory in economics and business management was designed for specific purposes but may not be appropriate for issues concerning environment and development.

Two strategies will be followed in the attempt to reconsider economics and business theory. One is to make the individual more visible as a responsible actor and the other to make the impact on the environment of business operations more visible. Economic Man will get a new much longed-for competitor, Political Economic Person (PEP) and the profit-maximizing firm similarly will confront a Political Economic Organization (PEO). This PEO is furthermore regarded as 'polycentric' in the sense that the individual does not totally disappear.

Role, relationship, activity, motive/interest are among the key concepts in understanding our Political Economic Person as a responsible actor. At a more integrating level, reference will be made to identity, network, life-style and ideological orientation. Ideology refers to «ideas about means and ends» in relation to specific human activities or more generally. It is assumed that each individual is guided by her «ideological orientation» and this orientation is the basis of valuing various phenomena or projects.

Individuals appear in different professional and other roles and can be more or less concerned about environmental problems. In the case of university scholars it can be argued with Gunnar Myrdal that «valuations are always with us» and something similar can be said about actors in business companies and other organizations. Changes in world-views or paradigms do not only occur in science but also in business (Halme 1997). In each case the individual refers to personal judgements as well as to that of others of her socio-cultural context. Actors in a paper-producing company may listen to consumers and actors in the wholesale business. A university scholar may similarly be sensitive to new trends in the scientific community or a perceived demand from actors in business or society at large. Actors in a business company with a «green» ideological orientation may cooperate with each other and with similarly inclined actors in other organisations.

A holistic and multidimensional idea of economics and efficiency is furthermore suggested. Monetary calculation is still important but regarded as partial analysis. In addition, there are a number of relevant non-monetary parameters or variables that should be the subject of monitoring and accounting practices. The «eco-efficiency» ideas advocated for instance by the World Business Council for Sustainable Development may fit into this picture but also various ideas about changes in the social or knowledge positions of a company.

### **The Ecological Risk Evaluation at Products Pipeline Failures**

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Failures at liquid and gas liquid products transport and processing objects (oil-condensate pipelines and methanol pipelines, oil terminals and storage, pump stations, petroleum refining and condensate processing etc.) are also accompanied by the physical and chemical effect of liquid hydrocarbons on soil, ground, waste and open reservoirs and cause at times the impossibility of a natural self-purification.

As a result of direct disturbances in the natural environment, the hydrological and hydro-geological modes, heat and mass exchange in terrestrial atmosphere, structure of vegetative cover are subjected to an indirect effect.

As a consequence of such effects, there is a possibility of the formation of thermocarst processes, territory swamping, lake formation, erosive processes development, ravine formation, etc.

Technical structures themselves can be exposed to an indirect effect caused by natural changes. So, ravin formation, soil creeping processes, swamping, soil heaving and settlement can result in the loss of a pipe line capacity, building constructions and technological facilities.

Within the framework of studies carried out by the institute «VNIPIGASDOBYCHA», the large place is taken by works related to the evaluation, analysis and management of a technical, individual and ecological risk caused by the unreliability of technological facilities.

At the stage of designing gas production objects there are executed works related to a risk evaluation on the basis of a simulation of physical and physical-chemical processes taking place in emergency situations, in particular, processes of emergency emptying of a technological system, dynamics of gas liquid components spreading in the natural environment, dynamic and thermal effects because of fires and explosions.

On the basis of domestic and foreign statistics in the report is given the analysis and evaluation of probabilities of ruptures of products pipelines, condensate- and oil- pipelines, possibility of inflammation and explosion of a heavy hydrocarbon mixture, impurity of soil surface, sewages and open reservoirs.

Many authors studied the problems of an evaluation of scales of fluids emergency spreading during the products pipeline ruptures.

However, the complexity of the problem and the necessity of taking into account of variety of natural environment performances (relief, soil and ground properties, geological and hydrological conditions, etc.) require the development of existing approaches, modification of available models and methods oriented for use in a design practice.

In the report, by way of example, is examined the problem of impurity dynamics of an aeration zone and mineral resources at products pipeline ruptures. The conditions of

intersoluble mixing of intruding and source fluids are considered.

The mathematical model of capillary impregnation of an aeration zone and dynamics of convective - diffusion transfer of fluids is described.

As an example of specific objects designed by SJSC «VNIPIGASDOBYCHA» the report presents the procedure of risk evaluation and optimization of design solutions with allowance for the probabilities of products pipelines ruptures, zones of possible spreading of toxic and fire hazardous products as well as scales of a negative effect on soil-ground massifs.

### **Ecological Economic Efficiency Regional Development (system approach)**

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Russia obtained results different from the results expected from «perestroika». One of the reasons of this situation is the absence of clear purpose of reconstruction and system approach to reforms conducting. The population connects their expectation with character and energy of one or another leader. The population did not recognize the fact that there were objective conditions, which determined the economic development. If we do not take the objective laws into account - political instability and economic destruction in regions will only grow.

To overcome ecological-economic crisis in Russia and regions one should conduct the number of measures within the system «ecology-economy». Hereunder there is a content of integral ecology-economy principles, which allow to use natural resources in industry in accordance with the requirements of sustainability. Imperatives of ecological ethics reflect content of these integral principles and connect ecology and economy on moral level.

In conditions of market economy regional ecological economic efficiency of development may be obtained by using Financial Industry Groups (FIG). A Bank or big enterprise groups around itself other medium and small sized enterprises, technologically linked with each other on the basis of the principle - «industrial waste of one, is raw materials for another». For enterprises this structure permits to reduce ecological costs and to rise their profits. If ecological costs have the tendency to grow, a company does not make a profit, it even goes bankrupt. For the bank this organization structure permits to minimize credit risk. For regions such grouping permits to preserve environment, health of population and employment. All these facts are condition of economic and political stability.

In order to organize FIG and such technological links between companies, the system of ecological-economic relations must be created in the region (country). The foundation of this system must be ecological relation of property on natural resources. Mentioned above ecological-economy integral principles must determine these relations of property on using of natural resources.

Today in Russia there is an opportunity to determine ecological relation of property in the process of privatization and licensing in industry. Only in this case credit facilities, tax rates, ecological insurance, penalties or another forms of punishment, condition of competition (image of company) will depend on the volume of pollution (dirty air, land and water) destroying the environment.

## **Sustainable Consumption - What Conceptualizations Do We Have?**

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The focus in the sustainability discussion has predominantly been on the production side. There seems, however, little doubt that consumption is equally as important for achieving sustainability (see Duchin/Lange 1994, Ropke 1996, Jackson 1996). Yet the barriers for questioning our consumption patterns are substantial. This has at least in part its roots in the way consumer behavior is modeled. Consumption is in conventional economic theory considered as the main determinant for consumer welfare. However, utility consists of more than the goods and services measured. Other («objective») concepts of well being (Doyal/Gough 1991, Max-Neef 1986; Hugg 1985) were discussed widely mostly in the context of developing countries. Still, there is wide disagreement about what human needs actually are and how they should be measured both within and across cultures.

The main difference between the two approaches is that the latter gives priority to the prevention of deprivation; this is not an inherent element of the preference approach (Penz 1986). To illustrate this difference, an example of a social innovation in organic farming is used. «Community Supported Agriculture» (CSA) groups are a fairly recent social innovation in the food sector. Their aim is to provide consumers with healthy, locally grown food and at the same time to revitalize local food economies, enhance local food security, protect the environment, and preserve small-scale, family farm type food production. CSAs appear to have many of the characteristics of sustainable food production systems, but are they viable and if so for whom? Several authors found restrictions to the expansion of CSAs (e.g., Ostrom 1997, Katkins 1997, Suput 1992) and why they may not serve as a model to be reproduced on a large scale (O'Hara/Stagl 1998). Nevertheless we can learn from the factors that prove important in the analysis of demand in CSA groups. It is argued that CSAs are an example of «synergistic satisfiers» (Max-Neef 1992), i.e. they manage to satisfy simultaneously several kinds of needs. To identify synergistic satisfiers in many areas of life and foster them in comparison to «psydo-satisfiers» or «destroyers» would be a contribution to higher sustainability.

### **Problems of Ecological Insurance Development in the Russian Federation**

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Providing ecological safety of economic activities in Russia is connected with the elimination of bad impact of industrial objects on environment. At the same time decreasing risks of emergency cases in production and as a consequence of ecological risks requires significant financial means which are not available either in the budget or at enterprises.

Federal environment protection Committee considers ecological insurance – insurance of responsibility for causing harm in the result of emergency pollution of the environment – to be one of the perspective economic mechanisms of providing ecological safety and protection of the population.

Introducing ecological insurance will allow to compensate the losses to those who suffered from emergency pollution of the environment and it will allow to create additional source of financing environmental protection measures, to elaborate competitive nature protection and resource saving technologies, implementation of which will allow to minimize risks of emergency situations occurrence in industry.

Such source can become the reserve of preventive measures and the profit of insurance companies, involved into the process of ecological insurance.

Obligatory insurance of responsibility of separate categories of manufacturers (services) is referred to as one of the most significant kinds of insurance by the Decree of the Government of the Russian Federation of 1.10.98 №1139 «About the main trends of development of national system of insurance in the Russian Federation in 1998-2000 years».

Correlation of goals of ecological insurance with the goals of socioeconomic development of the country and the list of obligatory kinds of insurance on the basis of Civil Codex of the Russian Federation will allow to consider ecological insurance as one of the important kinds of obligatory with the conditions, determined by the Decree of the Government of the Russian Federation of 1.10.98 №1139.

However at the first stage of insurance, the circle of the insured on an obligatory basis can be narrowed to the particularly dangerous objects (chemical, refineries, oil-chemical plants of power-heating complex and others).

### **Some Aspects of Ecological audit and Enterprise nature Environmental Activity Analysis**

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Reduction of natural resources utilization payments is one of the product cost reduction possibilities.

At some enterprises the size of ecological payments is so large that it is the main component of the product cost. But there are some ways of lowering this value by ecological audit and carrying out nature environmental measures based on nature management laws knowledge and introduction of ecological engineering and technological ways of production development. These ecological measures are often economically goal-oriented. To realize them it is necessary first of all to develop economic thinking and specialists competence, to stimulate (regulate) this process move actively at different management levels.

At any enterprise environmental pollution payments size increases every year. But the ecological situation and hence, the health of the population are not improved.

What is it caused by? First, by the absence of the proper enterprise analytical system; second, absence of the advanced payments collection method; third, lack of experienced ecologists capable to analyze natural resources utilization from the place of their intake to the place of their drain and their use.

Sometimes ecological payments are so essential that the product cost due to this economical component increases to a considerable extent. As a result, profitability of the enterprise will depend much on its combined activity.

Enterprise ecological payments calculation stage should precede the firm economical

analysis of the environment control activity. Nowadays, forming inner ecological audit mechanism allowing to supply data truth used for nature management and nature environmental activity analysis should be considered as this stage.

The audit ecological inspection should, first of all, display the correctness of readings formation characterizing enterprise ecological and economical activity, interconnection of complete production cycle.

The aim of ecological audit is to find out correctness of calculation and display completeness, environmental activity costs including ecological payments, and to make up necessary information base for defining ecological payments effectiveness.

One of the main questions is accurate definition of the whole environment pollution set produced by enterprise departments or the firm.

While calculating the parameters it should be taken into consideration that the formula of the given pollution mass is a product of pollution mass of the element by defined harmful substance and the substance toxicity indicator.

Mass value of nature environment element pollution by the defined harmful substance should be calculated proceeding from the volume of produced products, resources of products and per cent of the polluting substance, formed while processing definite resources and using special equipment and technologies. Cleaning effectiveness indicator on some concrete type of a harmful substance should be taken into consideration.

It is possible to low the size of payments for the account of ecological audit at an enterprise and environmental measures based on the results achieved by dividing flows of different toxicity level and technology improvement.

## **Economic Aspects of Ecological Insurance of Water Facilities**

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Negative dynamics of development of environmental protection conditions causes serious fears to the experts. Partly, the heavy ecological situation is determined by large failures and catastrophes happening at the industrial and manufacturing enterprises. The financial crisis accompanying Russia economy during last years, is characterized by the lack of means for the prevention of ecological failures on industrial objects and all that leads to significant deterioration of the environment. The financing of expenses was reduced to a water service since 1991 as a whole by 9 times, and from the federal budget - by 25 times [2].

In 1997 for management, restoring and protection of water fund, for research, for the repair of federal hydraulic engineering structures, there was allocated 164 billion Rbl., However to repair only one emergency dam of the Krasnodar reservoir it was necessary to spend a third of this sum, neglecting other 400 emergency dams and hydraulic engineering structures [2].

The essential role in a water complex belongs to reservoirs, which not only ensure regulation and redistribution in time of a drain of the rivers, but also ensure the guaranteed water-supply, guard of territories from high waters. Now in Russia there are 30 thousand reservoirs of general capacity of 800 cubic km, among them 325 large and especially large (single capacity of more than 10 million cubic m), which total capacity makes about 790 cubic km. Recently availability index of product of hydraulic engineering structures and coastal line of reservoirs essentially has worsened.

For the last decade there were breaks of dams in a number of large reservoirs, numerous ponds. The material loss from the destruction of these structures has made more than 500

billion Rbl., there were human victims, the industrial, economic and household objects are destroyed, potable and technical watertakings were put out of operation [2]. It is obvious, that the efficient economic mechanism for the prevention of failures, liquidation of negative consequences and reimbursement of damage is necessary.

Under existing conditions, the ecological insurance is the optimum mechanism of prevention of industrial failures, indemnification of losses, protection of the population and enclosing natural medium from negative effect of technogenic contamination.

The ecological insurance is based on the principles of dispersal of risk in space and time, mutual interest of the insured and insurer in the prevention of failure. They must be interested in escaping contamination of natural medium. The ecological insurance ensures a possibility of indemnification caused by contamination of natural medium of the losses, creates additional sources of financing nature protection.

The protection of the population and territories from negative effect of reservoirs (as well as from negative effect of water objects in general) should be carried out by means of insurance of their responsibility.

The ecological insurance of water objects will allow to shift the responsibility for possible negative effects on an environment on third faces, necessity of liquidation of consequences and indemnification of damage on the shoulders of insurance organization, thus obtaining additional sources of financing natural protection measures.

Market conditions of managing testify that only economic realization of expedient mechanisms will promote safety of an enclosing natural medium, increase a level of ecological safety, implicate financial resources in nature protection activities. Ecological insurance, with possibilities, intrinsic to it, of economic influence on nature protection activity should supply an actual protection of the population and environment from negative effect from water objects.

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### **Socio-Ecological Transition: New Dimensions of Environment**

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Interactions between person and environment are considered as one of the most important questions of survival of mankind. Quality and amount of such interactions become a subject of the scientific research. At the end of 90-th of our centennial a focus of study is displaced from bioecological aspects to socioecological dimensions of environments.

According to J. Bennett (1996) [1], interaction of person with the environment can be described in terms of *ecological transition*. *Ecological transition* characterizes the changes in relations of Homo sapiens and the physical environment. Carried in 1976, this term originally had a rhetorical contents and focused the attention on the global nature of changes, caused by human activity and the need in unceasing adaptation. With a time a volume of the concept is greatly increased and started to include the responsibility of a person for initiated changes and for the expanding ways of utilizing environment. This process has a dual character: «on the one hand, by making use of increasing quantities of natural substances and other living



species and enhancing their productivity by transforming them into «natural resources», human might be said to have freed themselves from the constraints of Nature; on the other hand, this increased freedom create exponential functions, especially population increase and an increasing *dependence* on Natures» [1, p. 3]. So, using different resources in different measures influences the stability of existence, person is capable to check produced by its activities changes to the life space - regrettably, in greater degrees by consequences. In the frame of this process an amount of sociogenic risks increases [2], generated by processes of vital activity of the society, its development, disintegration or transition to other conditions.

There were several transitions in human history: revolution in the food production (or Neolithic), the «urban » revolution (or the Bronze- Iron Ages) and the Industrial revolution (our time) [3]. It is possible to add occurring around the world Information revolution. Each of corresponding revolutions of technical achievements brought about the increase in human population, to the new patterns of settlement, to increasing an amount of consumed food, - in other words, each revolution represented a transition in the human capacity to utilize natural substances. Traditionally ecological transitions were considered as depending on material or technological innovations. Modern anthropologists pay more attention to mental system relations, social organizations and technologies. Such scientific installations were supported empirically: archeological prospecting has shown that in the base of ecological transition there is something greater than simply material objects - for instance, social organization and symbolic culture. Dominant technical-economic approach in understanding of global problems of mankind forces makes us focus more attention on cultural invariants and social measurements.

Modern state of the society in the opinion of L. Ionin [4] is characterized by the cultural breakup, one of the manifestations of which becomes a loss of social and individual identity. Really, identity of modern and torn chaotic identity of postmodern have exhausted their social-organizing potential. Trends of shaping new identity reflect leaving a person the limits of his body and egocentric mind, need of comprehension of his place in the world, shaping the new social contexts of global change.

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### **Ecological Aspect of Land Development in the Volga Region**

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Intensive land development in the arid Volga region, as a part of state program. guaranteed quick production of farm produce. Wide land development (about 1.7 mil. ha) and creation of great irrigation systems were aimed at getting maximum productivity of cultivated crops securing and using all external factors. Such intensive utilization of irrigated lands without taking into account ecological changes resulted in negative consequences during the last 20-30 years and we have the following:

- change for the worse in ecological state of the irrigated lands;
- soil fertility depression and lowering agroecological potential of the meliorative systems;
- environmental ecological disbalance and change for the worth in farm produce quality.

And as a result - the irrigated land area decreased from 1.7 mln. ha up to 1.1 mil. hec in the Volga region, and in Saratov region - from 481000 hec in 1987 up to 257000 hec in 1996.

During the last 20-30 years one hectare from 4 became worthless (0.02-0.24 hec from every irrigated one).

The future land development in the 21-century as a main factor of farm produce increase has to be based on the following:

1. To place meliorative systems in the agricultural landscape taking into account intercommunication of agroecosystems and natural ecological, anthropogene influences and ecological immunity of natural environment

2. To improve irrigation methods and limit technogene - and water load, to introduce new saving ways for water and resources. It provides rational utilization of the Volga resources in local and in regional places, reduction of water- and chemical elements penetration into the biological and geological rotation, averting soil salinization, swamping and degradation, and also intensified biosphere resistance to wasting.

3. To organize the meliorative system, on the ecological principles and achieve optimal productivity and ecological stability of agriculture ecosystems. Introduction of highly productive crops, new varieties and crop rotations, losing rational meliorative regime, safe rate of fertilizers and plant protection means, intensified productivity of the irrigated agricultural ecosystems.

4. To use biological melioration together with the irrigation systems and thus to raise biological activity- and fertility rate of soils, to prevent and eliminate salinization, stamping and irrigated soil deflation.

So, creating and using new meliorative systems in the Volga region stipulate for production of farm produce when ecological safety and biosphere stability- are closely connected with the economic expedience.

### **Socio-Economic and Ecological Sustainability: the Significance of Structures of Land Proprietorship**

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The system of land proprietorship within a given region or society is a critical factor in fostering or undermining socio-economic and ecological sustainability. This is true for the simple reason that the form of land proprietorship largely determines who controls access to natural resources and who decides how those natural resources are utilized.

A system in which land is individually owned and bought and sold tends to place control of resources in the hands of the individual. Individuals, in the process of meeting their needs and wants, rarely consider the implications of their actions for the broader community or society or for the long-term future. As such, within a system where land is bought and sold, individuals largely and haphazardly determine the fate of the environment. Furthermore, the buying and selling of land leads to speculation in the real estate market, resulting in a constant increase in the dollar value of land. This trend, in turn, leads to two important implications: 1) the concentration of land (and resources, wealth, and power) in the hands of the relatively wealthy, leading to the increasing impoverishment of the less fortunate; and 2) an ever-increasing pressure on land owners to utilize the land they control for the most immediately profitable form of commercial development (as opposed to the use that would be most

beneficial for the community or society as a whole over the long-term). As land becomes concentrated in the hands of the wealthy, cities swell with impoverished citizens desperately seeking employment. The uncontrolled growth of cities further burdens the natural environment.

In contrast, a system that unites individual private ownership of dwellings with a combination of local (e.g., village), regional, and federal stewardship of land (where individuals can buy and sell homes but land is not sold) provides a forum for the assignment of control of the lands and resources to the appropriate administrative level (village, regional, province, or federal, or even a combination of these). In other words, such a system elevates the decision-making process of community-wide, region-wide, etc. concerns from the individual to the appropriate level. Furthermore, such a system provides the needed latitude for the effective application of specific management guidelines aimed at mediating resource use and allocation in a way that is ecologically prudent and socio-culturally equitable. This system of proprietorship appears to hold genuine promise for providing an essential foundation for socio-economic and ecological sustainability.

In the U.S., this structure of land proprietorship is known as the Community Land Trust. A number of nonprofit public organizations (including the E.F. Schumacher Society, the Institute for Community Economics, and the Land Trust Alliance) provide assistance with the establishment of Community Land Trusts in the U.S. and have formulated a comprehensive set of guidelines and by-laws (including land use plans) that may prove to be of interest and value to citizens and officials in the Russian Federation as they address the issue of land proprietorship.

### **The Ecological-Economic Conditions of Sustainable Development of Reclamation in Povolzhje**

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In the history of reclamation of land in Povolzhje the period since 1965 until 1990 is distinguished by an increasing and decline of production activity. For this period in Povolzhje from 50 before 100 thousand hectares of irrigated lands was annually put into use. Equally quickly since 1986 the rates of construction have slowed down, and since 1990 areas of irrigation land began to come out of order and presently are practically decreased by 30 percent. Fast development of irrigation has helped to decide quickly many food problems: it has stabilized provender base, promoted the raising by 50% of consumption of meat and milk products, solved a problem of vegetables and rice.

Alongside with positive consequences of cultivating irrigated lands negative processes have been developed also. Determined regularity in intercoupling the ecological problems of irrigated lands and development level of economic structures of separate regions an Povolzhje have been observed. While advancing to the mouth of the Volga a share of territory, available for irrigation decreases by three times, the density of population falls by three times. Technical irrigation system level falls by 9 times. Rates of irrigation system construction in all regions practically were alike, that's why the effect was the ecological losses in lower regions. In Samara and Saratov of Zavolzhje critical ascent of water table (on 2-3 metres) is observed along 60-80 km, in Volgograd of Zavolzhje -on 120 km. The share of irrigated lands with the good reclamation conditions from Samara before Astrahan regions falls from 85 to 30 percent. The examination has shown that the reason for shaping unsuccessful situation of reclamation on 70% is inability of agricultural enterprises to ensure qualify irrigation system usage. Mortgaged in projects irrigated facilities were formed disregarding demographic situation and modern social rates on sidebars traditional for given places of enterprises of dry

husbandry, not capable to master technical ways of shaping the modes of reclamation. As a result complex ways of reclamation, automatic technologies, new levels of agriculture specialization closed production. Agricultural enterprises were left without qualified personnel. Mass examination allowed to introduce standards of ecology-economic safe organization of production parameters of agro-reclamation enterprises in borders of modern irrigation systems in Povolzhje. According to our calculations designing of irrigation system with taking into account for normative parameters will allow to realize the complex reclamation with the use of the production complex technologies of nature protection without the state subsidies for irrigation system usage.

### **Regional Ecological Economic Problems of Sewage Purification Technology**

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The conservation of the Volga river's basin is one of the most serious problems of Saratov region representing a large industrial centre. The solution of this problem is sufficiently complicated especially if we take into account multicomponent and large volumes of region industrial sewage.

There are two main approaches in the world practice which are used for sewage purification. One of them is typical for home industrial complexes. This method consists in forming the general industrial sewage and its purification with cumbersome multistage constructions. Purification of local sewage currents and making closed cycles of technical water-supply is a more modern variant of the water basin's protection. Such plants work on comparatively small volumes of industrial flows with practically invariable composition. Their introduction assures high efficiency of a process, considerably reduces resources expenses and helps to utilise the variable products.

Solution of regional problem of the Volga river's basin conservation does not exclude the application of both approaches. However the carried out technical economic research showed the preference of local cleaning plants utilization for sewage purification of industrial complex of Saratov region. It is proved that the highest efficiency has been achieved with the help of sewage ion-exchange purification. Local systems using ion-exchange fibrous materials are the most efficient.

However traditional methods of ion-exchange fibrous materials production require multistage technological processes, accompanied by considerable ecological problems, great power and material expenses. We proposed the alternative technology based on polycondensational method of ion-exchange fibrous materials production (patent of Russia №2021301). The technology advantageously differs from traditional method by high flexibility, less-stage production and broad possibilities of forming ion-exchange materials with expected structure and properties.

The carried out economic research proves the expediency of local cleaning plants for industrial sewage purification, ensuring ecologically sustainable progress of the region.

The usage of ion-exchange fibrous materials, obtained by method of polycondensational filling on local flows of industrial enterprises of Saratov and Engels provides 97-99% purification from monomers, dyes, petrochemicals and other ingredients. That permits to create the closed cycles of technical water-supply and practically completely eliminates pollution of the Volga river - the national property of Russia.

## **Environmental and Economic Problems of the Underground Waste Storage in the Volga Valley**

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The complex of special geology and geophysics investigations has to be elaborated for proving the safety of underground storage facilities. The constructing works can begin after this study. Unfortunately, practical experience shows that the cost reduction reasons greatly dominated over the risk reduction ones.

Obsolete oil and gas reservoirs are usually used for disposal liquid wastes and ancient wells are used for injection.

Exploration of new reservoirs for underground storage of liquid wastes is very expensive. For example, the reservoir for liquid wastes of the Volzhsky chemical plant, Volgograd Region, was constructed after drilling some wells and later the fault dislocations were discovered near injection zone. The cost of geology and geophysics works was 2,4 bln (the price of 1984) and the result was much more unsuccessful.

To save significant costs for exploration of new reservoirs we propose a special program to assess a reservoir location according to the requirements. The principal point of this program is based on neotectonic movements characterization. The amplitude of the neotectonic uplift determines the creation of fault dislocations and safety condition of reservoirs for underground storage.

## **Integrated Landscape Modeling: The Patuxent Watershed Case Study**

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The Patuxent Landscape Model (PLM) is designed to simulate fundamental ecological processes on the watershed scale, in interaction with an economic component that predicts land use development patterns. We focus on the ecological component of the PLM and describe how the spatial and structural rescaling can be instrumental for calibration of complex spatially distributed models. The PLM is based on a modular ecosystem model that is replicated across a grid of cells that compose the rasterized landscape. Different habitats and land use types translate into different parameter sets in the unit model. Cells are linked by horizontal fluxes of material and information.

This approach provides additional flexibility in scaling up and down over a range of spatial resolutions and is essential for tracking the implications of land use change patterns generated by the economic component. The model has been calibrated for several subwatersheds as well as for the whole watershed using time series (gage data, water quality measurements, tree ring analysis) and spatial data (NDVI). We apply the model for analyzing and comparing various scenarios of land use (buildout, all forested, all agricultural, etc.).

## **The Criteria of Acceptable Risk for the Population in Russian Regions**

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The population living near to dangerous industrial objects, has the right to know: to what risk it is exposed. The population also has the right to know whether this risk is acceptable. Unfortunately, up till now in Russia there are no criteria of acceptable risk. The world criteria of acceptable risk, industrial accidents frequencies in Russia, the real condition of technological equipment were analysed by the author. It helped to offer acceptable and non-acceptable individual and social risk criterions for adequate and transparent decisions.

So, in Russia, for the population, living near potentially dangerous objects, the following criteria of acceptable individual risk are suggested being established:

- non-acceptable risk (non-acceptable risk zone) - more, than  $10^{-4}$  accidents a year (for functioning objects) and more than  $10^{-5}$  accidents a year for new objects;
- controlled risk (strictly controlled risk zone) - risk between  $10^{-4}$  accidents and  $10^{-5}$  accidents a year (for functioning objects) and between  $10^{-4}$  accidents and  $10^{-6}$  accidents a year for new objects;
- acceptable risk - risk less than  $10^{-5}$  accidents a year (for functioning objects) and less, than  $10^{-6}$  accidents a year for new objects.

In the field of social risk it is offered to consider risk as non-acceptable, when 25 and more adults (or children, sick and old people) are exposed to danger with frequency more than  $10^{-4}$  (for functioning objects) and  $10^{-5}$  for new objects accidents a year.

The established criteria of risk acceptance or non-acceptance can serve as a basis for decisions (the use of monetary taking sanctions, the suspending of industrial activity, etc.), made by the state bodies or local authorities in Russia.

## **Parameters of Sustainable Development of Oil Industry**

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Traditional parameters of industrial safety in oil industry are: number and categories of accidents; number of accidents, victims and death-roll.

These are not enough for organization of an effective risk management system and sustainable development of oil industry.

With reference to such conditions as parameters of industrial safety it is necessary to consider: expected social risk; expected volumes of not planned losses; a level of insurance protection.

Not planned losses in the present work are:

- The price of replacement of failed basic production assets, materials;
- Compensation of the responsibility for causing harm to life, health or property of other persons and environment;
- Losses from breach of production.
- The price of replacement of failed basic production assets consists of the expenses on:
  - Purchase of the new equipment;
  - Delivery of the new equipment;

- Dismantling the old and installation of the new equipment.  
These parameters allow to estimate:
  - Real economic losses from accidents and emergencies;
  - Efficiency of the realized precautionary measures;
  - Economic validity of expenses for achievement of a required level of industrial safety.
- In the work the features of such parameters application in the estimation of sustainable development of oil industry are considered.

### **Complex Risk Analysis for Novgorodsky Region's Population**

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The method of complex risk analysis for region's population is offered in this work. The following things are examined in this work as the complex indexes of risk:

- the frequencies of death accidents of the different quantities of people (a year) from all natural and man-made emergencies, typical for a region;
- the frequencies of material damage of different scale appearing (a year) from all natural and man-made emergencies, typical for a region.

The method is based on the construction of event trees, and possible measures on risk lowering are taken into consideration in this case. This method was approved during the risk assessment for Novgorodsky region's population. The following accidents were examined as possible emergencies:

- accidents on flammable and explosive objects and main pipelines;
- accidents on chemical hazardous objects;
- transport accidents;
- high waters;
- forest-fires;
- storms and hurricanes.

As the carried-out calculations showed, the death-roll on the Novgorodsky region's territory can vary from a few people to several thousands. According to these calculations, the death of three men a year is awaited. These deaths are considered to be caused by the small accidents on industrial objects (so called «occupational injuries») and transport accidents, connected with the transporting of hazardous substances.

Simultaneous death of several thousand people is an extremely rare event for the population of the Novgorodsky region. The frequency of such event can vary from  $1 \cdot 10^{-7}$ , 1/year, to  $1 \cdot 10^{-8}$ , 1/year, and its happening can be connected only with a big accident on industrial object. For example, the accident on the chemical plant «Akron», connected with the unhermetization of vessel, containing 1000 tons of ammonium hydrate and emission of all this mass into environment or an accident on the autotransporting industrial union «Volna», with the momentary unhermetization of the vessels, containing 4000 cubic metres of liquefied propane, production of cloud, consisting of the explosive air-fuel mixture, with the following detonational regime of its explosive transformation.

The frequencies, varying from  $10^{-7}$  to  $10^{-8}$ , 1/year, are very small and satisfy the demands to industrial risks in highly developed western countries, for example, in Netherlands. The biggest threats for Novgorodsky region's territory (in the material damage field) are high waters, characterised by regularity (happen almost every year) and big material damage.

This study served as a basis for accepting decision of improving the regional system of acting in emergencies.

## **Nature and Resource Potential and Traditional Nature Uses of Evenks of the Chita Oblast North**

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Area of the North occupies almost one third of the total Chita Oblast area. It includes three administrative districts, the number of Evenks which is presently not large - 3,9 % (by data of 1994). Districts have a rich nature and resource potential providing prerequisites for the economic development. The latter is formed from a bioresource potential, which is the base for traditional nature uses, and a mineral and raw material potential - the base for industrial nature uses.

Currently the priority is given to industrial nature uses and accordingly to the mineral and raw material potential. Geological survey works performed in the north have revealed different deposits of mineral raw materials the opening of which is connected with the development prospected. Practically no attention is given to traditional branches of ethnic nature uses of Evenks: reindeer-breeding and hunting which are more vulnerable and less competitive in market relations.

Technogeneous effect leads to disturbance in biocenoses of the north, their destruction. For example, when developing deposits of minerals the damage to traditional nature uses is expressed in removal of lands, contamination of reindeer pastures, soils, water and air by heavy metals. It is known that for the north people the following food chains are typical: reindeer moss - reindeer - man, water - fish - man. Contamination affects each element of the chain.

It is necessary to increase the number of reindeer governing the number of used reindeer pastures, to regulate the sale of reindeer-breeding production (for instance, to workers of ore mining and processing enterprises at mutually beneficial conditions), to implement involvement of Evenks in the structure of territorial division of labor. All this would allow to integrate interindustry relations of the mining industry and ethnic nature uses.

## **Forming the Regional Reproductive Complexes as a Direction of Realization of the Sustainable Development Conception**

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The sustainable development conception taken by the world society makes an accent on a necessity to save natural conditions for ensuring the security, health and human existence. Humanity has a necessity to change the aims priorities and directions of the economic development, forming the norms of social development management and regulation which must be directed at carrying out sustainable development conception. Allocation and development of the material production on the concrete territory must be done in accordance with it is ecological endurance and balance between the ecology and economy. Resources exploitation, investment directions, technical development are co-ordinated with today's and future requirements. Forming the regional reproductive complexes is one of the directions of this principle fulfillment.

The conception of forming the regional reproductive complexes is oriented not only at providing the development of manufacturing complex in the region but on the reproduction



and development of the regional population, on the increase of the living level in the region. It is not only the field of productive sphere but the reproduction of people, natural balance in the environment. All the consequences of breach of dynamic equilibrium between the economy and ecology influence the regional population. That is why people are interested in saving the environment not only as a source of raw material and resources, but as the main condition of human activities. The economic welfare as a notion must include not only the number of goods and services but ecological welfare, environment quality influencing living quality, the health.

The formation of the regional reproductive complexes enables us to connect the use of the productive forces with the concrete natural conditions of the manufacture in the region and to provide the environment safety. The region is investigated as an open system oriented at the requirements of the region's population. Of course, the development needs solving many difficult problems. But working out the strategy directed at providing the sustainable development in the region must be based on the changes of the development aims.

### **Problem Aspects of Strategy of Sustainable Growth in the Russian Federation**

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The perspective development of any economic system from small enterprise to national economic is defined by several main moments, which form the strategy of its economic growth together.

The forming of the strategy of economic growth of macroeconomics system should be carried out according to the principles of expediency, stability and adequacy.

The principle of adequacy means, that providing economy with all the resources is quite enough for the execution of the strategy.

The principle of expediency means that strategic ideas should correspond to the ideas defining the development of economic system.

The principle of stability means that strategic ideas should reach plans respective to real life.

The degree of development of innovation activity is an important factor, which provides stable economic growth. This factor is irrespective of level of complication and submission of economic subjects.

Not so long ago soviet economic theory was based on marxism. So soviet scientists spoke about possibility of unlimited development of socialist economic system.

This factor created ideological preconditions for stagnation economics. The important goal of this system was wide reproduction but not meeting demands of population. So economy of the USSR was very urbanized macroeconomics system with some developed parts. This fact made a contradiction between interests of development and needs of society, which was the reason of slow development of the USSR.

So the strategy of economic growth requires some parities between interests of person and society between investments in new and old enterprises, etc. Non-observance of these parities brings down stability of economic growth and forms prerequisites for crisis.

\* \* \*

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