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ABSTRACTS

The Problems of Ecological Security of Agrosystem: Adjustment and Estimating

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Crucial changes in paradigm of economic development and moving towards sustainability are impossible without taking into account the problem of ecological security. The necessary tasks are the following:
- identification the main determinants of the ecological security;
- estimating its level with the help of various methods;
- working out the adjustment methods of ecological security.

We suppose that it is necessary to distinguish between two aspects of ecological security: the first - ecological security of produced final products from the view of their ability to correspond to consumer standards and quality, and the second - ecological security of products from the veiw their production impact on environment conservation and its quality.

The system of indicators for estimating ecological security level includes several groups of indicators among them are: relative amounts of polluted testes in total amount of testes, pollution intensity of production, nature intensity of production and others. Based of this system we have elaborated the 10-marked scale of ecological security level in different regions. This scale shows rather strong differentiation of regions. In our opinion the use of various methods of ecological adjustment should depends on this differentiation.

One of the main conditions of ecological security of agrosystems is diversity of crops, which doesn't allow the monoculture to emerge. The experience show, that sustainable agrosystems would have more crop rotation, because there is a link between the interbrance structure of agriculture and balance of carbon (gumus). Also there is a link between interbrance structure and measures of using pesticides. The condition of the crop rotation requires the competitiveness to be supported for those agricultural branches, which are essential in achieving the regional agrosystems sustainable development. It is necessary to introduce the following concepts: the monocultural branch of agriculture - the branch, having high competitiveness due to existence of favorable basic factors in the region; supplementing branch - it is essential for providing ecologically grounded proportions in the regional agroindustrial system. There are examples of monocultural branches: grain production in the Middle West of the USA and in the Volga region in Russia. The supplementing branches are the milk, beef cattle-breeding and sheep-breeding ones.

We study the methods of maintenance of the competitiveness of supplementing branches from point of view of the Makle Porter's theory of the competitive advantages. There are certain conditions of the supplementing branches competitiveness. The main conditions are:
- equal benefits per acre of arable land, are given by monocultural and supplementing branches;
- existence of a system of the protection of natural resources;
- existence of the factors promoting the final products of the supplementing branches.

Greening the National Accounts: the United Nations System of Integrated Environmental and Economic Accounts

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The United Nations Statistics Division (UNSD) developed a System of Integrated Environmental and Economic Accounting (SEEA) as an extension of the world-wide adopted System of National Accounts, the SNA. The System incorporates environmental assets and their use in monetary and non-monetary terms. As a result, physical flows of materials and residuals are recorded and environmentally adjusted economic aggregates, including capital, cost, value added, capital formation and net domestic product, are obtained. These indicators might permit the assessment of the sustainability of economic growth and underlying production and consumption patterns. Related economic and non-economic welfare effects affect the sustainability of "development". Those effects will have to be measured by means of alternative data and indicator systems.

The Value of Nature: Valuation in Environmental Accounting

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Sustainable development calls for the integration of economic and environmental concerns in planning and policy making. To achieve integration economists and environmental scientists apply their tools and values to the other field. The result is a dichotomy of (1) monetary valuation in environmental economics and accounting and (2) the development of non-monetary indicators and indicator frameworks. The System of integrated Environmental and Economic Accounting (SEEA) applies three categories of valuation in different modules of the SEEA: (1) market valuation of natural resource stocks and use, (2) maintenance costing of natural asset depletion and degradation and (3) contingent and related valuations of the welfare effects of environmental degradation. The paper will discuss the practicality and consistency (with national accounting and economic theory) of these valuations and the alternative of physical indicator development. It will call for the standardization of concepts and methods without discouraging research in and experimentation with alternative approaches.

The Ecological-Economic Model for Evaluation of Impact of Catastrophes on Regional Development

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An ecological-economic analysis of some regions of Russia, when natural and industrial catastrophes may occur, is very important now. For evaluating the catastrophes impact on the environment and on the regional industry development in whole, the modified mathematical model « Region » is suggested [1], which was applied in practice for working out the strategy of the Baikal region development [1]. Here the regional ecological-economic model contains some new terms. The catastrophe index denotes the type of catastrophe. For any fixed catastrophe index the vector of catastrophe strength and the functions, which characterize the changes of the natural resources and the industrial capital, are introduced into the model. The model contains d-functions in its description if the catastrophe is of the explosion type, and the characteristic function of the catastrophe time interval s if catastrophe is occur for the time interval s (as in the case of a large forest fire).

As the natural and the economic variables are interconnected, the model is useful to forecast different consequences in the ecological-economic system. The modified ecological-economic is a basis for scenarios calculations. The scenarios are corresponded to the regional development without any catastrophe or with some catastrophe of fixed type and fixed time interval. A comparison of the prognosis state of the regional ecological-economic system in different scenarios helps to evaluate the catastrophe consequences.

The results of some scenarios calculations for the Baikal region are discussed for the case of some forest fire catastrophe. The numeric values of the balance coefficients of the original Baikal region model [1] has been changed with accounting the Russian economic system changes.

A special attention is paid to the problem of economic evaluation of both direct and indirect losses.

Reference: V. Gurman, V.Baturin et al. The ecologo-economic strategy of regional development. - Novosibirsk : Nauka, 1990.- 184 p.

Energy Efficiency For Sustainable Development In Russia: Renewables, New Technologies, and Policy Issues

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Energy sector in Russia is a unique object based on the General Energy System of Russia (Russian GES), which supplies electricity for economic activity and households at the territory over 10 mln. square km. (the distance between the utmost boundaries is about 3000 km from North to South and 7000 km from East to West), with population over 200 mln people. It combines 82 of 97 energy systems of the country and provides about 90% of all electricity production in Russia. The Russian GES is built on the principle of concentration of electric energy generation at several very big regional power plants, and centralised supply and distribution system through general high-voltage network. Such principle would remain for a long time the major concept of Russian power sector development. This gigantic energy system enables electrification of a vast Russian territory, but at the same time it leads to high risks of accidents and huge level of environmental pollution. Such a big energy system respectively requires substantial investments for its development as well as for related environmental protection activities.

Despite the fact that the capacity of the Russian GES is sufficient for the recent economic level of Russia, further development requires growth of power sector. Thus, environmental problems along with compliment with increasing demand for energy should be solved on the ways to sustainable model of development, and this can be and should be done with the help of low-capacity power plants, using mainly renewable energy sources. From the other hand, investments into such sphere are economically profitable, since they provide fast return of the capital. It is also efficient to invest into those energy consumers, who substitute the old technologies by new less electricity-intensive ones, which finally also leads to faster capital turnover and substantial savings of natural resources.

Russia has already some experience with small hydro power plants (e.g., derivation and run-of-river hydroelectric microplants), and in making use of biomass (biogas units), wind and solar energy, as well as in low-potential heating. Another way (especially in a spatial aspect) to avoid undesired consequences of the Russian GES producing monopoly is to give more rights to (and respectively increase responsibility of) the Regional Energy Commissions in establishing such economic and environmental policy that provides solution to a threefold task: sustainable regional development, reliable energy supply to economic sectors, and loosening environmental problems.

The Normalization Problem for the Lake Ecosystem

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An ecological normalization is directed to the working out of the quota of the ecologically admissible influence, which does not imply the destruction of an ecological balance. The great attention is given to the normalization of the content of unhealthy matter in the water of lakes.

To solve the normalization problem for the lake Baikal we use the model of "interyear dynamics":

$$z(t+1) = Bz(t) + Fu(t), \tag{1}$$

$$z(0) = z_0 \in Z_0, \quad t \in T = \{0,1,...,N\}, \tag{2}$$

where $z(t) \in R^n$ characterizes the deviation of the current state of the system (R) from its natural state (R^*); $u(t) \in R^n$ is a vector of control,
$u(t) \in U(t,w) = \{u(t): v \le u(t) \le w\}, t \in T$.

Depending on the initial state z_0 and the moment t_0 the collection of parameters w generates the ensemble of trajectories corresponding to all possible influences from $U(t,w)$. Denote by $Z(\tau,w)$ the section of the trajectory ensemble at the moment τ and call it the set of possible deviations.

The problem consists of finding an influence on the system, such that the deviation of the lake ecological system from its natural state is admissible, i. e. $|z(t)| \le \alpha R^*$.

Given the set of admissible deviation

$$Z(\tau) = \{z \in R^n : Q(\tau, z) \ge 0\}, \tau \in T \tag{3}$$

we define the function $\chi(\tau,w)$, which is a choice criterion for a parameter w. Thus the problem is to maximize the function $\chi(\tau,w)$ under the constraint $|z(t)| \le \alpha R^*$ or, taking into account (3), under $Z(t,w) \in Z(t)$ for each $t \in T$.

Theorem. *Define the vector-function Q as the following*

$$\overline{Q}(\tau, z) = -z(\tau) + \alpha R^* \ge 0,$$

$$\underline{Q}(\tau, z) = z(\tau) + \alpha R^* \ge 0.$$

In order to the inclusion $Z(\tau,w) \subset Z(\tau)$ be fulfilled for each $\tau \in T$, it is necessary and sufficient that for each $\tau \in T$ the unequalities

$$B^{\tau - t_0} z_0 + \sum_{t=t_0}^{\tau-1} (M^+ w + M^- v) + \alpha R^* \ge 0,$$

$$-B^{\tau - t_0} z_0 - \sum_{t=t_0}^{\tau-1} (M^- w + M^+ v) + \alpha R^* \ge 0$$

hold, where $M = B^{\tau - t - 1} F$,

$$m_{ij}^{+} = \begin{cases} m_{ij}, m_{ij} > 0, \\ 0, m_{ij} \le 0, \end{cases} \qquad m_{ij}^{-} = \begin{cases} m_{ij}, m_{ij} < 0, \\ 0, m_{ij} \ge 0, \end{cases} \quad i = \overline{1,n}, \quad j = \overline{1,n}.$$

(B^k *means "B in degree k").*

By using this statement we can reduce the normalization problem to the linear programming one:

$$\sum_{i=1}^{n} w_i \to \max,$$

$$\sum_{t=t_0}^{\tau-1} M^{-} w \geq -B^{\tau-t_0} z_0 - \alpha R^*,$$

$$\sum_{t=t_0}^{\tau-1} M^{+} w \leq -B^{\tau-t_0} z_0 + \alpha R^*.$$

Identification of this model for the lake Baikal is carried out within the framework of the State program “Perspective information technologies” on the subject “Mathematical modelling of the perturbation of the lake Baikal ecological system”. The norms of perturbations were calculated provided that the deviation of the system state from its natural one is enough small.

Ecological Taxation: the Lithuanian Experience

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Ecological problems having reached an acute stage at the end of the 20 th century, concern about the environment has increased all over world. Great quantities of natural resources are involved in the economic turnover everywhere, while ecological limitations have hardly ever been taken into consideration. Therefore, growth in economy has often been accompanied by environmental degradation.

Among the main causes of the problem such phenomena as mechanical separation of economy and ecology, predomination of administrative-legal methods of environmental management, neglecting of economic instruments in environmental policy can be mentioned. But in principle, economic instruments generate a certain improvement of the environmental quality at the least cost, while the control cost of a command and control system is higher. (Because economical incentives are used, polluters use their superior knowledge of the options available- both process changes and « end- of- pipe » methods- to choose the cheapest abatement alternative).

The present changes in Lithuanian economy marking the transition period from centrally planned to market- based economic relations, require the exact definition of the theoretical principals for the use of economic methods for environmental protection.

The basic objectives of the paper can be formulated as follows : theoretically to analyse environmental economic methods, such as pollution charges, which are part of the more general class of environmental taxes, to estimate today’s employment of these methods for environmental protection, to discuss conceptual, analytical and methodological issues associated with the use of these instruments in the Lithuanian context, and offer theoretically backgrounded proposals for revising the system of pollution charges, enabling the improvement of the economic mechanism of environmental protection in Lithuania. (From April, 1991 in the Republic of Lithuania was introduced the Law on Taxes of Environmental Pollution, which stated, that the goal of the imposing pollution charges system is to reduce pollution emissions. So in Lithuania is extensive experience with using pollution charges).

A Tool to Assist and Enlighten Global Governance: the Global Energy Observatory (GEO)

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Over the next few months, a series of studies and events geared at producing an overall assessment of the follow-up of the 1992 Rio Conference will take place in the international arena. This process has started during the week of March 13-19, 1997 in Rio, where 400 selected participants from all constituencies reported on their monitoring of progress on Agenda 21 worldwide. Findings of this Rio + 5 exercise are now included in the official documents for the UN CSD, the UN General Assembly and other international meetings.

The preparation of this assessment and reporting on « Agenda 21 - Five Years Later » required a number of steps involving multiple stakeholders :

government, industry, civil society, NGOs, academia, youth from all parts of the world. For energy, the Global Energy Observatory (GEO) proposes a framework that would allow for the assessment of progress on energy sustainability since Rio. In the absence of a specific chapter on energy in Agenda 21 and given the lack of an international body overseeing the energy field in its entirety, it would seem advisable that this effort for 1997 be structured in such a way as to be useful for Rio+5, as well as for future recurring assessments of the energy situation.

Numerous and complex studies are being done by energy experts in governmental, academic and business circles. Databanks on best energy practices are being developed. An independent review and an analysis of these documents will lead to the identification of a methodology and of the tools best suited to be used in a monitoring system that would ideally be simple, transparent, adaptable and as comprehensive as appropriate for its meaningfulness.

This framework would be used for the assessment and monitoring of progress towards improved sustainability of energy systems at the national and global levels. It would allow both the evaluation of past performance and the monitoring of present activities, the assessment of the impacts of policies and measures related to international Conventions, and the identification of future paths for sustainable energy development.

Integration of Mass Balance Constraints in Neoclassical Production Functions and the System of National Accounts

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From an analytical perspective environmental impact and economic models have much in common. Both describe flows (through the ecosystem and economy respectively), acknowledge the distinction between flows and stocks and are designed in most cases to describe dynamics over time between flows and stocks. Yet a very important difference is that where environmental impact models deal with physical flows (of pollutants), economic models deal with monetary flows. The neglect of the physical realities in economic models has been a complaint from many environmental and resource economists and has been repeatedly brought

under attention (cf. Ayres and Kneese, 1969; Georgescu-Roegen, 1976; Daly and Cobb, 1989). This has resulted in the extension of the physical flows analysis to also describe the pathways of materials and energy in the economy and new fields of research have emerged in the area of industrial metabolism (Ayres, 1989) and material flow analysis (Ayres and Knees, 1969). However, the exact linkages between physical flows and monetary flows are still poor developed in these areas of research. Yet this is one of the crucial issues to overcome in integrated environmental-economic modelling.

The present paper aims at filling this gap and illustrates how a simple material flow model can be incorporated in neoclassical production theory and outlines the implications for the System of National Accounts and the generation of value added in the economy through the use of an adapted general equilibrium model. It is shown that the mass balance equation restricts the substitution possibilities for the individual firm. When aggregating also the elasticities of substitution for labour and capital for the whole economy will be restricted in a certain manner and are likely to be less than unity. The role of the prices of natural resources are investigated in more detail in the paper. It is shown that an increase in the prices of material and energy inputs initially results in a loss of value added, but in a later stage results in an increase in value added. Several technological and substitution options from the model for reducing emissions are also discussed.

A short application of the model used in IIASA's Regional Material Balance project will be given on the future developments of heavy metal emissions in Poland, the Czech Republic and (former) Eastern Germany. It will be shown that the framework can be used in scenario analysis to predict future emissions trajectories from economic forecasts.

Sustainable Economic Structures Scenarios for Sustainability in the Netherlands

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The paper introduces four scenarios for sustainable economic structures in the Netherlands for 2030. The scenarios reflect different perspectives on sustainability. In the first scenario, called Strong Together, environmental goals are very ambitious world-wide. In the second scenario, Strong Alone, environmental policy abroad is less ambitious. The third scenario, Negotiated Sustainability, broadly reflects a balancing of different goals. In the fourth and last scenario, Weak Sustainability, only low cost environmental measures are taken and environmental objectives are relatively loose.

The applied econometric model optimises economic growth subject to different environmental objectives, that are in line with the scenarios of Dutch environmental decision makers. In the Strong Together scenario, climate change and spatial requirements appear the most critical environmental themes ; in the weaker sustainability scenarios, besides climate change, eutrophication and waste are also highly critical. Acidification is critical in the Strong Alone scenario, since the Netherlands have to compensate for higher foreign contributions to domestic deposition. Some sectors lose market share in all scenarios, including most energy-intensive and agricultural sectors. On the other hand, ‘winners’ are dependent on the critical environmental objective(s) and hence differ between the scenarios.

It appears that both strong (environmental) technological progress and substantial structural changes are necessary for economic growth and environmental quality to be compatible. However, some trade-off between them remains. The resulting sustainable economic structures are not necessarily conflicting with.

Environment Management System in Nepal

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The paper is aimed to examine different environment management tools at macro level which are the products of the environment and resource - use Acts of Nepal. A top-down versus bottom-up flow of the environment and development messages has been diagnonized through the pyramids. Components of environment assessment and few findings of the major hydro-electric power projects are presented. Pre-investment and post-investment strategies for industrial pollution management have been dealt. A brief review of municipal solid waste management status is presented. Problems and prospectus of forest management procedures have been analyzed.

Approaches to Sustainable Development in Manchester - The Business Experience

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The ecological footprint of Manchester, the world's first major industrial city, expanded rapidly in the nineteenth century and remains large to this day. Both the local and the wider environmental issues have been addressed since 1970 by a combination of government and private initiatives, often involving challenging partnerships and the participation of community organisations. Many small and medium size business enterprises have played a prominent role in local initiatives, collaborating with schools and community groups. For many, a good environment is part of good business.

However, conflicts arise when the wider economic role of enterprises runs counter to local environmental needs. The local Agenda 21 process in Manchester highlighted several issues, but could not always resolve them. Progress towards sustainable development in the city will involve business interests being reconciled with environmental considerations. Sustainable development and protection of the environment require long term planning and financial investment, and these two essential elements are invariably in conflict with the interests of the small/medium business sector, especially during periods of financial stress. In the United Kingdom, which is a highly developed consumer society, there are a plethora of governmental agencies, quasi autonomous non-governmental organisations (QUANGOS) and voluntary organisations dedicated to both protecting the environment and to promoting the expansion of the small/medium business sector.

In addition, local government plays a crucial part in delivering Local Agenda 21. These differing views and goals need bringing together in a network where the parties involved can learn about each other and begin to understand how compromise and better plans can be made. In Manchester Local Agenda 21 has begun to be a catalyst in that process, involving the small/medium business community both directly and through the Chamber of Commerce.

Environmental Programme for Local Authorities in Poland

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Environmental programme is the main tool of effective individual and collective activities. It especially concerns activities which are related with environmental protection. Scope and contents of environmental programme and methodology of preparation can be different. Regarding to local community scope of this programme depends of community characteristics and kind of document. Department of Environmental Economics and Management carried out research in 11 local communities. The main goal was creation of environmental programme model (Committee of Scientific Researches project). Researches concerned : preparation of assistance programmes, creation of local environmental management system. In report I will introduce general foundation and methodology of preparation environmental programmes consider recommendations of Environmental Programme of ONZ (UNEP). Following problems will be discussed :

1. Scope of environmental valorisation.
2. Scope of social-demographic research.
3. Scope of economic valorisation.
4. Methodology of assessing environmental threatens.
5. Conception of ecodevelopment scenario of local community.
6. Means of choice development's direction and characteristic of specific activities in the areas of sanitary, social, economic infrastructures.
7. Conditions, tools and instruments of realisation environmental programmes in Poland.

How to Assess the Impact of Environmental Instruments on Business Behavior without Quantitative Data

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There are many interests at stake with environmental policies. The assessment of the impacts of their economic and command-and-control instruments is consequently of primary importance. This evaluation can be either of economic nature or ecological. Whatever it is, some problems exist, with the most difficult to be data reliability and validity, as well as the identification of environmental costs and benefits. Complication is brought by various time effects. Indeed, we face an evolving system with transitional phenomenon. One has also not to forget that environmental political instruments are not the only pressures put on enterprises. These standards and taxes may not be linked with environmental business results without taking into account the influence of other stakeholders (NGOs, consumers, neighbors, shareholders, etc.). These considerations let space for alternative methods of environmental evaluation.

The aim of this paper is to present and investigate a new method to evaluate the economic and environmental impacts of environmental political instruments. Surveys inside firms provide qualitative data within double classification: the first part of this typology details the environmental business behaviors, when the second part displays the effects on ecosystems. Behaviors and effects are sub-divided into two groups: the ones induced by environmental political instruments, and the ones induced by other environmental pressures. From such classification one can easily analyze the influence of each environmental political instrument upon business behavior and its ecological results. The control group for this analysis is constituted of behaviors and effects coming from other environmental pressure - namely the second sub-group. Some specific interesting behaviors can be further investigated. For instance, one can select the most relevant variables explaining the «reduction at source» behavior using factor analysis, and specify the relation with econometric regressions. This method of classifying qualitative data is called the diagram of the enterprise-environment connections. It has been built from a case study of water protection policy in eighty different firms of Wallonia (French part of Belgium).

European Experiences of Environmental Regulations: Lessons from a Comparison

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Dutch covenants, British standard BS7750, German EMAS, French "auto-surveillance": each European country seems to have its own specific way of regulating environmental affairs. It could be interesting to determine the different conditions with which these different frameworks are suitable. This could help to know which ones of the European examples are the best to adapt to foreign regulations.

After the presentation of these four cases, we will focus on two cases: France and the Netherlands, to study more specifically the environmental legal framework and performances. We stress upon the evolution of the environmental regulation in these countries. The Dutch case is based on decentralisation and result obligation. The French case is based on centralisation and means obligation.

The comparative analysis of the performances is mostly taken out of the air and water pollutions reductions of the metallurgy and of the chemical industry in the two countries between 1985 and 1995. The results are impressive as reductions are significantly higher in the Netherlands than in France. The contractual framework built in the Netherlands is associated with better performances than the regulatory framework existing in France. One more question should be raised. We want to know if the better performances noticed in the Netherlands are the consequence or the cause of the decentralised and contractual approach . The results in the Netherlands are ambiguous. On one hand, the targets defined for 1995 were already achieved in 1992-1993, when the first contracts between firms and government were designed and signed. On the other hand the process of the environmental planning between the firm and the central or local government has contributed to the improvement of the plans, especially in terms of targets. The contractual approach was made possible because performances were significantly improved before the contract itself. But the contractual approach itself also improves the environmental goals and management of the firms. Therefore as a conclusion we can define the preferable conditions of implementation of the French way of environmental regulation, and of the Dutch way of environmental regulation.

Accounting for the Environment, a Formal Analysis

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In many applied economic analyses, distributional issues of natural resources are carefully avoided. Apart from policy related obstructions, scientific obstacles block the inclusion of distributional issues in environmental economic analysis. A possible explanation is that researchers have not succeeded in the description of environmental services in terms comparable to standard economic goods.

The analysis broadens the set of services that can be described as economic goods with special emphasis on quality and diversity. Moreover, the environmental state is interpreted in terms of capital. In our formal treatment, the conversion from state variables into stock variables is linked to the construction of transformation functions homogeneous of degree one, satisfying the prevalent assumptions in mathematical economic models. As both environmental services and state variables are described as economic commodities, it becomes possible to account for resource services and states, i.e., incorporating the environment in national accounts. More specifically, the environment can be treated as a `normal' firm, e.g., consumers pay for the use of environmental services, and environmental losses can be understood as negative investments. Moreover, the intergenerational distribution of environmental services can be analyzed.

Finally, after formal analysis has been concluded, the analysis is applied to climate change. The biogeochemical cycles that dominate the earth climate system are considered one global renewable resource system. The application is based on a partial analysis, assuming a simple valuation structure for environmental services related to climate change.

Ecological Debt and Decision Making in Nature Use Management on a Regional Level

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Nature use is an essential sector of local economy in many regions of Russia. Governmental policy in nature use was mainly oriented to free market mechanisms during transition period. At the same time environmentally sound directions of nature use haven't comparative advantages. It results in a substantial ecosystem degradation of many territories and ecosystems.

Now the necessity of special tools of nature resource management - both institutional and economic- is evident. We try to create an information system to support decision-making procedures. It is able to a self-regulation and provides «direct and inverse connections». User can operate a modelling of consequences of decision-making and than make a choice. He also can compare results in reality with those he expected and make changes in regulation procedures. One of the main subject of management is the rate of payments for «nature use rights» (PNUR). This payments must be not only a source for regional governmental budget replenishment, but also a tool of economic regulation. It needs to reflect «an institutional

approach» to nature use regulation in the optimization models. We consider the non-increasing of ecological debt as a necessary condition on the way to sustainable development. The rate of PNUR is a variable in the optimization problem to minimize ecological debt, with constraint of total income to be greater than IAL - the income level, acceptable both for nature user and regional government. We consider this problem as a desirable model for nature use adjustment in resource dependent areas.

Use Values of Environmental Resources: Mangrove Forests in Ghana

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This paper reviews the economic value of goods and services produced by mangrove forests. A review of different environmental economic analyses will be complemented by a recent analysis of the economic value of mangroves in the lower Volta River Basin in Ghana. This review will stress the importance of the value of mangroves to the household incomes of poor residents of the mangrove forest area. In the lower Volta delta in southeastern Ghana, mangroves provide: i) fuelwood for household and commercial use; ii) construction materials; and iii) a habitat for fish, snail, and crab harvesting. Primary data collected from household and producer surveys will used to estimate these value of these outputs. Although absolute values of these outputs may be low, the mangroves produce a significant proportion of the income to poor residents of the mangrove area.

The paper will support the argument that in developing countries the estimation of the economic value of environmental goods and services should focus on production values instead of non-use values. A microeconomic model, designed to highlight the different roles of environmental goods and services in developed and developing counties, is presented. In developing countries the value of environmental amenities are relatively less important then the value of environmental resources in the production process, this is true of the value of mangroves in developing countries. Thus the use of popular techniques for the estimation of the value of environmental services, such as contingent valuation, hedonic pricing, and travel cost may be less applicable than less glamorous techniques such as the estimation opportunity costs.

The Role of Expert Working Parties in the Successful Design and Implementation of Sustainability Indicators

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« Principle 1 : human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature. »

(The Rio Declaration on Environment and Development 1992)

This paper examines the pragmatic approach adopted by one United Kingdom Local authority in its process of implementing Agenda 21 - the Earth Summit sustainability programme - in particular appraising the role of experts in one area of implementation - economy and work.

Weak sustainability -new for old ?

The human-centred approach to sustainability has been termed « weak » (Pearce (1993), Gray (1993), Turner (ed) (1988)) because it employs existing theories and structures to underpin it. Neoliberal economic theory - based on efficiency and market issues with underlying monetary values - allows the environmental crises to be blamed on inefficient use of natural resources or, in its worst manifestation, justifies the unrestrained use of the environment because it cannot be costed (it is an externality and therefore a free good). Elements of sustainability are « allowed » in this framework by accepting that the Earth's capital balance should not be decreased, but the reduction of natural capital (forests, the ozone layer, species,) can be compensated for by the increase in human-made capital (urban infrastructure, education). The suitability of substitution of one form of capital by another is not questioned in this paradigm. Even the recognition of certain elements of critical (or non-substitutable) natural capital does not make sustainability stronger in this definition, as the management of all capital to meet human needs is central to the weak sustainability argument. An alternative view

The greater emphasis on the interrelationship between the environmental and the social, and the desire to provide a more holistic approach can be found in the development of ecological economics and « strong sustainability ». The thrust here is that much more long-term viewpoints are needed - institutions and ways of thinking that develop the long-run and de-emphasise the short-term (Costanza 1991). This is much more difficult to achieve as it conflicts with much of our established industrial and cultural development which allows for the here and now to be valued whilst at the same time the future can be discounted heavily. Strong sustainability recognises that sustainable development is future-oriented and that :

«economic systems are underpinned by ecological systems and not vice versa» (Turner ed 1993)

In summary, then, any implementation processes to allow a more sustainable future must be grounded in a sense of sustainability that has at its heart a sense of ecology. Sustainable development as a concept must not be hijacked as a justification for inaction ; and the « crisis of definition » (Rees and Wehrmeyer 1995) must not prevent the concept from moving into reality.

The paper summarises the activities of the Specialist Working Group in the light of existing theory and asks : if the process of Agenda 21 is monitored by the progress towards (or away from) sustainability by the use of indicators, how are relevant indicators argued for, designed and framed, and how will they be accepted by local business and economic leaders ?

References

United Conference on Environment and Development (1992) The 'Rio Declaration' on Environment and Development

Pearce D (1993) Blueprint 3 - Measuring sustainable development Earthscan London

Gray R (1993) Accounting for the environment Paul Chapman London

Turner R K (ed) (1988) Sustainable environmental management : principles and practice Belhaven Press London

Costanza R (ed) (1991) Ecological Economics Columbia University Press New York

Rees S and Wehrmeyer W (1995) issues in the implementation of strategies for the UK local government context - crises of definition, identity, resources and authority Paper given at the International Sustainable Development Conference, Manchester, UK

Environmental Accounting in Large Companies: Supporting Sound Environmental Management, Responding to Stakeholder Pressures or Legitimising Unsound Activities?

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Large organisations are responding to calls for greater environmental openness by disclosing in their environmental report the results of their environmental activities. Their environmental obligation to stakeholders can be discharged in a number of ways, from a clear demonstration of their accountability in a separate report, including bad and good information, to the anodyne statements found in the non-statutory part of the annual report. Companies with an environmental management system will genuinely have matters to report, but whether all matters are disclosed depends upon management choices - how will bad news be taken by the stakeholders, and are internal management issues a matter for public discussion ? The environmental report can also be used to gauge what the company's response to an environmental crisis will be and not just a description of what has happened in the past. An analogy to this would be the annual report (a document of financial accountability) which can be used for both stewardship and decision making purposes. However companies are not using the financial reporting system in any meaningful way for environmental purposes. Is this because the accounting mechanisms are not capable of providing information relevant to the environment ?

The annual report is one outcome of many from the Accounting Information System (AIS), but it is not necessarily the most important for management purposes. Management accounting is an important element of the AIS itself sitting within the Management Information System (MIS) which supports management decision making. Within this decision making process there must be a response to the organisation's environmental impacts. The external environmental report is the organisation's environmental management system made visible. However this system cannot function effectively without the information fed into it from the management accounting information system.

This paper is concerned with the link between the management accounting system, environmental management system and the external environmental report. It investigates some of the connections between these elements of the management information system, their influences on each other and their interactions.

The extent to which a company is fully accountable can be assessed by comparing its own reporting outcomes with that from other sources (such as news sources, trade associations, pressure groups, etc.) whilst at the same time being aware that no information is value-free. The study reported in this paper looks at one company, Royal Dutch/Shell Group (Shell), which operates in an environmentally-sensitive atmosphere. It explores the motivation to report by reviewing the most recent environmental report in the light of one environmental crisis faced by the group over the past year. It also asks : how does management accounting inform environmental management and aid the process of accountability ?

The Ecological Economics and Indicator Framework for Measuring Taipei's Urban Sustainability

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Ever since the Earth Summit launched at Rio de Janeiro in 1992, the concept of sustainability has exerted significant influence on policy at local level. Sustainable urban development has also become an important local strategy for global sustainability. Due to their integrative and forward-looking characteristics, sustainability indicators have been proposed to measure and evaluate urban development. After discussing the ecological economic dimension of urban sustainability, this paper presents a procedure and a conceptual framework of indicator system for measuring Taipei's urban sustainability. On the basis of natural processes and evolving urban development, the approach to Taipei's sustainable development is defined as: reinforcing Taipei metropolis' life support system through its economic vitality for enhancing Taipei's urban productivity and quality and make Taipei a national capital with blue-green characteristics. Based on the conceptual framework of urban ecological economic system, 80 indicators are selected through participation of NGOs, which can be used as policy making indicators for measuring Taipei's urban sustainability. The policy making indicators are further aggregated into ten general public indicators and evaluated using signal lights (green, yellow, red). It is concluded that the proposed indicator system can provide evidence of progress on urban sustainability. Justification on public expenditure on urban development can therefore be evaluated.

Keywords: urban sustainability, indicator framework, urban ecosystem, ecological economics, Taipei

Environmental Geographics as a Group of Cost-Effective Methods

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Application of geophysical methods of exploration within solving problems of environmental geology becomes more and more important from a viewpoint of contaminated zones discovering.

Becide critical analysis of justified choice of each method within a certain field of environmental exploration, geophysical methods combinations for each case, accepted by world famous experts, are discussed. Further, available ways of environmental geophysical exploration data presentation are discussed, as well as topics for the future development. Finally, advantages of geophysical methods, as non-invasive, non-destructive and significantly lower hazardous for the health of working personnel in the field in regard to other ways of solving environmental problems (like drilling), are underlined.

One of the most important economic advantages of environmental geophysics is given in this paper through a short cost-benefit analysis comparing geophysics, drilling and probing programs.

Accounting of ecological issues in the System of National Accounts for Russia

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Increasing national and global impacts and repercussions of economic activities on and from the natural environment call for the analysis of environmental and economic problems within a common framework. National accounts (according to System of National Accounts 1968) view the relationship between the environment and economy from an economic perspective only. The revised System of National Accounts (1992) contain a more detailed description of assets.

Thus, ecological aspect of based on accounting on SNA is not complete. Therefore, its necessary to develop the system of integrated environmental and economic accounting system. The integrated environmental and economic accounting system should therefore not only comprise the market aspects of national accounts but also apply a broader concept of economic-ecological valuation. Remarkable is that most approaches to the valuation of the non-economic benefits and disbenefits of the use of the natural environment have been developed independently of national

accounts, typically as part of cost-benefit analyses for project or programs evaluations or for the overall modification of macro-aggregates such as national income or product.

The current objective of this work is to provide a conceptual and informational basis for implementing in Russia an integrated environmental and economic accounting system (a

satellite System of National Accounts) that describes the interrelationship between the natural environment and the economy.

The concept of the integrated environmental and economic accounting focus on environmental-economic interrelationship as far as they concern economic production and use of products. Therefore, the input-output framework and the non-financial asset accounts is used as a starting point for developing such systems.

It seems important to remark that the integrated environmental and economic accounting could be called a system of national integrated environmental and economic accounting because it is focused on the description of environmental-economic relations at the national level.

Integrated Ecological-economic Analysis of Transboundary River Basins for Sustainability

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River basins have always been favoured areas for human habitation because of the availability of fresh water resources. Due to urbanisation, industrialisation and transportation, rivers have changed in geomorphology, hydrology and water quality ; this has impacted, not only the ecological functioning, but also human uses, such as drinking water, fisheries and recreation. Sustainable management of river basins requires making trade-offs between the different functions of river basins and their spatial distribution (upstream versus downstream). Use of fresh water resources for one purpose may interfere with opportunities for alternative uses. This paper presents a methodology for an integrated ecological-economic analysis of sustainable management of transboundary river basins. Elements of this methodology are :

- Environmental functions, providing the link between ecology and economics ;
- Use of indicators to describe cause-effect chains in space and time ;
- Evaluation of alternative management strategies on the basis of :
  - Economic efficiency, using cost-effectiveness analysis in the conventional sense ;
  - Spatial equity, describing the ratio between costs and benefits related to the use of rivers ;
  - Ecological efficiency, assessing the river ecosystem and potential performance levels of environmental functions.

A first attempt at applying this methodology to the case of nutrients in the Rhine river basin will be presented.

Local Agenda 21 and the City of Durban (South Africa): the Challenge of Developing a Sustainable Economy

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In 1994, the City of Durban (the second-largest metropolis in South Africa) was identified as one of several cities in the world to be developed in terms of the United Nations' 'Local Agenda 21 Programme' for localised sustainable development. This commitment has necessitated wide-ranging research into the existing state of the environment and development in the Greater Durban Metropolitan Area (GDMA). Accordingly, this major research project has focused on five related areas: (1) the natural environment; (2) the built environment; (3) the economic system; (4) the social system; and (5) the issue of governance.

The present paper is drawn from the author's present involvement in the third focus area: the economic structure of the GDMA and the challenges posed by the aims of the 'Local Agenda 21 Programme'. It outlines the relationship between the environment and the economy, including an assessment of the limitations of environmental economics. Thereafter, particular attention is paid to the dominant role played by manufacturing, which constitutes the largest single economic activity in the region. Within manufacturing, three industrial sub-groups - chemicals, textiles and paper and pulp - are singled out for special attention.

These industrial sub-groups are particularly important because they constitute major consumers of natural resources (both non-renewable and renewable) and are responsible for many of the chronic pollution problems which characterise the GDMA. After examining the major macroeconomic and mircoeconomic issues relating to industry and the environment in the GDMA, suggestions are made as to the scope for the introduction of clean technology in industry. Concluding comments are offered on the challenges posed by seeking to shift industry onto a more environmentally sustainable growth path.

Problem of Sustainable Ecological Economic Development of the Saratov Oblast

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Saratov province (oblast) is one of the largest on the South-East of European part of the Russian Federation, with the territory of more than 100,000 sq. km. It is characterized by highly developed power engineering with various types of power stations (hydro-dynamic, heating, nuclear), industry (refineries, chemical plants, machine-building factories), civil engineering, transport, and also agriculture with big cattle raising, grain and vegetable farms with distributed irrigation systems. The province is located in diversified climatic zones from forests and steps on one bank of the Volga river to semi-deserts on the other. Intensification of the industrial and agricultural production, urban development, construction of dachas, irrigation systems, highways, etc., even under the present conditions of economic decline led to the violation of the environment equilibrium. Disastrous impact on the environment is manifested in people’s

health. The scientists, researchers and environment managers of the Saratov regional branch of Russian Ecological Academy outlined the programme for solving ecological problems at the level of the region. Within the project of Sustainable development they formed new fundamental trends of research, which determine necessary political and managing decisions and define the instruments of practical activities in the transfer of Saratov oblast to the model of sustainability. Inspite of the critical state of economy caused by the transition to the market, certain success has been achieved in collaboration and partnership with governmental organizations while setting up aims and priorities in solving some social tasks. The above steps of our activity contribute much to the ideas of sustainable development (Rio de Janeiro, 1992) and implement the tasks which were set up in the Decree of President of the Russian Federation of April 1,1996 «On the concept of transfer of the RF to sustainable development» and other regulation papers by Federal and oblast Government. Russian Ecological Academy is working out and implementing the regional scheme of the sustainable development of a province. That is a pilot project with further transfer from the regional to the federal model. The main constituent parts of the problem in the regional model are the grounds and quantitative definition of indexes which characterize the life quality of the people living in the province, the level of the economics development and ecological prosperity. In the created model it is necessary to consider the balance of interests, and the degree to which the requirements are satisfied and interdependence of environment protection and planned rates of economics development, taking into account market and centralized processes of management.

Are Deforestation and Capital Accumulation Processes Related? An Analytical Model

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To limit deforestation in inter-tropical areas it is necessary to define strategies and policies. However, the policy decision making process is not simple and the results are not always the expected. A way to have a better estimation of the impacts of policies results is to use a modelling approach. Nevertheless, there is a lack of theoretical models of deforestation, and most of empirical models of deforestation are faced with the difficulty of integrating natural resources into the economic analysis, and with the lack of data concerning the interactions between ecological and economic processes. This paper presents a prototype of a dynamic analytical optimal control model to evaluate deforestation processes. The principal hypothesis is that there is a linkage between the deforestation and accumulation processes that takes place during time in an agricultural system. Thus the main physical and economic linkages between forest, livestock and capital are taken into consideration represented, as well as their impacts on the accumulation process (feed-backs). Then, optimal control theory is used to define the optimal growth path and the evolution of the deforestation rate during time. The qualitative analysis of the results emphasizes the importance of developing theoretical approaches that include time dependent discount rates.

Thermodynamic Methods in Environmental Economics

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Understanding of Second Law constraints is very important in the search for sustainable development. Extropy is a new formulation of entropy. Extropy is the entropy shortage compared to the available maximum entropy state. It is the difference of entropies of the system plus its environment between the actual and the maximum entropy state. This difference is calculated between the actual values of entropies, and that of in the equilibrium state. Zero extropy means that the system is in equilibrium with its environment. It is not distinguishable from it. Calculation of extropy needs data as follows: temperature, pressure, chemical composition - for the system and for the environment. In a production the needed data are the material inputs and outputs including fuel. Extropy input is the total extropy of the inputs. The part remaining in the product (byproducts) is the useful extropy. Entropy production is the lost extropy. The waste extropy means an entropy generation potential that is not used but loaded to the environment.
Summing up the extropy consumption from cradle to the service we get the total extropy cost. It is the sum of the extropy of the product plus the extropy of the wastes and the total entropy production. We argue that a sustainable tax system has to be based on extropy cost.

The Intergenerational Contract and Maintenance of Public Capital: Lessons for Sustainability?

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Sustainability has a theoretical framework which brings together the economic, the social and the environment in ideas of equity within a generation, between generations and between species. There is a human emphasis in the generational equity concept which sets up an essential tension - can we be fair to those people alive today without compromising the needs of those yet unborn? Another question results from the tension between the different authorities which define the underlying concepts of sustainability and the debate surrounding the weak versus strong (anthropocentric versus ecocentric) sustainability argument.

Because the theory of sustainability and its principles is so complex, practical applications are difficult to achieve. Models of sustainability are beginning to emerge via such initiatives as Local Agenda 21 and commercial businesses are becoming involved in initiatives revolving around environmental management, but relevant mechanisms for change are not being developed in any meaningful way. There is very little cross-fertilisation between disciplines and initiatives in one area are not communicated to others. For instance the public sector in the UK has for many years struggled with the principles of an intergenerational contract where public works have been funded by a generation different from consuming generations. Capital Accounting techniques have been applied in the U.K. public services sector which link the funding to the consumption of capital. The paper explores how the intergenerational contract principles incorporated into the U.K. public sector accounting framework relating to man made capital can be developed further to take account of natural capital.

The paper examines the public sector model and its treatment of man-made capital and asks: can the conflict between established accounting models and the environment/sustainability debate be resolved by lessons taken from each discipline?

Economic Decline and Dynamics of the Air Pollution in Russia: 1990-2000

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Russia is now in a deep economic crisis. Its GNP decreased almost twice since 1991. As a consequence of the economic crisis the decline of the air pollution takes place (Dubovsky S. et all, 1994). The same refers to the pollution by the economic industries.

It is obvious that after upcoming recovery of the Russian economy the growth of the air pollution will begin. To estimate its dynamics the system of three models is used. These models are: macroeconomic models, 18x18 input-output model and the model of the air pollution. The system works by means the special computer simulation system NESSY (Safonov P., 1991).

The sensitivity analysis (Mironychev A., 1995) shows the low elasticity of the industrial pollution to the structural parameters of the models. For this reason the radical changes of the pollution level may be done only via complex effects.

Different scenarios were elaborated for the computer simulations. In accordance with the moderate scenario Russia achieves by 2005 the level of the air pollution of the 1990 year. To lessen the pollution escalation the considerable investments for the abatement equipment should be done.

Key words: economic crisis, recovery, pollution, system of models, scenario, computer simulation.

References

Dubovsky S., Mironychev A., Osipov S. (1994), "Ecologicheskie posledstvia socialno-economicheskogo razvitia Rossii v perechodny period// Pegov S. (ed.) Problemy okruzhaushey sredy, Moscow: VINITI, 18-24).

Mironychev A. (1995), "Sensitivity analysis of linear systems" // Singular soulutions in control Systems, Proc., of the Int. conf., Pereslavl-Zalessky, 67-68.

Safonov P., (1991), NESSY - Nature Economic Simulation SYstem, In: Decision Support Systems in Resource-Management, Proc. Of the Int. Conf., A&M University, College Station, Texas.

Valuing Multiple Impacts of Pesticide Use: Evidence from a Contingent Ranking Study for the U.K.

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This paper develops an application of the contingent ranking method to value the social cost associated with the multiple environmental impacts from pesticide use. Respondents are asked to view the price and the various consequences of pesticide use in bread production as product attributes - 'price of a loaf of bread', 'cases of human illness as a result of exposure to pesticides' and 'number of farmland bird species in serious long-term decline' - implying the need to make trade-offs between money, human morbidity and bird biodiversity. Such trade-offs have important policy implications for selection between alternative agrochemical practices, which frequently offer improvements along one dimension of environmental performance at the expense of another.

Results show that U.K. consumers are on average willing to pay six times as much to reverse decline in one species of farmland birds, as to prevent a single case of short-term human morbidity resulting from pesticide exposure.

A variety of tests were performed to evaluate the consistency of the ranking answers with the fundamental axioms of consumer theory - non-satiation, transitivity, continuity - and with the property of independence from irrelevant alternatives. Less than 30% of respondents systematically fail one of these tests on every occasion (although over 90% make at least one failure). By far the most frequently failed test is that for continuity, with nearly 20% of respondents systematically answering their contingent ranking questions in accordance with a variety of lexicographic orderings.

An extensive analysis of statistical specification was performed as well as an overall validity assessment of the results. The survey performs well in terms of standard tests of construct and convergent validity illustrating the potential of the contingent ranking methodology in addressing the valuation of environmental damages with intrinsically multi-dimensional characteristics.

Restoring and Protecting the Great Lakes: a Framework for Economic Assessment and Sustainable Development

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The restoration and protection of the Great Lakes is a necessary condition for sustainable development. Needed are patterns of development, and forms of growth that integrate and conserve the living resources essential to human survival and well-being. Standard environmental economics is blind to the value of ecological relations as a whole. The value of ecosystems as natural capital assets is not taken into account. Information on financial factors,

economic benefits, and valuation of ecosystems as assets, can assist and motivate. Using several Remedial Action Plan (RAP) areas as case studies, a framework evaluates potential benefits created by public and private investment in the natural capital of watersheds as ecosystems. Included are "visioning" processes, to account for the complex, social and organizational maneouvering that characterizes the self-organization of human economic development. Benefit categories include: sustainability benefits; avoided costs; use benefits; direct economic development capacity; indirect and induced economic development impacts. Sources of value include: (a) new opportunities due to new products, services, and markets (e.g. sediment and soil remediation, cleanup technology), (b) economic development and redevelopment ("brownfields") opportunities, (c) new user benefits and expenditures creating new income potentials for entrepreneurs, (d) cost-savings and other avoided costs, or (e) increased property values. In all areas, remedial actions are complementary to redevelopment of brownfields, which provide technology development for soil remediation, other cleanup technologies, and subsequent commercial, light industrial and residential activity Financial analysis gives insights on affordability, in particular, and has been done for several RAP areas. Monetary valuations of greenspace and groundwater have been done in two RAPs The results indicate that the "environment" is a substantial and integral factor of economic development.

Key Words: environment-economy integration; development capacity; complementarity; ecological capital

Rural and Urban Sustainable Development: Metropolitan New York Case Study

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Local urban and rural economies often cannot generate new economic activity, leading to lost jobs and a ‘leaky’ local economy unable to retain resident income : such a local economy is unsustainable, shown by educational practice around two related issues : food security and residential energy efficiency.

Food security, its availability and access to it by all segments of the urban population, is a concern common to metropolitan regions. Redesign of the regional market system(s) historically prevalent in American urban areas is well underway, propelled by a growing demand for organic produce, and concern about the safety of food.

The experience of Cornell Cooperative Extension in New York City, an element in the national Extension system, clearly shows that inner-city youth and others can become engaged in the system’s growth as ‘new farmers’, producing in urban and rural plots and direct marketing in urban neighborhoods to promote sustainable local development. The redirection of vacant lands to market production reveals how import substitution can have an impact at the neighborhood/ district level, with millions of retained dollars thus strengthening the regional economy that binds city and surrounding region together.

Inefficient energy use is a second example of ‘exported funds’ : studies have shown that 85% of urban utility charges leave the region, drawing away scarce capital and reducing the potential for such funds to recirculate within the local economy. An education program that promotes efficient

practices and identifies ‘no cost-low cost’ alternatives can generate funds to provide for further investment in the housing infrastructure, based upon a model that lends funds and draws the carrying charges from the energy savings realized by each household.

A prototype urban New York City neighborhood will be used to demonstrate the intersect between these two related program efforts, and to summarize the economic benefits of such educational programs operated in tandem.

Emergy Evaluation of a Dairy Industry in Brazil
(A Case Study of Regional Planning for Sustainable Development)

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An overall evaluation of the flows of energy, matter, money, information, environmental inputs, product and by-product outputs of a small dairy industry (2500 liters of milk per day) was undertaken. The production unit is located in Botucatu, at the center of the State of São Paulo, in the Southeastern part of Brazil. It is a new industrial plant and receives milk from a cooperative of organic producers, its main products being pasteurized milk, mozzarella cheese and fermented milk beverages.

The calculations, besides the traditional inputs, now include the contribution of energies added by environmental resources to the plant's production processes. The resulting perspective is that the plant is a system that should be served by a larger territory, on a regional scale, to be able to present emergetical indices closer to the regional ones in terms of efficiency and environmental impact, to promote economic, ecological and social long-term benefits.

As an outcome of the plant's function within a greater geographic area some expected benefits are: (i) the local production of wood for energy supply, (ii) satisfaction of regional demands, (iii) value added to product, (iv) reinforcement of local and regional economic patterns and functional webs, (v) job preservation and increment, (vi) betterment of farming and animal husbandry practices of local cattle raisers, (vii) introduction of new techniques to increase agricultural productivity, (viii) soil conservation and improvement, (ix) more appropriate land use planning and management, including native forest preservation and expansion to unified biological corridors and biodiversity at a regional scale.

The paper explains how to calculate the emergy values and transformities of raw milk and dairy products at different stages of processing, as well as the use of environmental indexes using emergy concepts for environmental impact evaluation.

Holes in the Cornucopia

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Environmental optimists such as Herman Kahn and Julian Simon claim that natural resources are, for practical purposes, « infinite, » since human ingenuity combined with demand will always lead to the discovery or production of new resources. Furthermore, they argue that there is no population problem in sight, and that, in fact, the larger the population the greater amount of potential brain-power « the ultimate resource. » This cheerful scenario is based upon formal theories of economics and «the lessons of history». I reply that such «cornucopian» views are based upon (a) an over-reliance upon the application of formalized economic theories, without subjecting them to empirical verification ; (b) a simplistic view of history and an untenable belief that past events in history can reliably predict the future ; (c) a view of nature as an inert « storehouse » of resources ; (d) a view of the biosphere as a mechanical rather than a systemic order ; (e) a belief that any resulting disruptions in « biological services » of the human economy can be adequately «managed»; (f) a deliberate disregard of a large body of scientific evidence, theory and opinion; and most significantly, a total disregard of the laws of thermodynamics, and particularly the principle of entropy.

The Libertarian Panacea: A Critique

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Free-market libertarians contend that government regulation of environmental protection is unnecessary, since, under a system of unregulated free markets and civil law : (a) private owners have a disincentive to damage their own property, and (b) an active and aggressive law of torts (civil damages) suffices to deter damages to the health and property of others. I present eight objections to this argument : (1) it is reactive rather than proactive ; (2) it puts disproportionate risks upon unconsenting parties (the entrepreneur risks loss of his property, while numerous citizens face loss of life, health and property) ; (3) it puts the burden of proof on the plaintiffs many of whom are « statistical casualties » i.e., individuals hard-pressed to prove their injuries are due to the accused, though it is virtually certain that there are many such victims « in general ; » (4) it is based upon untenable formal models such as « perfect markets » and « economic motives ; » (5) it assumes that the natural environment can be fully valued in terms of market values and compensations ; (6) it ignores « commons problems » i.e., the fact that natural forces do not recognize property boundaries ; (7) while correctly pointing out weaknesses in government regulation, it fails to demonstrate that privatization and torts is preferable ; and finally (8) the history of such attempts is not reassuring.

Evaluation of Hydropower in Russia: Institutional Problems in the Phase of Transformation

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Hydropower can produce a twofold rent :

- Cost difference versus other alternatives of electricity production,
- Reduced environmental emission compared to traditional fuel resources.

The appropriation of this rent is a highly controversial issue. It is determined to a large extent by legal institutions defining property rights for natural resources. In the phase of transformation such institutions need to be created. Economic wisdom tells us a lot about allocation of resources within a given legal framework, but what can it tell us about an appropriate framework ? This paper deals with this problem taking Russian hydropower as an example. The paper will make use of information collected during a research project during which there was no opportunity to elaborate these problems.

1. *Evaluation of renewable energy resources.* A short survey on the evaluation of renewable energy in electricity systems taking their availability (time and regional) as well as external economies into account.
2. *Regional property rights and rent*. Decentralised versus centralised approaches to economic development of regions will be analysed in order to find criteria for an appropriate institutional structure with respect to property rights for regional resources. Also a short summary on legal institutions of different countries regarding regional energy resources will be given.
3. *Institutional reform in the phase of transformation of the electricity supply industry (ESI) in Russia*. A short survey on the present structure of the ESI after privatisation.
4. *Appropriation of hydropower rents in the present framework.* A short account of the regional availability of hydropower, the rents available and the mechanism of allocation in the present framework. The present framework does not lead to a full use of available hydropower resources.
5. *Alternative solutions*. This section will discuss alternative institutional arrangements which could improve the allocation of resources.

Information System in Environmental Management

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Every management system works owing to information flow. Effectiveness of environmental management system depends on quality, quantity and usefulness of the information. It was decided to create modern environmental information system in Poland in 1990. In this period there was no modern environmental management system adopted to the market economy. Government decided to form national system of environmental monitoring, improve existing system of statistical reporting, make the most scientific information and results of scientific researches. Works which were leaded have showed that there is a need for analyses and theoretical generalisations. Department of Environmental Economics and Management carried

out research to aim at creation of environmental management model in sustainable conditions (Committee of Scientific Researches project) and methodology of environmental costs research (Environment Protection Department project). In report I will introduce general foundation of environmental management model with information's connections and methodology of scientific researches concerning economic expenditures for environmental protection consider recommendations of EUROSTAT.

No Chance for Market Economic Environmental Policies in Representative Democracies? A Public Choice Analysis

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This paper tries to give an explanation using the public choice approach, why in representative democracies in which political entrepreneurs act according to selfish utility maximization an environmentally oriented policy has hardly any chance of being realized. In order to give a satisfactory explanation of this "execution" deficit we differentiate between voters, politicians, interest groups and bureaucracies behavior and show that there are conflicts with other policies and that their good public aspects of environmentally effective policies. In final section we provide five suggestions how to overcome these difficulties.

Averse Noise Effects in Young Population Benefit-Cost Analysis

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This paper presents a preliminary economical calculation of the total cost for the society of the effects of noise pollution on young population in Chile. We perform numerical calculations for estimating both the physical damage and the economical cost of the damage caused by noise in environments like schools, concert halls, outdoor concerts, discotheques and the specific effects of sounds played in head-phones.

This study includes two mayor kinds of classes of problems : those related to youngsters with reversible damage and those related to youngster with irreversible damage due to over-exposition to noise.

The effects measured in epidemiological studies made in Chile, are in general well perceived in the public opinion, and therefore it is feasible to assign to them an economic value ; however, although in some measurements performed in clinical studies even physiological changes are detected, these are generally not perceived by the public opinion, and therefore it becomes quite difficult to assign to them an economic value.

It is therefore important to investigate whether there are causal relations between those two aspects that have not yet been studied. The environmental-economic models that are applied in this paper are multivariate and stochastic.

The model proposed at present has various limitations, but this is the first approach to a cost-benefit analysis.

Up to now decisions on noise policies are only based on social and behavioral studies of noise, but it is necessary to incorporate urgently in the decision process also economic models.

On the Problem of Anthropogenous Influence Normalization

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The problem of establishing quotes for the various pollution sources is well known and keeps its actuality up to now. Considering it we should avoid the extremes concerned of "green" ecology as well as irresponsible industrial policy. The constructing principles for the system of pollution norms near the pollution sources differ from the similar ones in the global scale. The local consideration of this problem leads to very hard restrictions on economic activity that may be avoided by the global view. However, in the last case we need to accept the situation when pollution concentration near the sources may be over admissible one. Notice that besides the problem of establishing the pollution norms the study of pollution dynamics as well as its distributions in localities being far from the sources is seemed to be very important. Now we pass to the statement of the normalization problem and the estimates of anthropogeneous influence.

Let the dynamics of pollution propagation be described by differential equation

$$\frac{dx}{dt} = f(t, x, u) \tag{1}$$

where $x(t) \in R^n$ is a vector of pollution concentration at the point $t \in T = [t_0, t_1]$. Here t does not necessarily mean a real time. It may be the distance from a pollution source etc. The variable $u(t) \in R^m$ denotes quantity of pollution matter emitted by some source. The environment state is determined by given set $X(t) \subset R^n$, $t \in T$. As a rule, $X(t)$ is constructed using of the constraints defined with the help of limit admissible pollution concentration. Let $X_0 \subset R^n$ be a set of possible initial pollution distributions at t_0. The set $U(t, \omega)$ means all the kinds of pollution flows at the point t with some parameter $\omega(\cdot)$, $\omega(t) \in \Omega(t)$. Denote by $Z(t, \omega)$ the set of all values of the solutions to the differential equation (1) at t for all possible functions $u(\tau) \in U(\tau, \omega)$, $\tau \in [t_0, t]$ and the given $\omega(\cdot)$, $\omega(\tau) \in \Omega(\tau)$, $\tau \in [t_0, t]$. The parameter $\omega(t)$ indicates the norms (restrictions) for the set $U(t, \omega)$ such that the inclusion

$$Z(t, \omega) \subset X(t) \tag{2}$$

holds for all $t \in T$. This corresponds to the local version of the effects normalization.

We generalize this situation. Given a family of points $\{\tau_i\}_{i=1}^s$, $\tau_i \in T$ in which the pollution sources are concentrated and $\{\Delta_i\}_{i=1}^s$ such that $\tau_i + \Delta_i \in T$ we define the set $X_i(t)$, $t \in [\tau_i, \tau_i + \Delta_i]$, possessing the properties:

$$X_i(t) \supset X(t), \quad t \in [\tau_i, \tau_i + \Delta_i],$$

$$X_i(\tau_i) = X(\tau_i), \quad X_i(\tau_i + \Delta_i) = X(\tau_i + \Delta_i), \quad i = \overline{1,s} \ . \qquad (3)$$

In particular, either $X_i(t) = X(t)$ that corresponds to the local normalization of pollution flows, or $X_i(t) = R^n$. The last case does not mean that the environment quality on $[\tau_i, \tau_i + \Delta_i]$ may be arbitrary; the conditions (3) exclude such a possibility.

Thus, the problem of the anthropogeneous influence normalization is to be defined the set $\Omega^*(t) \subset \Omega(t)$ such that for any norming function $\omega(\cdot), \ \omega(t) \in \Omega^*(t),$ either (2) in the local case, or the inclusions

$$Z(t,\omega) \subset X(t), \ t \notin [\tau_i, \tau_i + \Delta_i], \ Z(t,\omega) \subset X_i(t), \ t \in [\tau_i, \tau_i + \Delta_i] \qquad (4)$$

in the global one, hold. As a criteria for estimating the environment quality one may choose, for instance, a total pollution index for certain region

$$I(\omega) = \int_{t_0}^{t_1} \int_{Z(t,\omega)} g(t,x,\omega) dx dt \ .$$

As a rule, the inclusions (2) or (4) are hardly verified. Therefore they are often substituted to the following ones $Z^*(t,\omega) \subset X(t),$ where $Z^*(t,\omega) \supset Z(t,\omega)$ and the set $Z^*(t,\omega)$ admits the more simple representation, because $Z^*(t,\omega)$ is an external estimate of all the possible ecological system states for various $u(t) \in U(t,\omega).$ This permits to observe the dynamics of the pollution propagation and their distribution outside of the direct influence of sources.

Remark that outside of the pollution sources one may put $U(t,\omega) = U(t).$ Then the functions $u(\cdot), \ u(t) \in U(t),$ have a sense of background pollutions induced by environment pollution matters and brought into the system from other regions, for example, together with water or air.

Implementation of the SEEA in Germany

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The System for Integrated Environmental and Economic Accounting (SEEA) was published by the United Nations in December 1993. Important parts of the proposed concepts have been implemented in Germany by now. This work has been undertaken within the broader concept of German Environmental Economic Accounting (GEEA) which also comprises a geographical information system, an indicator system to the 'state of the environment' and other parts not linked with national accounts up to now.

In part A of the SEEA, an environment-related disaggregation of the conventional national accounts is proposed. This part especially comprises an information system on environmental protection activities and natural asset accounts. In Germany, we have completed a comprehensive description of the environmental protection activities which is also part of SERIEE of EUROSTAT. In this context, we compiled a special input-output table explicitly showing the environmental protection activities of the different branches. The work on natural assets has not yet been started because of other priorities in the field of asset accounting (revision of the produced asset accounts).

Part B of the SEEA comprises physical data on environmental-economic interrelationships. In Germany, a complete system of physical input-output tables have been calculated which show the natural material inputs of the economy, the physical transformation within economic processes and the residuals discharged into nature. The physical input-output table is comparable with the monetary input-output table for environmental protection activities. Thus, a combined analysis of physical and monetary data is possible. This data system is part of an even more comprehensive material and energy flow information system (MEFIS) aiming at standardizing the calculation procedures and supporting evaluation procedures.

Part C of the SEEA contains imputed values of the economic use of the natural environment. In Germany, we have applied the concepts of prevention costs. We estimated cost curves of preventing air emissions and calculated the level of domestic product which would be possible if carbon dioxide were reduced by 25 percent within fifteen years. This work has been undertaken in cooperation with the University of Osnabrück which has established a disaggregated econometric model belonging to the international community of INFORUM models.

In part D of the SEEA, an extension of the production boundary is proposed. This especially includes a comprehensive description of household activities. In Germany, we conducted a time use survey which delivers the necessary data base for household production satellite accounts. Based on this information, we calculated the value of household work. Detailed physical information on the household use of the natural environment is shown in the mentioned physical input-output table. Furthermore, we studied long-terms trends of environmental uses by households since 1960.

Choosing Environmental Efficacy Indicators for Transportation Decision Making

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A conceptual model of transportation system characteristics provided a basis for classifying basic attributes and identifying ten dimensions of transport efficacy. Conceptually, transportation systems, can be described by five sets of variables: system inputs, system outputs, system utilisations, system markets and system environment. Efficacy indicators are ratios between variables of any two of five sets. To assure that in decision making the multiple objectives of transportation services are included in comparative evaluations, all interrelationships among five sets of variables must be considered. The environmental efficacy is reflected by a subject off these interrelationships. The subject encompasses major quantifiable dimensions of transportation environmental efficacy that can be used for the comparative evaluation of system services. Certainly, it can be used for other purposes as well as including comparison with preestablished targets, sustainability and monitoring over time.

The system inputs reflect the recourses dedicated to transportation. Some of these inputs are in great concern to environmental issues such as non-reusable fossil fuel energy sources. The environmental stressors such as noise and air pollutants are among system outputs. Accidents, injuries and fatalities result from system utilization. Effects on endangered species and ecosystem, flora, fauna and historic sites reflect system environment. System market reflect demographic and socio-economic environment affecting system supply and usage and include,

among others, population, income, education, age, employment, facility ownership, housing and urban structure.

As transportation is major contributor of many short and long term environmental impacts, this sector owes to the community to clean up its house by discounting environmentally unfriendly practices and modifying or initiating practices that are in conformity with the ecological sustainability. To accomplish this task, a set of environmental efficacy indicators that quantifies the system impact is needed. The methodology adopted herein uses a conceptual model that assures no major dimension excluded. Application of the developed environmental efficacy indicators are shown by examples of several transpiration systems.

Economic Estimation and Price of Natural Resources

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Nowadays one can observe a dual situation in sphere of estimation of natural resources in the countries of transitional market economy.

1) Such category as economic estimation of natural resources is neglected, it has the same fate as many others really forced and fit only within the limits of administrative-commanding economic system of indices, categories and laws.

2) The property in land doesn't correspond to the real status quo. As regards the free-hold property the property right, the right of utilization and the right of disposal are not carried out.

There's no purchase and sale market of the plots of lands and , as a result, the market price of this or that plot isn't fixed.

Under the circumstances the payable nature-usage regime is based on the estimation materials made for socialist economy, in other words, on the purchase prices.

So, both the development of the full-fledged property-in-land inst. and the improvement in the theory of economic estimation of natural resources are necessary under the present scheme of events. At that there won't be any need to fix a price.

Besides, the economic estimation of plot of land, as against the price, makes it possible to consider its significant not only by one of its functions (soil fertility, spatial base of sitting off establishments) and for the society in the whole.

Peculiarities of Nature-Use of Zabaikalye Native Population

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Buryats and evenks were the native habitants of Zabaikalye and Pribaikalye at the beginning 17 centure, before arrival of the Russian people. After joining in 1647 Siberia to Russian state national composition of the population of territory, had been changed and this implied the changes in economic activity of buryats. The buryatic nomadic stands had been mixed with Russian village, becoming centers of spreading of agriculture. Area of settling of these peoples was strongly determined and was connected to character of their interaction with a nature. In this connection buryats mainly occupied steppe and forest-steppe sites. Evenks occupied mountain and taiga. Russians usually lived in mountain-hollow and valley natural systems.

A basis of a economy of buryats was migratory cattle breeding. Hunting and fishery were additional economical activities. Buryats people have special rules of nomadic life, based on experience and taking into account natural-climatic conditions of the given district.

Evenks had a hunting type of economy during long time. Alongside with it breeding of deers were also developed. At this time breeding of deers lose its primary, the number of deer is essentially reduced. Hunting goes to the first plan.

In 60's the old believers had come to Siberia. Now they have the areas of their settling, Khilok and Chikoy rivers valleys.

The basis of traditional economy of these groups of the population of Zabaikalye are biological resources: deers, wild animals, pasture for deers, grass. Use of these resources determined a leading type of economy.

At the same time conflicts of traditional nature-use and new branches of resource dependent industries inevitable arise. The report is devoted to looking for ways to successful combination of environmental and economic interests of traditional territories development.