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Environmental data and indicators and human security related issues in Romania: an institutional approach

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**ENVIRONMENTAL DATA AND INDICATORS AND HUMAN SECURITY
RELATED ISSUES IN ROMANIA: AN INSTITUTIONAL APPROACH**

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ABSTRACT. When the environmental issues are addressed in sustainability, human security terms the information demand is getting more complex, emphasising the need to integrate environmental, economic and socio-cultural information. This paper proposes an insight into the data and indicator issues on environment and human security in Romania from an institutional perspective. The environmental information system has been critically assessed in terms of content, information flows and further developments related to human security issues. The data reliability at various territorial levels of data collecting, processing and transmitting has been also analysed in this context. A special emphasis has been put on the actors involved in employing the environmental information for strategy and policy elaboration and implementation, management and administration as well as for scientific research, environmental education and public participation purposes. A typology of these actors from organisational viewpoint has been proposed and analysed, pointing out the need of enhancing the networking effects at both national and international level.

Introduction

Aiming to improve and maintain the well being of both people and ecosystems, *sustainable development* is the greatest challenge at the beginning of the new century.

In the debates on sustainable development the question of *environment and human security* is a central one, deriving from the close links between human activities and environmental changes. In this context human security is conceived as a modern, broader concept, referring to more than neutralising military threats to territorial integrity and political independence of a state; it also focuses on non-conventional threats such as: resource scarcity, rapid population growth, human rights abuses, outbreak of infectious disease, environmental degradation caused by toxic contamination, ozone depletion, global warming, water pollution, soil degradation and loss of biodiversity (Lonergan et al., 2000).

The multitude of actors involved in environment and human security matters – causing and/or confronting environmental problems, make *people* be a *key factor*, who ‘need to improve their relationship with each other and with ecosystems that support them, by changing and/or strengthening their values, knowledge, technologies and institutions’ (Carrew-Reid et al., 1994).

In all these phases of the strategy process *information is essential*: it helps to gain insight into the state of environment, to forecast further developments, to formulate adequate policies, to implement them, to monitor and to evaluate the effects. As defined by Nijkamp et al. (1990) and quoted by Douven (1997, p.4), information is ‘data that are collected and organised (for instance by way of statistical techniques and modelling) so as to improve insight or knowledge regarding a certain phenomenon’.

Many dimensions can depict environmental information. They refer to the type of problem (e.g. diffusion, waste, acidification, climate change, depletion of ozone layer), its sources (various economic groups or activities), the spatial scale of effects (local, regional, continental, global), the environmental factors (air, water, soil), the public functions (e.g. drinking water provision, the protection of outstanding natural beauty areas), the environmental policy and management aspects (Douven, 1997).

Starting from these overall considerations this paper proposes an insight into the data and indicator issues on environment and human security in Romania from an institutional perspective.

To a country in transition like Romania creating appropriate organisational structures and legislation has been a prerequisite to building a realistic and effective

environmental protection strategy. Therefore a presentation of the institutional and legislative framework of environmental protection created after 1989, in comparison with the situation in the communist period, has been considered necessary for understanding *the institutional context of environmental data collecting, transmitting, processing and employing*. On this basis *the environmental information system has been critically assessed* in terms of content, information flows and further developments related to *human security* issues.

The preparations for the accession to the European Union have induced specific concerns with harmonizing the standards and norms regarding the polluter concentration and the elaboration of norms for the sources of pollutant emissions similar to those already existing in the EU. In this context the need and possibility of conceiving and implementing managerial procedures of real time reporting and monitoring *crisis situations* have been also discussed, considering *the concerns with preventing Romania from becoming a source of regional environmental insecurity*.

A special emphasis has been put on the *actors involved in employing the environmental information* for strategy and policy elaboration and implementation, management and administration as well as for scientific research, environmental education and public participation purposes. A typology of these actors from organisational viewpoint has been proposed and analysed, pointing out the need of enhancing the networking effects at both national and international level.

Institutional changes in the environmental protection field since 1990

After 1990 serious efforts have been undertaken in order to create *a new institutional and legislative framework* of environmental protection in accordance with the exigencies of the modern, democratic society and radical changes required by the transition to the market economy. Appropriate institutions and legislation were considered a prerequisite for building a realistic and effective environmental protection strategy. This process has been a multi-track process, in which the two components – creating institutions and developing specific acts – have occurred simultaneously with other elements of the strategy preparation phase (information assembly and analysis, policy formulation, action planning, document preparation). Although some mismatches between the new and the old could not be avoided in various stages (for example the Ministry of Environment was set up soon after December 1989 whereas the Environmental Protection Act was issued by the Parliament as late as in December

1995) this procedure has been considered more effective than a single-track approach, in which most processes would have occurred sequentially.

For a society in transition from totalitarianism to democracy, like the Romanian society, a radical change of institutions and legislation has been a must. Even though Romania had a quite comprehensive legislation, it was largely ineffective. Most laws were issued in the 1960s and 1970s and some of them revised in the 1980s: Environmental Protection Act (1973), Water Act, Forest Act, Hunting Act, Agricultural Protection Act, Nuclear Activity Control Act, Toxic Substances and Products Act, and so on. The provisions of environmental regulations were similar to those applied in the developed countries in the early 1960s. Even these standards and regulations were weakly enforced and fees were so low that it was easier and cheaper for industrial polluters to pay penalties than to improve their environmental record. The state also granted many exemptions from its own regulations, making them ineffective.

Environmental protection was very fragmented since there was no central institution dealing with environmental protection, management and enforcement of existing regulations. Instead, various ministries such as the Ministry of Agriculture and Food Industry, the Ministry of Forest and Woodworking Industry, Water National Council, the Ministry of Health, the Ministry of Culture, the Ministry of Building, the Commission of Natural Monuments Preservation were responsible for different areas of environmental protection and management.

The immediate institutional changes after December 1989 included a new organisational framework for environmental protection as a national priority. In this context *the Ministry of Water, Forest and Environmental Protection* (usually named “the Ministry of Environment”) was set up in 1990, aiming at an integral approach of environmental management, to prevent pollution from transmitting among various environmental factors. It is structured into several directorates, dealing with: water resources, forestry resources, nuclear protection, strategies and regulations for environmental protection, monitoring ecological reconstruction programmes, international relations and public relations. The responsibilities of the Ministry of Environment are mainly related to: the development and implementation of the environmentally sustainable development strategy, the environmental policy with its corresponding instruments, operational plans and programmes, environmental projects; the development of law projects, regulations, technical standards in accordance with the international standards; the establishment of the institutional-administrative framework for identifying and promoting research programmes and for training the staff needed for environmental protection purposes; organising the national monitoring system; the collaboration with corresponding authorities from other countries, representing the Romanian

government in the international relations for the environmental field; co-operation with other ministries, firms, non-governmental organisations, individuals in the decision-making process; offering information on the environment state, policy and programmes for environmental protection; setting up an environmental control group.

One of the most important achievements of the Ministry of Environment has been the development of a *new, modern Environmental Protection Act*, issued by the Parliament in December 1995. A range of principles, quite similar to those expressed in international agreements and other domestic legislations, underlie this act. These include the precautionary principle and the principles of preventing ecological risks, maintaining biodiversity and conserving ecosystems. As these principles have a high degree of generality, it is very important to apply them in a way that reflects the cultural, political and economic climate of Romania and its communities.

Special chapters of the Environmental Protection Act are devoted to regulation of economic and social activities with significant environmental impact (via assessment of environmental impact studies, environmental permits, explicit conditions to firms and individuals with activities related to harmful substances and wastes), natural resource preservation and biodiversity conservation (with regard to technical norms, exploitation permits, emission standards, quality standards that have to be established by the Ministry of Environment for water, air, soil, subsoil, flora and fauna, protected areas and nature reservations), tasks and responsibilities of the authorities charged with the environmental protection, penalties (from fines to punitive actions). To be truly effective the environmental Protection Act has had to be followed by other 17 acts (Water Act, Flora and Fauna Protection Act, Nuclear Activity Control Act, Waste Administration Act, Atmosphere Protection Act and so on).

According to the *subsidiarity principle*, the responsibility of implementing the environment legislation and the corresponding strategy and policy at county level belongs to the *local (territorial) environment agencies*. Generally their actual situation is pretty weak, owing to the insufficiency of adequate equipment, trained staff and financial means. Thus most of funds are provided by central and local budgets whose revenues, given the deep economic recession, are far insufficient for covering basic economic and social needs. As regards the question of adequate professional skills, the employees are basically graduates of technical higher education in energy supply systems, agriculture, land improvement, industrial chemistry as well as environmental management, environmental economics, etc. However, owing to the low level of wages in environmental protection sector many employees look for other jobs, better paid and eventually leave this sector.

Many efforts are to be undertaken at local level in order to promote the decentralisation of environmental management. In this respect the process of developing and implementing local environmental programmes (as pilot ones) is under way. The activity of local agencies is closely related to the activity of local authorities. The main tendency is to increase the local autonomy through a multiple partnership: local environment agencies – local authorities – enterprises, rather than through command-and-control relationships. At present this kind of partnership is experienced by some local environment agencies and the pattern is to be extended to the other counties.

As regards *the environmental protection strategy*, it has been developed by the Ministry of Environment as a component of the national strategy of transition to the market economy and structural reform. It has taken into consideration the available natural resources, the economic and social development level and the quality of environmental factors as well as the obligations deriving from the international conventions and programmes.

Related to the last aspect, in addition to the obligations assumed before 1990 Romania has signed the Protocol of Montréal on the ozone layer protection (1991), the Convention on the biological diversity and the Framework Convention of the United Nations regarding climate changes (Rio de Janeiro, 1992), the Kyoto Protocol (1997) and various European agreements as well as bilateral conventions and agreements.

For the period 2000 – 2004 the environmental protection strategy is closely related to the EU accession requirements, with the following environmental policy and action objectives in view (Government of Romania, 2000):

- the evaluation of the Romanian natural capital in accordance with its diversity and present vulnerability and the development of the national network of protected areas;
- measures for recovering the natural capital in the deteriorated areas;
- sustainable management of water resources;
- ensuring the integrity of the national forest fund under the new circumstances created by changing the ownership form and management practice;
- supporting the national programme for sustainable land use and fighting land degradation;
- supporting the national programme for urban and industrial waste administration and re-use;
- building the financial instruments system so as to respond gradually to the *EU acquis* regarding water use, environmental protection in industry, agriculture, soil and deteriorated land protection, certifying organic products;
- consolidating the institutional capacity and developing the expertise needed for an effective partnership between Romanian environmental authorities and those of the EU so as to really benefit from the

opportunities offered by various accession support instruments (e.g. the ISPA fund for improving for improving transportation and environmental protection infrastructure);

- setting up the National Environment Fund as the main support for carrying out the priority objectives of the National Action Plan and National Plan for the Accession to the EU;
- the creation of the legal and institutional framework for facilitating and stimulating the dialogue between public authorities and civil society with regard to environmental strategy, policies, programmes and decision making process.

The emphasis will move from curative to prevention measures and actions concentrating on (Government of Romania, 2000):

- the development of the integrated monitoring system, the environmental system and the environmental state reporting system, as basic instruments for underlying environmental protection decisions;
- evaluating the accomplishment of the main policy targets and informing the public;
- promoting the ISO 14000 and EMAS standards (In the SME sector this must be an emergency measure) that should result in eco-efficient processes, products and services, of minimum risk to people and natural capital;
- the decentralization of the institutional system applying consistently the administrative autonomy principle and the 'polluter pays' principle. Clear competencies for local authorities will be established and will be encouraged prevention environmental policies at enterprise level;
- the share of market-based instruments (emission taxes, tradeable permits, etc.) will increase in long-run as an alternative response to command-and-control instruments.

In order to ensure a comprehensive, flexible framework to tackle the great variety of environmental issues, the environmental protection strategy has been conceived as a multisectoral strategy, related to other components of the general strategy (sectoral economic development strategies, the national spatial plan, the strategy of socio-economic regional development, etc.). Even if the integration of all these components was an important concern, it cannot be said that this has been entirely achieved. However, the links between the national environmental strategy and the other components of the general strategy as well as the way in which the national action programme has been developed have revealed the possibilities of collaboration between the Ministry of Environment and other ministries with important environmental objectives/constraints in their activity. Experts of these ministries have been involved in the development of the *national action programme*, the main idea being that of co-operation between ministries in solving environmental problems and not an absolutely independent action by the Ministry of Environment. The national action programme has been also connected with the Action Programme for Environment in Central and East European Countries – Lucern, 1993 – its general principles being adopted by Romania

and offering useful guidelines for increasing the concern with human security related activities.

The environmental information system – content and further developments

The institutional aspects of environmental data collecting, transmitting, processing and employing derive from the overall institutional and legislative framework of environmental protection, previously depicted. The approach of these aspects must start with the analysis of the *content* of the environmental information system, able to reveal the available data and indicators, the way they are used as well as further needs and possible developments.

From the beginning a distinction should be made between monitoring data and environmental statistics (Mandricelu, 1998).

Monitoring data are obtained by technical means, which help to observing the behaviour of a given parameter in a given place, at a given time, making it difficult time and space generalisation.

Environmental statistics offer the possibility of time and space generalisations, so as to provide a global view on the most important aspects of the evolution of a particular situation that represents a public concern.

Given these particularities, monitoring data can serve as a source to environmental statistics provided they are processed in accordance with the principles and the rules of statistics.

The main statistical information on the environmental protection domain is provided by special annual bulletins issued by the National Institute for Statistics and Economic Studies (NISES, former National Commission for Statistics till the second half of 2000) in collaboration with the Ministry of Environment. A synthesis of the indicators included in this bulletin can be also found in the Romanian Statistical Yearbook.

All environmental statistical information is organised in a *database* administered by the NISES. Its specialised dissemination department provides the information required by various organisations, usually upon request.

The environmental protection indicators are both *physical and value indicators*. The physical ones refer to natural characteristics, natural resources, pressures on the environment, quality of environmental factors, whereas the value ones mainly focus on the sources and destinations of environmental expenditures. There are also indicators serving to international comparisons.

The *data sources* consist in statistical reports filled in by the corporate sector's firms and the county agencies for environmental protection, for data concerning the quality of air in some localities and expenditures for environmental protection (National Commission for Statistics, 1999).

From *administrative* viewpoint, the Institute of Geography of the Romanian Academy and the Public Utility Company for Meteorology and Hydrology are responsible for data regarding the natural characteristics, the Ministry of Agriculture for data concerning the land fund, the Ministry of Environment for data about protected areas, the Public Utility Company "Apele Romane" ("Romanian Waters") for data on water resources and the superficial water quality, the self-administrated authority ROMSILVA for data on trees defoliation, the Institute for Pedological and Agrochemical Research for data concerning the quality of soil.

The national reports on the environment state in Romania annually issued by the National Institute of Research for Environmental Protection are another relevant source of information. The activity of this institute is particularly important in an international context too since it provides specialised assistance to the Permanent Secretariat of the United Nations – Framework Convention for Climate Change, to the Commission for the Vienna Convention on the ozone layer protection and the Montréal Protocol regarding the substances which damage the ozone layer. In this context it elaborates the country report referring to the emissions inventory and various ecosystems sensitivity to climate change.

Special measurements are also performed by the Institute for Atomic Physics where, for example, the Cyclotron Laboratory carries on research related to measuring the radioactivity after the Chernobyl nuclear accident and the influence upon various foodstuff, soil, water) and by the Institute for the Earth's Physics, which monitors a wide range of parameters relevant to earthquakes occurrence.

To elucidate *the question of data reliability* post 1990, a presentation of data collecting and transmitting is necessary. As regards monitoring data, there are three levels of data collecting, processing and transmitting (Constantin, 1998).

The first level regards environmental data collected by laboratories of the territorial agencies for environmental protection (42, set up at county level) as well as by laboratories belonging to the Public Utility Company "Apele Romane" (responsible for water consumption and quality) and the self-administrated authority ROMSILVA

(involved in forest preservation, in approving hunting and fishing permits) and to the Ministry of Health (for air and drinking water quality in populated areas). The firms must provide data themselves, when required by territorial agencies. The correlation and coherence of data collected at territorial level is ensured by the county agencies of environmental protection. This continuous, regular monitoring, in accordance with various technological processes, ensures primary data correctly reflecting the evolution of environmental parameters as well as the stability over time and the quality of data.

The second level regards transmitting these data to the National Institute of Research for Environmental Protection, which ensures the co-ordination of the whole process.

At the third level the Ministry of Environment appears as the main beneficiary, receiving detailed reports on all environmental factors.

A national reference laboratory for environmental preservation was set up within the National Institute of Research for Environmental Protection. It has to accredit a national network of environmental laboratories. At the moment, the process is under way, involving the implementation of a whole management system of environmental quality and accrediting.

As long as the environmental data are collected within the system described, there are good reliability chances. The system has been considerably improved in the last years, from both institutional and technical endowment viewpoints. The state budget and the PHARE programme have been the main contributors. Some achievements can be mentioned: a national reference laboratory for environmental radioactivity measurement (with the support of the International Agency of Atomic Energy), automatic systems for air emissions monitoring (at Baia Mare and Bacau), the use of mobile laboratories. Apart from the mobile laboratory system within the Ministry of Environment and other organisations, economic agents have started to set up self-monitoring systems based on mobile laboratories (Bucharest municipality, the self-administrated authority for electric power, RENEL, etc.).

At present a special emphasis is put on conceiving and implementing managerial procedures of real time reporting and monitoring crisis situations, considering the concerns with preventing Romania from becoming a source of regional environmental insecurity. These efforts will be correlated with the future actions of setting up a regional integrated system for monitoring the environmental factors and consolidating the reaction capacity in crisis situations (floods and other natural disasters) , as established recently at the Summit on environment and sustainable development of the Carpathian-Danube countries held in Bucharest.

However, the overall analysis of the data sources and flows points out some *drawbacks*, which cannot be ignored. Thus, the multitude of primary data collecting systems, the

existence of many data processing structures, some ambiguities in defining the responsibilities of various organisations with regard to the information they should provide make environmental information be still too much fragmented, without clear links between various components and possibilities for further developments in quantity and quality terms (Mandricelu, 1998, Constantin and Mitrut, 1999) .

To work out these drawbacks *a new approach to environmental statistics organisation*, in accordance with the EU accession requirements (in terms of Community “acquis” and environmental statistics of EUROSTAT) and new international standards, is taken into consideration by the NISES, focusing on an integrated impact – state – response framework. This framework is conceived so as to connect the information on environmental factors – flora, fauna, air, water, soil and on human settlements to the information regarding socio-economic activities and natural phenomena, environmental impact of human activities, the responses to this impacts, stocks, inventories and reference conditions (Mandricelu, 1999, Mandricelu, 2000).

The framework for environmental statistics development can employ a structure with the following components:

- statistics of the economic and social activities and natural phenomena, with indicators regarding the use of natural resources in the context of economic activity development, pollutant substances emissions and waste treatment, natural phenomena;
- statistics of the environmental impact of economic and social activities and natural phenomena, focusing on: natural resources variation, environmental factors quality, human health and ecological disruption;
- statistics highlighting the response to the environmental impact in terms of ecological reconstruction, monitoring and fighting pollution, prevention from natural disasters and risk alleviation, corporate sector’s reactions.

This new approach to environmental statistics organisation is reflected by the recent *National Programme for Environmental Statistics* aiming to create the appropriate instruments for providing the information needed for political environmental decision making, environmental planning at national, regional and local level as well as for public debate on environmental issues. The programme has in view three quality criteria, namely relevance, reliability and availability. *Relevance* means that statistical indicators should meet as largely as possible users’ requirements. *Reliability* refers to measurement and calculation methods that are transparent and can be verified easily. *Availability* concentrates on the need to provide information adapted to various categories of users (decision makers, resource managers, researchers, the public). The basic institutions in the process of building up the new environmental

statistics are the NISES and the Ministry of Environment that have to co-ordinate, to harmonise their programme in this field.

The improvement of the existing database so as to include all the above mentioned components would represent a decisive step towards the real, necessary co-ordination between the flows of the national monitoring system and the statistical environmental system and the *integration* of the Romanian environmental statistics in the international information flows in this field. It can also serve as an appropriate basis for expanding the international efforts with GIS to Romania as well as for including the country in the recent studies linking environment to human security questions.

So far the main preoccupations with human security aspects in an especially institutionalised framework have concentrated on the elaboration of the National Human Development Report, which is prepared every year, starting from 1994, by the National Institute for Economic Research of the Romanian Academy in collaboration with the NISES, commissioned and financed by the UNDP. The report is rich in information on the aspects regarding human development, inclusively environmental protection: macrostabilisation and human development in the transition period, equity and social cohesion, efficiency of governance in support of human development, legitimate governance, legitimacy of social policies.

To establish the rank of Romania among the UN member countries, *the Human Development Index* (HDI) is calculated, using three criteria:

- longevity, measured by life expectancy at birth;
- educational attainment, measured by a combination of adult literacy and combined primary, secondary and tertiary enrolment ratios;
- standard of living, in terms of GDP per capita in purchasing power parity dollars.

Since 1997 *the Human Poverty Index* (HPI) has been included in the Human Development Report as well, concentrating on the following essential elements of poverty: longevity, knowledge and a decent standard of living.

To a country like Romania, confronted with big social problems specific to the transition phase the calculation of the HDI and HPI provides useful information about the changes in the level of development of the whole community and the proportion of population left out of the progress, as a background for future development strategies and policies aiming to stop the decline and then to decrease the discrepancies between Romania and the developed countries. These indices offer the possibility of reliable comparisons with the other countries considered in international analyses.

The implementation of the new framework proposed for the development of environmental statistics would create appropriate conditions to creating more analytical structures and, thus, to providing the indicators needed for international studies based on the calculation of *the Index of Human Insecurity (IHI)* and *Index of Vulnerability* (Lonergan, 1998, Lonergan et al., 2000) . In brief, the Index of Human Insecurity comprises a set of indicators referring to environment (net energy imports, soil degradation, safe water, arable land), economy (real GDP per capita, GNP per capita, adult illiteracy rate, value of imports and exports of goods and services), society (urban population growth, young male population, maternal mortality ratio, life expectancy), institutions (public expenditure on defence versus education, primary and secondary, gross domestic fixed investment, degree of democratisation, human freedoms index). For constructing the Index of Vulnerability the indicators were selected for six categories (ecological/resource indicators, economic indicators, health indicators, social and demographic indicators, political/social indicators, food security indicators).

Compared to the HDI, the IHI provides a deeper theoretical perspective on both human security and human development and can be linked to indicators characterising specific aspects of environmental disruption and vulnerability (in terms of water, food security, etc.) as well as the capacity of reaction to environmental changes.

Actors involved in employing environmental information in connection with human security issues

The complexity of environmental protection issue entails a multitude of actors using environmental information for strategy and policy development and implementation, management and administration as well as for scientific research, environmental education and public participation purposes, all these activities being closely interrelated. Accordingly, a *typology* of these actors should contain: governmental institutions (at central and local level), corporate sector, research institutes, universities and the public. As the role of government and corporate sector has been already discussed, in this section the emphasis is to be put on the last three categories.

In general terms, *the environmental scientific research* in Romania is related to the actions promoted by the environmental protection strategy and the national action plan and concentrates on programmes and themes which attract scientists of various backgrounds (ecology, economy, geography, land-use, sociology, politics, etc.) as well as research teams and institutes of various profiles. The multidisciplinary character of

scientific research is here more obvious than in any other scientific domain. This character is very well reflected by the variety of scientific research institutes with environment and human security related activities. From organisational viewpoint these institutes fall into a couple of categories as follows (Constantin and Popescu, 1999):

- national research institutes in sectoral domains (e.g.: the National Institute of Research and Development for Environmental Protection, the National Centre for Sustainable Development, URBANPROIECT);
- departmental research institutes subordinated to the corresponding ministries (e.g.: the Research and Design Institute “The Danube Delta” and the Romanian Institute for Marine Research, co-ordinated by the Ministry of Environment, the Institute for the Earth’s Physics and the Institute of Atomic Physics, co-ordinated by the National Agency for Science, Technology and Innovation, the Institute for Hygiene and Public Health, co-ordinated by the Ministry of Health);
- research institutes belonging to the Romanian Academy, especially carrying on fundamental research (e.g.: the Institute of Geography, the National Institute of Economic Research, including: the National Economy Institute, the World Economy Institute, the Institute of Industrial Economics, the Institute of Agricultural economics, the Institute of Economic Forecasting, the Institute for the Quality of Life, the Institute of Finance, the Centre of Demography);
- research institutes belonging to the Academy of Agricultural and Sylvical Sciences (Research Institute for Pedology and Agrochemistry, the Institute for Sylvical Research and Improvement);
- research institutes acting as private companies (e.g.: the Research and Planning Institute for Land Improvement).

Starting from the institutionalised framework and the existing environmental information flows these institutes concentrate their research activities on monitoring, data collection, simulation modelling, scenario development and reference value development. Generally, three main components can be identified in environmental research, namely data handling functionality, environmental modelling functionality and decision-support activities (Douven, 1996).

Environmental research is also developed within Romanian *universities*, closely related to environmental training and education activities in various fields (e.g. economics, law, geography, biology, engineering, architecture, sociology). The environmental curricula

include a wide range of subjects of a particular relevance to environment and human security issues such as: environmental monitoring and dynamic protection, pollution and pollution prevention on air, water, soil, recycling and storing of industrial materials and waste, environmental problems in enterprise design, nuclear plants and environmental protection, environmental reconstruction, mathematical modelling of the environment, urban ecological systems, urbanism and zoning policies, architectural landscape management, environmental architecture for tourism, soil erosion control and water sources regulation, rural sociology, environmental economics, environmental management, environmental law and so on.

Last but not the least, the need to increase the awareness and concern about environmental problems and human security requires *the participation of the public*, with environmental NGOs, community groups, individuals, media, etc. as potential actors. For public participation to be meaningful, three main provisions must be ensured: access to information, provision for consultation and rights for standing (Caddy, 1999).

Before 1990 the information monopoly of the Romanian communist regime made it possible to conceal environmental statistics and most important information on the quality of environment. Environmental data were secret and the public did not have any access to environmental information. Local communities did not have a real image of the environmental conditions in their regions excepting those living in areas where environmental devastation was obvious. The lack of information led to a lack of interest among the public about environmental issues. Like in other communist countries, Romanians who tried to express their dissatisfaction, disagreement with environmental policy were persecuted.

Compared with the previous period a favourable evolution has been recorded in the last nine years. The democratisation of society has been creating an adequate framework for the participation of the public in promoting environmental preservation projects in accordance with its own interests: it may protest against pollution practices and demand better governmental action. Basically the information monopoly was removed but some fundamental problems remain.

Thus, the long communist period had a very negative influence on the behaviour of local communities and society as a whole. The perception of democratic values and attitudes has been greatly perverted and, in the transition to a democratic society, old

mentalities and attitudes are not easily transformed. After nearly fifty years of a government monopoly on environmental information it is hard to believe that a completely new way of perceiving environmental issues can be realised in a few years. The economic and social problems such as production decline and growing unemployment have made public concerns shift away from environmental issues to more immediately stressful ones: real wages are falling and job security is growing (Constantin, 1999).

Under these circumstances in parallel with the efforts to raise the quality of life in economic terms the environmental education must play an essential role, with a special emphasis on the elements less known or unknown to the public: climate change, energy saving, natural resource depletion, draught, flood, landslides, impact of pollutant substances emission on air, water and soil. The approach of this issue should be a behavioural one: 'behaviour simply means what people do, as opposed to what they say they do or what they are supposed to do in legal and institutional terms' (Stayner, 1980, p.26).

In order to make a decisive step towards an effective implementation of the environmental protection strategy, reflected in an increase in the quality of environmental management and participation of all responsible actors, *communication* must be considered a cornerstone. 'To develop institutional and scientific linkages between the current needs in environmental regulation and advances in ecosystem science, improved communication is required between regulators, scientists and the public' (De Gloria, 1993, quoted by Douven, 1997, p.66). To a country still in transition like Romania, this requirement has a particular significance: creating new, democratic institutions was a must in the first years, but at present the greatest challenge is making them work effectively.

The establishment of real, helpful linkages between the institutions involved in environment and human security issues can be realised in various ways: promoting multidisciplinary research projects, organising workshops able to bring together managers, scientists and public representatives, creating web-sites and internet user groups, setting up networks, etc.

The participation of governmental institutions, research institutes and universities, business firms, NGOs in international networks has got a special relevance, the first positive effects being already noticed. They consist in increasing alignment to

the European standards and regulations, a better access to the international sources of information, learning from successful experiences (or failures) of foreign partners and so on.

The growing commitment of the responsible factors of Romanian society to carrying out the reform processes and to meeting the conditions of accession to the European Union is expected to enhance these *networking efforts* with mutually advantageous effects.

Concluding remarks

The environmental information system must be conceived and implemented in accordance with the information users. Thus, this system can be imagined as a pyramid with the policy makers at the top, followed by the public, the resource managers in the middle and the researchers and academics at the bottom. The policy makers need a relatively small amount of information, materialised in synthesis indicators. The public also needs compact information presented in summary form. Given their role in making decisions about resources and environmental management, the resource managers require more specific information, even though much of it is still in the form of summary indicators. Finally, the researchers and academics use a large amount of information, most of it in an analytical, less aggregated form.

This pyramid grows in complexity if the spatial component is considered too. It generates specific organisational structures at local and central level for data collecting, processing and transmitting, making it necessary to carefully avoid shortages and/or overlaps. This implies the optimisation of the institutional system in environmental field, with orientations (norms, targets), mechanisms (procedures, standards) and organisations as basic components, decisively influencing the way in which the actors behave (Lonergan et al., 2000).

In Romania, the institutional aspects of environmental data collecting, transmitting, processing and employing derive from the overall institutional framework of environmental protection, considerably improved since 1990.

Yet, the assessment of the existing environmental information system has revealed a series of drawbacks such as: the multitude of primary data collecting systems, the existence of many data processing structures, ambiguities in defining the responsibilities of various organisations with regard to the information they should

provide, all of these making environmental information be too much fragmented, without clear links between various components and possibilities for further developments in quantity and quality terms

The environmental statistics improvement, based on an integrated impact–state–response framework, would create appropriate conditions to working out many of the above mentioned drawbacks and to providing the indicators needed for international analyses, in accordance with the EU accession requirements. In an integrated outlook these requirements should be understood from the viewpoint of the exigencies of the EU environmental statistics as well as from the viewpoint of observing the EU norms and standards in environmental protection field.

In a broader context the great importance of enhancing the networking efforts at both national and international level should be also taken into consideration.

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