

# ENVIRONMENT PROTECTION, SPATIAL REMOTE SENSING AND LEGAL STRATEGY FOR THE INTERSYSTEMIC COMMUNICATION

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## ABSTRACT:

Chapter 1- Concepts and rational approaches:

(a) the concept of “extreme limits”, meaning the tolerance of the various sub-systems of the biosphere and is in favour of the substantiation of the interdisciplinary cooperation (the first rational approach - the convergence of the geo-sciences) aiming at activating the dialogue among all sciences of the earth within a fundamental science, such as, the international law. This cooperation leads to the assertion of certain premises for the normative harmonizing: the System of International Environment Arrangements (SIEA);

(b) the concept of “geomatics” that is on the basis of the automated processing of the geographical data (including of those of spatial remote sensing) and sustains the motivation of the hetero-interdisciplinary cooperation (the second rational approach – the convergence of the geo-systems); it is aimed at changing the dialogue between various disciplines from within a series of systems, such as the technical disciplines of the spatial remote sensing, those that are specific to the informatic system, of the biological one a.s.o. This cooperation focuses upon the achievement of a complex objective: the environment matter (monitoring of the environment factors, inventory and valuation of the natural resources, the impact and the extent of the global phenomena) and leads to the assertion of certain premises for the normative consolidation: the System of Earth Observing Satellites (SEOS).

Chapter 2 - Paradigm changes and the project of an intersystemic structure:

(a) the integrative strategy , having in view: the globalizing trends, being noted with this phenomenon the role of a catalyzer of the spatial remote sensing; the informational explosion, requiring in connection with this phenomenon the optimizing of the communication (dialogue) through new institutional forms of international cooperation.

(b) the institutional consecration, consisting in a structure specialized in the cooperation of certain system strategies (SIEA and SEOS), starting from the identity of the leading interests and attitudes in the field. It is shown the proposals and the arguments in favour of such a form of institutionalization, as well as the mutual contributions of the communities within the intersystemic communication. Finally, it is summarized the stages of the project concerning the adoption of the international convention and the statute of the International Coordination Center (ICC) of the Remote Sensing and Earth Protection (RSEP), as a specialized agency of the UNO.

## 1. CONCEPTS AND RATIONAL APPROACHES

### 1.1 Extreme limits and interdisciplinary cooperation

**1.1.1 “Extreme limits” concept:** This concept refers to the deviation limits for the different subsystems of the biosphere, to the solicitations they are submitted to following human activities. Transgressing these limits can endanger or menace life itself. Though we shall not illustrate such extreme situations where the “break” may appear nor the point up to which the destruction trend for an ecosystem may be “allowed”. Instead we shall present some warnings given by specialized organisms:

- **Water crisis.** In 2025, the water crisis will affect 50% of the Terra population (according to the most optimistic forecasting, if the present consumption rate is maintained);

- **Climate warming.** At the end of 2100, the global temperature will increase with up to 10° C (in case there will not be reduced the present rhythm of greenhouse influence);

- **Forests destruction.** Since 1950 over 30 million sq km of forest have been destroyed (unfortunately, there is foreseen a continuous process of wood consumption from Terra’s forests, with a disastrous annual rate of 200,000 sq km);

- **Danube Delta degradation.** Starting with 1980, from the 580,000 ha of Danube Delta, 80,000 ha request an ecological reconstruction (these were transformed in the eighties in “agricultural surfaces” and became true “sterile fields”).

The explanation is not simple though, in essence, it is centered on the human intervention on nature, on an ever increasing penury of non-regenerating resources. The more important the anthropic modifications regarding environment factors (soil, water, air, stratosphere, flora and fauna, mineral and energetic resources) are the more precarious the global balance of the Society-Man-Nature becomes. Going beyond the limits of national jurisdiction, the noxious and harmful forms for the vital processes of mankind and the other living creatures could not be - most of them - unilateral controlled through internal law regulations and there were needed international law regulations with multilateral character, in view of establishing a deeper and more specialized cooperation in this respect, at regional or global level.

**1.1.2 The first rational approach: the convergence of geosciences: Interdisciplinary approach (IDA)** has initiated, in theory and practice, the permanent dialog among all earth sciences within one fundamental science, the *international environmental law*. The forms and specializations of juridical instruments have had a large spectrum: from international law on environment preservation or protection of fluvial and maritime environment, to the special environment of the polar ecosystems or the total environment, with its multiple pollution sources. Also, the structures and activity of international institutions (of economic or other profile, inter-governmental and non-governmental), as well as the sub-regional mechanisms (fluvial and maritime commissions) have played and still play an important part.

Within this normative and institutional frame, the principle of international cooperation was fully stated, enriched with the dimension of relations in the field of environment factors protection and resources conservation, stressing more intensely the general and specific principles of the international environmental law. Unfortunately, law regulations in this field registers only a few clear and precise rules regarding the *liability* for the transbordering damages caused to the natural environment and an insufficient number of compulsory ecostandards regarding the protection of environmental factors at regional and international level.

**1.1.3 Confirmation of the premise of concerted normative action - SIEA:** Problems complexity and the multitude of unfulfillments in environment monitoring and resources protection, according to the internal and international law principles and regulations for environment as well as due to the missing quantitative and qualitative data about environment state in developing countries regions on one hand and due to the non-observance of ecological requirements, in conformity with the humanitarian law principles and rules, that forbid the use of weapons that cause superfluous and serious prejudices to the natural and human environment on the other hand, impose *of necessity* unified processes of implementation, monitoring and administration for the entire System of International Environment Arrangements (SIEA), otherwise said, they impose a real *normative unification*.

While analyzing the dimensions of the new system, the cooperation objectives, and of the communication with other complementary systems respectively, gain other highlights, other priorities and other effects, in consequence, using other methods corresponding to other means, being well known that SIEA functions will be different from the total of functions of each component (treaty, agreement etc.), separately considered. In fact, the most useful information is the one that is referred - in view of being efficient - at the same time to physical, social, economic and administrative factors, restricted by the juridical ones, information that change in time and space. In addition, besides the *complexity* of the factors that we have to take into account, there also appears the *speed* in taking the adequate and relevant decision. Though, how can we solve such a challenge, especially since is addressed to the environment? How can be clarified the remaining ambiguities in applying the special principles concerning remote sensing? There are questions to which we have found, partially, an answer through geomatics techniques, starting from the spatial reference data; and there are questions that will find their answers completely through the elaboration and application of a normative document concerning remote sensing activity at international level.

## 1.2 Geomatics and hetero-interdisciplinary cooperation

**1.2.1 "Geomatics" concept:** This concept refers to the scientific and technical activities field, comprising automated processing for geographical data, within which an important component is represented by remote sensing data for the Earth. The improvement of the existing technologies together with the integration – besides spatial data – of other data types (biological, geodetical, etc.), the geographical information systems (GIS) were used in various specific and general applications, in view of environment factors modeling and of "coverage" evaluations for some micro-regions. From the point of view of the operator as well as from that of the beneficiary, GIS techniques architecture has fully proved its functionality, reaching unforeseen performances. The benefits and effects of these techniques are extremely relevant: the *benefit* of extracting quick information; the *effect* of quality thematic information.

**1.2.2 The second rational approach: geosystems convergence: The geosystemic approach (GSA)** takes into consideration a hetero-interdisciplinary cooperation between the different unrelated disciplines, cooperation that comprises many disciplines within a series of systems converging to a unique objective; besides the technical disciplines of the remote sensing system, disciplines specific to informatics system participate to this cooperation, without leaving aside the biological and sociological systems. In fact, the new approach facilitates prompt means (solutions), specialized and useful for environment administration or ecological reconstruction problems, among which we mention:

- synoptic appraisal on environment;
- reiteration of satellitary images;
- data processing capacity and speed;
- spatial modeling capacity;
- validation of models for modification forecasting;
- decisional models development.

No doubt, remote sensing development brought multiple effect consequences in key-fields, at local, national and international level. According to some authors, the consequences are of technical, social, economic and politic range. They can be mainly illustrated as follows:

- the possibility of enclosing, in a geosystemic approach, assuring coherence (from technical point of view) and facilitating the communication, according to this approach, among various structures of social life: technicians, administrative and politics decision-making persons (at social level);
- enlarging the group of those who are interested in using GIS integrated remote sensing as an instrument liable to increase the analysis capacity of bio-socio-geographical phenomena (at economic level);
- expanding the remote sensing contribution at public and private sector level, through a sustained policy of profile specialists training (at political level).

While in the initial and maturity phases of spatial remote sensing (experimental and operational respectively) there was demonstrated the value of spatial data insertion in different thematic GIS, in social practice, the models of interstate collaboration leave much to be desired. Especially it is about collaboration relationship among developing and industrialized countries, the latter being those who own remote sensing techniques. In this case, setting a collaboration was not easily and well done, but it continuously stressed out the problems arising from the balance between *necessity* (there is no question

that remote sensing, now integrated with the geomatics, presents enormous benefits in assuring environment protection) and *possibility* (following three classical models: buying key-services, technology transfer and institutional development). At the present, the market of these models is, to an important extent, out of date; in this respect, there was proposed, in view of fighting against the permanent dependency on highly industrialized countries, *the partnership model*, focused on the observance of mutual needs and on the alternative of a lasting technological development.

Considering some opinions expressed in profile literature, synopses or even the obstructions in the field of the abovementioned cooperation could have been facilitated by the following factors:

- inadequate combination between high technology and classic instruments (existent and active);
- hostility of some specialists or decision factors against the technological revolution;
- insufficient specialists training and motivation at local level, etc..

Yet, from our point of view, the main cause consists in the poor intra- and inter- institutional collaboration, existing at regional and international level. We ask ourselves how can we cope with new risks of failure or with old challenges already known, concerning the absence of binding rules in terrestrial remote sensing activity.

**1.2.3 Confirmation of premises for a normative consolidation - SEOS:** The premises for establishing a System of Earth Observing Satellites (SEOS) are either existing (unfulfillments and imperfections but especially the needs of new approaches) or future (the necessity of a preceding multilateral convention, signed by the interested countries). Their confirmation would first of all mean that the obstructions circle would close. Once confirmed, the new juridical entity may develop, on a permanently monitored and coordinated strategic basis, a multilateral and multispecialized collaboration. Regarding the preparation of the convention project, it is to be effected within the COPUOS Legal Subcommittee, based on the answers given by all UNO member states to a questionnaire and based on the text proposals (articles, norms) of the interested countries.

## 2. PARADIGM CHANGES AND PROJECT OF AN INTERSYSTEMIC STRUCTURE

### 2.1 Integrative strategy, institutional recognition

**2.1.1 Globalizing trends and catalyst role of remote sensing:** Paradigm changes appear at different levels: socio-professional structures (of attitude, mentality, including surveyor or cartographer mentality), complexity degree of problems (technical, economic and social), convergence or communication force (interdisciplinary, intersystemic) or juridical strategy content (from cooperation strategy to cooperation between systems of strategy).

Digital civilization, expression of modern technologies that has revolutionized the processing and information speed; in consequence, the action plan and the impact on decision had profound effects on the *global market* within which all the other markets including that of thematic spatial information interact. As global system, the development of Earth teleobservation itself, with the main products brought on GIS market (public-civil information as well as private-commercial

information) had a *catalyst role* for the globalizing and automation trends of Society and Man-Nature relationship.

### 2.1.2 Informational explosion imposes communication improvement:

Informational society is about to develop new institutional forms of international and regional cooperation; they represent the reintroduction of the chance to reduce, in a certain historic time, the hiatus existing among the developing countries and the industrialized ones. At internal level, the information access law is the decisive step of any democratic society to the condition of civil society, a new type of relations between state and citizen. At its turn, the international civil society, through the relations democratization between sovereign states, can become a partner of the states.

We must admit that, in doctrine, information is sometimes considered as *neutral*; of course, the important thing is who will benefit of it or in what purpose. The purpose must be a peaceful one; it must serve the harmony of human society, the reestablishment of natural relationship between Man and Nature. At the same time, information has the attribute of being *extensible* and *non-linear* (of multiple use). In its present format (digital), information may be electronically transported (easily and rapidly). It is true, at prices that, in some opinions, it is not yet reasonable. We do not avoid restating a well-known assumption: the one who owns information also has the power to set the price (and not only that). So, we do not avoid asking, rhetorically, the following question: is information, really, neutral?

We shall also stress out that, in the perspective of the globalization of the informational market, the fact that GIS techniques play the major and unique role of integrating, analyzing and evidencing different types of information and, fundamentally, the component with spatial reference. The use of these techniques will be more and more requested in view of achieving the objectives of correlating population growth with the urbanization degree, with pressure on environment and natural resources limitations. Concluding, we can admit that this spatial component is *dominant, objective, decisive and opportune* for the improvement of Terra's system model.

### 2.2 Towards a specialized structure: ICC/RSEP

**2.2.1 Identity of interests, dominant attitudes, institutional approach:** As we have seen, the "spatial era" was finally connected to the "informational era" and the critical signals have accelerated, in the middle of transition to geomatics, geoinformatics and geoiconics, among the possible signs of paradigmatic change, the transition from the cooperation strategy based on different objectives, to communication or specialized cooperation of some strategy systems (SIEA and SEOS), on one unique objective.

- **Identity of objectives.** Behind the two systems there are, placed at a major convergence, two "intergovernmental communities", one that serves international, regional and sub-regional treaties unification and the other serving the symbiosis between remote sensing and geomatics, materialized through a possible, yet necessary multilateral convention concerning remote sensing activity using satellites, oriented towards an unique objective: environment and resources protection. So, besides the two "communities of interests", embodied by SIEA and SEOS hypothetical systems there is a common fundamental theme that, in a possible future, could be double-focused on the projection of Earth's ecological systems.

- **Attitudes and other dominant themes.** In some "critical moments", in view of supporting the development of a remote sensing system, a series of positions were taken up and

contoured, as a consequence of the profound changes in the world, in the evolution of extra-atmospheric space use in peaceful aims in juridical, political, technical and economical terms; but less in *institutional* terms, we have to add. So, from UNISPACE II (1982) where the attention – within the Spatial Applications Program (SAP) – was focused on developing remote sensing means, on access to (and the need for) *information* respectively; next, UNO program (SAP) is to promote (thematic) applications for the (spatial) information field. As well, important mutations appeared in the attitude of specialists and in dominant themes of ISPRS congresses, works that have evolved within a registry with “democratic touch” – we could say – from the “need for the best possible products!” (17<sup>th</sup> Congress in Washington, 1992) to the “need for geoinformation for everybody!” (19<sup>th</sup> Congress in Amsterdam, 2000). As we can see, under these circumstances, the institutional aspects did not represent the object of some “accents” or “revelations”.

- **Institutional approach.** Starting from the premises of the two approaches (IDA, GSA), the creation of a specialized organization, precisely of an International Coordination Centre (ICC) for Remote Sensing and Earth Protection (ICC/RSEP), could administrate a continuous and specialized communication between SIEA and SEOS. In this respect, the approach can be motivated using the recommendations of the 6<sup>th</sup> Workshop on spatial international cooperation (Sevilla, 2001).

### 2.2.2 Proposals and arguments in favor of institutionalization

- **Proposals.** This desideratum may be fulfilled, according to the ideas suggested within the *proposals* foreseen by UNO documents (projects, questionnaires), in the following ways:

- within a single country (the case of USA, Russia, etc.);
- at a group of countries level (the case of ESA, etc.);
- as a specialized agency, under the auspices of UNO;
- as a new international organization.

The multitude of international and regional institutions (intergovernmental and nongovernmental) involved in remote sensing activities, and also the thematic character of spatial applications bring to attention the “question of assuring a coordination at a higher standard”. Yet to such a standard the last two proposals are referring. Which one is the adequate? Concerning the institutional approach, Romania has sustained a clear point of view in this regard, since 1974, meaning that the United Nations must admit not only the proper importance of “terrestrial remote sensing using satellites” but also the creation, with this purpose, of an “*international centre under the UNO auspices*, as well as of some *regional centres*” (-our underlining-). In view of encouraging the cooperation among all structural strategies (scientific, technical, administrative), the governments will have to create National Coordination Centers (NCC) for Remote Sensing and Earth Protection (RSEP), that will make media and information (magazines, the procedure of data and spatial data acquisition, the aero-spatial data bank, electronic post services, specialized library, etc.) available to internal users. The public or private sector will support the *training* and *research* units (the personnel qualified for institutes for R-D and projects elaboration, public and private); in the new context, the NCCs will have to support the training and research task within universities.

The World Data Centre (WDC), supplied by the National Data Centers (NDC) with remote sensing data about the Earth, oceans, atmosphere and stratosphere, will enter direct relationships (on line) with the International Coordination

Centre (ICC) and with the NCCs respectively. Concerning the world archives, these can still be completed with data from some special regional programs (at European level this was the case of CORINE LAND COVER Program); in this way it will be possible for data and information of SEOS to be used to a greater extent in the process of implementation and development of SIEA .

- **Arguments.** They are generated by the requests of some sub-components of strategic plans of lasting development at national level, in view of:

- a partnership among developed countries (suppliers) and developing countries (consumers);
- a new partnership paradigm among governments (public), corporations (private) and universities (academic);
- adopting the methods of satellitary data processing with respect to bio-geographical parameters of the “North” on one hand and to those of the “South” in the other, giving special attention to intra- and inter-institutional collaboration;
- promoting the technological and informational systems, considering the following aspects: the policy for information control, the availability of commercial sector, the displacement of gravity centre from supplier data to information requestor, from data access question to information access;
- a clearer definition of non-discriminatory access to spatial data or information, a more substantial definition of indigenous exploitation capacities of satellitary images;
- offering assistance to NCC, to regional and zonal centers for processing and distribution in view of understanding attributions (rights and obligations), settled through the unification of juridical approaches and standards of SIEA and SEOS;

the transition from the phase of Earth observation to operational phase, having the opportunity of some applications using digital images of high resolution, integrated in local GIS.

### 2.2.3 Mutual contributions within intersystemic communication:

The 6<sup>th</sup> Workshop on Spatial International Cooperation (Sevilla, 2001) has adopted 8 recommendations of the Work Group concerning “The Contribution of Earth Observation Systems to the Development and Implementation of Multilateral Environmental Agreements”. We shall mention the main recommendations regarding the act of inter-systemic SIEA-SEOS communication, as follows:

- SEOS community must learn more about the needs and objectives of SIEA community (the examination of use modalities for remote sensing data and information process in the field of international legislation and regulations, or in the field of policies and programs concerning environment and natural resources protection, at national and local level). Symmetrically, SIEA community must also learn more, at its turn, about SEOS capabilities;
- SIEA and SEOS communities must encourage interdisciplinary approaches (among specialists groups acting in the juridical field of environment protection and those acting in the technical field, and within disciplines that belong to geodesy as a science respectively);
- SEOS community must best support SIEA in identifying the information requested by its themes;
- SIEA community must take into consideration the information coming from all sources (yet, the use of SEOS sources and of derived information consecration must occur

correlated with the juridical obligation in force, and the potential growth in complexity must be equilibrated with the potential decrease in transparency);

- SEOS and SIEA communities must act in coordination in order to assure the institutional continuity of the information that is based on SEOS and requested for SIEA implementation (relevant informational parameters, obtained through research/experimental programs, must have continuity in operational programs).

The above mentioned workshop had 5 work groups. Their reports have been integrated within a document named "Spatial International Cooperation: Challenges Addressed to the New Millennium". Submitted to widespread circulation, the document is expected to play a significant role in optimizing the political and scientific conception concerning the juridical strategy of inter-systemic communication.

It is already a fact that in one hand, in many cases SEOS data and its derived products will be usable for SIEA in a more efficient way and in the other, at the same time they will be used at the very SIEA efficiency evaluation concerning the achievement of global, regional, national and local objectives.

**2.2.4 Epilogue, the phases of the project:** Once UNO General Assembly will take a principle decision in this sense, the phases could be defined, briefly, as follows:

- SIEA formation – at UNEP (Nairobi), where specialists in representative fields will elaborate a document project submitted to the approval of UNO General Assembly (that will also foresee SIEA statute);
- SEOS formation – at UNO (New York), where COPUOS members (juridical Subcommittee), based on the proposals and on the answer given to a proper questionnaire, will elaborate a project of multilateral convention concerning remote sensing using satellites (that would also foresee SEOS statute);
- International conference – under UNO aegis, where participant countries will adopt the International Convention concerning the satellitary remote sensing activity and the common statute of CIC/RSEP, as a specialized agency of United Nations, laying down, in this way, the osmotic communication between SIEA and SEOS, through the realization of a cooperation between two system strategies, normatively consolidated.

## REFERENCES

Bonn, F.(coord.), 1996 *Precis de teledetection*, vol. 2: Applications thematiques. Presses de l'Universite du Quebec/AUPELF-UREF, pp. 573, 575-590.

Fritz, L., 2001 *The Contribution of the Earth Observation Systems to the Development and Implementation of Multilateral Environmental Agreements*. Highlights, vol. 6, no. 3, pp. 24-28.

Neer, J., 1999 *A Commercial Perspective on a Changing Landscape*, Highlights, vol. 4, no. 3, p. 23.

Plevin, J., 1974 *La teledetection des ressources terrestres: un point de vue europeen*. Impact: science et societe, vol. XXIV, no. 3, pp. 261-275.

Pornon, H., 1992 *Les SIG: mise en oeuvre et applications*. vol. Traite de nouvelles technologies, serie Geographyque assistee par ordinateur, Editions Hermes, Paris.

Sion, I., 1977 *Aplicatii ale tehnicilor spatiale in domeniul protectiei si gestiunii mediului acvatic*. Aspecte tehnico-stiintifice si de drept international, vol. Stralucirile apei (editor-in-chief Al. Ionescu and V. Delurintu), Slatina, p. 196.

Sion, I., 1980 *Imperativele ecologice si necesitatea unei strategii politico-juridice in domeniul dezarmarii*. Revista romana de studii internationale, year XIV, pp. 324-328.

Sion, I., 1986 *Evolutii in cadrul institutiei raspunderii internationale: forme aplicabile in domeniul protectiei mediului inconjurator*. Revista romana de studii internationale, year XX, pp. 464-476.

Sion, I., 1990 *Ecologie si drept international*. Editura Stiintifica si Enciclopedica, Bucuresti, pp. 26-29, 46-126.

Sion, I., Csaki, M., 1995 *Contributia IGFCOT la realizarea proiectului Corine Land Cover in Romania*. Analele IGFCOT, vol. XV.

United Nations Environment Program, 1981 *Doc. GC/9/6*, p. 35.

United Nations Organisation, 1991.*Doc. A/C. 1/P.V. 1975*