

MONITORING RENEWABLE NATURAL RESOURCES - A JOINT PROPOSAL
OF THE EASTERN-CENTRAL EUROPEAN COUNTRIES

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ABSTRACT

The implementation of advanced technologies insustainable management of renewable natural resources and environmental rehabilitation has become one of the prerequisites of the successful transformation of agricultural and environmental sectors in the countries of Eastern-Central Europe. In recognition of the urgent need to develop and build up a sub-regional multipurpose land remote sensing and G.I.S. capacities in these countries, and in order to strengthen the services needed to support the restructuring of the agricultural sector and to improve environmental monitoring, a multilateral regional project has been prepared by the Hungarian Ministry of Agriculture¹ in frame of the regional PHARE programme of the Commission of the European Communities.

The paper highlights a proposal and recommendation on the development and implementation of a sub-regional remote sensing and G.I.S. based infrastructure network of the countries in transition. Background, objectives, technology transfer and suggested participants, potential users, actions to be done and related estimated costs are described.

KEY WORDS Satellite remote sensing, Monitoring, Agriculture, Environment, Information technology, User service, International cooperation

1. BACKGROUND

There is a common need of the Central-Eastern European countries to use the advanced aerospace remote sensing technology and ground-related information management (G.I.S./L.I.S.) techniques especially for applications associated with renewable natural resources as:

- wide-area environmental monitoring and site/impact analysis,
- agricultural inventory, monitoring, modelling and forecast,
- landcover assessments, land use planning and management,
- forestry,
- water management,
- regional planning and development policy, landscape analysis,
- G.I.S./L.I.S. assisted evaluation of marginal regions,
- digital cartography and thematic mapping.

All the Eastern-central European countries in transition have the same potential interest in upgrading the infrastructure also required for joining the European agriculture and environment protection oriented remote sensing programmes (MARS, CORINE) driven by the Commission of the European Communities. CEC is also targeted in order to support this regional-size initiative through its PHARE Aid Implementation Programme.

In recognition of the urgent need to build up the remote sensing and GIS/LIS capabilities of the Central/Eastern European countries, and in order to be able to provide the services needed to support restructuring of their agriculture sectors and to improve environmental monitoring a multilateral regional project prepared by the Ministry of Agriculture of Hungary was finalized and recommended by the participants, of a FAO-ESA Workshop held in Budapest last fall.

¹ The original draft was prepared by the PHARE Aid Implementation Unit and the Department of Lands and Mapping both of MoA and was submitted to the DG I of the CEC for approval in Spring 1991.

Upgrading the land remote sensing technology, its application in the desired areas and integration with the ongoing European programmes could be most rationally and effectively done on subregional basis:

- even with the national shades of emphasis, the Central-East European countries have essentially the same medium terms objectives in application of the land remote sensing system,
- the multidisciplinary feature of the land remote sensing can be utilized more adequately and efficiently in a regional solution than heterogeneous parallel projects,
- scientific work, technology transfer and training can be organized more effectively in regional project,- the data exchange, communication and utilization of means and information in the resulting integrated European system can be solved at a much higher level and efficiency in a regional development programme.
- the required coordination to be done on both ends (European Community and the Central-European Countries) will yield higher return on investment, in time, training, equipments and faster overall results.

The situation in remote sensing research and application over the subregion seems to be the following:

- In Bulgaria, the R+D had emphasized the remote sensing instrumentation (mainly for the space segment); in Czech and Slovak Fed. Rep. and Poland the forestry applications have achieved an internationally acknowledged level;
- In Hungary, especially the agriculture-oriented aerospace remote sensing technology and monitoring and mapping techniques have been developed, including the instrumentation developments in the visible, infrared and microwave spectra. Also geological and water/environmental management applications are to be mentioned;
- In Rumania no significant result in the land applications of remote sensing is known but plans are made for development and dynamic improvement can occur.

At present acknowledged National Remote Sensing Centres exist only in Hungary and Poland that provide similar service for their user community as the national centres of the European Space Agency's member states. In other countries of the sub-region the institutional background of remote sensing is mainly academic (R+D) or university level.

In Hungary, there is moreover a national remote sensing programme under the supervision of the National Committee for Technological Development since 1980 with full support of the Hungarian Academy of Sciences, and the ministries involved. The Remote Sensing Centre (FÖMI) functions under guidance of the remote sensing coordinator based at the Ministry of Agriculture.

The importance of the application (and development) of the remote sensing technology has received early recognition in EC's PHARE programme too. The 1991 PHARE regional programme in its environmental component does provide the assistance to remote sensing applications. This recently launched EC project for surveying the status, needs and potential application areas of remote sensing in the Central-European Countries (Assessment of the Potential Use of Earth Observation Application in the Central-Eastern European Countries) will provide a detailed overview of the situation and its conclusions and recommendations expected to be available latest in June 1992, and will be used to

refine the design of the present project proposal. Sub-regional coordination started also in another but technologically related area. The European Association of Remote Sensing Laboratories (EARSeL) initiated to set up a Working Group for coordinating the scientific aid for Central European countries in the different European aid programs and P. Winkler of FOMI, Hungary, was appointed as the Head of the Working Group in January, 1992.

Participated by the European Space Agency (ESA), Agenzia Spaziale Italiana (ASI) and the Austrian Space Agency (ASA), the member countries of the Central European Initiatives held its last meeting devoted to Space Research and Applications in Budapest early February, 1992. According to the memorandum, the space applications initiatives on satellite geodesy and Earth observation suggested for regional cooperation will be compiled in case of Hungary - under the umbrella of the just established Hungarian Space Research Office - by G. Remetey of MoA. This activity will be supported by the Italian Space Agency.

Contracted by the European Communities, an assessment of the potential use of Earth observation applications in the countries of Central and Eastern Europe has been started by an expert team headed by Prof. (Emeritus) Dr. C. Voute, and staff members of ITC, GAF and Scott Conseil. Over 600 questionnaires were circulated addressed to potential data users, education and training institutions, remote sensing centres and ITC alumni. The replies is under compilation and a qualitative and quantitative analysis will be made also taking into account of the personal impressions of on-site visits and interviews. The final report will be submitted to CEC decision makers.

2. OBJECTIVES

The overall objective of the project is to speed up introduction of operational applications of remote sensing and GIS/LIS technologies in the Central/Eastern European countries and to increase benefits from their appropriate use through regular appraisal of decision makers from the region on current capacities of these technologies to meet the information requirements of the agricultural and environmental sectors.

Major issues related to the mid-term objectives are as follow:

- Establishment, development and upgrading of the land remote sensing capacity in the Central-Eastern European countries for application in the planning, monitoring and management of natural resources and related human activities.

- Joining the European programs MARS as well as CORINE Land Cover, CORINE Air and CORINE Biotopes databases.

- Development of the capability to support the PHARE Danube River Basin and "Black Triangle" program started under the PHARE 1991 regional programme.

The region concerned is the subregion of Central-eastern Europe, namely the Czech and Slovak Republic, Poland and Hungary.

The region concerned should be extended as soon as possible (using UN funds) towards also Albania, Rumania, Bulgaria, Slovenia, Croatia, Estonia, Latvia and Lithuania joining their representatives in the network of cooperating institutions. According to the recommendation of the representatives of five countries off the region, a draft project document should be finalized and submitted by FAO, ESA and CEC JRC to potential donors by the end of April 1992.

3. ACTIONS TO BE DONE

The project is planned for three years (1992-1994) covering the following activities:

3.1. Advisory activities

- Survey of needs; detailed specifications of the sub-regional objectives; elaboration of the sub-regional developments concept.

- Detailed specification of the equipments and softwares needed for each participants of the subregion on the basis of the suggested configuration (see paragraph 7.) and the presently existing technical facilities of the national participants.

- Setting up an information system and advisory network within the sub-region with linkages to international centres as FAO RSC, CEC JRC IRSA, EARSeL....

3.2. Equipment and software installation activities

- Installation of the hardware configurations and softwares at participating centres

- Building up a network of the configurations installed at the participating centres

3.3. Training and education

- Specification of sub-regional training needs and establishment of a training program; execution of the program which supposed to include:

- * advanced image processing applications
- * raster and vector GIS processing
- * current trends in remote sensing
- * computer and periphery operation and maintenance
- * experimental and sampling design, sampling for integrating satellite, aircraft and ground measurements in statistically viable way
- * database design

- Application oriented thematic workshops organized in cooperation with institutions as FAO, ESA, Telespazio, ITC, ...

- Scientific exchange for experts among the participating countries with EC countries

- Organizing of meetings and seminars devoted to experimental and operational remote sensing applications

3.4. Development activities

- Development and application of the existing softwares of the participants on the installed new hardware configuration. Every participant should undertake to develop an application in which it has earlier results, achievements or plans.
- Systematic integration with CORINE and MARS

3.5. Data and information exchange

- Data and imagery exchange within the subregion with EC countries.

4. IMPLEMENTATION

- Survey and evaluation of the subregional needs, elaborating of a subregional development concept using the technical assistance from the EEC countries including expertise of ESA, FAO and JRC ISPRA;

- Training and visiting scientist program for experts of the participating countries in leading EEC, FAO and ESA remote sensing technology and applications centres.

- Organization of application-oriented thematic workshops regularly (twice a year).

- Attending expert's meeting, seminars, workshops and conferences devoted to experimental and operational remote sensing applications in the EEC countries.

- Development of harmonized and/or standardized basic infra-structure and implementation of basic technology needed for remote sensing in order to support agricultural and environmental monitoring applications in all participating countries.

- Acquisition, preprocessing, analysis and dissemination of remotely sensed data (at least one dedicated laboratory per country able to accept standardized remote sensing data products and to support interactive digital image processing, geocoded spatial data handling and information management including archiving, presentation and distribution).

- Higher amount of satellite remote sensing data (Landsat, SPOT, ERS-1, NOAA/AVHRR etc) - supplied by European distributors - are needed for multispectral, multiplatform and multitemporal applications.

5. SERVICES REQUIRED

High-level technical assistance and consultancy from ESA, FAO and leading space and application labs of the EEC countries (JRC Ispra, GDPA Toulouse, ITC Enschede, CCG Oberpfaffenhofen etc). Multilevel training for managers and decision makers, scientists, operators, potential huge users and educational staff members of the region.

6. SUPPLIES REQUIRED

- The upgrading of the facilities of the existing dedicated remote sensing labs (one per country) to be able to provide standardized and value added data and products for the domestic user community. (The upgrade includes adaption of filmwriter/scanner, workstations, storage devices and media, on-line data base access facility (to catalogue, e-mail, references, quick-look data etc) and related softwares. This hardware/software adaptation would be able to accept standardized data products and support digital image processing, geo-referenced data handling and L.I.S./G.I.S. assisted applications.

- Based on the remote sensing data provided by the European Space Agency (SPOT, Landsat, ERS-1, NOAA AVHRR etc) the utilization of the resources of the dedicated labs could be available as spare also for the participating countries.

- Establishment of a joint microwave instrumentation fleet (SLAR, SAR, MW Radiometer and related ground segments) already available for use of the participating countries for all-weather monitoring applications.

Location of delivery of the equipments is the dedicated remote sensing centre in each of the participating countries.

7. INPUTS

7.1. EC/PHARE contribution to the subregion as a whole:

- a) advisory services
- b) half of the training
- c) network hardware and software for subregional and European linkage

7.2. EC/PHARE contribution to each of the participating countries to create the technical and human resources and informatics base for the subregional work:

- a) advisory service
- b) training
- c) equipment on the basis of the following suggested configuration:

- personal computers (2 Pcs with 486 processor)
- workstation with UNIX operation system
- digitizer (A0 size)
- scanner
- large format thermal printer
- electrostatic plotter
- film writer
- photo laboratory equipments
- remote sensing data processing packages

- GIS packages
- graphics software (for vectorization)

7.3. Government contribution

Generally equipment that are available as counterpart contribution is, rudimentary with a few exceptions. Even if, available sometimes it will be difficult to integrate them into a European system. National expertise will be used for work on the project, these however will need some reorientation. Office and laboratory facilities will be made available in any case in each participating countries.

Indication for the contributions are as follow:

Bulgaria:

- a) few trained specialists in remote sensing and software development
- b) basic equipment and facilities

Czech and Slovak Fed. Republic:

- a) few trained specialists in remote sensing and operators for data processing, experienced in various application-oriented pilot projects and cost studies;
- b) PC based GIS system, photolaboratory equipment.

Hungary:

- a) few trained specialists and operator staff in remote sensing and software development, up to now 300 man-years R+D investment in agricultural applications (crop monitoring, soil, environmental and water management)

- b) PC based GIS systems, photolaboratory

Poland:

- a) GIS specialists and specialists of data processing
- b) some GIS equipments

Rumania:

- a) few specialists involved remote sensing and software development
- b) some remote sensing equipment

8. OUTPUTS

After three years of project life the participating countries expect to achieve the following results:

- a) Improvement at the present basic land remote sensing facilities for potential application in fields mentioned above.

- b) A higher degree of effective integration into the European programs MARS and CORINE for which experiments will have already been performed. This would also include mutual data communication. The national priorities for application of remote sensing techniques as they now appear are:

Bulgaria:

Agriculture, forestry, environmental monitoring, land use, urban planning and management, pilot studies based on specifics of Balkan peninsula

Czech and Slovak Fed. Republic:

Environmental monitoring and environmental management analyses, land use and regional planning-at the level of district office, agricultural inventories, crop assesment and yield forecast, forestry hydrology and water pollution monitoring.

Hungary:

Setting up a basic system for remote sensing centre that provide data to all users of the region, methodologies of different applications such as country-wide crop area assessment, yield forecasting and early warning, selected environmental applications, digital cartography.

Poland:

Improvement existing methods for agriculture, forestry, oceanology, hydrology, ecological analysis, land use and urban planning, transportation and telecommunication planning, digital cartography.

Rumania:

Risk and safety analyses, industrial applications, physical monitoring, land use planning, GIS application, sea pollution, surveillance

agricultural and selected environmental applications.

9. PARTICIPATING ORGANIZATIONS SUGGESTED OR POTENTIAL USER INSTITUTIONS:

- Bulgaria
 - Space Research Institute
Moskovska str. 6, BG-1000 Sofia
 - Solar-Terrestrial Influence Lab,
Bulgarian Academy of Sciences,
Bontchev str. bl. 3
BG-1113 Sofia
- Czech and Slovak Republic
 - Czech Surveying and Mapping Authority
 - Institute of Information Theory and Automation,
Czechoslovak Academy of Sciences
Pod vodarenskou vezi 4,
182 08 Prague 8, CSFR
 - Institute of Surveying and Mapping
Kostelni 42, 170 00 Praha 7
 - Czech Institute of Technology,
Remote Sensing Laboratory, Thakurova 7,
166 29 Praha 6,
 - Slovak Office for Geodesy and
Cartography
Hlboká 2, 81 323 Bratislava
 - Research Institute for Geodesy and
Cartography
Hlumeckého 4, 826 62 Bratislava
 - Centre for Radar and Satellite
Meteorology
Mali Javornik,
835 15 Bratislava, CSFR
- Hungary
 - FÖMI Institute for Geodesy,
Cartography and Remote Sensing,
H-1051 Budapest Sas 19.
- Poland
 - Institute of Geodesy and
Cartography, OPOLIS Remote Sensing
Centre (IGIK-OPOLIS) Jasna 2-4, PL-00-950
Warszawa
 - Satellite Data Receiving and
Processing Centre
Piotra Borowego Str. 14
PL 30-215 Krakow
 - Dept. of Geodesy, Cartography and Land
Management.
Ministry of Physical Planning and
Construction
ul Wspolna 2 PL-00-926 Warszawa
- Rumania
 - Remote Sensing Lab, National
Institute of Meteorology and
Hydrology 97 Soseaua Bucuresti-
Ploiesti, P.O.Box 18, Buchuresti
 - Civil Engineering Institute
B-dul Lacul Tei 124, Sect.2 R-79302
Buchurest
 - Institute of Atomic Physics,
Romanian Space Agency,
- Remote Sensing Division and
Institute for Geodesy,
Photogrammetry and Land Management

National Scientific and Technological Authorities informed:

- CSFR: Department of the International
Cooperation (MoSP)
Nabrezi kpt. Jarose 1000, 17032 Prague
- Hungary: State Office for Technological Development
(OMFB)
- Poland: State Commission for Scientific Research
(KBN)
- National OECD/CEC Phare Coordinating Offices
informed: Bulgaria, CSFR, Hungary, Poland, Rumania.

10. COSTS

The estimated overall cost for the three years programme is 11.5 MECU equally shared between the three participating countries.

- a/ Expertise:
 - permanent international project coordinator
 - international short term advisers (various specialists)
- b) Equipment
 - national laboratory completions (see para 5.1.)
 - establishment of sub-regional facilities
 - satellite imagery
- c) Training
 - training in Central-Eastern Europe on the job of inter-country groups
 - training in western European institutions and remote sensing centres
 - scientific exchange, inter European workshops

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