ECONOMIC COMMISSION FOR EUROPE
UNITED NATIONS

UNECE Working Group on Environmental Monitoring
Task Force on Remote Sensing

in cooperation with the Institute for Environment and Sustainability (IES) of the Joint Research Centre (JRC) of the European Commission (EC)

and with the financial assistance of the European Community Tacis

First Workshop on
REMOTE SENSING APPLICATIONS FOR ENVIRONMENTAL MONITORING

19-20 May 2003, Ispra, Italy

REPORT OF THE WORKSHOP

1. The workshop on remote sensing applications for environmental monitoring was held in Ispra, Italy on 19-20 May 2003.

2. The meeting was attended by experts from: Austria, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Russian Federation, Tajikistan, Turkmenistan, and Uzbekistan, representatives of the European Environment Agency (EEA), the Regional Environmental Centre for Central & Eastern Europe (REC), the United Nations Environment Programme (UNEP) and the Institute for Environment and Sustainability (IES) of the Joint Research Centre (JRC) of the European Commission, as follows:

Country experts:

Austria - Mr Gebhard BANKO, Department of Ecology and Nature Conservation, Federal Environment Agency

Azerbaijan – Mr Imran ABDULOV, Chief of the Department of Environmental Policy, Ministry of Ecology and Natural Resources

Belarus - Mr. Aleksandre KOVALEV, Director, Republican Scientific and Technical Centre "ECOMIR"

Georgia - Mr. Ramaz CHITANAVA, Adviser to the Minister, Ministry of Environment

Kazakhstan - Mr. Murat IBRAGIMOV, Scientific Specialist, Kazakh Research Institute of Environmental Monitoring and Climate

Kyrgyzstan - Mr. Meder SEYTKASYMOV, Chief Specialist, Ministry of Environment and Emergencies

Russian Federation - Mr. Valeriy KUKOSH, Head of Division, Department of Information Resources and Technologies, Ministry of Natural Resources

Tajikistan, Mr. Timur NAZAROV, Chief of the Department of Scientific and Technical Progress and Standards, Ministry for Environmental Protection

Turkmenistan**,** Mr. Amanklych BABAYEV, Leading Specialist, Desert Research Institute, Ministry of Nature Protection

Uzbekistan, Mr. Kamalitdin SADYKOV, Chief of Division, State Inspection for Analytical Control, State Committee for Nature Protection

United Nations Economic Commission for Europe (UNECE)

Mr Yaroslav BULYCH, Consultant

United Nations Environment Program (UNEP)

Mr. Ron WITT, UNEP Division of Early Warning and Assessment, Regional Coordinator – DEWA-Europe

European Environment Agency (EEA)

Mr Chris STEENMANS, Project Manager, Land & Remote Sensing

The Regional Environmental Centre for Central & Eastern Europe

Mr Jerome SIMPSON, Head, Information Program

Joint Research Centre of the European Commission

Mr Manfred GRASSENBAUER, Director of the Institute for Environment and Sustainability

Mr Vittorio BARALE, Research Scientist, Inland & Marine Waters Unit

Mr Fransisco GALLEGO, Research Scientist, Land Use – Land Cover Unit

Mr Philippe MAYAUX, Research Scientist, Global Vegetation Monitoring Unit

Mr Igor SAVIN, Research Scientist, Global Vegetation Monitoring Unit

Mr Thomas KEMPER, Research Scientist, Soils & Waste Unit

Mr Carlo LAVALLE, Research Scientist, Land Use – Land Cover Unit

3. The meeting was opened by the organizers: Manfred Grasserbauer, IES, JRC EC and Yaroslav Bulych, UNECE, welcomed the participants and underlined the importance of remote sensing (RS) techniques for monitoring and reporting on the state of the environment. Yaroslav Bulych briefly described the activities that have been carrying out by the UNECE

Working Group on Environmental Monitoring in this direction. He underlined that the current workshop has been made possible thanks to the Tacis project "Strengthening Environmental Information and Observation Capacity in the Newly Independent States (presently EECCA)".

4. The participants adopted the agenda of the workshop and its main objectives:

- To review current RS application potential for environmental assessments at national, subregional and regional levels;

- To review current country requirements and capabilities in this field;

- To discuss the possibility of preparing a comprehensive project proposal, to be later submitted through the UNECE Working Group on Environmental Monitoring to the European Union GMES (Global Monitoring for Environment and Security) framework.

5. To reach the first objective nine keynote presentations have been made, as follows:

5.1. *Phillippe Mayaux*: The Global Land Cover 2000 project: a successful example of international cooperation for environmental mapping with remote sensing data.

The general objective of the project was to provide for the year 2000 a harmonized land cover database over the whole globe. A special focus of land cover map was made on forests, wetlands, and desertification. During the project there was a strong involvement of regional and local experts.

A new Global Land Cover database for the year 2000 was produced by an international partnership of about 30 research groups co-ordinated by the European Commission's Joint Research Centre. The database contains land cover maps with detailed, regionally relevant map legends and a global product that combines all regional classes in one consistent legend. The database is designed to serve users from science programs, policy makers, environmental convention secretariats, international and non-governmental organizations and development-aid projects.

A web site of the GLC 2000 has been created as a specific component within the web site of the Global Vegetation Monitoring unit at JRC. Its address is http://www.gvm.sai.jrc.it/glc2000/defaultGLC2000.htm
It includes general description of the project, the list and address of partners, information and links related to input data and their characteristics, the documentation related to the GLC 2000 legend, the list of publication related to the project, with specific reference to the workshop, and a "special events" page where information about the organization of the workshops can be found.

5.2. *Vittorio Barale*: Using remote sensing and integrated geographical data in monitoring and managing coastal zones, marginal basins and enclosed seas.

The first part of the presentation contains a draft proposal on RS of the Eurasian Environment with an objective to provide a set of environmental indicators derived from RS data over regional to continental scale, and over entire seasonal cycle. The pilot program for the Eurasian macro-region should consists of three parts:

(a) Opportunity awareness campaign (identification of contact points in participating countries; consultation sessions with national EO expert teams; indicators selection and indicators map production).
(b) Training activities (to familiarise end-users with operational exploitation of RS-derived information by means of thematic workshops and/or documentation & staff exchanges).
(c) Application demonstration exercise (assessment of environmental indicators and RS data, with feedback from end-users; development of methodologies and of demonstration data products).

The second part of the presentation described how it was possible to use RS to assess marine primary production, ecosystem food chain and biological pump. One of the used indicators was chlorophyll concentration and its dynamics during a year. Another indicator was sea surface temperature and its dynamics.

5.3. *Javier Gallego*: Land cover maps and land cover statistics: accuracy and fine scale profiles.

The presentation was dedicated to accuracy and fine scales profiles during the preparation of the Land Use/Cover Area Frame Statistical Survey (LUCAS). The LUCAS was initiated by Eurostat in close cooperation with the EC Directorate General on Agriculture with the main aim to support policy formulation in EU.
LUCAS nomenclature combines Land cover (57 classes) and Land use (14 classes). The two stage sampling were organized:

- Primary sampling units (PSUs) – systematic sampling on a grid of 18 km. The whole territory of EU has app. 9800 PSUs;
- Secondary sampling units (SSUs) – 5x2 points 300 m apart. Each transects joined 5 points. And 4 pictures N-S-E-W were made from one of the points. The database consists of more than 30 000 pictures. Transect were used to estimate length of linear elements and number of land cover changes.

LUCAS is organized in 2 phases:

(1) A field survey in springtime aimed at collection of data on land cover/use as well as on the environment;
(2) A farmer interview survey in autumn aimed at gathering additional information on yields and agricultural techniques.

The survey does not only cover the agricultural territories but the full range of possible land cover types (such as constructed areas, forests, bushes, grasslands etc.) and land-use categories (such as residential, industrial, recreational etc.)

The survey was carried out in 2001 (2002 for UK and Ireland) for the first time. The time for second survey is 2003.

5.4. *Igor Savin*: Remote sensing indicators applied for crop growth monitoring.

The main aims of Monitoring Agriculture with Remote Sensing (MARS) program includes:

- To contribute to the EU external aid and development policy, in particular to the EU Food Aid and Food Security policy by the improvement of the information on crop yield prospects in regions of the world stricken by food shortages;
- To check if agricultural subsidies for farmers have been provided correctly;
- To estimate the potential crop in order to avoid food shortage or market disruption and better calibrate and direct European Food Aid.

MARS could also contribute indirectly to the Agriculture and Trade policies by providing crop prospects information on Russia, Argentina etc.

Crop monitoring bulletins for 3 of the four pilot areas are produced monthly: Eastern Africa, South America, Mediterranean Basin, Russia and Central Asian Countries. The monitoring of the agro-meteorological situation is based on the analysis of the following decadal data: minimal, maximal and average air temperature, sums of precipitation and global radiation, decadal values of the climatic water balance, and decadal maps of the Normalized Difference Vegetation Indexes (NDVI).

5.5. *Carlo Lavalle*: Monitoring and assessment of urban developments.

The Directorate General Joint Research Centre (DG JRC) of the European Commission (EC) is performing a pilot project named MOLAND (Monitoring Land Use /Cover Dynamics). MOLAND was initiated to respond to the main mission of the JRC, which is to support the preparation, definition and implementation of EU policies and legislation. The main aim of the project is to measure of the extent of urban areas and regional developments, as well as of their progress towards sustainable development. The other aim is to create a network of partners and collaborators within and outside Europe. The land use and transport network databases for various cities and geographical areas in Europe are created. The project also covers wider issues linked to sustainable development.

The methodology adopted in MOLAND included the following main steps:
- Preparation of databases for cities and regions;
- Development of spatial analysis techniques for production of indicators and for definition of strategies for integrated territorial analysis;
- Development of modelling techniques for production of scenarios of evolution.

MOLAND focuses on the following four specific applications:
- Indicators of sustainable urban and regional development;
- European Spatial Development Perspective and sectoral policies with spatial impact;
- Strategic Environmental assessment and EIA;
- Creation of network of cities and regions.

The MOLAND web site: http://moland.jrc.it/

5.6. *Thomas Kemper*: Remote sensing for environmental impact assessment and monitoring of mining-related contamination by (experiences from the PecoMines Project and the Aznacollar accident).

The problem of mining waste includes contamination of soils, rivers and groundwater due to production of acid mine drainage (AMD) and mobilization of associated heavy metals.
There are two different ways of contamination:
- Diffuse pollution, a rather constant emission of relatively low concentrations during a longer period of time;
- Acute pollution, releasing large, often concentrated amounts of pollutants in a short time due to accidents.

Exploration of mineral deposits has been one of the driving forces for the development of remote sensing techniques. However, the same approaches can be used for environmental impact assessment and monitoring purposes.

Advantages of RS includes:

- Area-wide assessment, not based on point measurements;
- Application from local to regional scales;
- High repetition fate for monitoring (space borne sensors)

The Pecomines Project had few objectives:

- To contribute to developing a standardized regional inventory of toxic waste sites from mineral mining in Pre-Accession countries in relation to "sensitive" catchments areas. The PECOMINES inventory combines site specific information coming from existing data bases in the countries with geo-referenced spatial information o the distribution and extension of waste material being mainly derived from RS data. This information is linked to relevant standardized spatial data layers such as CORINE Land Cover, thus adding the spatial dimension to the inventory of mining waste at regional scale;
- To compare the legal criteria for the assessment and remediation of contaminated areas in Pre-Accession countries with regulations adopted by EU Member States and with the existing EU legislative framework in the area of waste management;
- To develop a concept and tools for impact assessment allowing to link the site/source related information with spatial information at catchment's and regional scale. This can be achieved by combining an indicator approach according to the DPSIR framework and an analysis of satellite remote sensing;
- To contribute to the assessment of the consequences of mining accidents such as the Aznacollar (Spain) and the Baia Mare/Baia Borsa (Romania) events.

The principal objectives of the Aznacollar accident study was to assess the potential of the combined application of ground and airborne reflectance spectroscopy to mapping, impact assessment and monitoring of metal mining related accidental contamination of a flood plain. The Aznacollar test area had been affected by a tailings pond accident releasing large amounts of heavy metal bearing pyrite sludge into the environment.

5.7. *Jerome Simpson*: Satellite imagery for environment by (status, constraints, challenges, and opportunities for increased use in Central and Eastern Europe).

The presentation described the usage of satellite imagery use for environment in three countries of Central and Eastern Europe.

For instance in Hungary satellite imagery are used to assess temporal changes in land cover through the CLC2000 "update", to selective mapping of drought, waterlogged, flooded areas, through Agriculture Remote Sensing Programme. The other project is to implement the "CLC1:50,000" for sustainable land use planning, rural development, habitats directive implementation. There is growing interest in the country from academia and business in results of the projects.

In Poland there are research projects to develop methodologies for monitoring forest decline, and management of temperate European sensitive ecosystems. Some projects have agro-environment applications: monitoring of marshlands, land degradation, soil moisture, and biomass. The other use of RS data is for sporadic assessment of natural habitats, some use of data for environmental impact assessment, typically for ecological disaster areas. In Poland one can observe a good level of awareness for GIS at national and local level but limited use of satellite imagery locally.

In Romania the biodiversity information system has been realized under support from the World Bank. The other projects: atlas main waste deposits, EIA and land reclamation /degradation studies, and wetland heritage in the Danube Delta Biosphere Reserve (mapping of reed beds, coastal morphology, water quality, land use etc.).

The main problems on the way to more wide use of remote sensing data for environmental monitoring are as follows:

(1) High costs for images and techniques (vs. limited funding);
(2) Limited capacity to implement nationwide activities;
(3) A lack of well-developed methodologies for image application: urban planning, EIA, pollutant monitoring;
(4) Transferring satellite image usage from the domain of IT/photo specialist: insufficient attention given to know-how transfer;
(5) Poor data supply for frequent reporting/monitoring (e.g. pollutant emissions) and assessment (e.g. disasters).

The author's recommendations include:

(1) Capacity building: international exchanges, working groups, showcase events, trainings, best practice sharing and pilot projects;
(2) Integration of RS data into indicators for key directives, legislation & development of methodologies for everyday usage;
(3) Market based mechanisms reliant on RS data to enforce legal compliance;
(4) Single European centre supporting use of RS data, with special focus on environment, addressing constraints;
(5) "EO-friendly" space strategies, subsidized imagery, and flexible pricing/usage policies, PPPs between data providers/users.

Jerome made a proposal to prepare a contribution to the draft EC's Green Paper on European Space Policy. He mentioned that any comments to the Paper are welcomed by the end of May.

5.8. *Chris Steenmans*: Use of remote sensing for environmental reporting in Europe.

In the presentation it has been underlined that user's prospective point of view and policy makers demand should be taken into consideration.

The presentation describes and summarised the potential use of Earth Observation (EO) for environmental monitoring:

- EO is a unique instrument to provide complementary information to existing ground-based monitoring systems; it can be used to fill in the missing gap for timely information, providing synoptic trans-boundary information. Data and information obtained through EO can easily be used within Geographic Information Systems (GIS) for overlay and comparison with other geo-referenced information;
- EO can be used to maintain consistent nationally reported information, by improving the comparability of measurements at European level and by providing an independent means for synoptic evaluation of the spatial distribution of important environmental events and their impact (e.g. land accounting);
- EO can help gather information in areas, which are not comprehensively covered, by ground monitoring networks (e.g., Black, Caspian and Barents Seas, Baltic States, Russian Federation);

- EO can be used for retrospective trend analyses and diachronic detection particularly of slow changes, such as, urban expansion, due to the existence of long historical satellite records;
- EO can be applied in conjunction with dispersion modelling for the tracking of very dynamic phenomena, such as, transported air pollution;
- Policy makers demand indicators to monitor environmental progress. EO represents a holistic rather than analytical approach, which could help improving links between different components of the DPSIR (Driving forces-Pressures-State-Impact-Responses) model through a more integrated methodology.

Chris supported the Jerome's proposal and underlined that to show common position from the workshop to the EC Green Paper is of highly important.

5.9. *Gebhard Banko*: Small structured land use and mountainous areas in Austria: a challenge for environmental monitoring using remote sensing.

In the presentation there were described experiences and capabilities of RS application in Austria. The potential issues include:

(a) Monitoring rural development programs;
(b) Growth of built-up area;
(c) Monitoring forested areas;
(d) Natural hazards.

RS applications for environmental monitoring should be developed and based on continuity of data, long term monitoring programs, legally binding reporting obligations, usage of multi-purpose products and cost benefit analysis.

6. To reach the second objective the country experts made presentations on the experience in the use of remote sensing for environmental assessments in their countries and/or on the specific interests in using RS results. In their presentation the experts delivered information on:

- Pressing environmental issues in respective countries;
- Current requirements of remote sensing data;
- Institutions, agencies involved in remote sensing applications.

6.1. The country experts presentations cover overview of relevant environmental problems of concern. The issues raised range from local scales, to regional/basin scales, and to sub-continental scales. At local scales, the main focus was essentially on the problems linked to anthropogenic pressure on the environment (e.g. urban sprawl, transportation corridors, special – protected or dangerous – areas). At regional or basin scales, the attention shifted mainly to water issues and resources (Georgia, Kazakhstan, Kyrgyzstan, Russian Federation) from coastal and marine management (Georgia, Turkmenistan) to monitoring of lakes, snow cover and glaciers (Georgia, Kyrgyzstan, Tajikistan). At sub-continental scales, land use / cover and land degradation (e.g. desertification) were by far the issues attracting the greatest interest (Belarus, Kazakhstan, Kyrgyzstan, Russian Federation, Tajikistan, Turkmenistan, Uzbekistan).

6.2. At the Workshop, the country experts exposed a long list of environmental problems and RS requirements, while their technical means and expertise remain at a very basic level (with a few exceptions, notably that of the Russian Federation, where both RS expertise and data are available and in common use). Therefore the main concern is to improve essentially the countries capabilities to exploit the RS potential for approaching several specific national and

trans-boundary environmental problems. The country experts underlined that the first step for a follow-up project involving international organizations and EECCA countries should focus primarily on capacity building issues. A lack and/or obsoleteness of equipment and software (Georgia, Kazakhstan, Kyrgyzstan, Uzbekistan), a lack of skilled specialists (Georgia, Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan), and a lack of images (Turkmenistan) were raised as the main obstacles on the way of wide use of RS for environmental monitoring.

6.3. Some countries have a developed system of institutions involved in RS application (Belarus, Kazakhstan, Kyrgyzstan, Russian Federation). Some country experts mentioned that a little effort has been done in recent decade in the field of RS application for environmental monitoring (Azerbaijan, Georgia, Tajikistan). Many experts (except Belarus and Russian Federation) underlined that there is a sharp decline in RS data use in their countries since the collapse of Soviet Union.

6.4. The country experts presentation were followed by the discussion and the issues were raised as follows:

- Necessity of a stronger cooperation between EECCA countries and international bodies and institutions in the field of remote sensing application for environmental monitoring and reporting;
- Development of a methodology and guidelines for integrating data derived from remote sensing to fill information gaps critical for the decision making process;
- Organizing training on data handling, processing and integrated environmental reporting across the Eurasian continent and in particular in the EECCA countries;
- Supplying equipment to EECCA countries.
- Publishing of guidelines and a handbook describing the methodology and approach used to integrate RS data into environmental reporting.

7. To reach the third objective it was agreed as follows:

7.1. The country experts were asked to send to the UNECE Secretariat one-page information answering three questions (environmental hotspots; baseline data sets; prospective project partners in their countries).

7.2. JRC in cooperation with UNECE, EEA, REC and UNEP will draft a detailed project proposal for a follow-up. The project proposal will detail the activities suggested during the workshop for the development of specific actions, over a period of 3 years. As it was already mentioned, the first step of the project should primarily focus on capacity building issues. In a second step, it will be possible to develop specific application demonstration programs. The project proposal should concentrate on the use of (already identified) indicators, derived from policy-relevant, transboundary, timely and affordable data sets and (whenever possible) time series.

7.3. Draft project proposal will be discussed and finalized during the second workshop on remote sensing applications for environmental monitoring organized by the Task Force (tentatively planned for 25-26 September 2003, in Baku, Azerbaijan).

8. The general conclusions of the Workshop are as follows:

8.1. The satellite-based remote sensing data offers the great potential, value and benefits to environmental protection efforts in Europe through:

- Enhancing state of the environment reporting by complementing existing ground, and airborne-based data by providing: unique time series information showing spatial and physical changes; data on trans-boundary issues; and in selected cases, an affordable and timely alternative to *in situ* assessments;
- Supporting the monitoring of legal compliance and progress in implementation of policy targets;
- Enhancing the information base of the policy planning process, and quality of resulting decisions made for environmental protection.

8.2. A set of critical environmental issues and priorities in the EECCA countries have been identified during the workshop as mentioned above (item 6.1.).

8.3. In order to identify lasting solutions that respond to the above problems a package of measures should be implemented over the course of three years (item 6.4.). To this end JRC in cooperation with with UNECE, EEA, REC and UNEP will draft a detailed project proposal to be later submitted through the UNECE Working Group on Environmental Monitoring to the European Union GMES (Global Monitoring for Environment and Security) framework.

8.4. Following the proposal by Jerome Simpson, a Statement for the EC/ESA Joint Task Force was prepared by the participated representative of JRC, UNECE, EEA, REC and UNEP and sent to the EC/ESA Joint Task Force (annex 1).

Annex 1.

Statement to the Commission/ESA Joint Task Force
responding to the "Green Paper on Space" [COM (2003) 17 final]

We, the undersigned, representatives of the United Nations Environment Programme (UNEP), the United Nations Economic Commission for Europe (UNECE), the European Environment Agency (EEA), the Joint Research Centre – Institute for Environment and Sustainability (JRC-IES), and the Regional Environmental Center for Central and Eastern Europe (REC) met at the first Workshop of the UNECE Working Group on Environmental Monitoring (WGEM) ad-hoc Task Force on Remote Sensing at the European Commission's Joint Research Centre in Ispra, Italy on 19-20 May 2003 to discuss *Remote Sensing (RS) Applications for Environmental Monitoring*.

We concluded that satellite-based remote sensing data offers the following potential, value and benefits to environmental protection efforts in Europe:

i) enhances state of the environment reporting by complementing existing ground, and airborne-based data by providing: unique time series information showing spatial and physical changes; data on trans-boundary issues; and in selected cases, an affordable and timely alternative to *in situ* assessments;
ii) supports the monitoring of legal compliance;
iii) supports the monitoring of progress in implementation of policy targets; and
iv) enhances the information base of the policy planning process, and quality of resulting decisions made for environmental protection.

…/and have agreed these benefits can today be realized in assessing the following environmental problems and priorities, identified during the above workshop as being critical in the Eurasian continent: desertification, soil degradation and salinisation, deforestation, habitat changes, urban sprawl, surface waters availability and quality, both in the terrestrial and the marine environment, and "hot spots" of contamination at the local, regional/basin and sub-continental level.

We strongly recommend that the following package of measures should be implemented over the course of three years, in order to identify lasting solutions that respond to the above problems, and exploit the aforementioned benefits;

i) establishment of a network of contact points in each country of Eastern Europe, the Caucasus and Central Asia (EECCA) involved in environmental reporting, data gathering and RS data management;
ii) collection and updating of baseline data sets (including European-financed RS data) in the above problem areas for key EEA environmental indicators;
iii) development of a methodology for integrating RS data into environmental reporting to fill information gaps critical to the decision-making process;
iv) disbursement of equipment and hosting of trainings on data handling, processing, and integrated environmental reporting across the Eurasian continent and in particular in the EECCA countries as a means to build capacity, exchange experience, identify obstacles and foster networking;
v) publishing of guidelines and a handbook describing the methodology and approach used to integrate RS data into environmental reporting, including cost benefits, and containing relevant indicators for standardized European environmental reporting by other administrations dealing with such environmental challenges.

We are convinced that these activities will:

i) contribute to improved environmental decision-making;
ii) enhance environmental reporting according to key indicators;
iii) provide input to the fourth assessment report for the next Environment for Europe ministerial conference (requested within parag. 30 of the Ministerial Declaration of the Fifth Ministerial Conference "Environment for Europe" signed in Kiev, Ukraine May 2003); and
iv) address "lessons learned" from data collection for the Europe's environment: the third assessment report ("The Kiev Assessment"), by enhancing current indicators and data reporting practices.

Noting that the EC's Green Paper on European Space Policy (COM (2003) 17 final) identifies (pg.22) that "Earth observation... enables more effective management of natural resources and stricter control of environmental parameters and regulations," and that the Commission/ESA Joint Task Force invites contributions within the frame of the ongoing consultation process until 30 May 2003,
we call upon the EC/ESA Joint Task Force to;

i) consider the above initiative as a pilot activity within the GMES Framework;
ii) monitor its results in identifying future actions that could build on the experiences gained in the practical application of earth observation data for environmental reporting; and
iii) consider the challenges and constraints encountered during the project's implementation as a means for identifying future actions that could address these obstacles and enable the success of future similar actions

Implementation of the above could stimulate demand for European remotely-sensed data, support the EC's objective to achieve sustainable development, contribute to the development of the European space sector, and support the realisation of GMES objectives including "coherent solutions operational by 2008."

Thursday 22 May 2003

Vittorio Barale, Institute for Environment and Sustainability (IES), Joint Research Centre(JRC) of the EC

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