

The European Centre for Space Law - operated under the auspices of the European Space Agency

**PROCEEDINGS OF THE
THIRD ECSL/DUTCH NPOC WORKSHOP**

**"RECENT DEVELOPMENTS IN THE FIELD OF PROTECTION
AND DISTRIBUTION OF REMOTE SENSING DATA"**

**ESTEC, NOORDWIJK
APRIL 15, 1994**

PROCEEDINGS

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AND DISTRIBUTION OF REMOTE SENSING DATA"**

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Organised by the Dutch NPOC

&

The European Centre for Space Law

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THE EUROPEAN CENTRE FOR SPACE LAW

In the context of the developments of the law of space activities, and in order to meet the needs emerging in Europe, the European Centre for Space Law (ECSL) was established in 1989, at the initiative and under the auspices of the European Space Agency, with the support of a number of pioneers in this field.

Objectives and organisation of ECSL

Objectives of ECSL.- The main objective of ECSL is to contribute to the development and improvement in Europe of the knowledge of the law of space activities. Such an aim is pursued mainly through three means: exchange of information among groups active in this area of space activities; improvement and promotion of teaching in this field; organisation of means allowing groups active in the law of space activities to communicate and exchange views. Another objective of ECSL is to promote, outside Europe, European activities and to contribute to building a unique position for Europe in the field of space law practice, teaching and publications.

A flexible and open structure.- Although the Centre gathers mainly practitioners, lawyers, professors, editors, students... it is also open to interdisciplinary exchanges. ECSL currently constitutes a group of 450 persons. The Centre is organised in a very flexible manner. It is not a new institute or research establishment attached to a localised body. It has no legal personality. It is an informal structure drawing together all those wishing to take part in elaborating and implementing European space law. Great potentials do exist in Europe in the field of space law but are often isolated or scattered, and a forum such as ECSL allows such potentials to be gathered and the European contribution to space law to be improved. The Centre functions with a very light structure composed of a Board elected for two years by the Members, which reflects the geographical and professional groups represented in the Centre, a General Meeting of members every two years, and a Secretariat of one person, responsible for the daily management of the Centre.

Relays in Europe for ECSL actions.- To facilitate its contacts with members, the spreading of information and organisation of activities, ECSL has stimulated the establishment of National Points of Contact (NPOCs), acting as relays between the members and ECSL. Thus, eight points of contact have been set up in Belgium, France, Germany, Italy, Netherlands, Spain, Sweden and the United Kingdom. Their status differs depending on whether an institute or center for space law exists in the concerned country, and the legal form that their members have chosen. Besides this function of relay, these NPOCs play an important role as initiators of activities such as conferences, symposia, and research for the organisation of which they receive the support of ECSL.

held in Madrid in May 1993. Proceedings are available from ECSL. ECSL also participates in a number of conferences, which are often organised at the initiative or with the support of National Points of Contact. Finally, ECSL supports research done by students, either helping them gather materials, or promoting their works. In this view, ECSL transformed its bursary programme into a publication prize which will be awarded to exceptional works, according to terms which have to be further organised.

Spreading of documentation.- An objective of ECSL is to spread in Europe a substantial documentation on the law of space activities, its teaching and practice.... Various means are being used to this end. Firstly, ECSL has set up, with the support of the European Space Agency, a space law database called ESALEX. Each ECSL member is allocated a password to access the database which contains basic texts of space law, ESA basic texts, statutes of other international organisations. These documents are provided in full text. Besides, the database contains bibliographical files of the University of Cologne and of the ESA Library. ESALEX demonstrations are organised at the occasion of ECSL events (workshops, summer course, general meeting...) or upon request by the National Points of Contact. A version of ESALEX on CD ROM will be available in the course of 1994; Secondly, ECSL publishes a newsletter, ECSL News, read by some 2000 persons worldwide, and especially by ECSL Members. This newsletter contains mostly articles and announcements on activities of interest for our members, and a number of issues deal with one specific topic on which they provide concise articles. Finally, ECSL also occasionally publishes books or booklets, proceedings... (see list and order form at the end of this book).

Financing.- Currently, an important part of the funding is provided by the European Space Agency, and punctual support is provided by other institutions at the occasion of specific events such as the summer course. From January 1994, a small membership fee is requested from ECSL members.

Activities and resources

ECSL's activities aim at stimulating interest for the law of space activities and efforts of its members in this field, and, mainly, to meet the needs and expectations of these members whether they are practitioners, professors, students.... Within this balance, various activities are initiated or supported by ECSL, within the framework of the two-year plan adopted by its members. The number of activities is now considerable and only the main ones will be highlighted here.

Activities directed towards practitioners. - The most important achievement in this respect is the organisation of a Practitioners' Forum once a year. The first Practitioners' Forum took place in 1992. This meeting is intended to fulfil the needs of practitioners to have, once a year, an opportunity to meet expert lawyers practising in the field of space activities, who will provide them with an update of their knowledge and information in this area. This forum is a one day session during which eight specialists present the last developments in telecommunications, EC law, contracts and procurement law, liability, insurance, each presentation being followed by a question/discussion period. This forum is very informal and none of the papers are published, therefore allowing participants complete freedom of speech and exchange of views.

Activities directed towards academics. - The most important activity in this respect - which is also the most successful- is the ECSL Summer Course on Space Law and Policy. This summer course, organised with the support of ERASMUS, the coordinating university (1992: Messina; 1993: Toulouse; 1994: Granada), the European Space Agency, the British National Space Centre and Martinus Nijhoff Publishers, gathers an increasing number of universities (8 universities in 1992, 15 in 1993, 25 in 1994). During two weeks, about 45 students attend intensive courses provided by about 30 outstanding professors and lecturers, on space law as such (Resolution of United Nations, space treaties) and on legal issues in space applications (commercialisation of space activities, telecommunications, remote-sensing, launching, intellectual property rights...). Opportunities are also given to students to meet with practitioners who explain the legal issues they encounter in their daily practice, and to visit space industries. This course's main objective is to stimulate the interest of students for this field of law and to provide them with a basic knowledge to start further research. ECSL is responsible for the organisation of the European Preliminaries of this competition, and supports the winning team for the finals. The 1993 final competition, which took place in Graz during the IISL Conference, was won by the Dutch team, supported by ECSL.

Research and conferences. - ECSL is also a centre where researches are initiated, according to subjects chosen by its members and its Board. The first research carried out by the centre concerned the legal protection of remote-sensing data. Workshops and conferences have been organised on this subject. Solutions have been identified and ECSL, jointly with ESA, has undertaken discussions with the European Commission and exchanges with the European Parliament to study the means to take into account the suggestions resulting from this study. In this research, ECSL jointly with ESA, has tried to assess the impact of outer space inventions on intellectual property rights, the existing legal solutions, as well as the possible harmonisation in the future. This research has been presented in the course of a Workshop

THE DUTCH NPOC

The Dutch NPOC was established in 1990 with the following goals:

- 1.- The promotion of ECSL, making it better known in the Netherlands, by distributing information to the members with regard to activities of ECSL, and by recruiting members for ECSL.
- 2.- The coordination of activities of ECSL Members in the Netherlands by distributing relevant information to the other Dutch ECSL Members and to the ECSL Secretariat in Paris, and eventually coordination with other NPOCs when desirable. Due to the fact that the NPOC should not form a barrier for individual activities of Dutch NPOC Members, the coordination should be limited to the gathering of information with regard to activities as stated above and the rendering of advice. On the other hand, each Dutch ECSL member should keep the NPOC informed of his or her activities so as to enable the NPOC to coordinate in practice.
- 3.- The coordination between the ECSL activities in the Netherlands and activities of the Dutch working group on Space Law of the International Law Association.
- 4.- The promotion of knowledge of and interest in space law in general and the activities of ECSL within the Universities as well as outside (i.a. Government, industry, practitioners).
- 5.- The coordination of the selection of students within the Netherlands and, if need be, support of the selected students in order to acquire bursaries of the ECSL or elsewhere.

The Dutch National Point of Contact of ECSL was established with the International Institute of Air and Space Law at Leiden University.

The first General Meeting took place on 11 January 1991, at the Leiden Institute. Special guests were Mr Kevin Madders and Mr Harry Tuinder, both from ESA, Paris, who introduced ECSL to the participants. The Second General Meeting was held on 24 January 1992, where Dr Elena Kamenetskaya, from the Institute of State and Law of Moscow, as a guest speaker held a lecture on developments concerning space activities within the Commonwealth of Independent States, and the third General Meeting was held on 15 January 1993, where Mr Frans Lijnkamp of PTT Telecom, The Hague, spoke on the liberalisation of the telecommunications market in Europe. All General Meetings held so far were attended by thirty to forty participants from various occupations and various fields of space activities within the Netherlands, including government, industry, science and academics. The mailing list of the NPOC, de facto forming its membership, comprises over seventy members of the Dutch space community. After every General Meeting, the Leiden Institute offered participants the opportunity to meet and discuss more informally during drinks. In general, the meetings were highly useful for the purpose especially of establishing and maintaining close contacts among each other.

Apart from the General Meeting, the First Dutch NPOC Workshop was organised, in close cooperation with the ECSL, on September 27, 1991, on "The Implications of the CEC Green Paper on Satellite communications in Europe". The Workshop, which was held at ESTEC Headquarters in Noordwijk, was attended by some forty participants. Professor Wassenbergh, Chairman of the Leiden Institute, presided over six speakers and the discussions which followed their presentations. The texts of the presentations were published afterwards by means of proceedings, available from ECSL and the Dutch NPOC.

The Second Dutch Workshop took place on 26 March 1993 on "New Opportunities for Cooperation in European Space Activities" and proceedings were published.

The Third Dutch Workshop took place on 15 April 1994 on "Recent Developments in the field of protection and distribution of remote sensing data", and is published in the present proceedings.

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INTRODUCTION

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8 May 1994

Prof. Dr. Peter Malanczuk
University of Amsterdam

**Recent Developments in the Field of Protection and Distribution
of Remote Sensing Data**

3rd Dutch NPOC/ECSL Workshop, April 15, 1994, ESTEC, Noordwijk,
The Netherlands

Introduction by the Chairman

Ladies and Gentlemen,

let me welcome you to the 3rd Dutch NPOC/ECSL Workshop which will address "Recent Developments in the Field of Protection and Distribution of Remote Sensing Data".

The problems of finding an appropriate legal framework for the protection and distribution of remote sensing data have become virulent in view of the tendency towards commercialization with the privatization of LANDSAT and the creation of SPOT-Image. In Europe, the issue of copyright already arose in 1983 at CNES/Spot-Image in connection with the preparation of contracts for receivers of data from SPOT. Since then the topic has also become important for EUMETSAT and for ESA in connection with the operation of ERS-1.

The hitherto little covered ground of the international legal protection of remote sensing data was made a priority in the first phase of the research activities sponsored by ECSL. A first survey to identify the issues was prepared for ESA/ECSL by J.D. Dupuy in 1990-1991. In May 1991, a Workshop was held at ESRIN, Frascati, as a forum for all interested sectors, including the EEC Commission. The European Commission launched a comprehensive study, managed by experts from the Commission, ESA and ECSL, of the legal conditions of access to earth observation data which was undertaken by Professor Gaudrat. The results were discussed at two workshops in June 1992 in Paris and in October 1992 in Brussels.

It should also be mentioned that under certain aspects there is also a relation to developments in other areas which are addressed, for example, in the EEC proposal of 11 September 1991 for a directive on copyright and neighbouring rights applicable to satellite broadcasting and in the EEC proposal of 13 May 1992 for a database directive. Of further interest in this connection is the second research project of ECSL on intellectual property rights and outer space activities which concentrates on the legal questions pertaining to the protection of patentable inventions in outer space and the transfer of proprietary information, in particular, as regards microgravity activities. The First ECSL/Spanish Center for Space Law Workshop, held in May 1993 in Madrid, was dedicated to this topic.

The purpose of our Workshop today is to deal with recent developments with regard to certain aspects of the protection and distribution of remote sensing data. In the first part of the session, Mr. S. Bruzzi, Envisat Mission Manager at ESA, will introduce us to the technical aspects of remote sensing, including the different types of sensors and distribution methods. Mr. M. Ferrazzani from the Legal Affairs Department of ESA, who has been publishing on the matter, will then explain general legal principles applicable to remote sensing and ESA policy. Thereafter, Mr. P.H. Tuinder, who has been working with

ECSL and is now a space law consultant in Paris, will enlighten us on EEC developments regarding the protection of remote sensing data.

The second part is dedicated to two areas. First, Dr. A.P.M. Baede, who is from the Royal Dutch Meteorological Institute (KNMI) and Chairman of the Working Group Earth Observation, will speak on the Dutch policy and interests in remote sensing. Finally, Prof. Dr. J.L. van Genderen from the reknown International Institute for Aerospace Survey and Earth Sciences (ITC) in Enschede, The Netherlands, will analyse the implications of remote sensing for developing countries.

Conclusions by the Chairman

Ladies and Gentlemen,

at the outset, I would like to thank our speakers for their competent and clear presentations. We have had interesting discussions in which important and clarifying contributions were made from the audience. Thus, I am pleased to express the general feeling that the Workshop was a useful exercise.

In view of the advanced time, however, I should limit my conclusions to a few remarks.

It seems that the discussion on the appropriate legal method of protecting remote sensing data has not developed very much further beyond the general consensus that, in view of the unsuitability of copyright and other existing concepts, it is best to adopt a sui generis approach. The proposition to link such an approach to the proposed EEC database directive, with the appropriate amendments, is appealing in two major respects. First, it would overcome the difficulties and inconsistencies in attempting to unifying the law on the national level of the

Member States only. Second, it would strengthen the negotiating position of Europe on the international level, in particular, vis-à-vis the United States, in the quest for finding the necessary global solutions.

While it is obvious that private investment in remote sensing will only flourish, if there is an effective legal regime protecting the investment interest, there is also, however, the question of access of the public on reasonable cost terms to information gained by space technology. There is an inherent tension between these two types of interest and finding an appropriate balance in practice is one of the major challenges of developing an acceptable legal framework for remote sensing.

As witnessed by the debate on the 1986 United Nations Remote Sensing Principles, the aspect of non-discriminatory access to data is of special interest to the developing countries which are concerned of being deprived of benefits by the commercialization of remote sensing activities and the protection of property interests. A solution here can only be found on the global level and it remains to be seen whether the 1986 principles can be translated from general "soft law" into "hard law" by more specific and binding international obligations. It is interesting to note in this connection, that since a number of years the International Astronautical Federation and the United Nations Office for Outer Space Affairs have engaged in cooperation holding high-level workshops to promote the use of space technology, including remote sensing, for the benefit of developing countries.

My final remark concerns an important area of remote sensing which our workshop has not addressed. Of course, in view of the purposes of ESA, as stated in its Convention, it does not surprise that military aspects have not been on the agenda. Perhaps needless to say, it is clear that a meaningful discussion of remote sensing in general remains incomplete without considering the great practical relevance of its use for military

purposes. On the other hand, considering the specific topic of the workshop, it is of course difficult to see the significance of the legal protection and distribution of data which by their nature are to be kept secret in the national interest.

Concluding this workshop, I would like to thank once again our speakers and the contributors to the discussion from the floor. Finally, I wish to thank the Dutch NPOC, in the person of Drs. F. van der Dunk, and ESA/ECSL, in the person of Ms. V. Kayser, for organising and hosting the workshop.

**REMOTE SENSING: GENERAL LEGAL
PRINCIPLES AND ESA POLICY**

**M. Ferrazzani
Legal Affairs Department
European Space Agency**

ESTEC, 15 April 1994

Marco Ferrazzani
Legal Affairs
European Space Agency

The first European Remote sensing Satellite ERS-1 has now been operating successfully for nearly three years. The data originated by its sensors have been produced in vast quantities; more than 12,000 SAR scenes and several hundred complete sets of orbits of global LBR data, have been processed and distributed by ESA to various user communities.

The need to manage activities under such a comprehensive system led to the creation of a complex framed segment system within ESA dealing with the processing, archiving and distribution to users of such data as part of a mandate entrusted by European governments to ESA.

ESA's mandate has enabled it to acquire extensive expertise in this field, strengthening cooperation between European States.

ESA had to create an extensive legal policy applicable to remote sensing data, particularly for the acquisition of and access to its payload data, triggered by the need to give Europe the necessary tools to exploit to the full our expanding knowledge of the Earth's resources. Over and above the technological implications of ERS-1, Europe needed a well- balanced set of arrangements safeguarding the interests of all parties concerned and allowing the optimum management of its mission.

At the outset, we carried out a basic assessment of the international scene of remote sensing policies. In a world arena where some Earth Observation missions are exclusively scientific while others wish to become predominantly commercial, ERS-1 found its role in allowing a flexible use of its capabilities, without jeopardizing its commercial potential.

The ERS-1 programme within ESA brings together several European countries, joined by Canada, and is therefore the first remote sensing satellite programme in polar orbit to be undertaken on the basis of such wide international cooperation carried out within the framework of an optional activity of the European Space Agency.

As provided in the ERS-1 Programme Declaration, ESA had been entrusted with the execution of the ERS-1 programme including the operational responsibilities, for the duration of life in-orbit of the spacecraft, during which ESA itself assumes the responsibility for the operation of the satellite and the distribution of its data, rather than leave this activity to a user organisation, once the technical development programme is completed.

Its distribution system is based on a data policy discussed and agreed by the funding States and intended as a model for further European missions.

THE LEGAL SCENARIO

The ERS-1 spacecraft is owned by ESA in the name of and on behalf of States participating in the ERS-1 programme.

Shortly after its launch into outer space on 17 July 1991, it was recorded in the ESA register of objects launched into outer space and has been registered under the provisions of the Convention on Registration of Objects launched into Outer Space, opened for signature in New York on 14 January 1975, which entered into force on 15 September 1976. General international law therefore recognises the Agency as the entity entitled to maintain jurisdiction and control over the satellite. The Programme Declaration agreed by the participating States spells out the conditions of access to the ERS-1 data and their method of distribution, and has been completed by the principles of data distribution policy approved by the States participating in the ERS-1 Programme.

As the States have stated that the ERS-1 objectives are both of a "scientific and economic nature", the ERS-1 data policy has been aimed at stimulating the broadest possible

involvement of the Earth science community and, at the same time, promoting the application of the programme and therefore the aim to commercialise it.

In order to fulfil its specific mandate, the Agency had to guarantee the legal basis and protection of these data. Such protection, necessary against unauthorised reproduction or copying of the data, mostly at the distribution/commercialisation stage, must cover the whole range of ERS-1 primary data, processed data and derived products.

Since so far no national or international piece of legislation or regulation has explicitly provided for the protection of remote sensing data and images originating from sensors on board satellites observing the earth, ESA has chosen to secure such protection through direct agreements concluded with its partners requesting access to the data. The Agency has based the ERS-1 data policy on two basic legal principles.

The first principle is of fundamental public interest as ERS-1 primary data will be available to all interested users on an open and non discriminatory basis, in line with the generally accepted "Principles relating to Remote Sensing of the Earth from Outer Space" approved in December 1986 under Resolution 41/65 of the General Assembly of the United Nations. So far ESA has fulfilled the requests for access to the whole range of data from ERS-1 both from government entities for the installation of ground receiving stations in their capacity as observed States, and from private institutions when ordering processed data. No restrictions of access or undue conditions were imposed on the basis of the legal status of the applicant.

A second basic principle regards private rather than public international law. This is the concept of ownership of the remote sensing data identified as a result of the output of the sensors onboard the satellite along with its processed and derived products. The Agency retains full title and ownership as the holder of the intellectual property rights over the satellite produced data. This is clearly stated and acknowledged under the terms of the various agreements that ESA has concluded with all major international agencies involved in remote sensing activities.

The application of an ESA copyright on ERS-1 data provides the Agency with the broadest possible basis for the protection of ERS-1 data. We made sure that provisions to this effect were acknowledged in each legal instrument signed by the counterparts in the ERS data distribution system. So far there has been no evidence of infringement of the copyright title, neither has any of the counterparts reported an alleged infringement. I have indicated that this principle is more of a private law nature because of its legal essence and also because of the contractual approach, as this has so far been the way to follow in order to construe it. As many of you may already know, there are still no clear provisions in European legal systems recognising ownership erga omnes of remote sensing data as such. However, when we have received requests for data access and have completed legal procedures, it was clearly recognized by the user in a specific contractual provision that ESA retained full ownership of the data as owner of the satellite. This has established a precedent in terms of a European legal policy for Earth Observation data.

A fact that deserves particular legal analysis is that, because of the success of the ERS-1 mission, virtually any entity worldwide involved in remote sensing activities has requested access to these data. In order to do so, everybody has subscribed to the principle of ownership of the data. What has emerged is the application of copyright on each unit of raw data distributed under the terms of our agreements.

These legal instruments have been found to be useful in the development of a data policy insofar as they offer broad protection of the data from the moment of distribution and therefore allow the satellite operator and the data distributor to enjoy a more secure negotiating position at that stage. This concept of ownership and copyright has allowed ESA to distribute the data on a wide scale which was one of the main objectives of the data distribution policy.

A consequence of the concept of ownership is that the user has to obtain authorisation to receive the raw data and work with it. To this end, the owner licenses the use or the reproduction of the data. Each licence is either granted directly by ESA (as it is the case of the large scientific community of so called Principal Investigators), or by an appointed consortium acting on behalf of ESA as a distributor. In addition several international entities

who are able to receive ERS-1 data directly from the satellite through a ground receiving station have been licensed to receive, archive, use and reproduce the same data through an agreement.

Of course, such agreements also contain a number of other provisions based on the principle of non-interference with ESA's objectives.

All the described agreements and licences are non-exclusive and this formula has been found to be the best way to favour the widest possible access to and use of the data.

Any request for data which has been justifiable, be it for scientific or commercial ends, has been accepted. ESA has enacted a sound scientific programme providing a large amount of data on a cost-free basis, as scientific investigators have made an important contribution to the programme and to the scientific and application the research community.

THE AGREEMENTS

The SAR data cannot be recorded on board, owing to their high data rate, and are therefore acquired only for areas within the reception zone of a real time ground receiving station; on the other hand, the LBR data can be stored for one whole orbit on board the satellite, before being down-linked to a ground receiving station.

As a result, ESA provides ERS-1 data to the user community on a global basis for the LBR instruments and on a regional basis for the SAR data. In order to expand the coverage zone of the ESA ground stations receiving SAR data already planned under the ERS-1 Programme, a number of ground receiving stations have been installed or upgraded by operators outside the institutional framework of European space cooperation. Any such ground station operator has agreed terms of access under the ERS-1 programme through a specific Agreement with ESA, while some States participating in the programme have set up in parallel a national receiving ground station, whose coverage overlaps that of the ESA stations, and acquire SAR data on a technical non-interference basis.

ESA, through a set of 4 specifically dedicated ground receiving stations (Kiruna, Maspalomas, Gatineau, Prince Albert), performs the primary function of acquisition of the global LBR data set. Furthermore ESA, taking advantage of national expertise and investments, has implemented four Processing and Archiving Facilities (PAFs) (UK, F, I, D) for off-line processing and archiving of both SAR and LBR data. The ESA ERS-1 programme therefore comprises data reception, processing and distribution through the different elements of the ERS-1 ground system, that is the Earthnet ERS-1 Central Facility, the ESA stations, the PAFs, in addition to which any participating and non-participating State may set up ground facilities and negotiate with ESA its access to the ERS-1 data.

The international agreements concluded by ESA within the framework of the ERS-1 Programme represent legal commitments under which ESA establishes a direct working relationship with each of its counterparts. ESA has identified different situations each corresponding to a specific type of agreement applicable depending on the role and task of the partner and which I am now going to present to you:

1. Non-ESA Ground Receiving Station Operators

A network of agreements with a large number of ground receiving station operators constitute the main link of the system (see Table 1), since they provide for the activities of acquiring, processing, archiving and distributing the ERS-1 SAR data for additional coverage in the interest of the ground station operators concerned and for the benefit of the overall ERS-1 Programme and users.

Within this special legal framework conceived to allow a smooth implementation of the Programme objectives, the various agreements list the rights and obligations of both the Agency and the concerned partner. The general principle is that all activities are carried out under ESA's supervision and control, while all necessary technical information, instructions and in-situ assistance will be provided by ESA staff throughout the duration of the agreement. One should maintain that these non-ESA/Foreign stations are installed or upgraded with national funding or development aid funding for some of them and therefore the role of ESA is more limited than for the ESA-funded station.

At the same time, because of its research and development nature, ESA does not guarantee the suitability of the data for any purpose; neither is it liable for consequential damages brought about by the use of such data, nor can it bear the liability in the event of any damage or loss of revenue, directly or indirectly arising from a malfunction or interruption in the transmission of the data for whatever reason.

For SAR data received outside ESA's SAR coverage area, a complete archive at the station of all data acquired is also required by the Agency of the ground receiving stations. If this is too onerous, the station shall make its data holding available to ESA for possible inclusion in the PAFs' archive on a cost reimbursement basis. This will ensure that the Agency secures the maximum possible amount of data available in the world.

The ground station operator can process the ERS SAR primary data under the technical provisions of the Agency and extract, use and distribute the data from the station archive, only for the purposes of the licence for the production, reproduction, distribution and sale that is granted in the Agreement.

Each ground receiving station operator is granted in the Agreement a non-exclusive licence for the reproduction, distribution and sale of the data to the users who are resident of the country hosting the station.

At this moment in time nine such agreements have been concluded by ESA as per Table 1. Many other station operators have applied to receive data under the same conditions and negotiations are now open (Table 2).

2. PROCESSING AND ARCHIVING FACILITIES (PAF)

Each of the four Agreements concluded between the Agency and a national entity managing a PAF defines the tasks delegated by the Agency for the activities of archiving, retrieval, processing and distribution of data from the Agency's ERS-1 mission. These entities follow the programmatic instructions, procedures and planning established by the Agency, which

has also adopted a general scheme to harmonise the activities of the relevant British, French, Italian and German facilities.

The main undertaking of each PAF entity is to maintain and operate the equipment necessary to supply to the Agency and to the users on behalf of the Agency the ERS-1 data products and services on a timely basis.

The ERS-1 data archived by the PAFs remains the property of the Agency whilst being accessible to all interested users on an open non-discriminatory basis, in accordance with the general ERS-1 data policy adopted by the Agency. The users request and agree on standard terms of access to data with the Agency who then establishes procedures for the distribution and provision of data with the PAF concerned.

The PAFs also provides the Agency with a Catalogue of information (archiving report) of archived data and information relevant to the implementation of the system. The programme objective is to archive the ERS-1 data at each PAF for at least ten years from the end of the active lifetime of the ERS-1 spacecraft.

3. PRINCIPAL INVESTIGATORS

The Agency issued to the public on 20 May 1986 an Announcement of Opportunity for the submission of proposals for possible scientific or operational evaluation of the ERS-1 data. Valuable proposals submitted by persons responsible for related activities have been received and they were selected to be granted the status of Principal Investigator (P.I.) within the meaning of the Programme's scientific interest.

A special form of Agreement is concluded on the acceptance of standard Terms and Conditions of use of ERS-1 data by the P.I. requesting access to data. More than 270 PI's have been selected and have received data and already accomplished an impressive amount of work. Some preliminary results were disclosed at a symposium held last November and will be completed by future public seminars. Each P.I. is granted a limited amount of data free of charge, which is nevertheless estimated to be adequate for the purpose of the

investigation, for the exclusive purposes of the investigation agreed by ESA. It must comply with the general legal requirements of the Programme in handling the data, such as : ESA Copyright policy, internal use only, no reproduction or distribution, reporting its results and submitting it for wide publication, participation in ESA organised workshops.

Similar terms and conditions of access to ERS-1 data are also underwritten by different entities involved in other roles planned under the ERS-1 Programme: Institutions implementing Pilot/Demonstration projects, selected by the Agency through a call for proposals; National nominated centres for LBR fast delivery service; Meteorological Services from Participating States (including Eumetsat and ECMWF) cooperating with ESA in the assessment of the operational value of the LBR FD service, as well as for activities such as ice forecast, pollution monitoring, etc.

ESA COPYRIGHT AND LICENCE

In order to be able to enact a protection scheme the Copyright and licence concepts have been used within the meanings accepted by the legal experience. This implies that anyone signing and ERS-1 Data Agreement acknowledges the copyright of ESA on all ERS-1 produced data, and commits to respect and ensure the respect of the Agency's right.

The relevant provisions in the Agreements state that the ground station's operator will mark all ERS-1 data and analysed information with : c"ESA (year of reception)"; any or all media containing the station SAR archive : "ESA-R-SAR data"; finally, he must display on all ERS-1 data and analysed information processed by the station, the mention of the trademark that ESA has registered : "ERS-R-", plus the mention of the originator of the data product.

Of course, the ownership and copyright of ESA does not prevent the recognition of copyright in favour of the ground station operator or a third party in respect of its own original activity to add and incorporate in the data product further sources of information to produce analysed information that will result in a different and more elaborated product, therefore making the final product fall under its own copyright title.

In order to further guarantee ESA's right, users have agreed to the additional responsibility of informing ESA in writing whenever they learn that the Agency's copyright interests and trademark are being used unlawfully by a third party. Should that be the case, ESA may then take necessary legal action to protect the interest of Participating States, and also agree on a coordinated form of action with the user concerned. As indicated, so far we have had no evidence of any need for such actions to be brought for infringement.

The overall philosophy of distribution envisages that ERS-1 data be publicly available in a controlled way, through licence to use agreements granted by ESA, as the owner of the ERS-1 data.

In particular, the Agency prefers to grant several non-exclusive licences which are economically more interesting since more entities have access to the distribution activity of the ERS-1 data products.

It is recognised that ERS-1 data hold an economic value. In view of the substantial capital cost involved for the development of the ERS-1 system and because of its usefulness in a number of fields, ESA has decided upon a pricing policy and published a price list updated annually that is uniform and consistent for all ERS data products, irrespective of the facility or supplier which generated them, but that may vary reflecting the possible progressive development of the commercial values. This pricing policy is dependent on another traditional legal concept used in the commercial experience : the royalty related to each unit of product. The basic idea is that users from ERS-1 Programme participating States are not charged for a royalty on the price of an ERS-1 standard product, in recognition of the fact that their country has financed the ERS programme. On the other hand, foreign station operators credit ESA with a royalty fee for each copy of ERS-1 product distributed or sold to a user from a non participating State.

As regards onward distribution, whenever the holder of an ERS-1 primary or processed product wants to grant a licence of use for the product to a third party, he credits ESA with the royalty fee applicable for the standard product. This applies when the product, copied, re-formatted or processed, still retains the original pattern. The royalty is only half if the

product preserves the original pattern but has been further processed using non ERS information. No royalty is due to ESA where the ERS data can no longer be identified.

THE DISTRIBUTORSHIP

The Agency has also retained the right to distribute all ERS-1 data worldwide through a commercial Distributor specifically appointed by an ESA Contract.

The Distributor, as an industrial partner, holds the necessary infrastructure, field expertise and commercial vocation to better guarantee all the marketing and promotional efforts necessary for the optimal exploitation of the ERS-1 data products.

The idea of appointing a Distributor is in line with the commercialisation efforts towards stimulating a remote sensing data market which the ERS-1 data products should help to develop. The obligation to guarantee fair and open competition to all value-added industries interested in the ERS-1 data distribution enhances this concept.

The ESA appointed Distributor is constituted upon the signature of a distribution agreement by an international consortium of companies with skills in marketing, promotion and distribution of space remote sensing data, for worldwide reproduction, distribution and sale of SAR standard product and LBR standard products, with the right to appoint sub-licences at regional level. This ERSC Consortium is founded by EURIMAGE covering the distribution in Europe and the Mediterranean basin, RADARSAT serving clients in North America, and SPOT IMAGE for the rest of the world.

The start of the Consortium activities after the signature of the contract and the slow build-up of this special market for new classes of remote sensing data has shown that more impetus should be given to the marketing of new services and also methods of combining ERS data and products with equivalent ones originating from other satellites and in particular optical data from Landsat and/or SPOT. Furthermore, the pricing policy constantly evolves in response to market trends.

These principles of data distribution have worked effectively so far but are of course subject to refinement in the light of present experience. There are already plans to review the principles in order to take account of the lessons learnt and of the evolutions in the technical and economical developments taking place in remote sensing. The next satellite (ERS-2) to be launched in 1995 will follow the trend.

As ESA does not provide value-added services, but wishes to support the emergence of an active and successful value-added industry, it has adopted the principle of non-exclusive licences granted for the reproduction, distribution and sale of value-added and derived products as widely as possible.

CONCLUSIONS

Experience has shown that today an advanced earth observation satellite programme such as ERS-1 makes sense only if supported by a complex management network allowing efficient use to be made of data by all of the user community concerned.

The overall legal policy relating to the ERS-1 Programme has enabled the Agency to leverage through a number of international partnerships and cooperative relationships with the different entities involved on a worldwide scale. The maximising of the exploitation of the ERS-1 mission, the broadening of its participation and strengthening of its effectiveness can be considered to be achievements made possible by the described legal framework. This framework established by ESA represents Europe's expertise at this level and will undoubtedly be taken into consideration by the international community when preparing for multilateral remote sensing activities. As such it may be considered as a reference point when formulating a long-term policy for future generations of satellites observing the earth for the achievement of the many results expected from such missions.

<i>Network of International Agreements allowing acquisition and distribution of ERS-1 data other than from ESA ground stations (signed)</i>		
Ground Station Operator	Station	Signed
Norwegian Space Centre	Tromso, Norway	19 July 1991
Department of Energy, Mines and Resources of Canada	Prince Albert, Gatineau, Canada	5 August 1991
British National Space Centre	West Freugh, Scotland	30 August 1991
CLIRSEN	Cotopaxi, Ecuador	29 November 1991
Centre National d'Etudes Spatiales	Aussague], France	14 October 1992
US National Aeronautics and Space Administration	Fairbanks, Alaska	14 January 1986
Australian Centre for Remote Sensing	Alice Springs, Hobart, Australia	26 August 1991
National Remote-Sensing Agency of India	Hyderabad, India	26 June 1991
National Space Development Agency of Japan	Hatoyama, Kumamoto, Syowa, Japan	20 June 1991
CSIR of South Africa	Pretoria, South Africa	10 March 1994
INPE of Brazil	Cuiaba, Brazil	16 November 1993
National Central University of Taiwan	Chung-li Taoyuan May 1994

**ISSUES OF PROTECTION OF REMOTE SENSING DATA:
EC DEVELOPMENTS**

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Issues of Protection of Remote Sensing Data
European Union Developments¹

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1.- Introduction

Remote sensing is, after telecommunications, the most important domain of space applications in terms of turnover and immediate utility. Together with meteorology, it represents a satellite market as important in value as that for telecommunications².

In Europe, the commercial exploitation of remote sensing data did not grow as rapidly as was expected in the mid 1980's. The revenues³ from the exploitation of these data are consequently not sufficient to cover costs of development or even the operation of the space segment⁴. This presentation will address some of the obstacles for creating a market for remote sensing data in Europe. Also, attention will be given to the latest developments in the United States and Europe.

The role of the European Union (EU) in the field of earth observation is becoming more important as the Union has a specific interest and responsibility for the development of the remote sensing activities since its potential applications can facilitate the work of the EU in,

¹ Presentation for the third Dutch NPOC/ECSL Workshop on "Recent Developments in the Field of Protection and Distribution of Remote Sensing Data", April 15, 1994, ESTEC

² See "Industrial Policy Elements In a European Strategy for Space - A First Reflection -", a paper submitted for discussion to the (European Commission) Space Advisory Group Meeting of 21.2.1994

³ For example the value added industry for handling and processing remote sensing data is estimated having a volume of approximately 250-300 MECU and some 2000 people are working in this sector: source: The European Community and Space: Challenges, Opportunities and New Actions, COM(92) 360 Final

⁴ idem

for example, agriculture, forestry, fishery and environmental policy⁵ and, with the signature of the Treaty of Maastricht, also the Common Foreign and Defence Policy (eg the WEU satellite verification centre).

The European Commission represents the largest potential European user of remote sensing data and is, when we take into consideration its (political) aims, in a key position to stimulate developments that will lead to better use of this space application⁶.

The European Commission currently even takes a more prominent role in satellite earth observation as it decided in January 1994 to fund an earth observation instrument for the SPOT 4 satellite to be launched in 1997⁷. This decision, however, also marks the confusion in Europe with regard to the respective roles of ESA and the European Union as it would have been more logical that the Commission would have used the expertise of ESA to acquire such an instrument instead of CNES and ASI⁸.

As stated above, the development of the ground infrastructure for the distribution of earth observation data is not sufficient to keep up pace with the new planned earth observation satellites and the data to be provided by them. Apart from the technical questions, a consensus has to be achieved with regard the principles of data distribution, data access and

⁵ The draft version of the second Roving Report "European Space Policy 2000" to be submitted to the European Parliament in the coming months also refers to the ideas of the Commission to use satellites for the implementation of Union policies and for the enforcement of Union legislation

⁶ It is interesting to see that the European Commission is playing a "double role" as policy maker for for example future data distribution principles and as a user of remote sensing data through for example the Joint Research Centre (JRC) in ISPRA.

⁷ See Space News April 11-17, 1994 p.15: "Earth Observation Steps Into European Spotlight"

⁸ One can even raise the question whether "subsidiarity" and "complementarity", two important concepts for the Union clarifying where Union action is considered to be (un)wanted by the member states, have not been infringed by this Commission action.

formats of data. The European Commission identified the following problems that have to be solved to come to a better exploitation of earth observation data:

- the lack of an overall strategy and coordination between users and suppliers of data
- inadequate ground infrastructure for transmission, archival and dissemination of remote sensing data
- lack of quality and standardization of interpretation techniques (software)
- lack of European legal framework for the conditions of access to data⁹

For this presentation we will concentrate on the first and the last issue, namely the lack of an overall strategy and the conditions for access to the data and especially the legal aspects.

However, before addressing these issues, we would like to discuss some relevant developments that occurred in the past weeks and especially the decision of the Clinton Administration on March 10, 1994, to permit the private operation of remote sensing satellite systems with a resolution of up to one meter which implies the abandoning of the United States policy to prohibit the commercial operation of a satellite remote sensing system and the distribution of remote sensing data with a higher resolution than ten meter for reasons of national security¹⁰.

2.- Current Developments in the United States

The US Landsat program, which is the most important program for civil satellite remote sensing in the US, has been controversial for a number of years. There was a lack of secured government funding for the next generation Landsat satellites and there were many technical difficulties with the development of Landsat 6 and 7. These problems made the user

⁹ supra 2

¹⁰ This part of the presentation will be based upon the report of the United States Intelligence Committee Hearing on Commercial Imagery, 17.11.93

community concerned about the data provision through the Landsat system. Another problem with the US Landsat Remote Sensing Commercialisation Act of 1984 was that there was a complete failure of the marketplace philosophy¹¹. With the failure of the Landsat 6 there is the fear that this will result in a gap in the provision of data which then will be filled by France and India¹². Moreover, due to the end of the cold war, data with a higher resolution than ten meters are already distributed on the market by Russian companies¹³.

Under the 1992 Land Remote Sensing Policy Act, the Department of Commerce obtained the authority to issue licenses for private remote sensing systems. The Department of Commerce authorised the National Oceanographic and Atmospheric Administration (NOAA) to grant licenses for the operation of private remote sensing systems by domestic companies¹⁴.

Since the adoption of the 1992 Act, NOAA received four applications for a license to operate private remote sensing systems:

WorldView Imaging Corporation

EOSAT (joint venture of Hughes and Martin Marietta)

Lockheed Missiles and Space Company

Eyeglass¹⁵

¹¹ For example only 5% of the 2.5 million scenes of the Landsat archive have ever been used. See C. Nielsen and D. Wierle, "Do long-term Space Plans Meet the Needs of the Mission to Planet Earth" in Space Policy, Vol. 9, 1 February, 1993

¹² For example EOSAT signed an agreement with India for distribution of its IRS images

¹³ Ten meters resolution was the highest resolution to be sold commercially on the market in the US. Higher resolution data were considered as strategic information interfering with the security interests of the US. In France current practice is that data up to five meter may be sold on the market

¹⁴ For issuing such a license NOAA has to consult the Department of Defence and the State Department

¹⁵ Eyeglass is a consortium of Orbital Sciences, Itek Optical Systems and GDE Systems.

Two licenses were given to WorldView and EOSAT, all for systems with a resolution lower than five meters. Lockheed¹⁶, Eyeglass and Worldview did apply for a license for a one meter resolution system.

One reason for the new US policy could relate to the current problems of the US Aerospace sector which is heavily affected by the budget cuts for defence¹⁷. Another reason is the emerging market for higher resolution data. It is estimated by Lockheed that the potential sales of imagery from the CRSS would be at least one billion \$ per year for GIS systems¹⁸.

3.- The situation in (Western) Europe

In Europe, earth observation activities and the provision of remote sensing data is secured by the activities of ESA, EUMETSAT and SPOT. Contrary to the situation in the United States, remote sensing data are not characterised as public goods¹⁹ and moreover since the operation of the SPOT system, commercial sale of the data based upon ownership rights are an accepted practice.

ESA developed the successful European Remote Sensing Satellite (ERS-1) which was launched in 1991 and operated by the Agency. ERS-1 will be followed in the near future by a number of other satellites monitoring the earth environment and assisting meteorological services. These new satellites are for example the European ENVISAT destined for environmental research and the METOP programme which will provide meteorological data from polar orbits.

¹⁶ Lockheed obtained the approval of the department of Commerce for its operating license for its CRSS (Commercial Remote Image Satellite System)- a private remote sensing system with a one meter resolution on April 22, 1994.

¹⁷ Notably Lockheed went from some 30.000 employees to some 18.000 in 1993 and expects to make further cuts in 1994.

¹⁸ supra 8

¹⁹ Landsat data are considered by the US Government as public goods which implies that copyright cannot be applied to protect the data.

Other European remote sensing satellites are the Meteosat satellite generation developed by ESA which data are distributed by the EUMETSAT organisation and the French SPOT satellite system of which the first satellite was launched in 1986. The emphasis for all these programs was, initially, to develop the space segment enabling Europe to carry out remote sensing activities. As the technology matured and more applications become feasible²⁰ for the use of these data the ground segment has to be expanded to further develop the (private) value added industry.

Currently, the European user community of remote sensing data counts for eighty percent of institutional users and twenty percent of private users. This gives an idea about the problem one is encountering when developing a (private) market. It is therefore essential for the creation of a profitable industry adding value to earth observation data, and we only refer to the ground segment, that an adequate legal tool is available to enable private investors to recover the invested money.

4.- The importance of the legal protection of remote sensing data for Europe

As we have seen above, ESA and the European industry are further developing the necessary ground segment to use earth observation data. For creating the ground segment the active participation of the users of the data, network providers and value added industry is needed in order to achieve an optimal use of the data and to develop a European industry having the knowledge and technology to distribute the data. One of the main obstacles to develop the ground segment and the service industry using the data is the legal uncertainty with regard to the protection of these data. In the actual practice there appears to be confusion under which type of law the data should fall. Conflicting schemes for protection can be applied in

²⁰ The current applications can be broadly grouped into four sectors: environmental monitoring, resource management, meteorology and solid Earth resource. See "Issues in Earth Observation Data Policy in Europe", Executive Summary of a European Commission (DG XII) study carried out by Logica Space and Communications Limited, November 1992, Study Contract No: ETES-0018.

Europe as copyright laws, trade secret laws, or just ownership rights which all lead to different rights and obligations for the suppliers and distributors of these data.

This uncertainty hampers the further development of the European remote sensing industry as (private) investments will only be made when clear legal rights and obligations are established, making the risks of investments in the remote sensing industry predictable.

Currently, satellite operators in the remote sensing area claim ownership and copyright on their data. These operators in Europe are Spot Image, ESA and EUMETSAT. The last one even promoted changes to its Convention in an attempt to claim copyright-protection and ownership over its data and started to encrypt its signals in order to prevent unauthorised reception of processed meteorological data and images.

However, it is clear that copyright does not really solve the uncertainty concerning the legal status of these data as remote sensing activities have nothing in common with concepts like authorship, originality, creativity and human intervention. All essential doctrinal concepts within copyright²¹.

The protection of remote sensing data needs improvement because the existing legislation does not cover adequately remote sensing data. Even in the case protection can be attached by applying copyright or neighbouring rights, the remote sensing operator will be dependent on national legislations and interpretations which will vary from country to country.

ESA was confronted with legal uncertainty with respect the basis on which it could protect the data coming from its ERS satellite. ESA engaged itself in a large number of bilateral agreements enabling non-Member States to have access to the data coming from its ERS-1

²¹ See for a general overview of the current problems with regard to copyright and new technologies, Arthur R. Miller, "Copyright Protection for Computer Programs, Databases, and Computer-Generated Works: is anything new since CONTU?" in Harvard Law Review, Vol. 106, No 5, March 1993, p.982-1072.

satellite. The question did arise how ESA could control the flow of the data and consequently on which legal basis this control could be established²².

ESA and ECSL started in 1990 a research into the legal problems of the protection of remote sensing data. A questionnaire was sent to the main players in the remote sensing area in Europe and it became clear that although in practice no real problems were encountered, a clarification of the legal situation was considered to be important for the further development of the private industry in this area.

The results of this effort were presented in Frascati in 1991 at a workshop with representatives of all important remote sensing players. The conclusion was that further research had to be carried out and that ECSL and ESA should continue its work. As the European Commission expressed its interest to cooperate in the follow-up study ECSL, ESA and the Commission were jointly managing this study which started in 1992.

5.- The European Commission Study under the direction of Prof. Gaudrat

The EC study²³, carried out under the direction of Prof. Gaudrat, did result in a number of recommendations to improve the legal situation in Europe with respect to protection of satellite remote sensing data. These recommendations are now (partly) implemented by ESA and the EC through a joint effort to amend the Draft (EC) Directive on the protection of Databases²⁴ in order to make this Draft Directive applicable to satellite remote sensing data.

²² See for a detailed description of the questions raised within ESA "Legal Protection of Satellite Remote Sensing Data", ESA/AF (93)13, Paris 1 March 1993.

²³ The study is entitled "Conditions of Access to Earth Observation Data: Legal Aspects" and was concluded in April 1993. It is planned that the study will be published in 1994. See for a general description of the study, Ph. Gaudrat, Presentation de l'étude CEE relative aux aspects juridiques de la teledetection in Proceedings of the Central Symposium of the 'International Space Year' Conference, held in Munich, Germany, 30 March - 4 April 1992, ESA SP-341, July 1992, pp 1483 - 1494.

²⁴ COM (92) 24 Final - SYN 393, 13 May 1992

The Draft Directive is important for the European remote sensing community because it can (when some modifications will be adopted) solve the uncertainty of the legal status of remote sensing data and at the same time create a harmonised regulatory framework within the European Community.

Before discussing further the Draft Directive and its potential for protecting the remote sensing data we will first discuss more in detail the research and conclusions of the Gaudrat study.

The study of Prof. Gaudrat entitled "the Conditions of Access to Earth Observation Data: Legal Aspects" concentrated on legal issues with respect to the protection of 1) raw data and 2) analysed data. Hereto the legislation of ten EC Member States was analysed in order to come to an assessment whether raw and analysed data can be protected as well as under which legislations and under which conditions.

With regard to analysed data with a high added value, protection can be attached under most of the legislations. This protection will be given under copyright or droit d'auteur or neighbouring rights. The problem is that the protection for the same data can differ from country to country depending on the products we are dealing with (photographs, maps, films etc..) For other value added products like automated extracted photographs it is unclear whether this product can be protected under copyrights. In this case the provider will have to rely on trade secret or unfair competition rules which do not provide exclusive rights but only an ad posterio sanctioning. The reason for this uncertainty is that we have to apply copyright doctrine to remote sensing activities which results in problems with human intervention, creativity, work and data. This is even more true for raw data which will be normally not protectable under copyrights or droit d'auteur. Again there are alternatives as trade secret acts and other more contractual obligations which can be opposed to an abuse of the data. However, these rights can only be ascertained a posteriori and they will differ from country to country.

We can come to the conclusion that the situation with respect to the legal status of remote sensing data in the European Union is unharmonised and moreover will lead to uncertainty for potential private investors.

6.- The Draft Database Directive²⁵ and Remote Sensing Data

An important solution for this situation is identified by the Gaudrat study namely to bring remote sensing data under the protection offered by "The European Commission Proposal for a Council Directive on the legal protection of Databases" which is in its draft phase. This would mean that the signals transmitted by earth observation satellites would constitute databases within the framework of the Directive.

However, this solution requires a clarification of the Draft Directive because only by extensive interpretation of the Articles of the Directive, satellite remote sensing could be considered as an activity which creates a database falling under its protection. Therefore, clarification and amendments of the terms of the Article 1 of the Directive are needed in order to secure the interests of the remote sensing community.

The Draft Directive is based upon Article 100 A of the EC Treaty (viz measures of the Commission with the aim of progressively establishing the internal market over a period expiring on 31 December 1992 cf Art. 8a of the EC Treaty). This Article provides the mechanism for the Community to adopt such measures namely "The Council shall, acting by a qualified majority on a proposal of the Commission in cooperation with the European Parliament and after consulting the Economic and Social Committee, adopt the measures for the approximation of the provisions by law, regulation or administrative action in the Member States which have as their object the establishment and functioning of the internal market."

²⁵ Full title: "proposal for a Council Directive on the Legal Protection of Databases", COM(93) 464 final - SYN 393, 4 October 1993. See for the text of the Draft Directive, Annex II of this Presentation.

The Draft Directive aims at providing a harmonised and stable legal regime protecting databases created within the European Union. The Union Market for databases and electronic information services²⁶ is fragmented by technical, linguistic and legal barriers and the uncertainty of future technological trends, regulations and market response to new services and products hampers private investment in this area.

The Draft Directive establishes copyright protection for the way the collection in a database has been made²⁷ and protects against infringement of those elements of selection and arrangement. The content of the database may also be subject to copyrights or other intellectual property rights but the Directive gives also protection to the content where no intellectual property rights can be applicable²⁸. This protection under a sui generis regime is given against unfair extraction of the data of the database and is given for a term of ten years irrespective whether copyright protection is available.

It is clear that this approach of the Commission is very interesting for remote sensing data providers as when they are confronted with questions of applicability of copyright the Directive gives an immediate and harmonised (for all EU Member States) solution. Consequently there are strong reasons for promoting the "sui-generis" approach as adopted by the Draft Directive.

Firstly, it would avoid typical copyright discussions on questions as human intervention, originality etc. , which have in principle nothing to do with remote sensing activities and the protection of remote sensing data.

²⁶ Electronic information services covers amongst others online ASCII database services, videotext services, CD-ROM databases, and audiotext and broadcasting which offer bibliographical databases, electronic directories, real-time financial information services, and full text databases.

²⁷ That is the personal choices of the author in selecting or arranging the material and making it accessible to the user.

²⁸ For example when "raw material" is collected as statistical information, bibliographical information, or just names and addresses.

Secondly, remote sensing represents a financial investment for the remote sensing operator which he would like to be able to protect directly without having to apply "creative arguing" for enabling existing protection schemes to apply that moreover often result in indirect and unharmonised protection throughout Europe.

The question can now be raised concerning the needs for the European remote sensing community with regard the current Draft Directive as it has been proposed by the Commission.

It is clear that this Directive has not been drafted having in mind the needs of the space remote sensing players in Europe and that, therefore, the actual version of the Directive can only be applied to remote sensing activities when an extensive interpretation of the articles will be given.

However, due to the nature of a Directive and the freedom it gives to the States to implement legislation applying the Directive, the legal uncertainty which we identified before will not be solved in a satisfactory manner and moreover may not lead to a clear data policy and increased private participation in these activities.

In this respect it should be stressed that the databases created through earth observation sensors on board satellite platforms deserve particular attention because they are of growing importance to Europe due to their use for the observation, modelling and understanding the complexities of the Earth for addressing global environmental problems.

The Directive intends to regulate the specific problems which arise as a result of the use of electronic data processing equipment for the storage, processing and retrieval of "information", in the widest sense of that term.

By considering remote sensing as a process creating databases and by considering reception of these data as accessing the database the whole process of remote sensing would be covered and protection under the terms of the Directive could be given.

Hereto two main concepts of the Directive have to be adapted to the needs of remote sensing actors. Firstly, the concept of a database and secondly, the concept of extraction and accession of the database.

A database is characterised by the following elements:

- a structure which defines which information is contained in the database and in which format/organisation
- a medium on which the data is stored
- an access method defining how to retrieve the data, how to access the data base (protocols, access language, connection procedures)

As we will see below in the case of raw data, which are the data directly coming from the satellite, we can distinguish the following elements:

- there is a structure; the data are organised in a fixed and well defined format before being transmitted to the ground
- there is an access method; formats, decoding procedures, down-link characteristics etc.. These are described by the satellite operator in documents which are distributed to the entities authorised to receive the data
- there is a storage medium; 1) the data can be stored on tape on board the satellite or 2) the data can be transmitted to the ground (without storing on tape) in this case the data undergo a temporary storage in the memory of the on-board computer, during the reformatting process and while the telemetry packets are being assembled (see attachment for a schematic explanation)²⁹.

Thus in principle there are only two legal problems. Firstly, the database definition which is tailored for "earth databases" and which does not include databases without thesaurus and which consist, as in the case of remote sensing, of direct registered thematic information. Secondly, the question of accession has to be raised as data can be obtained from satellites by simple interception.

²⁹ This schedule is based upon the information given by S. Bruzzi, ENVISAT Mission Manager of ESA.

Hereto a small modification of the definition of access and extraction is necessary, such proposed additional wording will only complement the Directive's framework of rights and does not change the purpose and the extend of its applicability neither the degree of protection sought by the present draft Directive.

7.- The lack of an overall strategy for remote sensing data policy in Europe

Space activities were always of interest to the European Union and for example in 1985 The European Parliament adopted the (Toksvig) report that discussed ESA activities and that supported the policy of ESA with an emphasis on the creation of an independent European Space capacity ³⁰.

Since 1987, with the adoption of the Single European Act, the European Union became more actively involved in space policy as it was considered to be falling under the general R&D competence of the Union. A number of documents have been published within the European Community framework with regard the question of the role of the Community in space activities in Europe and on the importance of space activities for Europe in general³¹.

In this respect the Resolution on Space Policy³² adopted by the Parliament in 1990 is important to mention because in this report it was advised amongst others to "suggest proposals for solutions in the three most urgent fields of European Space Policy namely industrial utilisation of space technology, de-regulation of satellite telecommunications, the use of earth observation satellites for environmental and resource control and monitoring".

³⁰ Ref: PE 95.639/fin; doc A2108/85

³¹ See, also the first Communication of the Commission on Space entitled "The European Community and Space: A Coherent Approach", July 1988.

³² Roving Report; European Space Policy, European Parliament, 1990, EP/R9009001:

As to the relation between the European Community and ESA it was concluded that: "the overall objectives of the Community and ESA are the same: thus a sound basis for harmonious cooperation between the "two bodies" exists" but ESA as an intergovernmental international organisation has the character of a joint venture which implies that there exists no overall mutual legal or political obligations towards another and that there is no enforcement power of ESA towards its Member states".

The Community, however, as a supranational organisation has the instruments to define, implement and enforce common policies. Therefore, the Report concluded, the role of the Community is to complement ESA activities for the general benefit of Europe. Of course we are speaking here of two separate international organisations with different roles and responsibilities. The European Community with a prominent political and economic role and the European Space Agency with a responsibility of the management of the major space R&D programmes in Europe.

One of the means which was identified to complement ESA activities is "to enact the necessary legislation in Member states to make possible the full exploitation in Europe of the potential of space flight and technology by creating a favourable legal framework for the creation or growth of new or existing space markets".

In the last two years a number of documents were published by the European Community which draw attention to the problem of the protection of satellite remote sensing data.

For example in its Communication to the Council and the European Parliament³³, the Commission stated that uncertainties exist concerning the conditions of access to earth observation data and that therefore legislative action should be undertaken to establish the appropriate legal conditions for the protection of intellectual property rights for satellite data.

³³"The European Community and Space: Challenges, Opportunities and new Actions" of 23 September 1992 (COM(92) 360 final)

In the same Communication it is provided that the Commission will make proposals to increase and intensify the use of satellite data within the framework of various Community policies.

It is therefore obvious that for achieving this aim of the Community a clear legal framework for obtaining and distributing the data is essential and beneficial. Now, the Community is in the position to use its regulatory powers to harmonise and strengthen the use of remote sensing data in Europe by implementing the recommendations of the Gaudrat study.

As stated above the Community and ESA have a political interest in stimulating the use of remote sensing data and a stable legal regime for these data can be an important tool for reaching this aim. In this respect at the ESA Council Meetings at Ministerial level, held in Munich in November 1991 and in Granada in November 1992, European ministers competent for space matters unanimously supported the view of acquiring a solid basis for the formulation and strengthening of a European Earth Observation Policy³⁴.

The solution proposed in the Gaudrat study raised not only legal questions but also political problems which illustrate the low priority given by the space community in Europe to the harmonisation of the legal regime for remote sensing data. This because the major players discussing data policy and data protection are the (public) space segment providers as ESA and EUMETSAT and consequently give more priority to technical questions than to the legal ones which will affect the users of the data. Also the Commission concentrates on more technical oriented studies and suffers from internal problems of coordination of space policy³⁵

³⁴ ESA/C-M/CIV/Res.1 (Final), Chapter II. A. 8

³⁵ The Space Policy Coordination Unit in DG XII is coordinating space policy questions of all other directorates within the Commission. However, for implementing changes in the Draft Directive discussions were held with DG III (who is the originator of the Directive). This proces would have been much easier when legal expertise would have been available within the Space Policy Unit.

8.- Conclusion

If remote sensing activities are to be considered as activities creating databases falling under the protection of the Draft Directive an important goal for the European remote sensing activities will be reached: a harmonised legal situation for protecting remote sensing data in Europe. Due to the sui-generis approach of the Draft Directive, questions with regard to the author, originality and creativity are irrelevant. This would constitute, when we consider the nature of remote sensing activities, a far better legal approach and solution.

This will stimulate (private) investments in remote sensing activities in Europe. At the same time this harmonised environment would enable the remote sensing operators and the European Space Agency to base its data policy on a well vested legal framework.

Moreover, it would make the European position in international fora dealing with data policy and the exchange of remote sensing data much stronger.

ANNEX II

The Modifications which are proposed for the Draft Directive in order to cover remote sensing activities are the following:

Replace in Article 1 the definition of data base by the following text:

data base means a collection of materials arranged, stored and accessed by electronic means, including intellectual materials necessary for the functioning of certain databases such as the thesaurus, index or system for obtaining or presenting information; it shall not apply to any computer programme used in the making or operation of the database;

Add to Article 1:

materials means protected works as well as directly registered electronic measurements intended to produce thematic information by external processing;

access means the entering in the database including the interception of the signal carrying the whole or part of the information of the database;

extraction means all methods of accessing as referred to in paragraph 1 of this article;

THE DUTCH POLICY AND INTERESTS IN REMOTE SENSING

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**The Netherlands Policy and Interests
in Earth Observation
April 1994**

A.P.M. Baede

Introduction

In May 1992 the Netherlands government decided to participate actively, and at an adequate financial level, in the European Earth Observation (EO) programme of ESA and EUMETSAT. This paper explains the basis of this decision and describes the country's interest in EO and the way the Netherlands wishes to participate

Netherlands EO Policy

The Netherlands EO policy, presented by government to Parliament in a Memorandum and greeted with wide support, is based on three considerations:

- As a developed country with high technical skills the Netherlands is co-responsible for a world-wide EO infrastructure. The best way to contribute as a European nation is by participating actively at GNP level in the coherent European EO programme, as developed and implemented by ESA and EUMETSAT in close co-operation, and by ensuring influence in the relevant bodies of these organisations.
- The Netherlands is convinced that it can offer relevant contributions to this coherent programme. It has a successful and respected research programme in the field of EO and its applications, and a financial and organizational infrastructure to support such programmes also in the future. Moreover our R&D community, together with our space industry, is in an excellent and competitive position to contribute to the programme.
- Until recently EO programmes were mainly driven by technology push. The tide has turned, not in the last place through continual Netherlands insistence. The European EO programme is now basically user oriented. This means that more attention than in the past is paid to building a data infrastructure providing easy access to data. We have chosen to participate actively in building such user network nationally, but in a European context.

The Netherlands is particularly sensitive to the needs and requirements of users in

developing countries and wishes to ensure that their requirements, through existing organizations like WMO, will be taken into account.

Based on these considerations, the government has decided to participate in the coherent European EO programme of ESA and EUMETSAT at GNP level, including active participation in the building of an instrument to fly on the first European environmental satellite in polar orbit, ENVISAT-1. The government has made available some f 70 mln (\$35 mln) per year, an amount that includes f 6 mln for adequate user support.

Netherlands interests

The interests in our country in EO data cover a wide spectrum of applications, ranging from world-wide to local, and from real time weather forecasting to long range monitoring of the global environment

In operational meteorology for example, we have a long tradition and experience in the use of EO data, both imagery and derived quantities such as cloud motion winds and temperature soundings. We have contributed to developing the use of ERS-1 scatterometer wind data and the use of vertical soundings in numerical forecasting models.

The Netherlands has been very active in the field of anthropogenic climate change, both scientifically and on the diplomatic front. Gathering data for research and model validation and for long-term monitoring of the climate is essential and can only have world wide coverage by EO from satellite. We have a large and active research community and a government sponsored research programme that can only function when EO data are available.

Similarly we are actively involved in research on and monitoring of air pollution, atmospheric ozone and the ozone layer. Our understanding of these problems hinges on our understanding of the atmospheric chemistry, and therefore on our ability to observe and monitor the chemically active trace gases in the atmosphere.

Furthermore there is an urgent need for data for research and management of the environment. Research and monitoring of changes of the terrestrial environment, monitoring of water quality, and management of the coastal zone are examples of areas, which rely increasingly on remote sensing data in general and satellite EO data in particular.

This summary of Netherlands interests is certainly not exhaustive and suffers perhaps from an environmental bias. Suffice it to say that there is a strong interest in EO data, covering a broad range of scientific and socio-economic activities.

Netherlands participation

From the brief presentation of the Netherlands EO policy and interests, it should be clear that the Netherlands government has decided, not just to contribute financially, but to participate actively to the European EO programme. We plan to implement this decision by contributing technically and scientifically to the development of instrumentation to be flown on European missions, by developing new applications of EO data, and by active involvement in building a national, European and worldwide EO data infrastructure.

The Netherlands has a long and outstanding tradition in space based astronomical instrumentation. A well known example is the instrumentation of the IRAS satellite (Infra Red Astronomical Satellite). Data from this highly successful satellite continue to produce surprising results. The Research Institutes of the Netherlands Foundation for Space Research (SRON) and the Netherlands Space Industry together have excellent experience in this field. Building on this experience, a spectrometer SCIAMACHY is now being developed in close co-operation with Germany. With this instrument, which will be flown on the first European operational environmental satellite ENVISAT-1 to be launched by the year 2000, it will be possible to measure the spatial distribution of a number of important trace gases in the earth's atmosphere. This will lead to an improved understanding of the chemical processes in the atmosphere, relevant for such environmental problems as the depletion of the ozone layer and the greenhouse effect. SRON and a consortium of Dutch space industries are responsible for the design and part of the construction of the instrument.

An active user involvement in the development of new applications of EO data is essential. The necessary R&D is supported by government through programmes managed by SRON and by the Netherlands Remote Sensing Board (BCRS). On top of these regular programmes, the government has made available an extra f 6 mln (\$ 3 mln) per year for the support of future users of data produced by future European EO missions. Through

these regular and extra funds a wide variety of projects is being and will be financed. As an example, the Royal Netherlands Meteorological Institute (KNMI) has already an operational ozone data assimilation system that produces a near-real time picture of the status of the ozone layer worldwide on the basis of data supplied by US satellites. Supported by external funds, this system is now being improved to deal with data from the European instrument GOME, to be launched in 1994 on the ERS-2 satellite. This again is a first step towards developing a comprehensive system to assimilate data on many atmospheric components from SCIAMACHY in support of atmospheric chemistry research.

The large sums of money, spent on developing instruments, launching satellites and supporting application development, are well spent only if the data are accessible in a transparent and user friendly manner. In the past insufficient attention was paid to this problem, but that has changed now. Data access is of course not just a local problem but in fact a global problem. Ideally any user should have easy and transparent access to any data he or she wishes to use without having to know whether these data were produced by an American, a European or a Japanese satellite, or indeed where the data are archived. Such global infrastructure does not exist yet. However the first steps in this direction are being taken. The Netherlands government has initiated a study to inventory the present and future users of EO data and to propose a concept of an adequate infrastructure to serve these users, taking into account that it should be part of a European infrastructure. At a European level similar attempts are being made to define an appropriate EO data infrastructure. Finally at a global level, steps towards a worldwide data exchange system are being taken within the framework of the Committee on Earth Observations Satellites (CEOS).

**REMOTE SENSING:
IMPLICATIONS FOR DEVELOPING COUNTRIES**

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Remote Sensing: implications for Developing countries

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ABSTRACT

This paper¹ discusses the relevance of Earth observation to developing countries. It treats the requirement for a better user needs assessment to be made in order to concentrate on appropriate and practical applications of remote sensing. This is followed by an analysis of some of the key issues involved and the constraints to the transfer of remote sensing technology to the developing countries.

INTRODUCTION

Questions are often raised as to the relevance of Earth observation technology to developing countries. Is not space technology most 'inappropriate' in these countries? Why should these countries spend millions of dollars in capital intensive technologies when unemployment is

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rampant and they face more pressing problems of food security, environmental degradation and natural disasters?

These questions assume relevance and importance in the light of societies, in some of the advanced space-faring nations themselves, forcing their governments to reconsider the growth of major space ventures due to vast financial and human resources commitment they called for. It is understandable as any improperly planned and undisciplined deployment of visible operative technologies can cause societal disenchantment. Rightly or wrongly, in some of the advanced countries, space technology was partially directed towards military purposes, domination and purely for prestige purposes. With the end of the Cold War, some of these programmes lost their relevance and societal support, and Russia, USA and Europe are decreasing their engagement in space.

Society always views with doubts and reluctance any enthusiasm of scientists and technologists to introduce new technology to the fabric of an ancient culture, which is true in many developing countries, in the Asian Region especially. At the same time, no society can escape the responsibility of innovation and action if the ultimate result is to be truly beneficial. Societies will greatly support any high technology ventures, their absorption, adaptation and assimilation if they are in conformity with the societal goals and are used for improving the quality of life, health and welfare. Unless the technology is in synergy with the social development, it is not of much use to the society. Earth observation and remote sensing applications adopted appropriately in the sustainable developmental strategy of the nations provide this needed synergy.

At a recent consultative group meeting of senior experts held in Bangkok in March 1994, preparing a Ministerial conference on Space Applications for Development to be held in Beijing, China in September, many issues facing the developing countries were discussed. The following paragraphs provide a summary of these discussions, as an introduction to the subsequent treatment of user needs, issues and constraints.

One of the major issues facing the developing nations is the lack of 'awareness' of the planners, administrators and the political leadership that Earth observation is no more a

luxury or a prestige good, but an essential element of national developmental activity. There is a need to bring about awareness/knowledge and understanding of space applications in natural resources accounting, environmental monitoring, disaster management, communication and energy sectors, which are directly part of developmental planning.

Surprisingly, it is also noted that there is a lack of awareness among the users as well in some developing countries about the potential benefits of Earth observation. It could be due to fragmented nature of the user groups of remote sensing and may also due to a lack of a strong and persistent user voice. This lack of 'application-pull' has resulted in some countries opting for 'technology-push' solution of importing technologies from abroad, often leading to disenchantment due to inappropriateness of the solution.

Yet another noticeable aspect in many developing countries is the limited involvement of private sector industry in remote sensing applications. Most of these activities are largely confined to the government and public sectors. Investment from private sector in development and production of hardware and software for remote sensing applications in tune with the country's needs will not only reduce the governmental subsidy, but also hasten socio-economic development. Similarly, active involvement of non-government organizations and voluntary agencies in space applications need to be encouraged, which is presently at a lower ebb in many of these countries.

Inadequate knowledge of using remote sensing as an effective tool in combating problems related to sustainable development, lack of awareness of methodologies for integrating this high technology inputs into the developmental process, deficient institutional framework and assured financial support, lack of trained personnel, and a lack of rigorous commitment of authorities are some of the major reasons for poor integration of Earth observation applications to the development process in the region.

Most developing countries practice a sectoral approach to planning by allocating financial resources to different functional sectors, like agriculture, water resources, environment, wasteland development, rural development, urban planning, and energy sectors.

While this approach provides a means for financial accounting, ultimately the net impact on natural resources and environment is not felt, as the natural resources are interdependent. The planning, decisions, based on sectoral approach, fail to take note of this mutual interdependency as a result, the investment becomes infructuous. Such a situation, for a developing country with scarce financial resources, is highly unfortunate. Any sustainable developmental process, to be effective, has to be an integrated approach and space technology (particularly satellite remote sensing and GIS) provides a means of integrated resources survey which help the governments identify local specific solutions that are environmentally friendly, socially and culturally acceptable.

The validity of planning decisions is primarily controlled by the adequacy, reliability and categoric compatibility of the information vis-a-vis planning levels. It has been widely recognized that many a time, the dilemma between 'bottom up' and 'top down' approaches, with respect to quality and timeliness of information, is the root of reason why environment science has had little impact on strategic and conceptual decision making in many of the countries. Experience has also shown that biased or incorrect and inadequate information at the early stages lead to unrealistic strategies and cause lop sided development in many cases.

At the same time it is important to realize that adoption of high technology like remote sensing should not lead to an increase in dependence on other countries. An UNCTAD study has indicated that the rate of importation of technology in developing countries increases at a rate of two and half times their rate of industrial growth. It only means that industrial growth does not lead automatically to technological development. Formulation of any effective strategy for Earth observation development should take cognizance of the contrasting political and social systems, and different levels of economic, industrial and technological development of the countries in the region.

In the face of threats of irreversible environmental damage and consequent irreparable impact on quality of life, there is a need for the decision makers to establish a hierarchy of research objectives which duly reflect the concerned societal needs that could be taken as the basis for remote sensing applications. Presently, there seems to be a gap between decision making

mechanisms and research studies carried out by individual scientists and institutions in the region.

An appropriate fusion mechanism when established should lay the eventual foundation for:

- (i) effectively integrating Earth observation applications with societal goals; and
- (ii) development of a self-reliant technological base, conscious to the cultural, social aspirations of the local people.

USER NEEDS

One of the most important aspects in making remote sensing operational is to clearly understand users' needs. The international advisory committee set up by the World Bank and other multilateral and bilateral donor agencies to establish an environmental information system in sub-Saharan Africa has emphasized a much more demand-driven approach. In 1992, the European Commission set up an expert working group on European Earth observation data policy - a particularly important aspect in the process of operationalization of remote sensing.

It is clear that industry is today more responsive than the academic remote sensing community to meeting clearly identified user needs in remote sensing. The data providers such as Spot Image are continuously adapting their products and bringing out new products to meet latent and actual needs of present and potential users. The hardware and software companies are continuously making their systems simpler and more user-friendly.

As Brooner *et al* pointed out, and what many remote sensing researchers seem to forget,

- (1) What is theoretically possible and can be demonstrated in the laboratory does not necessarily work in operational programmes.
- (2) What works for large regions, continents and nations does not necessarily work at the provincial or local level.
- (3) What is sufficient for research information gathering is not necessarily sufficient for the administrative and legal responsibilities of governments.

- (4) What is possible as a one-off proof-of-concept or feasibility study is not necessarily economically sustainable in the long term.

For many problems facing decision makers, the data and information sources they need must have as many as possible of the following characteristics if they are going to incorporate remote sensing into their operational planning procedures:

- all-weather capability
- day-night capability
- high spatial resolution
- multispectral capability
- large area coverage
- frequent coverage of the areas of interest
- data continuity
- effective (cheap and fast) data dissemination
- computing power availability for preprocessing, processing and post-processing of data
- affordability
- reliability
- data integration/fusion
- uniformity
- repeatability
- high accuracy
- availability

One of the most important characteristics is that of sequential monitoring. Often it is not sufficient to have information of the present situation, but it is necessary to monitor changes over time. Access to accurate and timely information is thus a cornerstone in any decision-making process.

The international advisory committee referred to above, has set up a user-demand driven approach. The main features of the programme are:

- Based on local participation
- Focusses on human resources development
- Focusses on people's problems
- Mobilizes African expertise
- Comprehensive review of all existing national data systems
- Focusses on defining and establishing the policy framework
- Low-cost interventions and pilot activities

They have developed an approach for assessment and Programming activities which are adapted to the specific conditions of individual countries. The key elements are:

ANALYSIS OF THE CURRENT SITUATION

A. Assessment of the demand and options for remote sensing and gis products

This demand has to be assessed from 4 different viewpoints: (a) user levels (community, district, national levels); (b) specific sectoral needs (agriculture, urban, infrastructure ..); (c) inter-sectoral needs (meteorology, water, population ..); and (d) specific needs of on-going projects. The expected results of demand assessment from these 4 viewpoints will obviously overlap but it will allow a better definition of the global demand through cross-checking.

** User levels:*

- (i) At the community level: What resource data and land information do rural and urban dwellers and communities need? Do they have and/or do we have a clear perception of these needs? And if not, how can we assess them? In other words, what sort of surveys need to be carried out? What is the relationship between the needs perceived by urban and rural dwellers, and underlying needs to be addressed? What are the obstacles preventing these needs being addressed? What are the obstacles to these users for meeting their needs, and how can these obstacles be overcome?;

(ii) At the district level: identification of the current and potential users of maps and land information in both the public and private sectors; assessment of the use they have made of the existing data; difficulties and issues; assessment of their priority needs and gaps to be filled in terms of information systems for land administration and natural resource management;

(iii) At the national level: along similar lines as above (ii).

* *Sectoral needs*: agriculture, urban, forestry and wildlife, infrastructure, mining and industries.

* *Intersectoral needs*: population, meteorology and climatology, water ..

* *Specific demand at the project level*: in the various sectors (agriculture, forestry, natural resource management, infrastructure, urban ..). This demand has to be assessed not only for on-going projects but also for those about to be implemented. It includes the needs for planning, projecting and monitoring.

* *Technology options to meet demand*: coverage, scale, accuracy, acquisition frequency, costs.

B. Assessment of the general context

This is done simultaneously with (A).

* *Historical Perspective and assessment of the current Government Policy* regarding natural resource management and the present role of land information and remote sensing in improving such management.

* *Gathering of information on the main geographic features* of the country considered: total area, general topography, river network, main ecological areas and general

vegetal coverage; description of the different ecosystems, both natural and modified by human activities (primary forest coverage, other forest areas, savannas, wetlands, rainfed and irrigated cropping areas, human settlements; population, its geographic distribution and its trends; administrative boundaries; urbanization process; different types of cropping systems in the different ecological zones; land distribution according to tenure systems; plot sizes and distribution in the rural and urban areas (a large part of these information could probably be dug out during a desk review at the donor level).

* *Inventory of existing data regarding natural resource information and remote sensing:*

- (i) Geodetic Network: date and method of establishment; number of points, total covered area, average density, accuracy level; estimated percentage of points that have been destroyed. This should be collected for both primary and secondary network;
- (ii) Existing geo-based general products, their institutional location and their access: (a) existing aerial photos; types (panchromatic, colour, infrared ..), scale, date of surveying, total covered areas, form and status of conservation (placks, original films, slides ...); (b) existing maps; types and scales, methodologies used and updating process; total covered areas for each type; (c) existing satellite information; types, scale, existing magnetic tapes, total covered areas per types;
- (iii) Existing geo-based thematic products, their institutional location and their access: this inventory would be conducted on a sector-by-sector basis with a special emphasis on information systems related to: (a) soils, erosion, topography; (b) land use (agricultural land, forest cover, parks and reserves); (c) population distribution; (d) water (hydrology, hydrogeology) for agricultural, urban and industrial uses; (e) infrastructures; and (f) urban settlements;
- (iv) Existing data on property rights in both rural and urban areas: existing maps, their scale, data of establishment and methodology, total covered areas; updating systems in relation to land conveyances; existing land registration books, accuracy, usefulness

(i.e. how many times per day they are consulted by clients), demand in terms of certificates and copies; average number of registered land conveyances compared to total number (legal + illegal); indicators on land distribution and plot size; need for consolidation? Valuation of property, built and unbuilt.

* *Analysis of the institutional framework:*

(i) public sector

Diagnosis of the main institutions involved in the production of land information and remote sensing data (legal status, organization and management, building and existing equipment, budget and capacity for self-financing, personnel, training, technical assistance). Past, present and future trends.

Analysis of the main institutions using land information, mapping and remote sensing data. Access to information, networking and data management. This analysis regards not only the institutions dealing with natural resource in the rural areas but also those in charge of urban management;

(ii) private sector

Existing private surveying industry. Estimated total turn over and professional capacity. Main areas of involvement. Technical level and equipment. Main areas (ground surveying, aerial surveys, mapping and satellite remote sensing). Existing liaison between the public and the private sector.

* *Analysis of the legal framework:*

Existing legislation regarding aerial surveys, mapping and remote sensing. Access to information. Existing land laws and registration. Rules and regulations for cadastral surveys and land registration.

- * *Analysis of existing land taxation in both rural and urban areas.*
- * *Status of integration/non integration between mapping and remote sensing and other data on natural resources.*
- * *Potential problems and constraints for developing geographic information systems (GIS):*

Division of responsibilities among institutions regarding natural resource management; potential problems in terms of organization and collaboration between institutions; stated goals and present achievement; manpower constraints; financial constraints; present overall system for natural resource management (data acquisition, analysis, processing, dissemination and storage) and identification of problems; constraints for establishing GIS; lack of data, or quality and/or accessibility; lack of software and application systems; lack of hardware; problems related to policy and legal framework.

C. Urgent pilot operations

The most urgent problems in natural resource management should be identified at an early stage of the Programme. Some of these problems could be dealt almost immediately through low-cost pilot activities. The first APA mission should identify the latter, including related training, and propose a programme with estimated costs and monitoring indicators. This programme would be submitted to the Secretariat and interested donors for immediate financing. Initial results of the proposed interventions would provide practical experience for the formulation of policies and strategy. These results would be included in the reports.

D. Development of human resources

A special attention has to be paid to the development of human resources, both on-the job and formal training. What are the existing training facilities in-country, if any? What are the existing training facilities in-country, if any? What are the constraints? What is the training demand in the different sectors? How to meet the demand in the short, medium and long

term? At the same time, training activities, particularly familiarization to the whole process proposed, is expected to be initiated as an integral part of APAs.

E. Assessment of the gap and brief summary of main constraints

On the basis of the above items, a sort of balance sheet would be established, highlighting (a) the existing data systems, their current use in the different sectors, at the different levels; (b) the priority sectoral and inter-sectoral demand in terms of natural resource and land information also at the different levels; and (c) the main financial, technical, institutional and legal constraints.

From this balance sheet, one would derive: (a) the low-cost interventions that could be implemented almost immediately to improve the use of existing data; (b) the institutional, legal and fiscal changes that should be considered to lift the major constraints; and (c) the main lines of a possible long-term strategy.

Using such user needs assessment approaches has led to the identification of many real applications of remote sensing in the developing countries.

Several developing countries have used remotely sensed data for studies relating to floods, land productivity, desertification, soil erosion, water logging and salinity, deforestation, droughts and snow cover. Some examples of these and other applications of remote sensed data are:

- (a) Hydrogeological studies, preparation of national inventory of water reservoirs, and monitoring of changes taking place in existing water reservoirs.
- (b) Prediction of flooding of rivers and sounding of alarm for populations in vulnerable areas.
- (c) Estimation of biomass in semi-arid areas to study rangelands and to plan range-management programmes.

- (d) Vegetation mapping/forest resources management.
- (e) Crop production forecasting.
- (f) Geological mapping and coastal zone dynamics.
- (g) Updating maps.
- (h) Identification of locust breeding areas.
- (i) Detection of volcanic ash in the atmosphere, forest fires and their tracking.
- (j) Land use study and regional development planning.

Mapping of desertification and evolving of appropriate methods for halting the spread of desertification and management of arid zones; studies of rangeland and management of agriculture, tropical forests, soil erosion and improper land use; management of water resources, floods in the deltas of rivers; monitoring of sea level changes along the shoreline; and measurements on ocean dynamics, including the biomass, temperature distribution, upwelling, etc. which have direct relation with fisheries, monitoring of unsustainable urban expansion and pollution, and natural disasters are all problems for which a clear need has been established and which can be tackled by a proper use of Earth observation data.

UNCED '92's Agenda 21 also recognizes the user needs and has many sections on the use of remote sensing for developing countries. The following quotation from Chapter 12 is just one example:

"12.49 Governments of affected countries, at the appropriate level and with the support of the relevant international and regional organizations should: [...] (c) Strengthen national early-warning systems, with particular emphasis on the area of risk-mapping, remote sensing, agrometeorological modelling, integrated multidisciplinary crop-forecasting techniques and computerized food supply/demand analysis."

ISSUES IN EARTH OBSERVATION IN DEVELOPING COUNTRIES

Whilst the user needs can be identified and the remote sensing technology developed to meet these needs, most developing countries are yet to derive maximum benefits from Earth observation.

There are a number of issues which come in the way of and/or have a direct bearing on advancing applications of remote sensing technology and their ultimate integration with planning for sustainable development. Some key issues relate to, or arise out of:

- Cooperation, coordination and interaction both at national and regional levels;
- Human resources development;
- Inadequate resources for Earth observation applications;
- Resistance to change;
- Adoption/adaptation of technologies;
- Rapid technological developments;
- Restrictions on the transfer of technology;
- Changing policies;
- Standardization of hardware and software;
- Lack of involvement of private sector;

- Planning and implementation; and
- Infrastructure.

Another issue faced by developing countries is with respect to use of data. Super abundance of data does not mean that data is available for all situations. On the contrary, it is often the case that one finds it difficult to get the right data at the right time. Even if the data is available, their ultimate utilization depends on proper interpretation based on intimate knowledge of field conditions. With multitude of data products types, formats, and profusion of hardware in the market, most of the time the users in the developing countries find it difficult to derive maximum benefit out of the available data.

The data explosion and the need to retain ever-increasing amount of data, very essential from global change and environmental study angle, pose great many challenges for archiving the data. Besides the physical limitation of storage and other technology related issues, appropriate decisions have to be made on what to record, what to retain, and for how long. Archival policy is one of the most discussed issues in most of the earth observation satellite faring nations today, complicated by the ever-changing technology, making obsolete earlier recording mechanisms and equipment, non-existing vendors to support retrieve the data or supply spares, storage media degradation (for example, optical discs), and the cost and the uncertainties of the new media itself. Interestingly, there are cost implications on the archived data due to the additional maintenance requirements from quality angle and transcription etc. On the contrary, there are demands for reducing the prices of archived data products for global change studies (EROS Data Centre has already done it for Landsat MSS products).

Considering the importance of data acquisition and archival of valuable data of relevance to sustainable development, there is an urgent need to review data archival policy at the national and the regional levels and to establish an appropriate mechanism to assure data availability in adequate standard format, quality and quantity at a rate commensurate with the need. The need for data repositories, high bandwidth electronic data networks and directories, and how these could be organized at regional/international level are related questions to be addressed.

Such initiatives will enable better utilization of processing and archiving capacity, besides aiding in the planning of more efficient data acquisition, calibration and validation activities.

With more advanced satellites in the pipeline offering very high spatial resolution, and narrow spectral band data, the applications in the future are bound to grow. With advanced information technology offering high power work-stations with high computing capability, one should be able to integrate very high resolution digital remote sensing data, with GIS, GPS and digital photogrammetry in the future. It should, thus, be possible to generate cadastral maps using satellite data in the future. Presently, aerial remote sensing meets this important need. Clearly, the developing countries, for whom this is of great importance and relevance are not prepared today for meeting this situation. Adequate endogenous capability build-up, in terms of infrastructure and trained human resources development is the need of the hour.

Unnecessary restrictions are placed, in some developing countries, on making available topographic information for the users, in the name of security. In many countries, even official survey maps are restricted, while in some, quoting map coordinates in documents is illegal. Some countries are bogged down, associating remote sensing data with high security and/or economic surveillance risk, and it is not uncommon to find countries placing restrictions on aerial photography and related products. Similarly, some space-faring nations place unnecessary policy restrictions on the availability of data, thus, inadvertently associating remote sensing with dangers of misuse of analyzed information. Unfortunately, these tendencies are likely to divert attention from the pressing resource management problems facing the developing countries. On the other hand, inadequate, inaccurate information, both topographic and thematic, is counterproductive to the country's development.

Internationally, this restrictive attitude has effectively stalled to have an international collaboration programme for remote sensing satellite development on the lines of INTELSAT and INMARSAT, which would have greatly standardized both space and ground segments to the advantage of developing countries. Such a system also would have ensured continuity through an optimal replenishment strategy of space segment.

One of the important issues facing GIS usage, today, is non-availability of universally acceptable standards. GIS benefits depend on accurate, accessible and affordable data, all of which require standards. Cost effectiveness and utility are enhanced by standard for data transfer, quality and content. At least four classes of standards apply to GIS - data standards, application standards, information technology standards and professional standards.

Creating a consensus on standards among diverse, diffuse groups of vendors and user is a complex task. It is true that in any emerging new technology area, early enforcement of standards may suppress innovation. Sometimes, information technology standards may limit the full use of available machine or software capabilities; however, it is not expected to affect GIS capabilities, as few operations are limited by computing power. There is also a fear that standardizing operating systems and networks may have security implications, resulting in viruses etc., thus corrupting the data sources (Ventura, 1993).

Basically, what is most essential today is to have appropriate standards which will enable data exchange/transfer between the multitude of GIS systems available in the market. Maybe development of a common data transfer format could help transfer data between various systems by developing appropriate conversion routines such as being made by ITC's "ILWIS" remote sensing/GIS system, which has vector/raster conversion programmes to many commercial software packages.

In some aspects of space technology and infrastructure, the developing countries have already reached a surfeit. For example, apart from parts of Africa and the small island nations of the Pacific, the coverage by earth observation ground stations is more than adequate. There is considerable geographic overlap, and also many instances in which adjacent stations routinely access the same satellites. The redundancy is particularly pronounced in the Indian sub-continent and over south east Asia, and exists to a lesser extent in eastern China and Japan. In fact, the concentration of earth observation satellite ground stations is higher over Asia than anywhere else in the world. Whereas Europe, Africa and South America are each served by two or three reception stations, there are ground stations for Landsat Thematic Mapper data in Bangladesh, Indonesia, Pakistan, India and Thailand, as well as in Australia, Japan, China, Taiwan, Iran and Korea. New stations are being planned for Malaysia and Singapore.

Nearly all of these stations are also capable of receiving data from the SPOT satellite, while several are equipped to obtain data from the European ERS-1 and the Japanese JERS-1 radar satellites. Only the Indian reception station is currently equipped for the reception of data from the Indian IRS-1 resources satellite.

The apparent lack of coordination in the construction and operation of these expensive facilities (which have a capital cost of around US \$ 10 to 20 million per establishment) raises serious questions about their economic viability in some cases. Access fees for the reception of the commercial earth resource satellites SPOT and Landsat are approximately US \$ 1 million per annum per satellite. The cost of running an X band ground station, including about 10 specialist staff; consumables such as magnetic tape; and depreciation account for another US \$ 2 million per annum, approximately. This is a large expenditure which in every case exceeds ground station revenue from data sales.

The facilities, policies and procedures for processing and archiving earth observation data vary widely and have in many cases evolved in an ad hoc fashion. The same applies to calibration and to the generation of processed products, especially consistently calibrated long time series products.

For example, although INSAT has been generating hemispheric cloud and radiance data since 1984 and GMS since 1978, calibrated datasets from these sensors are not readily available and in some cases do not exist due to changes in archival policy or to deterioration of archived data.

Similarly although many countries operate High Resolution Picture Transmission (HRPT) ground stations to receive image and sounder data from NOAA's Advanced TIROS satellites which have operated since 1978, even relatively basic products such as regional baseline 1 kilometer resolution land cover maps do not yet exist.

CONCLUSION

Many developing countries such as in Asia and Latin America, where there has been soaring economic growth in recent years, have begun to realize the consequences of ill-informed development planning and are beginning to take advantage of modern and sophisticated technology such as space remote sensing and Geographic Information Systems (GIS) for natural resources accounting and natural environmental monitoring. As a result, there has been a rapid increase in space applications activities in recent years.

Increasing use of modern technologies such as remote sensing and GIS raises many issues on the social, political and environmental aspects of technology. The concept of Technology Assessment (TA) suggests that instead of discovering the negative social effects of technology only after they have happened, such effects can be determined before, in order to reduce or avoid them by means of studies, consultations and pertinent decisions. In remote sensing, aspects such as invasion of privacy, access to digital databases, resource exploitation in developing countries by western nations, etc. are just a few topics of social concern here. In America, social evaluation of technology began to be institutionalized in the late sixties and seventies with the setting up of environmental impact assessment and the Office of Technology Assessment. This trend is now also evident in Europe and in the developing countries.

The issues and constraints discussed in this paper show that the obstacles to the operational use of remote sensing are not primarily any particular limitation or weakness in the technology itself. Rather, they are to be found in:

- the under-estimation of the complexity and size of the impact that remote sensing has on existing institutions and how they relate to other institutions.
- the under-estimation of the costs associated with the introduction of remote sensing technology, such as daily running costs, system maintenance, staff development, etc.

By understanding why projects have not been successful, together with an analysis of the techniques and methods used in projects that *have* been successful, we can come up with practical approaches to operational Earth observation.

Some of the different aspects of remote sensing technology transfer that warrant further research and development are:

- transfer from research environment to operational use
- transfer of remote sensing techniques from one application field to another
- transfer of remote sensing techniques from one geographic region to another
- transfer of remote sensing techniques from a local to a global scale (and vice versa).

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REPORT ON THE THIRD DUTCH NPOC/ECSL WORKSHOP

**Noordwijk, 15 April 1994
D.S. Vestdijk**

Recent Developments in the field of protection and distribution of remote sensing data.

Noordwijk 15-4-94

Introduction

by *Prof. dr. P. Malanczuk*, professor of international law, University of Amsterdam.

In his short introduction professor Malanczuk recalls the 1986 United Nations principles on Remote Sensing. One of the most important aspects highlighted in these principles is non-discriminatory access. It is with regard to the access to remote sensing data that problems arise and that the forcefield between private/commercial and public space activities becomes highly visible.

In Europe the wellknown example of private initiative in the field of remote sensing is the French company Spot Image. Important example of a publicly funded project is the the Earth Remote Sensing(ERS-1) satellite that has under the aegis of ESA successfully provided users all over the world with remote sensing data.

Professor Malanczuk brings into memory a workshop on the same subject held in may 1991.

Legal aspects of remote sensing mostly deal with protection of data in the different stages between detection and final deliverance of processed data to users. The ECSL has commenced research in the field of property rights. One new development worth while to consider is the issuing of the EC directive on databases.

Technical Aspects of Remote Sensing - Different Types of Sensors and Distributing Methods.

by *Mr. S. Bruzzi*, Envisat Mission Manager, European Space Agency.

Satellites used in remote sensing are known in two classes: LEO and GEO. The first class consists of spacecrafts active in low earth orbits, typically between 250 km and 1500 km. Examples of the latter type can be found in the geo-stationary orbit, approximately 36000 km above earth surface. LEO satellites are mainly occupied with meteorology and provide images each half hour. Their rotation period is about 100 minutes. The earth rotation allows them to cover the complete planetary surface.

A satellite can only transmit data back to the planet if it is in visibility of a groundstation. Because satellites in LEO are not always in such a position, they (should) have a possibility on board to record data and store these temporarily.

question: *While the data are recorded, is there any change in its format?*

You could consider that data are already formatted when they come out of the recording instrument. Data are always numbers; we materialise them in pretty pictures for audiences like you. But scientifically speaking, the format of interest is the quantitative number. On board the satellite there is preliminary storage and preliminary processing. These early data can be transmitted to users in the form of fast delivery of data.

The data may be of various types: we may disseminate them in near real time.

question: *What is the exact meaning of raw data, processed data and the stages in between; how much information is added on the ground?*

For example, let's take the ERS satellite. At first the data are meaningless numbers that are recorded and then transmitted. They then are elaborated on the ground, starting with the attache-

ment of geographical axes to the data. Then, depending on the use you want to make of it, some sort of model is used to do calculations. For example, if you have heights of waves collected by ERS, then combination of these with a model of wind interaction with seasurface can be used to reconstruct windspeed above the seasurface.

The stages in between I would call transformations.

And finally you can process what we call a pretty picture.

There are some ways in which value can be added to satellite images:

- 1 Three images can be combined together in order to get multitemporal exploitation - you can see changes. Changes are given dominant colours and the analysts can discern where grass has been cut or trees have lost their leaves.
- 2 The adding of artificial colours for different image values. For example SPOT uses two spectral banks.
By selecting different colours we are able to make a three dimensional picture of the Greenland icesheet. In this way, climatologists are able to monitor the changes of volume of the ice.

question: *Does the satellite "know" the longitude and latitude of the area that it is sensing?*

In general, no. Satellites in LEO operate on the basis of time. For the attaching of geographical axes we must have high confidence in the orbital parameters of the satellite. A slight mistake could mean the difference between melting and growing of the Greenland Ice Sheet.

question: *How long has ERS been in orbit?*

In July of this year, ERS I will have been in orbit for three years which was also its expected lifetime. We are now crossing fingers and hoping for some months extra. Fuel and power look positive. At any rate, ERS II will be launched in the last part of 1994.

Remote Sensing: General Legal Principles and ESA Policy

by *Mr. M. Ferrazzani*, Legal Affairs Department, European Space Agency

The European archives are full of satellite data and there is a growing need to manage the activities of satellite data use. The European agency must process, archive and distribute such data for it is an ESA Mandate.

In order to do this ESA must develop a legal policy.

Remote sensing has both a commercial and a scientific aspect. The European Remote Sensing satellite (ERS I) has played a flexible role in this respect. The ERS I is the first Remote Sensing satellite in orbit on basis of wide international cooperation because it is an optional programme.

The data policy has been discussed and agreed upon by the funding states themselves. The document concerning the data distribution policy is under revision for the ERS II mission. The ERS II policy will be approved the next few months and be published before the launch.

The ERS objective is both scientific and commercial in the sense that ESA wants to commercialize ERS data to the highest extent possible. Therefore we need protection against unauthorized copying of data (primary data and processed data).

ESA holds two legal principles:

I There is a fundamental public interest for which reason RS data should be open on a non-discriminatory basis. This idea is laid down in the United Nations General Assembly Resolution 41/65 (Principles relating to Remote Sensing of the Earth from Outer Space). ESA wishes to comply with these principles.

II Private/Public international law

The main question arising in this field concerns the ownership of the data, seen as output of the sensors. ESA has concluded agreements with all kind of remote sensing organisations; everybody recognizes the ownership of the data.

Most of the ERS I data have been used for scientific calibration, only 5 or 10 % was used for commercial projects. It has become customary that a satellite operator writes down the rules for access to the collected data. For example, the USA uses rules for trade secrets to regulate access to data.

There is a tendency to grant access to data under license to use and distribute data.

Finally, when data come out as a publication, they are copyright protected.

question *What is the pricing policy?*

There is a different pricing policy for each category, which is discussed by the funding states. A price list is made for raw data and processed data. Each level of processing induces a level of cost. There is a preference for free access for scientific users. In that case, projects should be submitted in advance.

The second level is that for demonstration and research usage. This has a scientific connotation but may also play a commercial role.

The third level is the full commercial price.

This system of pricing is applied worldwide as all local groundstations have to use the same ESA conditions of access.

question *In this sense you deviate from Landsat/Spot?*

Landsat wants to maximize sales and for this reason uses a local pricing policy.

Issues of Protection of Remote Sensing Data: EC developments

by Mr. P.H. Tuinder, Consultant Space Law, Paris

A very recent development is a change in the US policy two weeks ago, when the Clinton administration allowed private operators to operate remote sensing satellites with 1 meter resolution (used to be 10 meters for national security-reasons).

The importance of remote sensing in economic terms has become obvious. In the United States remote sensing as a business is coming of age. The department of Commerce has the authority to issue licenses. Since 1992 four institutions have applied for a remote sensing license, amongst which Lockheed and Worldview Imaging Corporation.

In Europe, remote sensing activity is mostly publicly funded. The market consists of 80 % institutional users and 20 % private users. This should change and the private market should be developed.

Four points can be mentioned that stand in the way of new development:

- 1 lack of strategy for the relationship between user and supplier.
- 2 a bad infrastructure for dissemination of data
- 3 lack of standardization.
- 4 lack of legal framework

Until now, ESA has been the only actor on the remote sensing stage. An often heard complaint is that ESA does not care about the users.

Concerning the legal state of remote sensing data in Europe, one can say the practice is somewhat confusing: on the one hand ownership rights are invoked to establish legal protection, on the other hand copyright rules are being used for that purpose.

Four characteristics need to be present if copyright can be applied:

- 1 authorship
- 2 originality
- 3 creativity
- 4 human intervention

The first three aspects can not be found with remote sensing data because these reflect what is already there.

A study has been performed in ten EC states to analyse existing provisions. This project, known as the Gaudrat study, discerns between raw data and value added processed data. To the latter, rules of intellectual property rights can be applied.

Value added products, as distinguished from raw data, are protected, yet the legal content of this protection is dependant on the product and the country. The raw data however are not protected by intellectual property rights. Operators could ask for trade secret and confidentiality but this would have to be done on contractual basis, therefore only valid between two parties and not *erga omnes*.

In the Gaudrat study it has been suggested that raw data be protected under the rules currently established for electronic databases. Two aspects of the database-rules offer good solution to problems regarding RS data protection:

- *sui generis* rights with regard to right of extraction of data;
- rights are directly enforceable in the whole of Europe.

Assuming that remote sensing is a process creating a database, reception of data would then be equal to accessing the database.

However, before the database concept could be applied to remotely sensed data, two concepts in the draft directive would have to be changed:

- the concept of a database;
- the concept of extraction & accession.

In order to be applicable to RS data, it should be established that as soon as the signal comes down to Earth, one can speak of a **configuration of data**, i.e. a database. Temporal storage is the

only weak part in this reasoning.

An important element for being able to speak of a database is that there is a thesaurus.

At this moment the European Council is discussing the directive on databases. Space is playing a minor rôle in the discussions. France is opposing the directive and ESA is lobbying for an adoption of the directive in its amended form. ESA is mentioning the following pro's;

- A harmonised situation in Europe
- *Sui generis* protection
- Stimulation of private investors
- A better negotiating position for Europe

question *Does it matter for the directive under discussion that the signal is coming from outer space?*

Concerning jurisdiction and control over activities in outer space, it does, but not necessarily for protection under ownership or intellectual property rights.



The Dutch Policy and Interests in Remote Sensing

by *Dr. A.P.M. Baede*, Chairman Working Group Earth Observation, Royal Dutch Meteorological Institute KNMI

In a memorandum sent to the parliament in 1992, the dutch minister of economic affairs, mr. Andriessen, laid down the the dutch policy on remote sensing. The five following points form its basis:

- co-responsibility for global earth observation structure;
- relevant contributions;
- emphasis on earth observation for meteorology and environment;
- participation at GNP level;
- active participation and influence in the relevant representative bodies.

In the Netherlands exists a longstanding experience in instrument making. Starting in the early seventies with ANS (Astronomische Nederlandse Satelliet), building experience with IRAS (Infrared Astronomical satellite), dutch instrument makers are developing Sciamachy (Scanning Imaging Absorption Spectrometer for Atmospheric Chartography). Sciamachy, a German/Dutch joint venture will measure gasses in the atmosphere and it is expected to be launched in 2000.

In the past, Space was a technology driven business but things have changed and tides have turned. Nowadays, space developments are much more user oriented. During design and implementation of missions, easy access to data and active participation of users by means of socalled user networks need to be guaranteed. In meteorology and astronomy there are well defined user groups but with remote sensing this is unfortunatly not so; archeologists, forestologists, journalists, etc. haven't developed one voice yet.

Interest of the Netherlands in Remote Sensing

- a Operational meteorology
In this field there is the longest tradition. Several dutch institutions use these data (Wageningen, Utrecht, Amsterdam).
- b Climate Research & monitoring
mankind is changing the climate by adding greenhouse gasses to the atmosphere. When and how the climate will be changed, we don't know. Therefor the science needs to be understood, models be verified and continuing monitoring undertaken.
- c Atmospheric chemistry, ozone layer.
- d Water management
- e land application
- f cooperation with developing countries

As an example, some ozone measurements from the years 1991, 1992 and 1993 are shown: 1993 shows a real minimum on the northern hemisphere, which caused considerable panic. The 1994 measurements however show a return to the 1992 situation. In the meantime it has been established that the minimum was partly caused by the eruption of the Pinatuba vulcano. This doesn't mean that slow destruction of the ozone layer caused by human activities is not taking place.

Attention is being paid to the user interest and his access to data. The dutch policy proposes a worldwide context for login procedures. That is where the lawyers come in to tell us what we can do and what not.

Remote Sensing: Implications for Developing Countries

by Prof. dr. J.L. van Genderen, Department of Earth Resources Surveys, International Institute for Aerospace Survey and Earth Sciences ITC.

ITC trains 450 people from developing countries each year. 70 countries are involved. Since its foundation, ITC has trained 12.000 in total. At present, ITC has five sister organisations in Indonesia, China, South America, India and Africa.

ITC's funding from the government hasn't changed since 1971. ITC has been looking for growing contributions from private entities, the so-called "derde geldstroom".

In our attitude towards developing countries we have learned to listen twice as much as that we talk, for God has given us two ears and only one mouth.

Characteristics remote sensing programmes should have in order to be succesful

- all weather capability (Sumatra has been cloudy for 20 years and only now with ERS, having radar among its instruments, remote sensing has any sense).
- day and night capability.
- high spatial resolution
- multi spectral capability
- large area coverage
- frequent coverage of the areas of interest.
- data continuity
- effective dissemination (if data tapes are withheld in customs for one month, the effectiveness of the program is seriously effected).

Some applications

- Geological mapping/ mineral exploration.
- Map updating; in the former communist countries old and wrong data have been used for maps. In order to invoke cadastral laws and regulations remote sensing data are used.
- monitoring of desertification
- early disaster warning

Obstacles

- difficulties in obtaining the data because of lack of access to ground stations.
- Lengthy procedures, specially in customs. When a considerable amount of tapes with RS data had to be exported from China, the value had to be estimated; somewhere between \$500 and \$2000.
- human resources:
 - lack of a critical mass of trained personnel;
 - lack of experienced and multidisciplinary staff;
 - too much reliance on outside experts.
- Lack of funding.

PUBLICATIONS OF THE EUROPEAN CENTRE FOR SPACE LAW

The following documents are available upon request from the European Center for Space Law:

- 1.- *ECSL Space Law and Policy Summer Course, Basic Materials*, Martinus Nijhoff Publishers, 1993, Vol 1, 185 French Francs. Vol 2, 165 French Francs. Both volumes: 250 French Francs.
- 2.- *Space Law Teaching in Europe*, Martinus Nijhoff, 1993, free.
- 3.- Emmanuel Ducasse, *L'Europe des Télécommunications par satellite: entre libéralisation et coopération*, étude réalisée avec le concours de l'ECSL et sous la direction de Madame Simone Courteix, 1993, free.
- 4.- *The Implications of the CEC Green Paper on Satellite Communications in Europe*, Proceedings of a workshop organised by ECSL/Dutch NPOC in ESTEC, The Netherlands, September 1991, free.
- 5.- *Intellectual Property Rights in Outer Space*, Proceedings of a workshop organised by ECSL/Spanish Centre for Space Law, Madrid Diplomatic School, May 1993, free.
- 6.- *Changing Europe in Space*, Proceedings of a workshop organised by the Dutch ECSL NPOC, ESTEC, March 1993.
- 7.- *"The Implementation of the ESA Convention. Lessons from the Past"*, Proceedings of the ESA/EUI International Colloquium. Florence, 25-26 October 1993. Edited by the European Centre for Space Law. Martinus Nijhoff Publishers. Hardcover. 200 French Francs.

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