AN ANALYSIS OF THE CURRENT STATE OF INTERNATIONAL REMOTE SENSING DATA EXCHANGE AND TRANSFER

John Felkner, National Center For Geographic Information and Analysis(NCGIA), University of California, Santa Barbara, Department of Geography, USA

Commission VI, Working Group 4

KEY WORDS: Remote_Sensing Economy Distribution Exchange Global International

ABSTRACT

This paper attempts to analyze the current state of international remote sensing data exchange and transfer, with a special focus on conflicting policies between the U.S. and Europe (which together are responsible for the vast majority of remote sensing data that is generated). Both the need and the potential for the sharing of remotely sensed data internationally has never been greater. However, this paper will describe a number of economic, legal and policy issues that currently threaten to greatly restrict and confuse international sharing of remotely sensed data.

OVERVIEW

These issues have very recently come to the forefront of the international scientific community because of disputes over data sharing policy that have arisen in such international negotiations as the World Meteorological Organization (WMO) Twelfth Congress (June, 1995), and in on-going negotiations between the U.S. and the European Organization for the Exploitation of Meteorological Satellites (Eumetsat). The evolving legal and economic issues involved in consequent international negotiations between countries over sharing of remotely sensed data are very likely to continue to come to the fore. For example, recent negotiations between the U.S. government and the Indian government over access to Indian remote sensing data has brought in issues involving proprietary rights for the data, distribution rights, the U.S. First Amendment to the Constitution, as well as questions of national sovereignty and security.

In the post-Cold War era, international exchange of scientific data - including vital remote sensing data - is becoming more and more vital. We are currently witnessing the continuing growth of a vibrant and rapidly growing commercial market for remotely sensed data which, due largely to technical advances, allows such imagery to be applied to an ever-greater variety of applications at ever more cheaper prices. At the same time, scientists across the globe stress more than ever the need for comprehensive gathering of Earth observation data at global spatial scales and continuous temporal scales. As our world approaches the 21st Century, all nations together will face the environmental and natural resource challenges that are already upon us. These include: global climate monitoring; natural resource management; and monitoring of pollution for both land and aquatic ecosystems. For all of these activities, remote sensing as a method of data collection offers unprecedented potential for both quantity and accuracy of data collected for global scale understanding of these complex problems. The need for international cooperation to share and process this data is enormous. Such a scientific need most probably cannot be met by market driven mechanisms, and this fact will continue to interfere with growing movements to attempt

privatization of remote sensing government systems.

Thus, tensions are steadily building between strong economic forces on the one hand, and the need to utilize the fabulous tools that remote sensing offers for comprehensive scientific purposes. Equally, subtly differing legal precedents and policies within different countries are now coming into open conflict, as a number of factors - the end of the Cold War, economic forces, scientific needs, and significant technological advances in both remote sensing technology and international transborder data technology - are pushing for immediate international sharing and collection of data. These legal issues involved differing traditions and laws between countries of copyright of data, roles of meteorological and data collection services, and national "cost recovery" data pricing policies.

METHODS OF RESEARCH

Methods of research include literature review, analysis of recent and on-going international agreements, and extensive interviews with "experts" and policy leaders in the U.S. government, Europe, the United Nations and developing countries.

ISSUES OF INTERFERENCE IN THE INTERNATIONAL EXCHANGE OF REMOTELY SENSED DATA

Complex issues threaten to restrict and confuse the international sharing of remotely sensed data. These impediments can be broadly put into two distinct categories: **economic** and **policy** issues.

Economic Issues

In recent years, many of the crucial issues related to remote sensing data sharing (and indeed, all types of data sharing) have revolved around growing economic forces. These issues can be divided into the following topics:

The Growth of a Commercial Sector. The most significant economic development in the 1990s has been the enormous international growth of a private sector industry that is involved in both the selling of "value-added" remote sensing data products and, in some cases, actual generation of data by privately owned sensors. Such companies as Accuweather and Kavouras now respond to a growing international market demand for value-added meteorological and remote sensing data products. As the cost of software and hardware systems for processing remotely sensed data has decreased (and their accuracy and power increased) dramatically in recent years, the ability of private companies (or individuals) to process and enhance remotely sensed data has vastly improved. Firms are now able to offer specific value-added products for particular market sectors.

Also, the number of private firms launching and operating their own space-borne and airborne sensors has increased. This is due, in part, to the decrease in the relative cost of such projects, and the fact that technology for doing so is more readily available. In the U.S., for example, Space Imaging, Inc., a subsidiary of Lockheed, Inc., is designing a multispectral stereo land remote sensing satellite system capable of achieving resolutions of 1 m (panchromatic).

Partly due to the end of the Cold War, political factors that would have inhibited the growth of the market for digital imagery are disappearing. For example, remote sensing services of the former Soviet Union now work with individual distribution companies in the U.S. and Europe to sell and distribute high resolution imagery (up to 1 meter) formerly collected by Soviet military systems for profit.

Another crucial factor in the development of the commercial market for remotely sensed images has been that of technology, including the exponential growth of international computer networks which facilitate the instantaneous transfer of digital

information. It is now possible for almost anyone to purchase personal computer systems and image processing software for very reasonable costs and display and process digital imagery at high speed and with relatively high data storage capacity, in comparison to recent years. Furthermore, as the internet expands and reaches ever more millions of users, access to freely-shared imagery from all over the world is now possible. Because of the decreased cost and increased proliferation of both powerful hardware and easy-to-use software interfaces, applications - in urban planning, pollution monitoring, population management, infrastructure planning, landscape architecture, etc. - of remotely sensed imagery have grown enormously.

A World-Wide Trend Towards Privatizing of National Meteorological Services, and "Cost-Recovery." The growth of a commercial industry for remote sensing data has recently come into direct conflict with another significant international commercial trend: the move towards complete or partial privatization of national meteorological services, and implementation of policies of "cost recovery." This represents a direct recognition of the existence of a growing commercial market for remote sensing data.

This trend has been most noticeable in Europe. In recent years, cost recovery policies have been implemented in the United Kingdom, Germany, France, Finland, Ireland, and Denmark, among others, and by facilities multilaterally supported by the European Community. However, various U.S. agencies have maintained cost recovery policies for years, although the legal framework for U.S. government cost recovery is different than for most European countries.

However, countries that are now implementing cost recovery procedures often find themselves in direct competition with private firms selling data products. In some cases, they must compete with firms that are selling data they have originally generated and shared freely with other countries. This is known as "re-exporting" of data, and the recent contentious debate at the Twelfth Congress of the World Meteorological Organization (WMO) dealt with this problem, and exemplified the tension between free and open exchange of data and the development and exploitation of a commercial market for that data.

A Debate Over The Public/Private Sector Interface. With the growth of the commercial market for remote sensing data, a long-standing debate over commercialization of public remote sensing systems has come to the fore. This debate is different in different countries, because of differences in legal and national policies. The debate has been brewing for many decades and is now becoming more visible partly because of the growing power of economic forces.

Currently, there exists significant confusion and ambiguity in both the U.S. and Europe over exactly how to re-shape government services to make them cheaper and more efficient, either through full or partial commercialization, or through privatization. For example, the U.S. government turned over the selling, marketing and distribution of NASA Landsat imagery to the Eosat Corporation with the 1984 Landsat Act. However, shortly thereafter, the price for individual Landsat images rose to a high of $4300 per image, infuriating large sectors of potential users who could no longer afford the data. The difficulty of the commercial transition to Eosat was highlighted by a negotiation between the U.S. government and Eosat to purchase imagery for a global coverage in order to calibrate the Mission to Planet Earth. When Eosat announced that the price would be a hefty $50 million, the failure of the system was clear. By the early 1990s, the transfer to Eosat was largely perceived to be a failure, and with the 1992 Remote Sensing Policy Act, the commercialization of Landsat was reversed.

In Europe, the European Community's first land remote sensing program, the French Satellite Pour Observation de la Terre (SPOT) system, is operated commercially. Though more successful in data sales than EOSAT, SPOT Image requires substantial subsidy from the French government in order to function.

Thus, attempts for total commercialization of major remote sensing programs have not been completely successful. It is doubtful that the market could support the large capital costs of a major remote sensing system. Furthermore, in Europe and the U.S. the desire for commercialization must walk a fine line between encouraging and discouraging private sector growth. In Europe, cost recovery policies may compete with growing private firms. In the U.S., national policy for commercialization must mesh with encouragement of the private sector. For example, in October of last year, the U.S. House of Representatives passed a bill to partially privatize activities of the U.S. National Weather Service in direct recognition of the growth of private sector firms: the Bill specified that the National Weather Service "will not compile data that the private sector is able and willing to provide."

Finally, attempts at partial or total privatization of data collection agencies must consider whether or not the existing market will support the collection of data needed for long-term scientific data sets.

The Rise of an "Information Economy." Many economists now argue that international economic systems have evolved into an "information economy," where markets now respond to the inherent value of data, much as if data itself constituted a commodity. The above economic factors now affecting international remote sensing can be seen as an expression of this evolution.

Increasingly, in a world where data is becoming more and more of a "commodity" in the traditional economic sense, we are seeing international data agreements moving closer towards traditional trade agreements. For example, the on-going conflict between the U.S. and Europe over the World Meteorological Organization (WMO) Resolution governing charging fees for certain types of data has seen recent protests by the U.S. to the International Trade Administration, and possible future moves for the U.S. Department of Commerce to take over certain parts of the negotiation in a forum traditionally controlled only by meteorologists.

New economic theories and systems are now evolving to govern the economic value of information. It is recognized that not all kinds of information have equal value. New standardized systems of valuation for information must be agreed upon and used in order to facilitate the growth of a global market for information as a commodity. Within this evolving context, allowing the scientific community free access to certain data takes on a controversial air. New international agreements must be reached regarding which kinds of data will be "given" to science.

New regulatory infrastructures are also currently evolving to govern not only the value of information but its distribution and exchange. In the light of the growth of international computer networks, definitions of propriety and copyright, as well as value, will be of paramount importance.

POLICY ISSUES

The international community in the 1990s is facing a number of complex and difficult policy issues which must be resolved, or at least adequately addressed, to facilitate international cooperation. These issues include:

The Principle of Free and Open Access To Data. The Principle of free and open access to data has been a long-standing policy in the international meteorological community beginning with the creation of the International Meteorological Organization (IMO) in 1873.

Recently, the restrictions on data that have been initiated by a number of European countries (in part to protect their commercial activities to achieve cost recovery) have been viewed by many in the U.S. scientific establishment as a direct threat to the principle of free and open access to data. The overwhelming U.S. opposition to the Two-Tier proposal (to initiate restrictions on certain kinds of meteorological data) at the WMO Twelfth Congress has been the most visible example of this, as this was seen as a direct attack on free exchange of meteorological data, and one that could lead to "trade wars" between countries over data.

It must also be noted that in the U.S., a distinction has long been made when applying the principle of free and open access between meteorological and non-meteorological kinds of data. For example, NASA has in the past charged large fees for foreign access to Landsat data.

This is most probably not the last time the viability of the principle will be debated.

Copyright of Remote Sensing Data. This issue, perhaps more than any other, highlights major differences between U.S. and European legal structures for remote sensing data. It is integral to any debate on international agreements on data sharing, or cost recovery policies.

In most European nations, and indeed in the majority of countries worldwide, governments have the ability to copyright products and data and thus claim exclusive proprietary right. The major European remote sensing countries have clearly asserted their right to copyright government generated data, including France, the U.K. and Germany. This gives these countries a clear legal foundation for charging fees for access to their remotely sensed data.

The U.S., however, has a dramatically different policy regarding copyright of remotely sensed data, and indeed all government generated information. Federal U.S. law statutes prevent the U.S government from copyrighting information that it generates (partly to avoid potential conflict with the 1st Amendment to the U.S. Constitution which guarantees the right of free speech). Also, current interpretations of the Freedom of Information Act (FOIA) are that data in the possession of the U.S. government must be made available to any requester at the cost of reproduction. Thus, there is no legal basis in the U.S. for a market-based pricing policy to be imposed or enforced.

Both copyright and the principle of free and open access to data are issues that have figured largely during disagreements in the on-going negotiations between the U.S. and Eumetsat over Eumetsat sharing of data with the U.S. from meteorological satellites. Eumetsat has claimed the right to certain types of data from the satellites - based partly on a legal proprietary claim to the data - but has agreed to provide the U.S. with decoder machines.

Currently, a debate has arisen over U.S. access to data from U.S. sensors riding on Eumetsat satellite carriers. The U.S. claims free access to the data because of its ownership of the sensors, while Eumetsat claims the right to encrypt the data because the sensors ride on its carriers. Similar negotiations are also occurring between the U.S. and India over access to data from Indian IRS satellites.

What is the Role of Government? Underlying any plans to implement cost recovery processes on the part of government data collection agencies is the question of what kinds of data should governments be responsible for gathering? If a meteorological service is completely privatized, for example, will it only gather data for which there is a commercial market? What about the gathering of long-term ecological or meteorological data sets, which the international scientific community increasingly agrees is badly needed? Will a market-driven mechanism support such data collection?