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GLOBAL SPATIAL DATA INFRASTRUCTURE: ISSUES FOR SPACE LAW AND INTERNATIONAL COOPERATION

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ABSTRACT

The recent concept of a global spatial data infrastructure (GSDI) and its potential realization has captured the imagination and attention of policy makers, administrators, academia, industry and affiliated professions the world over. GSDI is essentially a movement towards widespread sharing of geographic information on a global level which bases itself on the concept of international cooperation through a borderless information flow- smooth, continuous, and most importantly, non discriminatory. From a humble beginning in 1996, as the dream of a small group of visionaries, GSDI has undergone tremendous expansion in terms of sheer concept alone. Though it aims to further global coordination, facilitation and cooperation among national and regional data producers/providers and users, GSDI actually ends up creating a plethora of legal and policy concerns instead. Using remote sensing and GIS as examples, this paper examines the various legal and policy issues which surround GSDI- public-private dichotomy, sovereignty, privacy, copyright and liability in particular. As a solution, international consensus through development of contextual understanding in a multilateral framework is suggested to make global spatial data infrastructure a reality.

1. INTRODUCTION

As we enter the twenty-first century, the concept of a global spatial data infrastructure and its potential realization has captured the imagination and attention of policy makers, administrators, academia, industry and affiliated professions the world over.
The Global Spatial Data Infrastructure (GSDI) began in 1996 as the dream of a small group of visionaries. In its initial stages it was a forum for those concerned with global spatial data to get together and discuss topics of interest, and try to come to agreement on activities that would help achieve their common aims. Now it has undergone tremendous expansion in terms of sheer concept alone. Making local geographic datasets available internationally and establishing a common inter-operability framework over shared data interchange protocols are important components of this concept.[i] It is essentially a widespread sharing of geographic information on a global level which bases itself on the concept of international cooperation through a borderless information flow- smooth,

continuous, and most importantly, non discriminatory. The importance and relevance of global spatial data infrastructure cannot be overlooked when we consider its immense potential in addressing global environmental and health challenges, in supporting international telecommunication, commerce, and human development, and in stimulating economic growth and productivity.[ii] The benefits of global coordination, facilitation and cooperation among national and regional data producers/providers to create a unified data infrastructure is, needless to say, a huge step forward for international cooperation in space activities.

The spatial data and processing capabilities supplied by technologies like remote sensing and geographic information systems (GIS) constitute a significant component of GSDI. Therefore, for the purposes of this paper, the various aspects of GSDI will be examined in the context of geographic information (GI), remote sensing and geographic information systems (GIS). Geographic information systems (GI) used interchangeably with the term 'spatial data', is any information that can be geographically referenced, i.e., describing a location or any information that can be linked to a location.[iii] To put it simply, when the information or data is referenced to the objects or the events that are geographic features on earth, then the information is geographic information.[iv] GI has to be further understood in the various technologies which employ it. Of them all, remote sensing and GIS are the most significant. GI consists of both remote sensing and non-remote sensing data. Remote sensing is a technology that collects data relating to the earth's surface without contacting with it, through a sensor mounted in a satellite or high-flying aircraft.[v] To just go by the layperson's definition- it is only a fancy way of referring to observation from space. In the broadest possible terms, geographic information systems (GIS) are tools in the form of computer software programs that allow for the processing of spatial data into information, generally information tied explicitly to, and used to make decisions about, some portion of the earth.[vi] This working definition is, however, neither comprehensive nor particularly precise as it represents a technology which envisages the integration of many subject areas.[vii]

With the advent of high resolution satellites in commercial domain, the Internet revolution and the convergence of GIS and space based remote sensing has improved access to detailed information to both civilian and government users.[viii] As a result, the need for development of a harmonized legal regime balancing national sovereignty, protection of privacy, liability and security concerns with public good and commercial objectives is increasingly being felt. In particular, GIS tools which enable combining of spatially referenced data such as socio-economic data and even personal data are subject to various legal regimes that govern different elements of generation and use of GIS databases, products and software. These have wide ranging legal and policy ramifications.

Hence, when we say that GSDI supports ready global access to geographic information we have to remember that it is really not that simple. As of now, the ideals have a long way to go before they can match up against the practical realities. The worldwide exchange and sharing of spatial data is all set to open another Pandora's Box. This paper will attempt to investigate the possible legal, policy and allied economic impediments to the adoption of global spatial data infrastructure. Using remote sensing and GIS as examples, this paper will examine the working of GSDI which, though it aims to further global coordination, facilitation and cooperation among national and regional data

producers/providers and users, actually ends up creating a plethora of legal and policy concerns instead. As a solution, international consensus through development of contextual understanding in a multilateral framework is suggested to make global spatial data infrastructure a reality.

2. THE INCREASINGLY HYBRID PUBLIC-PRIVATE ENVIRONMENT[ix]

Any discussion on the possibility of GSDI has to be made in the background of the public-private dichotomous environment that is the space industry. But this dichotomy has not been a recent phenomenon. It is the result of a long drawn process. Initially space always demonstrated a state-led character, witness to the immediate political and military goals it was assigned from the end of the 1950s in the U.S.A and U.S.S.R.[x] Because the development and exploitation of space programs, calls for national capabilities and investment beyond the norm, there has been a gradual shift towards commercialization of such space programs.

This is where space activity seems to be caught in a double bind. It is in the national interest and general public good to ensure that data are collected, archived and disseminated on an open and non-discriminatory basis. But more and more, the pressure to privatize is drawing decision makers away from this public good argument towards that of commercial market viability.[xi]

These moves toward commercialization and the integration of government space systems are premised on a patchwork of international and domestic legal regimes.[xii] The clarity of space law is particularly challenged by the expanding context of a hybrid public-private, international commercial space segment environment.[xiii] There have been a lot of controversies surrounding different national philosophies regarding the necessity or desirability of public-private separation, direct and indirect subsidies, and trade practices in the aerospace industry.[xiv] The problem can be best illustrated taking the example of remote sensing, which is at the forefront of all space applications. Leading remote sensing nations, including France, Canada, India and Japan, operate remote sensing systems based on mixed public-private institutions and principles. Other leading remote sensing nations have commercial technology applications that are clearly emerging from a government-funded, military heritage. Post-Cold War national budgets have created pressure to forge public-private partnerships even in nations historically committed to the separation of these sectors.[xv]

Remote sensing activities provide critical national technology capability and also ensure infrastructure for telecommunication, television broadcasting, meteorology, resource survey and management, and disaster management support. In addition to enabling applications that were previously impossible or impractical by other means, satellite-derived geospatial information products promise both time and cost savings over older or more conventional methods.[xvi] In fact, the particular activities recognized in the U.N. Principles on Remote Sensing- "improving natural resources management, land use and the protection of the environment"[xvii]- are increasingly identified among the potential markets for private and government space-based systems and have become the economic rationale for aggressive, commercial-like cost recovery policies for some public systems.[xviii]

With the rapid emergence of the private sector, technological advances in imaging satellites and GIS, GI will be disseminated openly and supplied to the international market. Global accessibility to remote sensing technologies and data has, however, broad international security implications. Given that much of today's remote sensing technology also has a heritage of supporting military reconnaissance and defense planning, and given the importance that space-based information products prove during war times, it is important to consider the security impacts that expanding access to Earth imaging technology will bring.[xix] Security is just one of the many concerns. Issues of state sovereignty, privacy, intellectual property rights and liability are the other ghosts GSDI has to battle with if its full potential is to be attained.
Thus, the inter-relationship of public and private functions in space activities is a space law subject that has far reaching legal and policy consequences on the way GSDI can be put into practice.

2.1 Sovereignty and Rights of the Sensed State

Sovereignty is the key characteristic of any state and cannot be compromised in any situation whatsoever. This right becomes all the more important in the context of GSDI. With the possibility of GSDI, with the potential for worldwide dissemination of high quality remote sensing imageries which can provide a lot of details regarding land surface and oceans, the sovereignty concerns of states is being seen by many as under direct challenge.[xx] Envisaging such a situation, Principle IV of the U.N. Principles on Remote Sensing lays down, *inter alia* that remote sensing activities "shall be conducted on the basis of respect for the principle of full and permanent sovereignty of all states and peoples over their own wealth and natural resources, with due regard to the rights and interests, in accordance with international law, of other states and entities under their jurisdiction. Such activities shall not be conducted in a manner detrimental to the legitimate rights and interests of the sensed state."
The rights of sensed states should be seen in the light of the sovereignty of states over their natural resources. It is a well established rule of international law that every state is free to manage and utilize the natural resources within its jurisdiction and to pursue its own environmental and developmental policies.[xxi] This right is, however, neither unlimited nor unguided. It is a right which is to be exercised within the limits set by international law.
Rao and Murthi have pointed out how access to data about their territories can be problematic for governments and lead to possible infringement of privacy. As data availability will be purely driven by market considerations, the affordability for assessing such data will be another major issue for a large number of states. As there are concerns about governments losing some degree of control over information about their territory, there could be tensions, particularly when a state considers that entities abroad have exploited information about its territory even as it had no fair and affordable access to the same- due to commercially driven policies. There are real threats to the rights to privacy- due to possibilities of industrial espionage, and potential use of imagery by anti-social groups. Commercial corporations from one country could gather information on exploitable natural resources in another country without the knowledge of its government

and could possibly gain strategic advantages in negotiations. The consequences of these are far reaching.

2.2 Privacy

The ability of public and private entities to obtain and manipulate vast amounts of information about people, their property, and their activities creates the potential for exploitation and further intrusion into traditionally private matters. In this regard, GSDI, through the medium of GIS, has a serious potential for exploitative and invasive uses by the government and private users. In "providing instant access to vast amounts of data, (a GIS) provides the opportunity to abuse, to misinform, and to invade the privacy of individuals on a greater scale than ever before."[xxii] Digital files can be "transferred, accessed, and combined in ways unforeseen by the provider and without the consent of the individuals affected."[xxiii] As a result, the "unanticipated uses of data may compromise individual rights or privacy or cause injury."[xxiv]

Beyond general privacy concerns, GIS can be misused in making policy itself. Maps and charts based on electronic databases can be manipulated quickly and more readily than maps on paper or microfilm. As one expert has repeatedly emphasized, "a single map is but one of an indefinitely large number of maps that might be produced from the same set of data."[xxv] Due to advances in low-cost computer graphics, "inadvertent yet serious cartographic lies can appear respectable and accurate."[xxvi] As a result, a profusion of slick but deceptive charts, exhibits, and photographs can been thrust upon cartographically challenged policymakers and the general population.

Also, an uncomfortable political dimension to GSDI is the degree to which those controlling the system can influence what the system produces.[xxvii] Political groups can search databases to target individuals based on their wealth, profession, residential location, tax payments, and even their racial background.[xxviii] There may be legitimate government uses of this type of information, but it can also be used for improper political or personal goals. Drawing voting or zoning districts to maximize one's own political and economic stature (or to minimize opponents') is one example.[xxix]

The final angle to this entire privacy issue stems from the fact that governments engaged in selling spatial data sets to the private sector have found that cadastral data (that is, the household level data that tie ownership information to the location and physical attributes of the land) are more in demand than any other layer of information. Having this kind of information allows businesses to conveniently aggregate information through computer cross matching. When local jurisdictions fail to have cadastral data available or readily accessible in digital form, businesses have found their own survey methods to generate "simulated" spatial datasets they use and market. The practice of collecting data about customers and profiling those draws attention to the very thin line between data collection for permissible commercial goals and impermissible intrusion into personal privacy.[xxx] This is something GSDI has to contend with as all this is going to herald a new social and technological era in which conflicts relating to privacy no longer affect single individuals but the entire community as a whole.

2.3 Copyright and Data Protection

Of the several areas of law that affect access to and use of geographic information, copyright is perhaps the most important. Protecting at least minimally creative and expressive aspects of the intellectual content of art, music, and literature, regardless of the effort or skill (or lack thereof) that went into their creation, is probably the major feature of copyright.[xxxi]

In general, copyright protection for spatial databases raises a series of emerging, unresolved theoretical questions. Resolving rights in spatial databases implicates the theoretical shortcomings of copyright law both as applied to geographic representations and to computer representations.[xxxii] The first problem crops up over the issue of idea-expression dichotomy itself. Copyright protects expression but not the underlying ideas, which can be and should be used without compensation to the spatial databases.[xxxiii] That copyright protects only expression, not facts was expressed in the 1986 Berne Convention[xxxiv]. The expression protected must be the product of intellectual creativity and not merely labour, time, or money invested. Facts, algorithms, physical truths, and ideas exist for use by everyone. These may be extracted and used freely.[xxxv]

Regardless of the nation, copyright subsists usually in compilations of geographic facts if there is some creative "authorship" in the "selection, coordination, or arrangement" of the compilation. There is a modicum of creativity in the selection, arrangement and coordination of almost any geographic data set. Thus, in the U.S. for example, wholesale copying of a competitor's geographic data set without permission is typically illegal under existing copyright law because, in the process of copying a data set, one is inevitably copying the creative elements of the work as well.[xxxvi]

Professor Raskind has pointed out, with specific reference to maps, that many interpretive problems of copyright derive from our failure to define originality in terms of the specific authorship criteria relevant to the variety of works that are in principle copyright protected.[xxxvii] He would seek originality in the special skills applicable to the type of work in question. In the case of maps, these would be skills in displaying spatial and quantitative relationships through scale, color, symbols, and overall design, including skills in compiling new maps from existing maps.[xxxviii]

Then, of course, we have the entire remote sensing angle to copyright. Now that commercial remote sensing programmes are operational in most of the space-faring nations, the continued existence of the technology depends upon how well the private sector can market satellite data. An understanding of the application of intellectual property rights to remote sensing data requires an understanding of the difference between enhanced and unenhanced data. Unenhanced data, or raw data, is obtained directly from the satellite, and primarily consists of digital information or photographs. Enhanced data, in contrast, is the result of human or electronic analysis of the raw data.[xxxix]

Copyright protection is unavailable to unenhanced data because the very nature of a copyright is to give exclusive rights to the copyright owner. The policy of nondiscriminatory access would be undermined by private operators attempting to exact royalties or licensing fees from users of raw data. Because of the value addition in enhanced data, intellectual property rights in enhanced data are necessary to increase the number of data enhancement firms and thereby increase the market for raw data.[xl]

Even a small data enhancement firm must invest significant capital in software, equipment, and trained personnel before it can begin operation. Copyright laws will

protect this investment and, by making processed data more valuable, will provide an incentive for firms to enter the market. Without the economic rents created by copyright, it is unlikely that enough firms will produce sufficient enhanced data to make commercialization worthwhile. This is because the data enhancement industry will constitute the market for raw data necessary to realise a profit.
Competition from foreign remote sensing systems provides another reason why legal protection of enhanced data is necessary. Many countries operate commercial remote sensing systems, and some of these, such as the French SPOT system and the European Space Agency's ERS-1 (both commercialised systems), compete with U.S.A.'s Landsat for international as well as domestic data markets. A significant feature of international intellectual property rights is that these rights shall protect competition among all entities producing enhanced data worldwide. Without copyright protection, an individual or entity could pirate enhanced data produced by someone else and legitimately pass it off as its own. There would be no mechanism to prevent such an entity from distorting the data to obtain financial or political benefits. Therefore, the nature of a commercial remote sensing programme mandates copyright protection for enhanced data. Such copyright protection will benefit producers of enhanced data worldwide due to the existence of multilateral copyright agreements.[xli]
A host of international instruments and conventions related to remote sensing like the Outer Space Treaty (1967), Principles Relating to Remote Sensing of Earth from Space (1986), The Berne Convention (1971), the Universal Copyright Convention (1971), the Rome Convention (1961), the Phonogram Convention (1971) and the Satellite Convention (1974) do make references to the copyrightable aspects of remote sensing but are not adequate in the real sense of the word.[xlii]

On the whole, there is currently no adequate and efficient protection of remote sensing data in international law. In the wake of the various copyright conventions, one may think that there is a need for such a specific convention, which may be a necessary step if the trend towards the proposed borderless information flow is to materialize. There are observers who clearly state that the Berne Convention itself is an "inadequate mechanism" for new technologies,[xliii] including remote sensing imagery.

Issues of copyright thus become a major cause of concern for GSDI.

2.4 Liability[xliv]

The importance of liability is crucial to every use of global technology and GIS is no exception. Considering the fact that the GIS is essentially a database centric technology, liability comes in the manner it is used. When an action or decision is taken based upon the information and analysis in a GIS, the liability exposure of those involved with the development of GIS software and databases, or with provision of information based upon analysis in a GIS, can be important. To elaborate, use of GIS data and software inevitably results in some action or decision. If errors or shortcomings have resulted in inappropriate actions or decisions and parties are harmed, the issue of liability arises for dataset and software producers as well as for all other parties involved in handling geographic information. As a general proposition, legal liability for damages is a harm-based concept. For instance, those who have been specifically hired to provide data for a

database or those who are offering data for sale to others are responsible for some level of competence in the performance of the service or for some level of fitness in the product offered. If others are damaged by mistakes that a producer should not have made or by inadequacies that should not have been allowed, the courts have reasoned that producers should bear some responsibility for the damages. But for their mistake or defective product, the damages would not have occurred. In commercial settings, liability exposure often may be reduced through appropriate communications, contracts, and business practices. However, liability exposure may never be eliminated completely; under current legal principles, it can be merely minimized.

Nor is its elimination desirable. Modern societies generally support the proposition that individuals and businesses should take responsibility for their actions if those actions have unjustifiably caused harm to others.

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There is the obvious formulation that liability exposure may have a substantial impact on whether businesses and others will be willing to share GIS data and whether they will be willing to offer GIS data for sale in a networked electronic marketplace.[xlvi]

However, it is also inevitable that errors and blunders will be contained in any practical database. Thus, the law holds that those in the information chain should be liable only for those damages they had a duty to prevent. Legislation affecting liability for spatial datasets and software typically might be found in statutes addressing such issues as tort law, contract law, intellectual property rights, privacy rights, anti-trust issues, and access rights. The liability in data, products, and services related to computerized geographic information systems is complicated by legal theory uncertainties surrounding liability for maps. This is compounded by the complexities and uncertainties in liability for information system products and services generally. Liability in GIS is further confused by the wide array of current and potential applications of geographic information technologies. Each application requires integration of information specific to the application and often will involve different attributes, analytical methods, spatial features, and accuracy requirements. The specific software and end users will also vary depending on the application to which the technology is being applied.[xlvii]

Another way of addressing the issue of liability is in relation to the public good aspect of geographic information. Pricing and financing information is a special kind of commodity: its use is non exclusive, the quantity is difficult to measure, and it has the character of a public good.[xlviii] Further, it is questionable if all users should be charged the same price. Therefore it is difficult to set a fair price, and the market does not really play. This issue then boils down to the question whether the spatial data infrastructure is considered a public utility that can be used by anybody regardless of his financial means, or a profit centre which has to recover its cost. In each case, the nature and quantum of liability attached would be different.[xlix]

Thus, the complexity of the legal questions surrounding geographic information system liability combined with the diversity of problems to which geographic information technologies are being applied has tended to create diffuse, changing, and often undefined liability concerns for all parties who would be involved in geographic information production and use.

3. CONCLUSION

The goal of global spatial data infrastructure is to promote sharing and communication of geospatial knowledge across national boundaries. Its growth and proliferation will likely be a natural market-driven growth, based on the principle of international cooperation for information exchange at a global level. Incorporating the efforts of governments and non-governmental spatial data providers and users into a flexible and extensible system can be done only once the specific hurdles in building a spatial data infrastructure as described in this paper are overcome. It can be foreseen that GSDI will increasingly become a part of the governmental and managerial landscape in the coming years. Legal and public policy issues associated with GSDI have slowly but steadily been rising and therefore they need to be given greater attention by policy makers. Liability, privacy, and public access are but a few of the many legal and policy concerns surrounding GSDI. Law and policymakers should be prepared to address these and other issues as the benefits and uses of GSDI become more apparent.

The only way out is to find a common platform so that the diverse issues related to GSDI can be tackled in a single forum at the international level. Perhaps the best way of doing this would be to mobilize international consensus through development of contextual understanding in a multilateral framework. This will be highly useful to make global spatial data infrastructure a workable reality.

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Notes

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[ii] Zaslavsky, ibid.

[iii] "Spatial Information Related Terms" at http://www.anzlic.org.au/glossary_terms.html (last visited May 4, 2006)

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[xix] Tahu, supra n. 16 at 179- 180.
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