



National spatial data infrastructure, intellectual property rights and geospatial technologies in aiding economic growth

by

Professor George Cho

School of Resource, Environmental and Heritage Sciences
Division of Health, Design and Science
University of Canberra, Canberra
ACT, Australia 2601

Abstract

This paper proposes an historical overview of the advent of the national spatial data infrastructure (NSDI) movement that then morphed into the global spatial data infrastructure and how these developments have impinged upon and aided economic growth. This holistic view throws up significant issues not only in regards to the changing interpretation of the 'infrastructure' involved but also in terms of the context and emphasis that has been made – from land information through to geospatial information. An early White Paper from the Open GIS Consortium (1996) is reviewed with reference to the benefits GSDI would bring and to whom and what needs to be done to promote GSDI growth. The challenges to developing countries are addressed including that of sustainable development. Together these throw up issues of access to the geospatial data, its dissemination, data quality and preservation as well as intellectual property rights. The paper concludes with some reflections on NSDI initiatives in selected countries in Asia and the Pacific.

Introduction

Since the advent of the national spatial data infrastructures (NSDI) in various jurisdictions around the world and in the drive to maturity, so-called 'second tier' issues are beginning to emerge. Such issues as ownership and property rights, privacy and security, open access and proprietary rights, private and public law have arisen and a systematic approach to addressing these are sorely needed. For some, practical solutions are becoming available whereas for others, innovative alternatives are being sought in a collaborative manner. This paper is a commentary on the evolution of the legal issues that are beginning to emerge.

There are different stages of maturity in both the development and the adoption of NSDI in the different jurisdictions (see Sengupta 2007 for a summary of developments in Asia). Each of these have brought forth different kinds of responses with some adapting existing policies and rules to the new developments while in others brand-new laws are being promulgated as a means to address the issues. In addition, as the NSDI evolves the solutions also change with the circumstances that produce a myriad of different scenarios. This paper posits the view that the NSDI should in reality be one of a public good and that of providing public services – whatever the business model adopted in a particular jurisdiction. It means that the NSDI should neither be seen as either a product or one capable of 'private ownership'.

To achieve this one needs to go back to the basic tenets of the NSDI and then, of late, the global spatial data infrastructure (GSDI) and re-examine the definitions of these concepts. From the definitions a clearer picture may emerge to better define "whose perspective" is being promoted. A review of the various tools that may be available is made before discussing the impact of such tools on the application of NSDI in the wider horizon of a country's economic growth and development. There is a danger that strict rules and regulations might impede greater adoption leading to a so-called 'anti-commons'. The successful implementation of the NSDI would depend on the careful crafting of these policy instruments. The summary and conclusion to this paper suggests that there may be policy, practical and strategic issues which need addressing if the NSDI of individual countries will contribute to a holistic sought-after GSDI.

Background

A conference in Bonn, Germany in 1996 on the Emerging Global Spatial Data Infrastructure provided the opportunity to standardize the vocabulary on data infrastructures. It was hoped that such a vocabulary could organize people's thinking and actions and form the basis of a curriculum for educating people who would participate in a network of NSDIs to build a GSDI (McKee 1996). To achieve such a goal a study of each component of the SDI is required including technology, legacy data, culture, academic resources, professional organizations, governmental agencies, and legal and regulatory structures. Even at this early stage there is demonstrated a consciousness of the importance of legal issues that needed to be addressed.

An early definition of the NSDI by the U.S. Federal Geographic Data Committee (FGDC) (1994) is stated thus: "an umbrella of policies, standards, and procedures under which organizations and technologies interact to foster more efficient use, management and production of geo-spatial data. The NSDI requires and will facilitate cooperation and interaction among various levels of government, the private sector, and academia". In addition a SDI consists of "organizations and individuals who generate or use geospatial data, of technologies that facilitate use and transfer of geospatial data, and of the actual data".

An alternate to this definition is that an NSDI is the "total ensemble of available geographic information that describes the arrangement and attributes of features and phenomena on the Earth within a nation's boundaries, as well as the materials, technology, and people necessary to acquire, process, store, and distribute such information to meet a wide

variety of needs" (National Academy of Sciences, 1993). This is similar to the Canadian vision which is "... to enable timely access to geospatial data holdings and services in support of policy, decision-making and economic development through a co-operative interconnected infrastructure of government, private sector and academia participants" Coleman (1999). This latter conception is an important one as it teases out the various players in the development of such an infrastructure – public, private, and academia.

Following from these, there were developments in this area to include the national and regional infrastructures into a global one. At the second GSDI Conference a GSDI definition was given to refer to "the policies, organisational remits, data, technologies, standards, delivery mechanisms, and financial and human resources necessary to ensure that those working at the global and regional scale are not impeded in meeting their objectives" (Clarke 2000; see also Coleman & McLaughlin 1997).

In diagrammatic form, the GSDI then is like a wheel with technology as its hub, and each spoke a different country. Each country may have SDI components or levels encompassing legacy data, culture, academic resources, professional organizations, governmental agencies and legal and regulatory structures for land tenure, privacy, intellectual property, environment and others. Links also exist between countries at each of these levels.

McKee (1996) in addressing each of these different components in an SDI noted that legal and regulatory structures will play a major role in NSDIs and the GSDI. In particular it is said that a nation's NSDI will be tightly linked to land policy and land tenure rules and these will shape administrative structures and policies. Such policies will need to be created to deal with indigenous rights, privatization of land and land resources, formal vs informal and customary systems, and rules that protect the environment. Moreover, public access to NSDI data should promote community-level solutions.

Two observations arise from the above. First, there seems to be an emphasis on land related matters within the NSDI in such conceptions. Second, hidden within the public access to the data are issues of privacy and security in the use of such data. Here one will note that the issues are involving from those that previously covered the ownership of land matters to the ownership of intellectual property.

Challenges in Evolving NSDIs: Case study

Indeed if one were to examine one particular country as a case study there is evidence of the land bias. In an effort to integrate the distributed land information systems implemented by various land related agencies in Malaysia, the National Infrastructure for Land Information Systems (NaLIS) was proposed and approved under the *Seventh Malaysian Development Plan (1996-2000)*. It has been observed that even with the development of NaLIS, there have been barriers to the fuller exploitation of the information were issues of organisational structures, copyright, pricing and privacy have come to the forefront. These hindrances were more significant than the technical or financial problems (Abdul Majid bin Mohamed 1998).

A NaLIS Convention in 1997 recommended that the government should continue to hold custodianship of NaLIS and its assets and that policy makers develop guidelines with regards to issues such as pricing, copyright, custodianship, confidentiality, security and funding (Abdul Majid bin Mohamed 1998). While these were recognised as 'difficult issues' nevertheless, new laws were drafted to ensure the privacy of individuals and information relating to them, and to the protection of intellectual property. For example the *Fees and Royalties (Survey Data and Digital Mapping) Order 1997* provides copyright protection of all forms of digital survey and mapping data as well as regulating the fees and royalties chargeable by the government.

Malaysian Centre for Geospatial Data Infrastructure (MaCGDI) was founded in 2002 to establish Malaysian Geospatial Data Infrastructure (MyGDI) as the Malaysian NSDI. Beyond establishing MyGDI, MaCGDI plays crucial roles to spearhead the geospatial

industry in Malaysia towards materialising the benefits of geospatial information. Key activities of MaCGDI include facilitating the sharing and dissemination of geospatial data among users and data providers besides formulation of policies and standards that are implemented through MyGDI as well as providing professional services related to the geospatial industry in Malaysia.

Here it may be noted that the process which national governments are adopting -- making use of extant legislation and adapting its use to cater for new challenges posed by information technology and the 'virtual' world.

An international conference on spatial information for sustainable development held in Nairobi, Kenya in 2001 has identified that issues associated with national security, data privacy and associated liability are potential 'show stoppers' for NSDI initiatives. African countries have been encouraged to establish legal frameworks to address these crucial legal issues as early as possible (see FIG 2001). Also it has been observed elsewhere that spatial considerations are integral to environmental information and knowledge. The establishment of the political, legal and organizational frameworks to develop the environmental component of the GDI in the Latin American and Caribbean region is an important priority (Reyes 2005).

Emerging Issues

The leading issues that need addressing with the evolution of the NSDI appear to be legal ones including intellectual property rights (IPR) and in particular those of copyright and patents, and privacy, security and liability. Other issues of importance include those of access to data and data attribution, on the metrics to be used when data are involved, and data quality including accuracy and uncertainty.

Taking intellectual property (IP) first, the question might be asked as to which aspects of GSDI / NSDI dataset should be protected? In answering this question there should be a recognition of the distinctions between public and private law protections. Statutory public law such as copyright or database protection laws, as in the European Union, can be very different from those of private law in the form of contracts, licences and treaties. To this must be added the different perspectives and sources of the data which could be governmental, commercial, or non-commercial if these are sourced by Non-Government Organizations (NGO) or the academic and educational sector research projects. Furthermore, there could be hybrid, multi-source databases, which are typically the result of the value-added geospatial databases or data products produced by quasi-government and private organisations. All of these produce more complexity, much less the promulgation of appropriate information law.

Interestingly, federal data produced by the U.S. government have no IPR which means that the data are in the public domain. In other countries there are more limited IP protection for government data and information, for example, the EU Directive on Public Environmental Information (see EEA 1997 and EU Directive 90/313/EEC and EU 2003 Directive 2003/4/EC).

The NSDI is dependent on various data sources. Each of these data sources operate within its own set of norms that are unique to its own objectives and remit. These would be set within the disciplinary community, the research program, and the institutional and national context. Each and every one of these data sources can determine their own agendas in regards to IPR, access rights and retention of ownership through various agreements on terms and conditions that might be mutually beneficial. Hence, data sources that seek cost recovery or commercial exploitation of their data will in general use whatever legal protections that might be available. In most cases, attribution of the source of the data is always necessary to ensure claims to ownership.

Within the NSDI too there might be other reasons for protection of the data and these might include national security, privacy, and confidentiality. Moreover, those datasets that

are not in the public domain would need to be protected to avoid the entire database to be either misappropriated or misused. This is especially so when third parties intermediaries need to have sharing agreements with data sources and data users. Furthermore, data distributors may add additional restrictions beyond those that have been specified by the data provider.

In summary, a user will need access to the data, should have rights to use and re-disseminate the data as well have exclusive rights over any derivative product and data. The underlying assumption in such a user perspective is that the data sources and owners are given proper attribution. From the point of view of the supplier of data to the NSDI the usual IPR protections need to be ensured as are those of documentation and reporting on the use of the data. As a distributor the rights and protection needed are those that are in support of the process of distributing the data and the access.

From this it is evident that there will be many kinds of bilateral or multilateral agreements to be developed among major data users, developers and distributors. Such agreements could be targeted to obviate the need for case-by-case arrangements in data sharing. In doing so an evolving item that needs consideration is the need for better, clearer and consistent definitions and practices in the use and dissemination rights within the NSDI. For example clear distinctions are required when data are disseminated for commercial, educational and scientific use as well as those that fall in between these distinct groups, for example, those that are partly commercial and partly altruistic.

Policy Instruments and Practice

What then are some of the tools either in policy or in practice that may be developed and implemented to address the emerging issues? It is believed that pure legal enforcement of terms and conditions on the use of data would involve negative adversarial aspects and substantial costs associated with monitoring the uses and asserting the rights. Moreover, it seems that legal approaches may not be the most appropriate tool to use for enforcing NSDIs because of the different types of users involved, the many data sources and the different objectives of data distributors. Perhaps legal tools may be appropriate for challenging commercial abuses and only in exceptional circumstances that involved large-scale infringement and misappropriation of databases.

Enforcement mechanisms can include legal, technological and the normative approach. With legal means the threat to litigation through cease and desist letters or commencing action could staunch the abuse and misuse. There are also various technologically-based means of enforcing rights through such means as – Trusted Platform Management (TPM), Digital Rights Management (DRM), or the use of persistent and unique identifiers embedded in the datasets. Under the normative approach, the use of scientific ethics and publicizing of transgressions through the ‘mobilization of shame’ may be one means to achieve the same ends as the more punitive legal mechanisms.

Other suggestions for data use and data sharing requirements that may be suggested include strict disclosure requirements so that the original source of the information is always included every time the data are used, the original owner granting permission to reflect a prior informed consent to the use of the data, benefit sharing so that developing countries may leapfrog the technology gap and engage in the benefits of the information age and technology transfer. This latter point is particularly important in respect to technical assistance and aid and for helping overcome the technological barriers to accessing and using data as may be found in other NSDIs and indeed the GSDI.

NSDI and Developing Nations

It is thought that in the developed world, the commercial and contractual frameworks for cooperation among the major players and the associated business models that is to be used will be key issues in the further development of NSDI. However, for developing

countries there remain a number of conceptual, technical and organizational challenges in the creation of a NSDI or regional GDI. Ultimately, it seems, that the goal of the GSDI should be to oversee the development of both rich and poor countries with economic growth that leads to sustainable and high quality ways of life. Irwin (1999) has written an interesting chronicle of the emergent GSDI and its role in promising returns from sustainable development.

In the developing world, it could be said that access to the data may be unequal, ineffective and uncertain. In such a context, there needs to be a conscious effort made to best ensure that there is easy access given the lack of resources and trained personnel in many developing countries. Thus, when legal instruments such as an IPR system is introduced the problems may be further compounded. IPRs as instruments of public policy confer economic privileges on individuals or institutions solely for the purposes of contributing to the greater public good. The privilege must be seen as a means to an end, not an end in itself.

However, the costs of getting IPR system 'wrong' in developing countries are more likely to be higher than in developed countries. And there is also the ever present danger of developing inappropriate IP systems within developing countries. Scientists in developing countries may be prevented from gaining access to protected data or have insufficient resources to do so and all of these stem from the fact that developing countries are 'second commers' to the table.

The Commission on Intellectual Property Rights (CIPR 2002) discusses the tensions in which proponents in the developing world argue that IPRs are likely to cripple the development of local industry and technology, will harm the local population and benefit none but the developed world.

In parallel, the question might be asked what then is the role of IPRs in the context of NSDIs and the GSDI. One position could be that of the 'anti-commons' in which people under-use scarce resources because too many owners can block each other. More IPR may paradoxically lead to fewer useful products for improving the human condition (Heller & Eisenberg 1998).

Summary and Conclusions

What then can one surmise from the above discussions? A summary of the various viewpoints will have to include the policy, practical and strategic issues if the NSDI and then the GSDI can succeed in its objectives. From a policy point of view there is a need first to adapt extant legislation to bring these to the age of the internet. An alternative is to develop new legislation to cater for the various needs of the NSDI. From a practical point of view there seems to be a push towards a sharing and custodianship regime where the NSDI is seen as a public good and the provision of data as a public service. From a strategic point of view there is much to commend the further development of the GSDI through its regular meetings and fora.

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