Legal Issues in the Use of Geospatial Data and Tools for Agriculture and Natural Resource Management

A Primer

Roger A. Longhorn, Victoria Henson-Apollonio, and Jeffrey W. White

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The International Maize and Wheat Improvement Center (**CIMMYT**®; www.cimmyt.org) is an internationally funded, nonprofit, scientific research and training organization. Headquartered in Mexico, CIMMYT works with agricultural research institutions worldwide to improve the productivity, profitability, and sustainability of maize and wheat systems for poor farmers in developing countries. It is one of 16 food and environmental organizations known as the Future Harvest Centers. Located around the world, the Future Harvest (www.futureharvest.org) Centers conduct research in partnership with farmers, scientists, and policymakers to help alleviate poverty and increase food security while protecting natural resources. The centers are supported by the Consultative Group on International Agricultural Research (CGIAR) (www.cgiar.org), whose members include nearly 60 countries, private foundations, and regional and international organizations. Financial support for CIMMYT's research agenda also comes from many other sources, including foundations, development banks, and public and private agencies.

The CGIAR Consortium for Spatial Information (**CSI**; http://www.spatial-info.org) evolved from a collaboration among CGIAR centers and GRID-Arendal with the objective of promoting effective use of GIS in international agricultural development. CSI creates mechanisms for standardizing data sets within the CGIAR, sharing methodologies and solutions, and facilitating inter-center collaboration. CSI serves as a platform for joint efforts in GIS-based agricultural research at global, regional, and local levels. Core membership includes 10 institutions.

The CGIAR Central Advisory Service (**CAS**) on Intellectual Property (http://www.cgiar.org/isnar/cas/) was established by the CGIAR in 1999 to facilitate the exchange of experiences and knowledge among the CGIAR centers and to provide expert assistance on intellectual property matters.

Correct citation: Longhorn, R.A., V. Henson-Apollonio, and J.W. White. 2002. *Legal Issues in the Use of Geospatial Data and Tools for Agriculture and Natural Resource Management: A Primer.* Mexico, D.F.: International Maize and Wheat Improvement Center (CIMMYT).

Abstract: This paper reviews concepts of Intellectual Property and other legal issues relating to Geographic Information Systems (GIS) used in agriculture and natural resource management. Topics covered include copyright, patents, legal protection of databases, confidentiality of information, data privacy, licensing, and liability. The intent is to provide an introductory primer that can help guide day-to-day activities of people involved in agriculture and natural resource management research.

ISBN: 970-648-094-3
AGROVOC descriptors: Natural resources; Agricultural resources; Geographical information systems; Patents; Legal rights; Agricultural Research; Databases
AGRIS category codes: P01 Nature Conservation and Land ResourcesD50 Legislation
Dewey decimal classification: 333.72

Printed in Mexico.

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Foreword

Information is a classic public good. Use of information by one person does not reduce applications by others within an increasingly globalized society; in fact, broad based access and analysis improves knowledge and understanding and thereby contributes to improvements in overall social welfare. The public sector, rather than the private sector, thus principally invests in the collection of primary information, whether censuses, remote sensed data, or welfare monitoring surveys. This information resides mostly, but not necessarily, in the public domain. However, the public sector has under-invested in the bridge between the production of data and the analysis of that information, most of which is also supported in public sector institutions. This under-investment has created an institutional space for private sector initiative in the collation and generation of databases, data products, analytical software, and front-end interrogation software. While providing better connectivity between the supply and demand for information, the increasing application of intellectual property rights (IPR) to these products has created uncertainties about the ownership of data, the potential for limitations on access to data, and increasing reservations by public sector institutions about unlimited distribution of data.

The increasing demand for multinational or global data sets, the expanding coverage of trade agreements on intellectual property, particularly TRIPS, and the rapid progress in communication and database technology, with often no clear lines between software and information, have all served to increase the need for improved clarity on application of IPR. This applies to producers, users, and funders of data and information. The Rockefeller Foundation has been active for some time in the area of patent law as applied to agricultural biotechnology, to ensure application of relevant research within the developing world. The conference and this report on legal issues applied to the area of agricultural and environmental information by the CGIAR Consortium on Spatial Information, CIMMYT, and CAS extends these issues into the area of international information flows and provides a basis for a first assessment and awareness-building in this key area. The global agricultural research and environmental change community relies on the free flow of information. However, to guarantee this flow into the future this research community must work within the expanding scope of IPR, where data transfers must be accompanied by licenses for usage. These requirements extend even more importantly to the funders of data collection and product development to ensure that IP does not encumber the free flow of information in which they invested.

The CGIAR, CIMMYT, and CAS have provided a valuable first step in assessing IPR as applied to the collection, collation, and exchange of geospatial information. These applications will certainly evolve and have the potential for becoming even more restrictive. It is incumbent on the international agricultural research community to understand the application of IPR in their work and to work within this changing environment to maintain an open and vibrant research environment.

John K. Lynam, Associate Director, Food Security Program, The Rockefeller Foundation

Preface

The world of agriculture and natural resource management relies increasingly on research and development approaches that emphasize integrative analyses. Multiple disciplines and sources of information employed with software-based tools such as geographic information systems (GIS), image analysis, and simulation modeling are central to such integrative exercises. Analyses using these tools are well known for their appetites for data, often obliging users to assemble data from diverse sources. In this process, questions regarding data ownership, data quality, and reliability of products often arise.

In activities of the GIS and Modeling Laboratory at CIMMYT, one of the authors (Jeff White) noted an increasing expectation among partner institutions that data exchanges would be accompanied by transfer agreements. Similarly, in collaborative efforts and contracted work, questions arose concerning ownership of software code and allowed use of commercial tools. In discussing these concerns, the opportunity arose for the CGIAR's then newly-founded Central Advisory Service to assist CIMMYT in reviewing IP issues relating to use of spatial information. Recognizing that such a review might interest a broad audience of researchers, development specialists and managers, the decision was made to conduct the review under the aegis of the CGIAR's Consortium for Spatial Information.

A draft of the manuscript was used as background material for a one-day workshop during the meeting "Geospatial Applications to Support Sustainable International Agriculture" (GASSIA) held at the USGS EROS Data Center, South Dakota, USA. Besides questions and comments from an enthusiastic and interested group of over 40 participants, five experts provided insights on specific topics:

- George Cho (Univ. Canberra, Australia). Lawyer, professor and author of the book *Geographic Information Systems and the Law* (1998; John Wiley & Sons).
- Laila Aslesen (National Mapping Service, Norway). Lawyer and coordinator of expert panel for 40 European mapping agencies (Eurogeographics).
- Sheree Westell (law firm of Taylor Joynson Garrett, UK). Attorney specializing in information technologies.
- Santiago Borrero (Director General of Inst. Colombiano "Augustin Codazzi," Colombia). Geographer and chair of GSDI Steering Committee.
- Paul Uhlir (Director, International S&T Information Programs, US National Academies, USA). Lawyer and expert on access to publicly-funded research.

The workshop thus provided a valuable opportunity to assess concerns and levels of understanding among potential readers as well as to benefit from the input of the expert panel. The value of these inputs was reflected in our decision to reduce the emphasis on liability and on policies for protection and diffusion of data held or produced by governments.

This process confirmed our suspicion that the first draft contained more detail than was conducive to a readable primer. Much of the information that was removed will be made available on the CAS web site[1]. Furthermore, we are considering the possibility of developing training modules that deal with specific topics in more depth (e.g., on lab record keeping or developing and implementing contracts for data set or software development).

The authors express their gratitude to the Rockefeller Foundation, especially John Lynam, for supporting this initial investigation and the resulting publication. We also thank the five experts who participated in the GASSIA workshop for their enthusiastic and knowledgeable input and to the organizers of GASSIA for their assistance. Shawn Sullivan (CIMMYT's Intellectual Property Manager and Counsel) provided especially valuable input on legal concepts.

In closing, we emphasize that this primer is an awareness building tool, not a source of legal advice. Readers will have to use their judgment to decide when a particular issue can be resolved through common sense and when legal advice should be sought.

Roger A. Longhorn, Victoria Henson-Apollonio, and **Jeffrey W. White**

[1] This material will be available on the CAS web site after 1 September 2002.

Chapter 1. **Introduction**

Overview of the Paper

Spatial information, geographic information, geodata – whatever your favorite term – is first and foremost "information." As information is exchanged among individuals or institutions, questions arise relating to ownership, authorized use, future use, and implied quality:

- If a laboratory purchases a set of point data to create an interpolated map, does the seller retain rights to the mapped data?
- How can a large database, perhaps representing 25 years of labor, be made widely accessible without forfeiting legal control?
- Does the phrase "for non-commercial use only" have any legal meaning?
- Can a novel software algorithm be protected, potentially to generate royalties?
- As a user of "open source" data or software, what are your rights and responsibilities?
- If maps or data sets contain substantial errors, are the providers legally accountable (liable) for damage or losses relating to those errors?

This paper reviews concepts of Intellectual Property (IP) and other legal issues relating to Geographic Information Systems (GIS) used in agriculture and natural resource management. Topics covered include copyright, patents, legal protection of databases, confidentiality of information, data privacy, licensing, and liability. The intent is to provide an introductory primer that can help guide day-to-day activities of people involved in agriculture and natural resource management research.

The field of legal issues in GIS is evolving rapidly, and various international agreements and national laws are under discussion that will affect use of spatial data and software. Key issues relate to respecting the rights of owners while avoiding barriers to the flow of data and processed information needed for research in agriculture and natural resource management.

In reading this document, initial reactions may be "why worry so much?" or "this is all too complex, so I'll just try ignoring it." Although the legal issues surrounding GIS are complex and represent moving targets in the evolving worlds of information technology and international trade, we would argue that sound management of IP is doable and core to good science. Sources of data and tools should always be tracked in any well-run project. Rights of individuals or institutions, particularly concerning creative efforts, should be respected. No one wants to see research activities blocked due to disagreements that might have been avoided through open discussion and a prudent approach to tracking data sources or software licenses.

Our focus is largely on legal issues, but the reader should recall that laws are meant to express the moral or political norms of societies. Ideally, researchers should base decisions or actions on what is correct from an ethical or policy perspective and then find that these mirror what is legally permissible. Most research parties will agree upon basic moral principles; e.g., hard work should be rewarded, and research should be conducted with due care to avoid errors or misleading results. Thus, reaching a consensus on the use of IP should be straightforward. Of course, situations arise where one may have the legal right to use data or software, but the political or moral consequences outweigh the possible benefits from use.

Perhaps the most important message of this primer is the need for clarity in understanding how data or software IP protection may affect the transfer of a product or collaboration. In most situations, this understanding should be expressed by a written agreement that is acceptable to all stakeholders.

Annex A presents a basic checklist for managing the IP and related legal issues for information and software tools needed or created by project teams, especially with international partners. The CGIAR-CAS web site offers readers access to additional checklists and resource materials.

This primer is not a substitute for legal advice. Where specific licensing or contract issues arise, readers are encouraged to consult legal experts. Choose experts familiar with the topic and who have experience with the relevant geographic jurisdictions, as laws vary from nation to nation.

Some Definitions

Intellectual Property (IP). Intellectual property (IP) is any product of human creative activity in industry, science, or art. Intellectual property rights (IPR) are granted by laws and cover two main categories (WTO 2001):

1. Copyright and rights related to copyright, which protect literary and artistic works.
2. Industrial property, including patents, industrial designs and trade secrets, which are protected to foster innovation and the design and creation of new technology, and trademarks and geographical designations (e.g., 'Champagne'[2]), protected for economic reasons.

Public Domain versus Public Sector Data and Public Disclosure. The term "public domain" is often used to indicate "free" or "available gratis," but in a legal context the term implies that that no property rights or restrictions are associated with the product. If copyright existed, it must be explicitly disclaimed. Copyrighted material and patented inventions also enter the public domain when the protection expires or is revoked through legislation. Public domain software is software that is not copyrighted. Note that software originally in the public domain can be modified, giving the person who did the modification IP rights for the modification. Similarly, developers of new data products derived from public domain material are often granted copyrights for the products. For neither software nor data, however, do the modifications affect the IP status of the original product.

Because public domain information is normally available for use at no or a low cost, there is little incentive to commercialize public domain data per se. However, such data can be processed or re-formatted and the resulting products marketed. This is the basis for businesses that add new value to public domain data and then sell the result, an approach that has seen rapid growth in the US information market for a number of years.

"Public sector data" are data produced by a public sector body. They may be in the public domain or strongly protected, depending on governmental and institutional policies. The definition of what types of organizations are in the public sector varies with country and time, since agencies take on new roles due to policy changes and reorganization.

[2] The named assigned to sparkling wines from the Champagne region of northern France.

Public disclosure is the act of permitting public access to information. Public disclosure does not remove IPR, but disclosure reduces the possibility of subsequently obtaining a patent. A window of as long as one year after disclosure may be left open for patenting, in jurisdictions with grace periods such as the USA.

Open Source and Copyleft. The term "open source" refers to the source code of computer software, whether an operating system, language, or application and implies that anyone can access the source code. This does not mean that the code is available at no cost or that the code is in the public domain. The open source concept also applies to content, such as documentation, data, and books.[3] Most open source material is made available under a license, such as the GNU General Public License[4] or variations[5].

Recipients of open source materials have rights similar to the originator, but the licenses prevent the recipient from restricting future use of the materials. A key clause in such licenses gives the recipient the "legal permission to copy, distribute and/or modify" the material, be it software or data. Most open source licenses for software prohibit any recipient from applying for a patent on the software unless such patent is licensed for everyone's unrestricted use.

Open source licenses implement "copyleft," which is the author's formal rejection of certain rights that exist automatically under copyright. Claiming that information or software is copyleft is not the same as putting it in the public domain, because authors still retain certain rights over copyleft material, such as requiring acknowledgment for its use.

Freeware, Free software and Shareware. The term 'freeware' is commonly used for software where redistribution but not modification is permitted. The source code is seldom provided. The user has "free license" to use the software but does not own it.

According to the Free Software Foundation (2002), 'free software' "…comes with permission for anyone to use, copy, and distribute (it), either verbatim or with modifications, either gratis or for a fee. In particular, this means that source code must be available."[6]

In the case of "shareware," people are free to redistribute copies with the stipulation that anyone who continues to use a copy must pay a license fee.

Main IP Protection Mechanisms

Not all forms of protection are of equal importance in the agricultural and environmental development community, especially with regard to spatial information. The most important are copyright, protection of databases, patents, trade secrets, and trademarks. Each of the topics is introduced briefly and then discussed further in subsequent chapters. Table 1 summarizes the major mechanisms for protecting IP.

Copyright. Copyright gives certain rights to creators of literary and artistic works, including books, drawings, and paintings. The concept has been extended to cover computer programs, maps, imagery, and databases. The right to

[3] See http://opencontent.org/opl.shtml and http://opencontent.org/openpub/ for examples of the Open Content License v.1.0 of July 1998 and the Open Publication License, v.1.0 of June 1999, respectively.

[4] See http://www.gnu.org/licenses/gpl.txt for the latest version of the GNU General Public License. GNU is a recursive acronym for "GNU's Not Unix'.'

[5] See http://dsl.org/copleft/dsl.txt for the Design Science License developed by Michael Stutz in 1999.

[6] See http://www.gnu.org/philosophy/free-sw.html for GNU's "free software" philosophy guidelines.

control use of a creative work is mainly economic, although authors also have moral rights; e.g., the right to claim authorship and to oppose changes to a work that might harm the author's reputation. In most national systems, moral rights remain with the author, even if economic rights are reassigned. As with other types of IPR, economic property rights are often assigned to an employer, especially for "works made for hire," a term that appears in some national IP (copyright) legislation or that can be included in contracts to avoid ambiguity regarding ownership.

Copyrights *protect the form of expression* of an idea, concept, method or formula, and *not the idea* itself. Copyrights are enforced by national laws, which permit the owner of a work to initiate legal action against persons or organizations that contravene his/her rights (called infringement). To enforce copyright laws, national agencies, such as the customs authority, are often given empower to assist IPR holders. National laws protecting economic and moral rights of copyright owners must conform to the terms of regional and international treaties governing IP. New treaties or amendments are being proposed to account for changes in the nature of information and technology. Many recent changes to copyright principles involve "related rights," including rights for the electronic version of a manuscript or a database. One issue is whether strict enforcement of copyright, which favors knowledge-rich societies, may harm developing nations by interfering with the flow of scientific information required for sustainable development (Chapman 1998).

For people working with spatial information, copyright is a primary means of protecting IP. Scientists and educators can generally use copyrighted material because of a "fair use" exception in the United States and equivalent exemptions in Europe, based on exceptions permitted in the Berne Convention. However, fair use does not permit large portions of copyrighted material to be copied or transferred to third parties.

Table 1. Comparison of basic features of different mechanisms for protecting intellectual property.

	Applicable to				
Mechanism	**Data *per se***	**Databases**	**Software**	**Geographic coverage**	**Comments**
Copyright	No	Yes	Yes	Respected across jurisdictions.	Only protects form of expression, not ideas or data.
Patent	No	No	Yes	Requires application in each country.	Not all countries allow patents on algorithms.
Database protection	Yes	Yes	No	Only available in certain countries.	Concepts of fair use remain to be established.
Written license	Yes	Yes	Yes	Terms used in licenses vary with country (e.g., "work for hire" vs. "contract of/for service").	If well written, provides perhaps the least risk of misunderstanding. Especially useful when dealing with agreements among diverse organizations.
"Shrinkwrap" license	Yes	Yes	Yes	Uncertain	Validity of such licenses is still bein tested in courts.
Trademark	No	No	No	Requires application in each country.	Used only for names and logos.
Trade secret	Yes	Yes	Yes	Laws protecting secrets vary greatly	Requires that deliberate efforts be made to keep information or product secret.

Legal Protection of Databases. The Berne Convention for the Protection of Literary and Artistic Works (WIPO 2001a), which provides for copyright and related rights, does not automatically allow copyright for a database. There are provisions for "collections," such as encyclopedias and anthologies, which "…by reason of their selection and arrangement of their contents, constitute intellectual creations…" (Berne Convention, Article 2), and the individual works in a collection may carry their own copyrights. However, for databases the US Supreme Court (in the *Feist*[7] decision) and high courts in Europe ruled that only databases whose creation required an intellectual input can be copyrighted. Databases produced only by "sweat of the brow"—that is, with large amounts of effort or money but without creativity—could not be copyrighted.

Recognizing that such sweat-of-the-brow databases form a significant economic and scientific contribution, all countries in the European Union now have separate database protection laws (Hugenholtz 2001). Other countries will probably enact similar protections, but as discussed later, there is controversy over whether such protection will overly restrict effective use of databases for educational and research purposes.

Patents, Petty Patents, Innovation Patents, and Utility Models. Patents grant an inventor a temporary monopoly to exploit an invention. This is done with the expectation that society, as a whole, will benefit if new inventions are publicly disclosed, but that researchers or inventors require a reward or stimulus for making their findings publicly known. Thus, a patent is granted as a state-sanctioned monopoly for a specified period, typically 15 to 20 years. Two of the major international treaties covering patents are:

1. The Paris Convention for the Protection of Industrial Property, 1883-1979 (WIPO 2001b).
2. The patent provisions within the Trade Related Aspects of Intellectual Property (TRIPS) Agreement, 1995 (WTO 1995).

The bases under which patent protection can be sought for an invention generally include (Cho 1998):

- Novelty, i.e., the invention must be new[8];
- Invention, i.e., the product must be the output of an invention process;
- Lack of obviousness since "obvious invention is inevitably not novel";
- Manner of new manufacture, i.e., the innovation has not already been used, sold or disclosed to the public; and
- Demonstration of usefulness (utility), i.e., it must be able to achieve the useful results claimed in the patent application.

In some jurisdictions, patents may be granted for business models and methods, including algorithms embodied in software (which would otherwise be protected only by copyright).

Petty patents, innovation patents, and utility models offer exclusive but shorter protection for technical inventions in several countries. These rights are similar to patents but can be secured more rapidly and cheaply. Legal protection usually is less secure than for a patent, due to a lower standard of search and examination and the

[7] See http://www.bitlaw.com/source/cases/copyright/feist.html for a description of this case, where the court concluded that the white pages of a telephone directory fail to meet the test of originality since they are simply a compilation of facts.

[8] Regarding "patentable subject matter," definitions of what constitutes novelty and non-obviousness can vary widely among national regulations. In the US, the courts interpret patent legislation and the interpretation can change over time as new cases are brought before the courts. If an invention is already in the public domain, then any subsequent patent that might be granted is invalid since it is not new, nor are certain types of inventions considered to be patentable in some jurisdictions, including software, methods of programming, schemes, plans and business methods.

absence of a requirement for an inventive step for the issuance of such protection. Utility models "…must be capable of industrial application;" i.e., they can be made or used "…in any kind of industry, including agriculture." An example is the Australian innovation patent scheme.[9]

Trade Secrets and Confidential Information. Confidential information, including trade secrets, come under Article 39, Protection of Undisclosed Information, in the WTO TRIPS Agreement. To be considered confidential, the information must be secret and have commercial value because of this secrecy, and reasonable steps must have been taken to keep it secret. Enforcement of these rights is an important part of TRIPS. In some countries (Mexico) trade secrets must be recorded in writing to be protected. National legislation often provides for criminal penalties for disclosure or misappropriation of trade secrets.

By relying solely on trade secrets to protect IP, however, an inventor runs the risk that another person will produce the same or a similar product, potentially obtaining stronger IP protection (for instance, through a patent). For users and creators of spatial information or software, this risk may be unacceptable.

Trademarks. A trademark is any sign, represented graphically, which is capable of distinguishing goods or services of an undertaking—typically an organization or business. In the Paris Convention for the Protection of Industrial Property, numerous articles protect registered owners of trademarks, service marks, and trade names, and ensure exclusive use of such marks. Trademarks can be extremely valuable, but it often requires large expenditures of time and money to establish a link between the mark and an undertaking. The period of protection for a registered trademark typically is 7 to 10 years, and protection is usually renewable, subject to payment of additional fees.

Use of someone else's registered trademark may have serious consequences, even if done inadvertently. The agricultural researcher's main concern is to avoid inadvertent misuse of trademarks. Before a product is named, trademark registries should be consulted to ensure that the proposed name does not infringe on an existing mark.

Other Forms of IP. Other types of intellectual property covered by major treaties include industrial designs, plant breeders' rights, geographical indications that identify a good as originating in a given place, and integrated circuit layout designs. New types of property rights that cover such IP as traditional knowledge may appear in the near future. These protections are not considered further in this paper.

Some Additional Legal Issues for Geospatial Data and Tools

Liability Regarding Information and Licenses. Anyone who creates, uses, or disseminates spatial information and tools, or services based on the data and tools, faces certain legal responsibilities. Cho (1998) highlighted the following legal risks relating to geodata and GIS:

- Failure to secure IP rights.
- Liability for infringement of IP rights, whether intended or not, including failure to control access to geodata or tools, resulting in illegal use of the data or tools by others.
- Failure to secure accountability for defective data or GIS tools (which can also mean models, methods, and services based on the data and tools).

[9] See http://www.ipaustralia.gov.au/patents/P_innvopat.htm for a full description of this new approach.

- Liability for breaching privacy or confidentiality obligations.
- Legal uncertainties involved in contracting out tasks (outsourcing) related to geodata collection, processing, and dissemination, whether by a government agency or for such an agency or private enterprise.

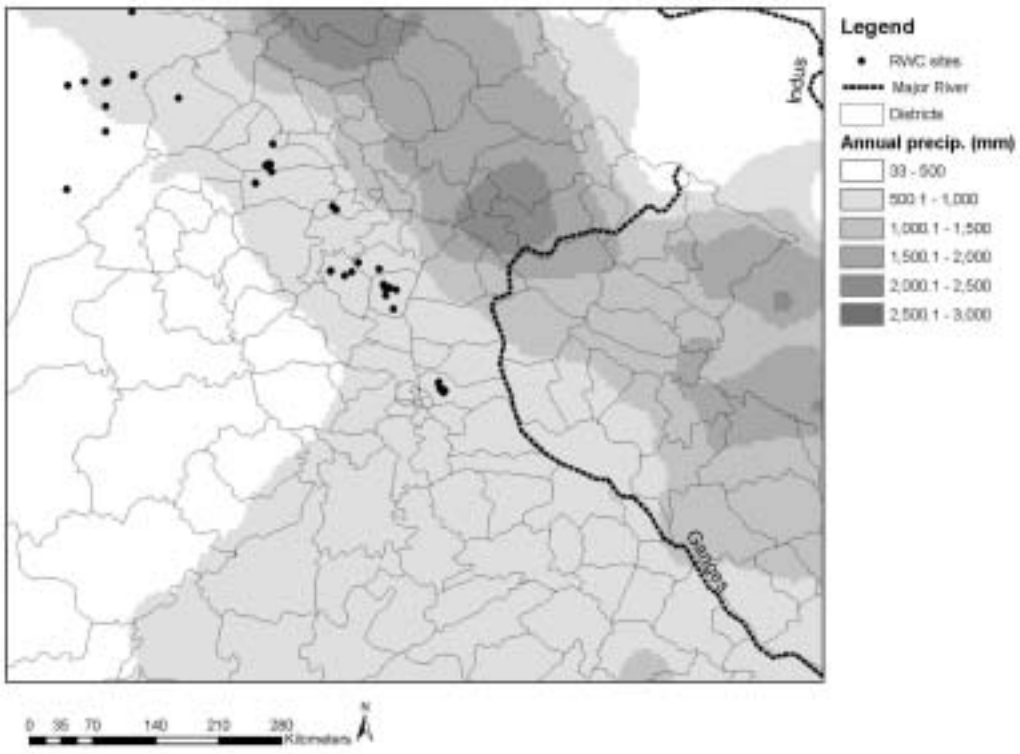
Factors that can mitigate liability include how much care was exercised in developing a product or service, how much was charged, and whether appropriate disclaimers were provided. Licenses that provide such information are a key means of limiting liability, but courts generally decide against attempts to disclaim all liability.

Data Protection for Personal Privacy. Coupling descriptive data to precise location data is the corner stone of many types of spatial analyses. But when locations are easily linked to identities of individuals or farms, there is potential for violating personal privacy. Illegal or unwarranted use of personal information is a serious issue being addressed by multinational legislation. Typical requirements for using personal data are that the data be obtained with informed consent and only be held as long as required for the authorized use.

Why Researchers Should Care about IP

An Example. To illustrate how readily IP and related legal issues can permeate a project using GIS, we consider a simple map of point locations, district boundaries, major rivers, and annual precipitation (the latter as an interpolated surface) as shown in Figure 1.

Figure 1. Location of Rice Wheat Consortium research sites in north-central India and adjacent regions.



The point data represent sites located with global positioning system (GPS) units mainly during farm monitoring tours conducted by the Rice Wheat Consortium (RWC) of the CGIAR.[10] The data were received by CIMMYT in spreadsheets with different formats. In many cases, site descriptions were completed by reconciling the sites with information from tour reports that were downloaded from the Internet. The GIS technician also corrected obvious positional errors. Some questions to consider:

- Who now owns the spatial data set? The RWC or CIMMYT? Does the law allow for shared ownership?
- Several of the points are linked to farms identified by the owner's name. What rights do the farmers have in relation to the data set?

The Ganges and Indus Rivers were located using data from the *ESRI Data and Maps 1998*. The instructions are on the inside cover of the CD-ROM set (with no formal licensing agreement) and state: "The Windows® Help file (.hlp) on the CD-ROM also contains further information about the data including appropriate scales for display and redistribution rights. Please check this information before redistributing any data."

On searching for "redistribution" and similar terms in the Help file, no such information was found for the database of major rivers.

- Can we safely conclude that the river data may be redistributed?
- Would it matter that CIMMYT only used a small part of the dataset?

The annual precipitation surface was calculated by CIMMYT from 12 layers of monthly totals provided by a second party, who in turn, produced the monthly data from long-term records held by other parties.

- Is the annual surface a sufficiently novel data product that CIMMYT holds full IPR?
- What IPR would another group have if they repeated this operation and obtained identical results?
- Does it affect the IPR of the calculated monthly surfaces whether the interpolations were done with an exact interpolator (which fits the surface exactly through each observed point value) or an inexact interpolator (which assumes that each point value may have error and thus does not provide an exact fit)?

The district boundaries were based largely on a set of boundaries from Deichmann (1996), which had no mention of copyright or licensed uses. About 25 boundary lines were hand-edited to accommodate recent changes in districting. The updating was done by a consultant hired by CIMMYT for general GIS support.

- Are the district data sufficiently "new" to constitute new IP?
- Who would own such IP, CIMMYT or the consultant?

Finally, the map, as presented in this document, was rendered as a Joint Pictures Expert Group (jpeg) image file.

- Does this simplified medium reduce conflicts over IPR as compared, say, to displaying the map through an Internet map server, where data layers can be queried but not downloaded?

[10] The RWC was established in 1994 as an Eco-regional Initiative of the Consultative Group on International Agricultural Research (CGIAR), involving the National Agricultural Research Systems of South Asia, the International Agricultural Research Centers and Advanced Research Organizations. The Consortium strives to form a network between national and international agricultural institutions to address the issues of productivity enhancement of rice and wheat in a sustainable fashion. See http://www.rwc-prism.cgiar.org/rwc/index.asp for further information.

Further discussion of this case is provided at the CAS web site.

What do Researchers Understand about Intellectual Property? At the special legal issues workshop on 28 May 2002, held within the GASSIA workshop framework, three scenarios concerning use of intellectual property in GIS were presented to the participants as a test of "fear, uncertainty, and doubt" (FUD).[11] The following is a brief summary of the results.

- Over half of the 16 respondents had misconceptions about intellectual property control over the Digital Chart of the World (DCW), a major database of global spatial data, and another 40% were uncertain of distribution rights to DCW data.
- Nearly half of respondents were uncertain whether they could publicly release a dataset incorporating Landsat 7 or ENVISAT (in the future) data. There was a lack of understanding of the data access and release policy for these major remote sensing platforms.
- Nearly half thought that peer reviewers would have access to the datasets used in scientific publications—not necessarily the case, where some of that data is acquired under strict licensing terms.
- Only 30% felt that co-investigators would know the IP regulations applicable in their home countries.
- Only 25% considered IP issues during project formulation, and another 25% stated that they never actively considered IP issues at this stage of a project plan.
- Two-thirds recognized that paying for access to data does not necessarily confer any ownership rights to that data; that it depends upon the terms of the license or contract.
- Confusion exists regarding public domain data, both as to its acquisition and use/reuse.
- Most respondents expressed uncertainty or lack of understanding regarding potential export restrictions for their software, models, and/or data products.
- The respondents generally understood the different degrees (and costs) of intellectual property protection associated with patents versus copyright, but failed to understand that patented software (or models) can still be made freely available under open source license terms.
- Two-thirds of respondents agreed that the "Scope of Use" clause in software and data supply licenses was very important**.**

Intellectual Property in a Broader Research Context. Whereas the focus of this document is spatial information, researchers should understand that IP issues are gaining importance throughout science and industry. Dr. Lester Thurow, professor of economics and management at the Massachusetts Institute of Technology, (1997) noted that, "Fundamental shifts in technology and in the economic landscape are rapidly making the current system of intellectual property rights unworkable and ineffective. … Skills and knowledge have become the only source of sustainable long-term competitive advantage. Intellectual property lies at the center of the modern company's economic success…" Thus:

- Knowing how to operate within current IP regimes may be crucial to developing new, sustainable, and more productive agricultural and natural resource management technologies.
- Researchers have responsibilities for promulgating their unique scientific contributions and rights over how their results are used. IP issues can influence their ability to distribute their products.
- Basic tenets of IP protection are being debated globally with a view toward adjusting IP legal regimes in response to new opportunities and challenges presented by information technologies.

[11] The full text of the scenarios is available at the CAS web site, http://www.cgiar.org/isnar/cas/

Chapter 2. **Copyright**

Introduction

The term "copyright" originally referred literally to a "right to copy" the literary works of an author, and was meant to encourage the publication of written works. Copyright was implemented by requiring publishers to secure permission from authors to reprint their work. Copyright provides a public benefit with little burden on citizens, and worked reasonably until advances in digital reproduction began permitting very low cost, high quality copying. Rights holders thus are taking increasingly drastic steps to protect their products, and some of these measures arguably impinge on the long-established rights, such as fair use, of certain users. As Richard Stallman (2000), founder of the GNU open source project, noted: "what was once an industrial regulation on publishers has become a restriction on the public it was meant to serve."

Copyright protects "literary and artistic works … that … include every production in the literary, scientific and artistic domain, whatever may be the mode or form of [their] expression, such as books, pamphlets and other writings" including "works of drawing, painting, architecture, sculpture, engraving and lithography; … illustrations, maps, plans, sketches and three-dimensional works relative to geography, topography, architecture or science" that are fixed (published) in a tangible medium (Berne Convention 1971). The definition of "works" has expanded significantly over past decades, as new technologies permit ever more diverse and powerful ways of expressing ideas. Such works must normally be original and creative in nature. A mere recitation of facts, regardless of how expressed, does not automatically qualify for copyright. Under Article 4 of the WIPO Copyright Treaty 1996 and by Article 10 of TRIPS, 1995, computer programs are considered literary works (discussed further in Chapter 5).

Copyright grants certain protective rights to the owners of the expression of an original idea, formula, model, method, or theory (the literary works mentioned above), but such works must be "…fixed in some material form" (Article 2, Berne Convention 1971). Contrary to patents, which protect concepts or ideas that have been developed to a practical level, *copyright provides no protection for ideas per se, only for the form of expression.*

The duration of copyright protection varies by country. The Berne Convention (Article 6) and TRIPS (Article 12) provide for protection for the life of the author plus 50 years as the minimum, but many countries specify a term equal to the lifetime of the author plus 70 years. For works with multiple authors, the term of protection is measured from the death of the last surviving author (Article 7). Under the US Copyright Act of 1976, anonymous works, pseudonymous works, and "works made for hire"[12] are protected for 75 years from first publication or 100 years from the year of creation, whichever expires first.

[12] This term relates to most creative work an employee produces for an employer, and therefore applies to most research work carried out by a scientist for his/her organization, as applied to copyright, unless a contract stipulates alternate terms

Two important protective rights granted to the copyright owner are control of reproduction, which prohibits copying, and control of translation. A translation acquires its own copyright, but this cannot infringe on the owner's prior rights; that is, the translation must be authorized by the owner and must acknowledge the owner's copyright in the original work.

The copyright owner does not usually need to formally register the material to be protected (WIPO 2002a). Formal registration may be important for legal action in claims of copyright infringement. The details of enforcement of rights can also affect an owner's ability to assert his rights. Most countries no longer require that a copyright notice ('copyright' or ©) be displayed. Older works that do carry the © notice may be in the public domain, due to expiration of protection, and some works may claim protection but, in fact, do not warrant protection. One example of the latter case is a work containing simple lists of facts, perhaps in tables, which a court determines to have neither originality nor creativity (nor sweat of the brow, in some jurisdictions) in compilation. Copyright infringement occurs in three forms:

1. Deliberate infringement occurs if the defendant used unauthorized copies in a manner that violates fair use.
2. Contributory infringement occurs when the defendant knowingly enables another person to infringe on a copyright.
3. Vicarious infringement implies that, although the defendant did not engage directly in infringement or enable another to infringe, the defendant had the right and ability to supervise the infringing activity (for example, as an employer or work supervisor) and had a direct financial interest in the infringement.

Penalties for infringement under US law can run as high as US$100,000. Infringement proceedings can be taken against researchers and their institutions. Risk of vicarious infringement increases in projects that involve multiple organizations operating under different legal jurisdictions and IP regulations or cultures.

As more works become digital and original works are transcribed to digital formats, they can be published—that is, copied and transmitted—at minimal cost and without knowledge or control of the author or owner of the work. This ease of abuse has undermined the basic principles of copyright and enforcement, leading to calls for stronger legal protection. The US Digital Millennium Copyright Act (DMCA) prohibits many actions not considered infringements in other laws governing copyright. Citizens in other countries face similar inconsistencies.

Copyright and Spatial Information

Researchers creating or using spatial information need to understand the basic principles of copyright protection, including possible consequences of infringements and specific issues concerning protection of databases.

In many projects, more than one copyright owner will provide data (e.g., Figure 1). An agricultural researcher may access a soils database copyrighted by a private company, whereas the land (parcel) boundaries used in the research may come from a government agency.[13]

[13] A recent study (Hájek et al, 2001) found that, in the EU, six categories of spatial data were typically needed for agricultural modelling: agricultural landscape, boundaries, blocks of lands, value of soil, parcels and thematic attributes specific to the research project. Data were typically 'owned' by three or more distinct organisations .

[14] "Fair use" is a term that originates in US law and one that is often casually used, in other jurisdictions, to indicate a certain standard of exception to the rights of a copyright holder.

To collect data relating to plant growth and to analyze and present the results, both sets of data are required. One source may willingly permit data to be used freely or at low cost, or the data may be in the public domain. The other data may be privately held or under control of a government agency acting under a strong cost recovery regime. Fair use[14] provisions may apply, depending on the amount of data used by the researcher, or special exemptions for non-commercial use by researchers or educators may apply. Provisions may apply under the national law of one data provider but not under that of another, complicating cross-border data interchanges. Such issues are best resolved through a careful inventory of data sources and associated IP. Detailed guidelines on how to inventory data sources and associated IP are available at the CAS web site.

Digital databases are not explicitly protected by copyright under the Berne Convention. The WIPO Copyright Treaty, 1996, (WIPO 1996a) extends copyright to "…compilations of data (databases)" as "intellectual creations;" but this protection may not cover the data itself, as facts are not viewed as the result of a creative process.

Copyright provisions in the WTO TRIPS Agreement (Article 10.2) give some measure of protection to databases. A proposed WIPO Database Protection Treaty (1996) would extend copyright protection to databases.

Copyright and Fair Use and Fair Practice

Copyright regulations provide for various public uses of works. The TRIPS Agreement and Article 10 (Certain Free Uses of Works) of the Berne Convention define these exemptions. Article 10 outlines fair practice in using several types of works, including access to databases:

1. It is permissible to quote from a work available to the public, provided that the quotation is compatible with fair practice and the extent of material used does not exceed that justified by the purpose.
2. It is up to national legislation or agreements between countries subscribing to the Berne Convention to permit works to be used to the extent warranted "by way of illustration in publications, broadcasts or sound or visual recordings for teaching, provided such utilization is compatible with fair practice."
3. When protected works are used in accordance with Article 10, the source and the name of the author should be published with the quoted material.

The fair use doctrine thus moderates a copyright's capacity to suppress expression. Unfortunately, there are no absolute tests to identify fair use. US courts issue opinions on individual cases, and it is unadvisable to extrapolate from one case to the next. Eisenschitz and Turner (1997) summarized the main copyright exceptions for fair dealing embodied in national law in the European Union, as follows:

- Copying for personal use.
- Copying for scientific, educational or other private use.
- Archival copying and library privileges.
- Educational exemptions and (other) graphic reproduction.

For alleged illegal use of copyrighted material, the main defense is under fair use exemptions. Applying fair use can be especially difficult though in the case of a database of facts. As stated by Cho (1998): "Reproducing facts without copying the expression or arrangement of facts will not be considered a reproduction of a substantial part of the work." Yet it is often not easy to separate facts from "expression of facts" in court. Even in the USA, where fair use is expressly referred to in copyright law, courts decide on a case-by-case basis whether an alleged infringer can employ fair use as a defense.

Chapter 3. ***Legal Protection of Databases***

Databases used by scientists may be in the public domain, copyrighted as compilations under the Berne Convention, protected by database laws, or protected as trade secrets and accessed through licenses. There is much debate on appropriate means to protect databases, due to the wish to reward large investments in compiling facts vs. the recognition that simple compilations are neither copyrightable nor patentable.

Copyright Protection for Databases

Article 5 of the WIPO Copyright Treaty, 1996, and Article 10 of the WTO TRIPS Agreement, 1995, extend protection to "compilations of data (database)," i.e., "compilations of data or other material, whether in machine readable or other form, which by reason of the selection or arrangement of their contents constitute intellectual creations shall be protected as such. Such protection, which shall not extend to the data or material itself, shall be without prejudice to any copyright subsisting in the data or material itself." These two treaties formally extend the definition of protected works contained in Article 2 of the Berne Convention. However, the definition of a compilation remains similar to that in the Berne Convention for literary works and does not approach the definition of a database set out in the EU Protection of Databases Directive.

Linne (2000) states that: "By law, the US federal government cannot copyright databases, although private vendors disseminating government information can. Scientists can generally use copyrighted material because of a fair use exception in the United States or equivalent exemptions in Europe."

EU Legal Protection of Databases Directive (1996)

To protect investments in large databases and harmonize disparate national legislation in Europe, the European Union adopted a directive providing a novel form of legal protection for databases in 1996 (European Commission 1996). The directive has now been translated into national laws or transposed into existing legislation in the EU countries (Hugenholtz 2001). Because of its scope and emphasis on rights of investors, this activity is potentially the single most important legislative development affecting users of spatial information in recent years. Features of the directive include the following:

- Protection is not based on extensions of copyrights or patents. It represents a unique or *sui generis* right (meaning "of its own kind").
- It protects "databases in any form," where database is defined as "a collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible by electronic or other means." (Protection does not extend to software used to make or access databases.)
- The protection is "…for the maker of a database which shows that there has been qualitatively and/or quantitatively a

substantial investment in either the obtaining, verification or presentation of the contents to prevent extraction and/or re-utilization of the whole or of a substantial part, evaluated qualitatively and/or quantitatively, of the contents of that database."

- Extraction is defined as "…the permanent or temporary transfer of all or a substantial part of the contents of a database to another medium by any means or in any form" and re-utilization means "…any form of making available to the public all or a substantial part of the contents of a database by the distribution of copies, by renting, by on-line or other forms of transmission."
- In place of a fair use concept, the directive prohibits "…repeated and systematic extraction and/or re-utilization of insubstantial parts of … the database … which conflict with normal exploitation of that database or which unreasonably prejudice the legitimate interests of the maker of the database."
- Users may extract or re-utilize a substantial part of the contents of a database if this is done for private purposes or for "…purposes of illustration for teaching or scientific research" and as long as the source is indicated and the extent of copying is justified by the non-commercial purpose to be achieved.
- The term of protection for a database under the sui generis right runs for 15 years. Any substantial changes to the contents of a database, such as additions, deletions, or alterations that require a large investment, can qualify the modified database for a new term of protection.[15]
- Databases that "…by reason of the selection or arrangement of their contents, constitute the author's own intellectual creation" are still protected by copyright. No other criteria need be applied to determine eligibility for protection. But copyright protection does not extend to the contents of such databases and is "…without prejudice to any rights subsisting in those contents themselves."
- A reciprocity clause in the directive states that only countries that offer similar protection to EU nationals will receive this new level of protection within the European Economic Area.

Many parties would agree that copyrights and patents provide little or no protection for the contents of databases and that investments by groups that assemble large databases merit some form of protection, thus regulating large-scale copying and redistribution of the data. However, the EU directive has been severely criticized on multiple fronts, an underlying theme being that the protections excessively favor large commercial database providers at the expense of research and educational communities. One of the foremost concerns relates to the creation of the novel right. Copyright and patents have stood the test of time, and it seems risky to introduce a whole new class of protection without much more extensive consultation and deliberation. The directive also diverges from previous practice in automatically assigning rights to the investors rather than the creators. Critics further suggest that the provision for new periods of protection following database updates essentially authorizes perpetual protection, contrasting with the fixed time limits for copyrights and

[15] Note that many IP professionals regard this point as allowing perpetual coverage of a database, since an entity could "renew" coverage every 15 years, by updating the database.

patents. A fourth concern is that whereas terms like "fair practice" have resulted in extensive litigation in relation to copyrights, the directive contains a large set of descriptors such as "substantial part," "non-commercial purpose," and "substantial investment," that will have to be interpreted through court cases.

Partly in response to the EU directive, WIPO proposed a Draft Treaty on Intellectual Property in Respect of Databases in 1996 (WIPO 1996b). The draft generated strong disagreement among various sections of the information community, and this impasse has yet to be resolved.

Because a large body of international research is done by or through institutions based in the EU member states, researchers should understand that the sui generis right is now active. Many spatial databases may have such protection, regardless of whether the immediate provider is aware of its scope and potential implications.

Protecting Databases by Other Means

Legal means such as contracts and technical measures such as encryption can also protect databases. A contract "…is a two-party agreement, the terms of which are specified by the individuals involved. … (the contract) can be used to prevent unauthorized uses of a database by the parties to the agreement." (Linne 2000)

Legal contracts have been used since the first on-line electronic databases were created for medical information, patents, and other scientific data. Contracts are used to control access to many large, spatial information databases, such as those created by many national mapping agencies and by satellite imagery vendors.

Contracts have drawbacks, including "(1) a high administrative burden of negotiating terms with each user and provider of data, particularly for databases compiled from several sources, and (2) they cannot prevent unauthorized downstream uses of the database because they are only binding on the parties to the agreement." (Linne 2000) Whereas the first concern is being addressed through cleverly implemented, on-line, "click to use" licenses, the second concern is much more difficult to eliminate.

Technological methods such as encryption can also regulate use of databases, but they are expensive and complex to implement, both for vendors and users. The WIPO's Digital Agenda (WIPO 1999) focuses on e-commerce in the information area and IP in particular, and addresses use of such methods. In the USA, the Digital Millennium Copyright Act (DMCA) enacts the provisions of the 1996 WIPO Copyright Treaty (Article 12) that prevents "…removal of electronic rights management information without authorization" from any protected work. The DMCA further makes it an offence, with severe punishments, to publicize information that could lead to removal of protection mechanisms.

Although not providing protection per se, data in large databases are often modified in a readily detectable way to permit reliable identification of the source, even when copied to new media or database software. Such digital watermarks may include manipulation of non-significant digits to create readily identifiable patterns and inclusion of records with fictitious data (Isenberg 2002).

Examples of Databases using Different Protection Mechanisms

The Digital Chart of the World (DCW)[16], as produced by ESRI, is a database of geographical information in vector format derived from the US government's Vector Map Level 0 (VMAP-0) of the world. ESRI has provided enhancements and additional quality control, and otherwise added value. The box containing ESRI's "Digital Chart of the World for use with ARC/INFO® software" contains fine print warning potential users that if they do not "…agree to the terms and conditions as stated, then ESRI is unwilling to license the database" and that the unopened box should be returned. Permitted uses include:

- Installing the data on a server.
- Making one copy for backup puposes.
- Modifying the data or merging with other data sets.
- Selling, marketing or otherwise distributing hard copies (paper maps) of the database or parts of it, provided that ESRI is acknowledged as a source.

Prohibited uses are:

- Selling, renting, transferring, etc. of the data to unlicensed third parties.
- To reverse engineer the ESRI ARC/INFO format.
- Selling, marketing or otherwise distributing the data in digital form (including derived forms).
- Removing or obscuring any ESRI copyright, proprietary, or trademark notices.

The document states clearly that it "is a license and not an agreement for sale." Additional sections deal with duration of the agreement, warranties, export regulations, and other details.

Land Information New Zealand (LINZ) supplies their Land*online* Bulk Survey Data (LINZ 2001) for the cost of distribution only and permits the data to be redistributed at no additional fee to LINZ. LINZ retains copyright, but the IP in any modification or derivative work resides with the person adding value to the raw data. Thus, while LINZ operates under a "crown copyright" (government copyright control) regime, it releases raw survey data without seeking financial gain from derived products.

[16] The DCW was based on the Defense Mapping Agency (DMA) Operational Navigation Chart (ONC) series produced by the United States, Australia, Canada, and the United Kingdom, at a scale of 1:1 million (1 inch equals approximately 16 miles).

Chapter 4. **Patents**

Contrasting with the focus of copyrights on forms of expression, patents deal with useful inventions. Patents are regulated under terms of the Paris Convention for the Protection of Industrial Property, 1883 – 1979 (WIPO 2001b) and Section 5 of the TRIPS Agreement (WTO 1995). The TRIPS Agreement sets a minimum protection period for patents of 20 years "from the filing date" (Article 33). Patent protection must be requested from designated bodies in each country, following strict procedures. Applications usually are filed via patent agents who know these procedures. Agents also advise whether the application is likely to succeed, following a search for published information that might negate claims to novelty or non-obviousness.

Treaties such as the Patent Cooperation Treaty (PCT) and the Patent Law Treaty (PLT) simplify the application, search and examination processes. National applications must still be filed with the patent office of each nation, except where regional systems exist, such as the Organisation de la Proprie Intellectuelle (OAPI) in the francophone countries of Africa.[17] The filing cost ranges from a few hundred US dollars to more than US$ 10,000. Maintenance fees can further increase the cost and, if necessary, defending a patent can cost millions of US dollars (Barton 2000). Since patent protection is only a right to prosecute infringement, the potential costs should be taken into consideration when deciding to file for a patent, and if so, where to file.

Patent protection is sought not just for economic benefits and to restrict use of the patented elements, but to secure IP control of important new techniques, models, or tools which can then be released to the public, including other researchers, in a more managed way. Patents can protect the conceptual framework underlying intellectual property that has been rendered useful by a "reduction to practice." The danger to research institutions is that an organization will be granted a patent for a critical element of research, and this patent thus allows access only to those who can afford to pay the license fees.

Patents are awarded after search and examination by experts employed in or contracted by national or regional patent granting authorities. The validity of a patent depends on the skill of the examiner, the honesty of the inventor(s), and drafting skills in preparing the application. In recent years, there has been an outcry against patents that would have affected millions of users of information and communications technology equipment or services. Some were later overturned on request for re-examination, appeal, or in civil cases regarding fulfillment of patenting requirements. Some failed the novelty or usefulness tests. Others were disallowed on technical grounds when additional prior art was discovered or the innovation had actually been used, sold, or disclosed to the public prior to the filing of an application.

[17] In practice, the PCT system virtually assures that a patent will be issued by a national patent office, if the search and examination authority, say the European Patent Office (EPO), looks favourably upon the patent application. The EPO can issue an EPO patent. However, this can become a national patent, subject to an opposition process, only in States that were designated at the time of filing and that are members of the EPO.

If a patent is infringed, the only remedy is generally a civil or administrative lawsuit. This contrasts with infringement of copyright, which can carry criminal penalties as well, and breach of confidentiality and unlicensed use of a trade secret without permission, which are criminal acts in most jurisdictions.

For agricultural research staff and their institutions, especially as regards spatial information, one key question is whether software tools, methods, and models are patentable in their legal jurisdictions. If so, then the possibility exists that third party products used in research are patented. In addition, the option exists to seek patent protection for research products developed by these staff or institutions. See Chapter 5 for further discussion on protecting software by patents.

Patent Protection for Methods and Processes

The patent system is designed to protect invention of both products and processes. Patent systems in some nations, such as the USA, grant patents for business methods, a practice not allowed in systems such as that of the European Union. The current debate centers on two issues: (1) whether such patents should be allowed and, if allowed, (2) how to better regulate the process by which they are granted, since patents are awarded for many seemingly obvious methods.

The US government supports the concept of patenting business methods, and a court ruling in 1998 (*State Street* 1998) found that "…such patents express the practical application (useful, concrete, and tangible result) of technology that is the essence of innovation." A US Patent Office White Paper (USPTO 2000) concludes: "USPTO management is committed to the successful examination of these applications to ensure continued growth and innovation in this important area." In various international agreements, the US government has pressured trading partners to clarify IP laws protecting business method patents, including software algorithms.

During the consultative process preceding current attempts to create an EU Community Patent, the 19 countries that operate the European Patent Office (EPO), which examines European patent applications for a number of European countries, voted to allow patents "…in all fields of technology," including methods and software (Fox 2000). According to some sources at the EPO, both software and some business methods claims have already been allowed by the EPO. In February 2002, the European Commission published a draft directive for patentability of software (European Commission 2002). The spirit of the document has been broadly attacked,[18] and the fate of this initiative is as yet unclear.

Examples of Patents Related to Spatial Analysis

A search of the US Patent and Trademark Office's on-line database[19] for "GIS" reveals the prevalence of GIS and related tools in the patent literature. Table 2 lists examples from this list as well as patents from related fields including image processing, GPS, and database design. We examine a few examples below.

[18] See http:/www.eurolinux.org/ for an extensive critique of the proposal as well as links to the Eurolinux Petition for a Software Patent Free Europe.

[19] http://www.uspto.gov/patft/index.html provides access to the U.S, Patent and Trademark Offices ' searchable databases.

United States Patent 6,240,360 was granted to Sean Phelan on 29 May 2001 for a "Computer system for identifying local resources" (Figure 2). The abstract describes a system for transferring spatial data from a server to a remote computer based on location information provided from the remote device:

> *A map of the area of a client computer (10) is requested from a map server (11). Information relating to a place of interest is requested from an information server (12) by the client computer (10). The information is superimposed or overlaid on a map image at a position on the map image corresponding to the location of the place of interest on the map. The information (or "overlay") server (12) may contain details of, for example, hotels, restaurants, shops or the like, associated with the geographical coordinates of each location. The map server (11) contains map data, including coordinate data representing the spatial coordinates of at least one point on the area represented by the map.*

The numbers refer to a drawing provided with the patent application (included in Figure 2). The patent is held by Multipmap.com in the UK, which reportedly has attempted to enforce the similar UK patent.[20]

Various data compression algorithms are patented. The GIF image format uses LZW compression, which is covered by patents held by Unisys and IBM. Software that allows manipulation of GIFs should include a license from Unisys. Open source software specifically avoids use of GIFs to eliminate the need for licensing (Anonymous, 1999). Other patented compression algorithms include MrSID (LizardTech Inc.), which is based on technology licensed from Los Alamos National Laboratory, and Enhanced Compression Wavelet 2.0 (Earth Resource Mapping, Inc.). These two algorithms are currently the subject of a patent infringement case.[21]

IDELIX Software Inc.'s Pliable Display Technology (PDT) extends display capabilities of traditional GIS software by providing "magnification-in-context" tools. As the user moves a "lens" over a display the image is magnified. Patents for PDT are pending.[22]

Garmin Corp., a major manufacturer of GPS units and related products, holds a patent for "peer-to-peer position reporting," as featured in their GPS-enabled, two-way radios. The patent covers portable devices that combine GPS and radio technologies to enable such devices to transmit positions to other such devices, as well as a method for indicating the location of one device on the display of another portable device. Garmin Ltd. and its subsidiaries hold 67 US patents and have almost 100 US applications pending.[23]

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[20] See http://www.gismonitor.com/news/newsletter/archive/040402.php and http://mapserver.gis.umn.edu/wilma/mapserver-users/0203/msg00495.html for discussions of this case.

[21] See http://spatialnews.geocomm.com/dailynews/2001/apr/24/news3.html and http://www.jurisnotes.com/Cases/LizardTech.htm for perspectives on this case.

[22] http://www.idelix.com/pdt_prodsheet.shtml

[23] http://www.garmin.com/aboutGarmin/invRelations/releases/050102b.html

Table 2. Recent US patents related to Geographic Information Systems. Details on individual patents are provided at the US Patent and Trademark web site (http://www.uspto.gov/patft/index.html). The assignee is the individual or entity to whom ownership of the patent was assigned at the time of patent issue, typically the business that employed the inventor(s).

No.	Title	Assignee
2002		
6,411,899	Position based personal digital assistant	Trimble Navigation
6,408,107	Rapid convolution based large deformation image matching via landmark and volume *imagery*	(Not indicated in USPTO database)
6,404,920	System for generalizing objects and features in an image	(Not indicated in USPTO database)
6,389,356	Geographic information system	Matsushita Electric Industrial Co
6,353,832	Selectivity estimation in spatial databases	Lucent Technologies
6,343,290	Geographic network management system	Celeritas Technologies
6,337,693	Vector-based geographic data	Autodesk
2001		
6,327,533	Method and apparatus for continuously locating an object	Geospatial Technologies
6,321,158	Integrated routing/mapping information	DeLorme Publishing Company
6,313,837	Modeling at more than one level of resolution	Schlumberger Technology Corporation
6,308,177	System and method for use and storage of geographic data on physical media	(Not indicated in USPTO database)
6,307,573	Graphic-information flow method and system for visually analyzing patterns and relationships	(Not indicated in USPTO database)
6,292,827	Information transfer systems and method with dynamic distribution of data, control and management of information	Shore Technologies
6,282,362	Geographical position/image digital recording and display system	Trimble Navigation Limited
6,269,358	Method and system for similarity-based image classification	
6,262,741	Tiling of object-based geographic information system (GIS)	PRC Public Sector
6,247,019	Object-based geographic information system (GIS)	PRC Public Sector
6,240,424	Method and system for similarity-based image classification	NBC USA
6,240,360	Computer system for identifying local resources	Multipmap.com
6,229,546	Rapid terrain model generation with 3-D object features and user customisation interface	Geosoftware
6,216,130	Geographic-based information technology management system	InGeo Acquisitions
6,202,063	Methods and apparatus for generating and using safe constraint queries	Lucent Technologies
6,191,787	Interactively constructing, editing, rendering and manipulating geoscience models	Schlumberger Technology Corporation
6,184,897	Compressed representation of changing meshes and method to decompress	IBM
2000		
6,144,338	Predictive drop and load algorithm for an object-based geographical information system	PRC Public Sector
6,134,541	Searching multidimensional indexes using associated clustering and dimension reduction information	IBM
6,128,577	Modeling geological structures and properties	Schlumberger Technology Corporation
6,122,628	Multidimensional data clustering and dimension reduction for indexing and searching	IBM
6,119,069	System and method for deriving field boundaries using alpha shapes	Case Corporation
6,115,672	Method for measuring and quantifying amounts of carbon from certain greenhouse gases sequestered in and by grassy and herbaceous plants above and below the soil surface	Environmentally Correct Concepts
6,107,961	Map display system	Kokusai Denshin Denwa Co
6,081,624	Spatial index compression through spatial subdivision encoding	Autodesk
6,052,650	Enforcing consistency in geoscience models	Schlumberger Technology Corporation
6,031,548	Progressive multi-level transmission and display of triangular meshes	IBM

Figure 2. Example of a description of a US patents for a "Computer System for Identifying Local Resources: (US Patent No. 6,240,360 B1). Information was downloaded from the US Patent Office web site.

US006240360B1

(12) **United States Patent**
Phelan

(10) **Patent No.: US 6,240,360 B1**
(45) **Date of Patent: May 29, 2001**

(54) **COMPUTER SYSTEM FOR INDENTIFYING LOCAL RESOURCES**

(76) Inventor: **Sean Phelan**, 24 Merton Rise, London NW3 3EN (GB)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/011,691**

(22) PCT Filed: **Aug. 16, 1996**

(86) PCT No.: **PCT/GB96/01996**

§ 371 Date: **Feb. 13, 1998**

§ 102(e) Date: **Feb. 13, 1998**

(87) PCT Pub. No.: **WO97/07467**

PCT Pub. Date: **Feb. 27, 1997**

(30) **Foreign Application Priority Data**

Aug. 16, 1995 (GB) 9516762

(51) **Int. Cl.**[7] **G09G 1/123**

(52) **U.S. Cl.** **701/208**; 701/207; 701/212; 345/133; 345/113

(58) **Field of Search** 345/133, 113; 701/208, 212, 200, 201, 207, 27; 340/990, 995; 395/200.09, 200

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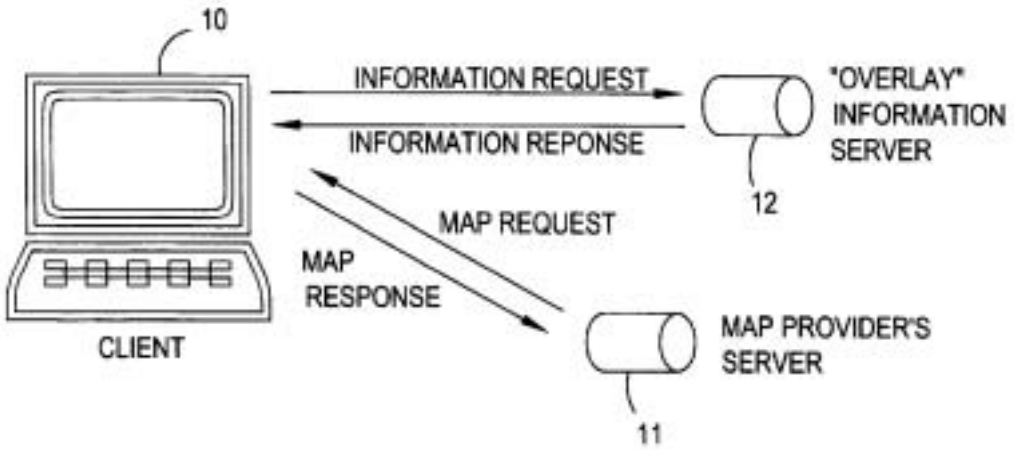
(57) **ABSTRACT**

A map of the area of a client computer (**10**) is requested from a map server (**11**). Information relating to a place of interest is requested from an information server (**12**) by the client computer (**10**). The information is superimposed or overlaid on a map image at a position on the map image corresponding to the location of the place of interest on the map. The information (or "overlay") server (**12**) may contain details of, for example, hotels, restaurants, shops or the like, associated with the geographical coordinates of each location. The map server (**11**) contains map data, including coordinate data representing the spatial coordinates of at least one point on the area represented by the map.

37 Claims, 2 Drawing Sheets



Chapter 5. **Computer Software Protection**

Computer Software and Copyright

Computer software is typically protected by copyright or licensing agreements. The Berne Convention says nothing about copyrighting computer software, but Article 4 of the WIPO Copyright Treaty, 1996, states that computer programs are to be protected as literary works as per Article 2 of the Berne Convention, "…whatever be the mode or form of their expression." Article 10 (1) of the WTO TRIPS Agreement also states that "Computer programs, whether in source or object code, shall be protected as literary works under the Berne Convention (1971)." Thus, all nations that ratified the WIPO Treaty or WTO TRIPS Agreement must allow computer programs to have copyrights.

The EU's computer software copyright directive (European Commission 1991) requires member states to protect computer programs by copyright as literary works, within the meaning of the Berne Convention. The term "computer programs" would include their preparatory design material, including source code. The directive further stated that the computer program would be protected if "…it is original in the sense that it is the author's own intellectual creation" and that no other criteria would be applied. Protection applies to the expression of the computer program in any form but not the underlying ideas or algorithms.

Computer Software and Patents

Some jurisdictions have permitted computer programs to be patented. In the USA this is allowed under current patent legislation. In Europe, as discussed in Chapter 4, the European Patent Office has allowed software patents despite the lack of a legal framework that explicitly permits such patents. Elsewhere, the practice is still being debated. Such protection potentially affects the use of computer programs by people in the spatial information sector, because the protection extends to the *ideas, formulas,* or *methods* underlying the computer code, not simply to the code itself as with copyright protection.

New computer hardware is readily patentable, but computer programs have generally been considered to "…fall within the general prohibition against schemes, plans, and other types of intellectual information" (Cho 1998). Patents on software are now common in the US patent system, but Article 52 (2) of the European Patent Convention specifically excludes software from the list of patentable inventions. The president of the European Patent Office (EPO) estimated that the EPO had "issued (allowed) over 20,000 patents on computer programs" by the end of 1997 (Basinski 2001), but an attempt to remove the software restriction from the European Patent Convention failed in 2000 (Sayer 2000).

Protecting Software via Copyright versus Patent

Software can be protected by copyright at virtually no cost and for very long periods of time (70 years or more). Patents are expensive to obtain and to defend and offer protection for much shorter time periods (15 – 20 years). Thus, one might question why software developers are eager to patent software.

Recall that copyrights apply to forms of expression and not ideas. While a third party cannot copy software directly, they can use the ideas contained in software to create software with similar functionality, even down to using the same logic in complex algorithms. In contrast, with patent protection, the underlying ideas are fully protected. Researchers might consider patenting software that implements novel methods, procedures or processes for two reasons:

1. The policy of the researcher or his employer may be to try to capitalize on research funding and the patented software or method can be exploited.
2. Once the software is patented, the patent owner can decide to freely distribute the software under terms that they control, via licensing, even of an "open source" nature. This protects other members of the research community or beneficiaries of the research from some day facing potentially steep charges should some other less benign innovator create similar software or procedures and then decide to charge all users for its application. This type of strategy is often referred to as "defensive patenting".

Whether or not patents are applied for will also depend upon the legal regime of the target country and the information access policy of the institute.

Chapter 6. **Other Legal Issues**

Other legal issues affecting use and misuse of spatial information include:

- Protecting commercial or organizational confidentiality.
- Ensuring data privacy (personal confidentiality) for individuals or groups.
- Abiding by national laws on exporting or importing data or information products.
- Understanding and incorporating appropriate licensing terms.
- Managing liability related to data, information and software products.

These issues may interact with each other and with the IP issues discussed previously. Consider the range of national and/or institutional regulations that might affect collecting spatial information from multiple data owners, analyzing the data using models or other input from other researchers, or the publication and distribution of maps created through a GIS. This chapter examines confidentiality and privacy issues, while licensing and liability are covered in the two following chapters. Laws governing import and export of certain types of information and software vary quite dramatically across national jurisdictions and are outside the scope of this primer.

Protecting Confidentiality in the Information Age

One method of protecting IP is simply to keep private as much information as possible about the product, process, technique, model, or method that is to be protected. Prior to the advent of patent regimes, secrets were one of the few protections available to inventors.

Confidentiality. Confidentiality of information does not arise automatically. A communication, in whatever form, should be clearly identified as "in confidence." Protecting confidences is governed by legal provisions differing from those for ideas. Common law and equity protect secrets (Cho 1998) via legal actions for breach of confidence. Laws in most countries consider it to be a breach of confidence if a person receiving information "in confidence" discloses the information to a third party. Almost anything, ranging from industrial formulas to lists of customers, can be protected. The main requirements are that the information must be "…secret, a discrete entity and uniquely ascertainable" (Cho 1998). The information does not need to be expressed in material form; verbal information is protected as fully as written information. The protection of confidential or trade secret information has become more standardized and enforceable internationally as a result of TRIPS provisions (Section 7) covering this area.

To maintain the confidentiality of electronic communications, include a simple confidentiality statement as part of the prefix or suffix to a message. A typical example found attached to many e-mail messages is:

> *"This message is sent in confidence for the addressee only. It may contain legally privileged information. The contents are not to be disclosed to anyone other than the addressee. Unauthorized recipients are requested to preserve this confidentiality and to advise the sender immediately of any error in transmission."*

Vendors of spatial information and GIS tools often invoke confidentiality restrictions on purchasers via clauses in licenses for data or software. Such clauses allow the purchaser to use the data or tools (software or models), but prohibit the purchaser from disclosing any details to a third party. The terms are enforced via contract law. Researchers should note that third parties who unwittingly use confidential information may still be liable, depending on how they accessed the information and whether they should have suspected that the information was meant to be confidential.

Research staff working on projects involving cross-border partners should be aware of any confidentiality clauses that may exist in project documents or funding arrangements relating to entire programs. If a research group involves institutions and research staff from different countries or different legal jurisdictions, contractual terms should be introduced into project agreements that can be used later to establish breach of confidence, should confidential information be knowingly or inadvertently misused.

Trade Secrets. Trade secrets are typically protected by unfair competition law (WIPO 2000). Protecting trade secrets in today's digital network environments relies heavily on technological measures such as encryption and password control. Once a trade secret has been stolen and posted to the Internet, courts may have trouble determining the "secrecy" element of the trade secret, as set out in TRIPS Article 39 (2-a and 2-c) below:

> *Natural and legal persons shall have the possibility of preventing information lawfully within their control from being disclosed to, acquired by, or used by others without their consent in a manner contrary to honest commercial practices so long as such information:*
>
> *(a) is secret in the sense that it is not … generally known among or readily accessible to persons within the circles that normally deal with the kind of information in question;*
> *(b) has commercial value because it is secret; and*
> *(c) has been subject to reasonable steps under the circumstances, by the person lawfully in control of the information, to keep it secret.*
>
> *(For the purpose of this provision, "a manner contrary to honest commercial practices" shall mean at least practices such as breach of contract, breach of confidence and inducement to breach, and includes the acquisition of undisclosed information by third parties who knew, or were grossly negligent in failing to know, that such practices were involved in the acquisition.)*

Staff involved in agricultural research that generates information of commercial value should be aware of their responsibilities in regard to trade secrets. Such information is considered to be a trade secret if (1) the owner takes reasonable measures to keep the information secret and (2) the information has real or potential economic value by not being made public (Selzer and Burns 1999). Thus, not all confidential information is necessarily a trade secret, yet both types of information can be protected.

A particular problem may arise when staff leave one organization and join another, taking both confidential and trade secret information with them simply because they were party to its creation or used such information in their work. Both staff and institutions should recognize their rights and responsibilities in such cases, and stated policies should be in place, including appropriate non-disclosure and confidentiality agreements and forms, both in contracts of employment and perhaps even on a project basis.

Personal Privacy (Data Protection)

People working in agricultural and natural resource management may consider that such work normally does not invade anyone's privacy, yet seemingly innocuous records of farm expenditures, farming practices, or property boundaries are legally viewed as personal data, especially under recent European privacy laws. Countries with personal data legislation generally require that administrative steps be taken to inform the person(s) affected as to what is being collected, why, how, and for what use, as well as to register databases holding the personal data. Failure to follow these protective steps can lead to criminal prosecution, as under the UK's Data Protection Act 1995.

To avoid the need for such controls, a valid alternative is to eliminate the use of actual identities of any persons who might otherwise be identified via the research. The US National Institute of Statistical Science[24] is developing a system for the US National Agricultural Statistics Service[25] to disseminate geographical survey data on agricultural-chemicals usage that protects the identity of farmers (Karr et al. 2000; Karr et al. 2001; Federal Committee on Statistical Methodology 1994).

The information privacy policy promoted by the US Federal Geographic Data Committee (FGDC 1998) to protect personal information in "geospatial databases" is as follows:

- When personal information is collected directly, at the time of collection agencies should inform individuals of:
  - o why they are collecting the information and their legal authority to do so,
  - o how the information will be used and protected as to confidentiality, integrity and quality,
  - o the consequences of providing or withholding the requested information,
  - o how to correct personal information if it lacks sufficient quality to ensure fairness in its use,
  - o the opportunity to remain anonymous when appropriate and any rights of redress, plus the records retention schedule of the agency.

- Personal information is to be acquired and used only in ways that respect an individual's privacy and such information will be collected only as needed to support current or planned activities.
- Agency staff should be are aware of the privacy implications of geographic information system technology.
- Technical and managerial controls will be used to protect the confidentiality and integrity of personal information, including prevention of alteration or destruction of such information held in or linked to geospatial databases, and such information should be as accurate, timely, complete and relevant as possible for the purposes for which it is acquired and used.

These policies apply to any US agency that collects personal information. They serve as an excellent model for policies to protect privacy.

[24] NISS www.niss.org/dg

[25] NASS http://niss.cnidr.org

Chapter 7. ***Licenses and Licensing***

Given the uncertainties over coverage by copyright and other protections, licenses remain one of the most common mechanisms used to protect software and data products. Research staff should understand the various types of licenses and the terminology used, both as end-users and as potential producers.

Typical Licenses for Software and Data Use

It is difficult to identify software licenses for commercial software packages that consist of less than several pages of small print. The ESRI Master License Agreement (MLA)[26] has 11 major articles with numerous sub-sections plus a table and explanatory notes, as outlined below:

1. Definitions.
2. Intellectual property rights and reservation of ownership.
3. Grant of license (covering normal licenses, beta release licenses and evaluation licenses).
4. Scope of use (permitted uses and uses not permitted).
5. Maintenance.
6. Term and termination.
7. Limited warranties and disclaimers (3 sub-clauses).
8. Exclusive remedy and limitation of liability (2 sub-clauses).
9. Infringement indemnity (3 sub-clauses).
10. General provisions (with 11 sub-sections).
11. Entire agreement, amendments.
12. A table for scope of use showing what types of licenses apply to what products in the ESRI product line, including both software and data.

A separate ESRI Data License Agreement[27] has 15 clauses, including permitted and not permitted uses, redistribution rights for derived data sets, no warranty given for quality, limitation on liability, and export restrictions.

Licenses for software or data downloaded from a Web site can be read by the user prior to accessing the information product. For packaged products, the paper version of a license is typically contained inside the physical packaging that contains the software or data. By opening the software package, most vendors lead users to believe that they have already agreed to the terms contained therein. Such "shrink wrap licensing" claims have been contested in various countries with varying results. Considerable time and money may be spent in fighting claims by vendors against the purchaser in regard to defending the latter's right to refuse and/or return the software once the packaging has been removed. In the USA, courts have variously upheld and rejected the validity of shrink wrap or "click to agree" (on-line) license terms, in interpretations of the Uniform Commercial Code (UCC) that embodies US commercial law (Myers 2000). A key issue is at what time did the purchaser have the opportunity to actually see the terms to which he/she had allegedly agreed, in relation to the time at which the product was purchased or first used.[28]

[26] See URL http://www.esri.com/software/arcims/License.pdf for the latest version.

[27] See URL http://www.esri.com/data/online/datalicense.html for the latest version.

[28] See also http://www.bsa.org/usa/policy/consumers/wysps.phtml for details of the US Uniform Computer Information Transactions Act.

Researchers who offer their data under any conditions other than public domain need to carefully consider why the data are being released and what licensing terms are needed to achieve those aims. If data from multiple sources are integrated into the final result, careful consideration must be given to the licensing terms for each product. Unfortunately, few purchasers of software or data packs read licenses thoroughly and thus understand the legal conditions governing use of the product. Furthermore, the license text often requires an understanding of legal terminology to fully comprehend the ramifications of the agreement.

Two important topics used in licenses are those dealing with "uses not permitted" and "redistribution rights for derived data sets" (e.g., in the ESRI Data License Agreement discussed previously). Most such agreements prohibit transfer of data to unlicensed third parties. More importantly, since data acquired from outside a research project are likely to be integrated with data collected during the research, limitations on distribution rights for the "derived data sets" can be crucial. Such rights should be closely scrutinized at the start, to ensure that there *is* such a right, even if at an additional cost.

For data or tools made available to educational institutions, a statement is often provided that the product can only be used or disseminated for "non-commercial use." This concept also appears in the licensing agreements for many publicly available (but not public domain) spatial datasets, such as the 1:1 million scale Global Map project and for national datasets from many countries around the globe that are participating in the Global Spatial Data Infrastructure (GSDI) initiative. An educational institution using a topographic base map for classroom instruction has nothing to fear from such a restriction. A scientist who may have acquired similar data and uses them in completing a commercial research project faces quite a different problem, including potential infringement.

Therefore, while apparently gaining ready access to no-cost or low-cost spatial information that is crucial to either their research (for spatial analysis purposes) or to the publication of final results, researchers should be aware of the terms and conditions of any external data sources used, unless the data are officially in the public domain.

They should also beware of potentially losing rights to software or data that already purchased, as a result of upgrading to newer versions offered by the same supplier. Some licenses, covering trade-in upgrades, restrict the use of previous versions. However, most software upgrades and associated licenses impose no such restriction on the user or original purchaser, although all original terms of acquisition do still apply (Jenness 2001).

Copyleft Licenses and the GNU Open Source Tradition

The GNU General Public License intends to ensure open access to software and data. "Copyleft" is a claim to willfully revoke the exclusivity inherent in copyrighted works under stated terms and conditions. Anyone can copy and distribute the work or properly attributed derivative works, but all copies remain under the same terms and conditions as the original. The terms for copyleft software typically prevent those who redistribute the software from adding restrictions during redistribution, even if they modify the original software prior to redistribution. Copyleft software is "free software," even if modified. The GNU Project copylefts almost all the software it produces, because their goal is to give *every* user the freedom implied by the term "free software."

To copyleft a program, researchers need to use a specific set of distribution terms, which can be written in many ways. The GNU Web site[29] contains much information on different types of open source licenses plus educational material about the entire open source movement. There are also links to the Free Software Foundation, Inc., in the USA, which is one of the driving forces behind the open source movement.

If a researcher or institution develops a new program for which they want to encourage the widest possible use, this can probably best be achieved by making the new product "free software" (as opposed to "shareware"), which everyone can then redistribute and change under the GNU Public License terms. To do this, simply attach the notice (shown to the right) to the program, typically at the start of each source file, to convey the exclusion of warranty. Each file should have at least the copyright line, a pointer to where the full copyright notice can be found, and contact information for the program author.

Freeware Notice

Copyright (C) yyyy Name of Author

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You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place - Suite 330, Boston, MA 02111-1307, USA.

[29] See http://www.gnu.org/home.html for extensive coverage of 'open source' software.

Licensing Summary

The following summary of license considerations may help focus research staff on the value of licenses and the main terms to be included, if creating a license, or to be aware of, if entering into a license (European Commission 2001):

- Licensing terms are not backed by the international IP treaties nor, in most developed countries, by national IP law. Rather, their use is regulated by the laws of each nation, ranging from privacy protection to consumer protection to national security considerations, or proper use may be defined within the license itself.
- If claiming IP rights, state this clearly in the license. List what rights you are claiming and that you are claiming them. Include confidentiality statements dealing with the disclosure of IP in the products, whether software or data.
- Various open source licenses allow you to surrender specific rights associated with IP protection (for instance, copyleft clauses), while still controlling how the IP is to be used or redistributed.
- Licenses can offer differing levels of protection in different legal jurisdictions and even in regard to different types of products and services in a single country.
- There is much more experience (in law) with licensing software than with licensing data, especially digital data and especially digital data made available via the Internet.
- Examine the termination clauses in a license, listing specific events that can lead to termination of the license, some of which may be automatic.
- Consider use and redistribution clauses carefully; for example, the number of copies permitted to be made by the original purchaser, use on networks versus stand-alone systems, any additional support costs for networked systems, upgrade fees (if any are planned), or use for commercial versus educational purposes.
- Be aware of defensive clauses excluding liability for the different forms of loss or damage that may arise as a result of using the software or data, either due to faults in the product or in its misuse by the end user.
- Be aware that the terms of licenses depend upon the law of the jurisdiction in which the product is sold and that special legal requirements may need to be met for the license to be enforceable, such as the language of the license. For software or data delivered on-line, this can be especially problematic, and involves laws on taxation (both sales and value-added taxes), e-commerce rules that may be in place (e.g., recognizing digital signatures), laws on export control, and even laws on currency control.

Chapter 8. ***Liability Issues***

Nearly any human endeavor that delivers a product or service to the public, whether for sale, for hire, or for free, can create liability. A large body of law already exists in many countries for liability and computer software. Liability in relation to data is a much newer phenomenon in regard to both statutes enacted and legal cases previously argued in court. Although laws vary from one country to another, in general, liability for data can arise in four areas:

1. Errors in represented location due to measurement or data manipulation mistakes.
2. Errors in representing otherwise error-free data; for example, graphically showing data at the wrong scale, thus misleading the user (even if done inadvertently).
3. Harm caused to users by unintended or inappropriate use of the data (or of software, in an integrated system), which might or should have been (in the opinion of a court) prevented by the provider.
4. Infringement of copyrights or other IP protections.

Liability falls into three broad categories (Westell 1999a, 1999c; Klinkenberg, 1997):

1. Contract liability (or breach of contract), including breach of express and implied warranties.
2. Negligence.
3. Product liability (or breach of statutory duty regarding consumer protection statutes).

Negligence arises if harm, loss or damage results when a supplier fails to exercise reasonable care to a standard normally accepted in the same situation. Reasonable care has been defined in statute and by courts for many situations. Defects leading to such liability include design faults and marketing misrepresentations; for example, leading potential users to believe that products or services are fit for a purpose for which they are not. Map makers and users of maps have been found to be negligent in past court cases, although such cases are sufficiently infrequent that many practitioners are not unduly concerned.

In some jurisdictions, neither the cost of software or data nor pure economic loss can be recovered under a negligence claim. Losses that are covered include losses for death or injury to persons and damage to personal property, as well as economic losses arising from personal injury or damage to physical property (Westell 1999b). Under the strict product liability or breach of statutory duty laws of some countries, the user is required to show that the product is inherently dangerous in nature. It does not require that the injured party demonstrate improper action on the part of the producer, and liability can extend beyond the producer of the data to anyone acting on behalf of a producer; for example, by importing or distributing the product.

Liability relating to spatial information raises many questions, because it is often difficult to measure the completeness, accuracy, or reliability of such data as "express terms" in a supply contract. It is important to specify the nature of

the data product as completely as possible, to let potential users know (1) what the data were collected for, (2) what they were used for initially, and (3) what they are not suitable for, even though such a list is not likely to be exhaustive. Provision of adequate "metadata" (descriptions of the nature and sources of the product in question) with data should reduce liability.

Note that so far as limiting liability goes, there is potential for a basic conflict of interest among parties negotiating contracts. People contracting for products or services will normally expect that a contract clearly state the purpose of the product or service and provide warranties that the product or service is fit for its intended purpose. In contrast, product or service providers will seek to minimize explicit claims of suitability, to reduce potential liability. In an ESRI White Paper on publishing GIS software, which applies equally well to publishing spatial information, the following advice is given (ESRI 1995):

- Put disclaimers in log-on screens (for software or database access) and user manuals, stating what you actually know to be true about the software or data (e.g., accuracy, timeliness, sources), but that no warranty is made concerning this. Add footnotes showing where data can be verified.
- Be careful in wording of advertising and marketing material that might be used in evidence against you later if determined by a court to be misleading.
- Add legends that actual data should always be checked and that this is the responsibility of the user and that information is subject to change, plus notices of actual changes. Make full disclosure of known uncertainties and hazards in use of the software or data.
- Advise users to seek expert help for specific advice or actions and require signed user agreements acknowledging all the foregoing.
- Carry comprehensive insurance against liability.

While sound advice for a product or service provider, it is easy to see why someone contracting work might feel uneasy about this attempt to disclaim responsibility.

Agricultural research staff and their institutions should recognize that there are two sides to attempts to ensure a quality product or service and, as always, consult legal advisors before entering into contracts (by signing or otherwise agreeing to license terms), or when creating licenses of their own for release of research results, regardless of what level of IP control is intended.

It is possible to release software, data, or advice into the public domain, claiming neither IP nor economic gain, and still be held liable for the product or service so offered. However, anecdotal evidence suggests that, for spatial information services that are offered at no/low cost by public research organizations and that carry appropriate disclaimers, the risk of being held liable may be lower than would otherwise be the case.

Chapter 9. ***Legal Issues in the Context of Projects***

The previous chapters have addressed issues on a component basis, mainly examining IP in relation to databases and software as discrete entities. Most activities using spatial information will occur within the context of projects, whether within a single institution or research unit or among multiple research groups.

Project Work Plans, Memoranda of Understanding, or Contracts

A project work plan, memorandum of understanding, or contract can spell out who will own what outputs of a project, how the intermediate or final products can be used, and disclaim potential liabilities (within reason). A well-written agreement is an excellent way to clarify expectations, regardless of applicable laws, and to ensure that a project satisfies institutional policies, particularly when more than one institution is involved. Besides the project goals, objectives and activities, a robust project description for work involving spatial information should address data and software management and reporting explicitly.

For data, this entails ensuring that, for any data used, there is clarity on expected quality, allowed uses, and ownership. In situations where researchers may wish to publish from data or maps produced through their labors, an institution may license proprietary rights for a fixed period (e.g., one year) while retaining ownership. This is an effective mechanism for avoiding dubious promises that data will be released "after they have been published" and clarifying that ownership resides with the institution, not the researchers.

Attention should always be given to provide and maintain metadata. Properly describing source data and data products is simply a basic part of good research, and will have the added benefits of forcing researchers to examine source documentation, including permitted usage and data quality.

In dealing with software, the most contentious issue is usually ownership of software developed within a project. Keep in mind that, with GIS and related tools, the line between software development and simply using an application is often blurred by use of macro languages or specialty programs for data manipulation. If there are doubts over the timeliness of delivery and robustness of software developed in a project, a work plan may define explicit activities for testing pre-release (beta) versions against agreed-upon performance criteria. Nonetheless, software projects are notorious for exceeding time limits and budgets (Standish Group 1995).

The main caution in relying on written agreements is that allowable conditions and terminology vary from country to country. In US courts, emphasis is given to what the intent was in an agreement as well as to whether there are conditions that are unreasonably harsh or restrictive. Courts of other countries adhere very closely to the wording of a contract. In reviewing a work plan or contract, some key points worth considering are:

- Who owns the data or information? Who owns information resulting from the research, in the economic sense? Who has permission to release what portions of the data to the public, perhaps for peer review or in developing or monitoring government policies?

- Who is responsible for data if they turn out to be of poor quality or are misused? Are project participants adequately protected from liability?
- What legal remedies exist to resolve disputes that may arise concerning ownership, allowed use, and liability?
- What legal jurisdiction takes precedent in seeking legal remedies?
- If data or software products are to be sold, is this consistent with the cost-recovery policies of the researchers' organizations, whether public or private? Does charging for the product violate any of the licenses for data or software to be used in the project?
- In describing data acquisitions, does the terminology facilitate the required research use?

Whereas a primary objective of this primer is to avoid conflicts over use of spatial information or software, history shows that the best-laid plans can still generate misunderstandings. All agreements should contain provisions governing the resolution of disputes arising from or relating to the agreement. Four approaches to resolving conflicts can be pursued.

1. Most disagreements can be resolved through timely and open discussions. Regular meetings of project participants is an excellent vehicle for ensuring that problems or potentially contentious issues are kept under control.
2. Many contracts require the parties to mediate their disputes prior to taking legal action. In mediation, a neutral third party, the mediator, works with the parties to identify a workable solution. Mediation is non-binding, so if the aggrieved party is not satisfied, they can still pursue more formal solutions.
3. Litigation is one option for forcing resolution of a conflict. The legal venue will usually be the nation where one or more parties are located or where a substantial portion of the project activities took place. Litigation exposes the parties to a large range of uncertainties concerning the nature and quality of the judicial system involved, and often proves much more costly and problematic than is initially anticipated.
4. In arbitration, the parties agree to accept the decision of a neutral party. In contrast to litigation, the arbitrator(s) may be selected on the basis of having expertise in the relevant field. Within a single country, standard procedures for arbitration are often provided within laws governing contracts. At the international level, arbitration can be handled by bodies such at the International Chamber of Commerce, or private entities.[30] Arbitration can also be as time-consuming and expensive a process as litigation, especially where multiple legal jurisdictions are concerned.

Projects in the International Arena

International collaborations present a range of challenges, due to the potentially conflicting policies and laws that may apply. As emphasized in previous sections, while basic principles of IP are similar among different nations, details of copyright, patent, and contract laws can differ substantially across jurisdictions. For copyright, points to be aware of include whether "sweat of brow" is a valid criterion for recognizing

[30] See, for example, information from a private law firm at http://www.mwe.com/area/int-arb.htm.

protection, and what criteria define "fair use." For patents, remember that a product must have been patented in the jurisdiction in question. Also, interpretations of patentability of software and software algorithms varies greatly, and in some cases, software patents have been granted even when the laws appear to prohibit this.

The situation for database protection is especially polarized. Under the laws complying with the1996 EU Directorate, all EU member countries have strong protection. While similar legislation is being considered elsewhere, the strong opposition to this type of protection suggests that many countries will enact less stringent protection.

Whereas one might wish for uniform, globally applicable policies, it should be borne in mind that this diversity reflects fundamental differences in cultures, histories, and economic policies. Treaties promoting globalization of trade appear to be reducing some of these differences, but it is not clear how far reaching these reforms will be. Faced with this panorama of uncertainties, written work plans and contracts again remain the safest mechanisms for clarifying ownership and allowed use of intellectual property.

International projects involving spatial information face additional challenges. Representations of international boundaries are potentially contentious, and representing a boundary in an unacceptable way can have serious repercussions, especially for employees of governments involved in disputes. Besides attempting to represent boundaries as correctly as possible, researchers may need to indicate certain boundary positions as "disputed" or "uncertain." The International Boundaries Research Unit maintains a searchable database on boundaries.[31] To address this issue, maps or data sets can include relevant disclaimers (see box below).

Researchers should also determine whether particular activities are allowed, especially when involving work near conflict areas. Large-scale maps may be considered "military secrets" and use of GPS units may be restricted in some areas. The USA has recently tried to control distribution of very high-resolution commercial satellite imagery of regions where its military forces are active (Nardon 2002).

Sample Disclaimer for Boundaries

The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of [name of institution] or contributory organizations and institutes concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

[31] See http://www-ibru.dur.ac.uk/ for access to the database and an extensive set of documents and links relating to international boundaries.

Chapter 10. **Public Sector Information**

GIS applications in agriculture and natural resource management rely heavily on data and software tools from public sector institutions. Policies toward access to information held by governments vary greatly, however, both among nations and among federated states such as in the USA (Table 3). Public institutions, including international organizations, also vary greatly in their approaches to information sharing.

Recall that "public domain" is a legal status—anything in the public domain is copyright free. Public sector information is not necessarily in the public domain, and in some countries or legal jurisdictions, is not even easily accessible. Access to public sector information may be governed by constitutional law or may be an inherent element of the information culture permeating government.

The Freedom of Information Act (FoIA 1996) of the USA is often held up as a model for other countries. Basic provisions are that federal institutions must provide information to anyone who requests it, with logical exceptions to protect confidentiality and national security. The information has to be provided within a reasonable time period, and the provider can only recover costs of copying the information, not the cost of acquisition. FoIA does permit specific exceptions to be applied, which had direct impact on the agricultural and environmental research communities some years ago when low-cost access to Landsat imagery was replaced by fees many times higher than previously charged. Although users of spatial information have benefited greatly from FoIA, a major driving force behind FoIA was a desire to identify and expose abuses of federal power (e.g., in relation to civil and human rights).

Table 3. Examples of data use or ownership policies of mapping or data agencies in various countries.

Country	Agency	Cost	Uses allowed
Denmark	Danish Data Archive	No cost	For non-commericial use. May not be redistributed.May only be used for stated purpose after which data must be returned or destroyed.
Ireland	Ordnance Survey Ireland	Varies with intended use	Uses are licensed according to categories of activities (e.g., for architects, solicitors, Internet, etc.)
México	Instituto Nacional de Estadística, Geografía e Informática (INEGI)	Cost recovery is allowed	Reproduction for commercial gain ("*fines de lucro")* is prohibited in statement on CD ROM liners.
New Zealand	Crown Research Institutes	Recovery of direct costs is allowed	Open, except where use is not to the benefit of New Zealand
UK	Ordinance Survey	Cost recovery is allowed	Uses are licensed according to categories of activities
USA	United States Geological Survey (USGS)	Reproduction and handling	Unlimited

A wide-ranging debate on access to and exploitation of public sector information is underway in Europe. A key problem is in defining what constitutes the public sector and what is public sector information (Longhorn 2002). Due to the wide variation in types of national government and in national information cultures, and recognizing the practical problems posed by lack of information infrastructure in many countries, it may never be possible to agree on definitions acceptable to all.

Note also that the private sector is becoming increasing involved in collecting, processing, and disseminating what many consider to be traditional public sector data, including scientific data (Linne 2000). However, price and end-user cost are not due to IP systems, but rather to the policies of governments, industry, and many research and educational institutions, both in the public and private sectors. All information has a cost and someone must bear this cost, or the information will not be collected. The debate regarding access to public sector information is who should bear this cost and how (Weiss 2002).

Some scientific research organizations are now setting more restrictive policies for disseminating research results, invoking the legal instrument of copyright protection. There is currently a wide-ranging debate on the issue of science publishing, wherein certain policies now restrict dissemination of information to the research community, thus impeding peer review, replication of experimental results, and the ability of other scientists to incorporate research findings in their own projects or fields in building on prior results.

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Annex. Abbreviated Recommended Guidelines for Managing Spatial Information IP

Detailed checklists will be available at the CAS web site (www.cgiar.org/isnar/cas).

1. Keep a laboratory or project note book that documents:
   - Data sources, data created, enhancements to data.
   - Software used or created.
   - Any transfers of data or software among research groups or institutions.
   - The notebook should indicate who did what when and be updated and backed up regularly.
2. Read the license agreements when acquiring software packages or access to data sources.
3. Maintain a physical file containing all data and software transfer agreements.
4. Maintain metadata with references to all data and software transfer agreements.
5. Use a data or software transfer agreement to document terms of any interchange, checking that the terms in the distribution agreement do not conflict with other licenses (e.g., for data from third parties).
6. Provide secure storage for all data (primary and secondary) for a minimum period of 10 years following closure of a project (according to several codes of good practice).
7. If major data sets may need to be traced over time, consider including "digital watermarks" that will allow the owner to identify the data even after it has been extensively modified.
8. When dealing with data that include personal information (e.g., names of individuals or their land holdings), explain the purpose of collecting the data to the affected individuals and establish a clear policy for disposition of the data at the end of the project. Alternatively, manage the data in such a way that identities of individuals are not recorded (e.g., by assigning identification numbers or by aggregating to a level above the individual, farm or whatever).
9. In creating names for products, especially software, conduct a search for similar already trademarked names.