Developing Australian Spatial Data Policies – Existing Practices and Future Strategies

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Abstract

Organisations supplying spatial data need to consider such issues as pricing, technical access to data, legal obligations, legal and technical protection of their data and potential legal liability risks when supplying spatial data to users. Similar issues exist for the development of Spatial Data Infrastructures (SDIs) at global, regional, national and local level, except that SDIs need consistent spatial data policies to succeed, while individual organisations do not. Such organisations should therefore consider their own individual case and incorporate SDI requirements as much as possible. The requirements of individual organisations and those of SDI may be in conflict because SDIs call for consistent low spatial data pricing. While this may be acceptable for some data providers, for others, it may be unacceptable, because they may need to rely on income from the sale of the spatial data for their operation. However, no matter how different individual policies are they all form part of an SDI.

This thesis analyses SDIs and current spatial data policy practices for Australia by way of a Survey. It also describes and studies access and pricing policy issues. These issues were defined and classed as the twelve significant factors to be considered when developing spatial data policies. The factors are: SDI requirements; organisational issues; technical issues; Governmental/organisational duties; ownership/custodianship; privacy and confidentiality; legal liability, contracts and licences; Intellectual Property Law; economic analysis; data management; outreach, cooperation and political mandate; and users' choices, rights and obligations.

Legal issues include the management of legal liability and the protection of intellectual property. Legal liability can be reduced but never totally eliminated by using legal risk management strategies and good business practices. Intellectual property protection affords the user exclusive use rights to his/her work; this thesis applies intellectual property law to providers' spatial data and suggests the utilisation of copyright for protecting spatial data. Finally, spatial data policies are defined and the spatial data policy needs of individual groups are prioritised to assist organisations in the development of spatial data access and pricing policies.

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List of Acronyms

ACT	Australian Capital Territory
ALIC	Australian Land Information Council (Note: now ANZLIC!)
ANZLIC	Australia New Zealand Land Information Council
ASDD	Australian Spatial Data Directory
ASDI	Australian Spatial Data Infrastructure
AURISA	Australasian Urban & Regional Information Systems Association
AUSLIG	Australian Surveying & Land Information Group
CLRC	Copyright Review Committee
DCDB	Digital Cadastral Database
DNR	Department of Natural Resources (Queensland)
DNRE	Department of Natural Resources and Environment (Victoria)
DOI	Department of Infrastructure (Victoria)
DXF	Digital Exchange Format
ERIN	Environmental Resources Information Network
FGDC	Federal Geographic Data Committee
FOI	Freedom of Information
GI	Geospatial Information
GIS	Geographic Information System
GPS	Global Positioning System
IT	Information Technology
NSW	New South Wales
NT	Northern Territory
OECD	Organisation for Economic Co-operation and Development
OGC	OpenGIS Consortium
Qld	Queensland
SA	South Australia
SDI	Spatial Data Infrastructure
SDTS	Spatial Data Transfer Standard
Tas	Tasmania
UNCED	United Nations Commission for Economic Development

USA	United States of America
USGS	United States Geological Survey
Vic	Victoria
WA	Western Australia
WALIS	Western Australian Land Information System
WWW	World Wide Web

Chapter 1 - Introduction

1.1 Overview

As more and more people become aware of existing and potential environmental problems such as famine, natural disasters, and continuous reduction in natural resources, all organisations responsible for collecting and managing spatial data should consider how they could help reduce or solve these problems. Spatial data was identified as a major factor in assisting sustainable development and environmental management at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992. Spatial information is useful to a broad range of organisations. Many use spatial data for activities such as land use planning, land management, land development and for fiscal purposes. As a result of these uses and the consequent need to share spatial data and to avoid duplication of spatial data acquisition, Spatial Data Infrastructures (SDIs) have commenced development. Since SDIs and Geographic Information Systems (GIS) require numerous spatial datasets for operation, many organisations, which collect spatial data, have had to consider their policies for collecting and updating existing spatial databases, and providing access to them.

Many government, utility and private organisations collect and maintain their own spatial data without distributing it to others. Many of these costly exercises could be reduced if spatial data are shared, since other organisations may have already collected the same or similar spatial data. However, in order for organisations to share spatial data, it must be transferable and useable on different computer systems and by different applications. Hence, standards and detailed information about the fitness of the data for a particular use are necessary. In addition, since a spatial data user must be able to rely on the quality of spatial data, the data must be of suitable quality and up-to-date. If spatial data quality and currency is not maintained, reliance on that spatial data could lead to disasters. For example, the US Central Intelligence Agency (CIA) publicly admitted that due to using outdated maps and analytical misjudgment, the Chinese embassy in Belgrade was bombed by mistake during the recent Kosova conflict (ABC news, 1999).

Better utilisation of existing spatial data and the development of new spatial data are the main purposes of SDIs. They aim to provide the necessary infrastructure for the distribution of spatial data. SDIs are constantly growing in importance as the rapidly developing delivery and communication mechanism of the Internet is accessible by more and more people. It is therefore not surprising that, for example in the US, President Bill Clinton formed an Executive Order 12906 in April 1994 to establish the National Spatial Data Infrastructure (NSDI) in the USA. Australia is also developing an SDI, the Australian Spatial Data Infrastructure (ASDI). The components of the ASDI, as for most SDIs, include standards, technology, data policies and institutional framework. Spatial data providers are afforded spatial data distribution mechanisms, while spatial data users will benefit from the development of the standards. Data will be distributed via a data clearinghouse, which is a form of search engine designed for the dissemination of spatial data. Australia so far has established the Australian Spatial Data Directory (ASDD), which provides a means for locating data, determining the data's fitness for use via its metadata, and details of accessing the data. The standards to be used include www (World Wide Web) communication protocols that enable a search for geospatial data over the Internet, standards to enable data sharing and information on the quality of a particular dataset.

For the ASDI to function effectively, it needs to be accepted by spatial data providers and users. This should be possible if the ASDI is developed by both bottom-up and top-down approach. This approach was suggested by David Rhind at the 1997 Global Spatial Data Infrastructure (GSDI) Conference as a feasible step for developing the GSDI. A top-down approach involves setting strategic goals, action plans, locating resources, initiating projects, and monitoring and analyzing its progress. Governmental departments or a consortium of interested parties generally undertake this stage. But for these plans to work effectively it is also necessary for local bodies and individuals who will be involved in implementing and using SDIs, to embrace the plans and be content they are part of the process. This can be achieved in the bottom-up approach, where individuals and local organisations are encouraged to share details on how to implement and use SDIs, as well as benefits of providing data over the Internet.

As the need for spatial data increases, many organisations find that when they attempt to develop spatial data access and pricing policies, the associated issues are manifold and complex. As SDIs provide the necessary infrastructure for access to spatial data, it is mandatory for organisations to develop spatial data policies that facilitate SDI development. The title to this thesis specifies spatial data policies, although the thesis considers all spatial data policy issues to be part of an access and pricing policy.

1.2 Fundamental Issues Affecting Spatial Data Access and Pricing Policies

In this thesis, reference will repeatedly be made to the spatial data policies of an individual organisation, and the requirements of a national SDI. These issues are considered as complementary. An individual organisation providing spatial data will be a component of an SDI. Their plans to develop a spatial data policy will impact on the national SDI. If their policies are incompatible with those of the SDI, then the SDI may not function as effectively as it otherwise would. Therefore, to ensure the most efficient operation of the SDI, it is necessary for the policy of that organisation to be developed within the parameters of the SDI, by a top-down and bottom-up approach.

Factors currently retarding the development of SDIs and sharing of data are manifold and include:

- lack of data;
- incompatible standards such as data transfer standards and including those for metadata;
- incompatibility of existing spatial data pricing and access practices;
- commercial policies that inhibit data sharing;
- uncertainties in the use of copyright to protect spatial data; and
- lack of awareness of legal responsibilities and liabilities.

These factors need to be overcome in developing access and pricing policies.

Metadata is information about data. Metadata for example describes when the data was created, by whom, its accuracy and reliability. It aims to provide a standard for a consistent description of the content and fitness for use of a dataset. The Australia New

Zealand Land Information Council (ANZLIC) has developed Metadata guidelines for Australia and New Zealand defining the characteristics (core elements) of a dataset, but there is currently a lack of adequate metadata.

Access to spatial data requires that the data are compatible with the computer system and software application of the user. A spatial data provider must avoid legal liability claims from misuse of their spatial data. As well, the organisation must be able to prohibit unauthorized users gaining access to their spatial data and protect itself from third parties using their data illegally. The existence of legal protections therefore needs to be considered. It is also important for both the data provider and the data user to know their rights and obligations. Since pricing of spatial data is a factor impacting on access an organisation must consider the value of the spatial data to itself, as well as the wider community. Finally, since the development of future strategies is influenced by current practices, spatial data access, pricing, intellectual property protection and legal liability must be investigated.

The purpose of this research is therefore to investigate current spatial data policies and develop future policy strategies including the analysis of policy priorities for various organisations, and a better facilitation of SDI development in an Australian context.

1.3 Research Objectives and Design

The aim of this thesis is to establish background material that will enable organisations to develop spatial data access and pricing policies. The material will inform spatial data providers as to the issues that are involved and the options that can be adopted. Often, spatial data policies currently either do not exist at all, or are in a development phase. Where they do exist, they are often incomplete, and/or vary in detail between different Australian states, territories and locally within the states. To achieve the desired aim, the thesis has the following objectives:

- Determine factors that influence SDI development at global, regional and national level;
- Research SDI policy deficiencies and determine SDI requirements for Australia;

- Survey existing practices and policies used by spatial data providers in Australia for spatial data access and pricing, including the areas of metadata provision, physical access, basis used for pricing, and legal protection;
- Summarise all issues involved in a spatial data access and pricing policy and study international developments;
- Review current data access and pricing policies used by Australian jurisdictions and New Zealand;
- Review the legal framework applicable to spatial data in Australia; discuss legal liability issues in maps and databases, and review legal protection means against potential liability claims;
- Review intellectual property laws relevant to spatial data and measure the spatial data providers' level of reliance on intellectual property law;
- Compose a summary of policy recommendations based on the research;
- Develop a Spatial Data Policy definition that facilitates SDI development.

Previous research on SDI development in an Australian context has usually concentrated on the design and implementation of SDIs, and rarely on actual performance measures of the ASDI or on individual policy formulation. The purpose of the thesis is to investigate actual empirical spatial data policies employed, especially an analysis of a quantifiable Australian situation and to provide direct guidance to spatial data policy developers. The research will be unique in documenting current Australian spatial data policy practices in the areas of spatial data access and pricing, including legal protection of spatial data and legal liability awareness. These practices will be analysed by way of a national spatial data industry survey. The thesis also aims to make a unique contribution to the development of the ASDI. It will document the current knowledge of intellectual property law applied to spatial data. Further it will consider current national, regional and global SDI initiatives to not only determine spatial data access and pricing policy issues, but also to enable the analysis of SDI development deficiencies in the areas of data quality, access, pricing and legal issues, such as intellectual property protection of spatial data. The 'SDI requirements' to overcome the SDI development deficiencies will also be included in the spatial data policy strategies.

As the thesis will develop some future strategies for spatial data policies, it will be very useful to organisations developing or planning a spatial data policy, and it will thereby make an original contribution to the spatial data industry.

1.4 Thesis Structure

The thesis is divided into 8 chapters. Chapter 2 reviews global, regional and national Spatial Data Infrastructures (SDIs), including their developmental phases and identifies their deficiencies. Chapter 3 analyses the outcome of the 'Australian Spatial Data Survey' conducted as part of this thesis to evaluate quality, access, cost, and legal protection of spatial datasets in Australia. The survey compares answers to all the questions in the questionnaire from groups such as: Federal, State, and Local Government Organisations and Private Organisations. Chapter 4 reviews spatial data access and pricing issues, and evaluates and compares spatial data access and pricing regimes within the Australian States, Territories and New Zealand. The chapter also describes the progress of some of the major state government spatial data providers in developing spatial data policies. Chapter 5 sets out the legal framework for Australia, including legal liability issues and risk management, while Chapter 6 considers relevant intellectual property rights applicable to spatial data. Chapter 7 analyses the information given in Chapters 2 to 6 to develop a list of policy recommendations and to define spatial data policies for federal, state, local government organisations and private organisations. Chapter 8 finally evaluates how the research objectives given in this chapter have been achieved and answers questions raised at the end of Chapter 2.

Chapter 2: Global, Regional, National and State Spatial Data Infrastructures (SDIs)

2.1 Introduction

As the world's economy and society's values and needs change we are forced to determine more efficient and effective ways to manage our finite resources. Spatial information is one of the most fundamental elements underpinning efficient and effective resource management. Many governments throughout the world believe that for a better decision-making process we need access to reliable, accurate, standardised and inexpensive spatial data, which can only be achieved by Spatial Data Infrastructures (SDIs). SDIs are

> "fundamentally about facilitation and coordination of the exchange and sharing of spatial data between stakeholders from different jurisdictional levels in the spatial data community" (Rajabifard and Williamson, 2001, p.1).

Spatial data infrastructures specify necessary standards and provide access technologies, data policies, an institutional framework and the human resources required to manage the infrastructure for the distribution and use of spatial data. These SDIs are not only developing at the local level but also at global, regional, national and corporate level. All SDI initiatives and the organisations managing them are faced with similar issues, which are identified in this chapter. The corporate SDI level is argued by Chan and Williamson (1999) as the lowest level in the hierarchy of SDIs worldwide. A corporate SDI is the GIS used within an organisation. In an ideal corporate SDI, all data users of the organisation share datasets and the GIS has successfully been implemented. The researchers discovered that there are four patterns in which a GIS system develops, and they argue the same applies to the development of all SDIs. The analysis of the patterns of development revealed that no pattern guarantees successful GIS implementation.

Spatial data are information geographically linked to specific locations. Spatial data can include topographic, property boundary, administrative boundary, geologic, natural resources and demographic information. Property boundary information may be used by a solicitor for the conveyance of property from one person to another. An exploration company may use geological information to determine potential mining sites for minerals and the same data could be shared and used to identify geological water sources. A government department may use natural resources information to restrict access to rare natural resources. Spatial data are extremely important in many decision-making processes and can be used and shared amongst many professionals including lawyers, surveyors, engineers, geodesists, geologists, geophysicists, biologists, scientists, farmers, explorers, street navigators, real estate agents and even marketing personal. The importance and use of spatial data can also be highlighted by the fact that much government held information are spatial to some extent. For example, 60% to 80% of all government held data in the UK are spatial to some extent (Coopers and Lybrand, 1996). Effective and efficient spatial data use can only be achieved if spatial data are shared via SDIs, as this

> "can produce significant human and resource savings and returns."(Chan et al 2001, p.3)

The literature on spatial data infrastructures (SDIs) and their challenges is abundant and much has been written in the last decade. Some of this literature may be found in Onsrud and Rushton (1995), Groot and McLaughlin (2000), Coleman and McLaughlin (1998), Rhind (1997a), Masser (1998a), Tosta (1995, 1997), Longley et al (1999) in Global Spatial Data Infrastructure (GSDI) Conference, Urban and Regional Information Systems Association (URISA), Australasian Urban & Regional Information Systems Association (AURISA), Mapping Sciences Institute (MSIA), and Geospatial Information & Technology Association (GITA) publications amongst others. Apart from the literature cited in the thesis text the author also undertook an extensive review on SDI literature and included the review in the Bibliography at the end of the thesis.

In Australia the former Australian Land Information Council (ALIC) and now the Australia New Zealand Land Information Council (ANZLIC) was established in 1986 with the responsibility to coordinate national and regional land-related issues including spatial data infrastructures. SDIs incorporate a very broad area of research and involve the resolution of many challenges such as political accountability, standards, public access, intellectual property rights, and data protection. Some research on the issue of public access to spatial data in Australia is coordinated through the funding by AUSLIG's (Australian Surveying and Land Information Group - Australia's National

Mapping Agency) Australian SDI Partnership Grants Program. This program funded outreach projects to increase access to spatial data. Other research is guided by ANZLIC's and the Commonwealth Spatial Data Committee's (CSDC) coordination efforts (AUSLIG, 2000b).

SDI development started in Australia in the early 1980s and was largely driven largely by environmental management needs, business needs, technological developments, political decisions often triggered by economic rationalism and sustainable development, and government policy (Williamson et al, 1998). A multitude of articles, monographs and conference proceedings have appeared since that time and include works by the following authors: Baker (1994), Bishop et al (2000), Chan et al (2001, 1999, 1995), Feeney et al (2000, 2001), Gelatly and Baxter (1995), Grant (2000), Jacoby et al (2001), Mooney and Grant (1997), Rajabifard et al (2001, 2000a, 2000b, 1999) Ting and Williamson (2000), Williamson and Williamson et al (1997, 1998, 1999), Nairn (1998). These works often concentrate on the design and implementation of SDIs but not so much on actual performance measures of the ASDI or on individual policy formulation. This thesis will attempt to address these issues. Much literature lacks empirical investigations especially an analysis of a quantifiable Australian situation and provides little direct guidance to spatial data policy developers. The formation of the text in Chapter 2 was largely a result of reviewing the research undertaken by the above international and Australian national authors and as cited in the text below.

The following sections aim to explain what global, regional, national and local spatial data infrastructures exist, and what organisations control their development. This chapter will point out the objectives of SDIs, their current development phase, and their benefits. Finally, problem areas of SDIs will be discussed especially with regard to spatial data standards, access, pricing and legal issues.

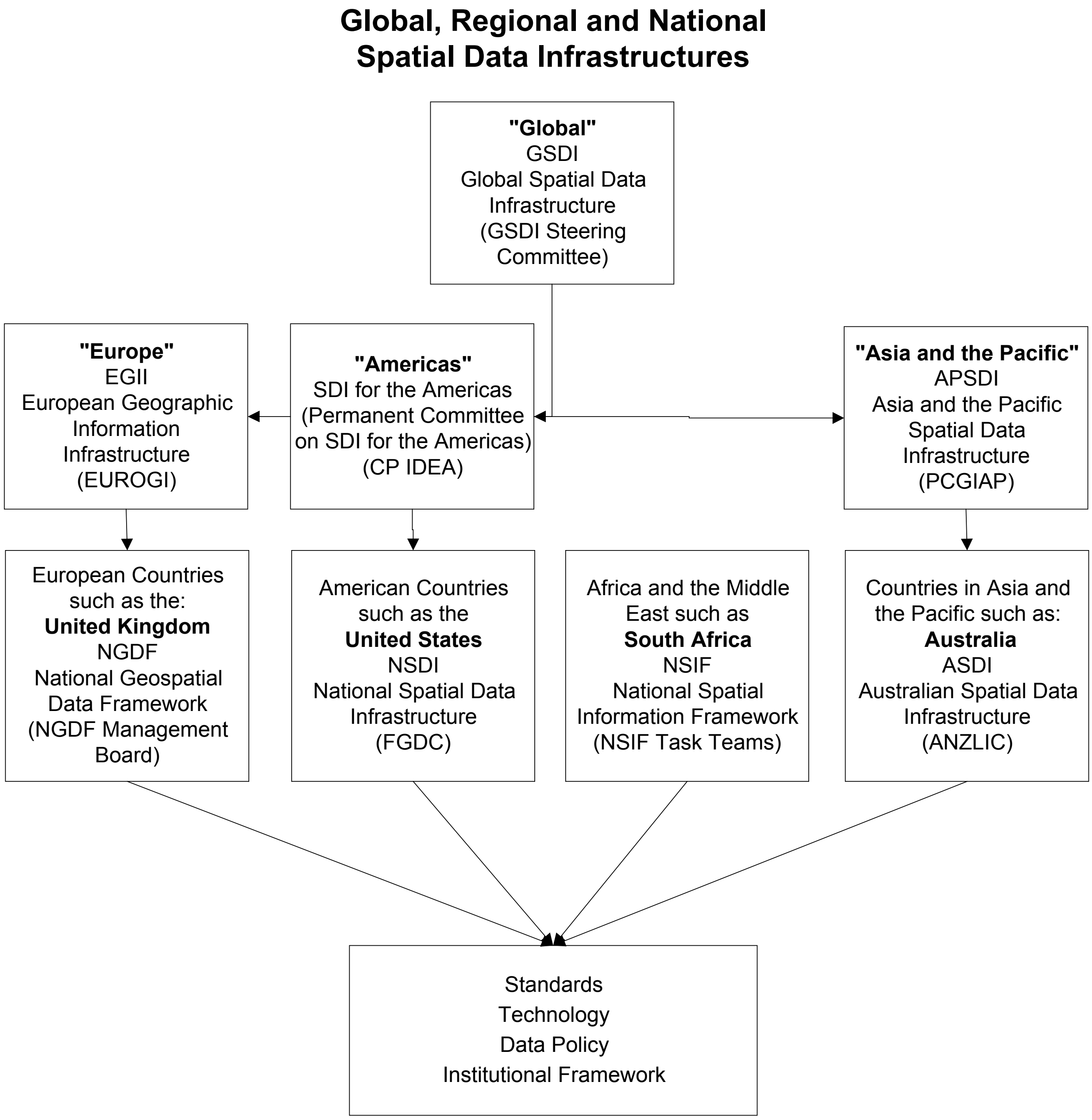


Figure 2.1: Spatial Data Infrastructures and their Coordinating Bodies

2.2 Global SDI and Associated Initiatives

On top of the SDI hierarchy (Figure 2.1) is the Global Spatial Data Infrastructure (GSDI). The GSDI is a global process that began in 1996 with the objectives to provide policies and an organisational framework for global spatial data. These objectives include data, standards, technologies, delivery mechanisms, human resources and the financial means to achieve them. Four conferences have been organised so far. The first was held in Bonn, Germany in 1996.

The GSDI will have a major input into regional, national and local spatial data infrastructures. It will help, for example, to develop standards and establish policies. Australia is a major player in developing the GSDI and has therefore influence over its shaping. This involvement will also help Australia in its development of the national spatial data infrastructure, so that it is in harmony with global developments. This is an important step for Australia because there is a great need for an Australian Spatial Data Infrastructure (ASDI).

Australia needs accurate and timely spatial data to base management decisions on. The areas that would benefit mostly from the availability of accurate spatial data include land administration, natural resources management, environmental management, better future disaster predictions and disaster management. Many organisations across all levels of government base their land administration decisions, such as the control of land use or levying council rates or taxes, on similar spatial data. Hence significant spatial data duplication costs are saved, or can be saved when spatial data are being shared. Although spatial data are currently being shared to some degree, there is still room for improvement. In addition, without adequate data standards data sharing is impossible. To enable standardisation it is essential to guarantee interoperability, transferability and user friendly data. This is one of the key components of the ASDI.

To demonstrate some of the positive and negative issues involved in establishing the ASDI and also on a global basis, the four GSDI conferences held so far are described in more detail.

2.2.1 GSDI 1996 Conference

The title of the first conference was 'Emerging Global Spatial Data Infrastructure (GSDI)'. It attracted 63 invited representatives from 20 participating countries. The conference was organised by the following organisations: the European Umbrella Organisation for Geographical Information (EUROGI), the German Umbrella

Organisation for Geoinformation (DDGI), the Atlantic Institute (AI), the Institute for Land Information and its Land Information Assembly (ILI/LIA), the Open GIS Consortium (OGC), the US Federal Geographic Data Committee (FGDC) and the Federation Internationale des Geometres - Commission 3 (FIG-COM3) (GSDI, 1996).

The President of the German Umbrella Organisation for Geoinformation (Deutschen Dachverbandes für Geoinformation, DDGI) Klaus Barwinski, said at the end of the opening session that all people on earth are visitors and that they must be careful with all urban and rural planning activities to save the living space for our future generations. The environment must be protected from disasters such as floods and pollution (Report, 1996). Hence the world population needs the best available information to base high quality decisions on. Part of that information are spatial data, which, for example will enable society to better predict future disasters and/or help in disaster management. Mr Barwinski emphasised the need for a global spatial data infrastructure, which will only be made possible through the cooperation between all nations around the world.

This conference established the need for a GSDI and determined that National Spatial Data Infrastructures (NSDIs) needed developing, which when networked and used together, would constitute the GSDI. The main aims of the conference were to minimise duplication of national efforts and to develop standards needed to build national and global spatial data infrastructures (Report, 1996).

At the time of this conference Australia was commencing the development of its NSDI, as well as a joint SDI with New Zealand. The structure and development of other national SDIs in countries such as the United States of America (USA) were also studied at the conference. The US acknowledged that they were spending approximately $4 billion annually on the collection, management and dissemination of spatial data. The problems encountered with spatial data included difficulties in locating and accessing data, as well as incomplete, out-of-date and undocumented data. These problems forced the US to establish the Federal Geographic Data Committee (FGDC) and to issue the National Spatial Data Infrastructure (NSDI) Executive Order No 12906 signed by President Clinton on the 11th of April 1994. By 1996 the FGDC had established metadata services and a core dataset (Report, 1996).

Two global projects, 'Earthmap' from the USA and 'Global Mapping' from Japan were also presented. Both were in the definition phase, aiming to assist the decision making process for sustainable development, by providing geospatial data.

On day two of the conference the participants were divided into groups to discuss the following topics:

- Benefits of GSDI
- Potential GSDI Engineering Projects
- Political, Social Economic and Legal Issues

The following three sections summarise the outcome of these discussions (Report, 1996).

- **Benefits of GSDI**

The main benefits of a GSDI were found to be:

  - the use of a common language and standards;
  - it would enable better global operations (GPS based);
  - aid the development of public safety, transport, environmental modelling;
  - assist epidemiology;
  - make land reforms more economically viable; and
  - help to improve natural resources management.

In terms of intellectual and human capital, a GSDI would provide the mechanism for more sustainable development.

On the other side of the spectrum there were the unanswered questions: Who pays for the establishment of the GSDI and who reaps the benefits? What would be the common language and standards used, and what would be the common look and feel of the data?

- **Potential GSDI Engineering Projects**

The Group discussed engineering aspects affecting the building of a GSDI. The group suggested that initially a small task force should investigate engineering projects related to GSDI building including network access to spatial data, describing what is required; recommend solutions and the building of prototypes. These prototypes should be able to demonstrate current capabilities and suggest areas where further research and development is needed. Three concrete actions were proposed: to establish a test site; to publish metadata worldwide; and ensure that research on GSDI engineering projects should not proceed in isolation.

- **Political, Social Economic and Legal Issues**

The worldwide collection of geospatial data is estimated to cost around $50 billion plus annually (Rhind, 1996). Much of the data are in non-standard form. It is difficult to define the actual size of the spatial data market, and to measure the public good achieved when spatial data are accessible. The way in which the data can be accessed varies; often the way users access data is different in theory than in practice. These issues establish the need to analyse current policies used to distribute or provide access to spatial data, globally and nationally in Australia. This analysis will help target problem areas and enable the proposal of better and more cost effective data access practices.

Political issues include the role that a government at federal, state or local level should have in the collection, dissemination or exploitation of spatial data. Who does the data belong to? When the taxpayer's money contributes to the spatial data collection, should the government profit from the sale of that spatial data?

Governments need to be more efficient and hence develop cost effective policies or increase revenue to cover some of their own operational costs. However policies that lead to increases in government revenue often, as a byproduct, harm the protection of the individual citizen’s privacy. Liability for incorrect data is also a concern for any government that charges a fee for data.

What will work in one country may not work in another. For example spatial data are freely available in the USA at the federal government level, and European countries often charge on a cost recovery basis, while in Australia pricing policies vary, are often outdated, or do not exist at all, especially at the local government level (Mason, 1999a). In addition, what will work in one organisation, say a government organisation, may not work for a private organisation.

The conference established that laws and regulations have to be complied with, for example statutory laws, public procurement laws or regulations, fair trading laws, intellectual property laws, legal liability laws, public access laws, human right laws, and data protection laws. Overall the conference participants concluded that to harmonise law and policy in different countries was a major challenge and its outcome unpredictable.

Following this first conference in 1996 the next GSDI 1997 Conference was held in Chapel Hill, North Carolina.

2.2.2 GSDI 1997 Conference

Two theme papers were produced for discussion at this conference. Theme Paper one:

1. Identified a working definition for a GSDI;
2. Identified regional and global SDI's;
3. Provided GSDI's stakeholders needs, such as for the military, science and environment, and international maritime community;
4. Developed a GSDI from 5 perspectives:
    - 4.1. data-driven,
    - 4.2. technology driven,
    - 4.3. institutional,
    - 4.4. market driven, and
    - 4.5. application driven (Coleman and McLaughlin, 1998).

Theme Paper two dealt with the implementation of a GSDI (Rhind, 1997c).

Participants of the 1997 Conference agreed on the following findings and resolutions:

1. "The GSDI -- which encompasses the policies, organisational remits, data, technologies, standards, delivery mechanisms and financial and human resources -- is critical to the attainment of substantial and sustainable development in both the developed and developing countries of the world." (GSDI, 1997, Finding 1)
2. “GSDI is of vital importance to implementation of Agenda 21 of the Rio Summit and to the multi-national environmental conventions …” (GSDI, 1997, Finding 2)

3. To establish a GSDI, decision makers at the highest level (in business, government, & academia) need to be involved, including the G7 countries and organisations such as the UN, and World Bank.
4. All international bodies working on individual GSDI issues need to communicate, coordinate and collaborate their efforts.
5. Need to foster education and research.

Various issues were resolved and participants at the 1997 conference established the following needs:
1. An organisational nucleus.
2. Permanent Committees such as the PCGIAP are important to the success of a GSDI, and there is a need to encourage the development of such groups where they do not exist.
3. International standards. GSDI should include standards such as ISO/TC 211, but also IT standards.
4. Translation of data without loss of data relevance.
5. GSDI should be in harmony with the individual nation’s political or legal systems.

(Brand, 1998a; GSDI, 1997).

2.2.3 GSDI 1998 Conference

The third GSDI conference was held in Canberra, Australia in November 1998. The conference theme was "Policy and Organisational Framework for GSDI", with research papers being presented on developing NSDI's, new SDI initiatives, and "Global Spatial Data Infrastructure: Policy and Organisational Issues".

One of the conference papers (Masser, 1998b) examined and analysed existing national SDI’s that could be classified as "First Generation of National Geographic Information Strategies". The SDI countries included Australia, Canada, Indonesia, Japan, Korea, Malaysia, Netherlands, Portugal, Qatar, United Kingdom, and United States. The conclusion drawn from those SDI strategies was that even though many SDI’s differ greatly, useful lessons for the future could be drawn from them. The reason why most SDI’s differed was because of the individual SDI's developmental driving forces. It would be difficult to conclude whether one development was better than another one.

As all countries differed greatly in size, population and the way they are governed, no SDI could be directly compared. However a comprehensive SDI approach seemed easier and faster, as long as there were similar levels of strong commitment. Masser in his introduction suggests that the success of the SDI's in the medium to long term

> "is likely to be coupled with the extent to which geographic information is utilised in practice but also with respect to its impact on the economics of spatial database creation and maintenance".

He also pointed out that all countries with an SDI strategy were most likely to be part of the next generation of SDI strategies including a number of developing countries in the Asia and Pacific region. As well, a group of central and east European countries such as the Czech Republic, Hungary and Poland would most likely be part of the next generation.

Harlan Onsrud surveyed national and regional SDI's around the globe to help determine whether there are enough similarities between NSDI's to be able to group them. The second reason for the survey was to assess the need for a GSDI. In 1998 a summary of responses from 22 nations were presented at this 3rd GSDI Conference. As the survey is ongoing, another presentation was made at the 4th GSDI Conference in Cape Town, South Africa, which included several new submissions (Onsrud, 2000).

Brand's theme paper entitled "Global Spatial Data Infrastructure: Policy & Organisational Issues" sorted various NSDI's into different groups (Brand, 1998b), identified as "Government oriented", "Business oriented", and "Umbrella oriented" type spatial data infrastructure organisations.

Government type organisations established by the Government or a governmental department have usually some official political recognition, and some resources to develop them. Examples of government type organisations are the Conseil National de l'Information Géographique (CNIG) from France, and the RAVI (Dutch Council for geographic information) from The Netherlands.

Business type organisations, formed by various businesses, may be better resourced and more productive than government type organisations, but that will largely depend on the level of the stakeholder's commitment. An example of this type is the OGC (OpenGIS Consortium).

Umbrella type organisations could involve the whole global spatial data infrastructure community, by representing all types of organisations. An example for this is EUROGI (European Umbrella Organisation for Geographic Information). Regional type organisations are umbrella organisations that involve the membership of some countries in a particular region or continent.

Onsrud's survey pointed out that a workable GSDI probably needs to have decentralised geographic data clearinghouse nodes. He found that most countries plan to incorporate metadata, clearinghouses, core data, and data standards into their NSDIs. He suggested that if nations could agree on metadata standards, most NSDI datasets could be made available on the Internet and hence the idea of a GSDI could be realised. Australia in 2000 has established an Australian spatial data clearinghouse concept. The Australian clearinghouse is the environment that links the data provider with the data user. It incorporates technical and institutional facilities, data brokerage and the data. The data in the ASDI and its products will not be centralised, but will be made up of decentralised core data nodes. Some metadata nodes have already been established and can be viewed on the Australian Spatial Data Directory (ASDD) at:
http://www.environment.gov.au/net/asdd/ (ANZLIC, 2000h)

Onsrud's survey also established that there are few similarities in the legal and economic policies used by different nations, making it very difficult to combine these policies in a GSDI. The policies also affect other types of data as well as spatial data, and hence

> "forums other than GSDI would appear to be more appropriate and productive in resolving conflict in data policies among nations" (Onsrud, 1998b, Summary of Responses – Implications of the Survey Results relative to a GSDI vision).

Other outcomes of the survey were that a total of 30+ nations are planning and developing national infrastructures (Moeller, 1998). In Australia many data providers have no clear policies on legal and economic issues (Mason, 1999a). However some jurisdictions such as Queensland have revised their spatial data pricing policy because their State Government has recognised that Government information is the property of its citizens (Mawn and Stanton, 1999). Queensland has, for example, reduced the pricing of their digital cadastral data by up to 95%.

Brand's theme paper established the stakeholders, major challenges, goals, obstacles, tasks and organisational models for a GSDI. Many of the obstacles are similar at the local, national and regional spatial data infrastructure level. Most of them are still a problem in 2000, and they include:

- “Lack of data;
- Lack of adequate metadata;
- Existence of policies that prevent sharing;
- Lack of access to communication networks;
- Lack of common standards;
- Lack of awareness at all levels local, national and regional;
- Lack of education;
- Lack of effective search engines;
- The impact of security;
- Lack of freedom of access;
- The issues surrounding pricing;
- The cost of data acquisition and/or conversion” (Brand, 1998b, Obstacles).

Following the three conferences a book was published to identify key elements of SDIs; elaborate on SDI design; and identify best practices using case studies (Groot and McLaughlin, 2000). The editors summarised the major issues affecting SDI design implementation and maintenance as follows:

- *Political accountability*,
- *operational responsibility* (for the SDI initiative),
- *public access*,
- *copyright and other intellectual protection rights*,
- *data protection* and *security*,
- *liability and privacy*.
- *Economies* of SDI such as *financing, pricing* strategies, with data collection being the most costly exercise (Rhind, 2000).

- *Standards* such as computer and communication requirements, data model standards, exchange standards, standards dealing with interoperability, and quality management standards.
- *Cultural factors* are affecting SDI development and implementation. These factors include human inequality in power and wealth; ways of dealing with uncertainty; division of roles between men and women in society; and relationships between individuals and groups (individualism versus collectivism).
- *Technology* that is necessary to build and link the relevant databases (clearinghouses) and the spatial data technology that enables data modelling.
- *SDI architectures* that define the SDI system whether it is inter-operable or a distributed system and the components of such a system and of a clearinghouse.
- *Spatial data issues* such as framework data, which are generic versus application specific data and other issues such as optimal data collection that arise when data are being shared. Spatial data acquisition (and its various acquisition technics) and display (an intersection of cartography, multi-media and animation technology); and spatial data referencing systems (such as GPS versus traditional reference systems create matching problems**).**
- *Human resources requirements* need to be addressed because of economic pressures and technological advances, resulting in the need for reducing staff numbers, and the need for highly trained professionals.
- *Jurisdictional* specific needs also determine SDI priorities and issues. SDI development cannot only be shaped by policies, but also by the market (McKee, 2000).

One of the case studies covered Australia's SDI, which reported that a significant push to further develop the ASDI was achieved by a project undertaken by Public Sector Mapping Agencies (PSMA), a consortium of Australian public mapping agencies at federal and state/territory level. PSMA developed a digital spatial dataset covering the whole of Australia for the Australian Bureau of Statistics (ABS). This spatial dataset incorporates topographic and cadastral information. The main problems faced in the project were inconsistent datasets from the individual state/territory bodies. Datasets were held in different systems, formats, specifications and various map coverages. Grant (2000, p.262) concludes with a warning to policy makers and standard creators:

> "all the proselytising in the world will not produce a SDI. Whilst essential for the envelope onto which a geospatial data infrastructure will fit, it will not happen without leadership, sound management, and a funding source."

Mooney and Grant (1997) found as a result of the ABS project, that because of the lack of national standards many other proposed national datasets were held back, but the success of the ABS project indicated that not too much weight should be put on standards. Standards may also change with time and may only be tested on real projects. The authors suggested that the role of the federal government in surveying and mapping should be to provide policy, co-ordinate the efforts of states, set appropriate standards, and stimulate mapping programmes by the provision of funding where necessary.

2.2.4 GSDI 2000 Conference

The fourth GSDI Conference was held in Cape Town, South Africa between the 13-15 March 2000. Mrs Thoko Didiza, the Minister for Agriculture and Land Affairs, South Africa, officially opened the Conference. Twenty four technical papers were presented at the conference grouped into the following sessions: global visions; directions, policies and institutional issues; North American perspective; case studies and progress reports; technical strategies and considerations; and GSDI Africa. Three keynote papers were presented at the conference, one on the global survey of national SDI activities; the second from the United Nations Economic Commission for Africa and the third from the United Nations Commission for Sustainable Development.

The GSDI Steering Committee met before the start and at the end of the conference. It appointed one of their members to coordinate the submission to the UN Commission on Sustainable Development, as drafted at the 3rd GSDI conference and expanded at the 4th GSDI conference. The Steering Committee consists of the chair, vice chair, the past chair, and representatives from the four regions of the world: Asia-Pacific, Europe, Africa-Middle East and the Americas, being made up of members representing nations and a cross section of GSDI stakeholders and consisting of nineteen members (GSDI, 1999).

The GSDI Steering Committee is temporarily managing the GSDI development, while also attempting to establish a permanent global umbrella organisation that can take the GSDI into the future. It has established four working groups in the areas of operations, technical, legal and economic, and communication and awareness, and aims to develop a business case for SDI development as resolved at the 3rd GSDI conference, by commissioning a scoping study. A business case for SDI development can be described as identifying

> "the economic, social, environmental and disaster management benefits that could be achieved through development of national and regional SDI's and the global SDI" (AUSLIG, 2000a, p.iii).

The study report entitled 'Scoping the business case for SDI development' identifies the scope and methodology for the business case, SDI key risk areas, terms of reference, including a timetable and budget (AUSLIG, 2000a).

2.2.5 Global Map (ISCGM)

Global Map is an initiative of the International Steering Committee for Global Mapping (ISCGM), which is encouraging all nations to work together in establishing open access to global geographic information. Global map aims to provide vector data at a scale of 1:1,000,000 and raster data with a ground resolution of one kilometre. It aims to facilitate the implementation of global geographic information needs in order to aid environmental protection, natural disaster management and to encourage economic growth (PCGIAP, 1999b). Global Map has eight themes: vegetation; elevation; population centers; drainage; transportation; land cover; and land use. As of March 2000, seventy-seven countries are participating in Global Map and thirty-six countries are considering participation (ISCGM, 2000).

2.2.6 SDTS, ISO TC 211 and Open GIS Consortium

To enable the transfer of spatial data from one computer system to another, standards are required. For example, to transfer files such as CAD drawings the AUTOCAD dxf industry standard is used. In the GIS environment the dxf format is not sufficient because it only enables the transfer of the geometrical component of spatial data and not the topology or other cartographic features of spatial data (Phillips et al, 1999).

To enable the transfer of spatial data, the USA developed the Spatial Data Transfer Standard (SDTS), which has to be used by all federal agencies in the USA. All other stakeholders such as state and local governments, private enterprise, research and academia have access to SDTS. SDTS for Australia and NZ was modified as AS/NZS 4270 parts 1 to 3 (1995) and part 4 (1998). This standard was not heavily used in the past because of its complexity (Hesse, 1997). There is also AS 2482 (1989), used when specific spatial information, existing at different scales, is to be exchanged. It specifies the necessary format and coding of only digital point and vector geographic data (Standards Australia, 2000). Both standards are still operational, however the latest spatial data transfer standard developments are occurring at an international level. The Australia New Zealand Land Information Council (ANZLIC - for more detail on ANZLIC see 2.3.2.3) is presently participating in the work of ISO Technical Committee (TC) 211 and the harmonisation of Australian standards with international standards.

The International Organization for Standardization (ISO) is an international body made up of national standard bodies, such as ‘Standards Australia’, from 130 different countries (ISO, 1999). ISO/TC 211 Geographic information/Geomatics, formed in 1994, aims to establish standards for digital spatial information linked with other information technology standards and provide the structure for spatial data applications. Thirty-three countries are represented on ISO/TC 211 (including Australia and New Zealand) together with eighteen observing members, and numerous liaising organisations and other internal ISO groups (ISO/TC 211, 2000). The technical committee’s goal is to develop international standards that will encourage the use of spatial information, increase the availability, access and sharing of spatial data, and enable interoperability. To achieve their goal they cooperate with others and hope to build the groundwork for SDIs. The committee aims to develop standards that, for example, specify data management tools and methods, including the collection, processing and transfer of spatial data. One important liasing organisation and key player in the drive towards open spatial data standards is Open GIS Consortium Inc. (OGC).

OGC was established in 1994 because of the need to solve problems caused by incompatible spatial data transfers. OGC has many members that participate in building

OGC interfaces that act as middleware between the spatial data provider and the spatial data user. OGC does not produce transfer standards, but provides a formal structure allowing technology users and technology providers to reach consensus on common interfaces. It enables interoperability by providing interface specifications (OGIS, 2000). Software with interfaces that follow OGC's specifications will enable automatic map overlay manipulations using ordinary web browsers, regardless of map scale, projection or coordinate system. Web mapping capabilities were achieved by establishing a 'Web mapping Testbed' in Australia in May 1999. The Testbed enabled the development of Open GIS Web Map Server Interface Specifications. These new specifications are a breakthrough in web mapping and will most likely be adopted by many people (AURISA Workshop, 2000).

2.3 Regional SDI's and Organisations

The second row of the hierarchy in Figure 2.1 shows existing Regional Spatial Data Infrastructures. At the present time there are European, American, and Asia/Pacific region initiatives, but no initiatives for Africa or the Middle East (Stevens, 2001). Problem areas in the development of regional infrastructures will be described, especially with regard to spatial data standards, access, pricing and legal issues for Europe and the Asia/Pacific region.

At the regional level the main problems with data exchange between organisations are security, cost recovery, copyright, non-standard data formats, metadata and the quality of datasets.

> "The most anticipated political barriers regarding the establishment of a regional fundamental dataset includes access to datasets for security reasons, lack of resources, national administrative boundaries as a data layer, and copyright issues. Regarding technical barriers, the important issues are using different standards, lack of technical expertise, lack of valid information, lack of uniformity in dataset specifications, and differences in geodetic reference frameworks and lack of basic infrastructure in the area of GIS" (Rajabifard and Williamson, 2000, p.7).

2.3.1 Europe

2.3.1.1 EUROGI

The European Umbrella Organisation for Geographic Information (EUROGI) is an umbrella organisation that represents the interests of 18 national geographic information associations and 1 pan-European sectoral organisation. EUROGI was formed in November 1993 following a study commissioned by Directorate General XIII-E of the European Commission. The study put forward the need for a unified European approach in the use of geographic technologies. (EUROGI, 1999a)

EUROGI aims to provide accurate and detailed geographic information for Europe, to encourage and improve the use of geographic information and new technologies such as Global Positioning Systems (GPS) and Geographic Information Systems (GIS). The sharing of geographic information, amongst EUROGI's members will enable them to exchange data and share knowledge on research initiatives.

EUROGI has initiated many actions towards implementing its goal, by raising awareness, encouraging greater use and sharing of geographic information, implementing a European geographic information (GI) policy and facilitating the development of the European Geographic Information Infrastructure (EGII). EUROGI also takes part in the GSDI and encourages European countries to develop national GI organisations.

Actions taken by EUROGI include:

1. Support of GI policy and development of EGII (defined on the next page)-
   - Actions involve Letters of Support for GI2000, including approaches to the European Parliament; reports, presentations and papers on issues such as cross-border GI applications and EGII; organising workshops; involvement in GSDI, NSDI's and LSDI's, and in European Commission projects.
2. Raising awareness of GI and technologies and sharing of knowledge between its members and the European Commission -
   - Raising awareness of GI and technologies is being supported by the provision of GI Directories such as: GI People, GI Events, GI Job Offers, GI Job Seekers, GI Industry, GI Publications and GI Data Description.

    - Sharing of knowledge amongst its members is encouraged via the EUROGI Discussion Board, publication of EUROGI Members and their profiles, EUROGI reports and communicating with various EUROGI observers, and provision of links to other GI sites such as data producers, users, vendors, and publishers.
3. Encouraging use of GI in Europe by improving access and availability of GI, removing legal barriers and economic constraints and promoting the use of standards.
4. Representing the European view in the development of GSDI and other SDIs.

2.3.1.2 EGII

The European Geographic Information Infrastructure (EGII) is being established by EUROGI (EUROGI, 1998) which allows its members access to some national and European geographic information. At this stage the EGII is not formalised, but EUROGI is pressing its members to obtain official mandates and resources to officially launch the EGII (Onsrud, 1998b)

Development of consistent data standards and metadata are on the EGII's agenda. However at present, several different metadata standards are being used, thereby causing difficulties. For example, the Multipurpose European Ground Related Information Network (MEGRIN) uses Geographical Data Description Directory (GDDD), while Geodan in the Netherlands uses European Spatial Metadata Infrastructure (ESMI). EGII uses the following standards: CEN/TC287 and TC278 and the draft ISO/TC211. MEGRIN is described within the next CERCO section.

Access to most datasets in Europe as of 1998 is provided via paper and electronic catalogues, telephone calls, faxes and postal mailings (Onsrud, 1998b). The pricing of spatial datasets is determined by the individual department or company’s policy, resulting in a range of charges. Philosophies on spatial data as an asset within government departments are unclear (Onsrud, 1998b). Legal problems are encountered in the differing copyright laws and related regulations of EUROGI’s members.

Geographic data that has been developed at the European level include for example the datasets "Seamless Administrative Boundaries of Europe" (SABE) and Road database.

SABE was produced by MEGRIN by a public initiative and involved 19 national mapping agencies. The road database, produced by Navtech, was a private initiative.

2.3.1.3 CERCO

Comité Européen des Responsables de la Cartographie Officielle (CERCO), founded in 1979, represents more than 30 national mapping agencies of nearly every European country (CERCO, 1999a). CERCO aims to help the individual member nations meet mapping and spatial data needs, including those of Europe, and takes a key role on behalf of its members, in the development of the geospatial information industry in Europe.

CERCO meets its objectives by promoting its members within the European Union and its Commission, raising awareness of spatial data products and services from its members and MEGRIN, supporting best practice and helping to define standards. CERCO also meets its objectives by assisting MEGRIN in its development, collaborating with the private sector and amongst members and studying members' common issues and concerns.

CERCO has formed working groups dealing with common interest problems that have the potential of being solved or improved. There are four working groups which deal with: legal issues and organisational issues; geodesy framework; maintenance of digital databases; and a work group on quality issues (CERCO, 1999b).

MEGRIN

Multipurpose European Ground Related Information Network (MEGRIN) was set up by CERCO in 1993 with the aim to create and market pan-European geographic information. Its income is derived from members' financial contributions and the sale of its commercial products.

MEGRIN's aim is being implemented by four main actions:

1. Develop and maintain a metadata service called Geographical Data Description Directory (GDDD), which is freely available on the Internet
2. Harmonise national data held by its members.

3. Collaborate with the European Commission in the definition and creation of pan-European products.
4. Represent CERCO at conferences, workshops, symposia and in organisations such as GSDI, ISCGM, and the Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP) (MEGRIN, 1999).

2.3.1.4 GI2000

GI2000 are consultation initiatives funded by the European Commission (Directorate General (DG) XIII/E) to investigate European geographic information policies and infrastructures. The first document was the "EGII policy document" produced in December 1995. Subsequent documents expanded on the initial document. The most recent one was released in 1998, ‘GI2000: Towards a European Policy Framework for Geographic Information’ (EUROGI, 1999b). This document was presented to the European Parliament (EP) and in September 1998 the Parliament was questioned about progress in adopting the GI2000 document. Unfortunately political events and lack of resources and understanding of the importance of geographic information (GI) within the EC dampened the initiative, which finally died in October 1999 (Longhorn, 2000).

A new initiative is being undertaken by a group called COmission GI (COGI), which is convened within the EC and managed by Eurostat, the Statistical Office of the European Communities DG, in partnership with the Information Market Directorate of the Information Society DG. Both are located in Luxembourg and only consist of EC staff members. COGI is responsible for advising the EC on matters relating to GI and GI systems. COGI has, as of March 2000, organised only one meeting, in November 1999, while a second meeting, scheduled for February 2000, was postponed (Longhorn, 2000).

Longhorn (2000, p.7) believes that it is

> “up to EUROGI, CERCO national GI associations, OGC Europe, AGILE (the Association for GI Laboratories in Europe) and other organisations that collect, rely on, use or create GI to help keep the GI policy alive while the Commission reviews the options for creating a regional policy framework for GI via COGI.”

Other projects focussing on information in general and not specifically on GI are carried out under the INFO2000 program of the DG XIII/E. Early in 1999, for example, the DG XIII/E released the "Green Paper on Public Sector Information in the Information Society". This Green Paper discusses the use of information held by government departments for the benefit of Europe's citizens (INFO, 1999).

2.3.2 Asia and the Pacific

2.3.2.1 PCGIAP

The Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP) was established by the United Nations Regional Cartographic Conference for Asia and the Pacific (UNRCC-AP) in 1994. PCGIAP membership consists of 55 nations represented by the directorates of national survey and mapping organisations or equivalent national agencies. The committee's mission is to increase economic, social and environmental benefits through the use of geographic information, by providing a forum for its members. This forum aims to:

1. develop the Asia and the Pacific Spatial Data Infrastructure (APSDI) a regional geographic information infrastructure;
2. assist in the development of the GSDI; and
3. share knowledge and take part in education, training and technology transfer.

The APSDI is defined by PCGIAP (1999a, Article 4) as:

a) "Institutional Framework which defines the policy, legislative and administrative arrangement for building, maintaining, accessing and applying standards and fundamental datasets
b) Technical standards which define the technical characteristics of fundamental datasets
c) Fundamental datasets which include the geodetic framework, topographic data bases and cadastral data bases
d) Technological framework which enables users to identify and access fundamental datasets"

Data standards have not been adopted yet, however PCGIAP observes the development of ISO TC 211 and the Global Map project.

Access to data is planned via a network of APSDI data nodes, which would be responsible for the distribution, management, maintenance and metadata records of their own data. If the 'Draft Policy for Sharing Fundamental Data' (PCGIAP, 1999c) is adopted by PCGIAP, then all members will need to have easy, efficient and equitable access to fundamental spatial data where other factors do not hinder its use.

PCGIAP has no pricing policy. However Dato' Abdul Majid bin Mahomed (former President of PCGIAP) (Onsrud, 1998b) expects that regional fundamental data will be sold only for the cost of transfer. Legislation, administration and policies of PCGIAP members vary greatly, thereby adding to the challenge of establishing an APSDI.

PCGIAP identified the possible inclusion of certain core datasets in the APSDI. These datasets are: geodetic control, geographical place names, topographic/hydrographic features and major administrative boundaries, but not cadastral data, as these are too varied amongst PCGIAP's members.

2.3.2.2 ICSM

The Intergovernmental Committee on Surveying and Mapping (ICSM) was set up in 1988 by the Australian Prime Minister, state premiers and the Chief Minister of the Northern Territory. ICSM members are the heads of Australia's Commonwealth, State, Territory and Defence surveying and mapping agencies and New Zealand. ICSM's main aim is to share information to avoid unnecessary duplication and to provide a forum that will consistently approach surveying, mapping and charting issues for national development and defence. Specialist working groups are investigating issues in areas such as Geodesy, Geocentric Datum of Australia (GDA), Cadastral Data, Street Addresses, Topography, Geographical Names in Australia, and Tides and Mean Sea Level. One of ICSM's most recent achievements has been the availability of the GDA'94, and ICSM recommended its adoption by the year 2000 (ICSM, 1997).

2.3.2.3 ANZLIC

The Australia New Zealand Land Information Council (ANZLIC) was originally established in 1986 as the Australian Land Information Council (ALIC) by agreement between the Australian Prime Minister and the heads of the State governments. When

New Zealand joined ALIC in 1991 as a full member it was renamed ANZLIC. ALIC was formed to coordinate the management and sharing of land information in Australia on a national basis, thereby allowing cost-efficient access to compatible land information. ANZLIC now includes all Australian States/Territories and New Zealand.

ANZLIC's delegates represent land information coordination agencies within their own jurisdiction. These coordinating agencies include the Western Australian Land Information System (WALIS), the Queensland Spatial Information Infrastructure Council (QSIIC), and the Commonwealth Spatial Data Committee (CSDC).

WALIS now represents 27 State Government agencies that work with local government, business, education and the community. WALIS enables its members to manage the Western Australian land and geographic information on a state level. It aims to coordinate the sharing of land information, making land information consistent and promoting it to potential users. The land information held by WALIS members is not centralised, but held by the individual members and networked for easy access to users (WALIS).

QSIIC has representatives from the private and public sector and aims to provide the general public with accurate, timely and reasonably priced datasets. These datasets will be made more easily available, while still protecting confidentiality and privacy. (QSIIC, 1999)

CSDC was formed in 1992 with the mission to coordinate Commonwealth Government spatial data management. This coordination was necessary because of:

- The demands placed on spatial data by GIS;
- The need to avoid duplication of spatial data collection and management;
- The need to combine spatial data products;
- The need to form common approaches for issues such as data standards, distribution, copyright, privacy and pricing; and
- The need for the Commonwealth to be represented on forums such as ANZLIC (CSDC, 2000).

ANZLIC's delegates are responsible for gaining knowledge on the status of spatial data in their individual jurisdictions, providing that knowledge to ANZLIC and promoting and implementing ANZLIC's strategies within their jurisdiction. Until April 1999 ANZLIC had an Advisory Committee, which was made up of all jurisdictions with the responsibility to implement ANZLIC's strategic plan. Since April 1999 this Advisory Committee has been discontinued and two standing committees now undertake the work of the Council. One directs industry development and the other SDI. Ad hoc committees are addressing strategic and policy issues (ANZLIC, 1998a).

ANZLIC communicates with other relevant organisations such as the Intergovernmental Committee on Surveying and Mapping (ICSM), the Public Sector Mapping Agencies (PSMA) consortium, the Registrars-General and the Valuers-General. ANZLIC also aims to build links with coastal, marine and natural resources data custodians (ANZLIC, 1998a).

ANZLIC has guided and undertaken many developments in land information management. They have developed standards and in future will provide a forum for coordination and consultation. Below are some of their achievements, and documents they have developed or commissioned:

- Spatial Data Infrastructure for Australia and New Zealand - A discussion paper (ANZLIC, 1998c)
- Custodianship Guidelines (ANZLIC, 1998d)
- Metadata Guidelines (ANZLIC, 2000i)
- Report on Implementation of the Spatial Data Transfer Standard (SDTS) (ANZLIC, 1997) (ANZLIC, 1998b)
- Cost/Benefit Analysis – The investigation, undertaken by Price Waterhouse Urwick (1995), determined a cost /benefit ratio for data usage of 4:1
- Research and Development Needs
- Others such as Training Needs; Street Addressing Guidelines; a Land Use Code Draft; and the promotion of spatial data infrastructure (Irwin and Holland, 1996).

2.4 National SDIs

National Spatial Data infrastructures (SDIs) are playing important roles in establishing access and standards for spatial data within various jurisdictions. They also help in the development of global, regional, national, state and local SDIs. They aim to help the public in their decision-making process by providing access to fundamental datasets. The main features all SDIs have in common (see Figure 2.1) are:

- Standards
- Technology
- Data Policy and
- Institutional Framework.

Coleman and McLaughlin (1998) found that apart from those four features another important component is people, because they are and will be the key driving forces in SDI's development. They include spatial data providers and users, and other driving forces such as academia.

Factors that will heavily influence or dictate the overall national SDI development are manifold and numerous, but similar to the ones discussed in the GSDI section. In addition, national politics, funding, and an improved data policy environment will heavily influence or dictate the overall SDI development while politicians will be driven by particular priorities (Dale and McLaughlin, 1999; Gelatly and Baxter, 1995). The development of an NSDI will encounter political, organisational, and financial problems rather than technical issues. Other problems include:

> "ownership of data, copyright, licensing, data distribution, security of data, liability for the deficiencies of data, and so on." (O'Donnell and Penton, 1997, p.224)

The most critical external influences to SDI development are: the world economy, globalisation, environmental issues, the Information Highway and technology change (O'Donnell and Penton, 1997; Williamson 1999, et al 1997).

Six key factors for the success of an SDI development are: awareness of spatial information and SDIs; cooperation between the various users; the involvement of politicians; knowledge about data availability; and accessibility to data and use of data

(Rajabifard and Williamson, 2001). To enable a better facilitation of SDIs, cross-jurisdictional projects and partnerships are heavily encouraged by ANZLIC to meet user decision-making requirements and to support sustainable development objectives (Feeney et al, 2001).

In the sections below, several national SDIs are described to provide comparisons and to consider problem areas, especially with regard to spatial data standards, access, pricing and legal issues.

2.4.1 United States of America (USA) - FGDC, NSDI 1990

The US National Spatial Data Infrastructure (NSDI) had its beginnings in 1990 when the Federal Geographic Data Committee (FGDC) was set up in response to a Circular A-16 issued by the Office of Management and Budget (OMB, 1990). This Committee was tasked to coordinate the dissemination, sharing, and development of surveying, mapping and other related spatial data. The so-called NSDI finally came into existence because of the Executive Order 12906 signed by President Bill Clinton in April 1994. The Order was titled "Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure" (Clinton, 1994).

The NSDI's vision incorporates metadata, a clearinghouse, data standards, core data and a framework of data from different levels of government and private sectors. FGDC has developed NSDI standards, demonstration projects such as metadata, framework and clearinghouse development projects (Onsrud, 1998b).

Access to the data is provided via the clearinghouse. There is a difference in pricing between government held data and commercial data. Federal government held data are made available at cost of dissemination or less. Similar rules apply to most local and state government held data, however some charge more than the cost of dissemination. Thousands of public accessible datasets are available. Commercial providers of data are encouraged to use the framework and policies of the NSDI, but their data does not form part of the NSDI and is priced by the individual corporation (Onsrud, 1998b).

Legal protection and restrictions in the use of datasets exist only for commercial data in private and some local and state government hands. Commercial data providers can choose to use legal protection such as copyright and/or licensing. Federal government data and most state and local government data are available without any user restrictions (Onsrud, 1998b).

Spatial data, when collected via public funding, are viewed by the American Government as a national asset. Since taxpayer's money contributed to most of its collection it should be made freely available. This reason and the democratic need of an open government are the guiding forces by which federal government departments make their spatial data freely available. Data held by the private enterprise are rarely free, or without ownership claims, and much of that commercial data incorporates public data. More information on spatial data pricing are provided in Chapter 4.

Core data, also termed fundamental data, being developed for dissemination via the NSDI includes: geodetic control, elevation and bathymetry, digital imagery, government boundaries, land ownership, transportation and hydrography (rivers and lakes). Other thematic data that are not core data are also made available through the NSDI. Longhorn (1998) found that the FGDC and the NSDI do not have the impact at local government level or with 'legacy data', as one would have hoped for. 'Legacy data' are data that are already in existence, and most commonly stored in different formats, thereby making it difficult to share or sell. In 1997 the FGDC tried to improve the NSDI impact at the local government level and stated its vision for the NSDI as

> "Current and accurate geospatial data will be readily available to contribute locally, nationally, and globally to economic growth, environmental quality and stability, and social progress" (FGDC, 1997, a solution)

Problems associated with the NSDI include complex metadata requirements, lack of standard adoption, and time requirements0. Standards such as metadata standards and others developed by the FGDC are often not implemented, firstly because of the cost involved in doing so, and because there is no requirement for private data providers to do so. Development of the NSDI and its adoption will take a long time, and the US is still far from achieving its NSDI goals (NAPA, 1998).

2.4.2 United Kingdom (UK) - NGDF Management Board, NGDF 1996

A UK Parliamentary Committee chaired by Lord Chorley in 1987 enquired into the handling of Geographic Information (GI) and produced the 'Report of the Committee of Enquiry' in 1987. This report recommended better dissemination, collection and handling of GI and the creation of a national non-governmental GI association or council. Even though the recommendations were rejected by the government of the day (Masser, 1998b) the Association of Geographic Information (AGI) was established in 1988; in 1998 it had 1000 members (Longhorn, 1998).

The UK's National Geospatial Data Framework (NGDF) commenced in 1996 with its main objective to involve all members of the GI community in its development. Their strategic approach involves collaboration, access to data and standards, and best practice (Hobman, 1997). The NGDF will not provide spatial data products (Onsrud, 1998b), but incorporate metadata guidelines, data standards, and probably core data. Investigations have been made into transfer formats, communications protocols, and other SDI's around the world. Metadata guidelines adhering to ISO's draft GI metadata standards 15046-15 were produced in June 1998 (NGDF, 1998).

Legal protection and restrictions apply to commercial data, which includes data held by government agencies. Government agencies might be required to provide greater access to spatial data because of Freedom of Information legislation (Onsrud, 1998b). Spatial data are charged on a commercial basis from the private, and government enterprises. As of 1998 the NGDF Management Board had not decided if core data was going to form part of the NGDF. The UK has one of the most advanced digital mapping capabilities in Europe, but GI technology is under-utilised due to spatial data pricing policies. There is a real need for standards, interoperability, education, and training, while uncertainties in copyright are issues that create problems (Longhorn, 1998).

2.4.3 Australia - ALIC, ASDI 1986

In Australia the Australian Surveying and Land Information Group (AUSLIG) is involved in all levels of national land information issues and infrastructures and also in international issues. This enables Australia to not only better shape its own infrastructure so it is compliant with others, but also to be involved in shaping regional and global infrastructures. For example at the present time the General Manager of AUSLIG is the Chair to the GSDI Steering Committee. ANZLIC's executive officer, the ICSM's executive officer; and the PCGIAP's director are all working out of AUSLIG (AUSLIG, 1999a).

Development of the Australian Spatial Data Infrastructure (ASDI) began in 1986 when ALIC (now ANZLIC) was formed with the responsibility to coordinate land information management in Australia. ANZLIC is serviced out of AUSLIG.

> "AUSLIG is the Commonwealth Government's primary source of advice on land information matters" (AUSLIG, 1999b, About AUSLIG).

AUSLIG's main duties include the development and implementation of national land information policies, standards, and infrastructures, and the management of maritime boundaries, national mapping, geodesy programs, and remote sensing.

ANZLIC is responsible for coordinating the SDIs of the various member jurisdictions to form the ASDI. The implementation of the ASDI is one of the main responsibilities of AUSLIG. ANZLIC and the CSDC are promoting the ASDI, and the projects undertaken by AUSLIG harmonise and complement ANZLIC's and the CSDC's activities. Drew Clarke, the Chairman of ANZLIC's Standing Committee on Spatial Data Infrastructure describes ANZLIC's vision of the ASDI as follows:

> "ANZLIC's vision for the ASDI is a distributed network of databases, linked by common policies, standards and protocols to ensure compatibility. Each database will be managed by a custodian with the expertise and incentive to maintain the database to the standards required by the community and committed to the principles of custodianship." (Clarke, 1999, The ASDI)

The ASDI is made up of five components: the institutional framework; fundamental datasets; technical standards and protocols; clearing-house networks; and promotion and outreach. The new Geocentric Datum of Australia (GDA'94) will be used as the ASDI's spatial reference system, which is compatible with modern satellite-based positioning systems (Blake, 1999).

The institutional framework addresses data, custodianship, pricing, maintenance, access, industry development and community consultation. The first task of ANZLIC's new

ASDI Standing Committee is to develop an implementation plan mainly concerned with:

- Spatial data management standards;
- Identification of fundamental datasets and their custodians;
- Monitoring fundamental spatial data;
- Development of the ASDI;
- Spatial Data Clearinghouse; and
- Cooperation with related national initiatives (Clarke, 1999).

Some state infrastructures are making progress in their efforts to coordinate their spatial data infrastructure initiatives. WALIS for example, is currently developing consistent pricing policies for Western Australia (WA) (Clarke, 1999), while Queensland has already reduced their digital cadastral data pricing by up to 95%, thereby recognising their obligation to taxpayers.

Draft fundamental datasets have been identified and the National Land and Water Resources Audit (NLWRA) will establish availability and quality of spatial data in Australia by June 2001. The audit will develop metadata for spatial datasets held by Commonwealth, State and Territory governments. WALIS has, for example, identified four fundamental datasets that are reference datasets and/or needed for government priorities such as emergency dispatch systems. These four datasets are:

- Geodetic Control network;
- Cadastre;
- Road centreline; and
- Street Address (Clarke, 1999).

Some committees and organisations in Australia have been involved in developing spatial data standards and metadata guidelines not only for their own use but also for others, examples are:

- ANZLIC supports the technical committee on geographic information standards of Standards Australia and the international standard ISO TC211, thereby having some control in standards development.

- Metadata guidelines have been published by ANZLIC in 1996 and a second edition is in preparation.
- GDA'94 is the new geocentric datum to be adopted by all jurisdictions in Australia by 1 January 2000.
- An ASDI dataset compliance-testing model has been developed by the Commonwealth and is available on the ASDI website.
- In Queensland for example the Digital Road Network Standard has been created and is used to distribute the State's Digital Road Network to all State Government agencies (Clarke, 1999).

Clearing-house networks and spatial data nodes are being implemented for the ASDI. Management and promotion of the Australian Spatial Data Directory (ASDD) is undertaken by AUSLIG, technical development of the search interface is done by the Environmental Resources Information Network (ERIN), and Commonwealth and State nodes that are under development are hosted by the Bureau of Rural Sciences (BRS).

Australia has made progress on its on-line mapping and therefore has been nominated as the lead nation on Internet mapping for the GSDI technical working group. AUSLIG has joined the Open GIS Consortium as a full voting member and established the Australian WWW Mapping consortium (which has 24 industry, research and government partners) to coordinate web mapping and provide national feedback to OpenGIS.

AUSLIG, ERIN, NSW Department of Land and Water Conservation and Social Change On-line have recently been successful with a proposal to the OpenGIS to implement an Australian Web Mapping Testbed that demonstrates natural disaster response mapping capabilities for two recent natural disasters in Australia. The first case is the cyclone encountered in Cairns on the 11 February 1999. The second case is the Sydney hailstorm on the 14 April 1999. The aim of these projects is to demonstrate the use of Internet mapping techniques and linked databases for emergency responses (ASDI, 1999).

Some spatial data or Internet standards have been developed or are developing. The implementation of the Australian Spatial Data Directory (ASDD) the Clearinghouse Network for example, has been based on the Z39.50 protocol, an Internet based distributed directory architecture. Access to national spatial data in the ASDI will be provided via the ASDD. The ASDD will not control all datasets centrally, but rather individual datasets will be held and managed by individual custodians. At this stage the ASDD provides metadata to spatial data, but in future it will also include on-line links to the data itself.

As most jurisdictions in Australia have different pricing and licensing policies, the ASDI's aim is to accommodate different pricing and licensing regimes (Onsrud, 1998b). Costs of datasets vary depending on the pricing applied by individual jurisdictions. ANZLIC's draft national policy on spatial data recommends that environmental management data should be made available at the average cost of transfer and most jurisdictions follow that recommendation. ANZLIC also promotes the view that all fundamental datasets should be made available at minimum cost. The CSDC is presently developing a new access and pricing policy. While as of December 2000 no information about that new policy was available, more information on access and pricing for all States and Territories is provided in Chapter 4.

Core data that are and/or will be included in the ASDD are:

- Primary reference data - such as the Geodetic Control Network, the National Geodetic Database, the Australian Height Datum.
- Administration data - such as Land Parcels/cadastre.
- Natural environment - such as soils, vegetation.
- Socio economic data - such as census collection, demography.
- Built environment - such as water supply, wastewater; telecommunications network.
- Other data such as river catchment/drainage area, geology, mineral resources (ASDI, 2000).

Problems encountered in the implementation of the ASDI are pointed out above and include the establishment of knowledge on the quality, access, cost and legal protection of spatial datasets in Australia. This thesis will analyse current practices used by data providers to establish that knowledge. The analysis will be conducted by way of a survey of spatial data providers and their data users.

2.5 Summary and Conclusion

Spatial data infrastructures are being developed at global, regional, national, state and local levels to aid decision making for sustainable development and environmental management. This chapter analysed various examples of SDIs to determine factors that influence SDI development. Even though the thesis will concentrate on individual Australian spatial data policy issues, it was important to gain an overall global view to:

- learn from experiences in other countries,
- to determine all relevant factors influencing SDI development and spatial data policies, and
- to enable the incorporation of SDI requirements into any spatial data policy.

By comparing various SDI development initiatives at any SDI level (e.g. GSDI or NSDI) in Chapter 2 it was found that all are faced with the same or similar issues and challenges. These challenges are usually not so much of technical nature, but rather a lack of policy, finances and management of spatial data, including such issues as ownership, copyright and legal liability. External forces such as the world economy, globalisation, environmental issues, the Information Highway and technology change also heavily influence policies and SDI development. Hence factors that influence SDI development, as documented throughout Chapter 2, are as follows:

1. *External Forces* (world economy, globalisation, environmental issues)*;*
2. *Organisational Issues* (operational responsibility for the SDI initiative, leadership at appropriate level, priorities, and human resources)*;*
3. *Technical Issues* (standards, clearinghouse technology)*;*
4. *Governmental/Organisational Duties* (legal, political, security)*;*
5. *Ownership/Custodianship;*
6. *Privacy and Confidentiality;*
7. *Legal Liability, Contracts and Licences;*
8. *Intellectual Property Law;*
9. *Economic Analysis* (financing and pricing) *;*

10. *Data management* (data protection and security)*;*
11. *Outreach, Cooperation and Political Mandate; and*
12. *SDI Users' Choices, Rights and Obligations*.

From the investigation of Chapter 2 we can conclude that to improve the facilitation of SDIs, common policies are required. These policies need to be consistent and for Australia need to incorporate the following 'SDI requirements':

- Use of ANZLICs custodianship guidelines;
- Use of common ASDI standards, technology standards and metadata guidelines;
- Use of ASDI technology and access network (Clearinghouse) for displaying or using data;
- Use of government policies, guidelines and laws where applicable;
- Greater security for the spatial data provider and user;
- Use of fundamental datasets if needed by the organisation;
- Promoting data sharing and access, and use of high quality data;
- Consistent and low spatial data pricing;
- Promoting spatial information and SDIs; and
- Awareness of new spatial information and SDI developments.

As the above twelve factors encompass such a large variety of issues, it is beyond the scope of the thesis to deal with them all in detail. Most of these factors also need to be considered when formulating an individual spatial data policy. More detail on these factors influencing spatial data policy and brief descriptions of them are provided at the beginning of Chapter 4.

Some of the main implementation challenges to be investigated in this research in more detail can be summarised under the following headings:

- **Standards and quality of spatial data**
- **Access to spatial data**
- **Pricing of spatial data**
- **Legal issues such as intellectual property protection of spatial data**

Standards and quality of spatial data

SDIs need national and international standards to allow data to be interoperable. This enables the data to be exchanged and manipulated on any computer system, no matter what the spatial data format is or what the software or hardware components are. SDIs should include standards such as ISO/TC 211, be interoperable (which is being addressed by actions within OpenGIS), and also include other Information Technology (IT) standards. In Australia ANZLIC has made much progress on the development of metadata and is involved in other national and international standard developments such as the ISO/ TC211. Metadata guidelines were published in 1996, and even an ANZLIC Metadata Entry Tool (version 5.0) is available free of charge (ANZLIC, 1999). However, how much impact will these developments have on spatial data providers and users from the academic, private and public background? Are most providers aware of ASDI developments and do they follow the guidelines? Are data providers supplying additional data with the spatial dataset, such as metadata or disclaimers? These are some of the questions this research will consider by way of a Spatial Data Provider and User Survey in Chapter 3.

Chapter 2 revealed a great need for consistent standards and easily accessible spatial data of high quality. The survey in Chapter 3 will determine what additional data, data providers provide with their dataset to establish any trends or inconsistencies.

Access to spatial data

One of the difficulties in providing public access to spatial data is not so much a technological problem but rather an organisational and policy problem. It is difficult to develop national policies when state and local spatial data access policies vary. Harlan Onsrud found in his "Survey of National and Regional Spatial Data Infrastructure Activities around the Globe" that access to most datasets in the European Geographic Information Infrastructure (EGII) was provided via paper and electronic catalogues, telephone calls, faxes and postal mailings (Onsrud, 1998b). What spatial data access mechanisms do Australian spatial data providers use? Is it possible to share electronic data, and are organisations prepared to do so? Chapter 3 will address these questions in a survey, while Chapter 4 will analyse in detail the issues affecting spatial data access.

Pricing of spatial data

Pricing of public spatial data is being heavily debated all around the world. America, at the federal government level, has the policy to not charge for public data, while the UK's Ordnance Survey (UK's lead national mapping agency) charges on a cost recovery basis. The pricing of spatial datasets within the European Geographic Information Infrastructure (EGII) is determined by the individual department or company, resulting in different charges. The pursuit of philosophies that spatial data are assets within government departments is therefore uncertain (Onsrud, 1998b). In Australia, Queensland, for example, has recently reviewed its pricing policy for public spatial data and reduced the cost of digital cadastral data by up to 95%. What is the overall situation in Australia? What spatial data pricing policies do other Australian States' and Territories' and New Zealand's government spatial data providers' use? Do public data providers value their spatial data as revenue producing asset, or more as the public asset that should be made freely available? These questions will be addressed in a survey in the next chapter and further spatial data pricing issues will be discussed and analysed in Chapter 4.

Legal issues such as Intellectual Property Protection of spatial data

Some major problems in establishing the GSDI occur because of difficulties in harmonising laws in the areas of intellectual property, privacy, security and legal liability. These problems may cause major hurdles that will take a long time to overcome, and their outcomes are unpredictable. This thesis will consider some of these areas from an Australian perspective. The main areas studied will be intellectual property rights, and legal liability. Chapter 3 will address the situation in Australia by way of a survey and then discuss the outcome and legal issues in more detail in Chapters 5 and 6.

In summary the areas to be further investigated in this research include:

- Chapter 3 – A Survey to determine current practices in Australia with respect to Metadata, access and pricing, legal liability risks and intellectual property protection of spatial data.
- Chapter 4 – Discussion and analysis of spatial data access and pricing issues, which incorporate legal liability risks and intellectual property protection of spatial data.

- Chapters 5 and 6 – Discussion and analysis of legal liability risks and intellectual property protection of spatial data in more detail.
- Chapter 7 – Definition of a spatial data policy and recommendations.
- Chapter 8 – Evaluation of the research objectives and answers to all the above questions.

Chapter 3: Australian Spatial Data Policies – A Survey of Existing Australian Practices

3.1 Introduction

Chapter 2 reviewed Spatial Data Infrastructures and pointed out their present status, shortcomings and needs. On researching spatial data policy development for SDIs, it was found that current practices must be analysed to enable the development of consistent Australian spatial data policies necessary for the further development of SDIs. This chapter will analyse current practices of spatial data policies by way of a survey. The main areas to be covered in the survey are spatial data quality provisions used by spatial data providers, spatial data distribution, spatial data pricing and legal protection of intellectual property in spatial data.

Chapter 3 starts with an overview of the spatial data survey and then follows a similar structure to the survey questionnaire that was mailed out to spatial data providers and users (see Appendix 1). Section 3.3 covers the general questions to all respondents, Section 3.4 covers questions addressed to spatial data providers, while Section 3.5 covers the questions to spatial data users.

3.2 Spatial Data Survey

3.2.1 Aim

The survey questionnaire was designed with the aim to determine current practices of:

- **Standards and quality of spatial data**: that is, what additional data is the data provider supplying with the dataset (eg. Accuracy, Disclaimer, Metadata). How satisfied is the spatial data user with their acquired dataset and what problems does the user encounter?
- **Access to spatial data**: that is, how is access to datasets provided (eg. e-mail, Hardcopy).

- **Pricing of spatial data**: that is, what is the basis of cost recovery, and do data providers value their spatial data as a revenue-generating asset.
- **Legal issues such as intellectual property protection of spatial data**: that is, how is legal liability exposure managed and what forms of legal protection are utilised (eg. copyright, licences).

3.2.2 Design

The survey questions were designed with the aims listed above in Section 3.2.1. A lot of help in devising a questionnaire was received from the Educational Testing Centre at the University of New South Wales. Before the questionnaire design was finalised, a pilot study was undertaken. The pilot questionnaire was first checked by the ANZLIC Executive Officer and after slight alterations mailed to ten key people in the spatial data industry and six responses were returned. The pilot group were asked to fill in the pilot questionnaire and answer the following questions:

1. What are the most likely questions you would answer?
2. Would you prefer to answer the questionnaire in digital format and e-mail it back or in Hardcopy?
3. What is the likelihood of you sending in a pricelist, sample contract, sample licence agreement, and a list of disclaimers? If not, why not?
4. What is the likelihood of you returning the questionnaire? And if not, how could I encourage you to participate?
5. What other issues do you think are important in the area of intellectual property protection that do not seem to be addressed?
6. How relevant do you think this survey would be to the GIS industry?
7. What other issues do you think the GIS industry would be interested in knowing?

The pilot enabled an analysis of the usefulness of the questionnaire and gave some feedback on the design. All respondents to the pilot thought the survey would be very relevant and timely, and one person suggested that the target audience should include the whole spatial industry and not only the GIS industry. Four of the six respondents specified they preferred the questionnaire in digital form and two out of those six specified the questionnaire should be made available both in hardcopy and digital form.

Hence, the questionnaire was not only printed in hardcopy form, but also made available as an interactive Internet website. With the help of the feedback from the pilot group the questionnaire was changed and shortened.

Once the design of the questionnaire was completed, the spatial data survey was conducted between October and December 1998. Many similar questions were addressed to both data providers and data users to obtain answers from both perspectives, and to determine the level of satisfaction of spatial data users with supplied datasets.

A total of 6630 hardcopy questionnaires (sample questionnaire and cover letter, see Appendix 1) were mailed out directly and by the Australasian Urban & Regional Information Systems Association (AURISA), the Institution of Surveyors Australia (ISA) and the Mapping Science Institute Australia (MSIA). More than 400 responses were received with some organisations returning multiple responses. The questionnaire was also available on the Internet, but only 29 Internet responses were received. The total number of useful survey responses was culled to 379.

The questionnaire (see Appendix 1) was designed in 3 sections. The first section covered general questions; the second was only to be answered by spatial data providers and the third section by spatial data users that use other provider's spatial data. The actual survey question being discussed will be displayed when it is analysed.

I. General Questions

The answers to the questions in the general section provide information as to whether the responding organisations are data providers and/or data users, and whether they use Geographic Information Systems (GIS).

II. Questions for Data Providers

The answers to this section provide information about spatial data quality provisions, access and cost, legal protection and the philosophies of organisations towards their spatial data as a form of intellectual property.

III. Questions for Data Users

A data user can be classified as someone that uses any other organisation's spatial data. The answers to section III enable the analysis of the most commonly used spatial datasets and the level of satisfaction of the spatial data user with them. The answers provide information about the current practices of spatial data providers' provision of spatial data quality, access and cost, and legal protection from a spatial data users' point of view.

3.2.3 Respondent Groups

Many more responses were received from local government departments than any other group; hence this thesis makes comparisons between the two main groups of 'Local Government' and 'All Other Organisations'. The actual numbers of respondents in each group for the corresponding sections in the questionnaire appear below in Table 3.1. The numbers of respondents vary, because respondents were asked to only answer the sections relevant to them. Hence some answered all the questions, some only the questions from one section and some, the questions from two Sections.

Table 3.1: Entire respondent group & the two main groups, per questionnaire section

		Number of Respondents		
	Group	**Sec. I. (General)**	**Sec. II. (Provider)**	**Sec. III. (User)**
1.	Entire respondent group	379 (100%)	258 (100%)	338 (100%)
2.	All Local Government Departments (= largest single group)	208 (55%)	117 (45%)	190 (56%)
3.	All other Organisations	171 (45%)	141 (55%)	148 (44%)

Some questions with multiple choices required the respondent to tick more than one item. The percentages for these questions have been calculated against the total number of respondents, rather than the total number of check boxes. Hence the sum of the percentages in corresponding graphs generally adds up to more than 100%, to indicate the actual number of ticks. These cases are indicated on the individual graphs.

For a more detailed analysis, the entire respondent group is divided into 4 subgroups. These are ‘Federal Government’, ‘State Government’ (includes Territories), ‘Local Government’ and ‘All Others’. The detailed analysis also differentiates between responses for the 8 different Australian States and Territories, from ‘State Government’ and ‘Local Government’ and ‘All Other’. Tables 3.2, 3.3 and 3.4 display the total number of respondents per State/Territory for each of the 3 sections.

Because most of the responses were received from only 4 States, namely NSW, Qld, Vic and WA, the analysis will concentrate on these states. However summaries will indicate the total number of responses for all States/Territories.

Table 3.2: Detailed respondent numbers for section I (General)

Section I	**ACT**	**NSW**	**NT**	**Qld**	**SA**	**Tas**	**Vic**	**WA**	**Unknown**	**Total**
State G.	**1**	**12**	**1**	**25**	**3**	**1**	**6**	**12**	**1**	62
Local G.	**0**	**70**	**4**	**47**	**17**	**9**	**29**	**28**	**4**	208
All Other	**1**	**26**	**1**	**27**	**8**	**0**	**17**	**12**	**3**	95
Sub-total	**2**	**108**	**6**	**99**	**28**	**10**	**52**	**52**	**8**	365
Federal G.										14
Total										379

Table 3.3: Detailed respondent numbers for Section II (Provider)

Section II	**ACT**	**NSW**	**NT**	**Qld**	**SA**	**Tas**	**Vic**	**WA**	**Unknown**	**Total**
State G.	**1**	**9**	**1**	**23**	**2**	**1**	**6**	**12**	**1**	56
Local G.	**0**	**47**	**2**	**27**	**7**	**5**	**16**	**11**	**2**	117
All Other	**1**	**19**	**1**	**21**	**8**	**0**	**8**	**10**	**3**	71
Sub-total	**2**	**75**	**4**	**71**	**17**	**6**	**30**	**33**	**6**	244
Federal G.										14
Total										258

Table 3.4: Detailed respondent numbers for Section III (User)

Section III	**ACT**	**NSW**	**NT**	**Qld**	**SA**	**Tas**	**Vic**	**WA**	**Unknown**	**Total**
State G.	**1**	**9**	**1**	**23**	**3**	**0**	**5**	**12**	**0**	54
Local G.	**0**	**65**	**3**	**44**	**16**	**7**	**27**	**26**	**2**	190
All Other	**1**	**24**	**0**	**20**	**7**	**0**	**14**	**12**	**2**	80
Sub-total	**2**	**98**	**4**	**87**	**26**	**7**	**46**	**50**	**4**	324
Federal G.										14
Total										338

In the detailed analysis graphs, the State/Territory appear on the x-axis, while the number of respondents appear on the y-axis, sometimes as actual numbers but mostly as percentages. To enable a direct comparison between the different States, all total numbers of responses per State/Territory were set to equal 100%. Hence individual States/Territories trends can be read from those graphs but not the actual number of respondents. To clarify the analysis, refer to the example below. Some of the actual numbers of respondents per State/Territory are very small, and in these cases it is assumed the respondent's answers are a general trend for their State/Territory.

For example, Question 1 of the Survey asked respondents to indicate whether they are '*Data Providers*', '*Data Users*' or '*Both*'. The actual respondent numbers plus their percentages per State/Territory appear below in Tables 3.5, 3.6 and 3.7. Figures 3.1, 3.2, 3.3 and 3.4 are the corresponding graphs. The number of respondents per State/Territory for each respondent group appears in brackets behind the State/Territory on the x-axis. Apart from this example all question respondent numbers are in Appendix 2 and most relevant graphs appear in this chapter.

Table 3.5: Number of Respondents per State/Territory for Question 1 in Section I

Question 1:	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Unknown	Total
State G.	**1**	**12**	**1**	**25**	**3**	**1**	**6**	**12**	**1**	**62**
Data Provider	\	3	\	1	\	1	1	\	1	7
Data User	\	3	\	1	1	\	\	\	\	5
Both	1	6	1	22	2	\	5	12	\	49
No Answer	\	\	\	1	\	\	\	\	\	1
Local G.	**0**	**70**	**4**	**47**	**17**	**9**	**29**	**28**	**4**	**208**
Data Provider	\	\	\	1	\	\	1	\	1	3
Data User	\	18	1	18	9	2	12	15	1	76
Both	\	47	2	26	7	5	15	11	1	114
No Answer	\	5	1	2	1	2	1	2	1	15
All Other	**1**	**26**	**1**	**27**	**8**	**0**	**17**	**12**	**3**	**95**
Data Provider	\	2	1	5	1	\	2	\	1	12
Data User	\	7	\	4	\	\	8	2	\	21
Both	1	17	\	16	7	\	6	10	2	59
No Answer	\	\	\	2	\	\	1	\	\	3

Table 3.6: Respondents per State/Territory in % for Question 1 in Section I

Question 1:	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Unknown
State G.	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Data Provider	\	25%	\	4%	\	100%	17%	\	100%
Data User	\	25%	\	4%	33%	\	\	\	\
Both	100%	50%	100%	88%	67%	\	83%	100%	\
No Answer	\	\	\	4%	\	\	\	\	\
Local G.	**0%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Data Provider	\	\	\	2%	\	\	4%	\	25%
Data User	\	26%	25%	38%	53%	22%	41%	54%	25%
Both	\	67%	50%	56%	41%	56%	52%	39%	25%
No Answer	\	7%	25%	4%	6%	22%	4%	7%	25%
All Other	**100%**	**100%**	**100%**	**100%**	**100%**	**0%**	**100%**	**100%**	**100%**
Data Provider	\	8%	100%	19%	13%	\	12%	\	33%
Data User	\	27%	\	15%	\	\	47%	17%	\
Both	100%	65%	\	59%	88%	\	35%	83%	67%
No Answer	\	\	\	7%	\	\	6%	\	\

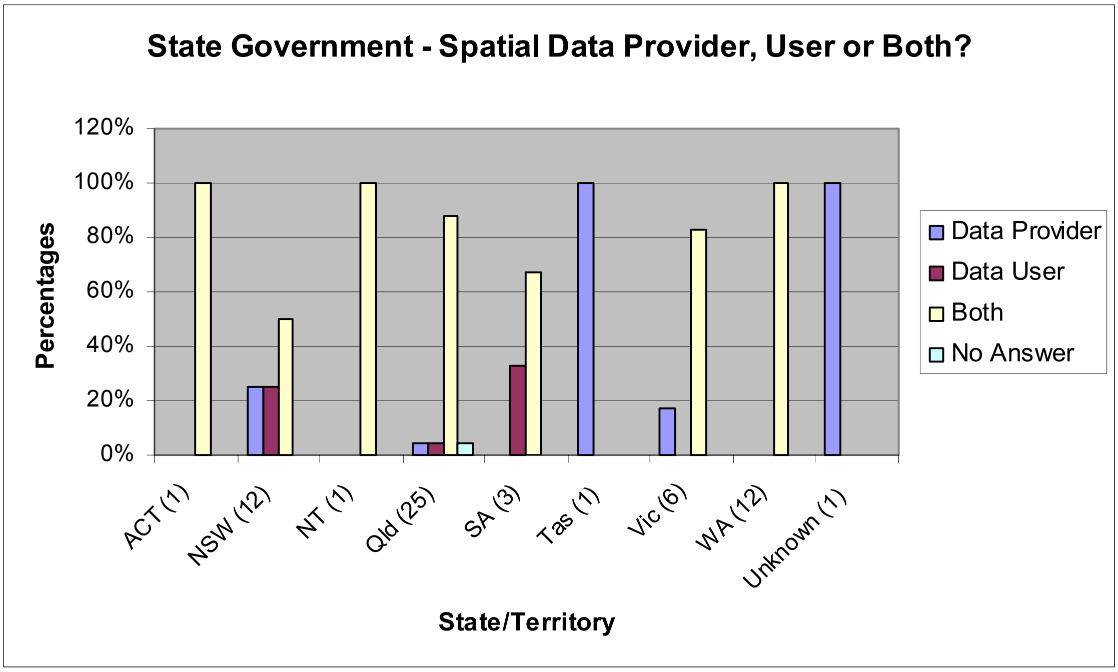


Figure 3.1: State Government - Spatial Data Provider, User or Both?

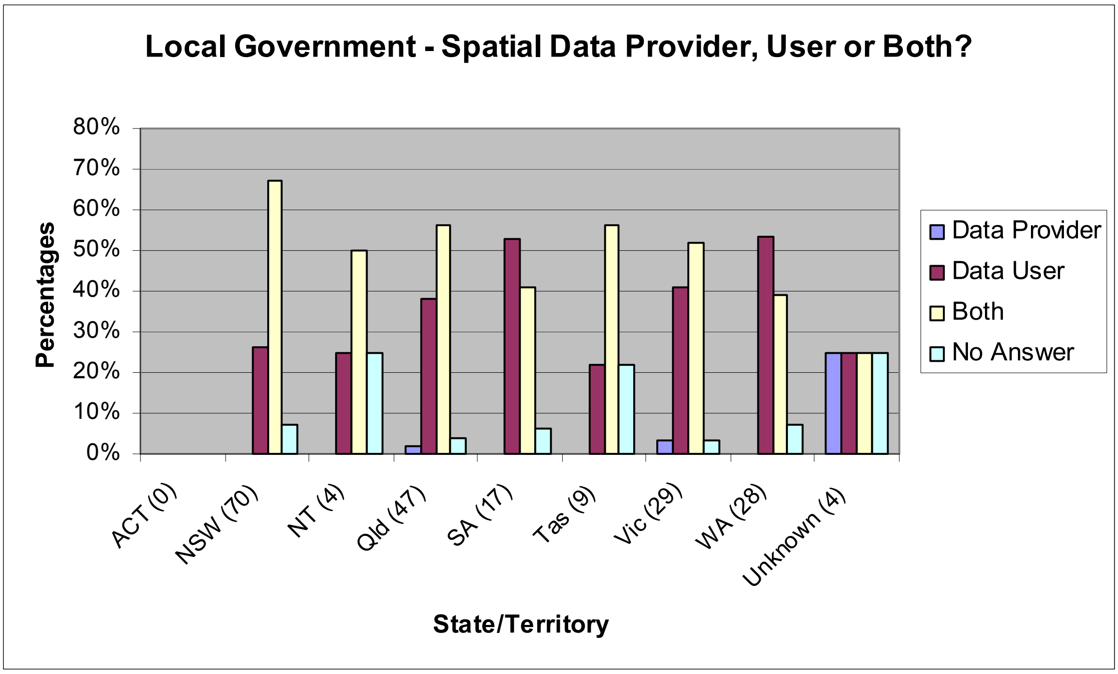


Figure 3.2: Local Government - Spatial Data Provider, User or Both?

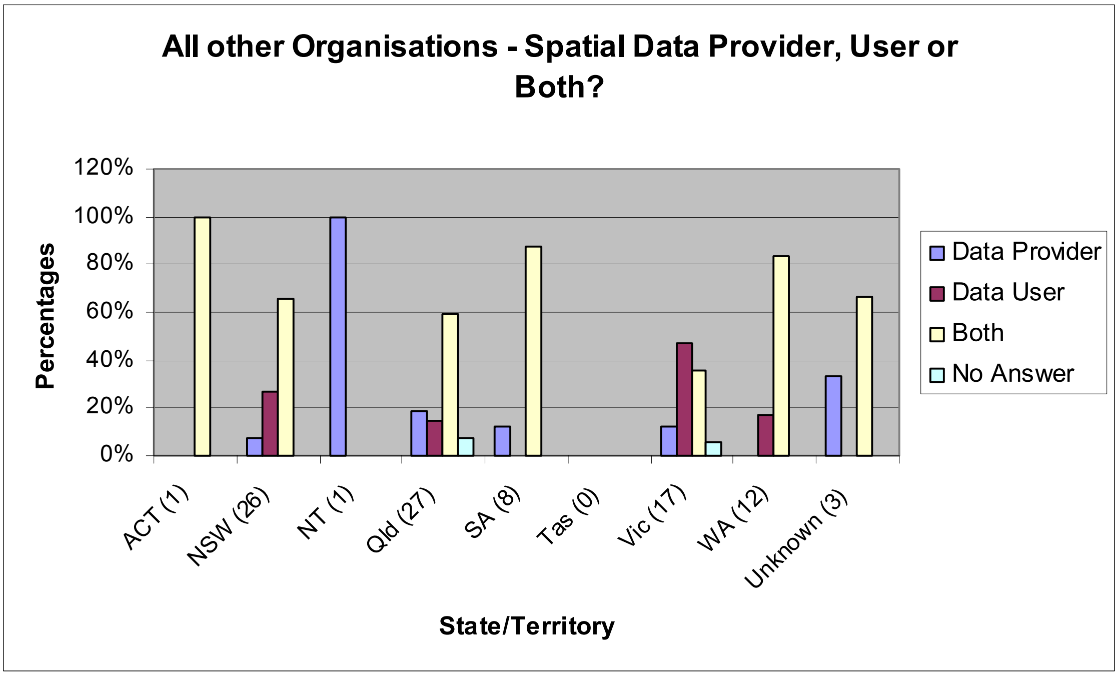


Figure 3.3: All other Organisations - Spatial Data Provider, User or Both?

Table 3.7: Summary of State, Local and Other Respondents per State/Territory for Question 1 in Section I

Summary	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Un-known	Total
Data Provider	**0**	**5**	**1**	**7**	**1**	**1**	**4**	**0**	**3**	22
Data User	**0**	**28**	**1**	**23**	**10**	**2**	**20**	**17**	**1**	102
Both	**2**	**70**	**3**	**64**	**16**	**5**	**26**	**33**	**3**	222
No Answer	**0**	**5**	**1**	**5**	**1**	**2**	**2**	**2**	**1**	19
Check	**2**	**108**	**6**	**99**	**28**	**10**	**52**	**52**	**8**	365

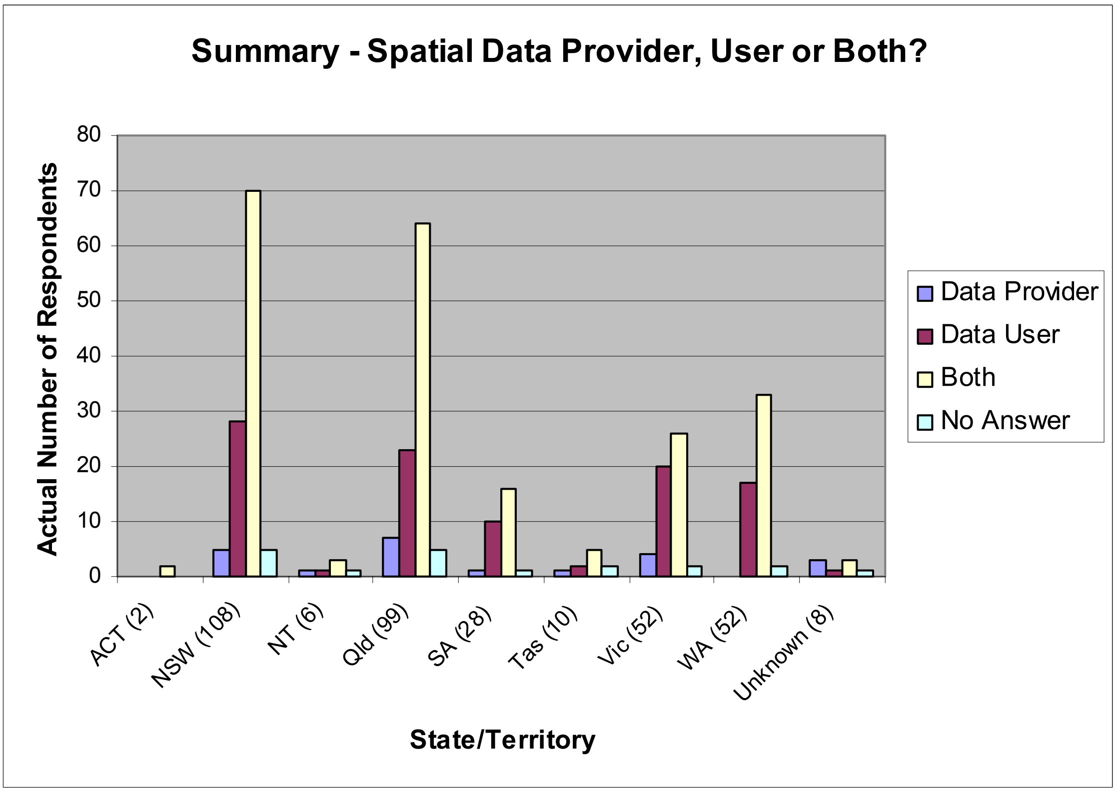


Figure 3.4: Summary - Spatial Data Provider, User or Both?

Throughout sections 3.3 to 3.5, two types of results are presented. The first is the two main groups as per Table 3.1. The second is a more detailed analysis of four groups, 'State Government', 'Local Government', 'All other' per State/Territory and 'Federal Government' agencies as given in Table 3.2, Table 3.3 and Table 3.4. To distinguish the two types of results the following headings are used throughout Chapter 3:

- 2 groups – Local Government vs All other Organisations
- 4 groups – State, Local Government & All Other Organisations per State/Territory and Federal Government

3.3 General Questions (Section I)

In this first section the figure of 379 respondents equals 100% of all the survey respondents, while the number of respondents from local government departments and from all other organisations is 208 (=55%) and 171 (=45%) respectively.

The breakdown of the participating organisations for section I is shown in Figure 3.5:

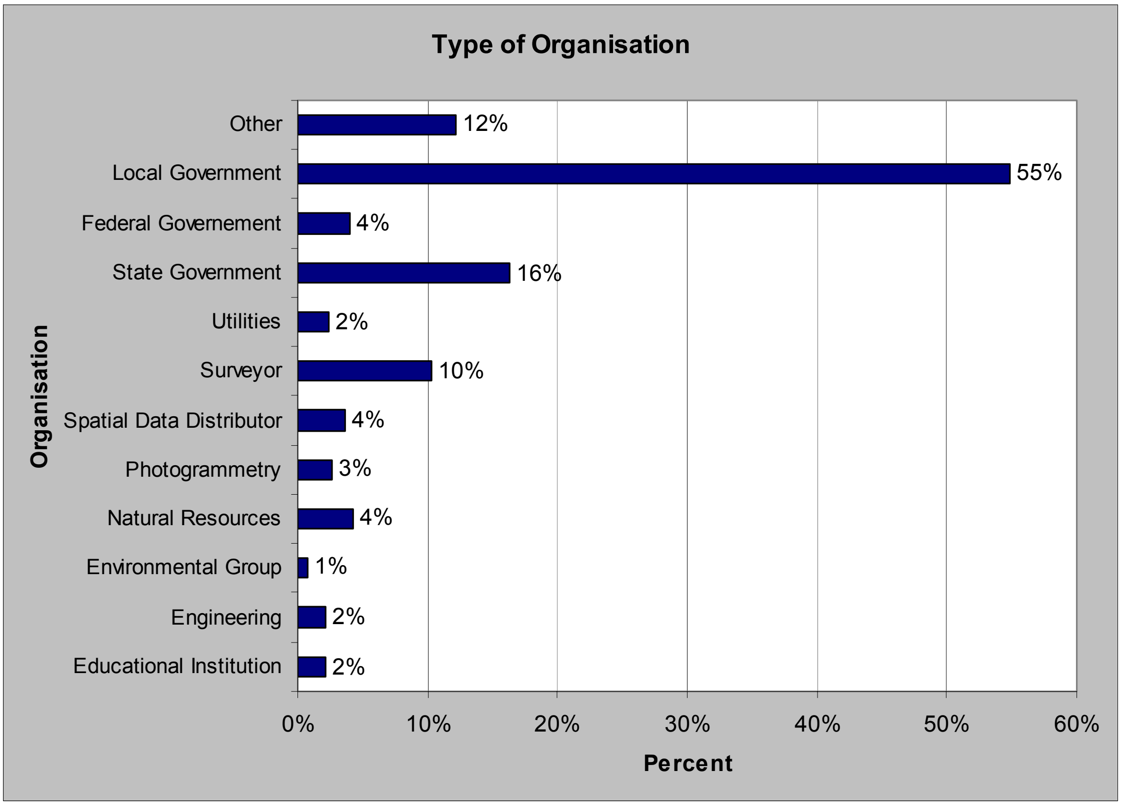


Figure 3.5: Type of Organisation

(Note: Some respondents nominated more than one type of organisation, hence total percentages add up to more than 100%).

The majority of survey respondents for section I are from Local Government Departments (55%) followed by State Government Departments (16%) and then Surveyors (10%). The rest are made up of Federal Government Departments, Utilities, Spatial Data Distributors, Photogrammetry, Natural Resources, Environmental Group, Engineering, Educational Institution and other.

Fourteen Federal Government agencies responded to the survey. The actual numbers of responses per State/Territory for State-, Local Government and All Other agencies are shown above in Table 3.2 and below in Figure 3.6.

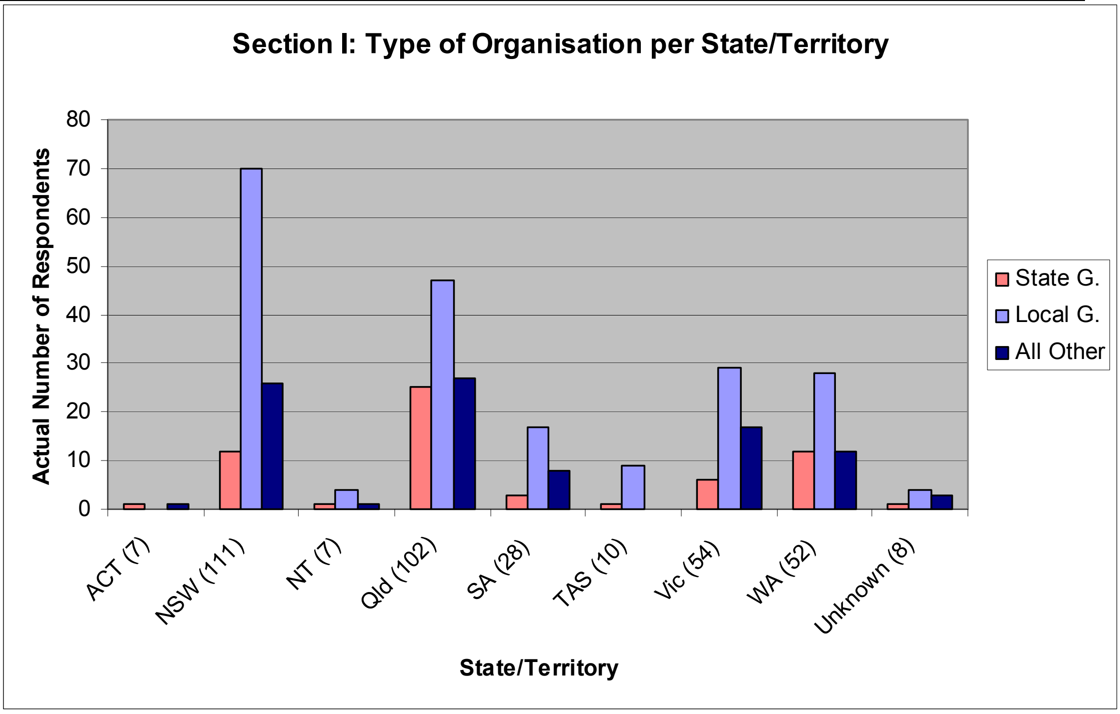


Figure 3.6: Type of Organisation per State/Territory

As Figure 3.6 points out the majority of responses are from NSW followed by Queensland, Victoria, Western Australia, South Australia, and finally ACT and NT.

Question 1: Please indicate if you use spatial data, or provide spatial data to others, or both.

- **2 groups – Local Government vs All other Organisations**

The answers to this question (Figure 3.7) indicated that 62% of the responding organisations were providers of spatial data and also users of another organisation's datasets. 27% were solely data users and 6% were solely data providers.

When splitting the above responses into the sub-groups of ‘Local Government Departments’ and ‘All Other Organisations’, local government departments made up 30% for both, 20% for users and 1% for providers. In the ‘All Other Organisations’ sub-group the corresponding percentages were 32%, 7% and 5% respectively. These figures clearly show that among the responding organisations there were more organisations that were both a provider and a user of spatial data, than organisations that were purely spatial data providers or just users.

To enable a direct comparison between both subgroups, the respondent numbers for each subgroup were assumed to equal 100%. It was somewhat surprising to see that the 'Local Government Departments' sub-group was a slightly bigger user group (92% compared to 86%, see Appendix 2.1, p.1) and a significantly smaller provider group (56% compared to 82%) than the 'All Other Organisations' sub-group. These figures imply that not as many local government departments distribute their own spatial datasets to outsiders, compared with other kinds of organisations. However, half of the 'All Other Organisations' spatial data provider sub-group are Federal and State Government Departments, this is part of the reason why this sub-group is a bigger spatial data provider group than the 'Local Government Departments' sub-group.

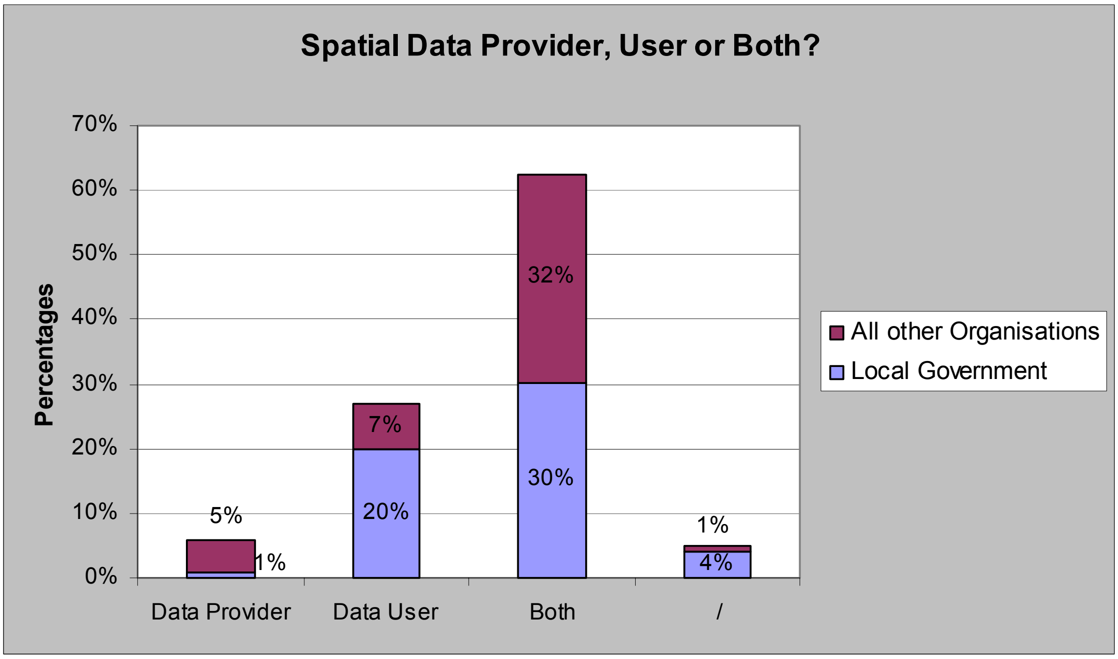


Figure 3.7: Spatial Data Provider, User or Both?

- **4 groups – State, Local Government & All Other Organisations per State/Territory and Federal Government**

All fourteen Federal Government organisations are both - Data Providers and Data Users.

When comparing the different responses among State Governments, it can be noted that the majority are both providers and users. However Tasmania, NSW and SA differ. It is difficult to draw conclusions from Tasmania's and SA's responses, because only one and three State Government Departments respectively answered the Survey. The trend in NSW clearly differs. Half of the 12 organisations are both data users and providers, 3 are data providers and the remaining 3 are data users (Figure 3.1).

Local Government trends are more mixed with 5 out of 7 State/Territories responding that more of their departments are '*Both*' with percentages varying between 67% for NSW down to 50% for NT. Next the '*Data Users*' box received 41% of ticks for Victoria down to 22% for Tasmania. Last, the solely '*Data Providers*' group is overall very small with only 3 out of 208 organisations being only data providers and not users. The results for the other 2 out of 7 States, SA and WA are very similar. SA's results show that 53% are '*Users*', 41% are '*Both*', and 6% did not answer. For WA 54% are '*Users*', 39% are '*Both*' and 7% did not answer (Figure 3.2).

Responses of all other organisations indicated that the majority are '*Both*', however Victoria and NT are different. 47% of Victoria's 'All other Organisations' said they are '*Data Users*', 35% are '*Both*', and 12% '*Data Providers*', and 6% did not answer. NT cannot be taken into account, because only 1 'All other Organisation' answered the survey (Figure 3.3).

In summary the main points that can be drawn from the answers to this question are that Federal Government Departments are '*Both*', data providers and users. The majority of State, Local Government and All other Departments are also '*Both*', data providers and users, with 79%, 55% and 62% respectively. The main differences between those three types of departments are that Local Government Departments are a bigger User Group than 'All other Organisations' or State Government Departments with percentages of 37%, 22%, and 8% respectively. They are a smaller provider group than both the other groups with percentages of 1% compared to 13%, and 11% respectively. This agrees with the results given above under the heading '2 groups – Local Government vs All other Organisations'. The actual respondent numbers plus their percentages for Question 1 appear above in Tables 3.5, 3.6 and 3.7. Figures 3.1, 3.2, 3.3 and 3.4 are the corresponding graphs.

Question 2: Does your Organisation use Geographic Information Systems (GIS)?

- **2 groups – Local Government vs All other Organisations**

From an analysis of the responses it was clear that a relatively high proportion of organisations use GIS technology. In Figure 3.8, out of the 379 respondents 76% used a GIS while 23% did not. The proportions were similar within the two sub-groups.

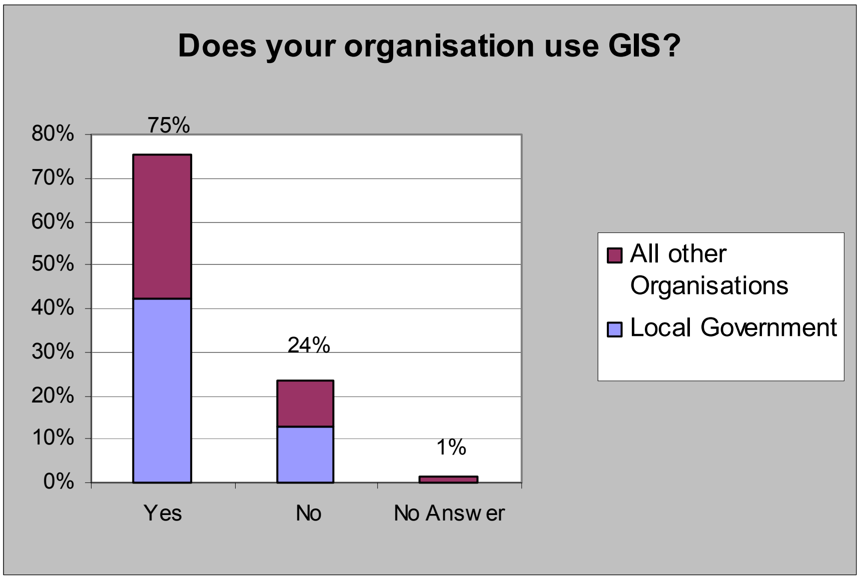


Figure 3.8: Organisations using GIS

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

Although only 14 Federal Government Agencies answered this survey they all use a GIS.

State Government agencies gave similar answers. The following State respondents answered '*Yes*' (100%) to using GIS: ACT, NSW, NT, Tas, and WA. For Qld 84% of the 25 respondents use a GIS, while 12% do not and 4% did not answer this question. The numbers of responses from South Australia were small with 2 organisations stating they use GIS and one does not. Six State Government agencies from Victoria answered this question with five agencies using GIS and one not using GIS.

Local Government agency responses were quite different to State Government agencies. The majority of responses for 6 out of 7 State's (No ACT Local Govt answered this survey) use GIS, the highest % being in Qld and the lowest in WA. The percentages that follow are the individual State/Territory (‘*Yes*’, ‘*No*’) number of responses. Qld (89%, 11%), NSW (86%, 14%), Tas (78%, 22%), Vic (76%, 24%), SA (65%, 35%) and WA (54%, 46%). Three Local Government respondents from the Northern Territory answered No, while only 1 answered Yes.

For responses of ‘All other organisations’ there is only a clear trend in NSW, Qld, Vic, and WA. The percentages that follow the individual States are in the following order (Yes, No, No Answer). WA (83%, 17%) NSW (58%, 35%, 8%), Vic (53%, 41%, 6%) Qld (52%, 44%, 4%).

In summary there are more Federal and State Government agencies using GIS than Local Governments and All other organisations on a percentile basis. All 14 Federal Government agencies use GIS. 89% of State Governments use GIS compared to 77% of Local Government Agencies and only 59% of ‘All other Organisations’. The main variation amongst State Government departments is that in most States the agencies use GIS (100%), while for Qld 84% do. Around 75% of most Local Government Departments use GIS, with the main outlier being WA, where only 54% use GIS.

Question 2A: If your organisation does use GIS, how many people are working with the GIS?

The histogram in Figure 3.9 shows that there was a strong tendency for organisations employing less than 10 people to use GIS technology, but there were some organisations with large numbers of employees using GIS technology. It should be noted that no differentiation was made between the type of GIS users, such as whether they are expert users or not. Hence it is not possible to know what tasks are being performed using the GIS, eg front counter display or complex analysis.

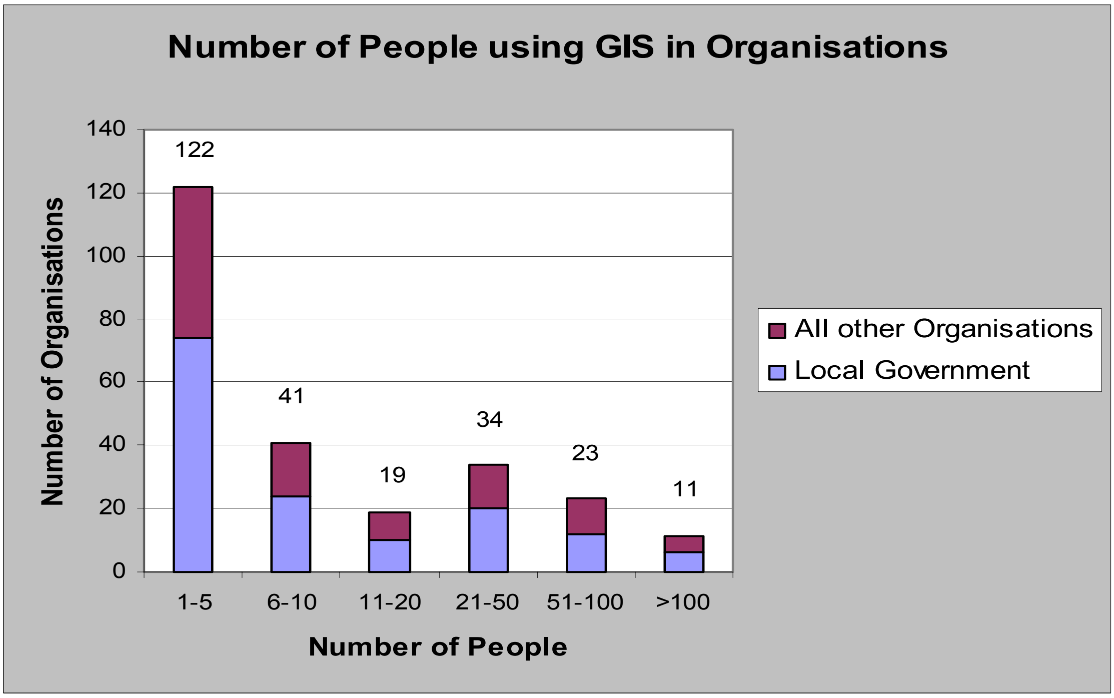


Figure 3.9: Number of People using GIS in Organisations

Question 3: Does your organisation use a Trade Mark?

Question 3A: If yes, did you register that Trade Mark?

Question 4: Did you register your business name?

The answers to these questions were either inconsistent or unknown to the respondent and hence not included in the analysis. No problems were identified when the pilot group answered these questions; hence they were left in the final questionnaire. These questions originally aimed to determine general intellectual property protection used within an organisation, but it was later found to be unimportant for this thesis.

Question 5: Are you aware of any liability cases that arose from spatial data applications (eg. provision of inaccurate data)?

Only 10% of responding organisations were aware of legal liability cases, while 86% were not (4% did not answer this question). Originally, the aim was to extend this question to determine what problems and/or liability issues respondents had encountered within their own organisation. A question similar to this was included in the draft survey questionnaire, but because of confidentiality issues the results of the pilot study group suggested that this question should be deleted.

3.4 Spatial Data Providers (Section II)

- **2 groups – Local Government vs All other Organisations**

258 respondents answered section II of the questionnaire. 117 (=45%) of these were local government departments and 141 (=55%) were from the 'All Other Organisations' sub-group.

The breakdown of the participating organisations for section 2 is shown in Figure 3.10:

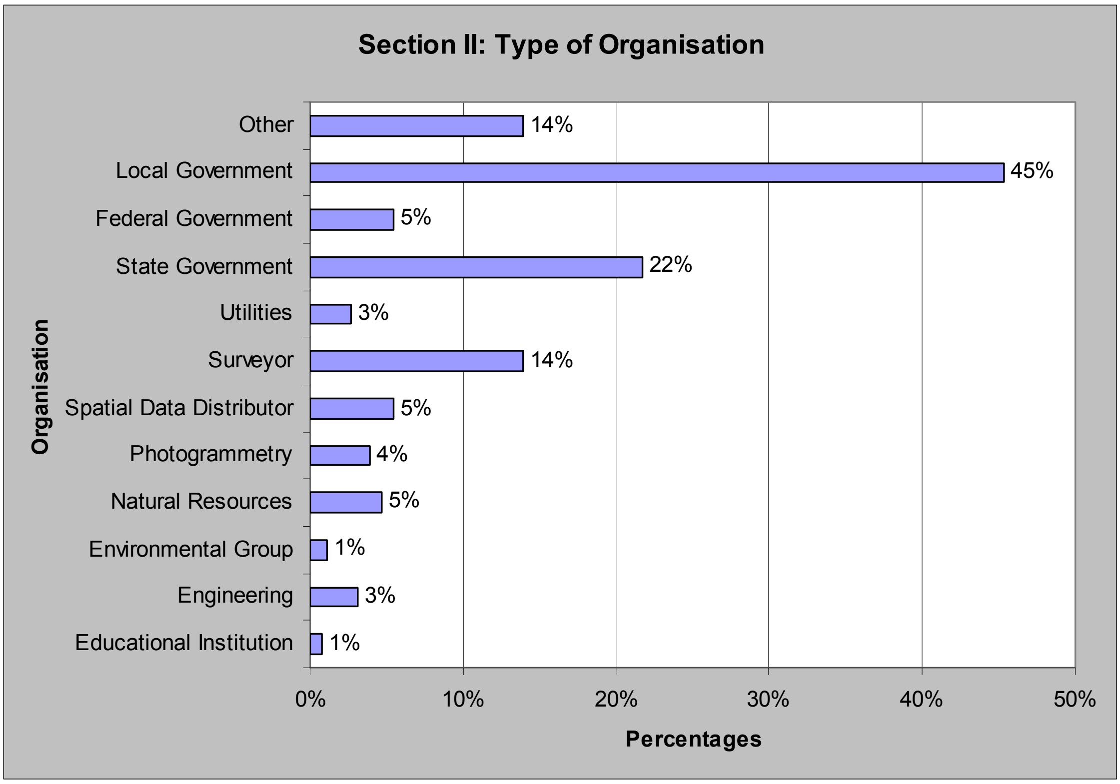


Figure 3.10: Type of Organisation

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

When dividing the above 2 groups into 4 and separating the responses into States/Territories, the types of organisations and the number of responses can be seen in Table 3.3 and Figure 3.11. Because so many States or Territories have less than 10 respondents they were not used in the detailed analysis, except in overall summaries. The only States used were NSW, Qld, Vic, and WA.

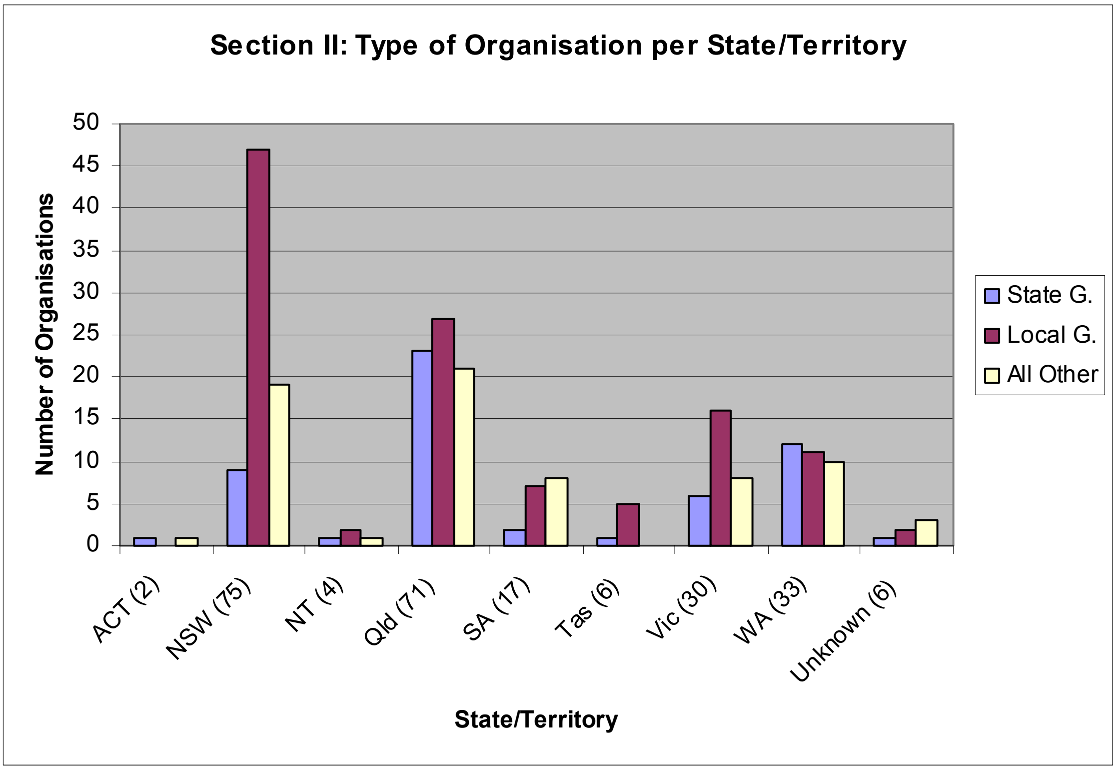


Figure 3.11: Type of Organisation per State/Territory

3.4.1 Data Quality

Data quality in the context of the questionnaire is not so much the actual quality of data, such as data accuracy, but rather whether the data provider provides such additional information with the dataset.

Question 1: What additional information do you provide with your spatial datasets you supply to others?

This question was aimed at finding out how many organisations supply information about their data, for example information about the accuracy of a dataset, or even whether they are aware of what metadata is?

- **2 groups – Local Government vs All other Organisations**

The most common form of additional information provided to users was a '*disclaimer*', followed by '*accuracy*' and then '*metadata*' (Figure 3.12). However there was a very strong tendency towards using different additional information for different datasets. It was interesting to see that '*metadata*' was the second most commonly used quality item among 'All Other Organisations', while for local government departments it was in fifth place while '*nothing*' (no additional information) was in second place. Many of the responding organisations were therefore aware of metadata and were supplying it. However, from the results of the survey it was not clear whether people were able to differentiate between various kinds of quality information and other metadata, or whether they ticked metadata because of the metadata explanation note below the question. (The note read: 'Metadata = information about data, for example when was the data created, by whom, its accuracy and reliability. Metadata aims to provide a standard that enables a consistent way to describe the content and fitness for use of a dataset').

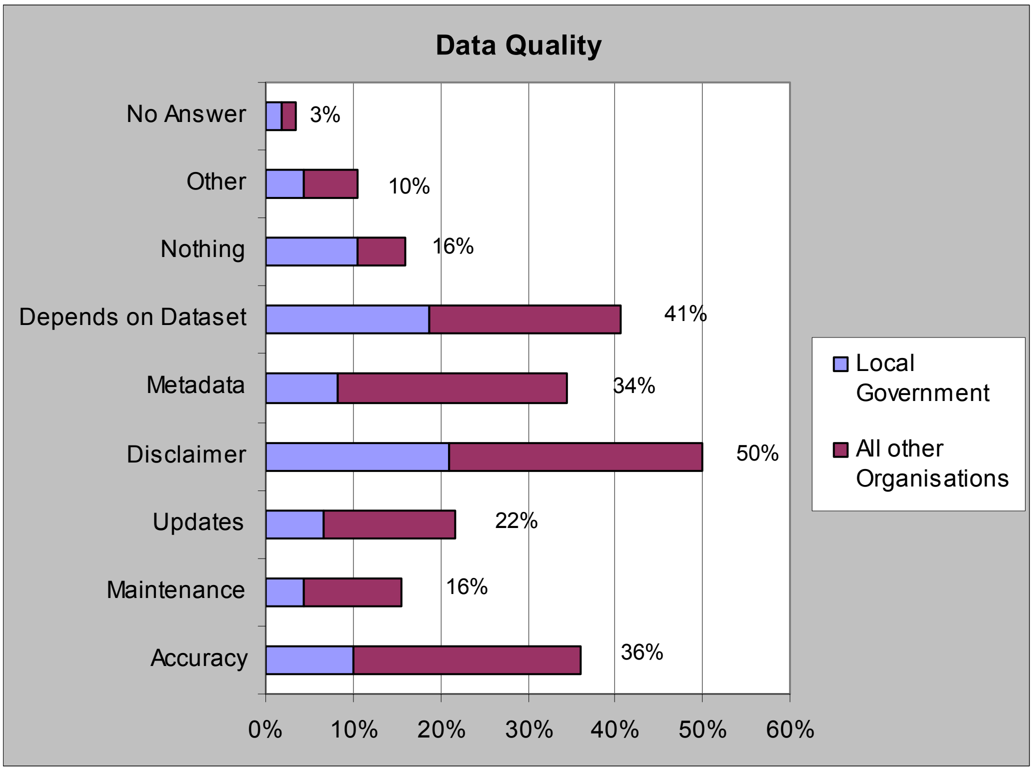


Figure 3.12: Data Quality

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

No trends could be found when comparing the 4 different groups (see Appendix 2, p.2 and 3). Figure 3.13 shows all groups combined with actual numbers of respondents per State/Territory below. When comparing the States with more than 10 respondents (NSW, Qld, SA, Vic, WA) the main differences are as follows. WA emphasises the provision of maintenance with their datasets, while NSW has maintenance as one of its lower priorities. The order of priorities in Qld in providing additional information with their dataset is '*Disclaimer*', '*Accuracy*', '*Maintenance*' and '*Depends on the individual Dataset*'. In NSW '*Disclaimer*' is the most common, followed by '*Depends on individual Dataset*', and then '*Accuracy*'.

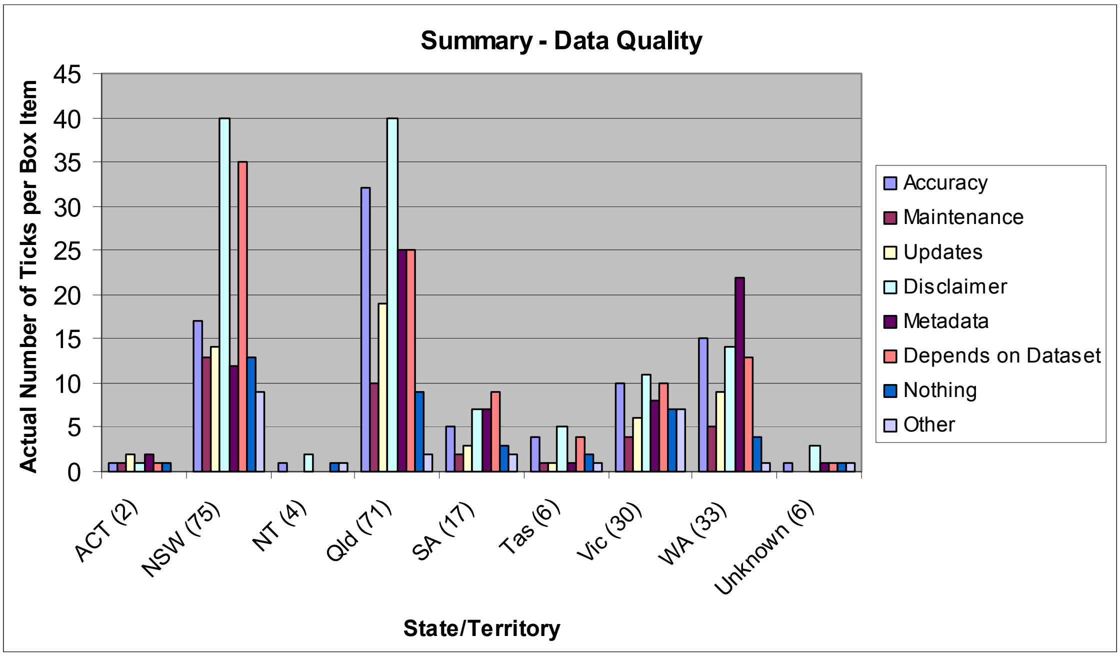


Figure 3.13: Additional information provided with dataset

3.4.2 Data Access & Cost

Question 1: How do you provide access to your spatial datasets? (Hardcopy or Digital)

It was interesting to note that even with the rapid adoption of technology, the most common way to access spatial data was still as '*hardcopy over the counter or by mail*'

(83%), followed by having the data stored on '*floppy disk*' (60%), '*e-mailed*' (48%), or stored on a '*CD-Rom*' (46%) (see Appendix 2, p.4). There were however some organisations that commented on wishing to implement 'downloading' and '*viewing only*' via the World Wide Web (WWW) in the near future.

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

Some trends could be observed between the 4 different groups. For example, 11 out of the 14 Federal government departments provided data on '*CD-Rom*', followed by 10 each by '*e-mail*' and '*floppy disc*' and 9 by '*hardcopy*' (Figure 3.14). Figure 3.15 shows that for NSW, Qld, SA, Vic, and WA a similar pattern applies as noted above within the 2 groups. Therefore the demand for digital spatial data from a federal government agency must be greater than from other sources.

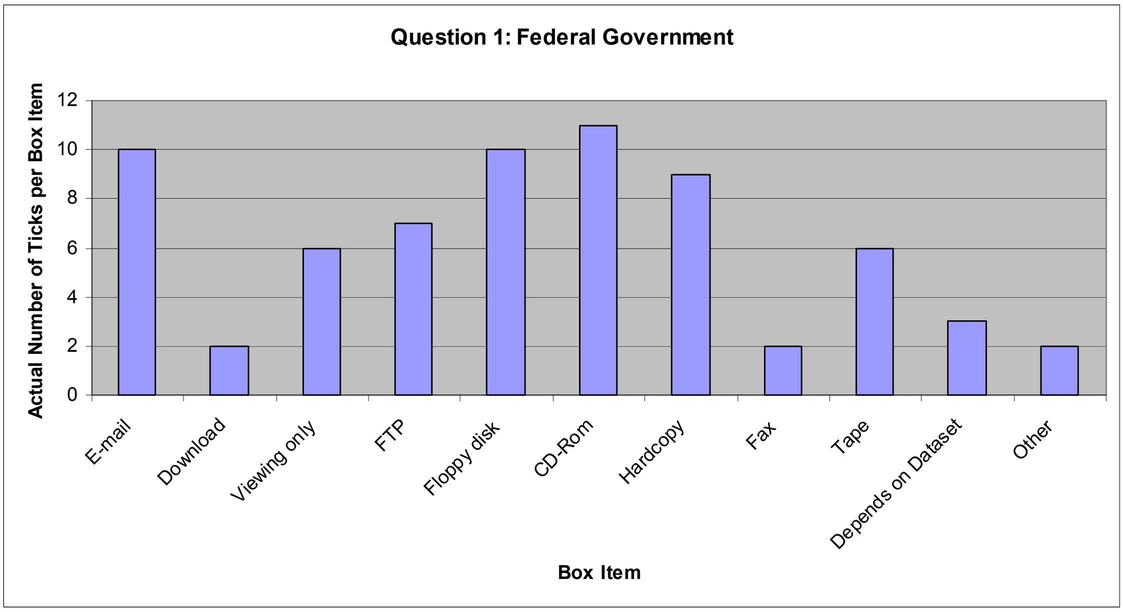


Figure 3.14: Data Access (Federal Government)

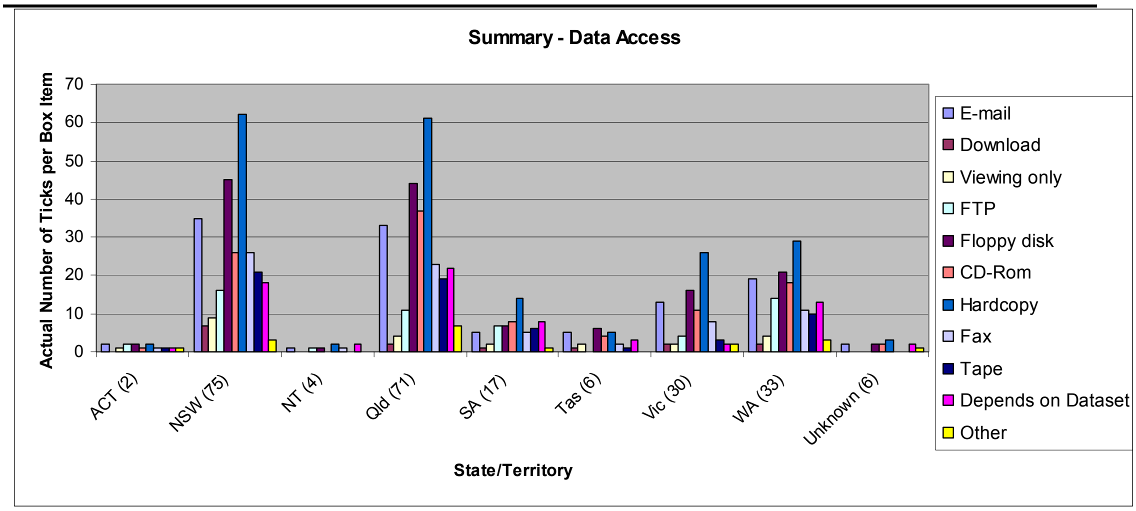


Figure 3.15: Data Access

Question 2: On what basis do you attempt to recover the cost of your various spatial datasets?

43% of all respondents were recovering the cost of supply of their spatial datasets, followed by 26% that did not try to recover their costs at all. However 34% said that their basis for charging varied depending on the dataset itself (Figure 3.16).

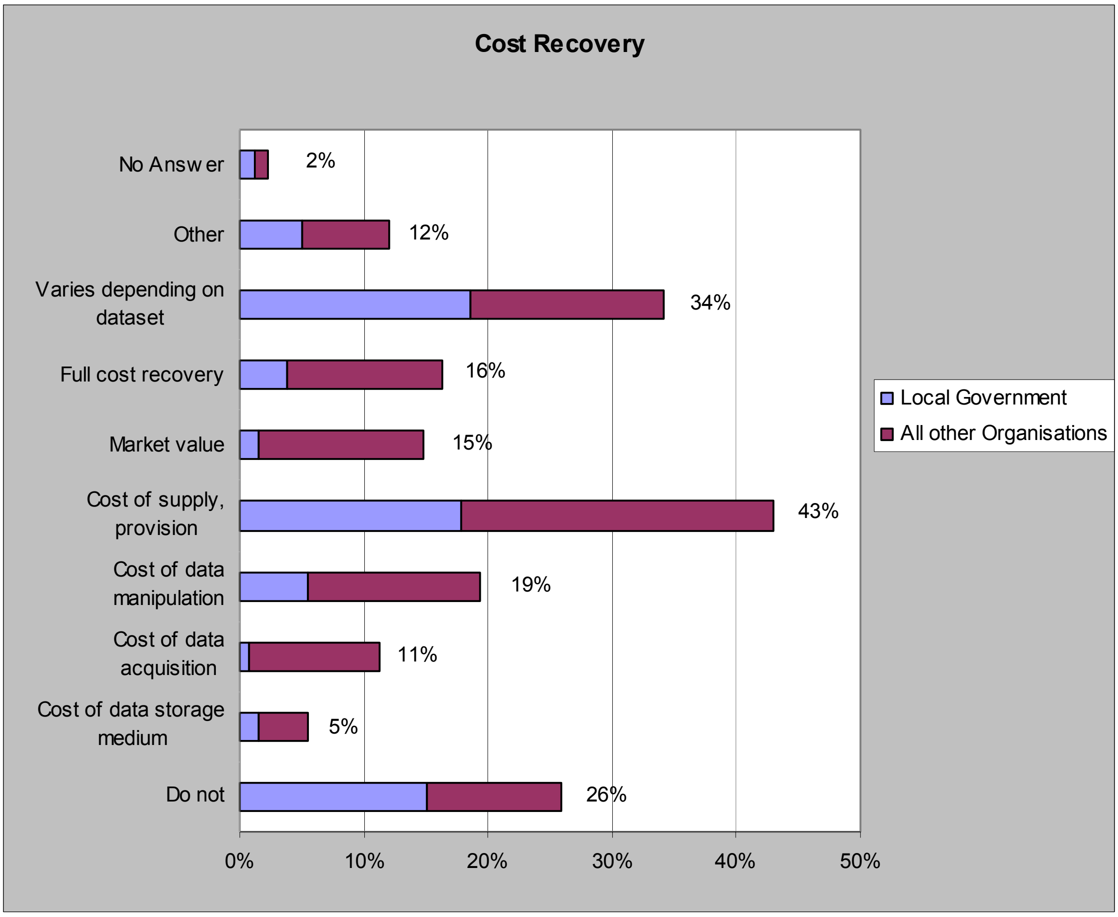


Figure 3.16: Cost Recovery

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

Out of the 14 Federal Government Departments, 8 specified they '*Do not*' charge, and 5 charge for the 'Cost of supply, provision'. However 4 specified the charge depended on the individual dataset.

Among the State Government Departments the main charge is '*Cost of supply, provision*'.

Local Government respondents indicated that for NSW and Qld the main charge is for '*Cost of supply, provision*' (47%, 41%) then '*Varies depending on dataset*' (45%, 37%) and then '*Do not charge*' (26%, 30%). For Vic it is firstly '*Do not charge*' (50%), followed by '*Cost of supply, provision*' (25%), and then '*Varies depending on dataset*' (19%). In WA most respondents indicated that their charging '*Varies depending on dataset*' (55%) followed by '*Do not*' (36%) and then '*Cost of supply, provision*' (18%).

In the All other organisations sub-group the main charges are '*Cost of supply, provision*' plus '*Full cost recovery*'.

In summary (Figure 3.17) all three graphs for NSW, Qld and WA look similar with '*Cost of supply, provision*' being the most commonly used approach to charging followed by '*Depends on dataset*' and then '*Do not charge*'. In NSW, '*Do not charge*' was chosen before '*Cost of data manipulation*'. Vic varies in that most respondents ticked '*Do not charge*' followed by '*Cost of supply, provision*' and then '*Depends on dataset*'.

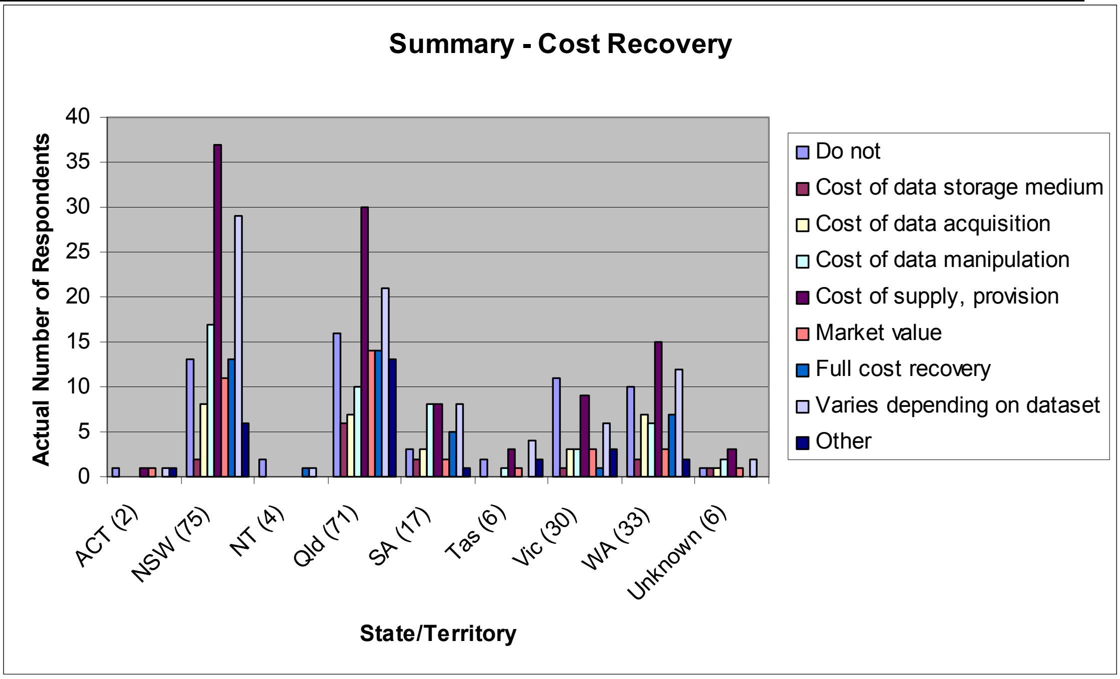


Figure 3.17: Cost recovery per State/Territory

Question 3: What unit price do you charge for your spatial datasets?

The highest number of respondents (34%) indicated that they charged for supplying data on the basis of an '*hourly rate*' for the labour involved, followed by 33% that said they charged '*per mapsheet*'. For 29% the unit price charged also depended on the individual dataset. A similar pattern applied to the 'All Other Organisations' sub-group, where an '*hourly rate*' was charged by 22%, followed by the dependence of unit price on individual datasets (17%). 15% answered that their unit price was charged '*per mapsheet*'. In the 'Local Government Departments' sub-group, 17% of the responding organisations charged '*per mapsheet*', followed by 14% that did not charge at all and then by 13% that charged on the basis of an '*hourly rate*' for the labour involved (Figure 3.18).

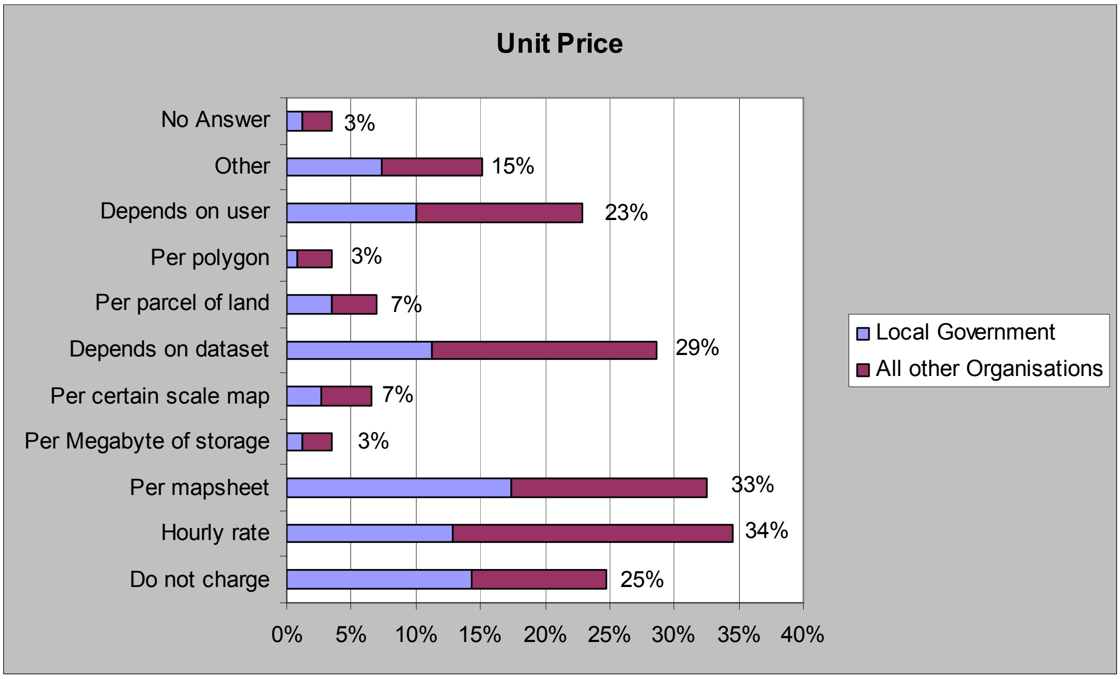


Figure 3.18: Unit Price

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

Out of the 14 Federal Government Departments, 8 specified they '*Do not charge*', and 5 charge '*Per mapsheet*', but 3 out of 14 specified the charge depended on the individual dataset.

Amongst State Government departments or Local Government departments there were no real trends.

3.4.3 Legal

Question 1: Do you use disclaimers? (e.g. Do not use the data other than as specified)

The majority of all respondents (64%) indicated that they used disclaimers, and about one third (34%) stated that they did not.

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

Out of the 14 Federal Government Departments 10 specified they do use disclaimers while 4 do not.

Within the other sub-groups more organisations (NSW, Qld, Vic, WA) specified they use disclaimers than not. The exception among State Government departments is Victoria that answered 50% for Yes and 50% for No. Interestingly, WA for the sub-group Local Governments has 8 out of 11 specifying they do not use disclaimers.

Question 2: Do you allow data users to distribute or sell your original datasets to others?

Question 3: Do you allow data users to distribute or sell your datasets that they added value to?

70% of all respondents said they did not allow data users to on-sell or distribute the original dataset. However when data users added value to those datasets, the number of respondents that did not allow users to distribute the '*original plus value added*' decreased to 52%.

Question 4: What legal forms of protection do you utilise to protect your intellectual property in your spatial datasets?

Overall it was most common not to use any form of legal protection (see Figure 3.19), followed by '*copyright*' and then '*licences*'. However since many respondents ticked more than one item, it can be assumed that the legal form of protection chosen depended on the individual dataset. More than half of all the local government departments responding indicated that they did not utilise any form of legal protection, followed by one quarter that relied on '*copyright*'. On the other hand, organisations in the 'All Other Organisations' sub-group relied more heavily on '*copyright*' protection (26%) followed by '*licences*' and no protection at all (each 20%) (see Appendix 2, p.9).

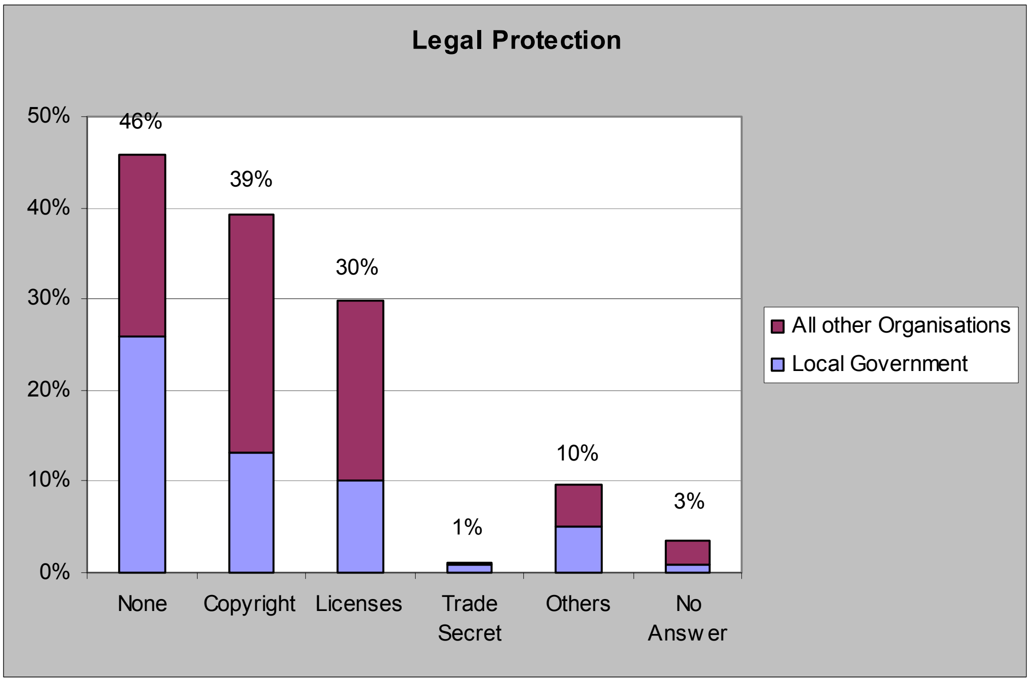


Figure 3.19: Legal Protection used for Intellectual Property

(Note: More than one legal protection item was ticked on average and hence the total percentages add up to more than 100%)

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

Out of the 14 Federal Government Departments 8 specified they use Copyright and/or Licences. 3 departments ticked '*None*' or '*Others*'.

State Government Departments for NSW and Qld specified they most commonly use '*Copyright'*, then '*Licences'* and '*Nothing'*. Vic and WA differ. In Vic the highest number of respondents indicated they use '*Nothing'* followed by *'Licences'* and then *'Copyright'*. In WA the highest number is for *'Licences'* then *'Copyright'* and then '*Nothing*' (Figure 3.20).

Among Local Government Departments many more respondents indicated they use '*Nothing*' to legally protect their datasets (Figure 3.21).

Within the All other Organisations sub-group there is no visible trend (see Appendix 2, p.11).

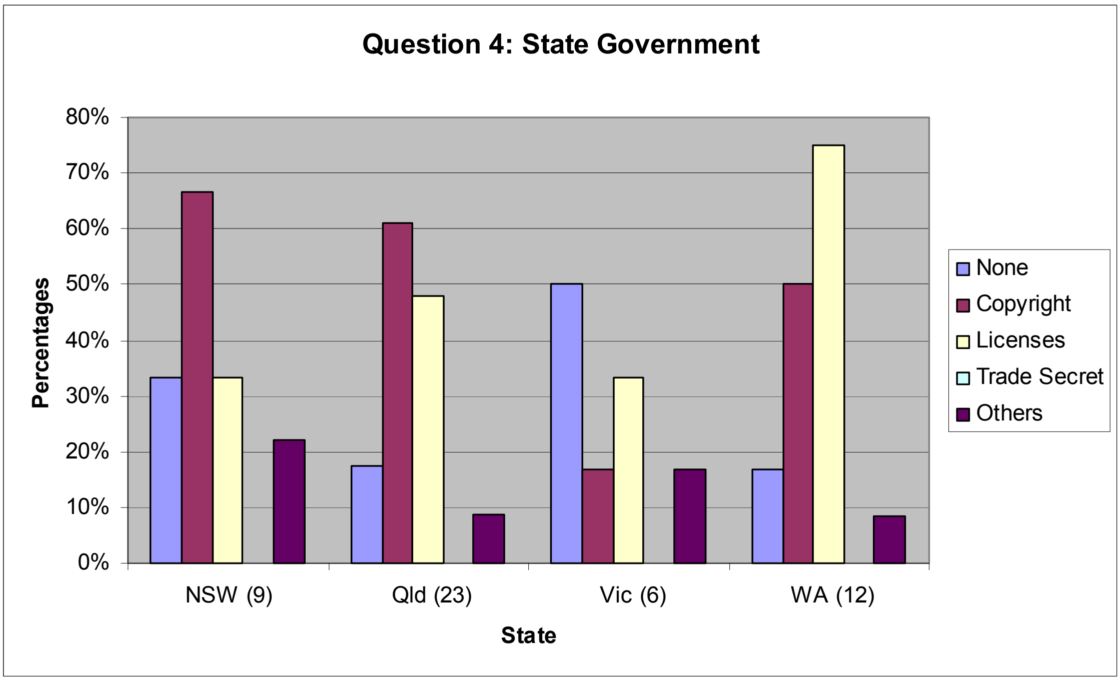


Figure 3.20: Legal Protections used by State Government Departments

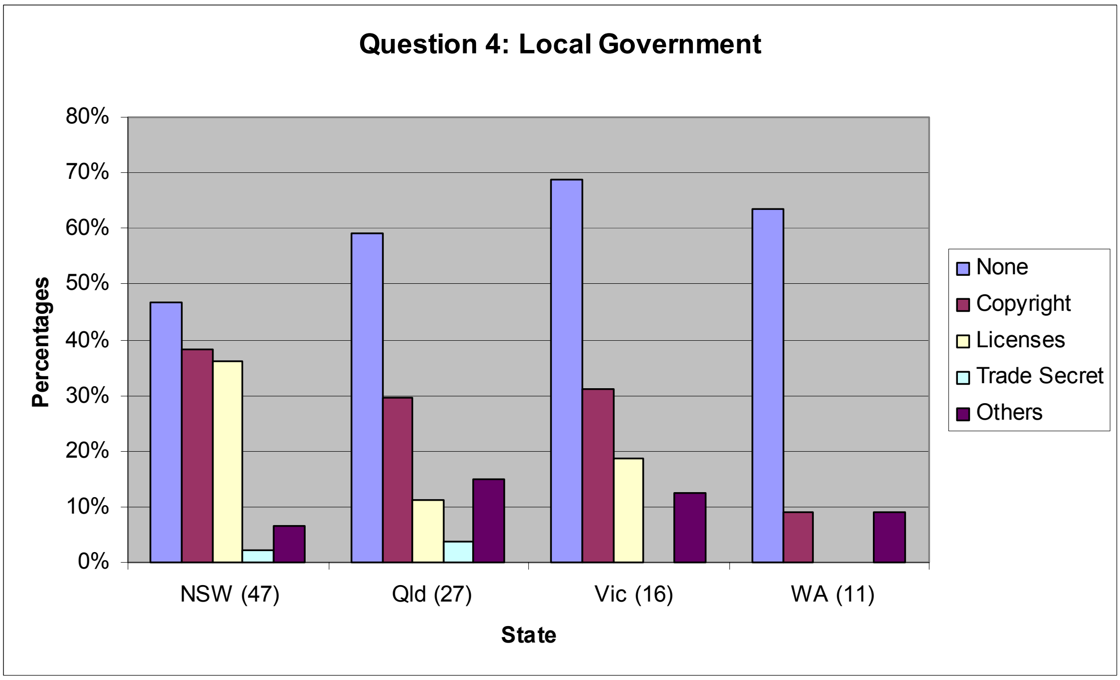


Figure 3.21: Legal Protections used by Local Government Departments

3.4.4 Philosophical / Technical

Question 1: What is your organisational philosophy in regards to your own intellectual property in spatial data?

This question was aimed at determining the kinds of philosophies (policies) that organisations have towards their spatial datasets as assets. Figure 3.22 shows that 50% answered that 'public good' was more important than revenue. However this trend may change, as some organisations commented that they were working on developing policies.

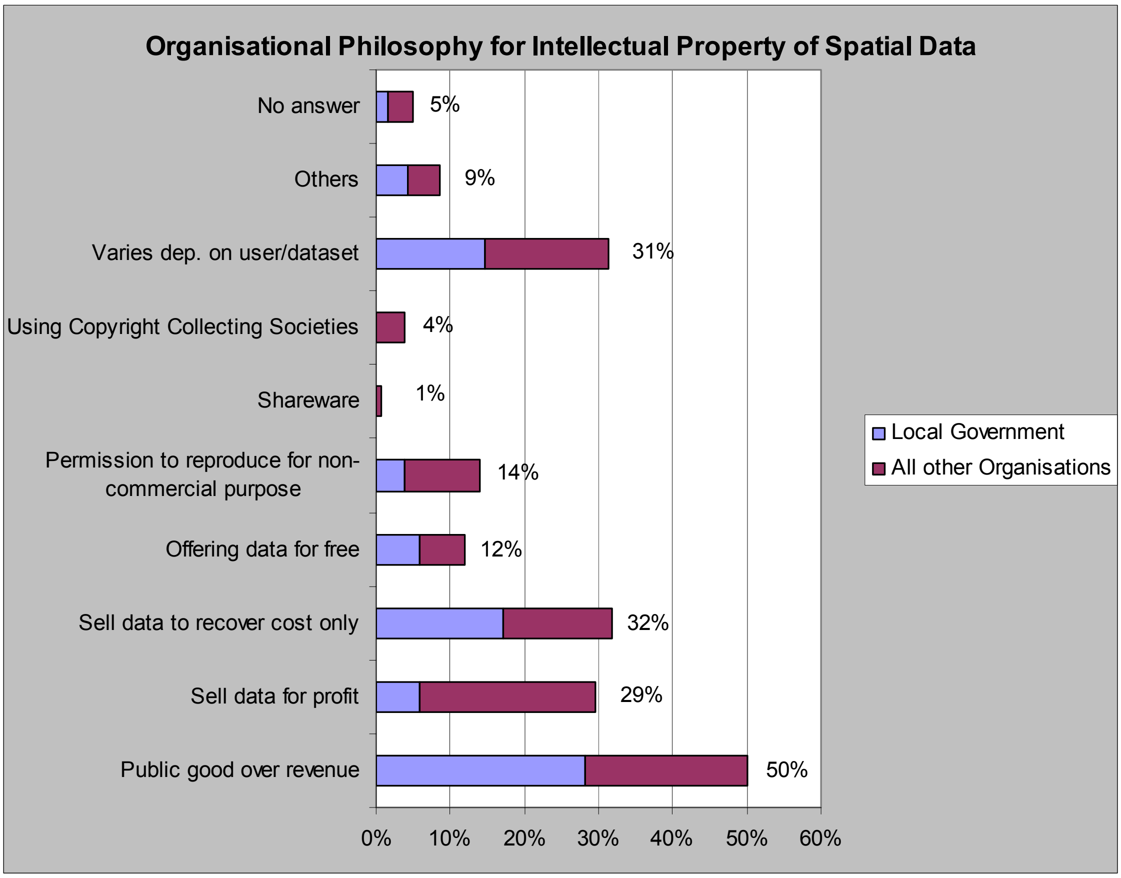


Figure 3.22: Intellectual Property Policy for Spatial Data

(Note: More than one item was ticked on average and hence the total percentages add up to more than 100%).

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

Out of the 14 Federal Government Departments 12 specified 'Public good' was more important than creating revenue.

For State Government Departments Qld, Vic, and WA had the largest number of ticks in '*Public good over revenue*', considerably more than for '*Selling data for profit*'. NSW on the other hand marked '*Sell data for profit*' (6/9). It was usually followed by '*Public good over revenue*' (5/9). However the number of respondents was only 9 (Figure 3.23).

Local Government Departments indicated that Public good was far more important than revenue. The second item selected was '*Sell data to recover cost only*' (Figure 3.24).

All other Organisations answers indicated 68% of all the respondents sell their data to make a profit (Figure 3.25).

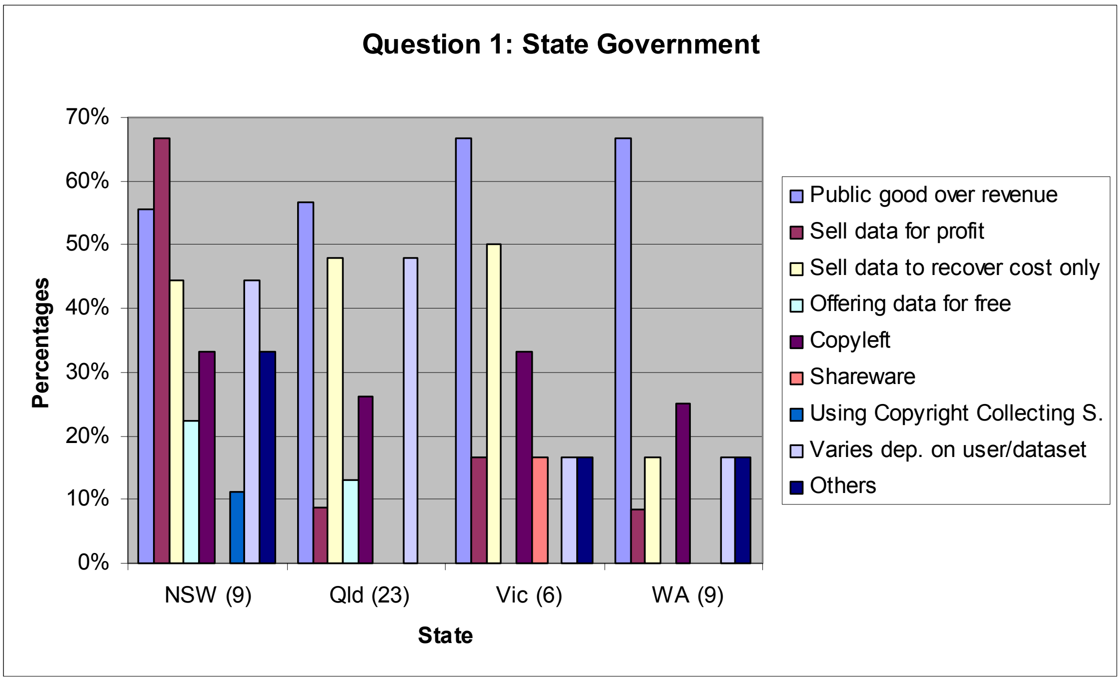


Figure 3.23: Organisational Philosophy for State Government Departments

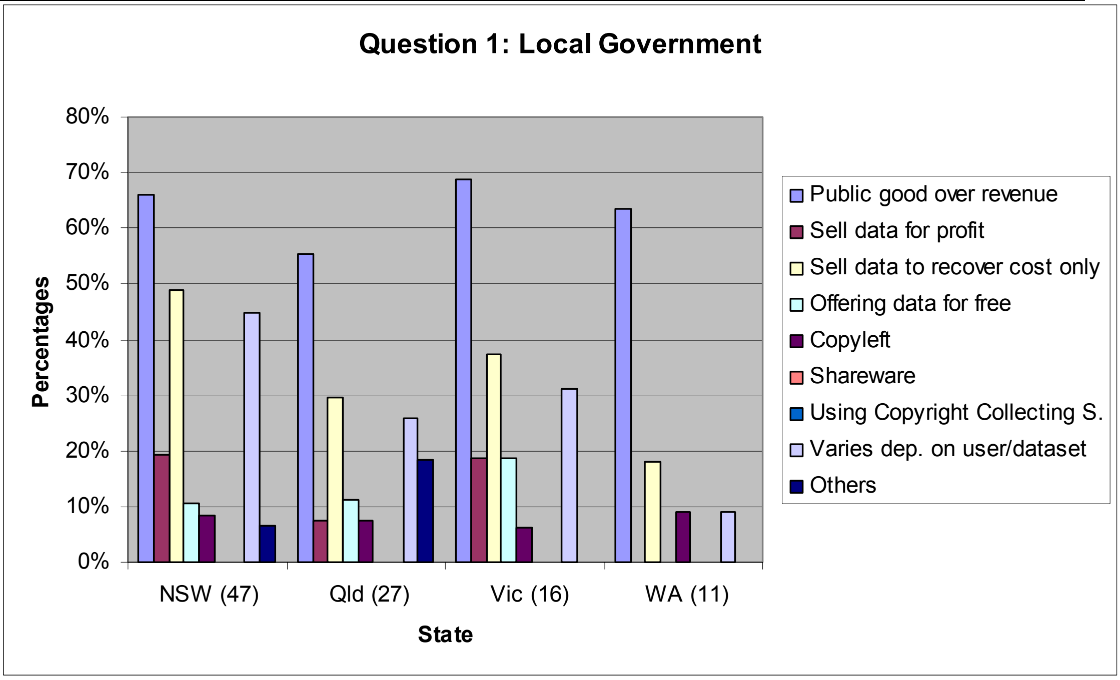


Figure 3.24: Organisational Philosophy for Local Government Departments

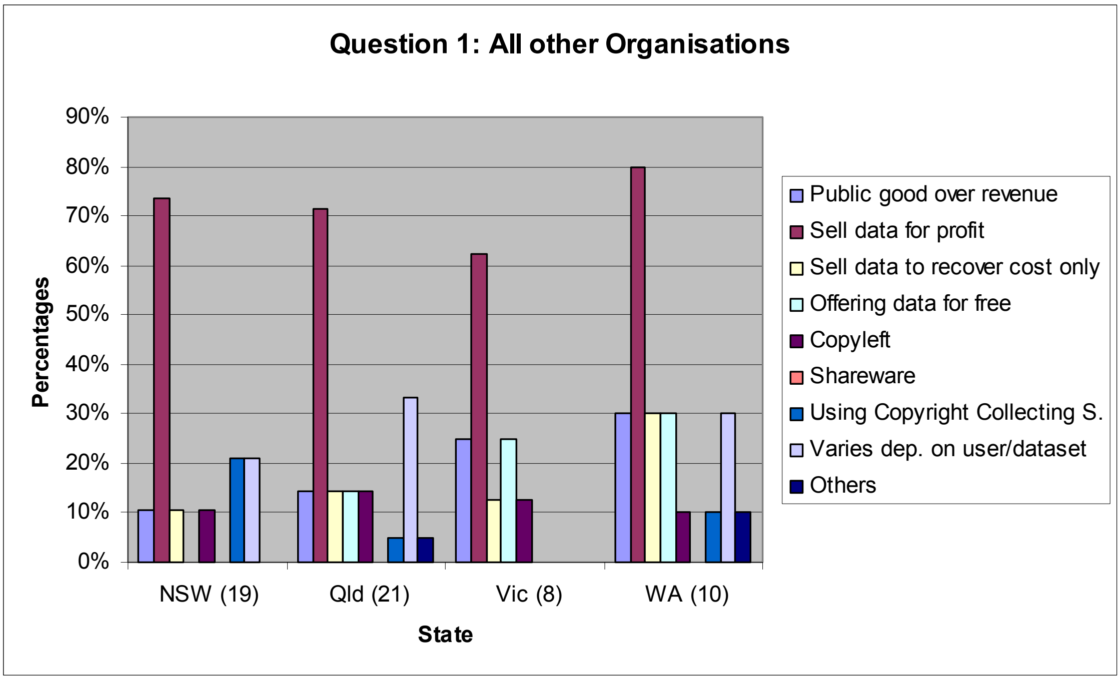


Figure 3.25: Organisational Philosophy for All other Organisations

Question 2: What technical form of protection do you use to protect your spatial data?

62% of all respondents were using no technical protection at all, followed by 21% using passwords.

3.5 Spatial Data Users (Section III)

- **2 groups – Local Government vs All other Organisations**

338 respondents answered this section III of the questionnaire. 190 (=56%) of those were local government departments and 148 (=44%) were in the 'All Other Organisations' sub-group.

The breakdown of the participating organisations for section III is shown in Figure 3.26:

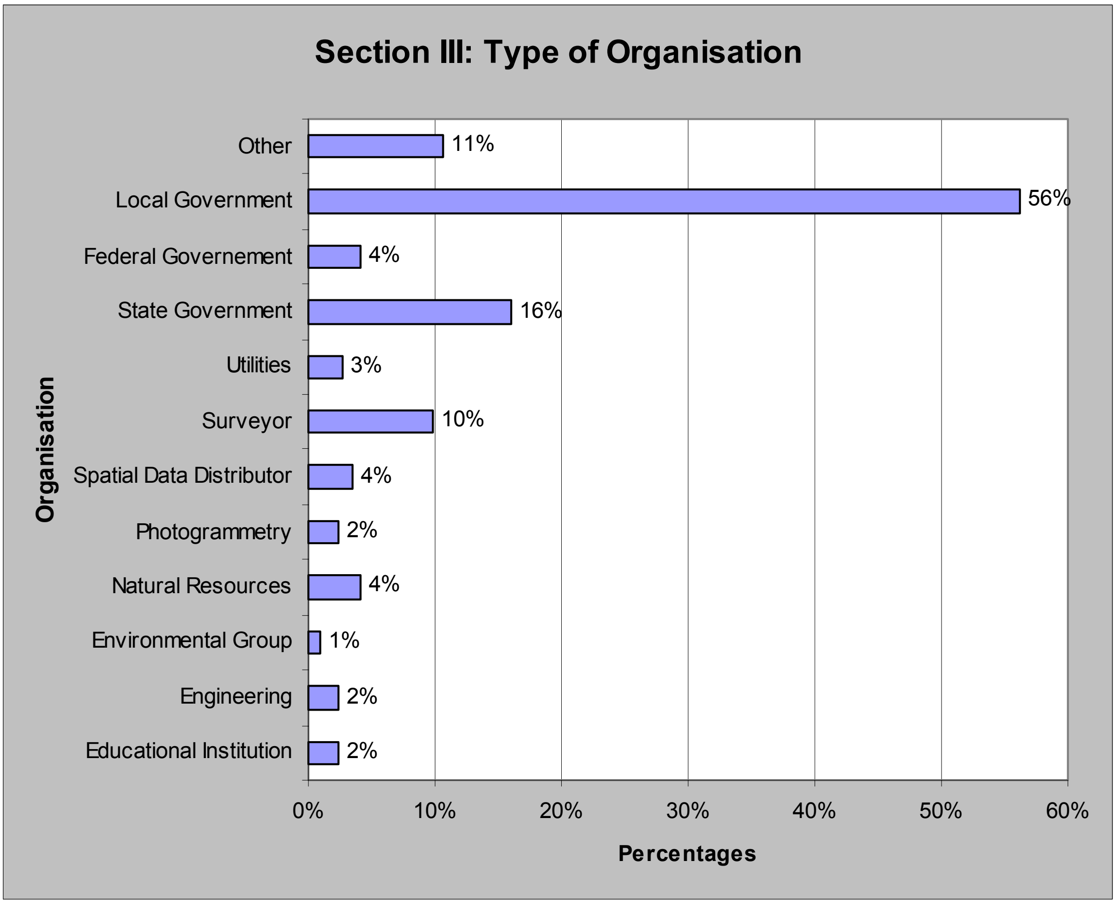


Figure 3.26: Section III – Type of Organisation

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

When dividing the above 2 groups for section III into 4 and separating the responses into States/Territories, the types of Organisations and the number of responses can be seen in Table 3.3 and Figure 3.27. Because so many States or Territories have less than 10 respondents they were not all used in the detailed analysis, except in overall summaries. The only States studied were NSW, Qld, Vic, and WA.

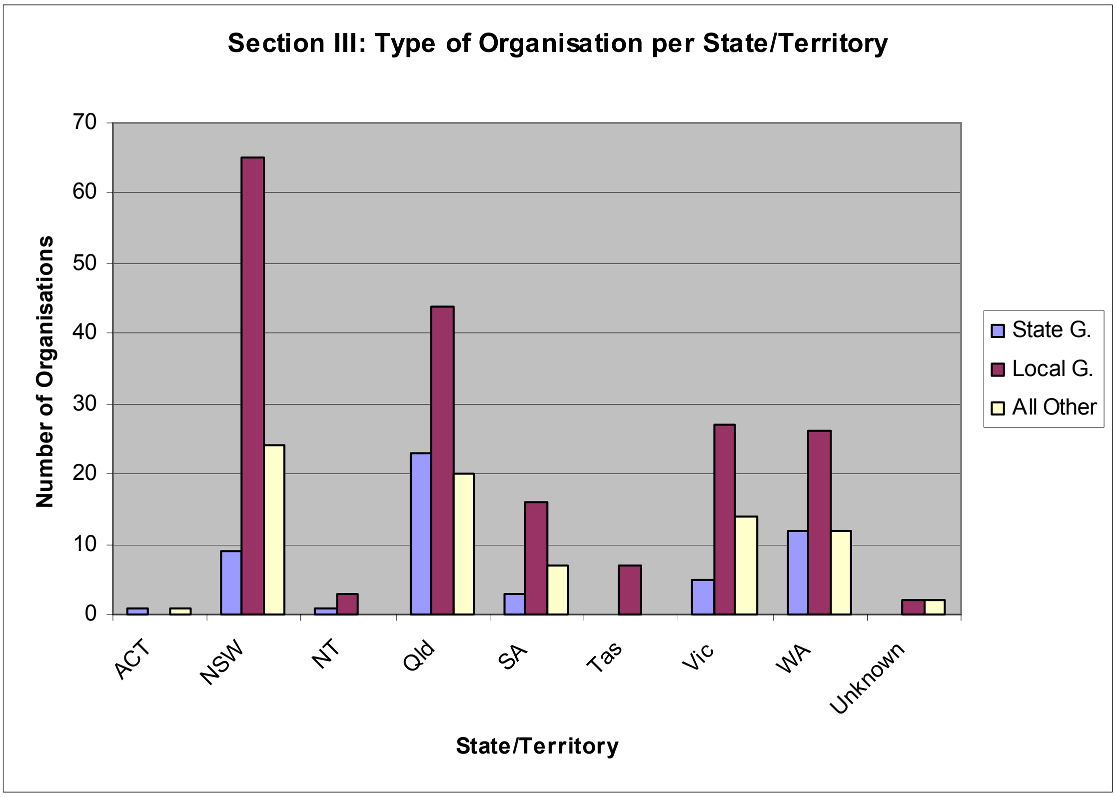


Figure 3.27: Section III – Type of Organisation per State/Territory

3.5.1 General

The questions for this part were addressed to data users and aimed to determine the type of data most commonly used and the data users' satisfaction with their acquired datasets.

Question 1: What type of spatial data do you acquire from other providers?

- **2 groups – Local Government vs All other Organisations**

Figure 3.28 shows that the most commonly used datasets by 76% of respondents were '*Property Boundaries*', and '*contours*' by 53%.

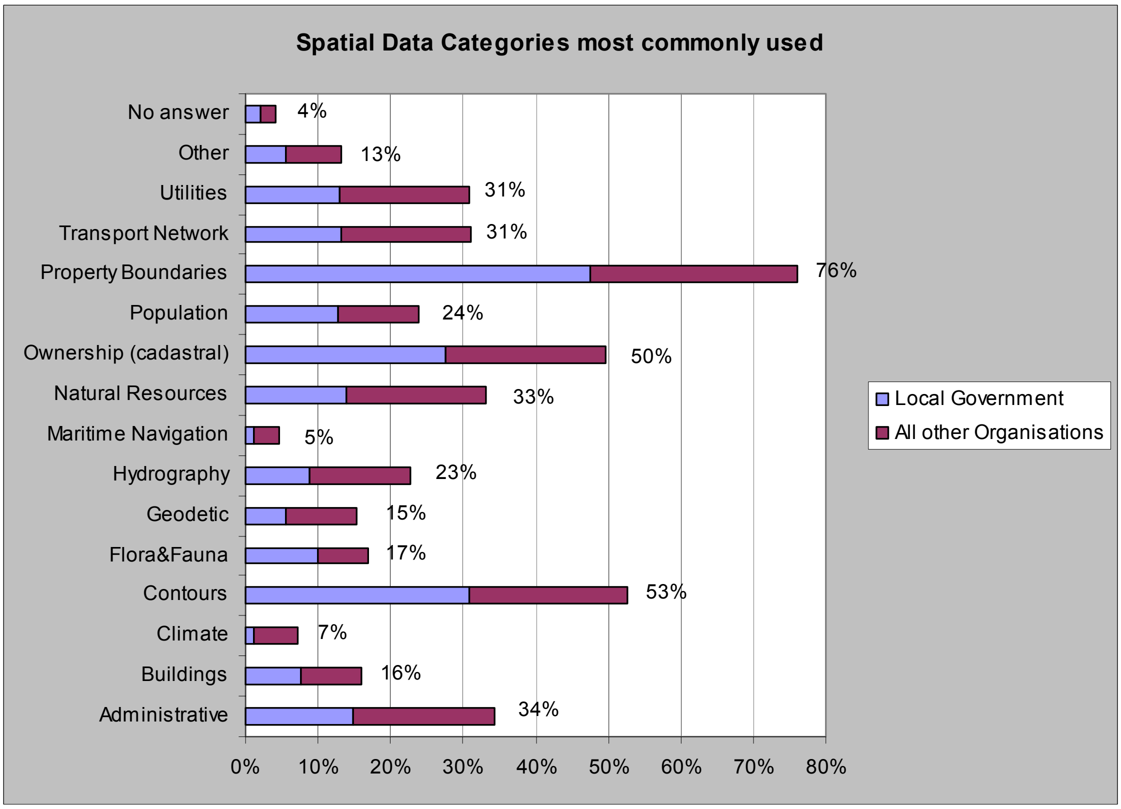


Figure 3.28: Spatial Data Categories most commonly used

(Note: More than one type of spatial data category was ticked on average and hence total percentages add up to more than 100%).

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

From the 14 Federal Government Departments, 11 use Hydrography, followed by 10 using Transport Network, and 8 Departments said they acquire Administrative Data, Contours, Natural Resources and Utilities.

The most commonly used dataset among State Government Departments are the '*Property boundaries*' (37, 69%) closely followed by '*Administrative data*' (36, 67%) and then '*Ownership (cadastral) data*' (32, 59%). The number in brackets is the actual number of responses followed by their percentage value. When we view the State's separately, a slightly different picture can be observed. Although NSW had only 9 organisations respond to this section, 8 ticked '*Administrative data*', with the next highest number of ticks being for '*Property Boundaries*' (4). For Qld 70% of the 23 respondents indicated they acquire '*Property Boundaries*' and 65% '*Administrative data*', closely followed by '*Ownership (cadastral) data*' (61%). 4 of the 5 Victorian Departments acquire '*Transport Network Data*', and in '*Western Australia*' the most number of ticks were for '*Ownership (cadastral)*' and '*Property Boundaries*' (both 11 out of 12). The next highest number of ticks was for '*Contours*' and '*Administrative data*' (each 10 out of 12) (Figure 3.29).

Among Local Government Departments the most commonly acquired datasets are the '*Property Boundaries*' followed by '*Contours*' (Figure 3.30).

For All other Organisations there is not such a clear picture, except that the most commonly acquired datasets are '*Property Boundaries*' and '*Contours*' (Figure 3.31).

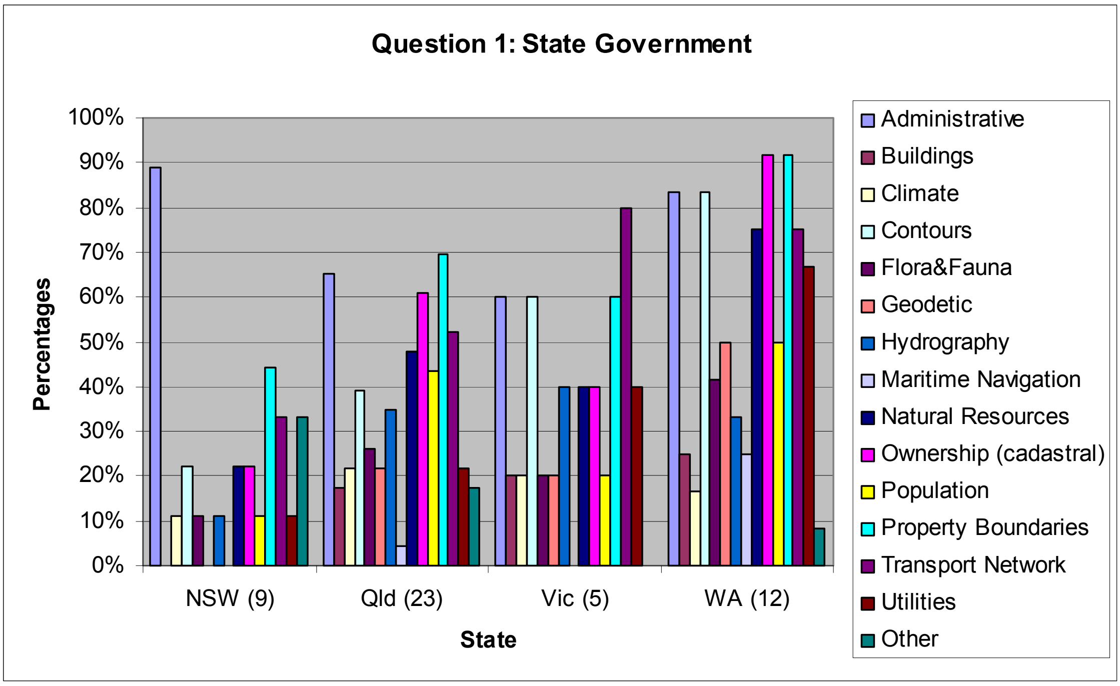


Figure 3.29: State Government - Spatial Data Categories most commonly used

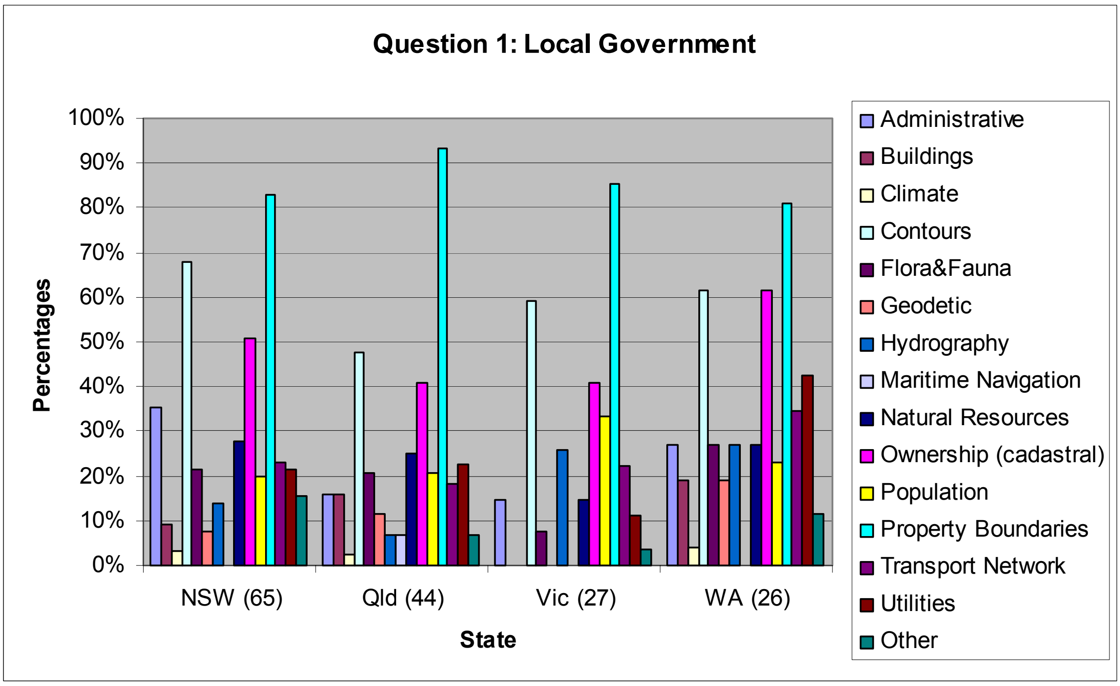


Figure 3.30: Local Government - Spatial Data Categories most commonly used

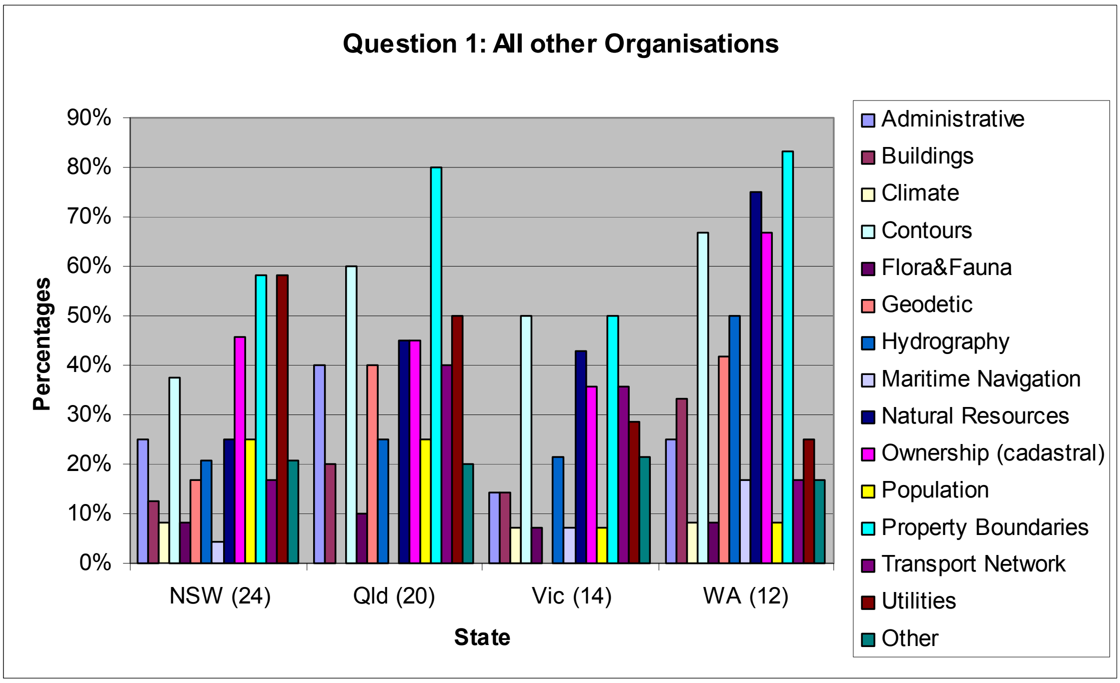


Figure 3.31: All other Organisations - Spatial Data Categories most commonly used

Question 2: How satisfied are you generally with provider's datasets?

34% were moderately satisfied, followed by 31% that were satisfied and 20% that were neutral. However, it is worth mentioning that 10% of users were moderately dissatisfied. Unfortunately, the survey did not seek to find out the reasons for any expressed dissatisfaction.

3.5.2 Data Quality

Question 1: Are the datasets you acquired from other data providers compatible with your own system without translation (eg. format)?

In Figure 3.32, 35% answered that the data providers' datasets were not compatible with their own system. However to most users this was not a major problem.

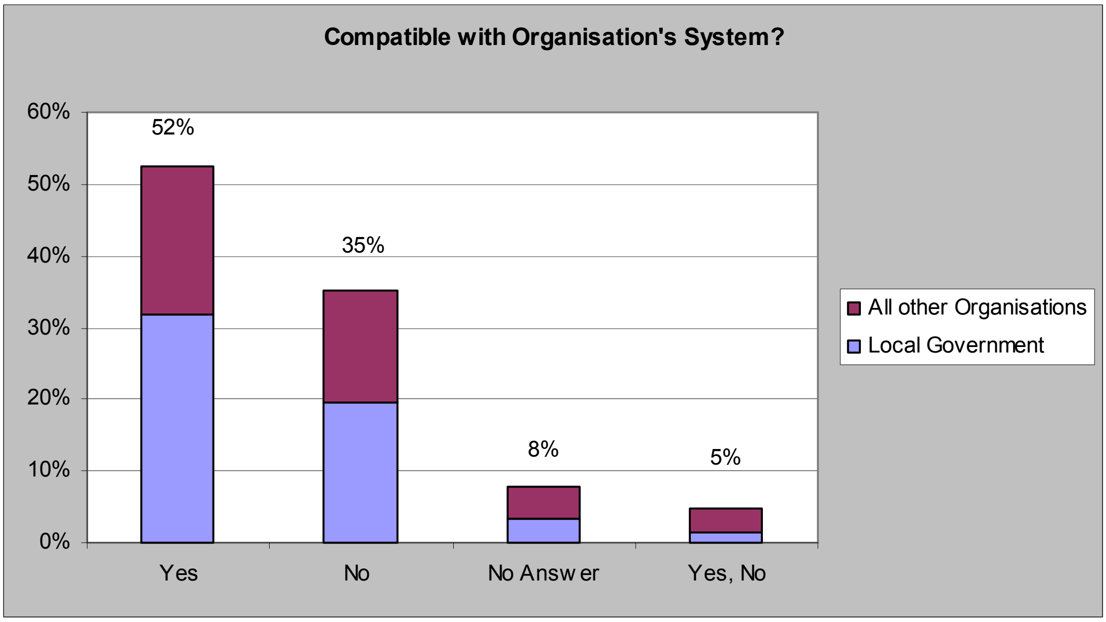


Figure 3.32: Datasets Compatibility with Organisation's System

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

The order among Federal Government Departments is different to the above. Out of 14 respondents, 8 said the dataset is not compatible with their own system, and 6 said it is.

From the 9 State Government Departments for NSW 5 said the dataset was compatible, and 4 said it was not. For Qld 57% out of 23 answered yes and 35% answered no. Vic and WA are the other way around. 3 out of 5 Victorian Government Departments answered no and 2 yes. In WA 75% out of 12 Departments answered no and 33% yes.

For all Local Government Departments the positive answers, that the datasets were compatible with their own system, outweighed the negative answers. For all Other Organisations a similar situation applies, except in Qld where there were more negative answers (50% out of 20) than positive (35%).

Question 2: Do data providers supply any of the following information with their dataset to you?

The following items were ticked: '*Disclaimers*' 38%, '*Updates*' 36%, '*Accuracy*' 30%, and '*Metadata*' 28%. When the overall group was divided into a 'Local Government Departments' sub-group and an 'All Other Organisations' sub-group, the percentages were: '*Updates*' 27%, '*Disclaimers*' 21%, '*Depends on dataset*' 16%, '*Accuracy*' 16%, for the 'Local Governments Departments' sub-group. For the 'All Other Organisations' sub-group: '*Depends on dataset*' 20%, '*Disclaimer*' 17%, '*Metadata*' 16%, and '*Accuracy*' 15% respectively (Figure 3.33).

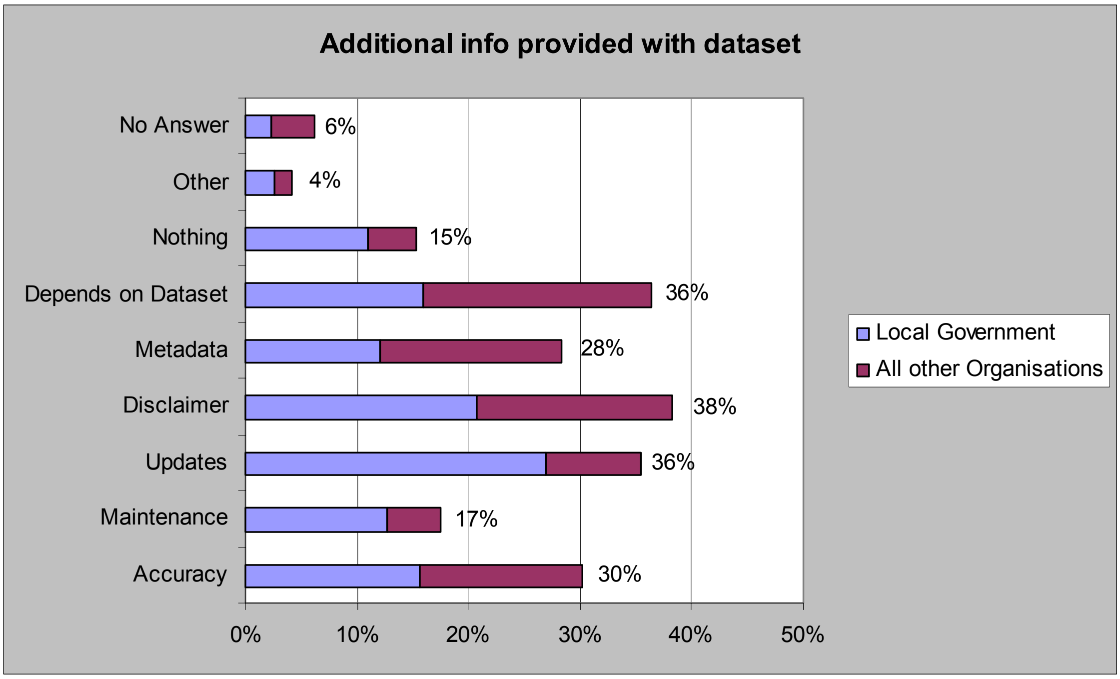


Figure 3.33: Data Provider's additional data provision as observed by Data User

3.5.3 Data Access & Cost

Question 1: What do organisations that provide data to you charge for their datasets?
As shown in Figure 3.34, many respondents indicated that their charge for datasets '*varied for individual datasets*' (38%). The most commonly used unit price for a dataset was a '*charge per mapsheet*' (31%), followed by a '*charge per parcel of land*' (24%). 18% of users indicated that they were not charged at all for the datasets they obtained.

When compared with Question 3 in section II B there is an inconsistency in the answers. In this section, the most common approach to charging for spatial data, used by spatial data providers, was on an '*hourly rate*' (34%), followed by charge '*per mapsheet*' (33%), which are different to the spatial data users' results for the same questions. It is possible that this apparent anomaly occurred because the datasets referred to by spatial data users were not necessarily the same datasets as the providers' ones. Furthermore, some datasets may be used by many more users than other datasets.

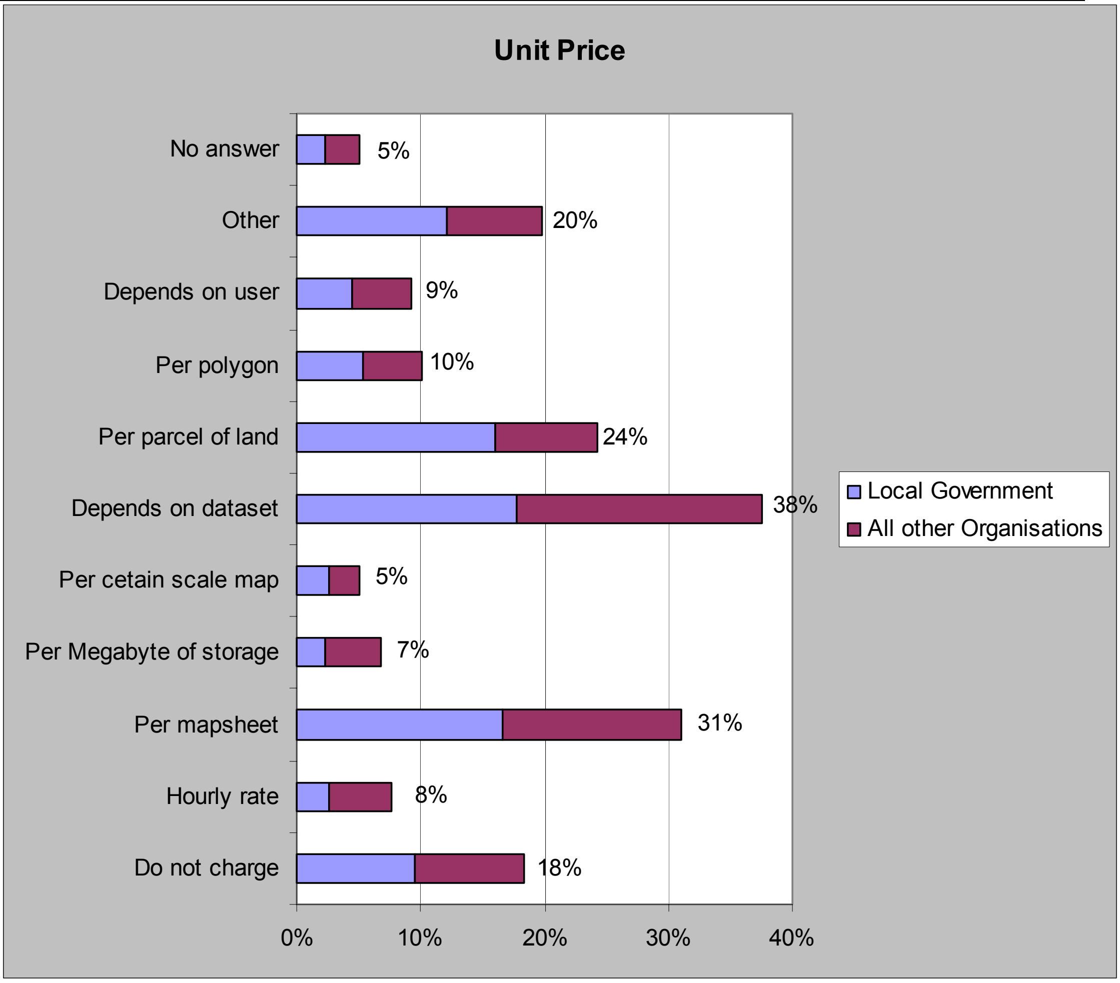


Figure 3.34: Unit Price

(Note: More than one unit price item was ticked on average and hence the total percentages add up to more than 100%).

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

When comparing the Federal Government Departments, 7 out of 14 indicated that their data provider does not charge for the dataset, however 6 specified that it depended on the individual dataset.

50 % of State Government Departments ticked that the unit price charged depended on the individual dataset (Figure 3.35).

32% of all Local Government Departments indicated that the unit price they are charged by the Data Provider depended on the individual dataset. 29% answered the unit price was charged per map sheet and 28% said per parcel of land. Amongst the individual States, 52% of all NSW Local Government Departments are charged '*per parcel of* *land*' and 31% '*per map sheet*' (Figure 3.36). All other Organisation's responses can be seen in Figure 3.37.

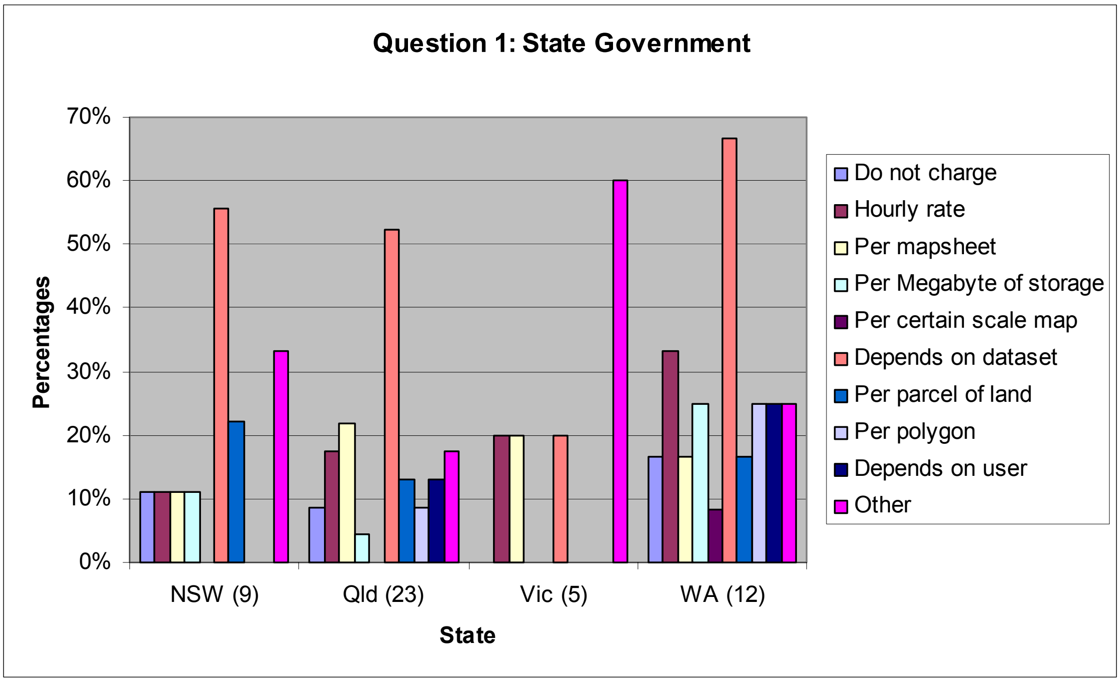


Figure 3.35: Data provider's unit price as observed by data user

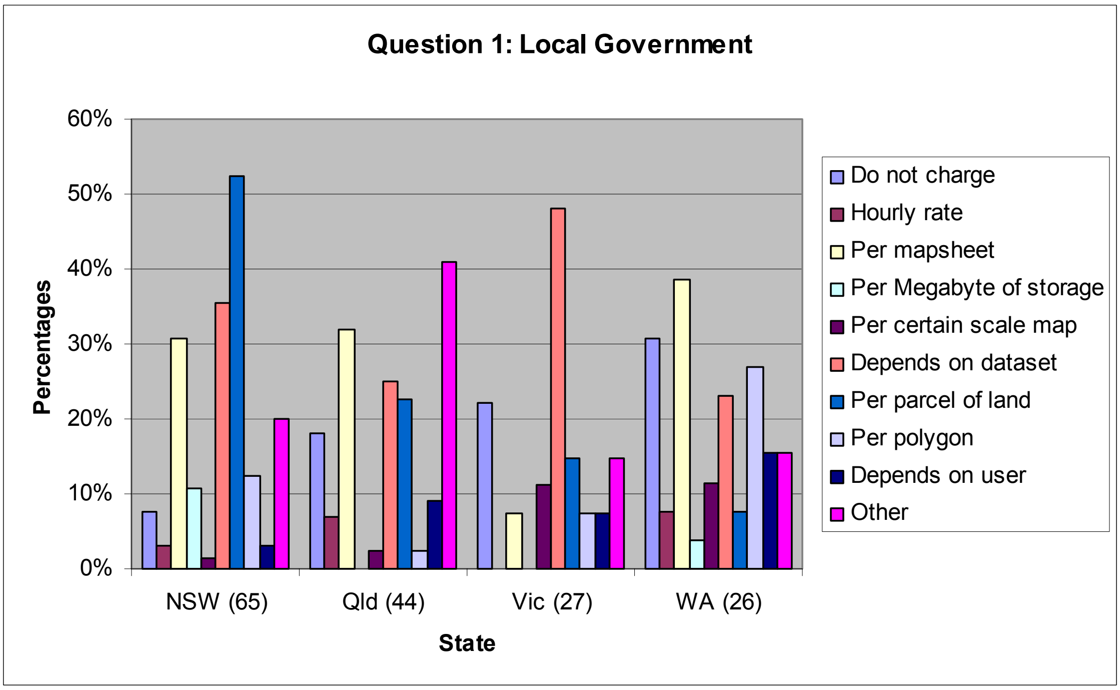


Figure 3.36: Data provider's unit price as observed by data user

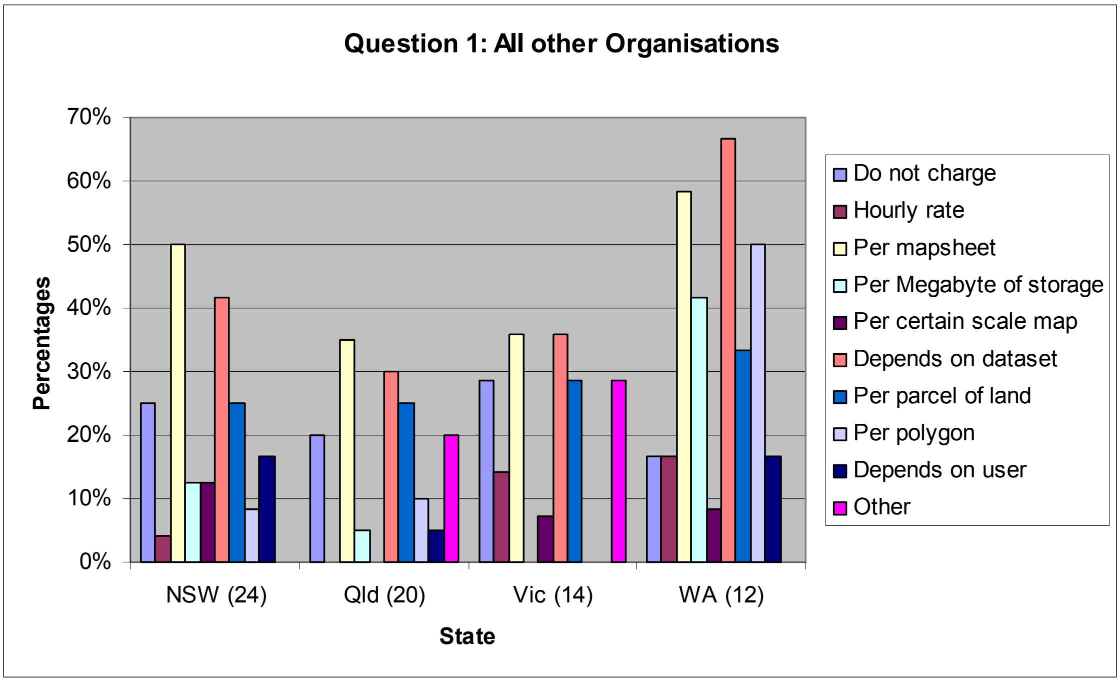


Figure 3.37: Data provider's unit price as observed by data user

3.5.4 Legal

Question 1: Indicate what legal protection means are used by the data providers, from whom you buy or get data.

Figure 3.38 shows that 63% of users stated that the most commonly used means of legal protection by data providers was licences, 37% of those being from the 'Local Government Departments' sub-group and 26% from the 'All Other Organisations' sub-group (also see Appendix 2, p.12 to 14). These figures are different to the answers in Question 4, Section II under the subheading 3.4.3. This is to be expected for the same reason as explained for Question 1, Section III under the subheading 3.5.3, given previously.

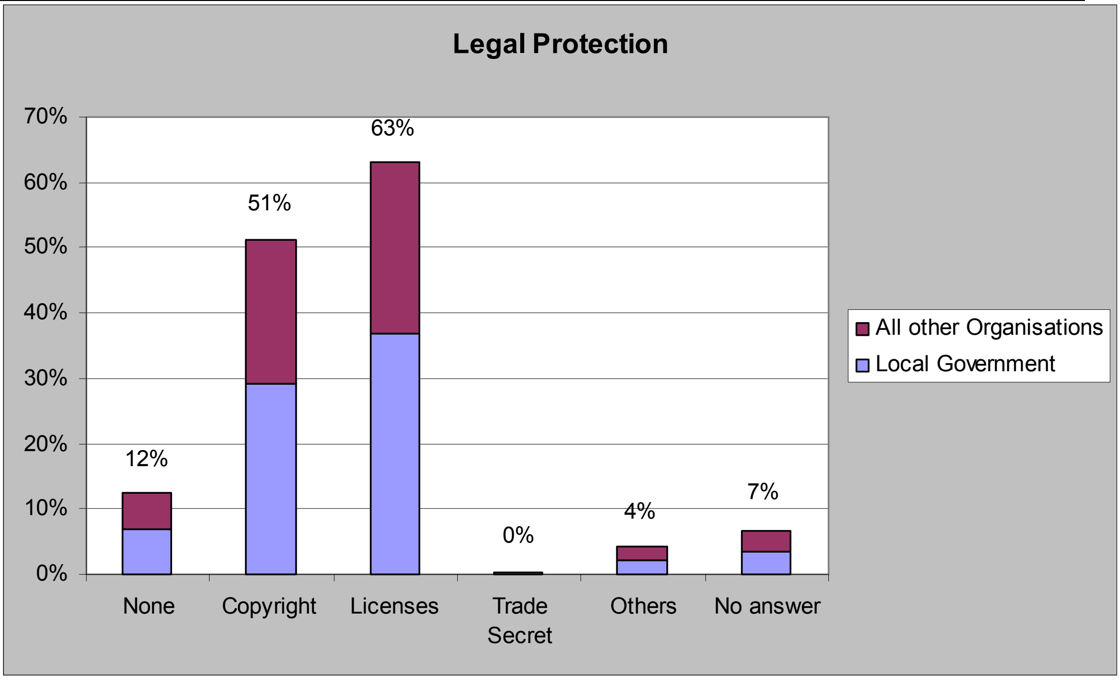


Figure 3.38: Legal Protection

(Note: More than one legal protection item was ticked on average and hence the total percentages add up to more than 100%).

- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

The results for all individual groups are very similar to the above results. For the majority of State Government organisations the '*Licences*' (70%) box was ticked most, followed by '*Copyright*' (46%) (Figure 3.39). These figures are similar for Local Government Departments (66% and 52%) (Figure 3.40). Amongst All other Organisations, NSW and Qld had the same number of boxes ticked for '*Licences*' and '*Copyright*' (50% of their responses), while for Vic and WA the order was '*Copyright*' then '*Licences*' (Vic 50%, 36%; WA 83%, 67%) (Figure 3.41).

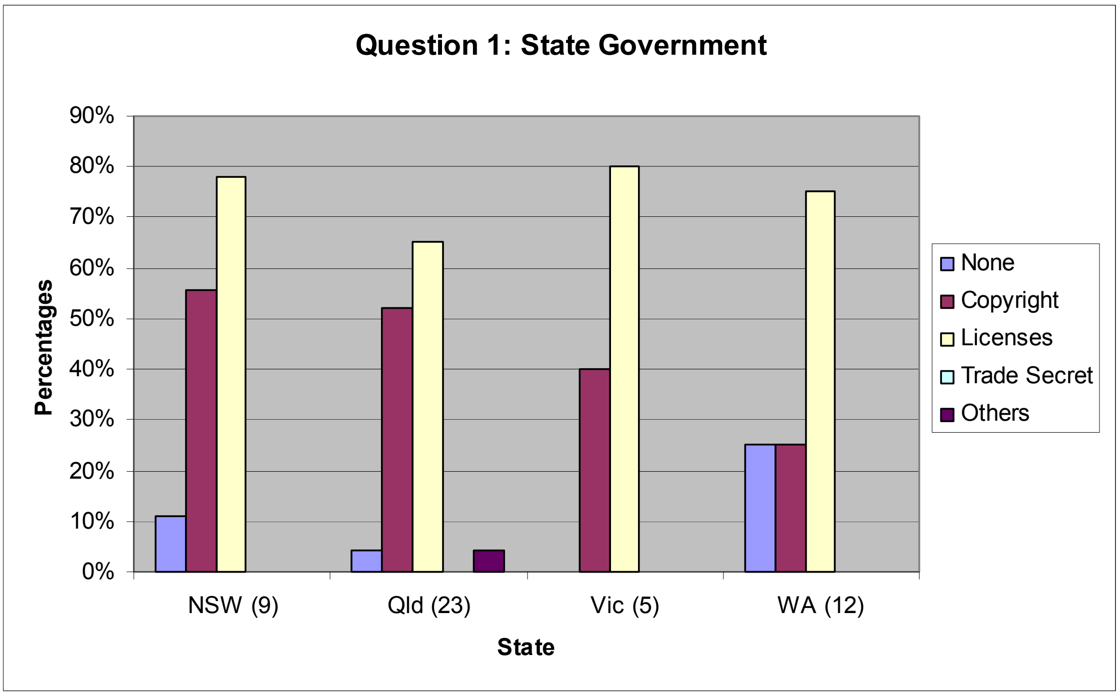


Figure 3.39: Legal Protection used by data providers observed by data users (State Government)

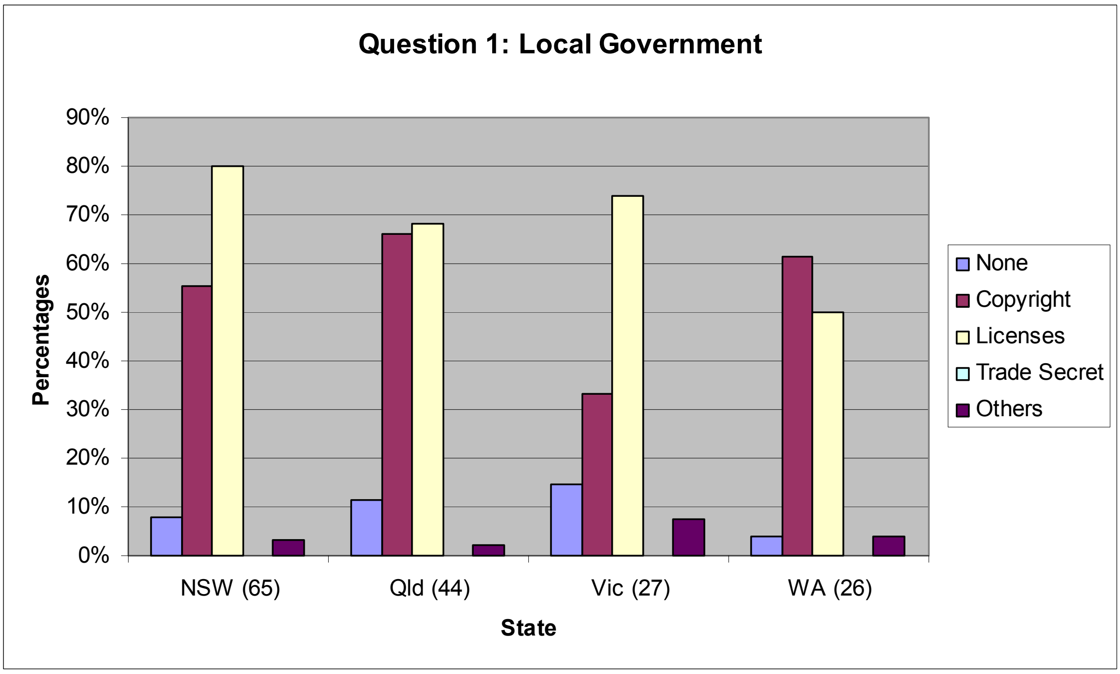


Figure 3.40: Legal Protection used by data providers observed by data users (Local Government)

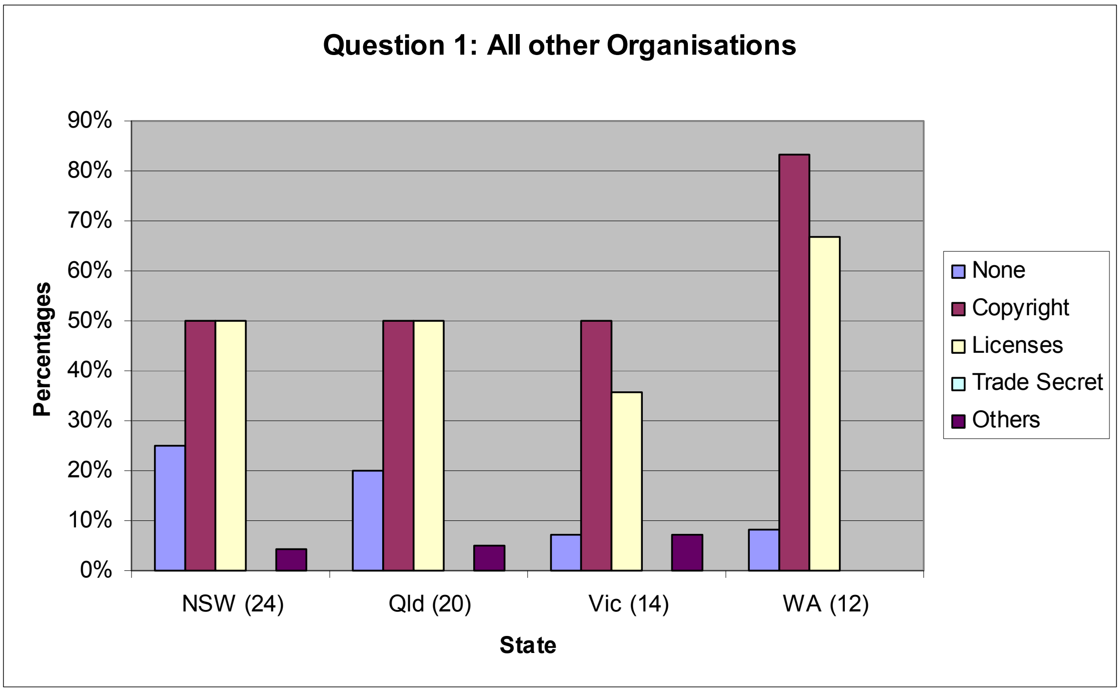


Figure 3.41: Legal Protection used by data providers observed by data users (All other Organisations)

Question 2: Do you sell or distribute provider's spatial data, in its original form, to others?

Question 3: Do you sell or distribute value added providers spatial data to others?

70% of all respondents indicated that they did not distribute the original dataset they had acquired. Once value was added the 70% dropped to 61%. The number of people selling datasets in their original form was 14%. After adding value this figure rose to 25%.

Interestingly, when this question was directed to all data providers in Section 2, 70% of all respondents said that they did not allow data users to on-sell the original dataset. However after the user added value to the datasets, the data provider's response decreased to 52%. The statistics for the providers and users are similar. A large proportion of users and providers do not allow original datasets to be on-sold. The small proportion of value-added data that is on-sold by users possibly indicates that such processing might be mainly for internal organisational use.

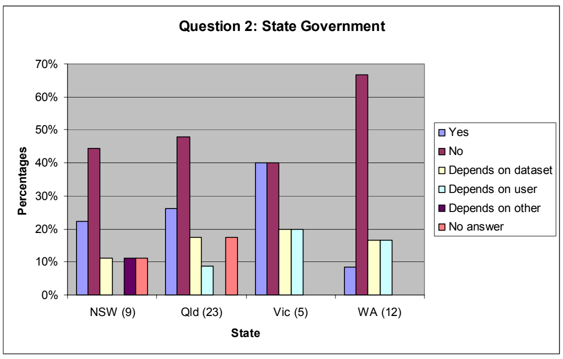
- **4 groups - State, Local Government & All Other Organisations per State/Territory and Federal Government**

There are slight differences when dividing the overall responses into the different groups. Federal Government Departments reported that once they acquired the data, then 10 out of 14 said they do not on-sell the dataset in their original form and none said yes. Once value was added, 8 out of 14 said they do not on sell the data and 4 said they did.

For State Government Departments the figures were 28 (52%) '*no*', and 12 (22%) '*yes*'. After the Departments added value to their data, the first figure remained at 28 (52%) and the second changed to 17 (31%). For more detail on the individual States see Figure 3.42 and 3.43.

Local Government Departments answers indicated that 141 (74%) departments did not on-sell the original dataset and 21 (11%) did. After value was added by the individual Departments, 120 (63%) continued not to on-sell the value added dataset, while 44 (23%) did (Figure 3.44 and 3.45).

57 (71%) of All other Organisations said they do not on-sell the original data, and 15 (19%) said they did. After adding value to their data 49 (61%) said they did and 22 (28%) said they did not. For more details on the individual States and a Summary of all responses see Figures 3.46, 3.47, 3.48 and 3.49.



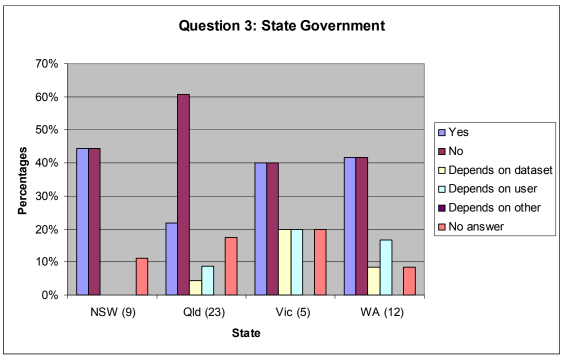
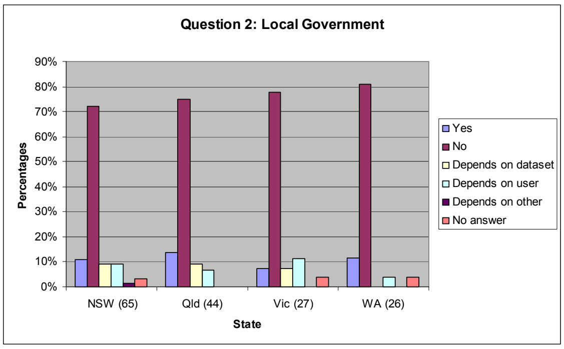


Figure 3.42 and Figure 3.43: Distribute original dataset versus distribute value added dataset (State Government)



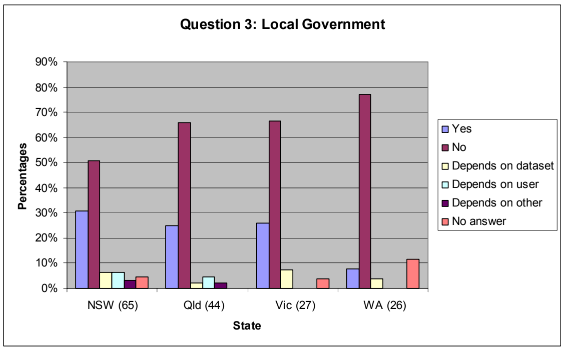
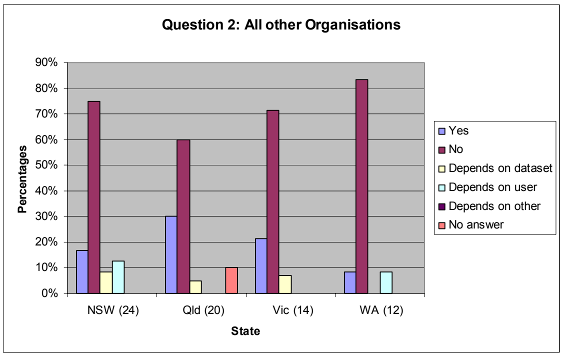


Figure 3.44 and Figure 3.45: Distribute original dataset versus distribute value added dataset (Local Government)



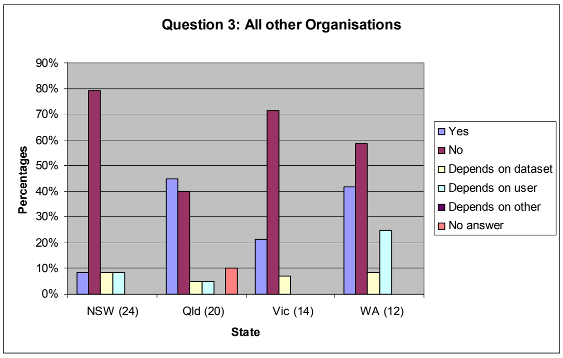


Figure 3.46 and Figure 3.47: Distribute original dataset versus distribute value added dataset (All other Organisations)

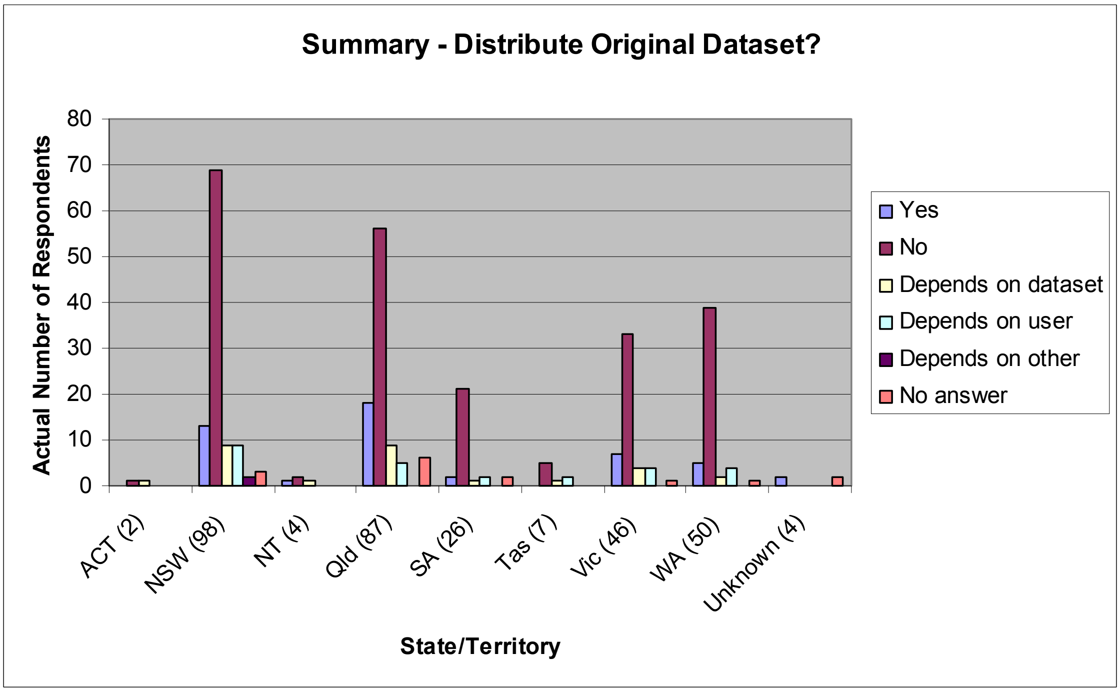


Figure 3.48: Distribute original dataset (Summary of all responses)

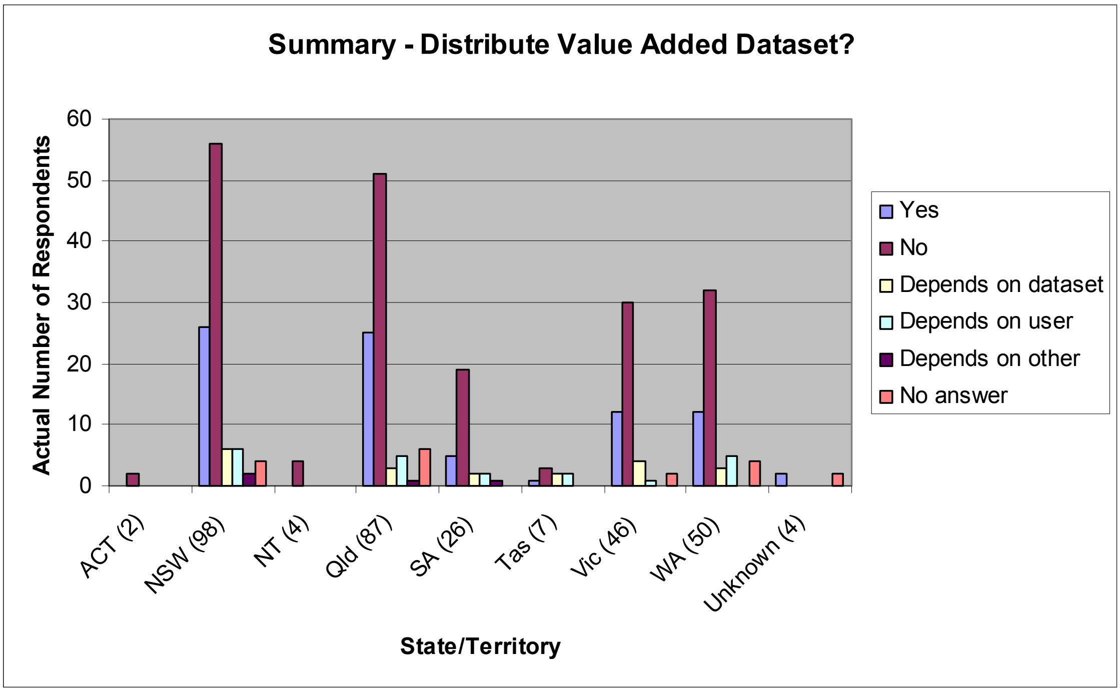


Figure 3.49: Distribute value added dataset (Summary of all responses)?

3.6 Conclusion

The survey confirmed that a high proportion of organisations in Australia provide spatial data to other organisations as well as use spatial data from other organisations, with parcel boundaries and contours being the most commonly used datasets. However, the industry is still not as automated as might be expected. Hardcopy is still the most common way of transferring spatial data.

People in the spatial data industry seem to be generally aware of metadata. Not surprisingly, State and Federal Government Departments are the biggest providers of metadata. It is interesting that the 'All other Organisations' appear to be greater providers of metadata than local government departments.

A large proportion of respondents recover the cost of supplying their spatial datasets to others. However, a significant number of respondents do not try to recover any cost. Many respondents also indicated that there was no standard policy being applied with regard to charging, as it often depended on the specific dataset. On the methods of determining charges for data, respondents indicated that they follow different policies. The highest number of respondents charged an hourly rate for labour costs, followed by a large number that base their charges on data units such as map sheets. Another discovery was that not a single pricing policy was being applied for all spatial datasets within an organisation, rather prices varied for specific datasets.

The survey was also aimed at determining the kinds of philosophies or policies that organisations have towards their spatial datasets as assets. It is interesting that 50% of the respondents answered that public good was more important than revenue. However, at this stage it is unclear how this affects pricing and distribution policies. Also, this trend may change, as some organisations commented they were working on policies for intellectual property at the time of the survey.

The survey discovered the following deficiencies:

Standards and quality of data

- Lack of metadata
- Lack of compatible data
- Lack of satisfaction with quality of data

Access to spatial data

- Lack of efficient distribution in electronic form

Pricing of spatial data

- Lack of consistent pricing policy
- Lack of consistent philosophies towards spatial data

Legal issues such as intellectual property protection of spatial data

- Lack of knowledge on legal liability exposure and intellectual property protection
- No legal protection
    - Lack of policies on value-adding

The survey indicated that many organisations are now providing and using spatial data and spatial technology, but the implications of easy and rapid copying of data using modern technology seems not to have yet been fully considered. The implications of these developments include the protection of spatial data assets. Because copying of electronic data, for example on the Internet, is simple but hard to monitor, it would be difficult to detect any breach of copyright. Standards are needed for the sharing and dissemination of spatial data, so that the data can be uniformly shared across various jurisdictions making use of modern technology. How is the quality of spatial data controlled? What is the best practice for metadata provision? Who owns the copyright to information, the collection of which is part funded by the taxpayer, but yet displayed on the Internet all over the world? Who has to accept liability for errors in datasets? How can the spatial data industry be regulated? In order to develop consistent spatial data policies, some of these questions and issues need to be resolved.

Many of the responding organisations had no spatial data policies or no individual policies for spatial data pricing and/or intellectual property protection of spatial data. With large investments in data and technology, organisations providing spatial data need to consider their data as an asset and to develop policies for appropriately managing that asset. Even if they do not want to charge for the data, they still need to be aware of legal liability implications and intellectual property rights.

In summary, the incorporation of SDI policy requirements (discussed in Chapter 2) in individual policies is still in its infancy and therefore any organisation must develop consistent spatial data policies that address SDI development deficiencies. Hence, the way forward for this research is to establish spatial data policy guidelines that address all SDI deficiencies, and spatial data policy issues relevant to individual organisations. Chapter 2 identified the SDI implementation challenges on pages 41 and 42, and grouped them under the headings: standards and quality of spatial data; access to spatial data; pricing of spatial data; and legal issues such as intellectual property protection of spatial data.

When an organisation develops an access and pricing policy, all the identified factors are relevant and should be considered. However, some organisations may decide to single out certain issues into separate policies. Chapter 4 will discuss and analyse all the factors that influence an individual spatial data access and pricing policy.

Chapter 4: Spatial Data Access, and Pricing

4.1 Introduction

In order to develop strategies for new spatial data policies, Chapter 2 reviewed global and national SDI problems and requirements while Chapter 3 investigated and reviewed existing Australian policy practices. These reviews will not only help to determine and overcome current problems, but also enable the development of policies that incorporate SDI requirements. Two problem areas found in Chapters 2 and 3 are inconsistencies in access to and pricing of spatial data. Access and pricing issues may be classified as:

- Issues involved in providing physical access to data, and
- Issues involved in the pricing and legal protection of data.

Physical access to digital spatial data, for example, may involve the provision of search, retrieval and distribution facilities. Pricing on the other hand may incorporate such issues as commercial versus non-commercial use. Legal protection may involve the use of contracts and licences, and risk management. The issues vary greatly and make it difficult for an agency to decide what their spatial data access policy should include. For example, an agency may not only consider its own organisational spatial data needs, but also other organisations' requirements on a local, state-wide, national and even global basis. Other local organisations may require datasets and are prepared to either pay for the data or trade their own datasets if compatible. State-wide, national and global spatial data may be required to deal with major environmental problems. However, the priority weighting for each requirement may differ for each individual organisation.

Chapter 4 will firstly address all issues involved in a data access and pricing policy and then study international developments. Following these issues is a description of the access and pricing policy status for all ANZLIC members: the Australian Commonwealth, States, Territories and New Zealand. Finally, the spatial data survey results from Chapter 3 will be related to the information in this chapter to provide a clear analysis of the situation in Australia.

4.2 Spatial Data Access and Pricing Issues

Before discussing individual policy issues the point should be made here, that many policies and practices are the result of government mandates, which organisations have to follow and these authoritative mandates do not necessarily aim to facilitate SDI development.

Two opposing views on pricing are relevant to the discussion in this chapter: pricing for full recovery of cost or minimal (or no) pricing. The issue of pricing is also associated with the issue of access. Should access to spatial databases be open or restricted and in what technical form should it be provided. Considering the large investments made by companies to collect and manage their spatial databases, the decision as to whether the databases should be sold, freely given away or an in between pricing structure used, is a major issue.

Following are the twelve factors that influence SDI development, as documented throughout Chapter 2 and summarised at the end of Chapter 2:

1. *External Forces* (world economy, globalisation, environmental issues)*;*
2. *Organisational Issues* (operational responsibility for the SDI initiative, leadership at appropriate level, priorities, and human resources)*;*
3. *Technical Issues* (standards, clearinghouse technology)*;*
4. *Governmental/Organisational Duties* (legal, political, security)*;*
5. *Ownership/Custodianship;*
6. *Privacy and Confidentiality;*
7. *Legal Liability, Contracts and Licences;*
8. *Intellectual Property Law;*
9. *Economic Analysis* (financing and pricing)*;*
10. *Data management* (data protection and security)*;*
11. *Outreach, Cooperation and Political Mandate; and*
12. *SDI Users' Choices, Rights and Obligations*.

Most of the above factors also influence individual spatial data access and pricing policy development, however sometimes from a different perspective. External forces, including such issues as the world economy, globalisation and environmental issues, can translate into governmental budgetary restraints, and a climate of interdependence, thereby impacting on the public and private sectors. However, addressing external forces is a matter for government policy rather than for individual mapping organisations (Rhind, 1997b). The results of these forces are often reflected in organisational issues changing through budget restraints and therefore they are not included in the actual list of factors that influence policy development for the individual organisation (see table 4.1).

Table 4.1: Factors influencing Spatial Data Access and Pricing Policy Development

1.	• SDI Requirements
2.	• Organisational Issues
3.	• Technical Issues
4.	• Governmental/Organisational Duties o Legal o Political o Security
5.	• Ownership/Custodianship
6.	• Privacy and Confidentiality
7.	• Legal Liability, Contracts and Licences
8.	• Intellectual Property Law
9.	• Economic Analysis (cost, value, or market (demand) driven) o Private vs. public user o Commercial vs. non commercial use o Free to full cost recovery range o Dataset ▪ Quality ▪ Quantity
10.	• Data Management
11.	• Outreach, Cooperation, and Political Mandate
12.	• Users' Choices, Rights & Obligations

The content of some factors influencing SDI development and individual organisation's spatial data policy development differ and these are: organisational forces; economic analysis; data management; outreach, cooperation and political mandate. While all other factors hardly differ at all. The only other factor that needs to be included in the list is the 'SDI requirements'. Table 4.1 displays the list of twelve factors that influence spatial data access and pricing policy development. It is beyond the scope of this thesis to examine all of these factors. Hence, this chapter will only examine *technical issues*; *governmental / organisational duties*; *ownership / custodianship*; *economic analysis*; and *users' choices, rights and obligations* in detail. However, Chapter 2 studied SDI requirements, and Chapters 5 and 6 will examine legal liability issues in spatial data and Intellectual Property Law respectively and provide some policy guidelines. The sections below briefly define all the factors in Table 4.1.

SDI requirements (1) – Spatial data infrastructure requirements as described in Chapter 2 provide the spatial data policy maker with a list of issues and guidelines to facilitate the implementation of SDIs. The requirements for Australia include: use of ANZLICs custodianship guidelines; use of common ASDI standards, technology standards and metadata guidelines; use of ASDI technology and access network (Clearinghouse) for displaying or using data; use of government policies, guidelines and laws where applicable; greater security for the spatial data provider and user; use of fundamental datasets if needed by the organisation; promoting data sharing and access, and use of high quality data; consistent and low spatial data pricing; promoting spatial information and SDIs; and awareness of new spatial information and SDI developments. Government and private agencies have to take local, national, and global spatial data infrastructure needs and requirements into account when developing strategies and individual policies to satisfy their own and especially local and national needs.

Organisational Issues (2) – Organisational issues include internal organisational, behavioural and philosophical issues such as organisational resistance to data dissemination or sharing, loss of control and whether the organisation should use a wholesaler or sell the data directly to the user. It includes the need for a GIS/spatial data policy champion that will take the necessary steps to move forward. Senior management support is necessary to ensure sufficient financial support. An organisation must prioritise their needs including an analysis of options available to increase their income, if needed, even if this includes relying on revenue from selling their data. In that case the organisation must determine whether their pricing and access policy supports the strategic plan of the organisation.

Organisational issues from an SDI perspective, on the other hand, include such issues as bringing together the relevant representatives into a new or existing organisation that will take on the responsibility for the SDI initiative with the appropriate leadership; seeking high level jurisdictional political support; develop, implement and monitor priority SDI development issues; and develop training and education strategies for human resources necessary to manage and operate SDIs.

Privacy and confidentiality (6) – By providing access to spatial data will the individual's rights to privacy be at risk? What can be regarded as confidential information, when a government agency has to provide data under the Freedom of Information legislation?

Legal Liability, Contracts and Licences (7) – If a data user uses data that is inaccurate and contains errors, who is legally liable and to what extend? Legal liability for errors in spatial datasets, use of contracts and licences are discussed in Chapter 5.

Intellectual Property Law (8) – What types of intellectual property rights are available to protect spatial data from misuse or copying by third parties is discussed in Chapter 6.

Data Management (10) – This topic relates to how the organisation manages their data, and how the data was collected, recorded, edited, analysed, managed, maintained or how value was added to existing data. These matters are very important not only to establish current metadata, but also to help decide what dataset will be most accurate and should be made available because of potential legal liability risks. Organisationally sensitive data may need to be managed differently than less sensitive data and perhaps require strategies that ensure organisational security can be protected. The same management needs apply to SDI implementation, except it is more likely that national defence security is at risk rather than organisational security.

Outreach, Cooperation and Political Mandate (11) – Marketing and promoting spatial data and SDIs are key issues in fostering market growth, ensuring better utilisation of spatial data and SDIs, and improved data sharing. Hence it is in the best interests of all policies to aid the outreach, by either financial or in-kind support. Cooperation amongst agencies and Government support at high levels are also necessary to further develop and direct SDIs into a future where spatial data will become a necessity in managing sustainable development and greatly aid economic growth.

Following is a more detailed description of spatial data access and pricing issues relevant to technical issues; governmental / organisational duties; ownership / custodianship; economic analysis; and users' choices, rights and obligations.

4.2.1 Technical Issues (3)

Technical issues that need to be included when providing access to spatial data or data sharing are standards, metadata, transfer protocols, security issues, and clearinghouses. Standards and transfer protocols are necessary to enable data transfer to different hardware and software systems. Internet protocols may also be important to enable access to data on-line and to manipulate data remotely. Metadata will enable the spatial data user to determine all characteristics of a dataset, such as how, when and by whom the data was collected, its accuracy, scale, quality and content. Each of these characteristics is described in a metadata guideline as core metadata elements. The metadata guideline was published by ANZLIC in 1996 and 1997 (see Appendix 3) and describes the type of information that should and/or can be included in metadata statements. If access to data is being provided on-line, then security measures should be considered to stop others from copying and/or manipulating the data.

Clearinghouses are being set up as part of spatial data infrastructures. The clearinghouse in Australia will provide the environment that connects the data provider (custodian) with the data user. The clearinghouse will incorporate technical mechanisms and institutional arrangements such as standards and policies and intermediate data providers such as service providers. Service providers may value-add and supply a product to customers. Service providers include small, medium, and large national and multinational companies, as well as single-person consultancies. However, an organisation may raise the question, as to whether it wants to be part of the clearinghouse, whether its data are to be considered confidential, or whether an organisation would breach any laws by providing data on-line.

This thesis and the survey in Chapter 3 will not cover all technical issues, rather more specifically metadata use. Metadata core elements as outlined in Appendix 3 cover such dataset characteristics as spatial data quality and access.

Metadata – specifically data quality

Data Quality is important for data users to determine the usefulness of a dataset for a particular purpose (ANZLIC, 2000i). It includes lineage, positional accuracy, attribute accuracy, logical consistency and completeness. *Lineage* describes the source history of the data and how it was produced. *Positional accuracy* describes the closeness of the digital data to their true positions on Earth and includes horizontal and vertical accuracy, and how the accuracy was determined. *Attribute accuracy* provides the reliability of the descriptions of the dataset features such as, how the feature was classified, and the accuracy of the database features (eg. % of misspellings and missing data), and how the accuracy was determined. *Logical consistency* describes the maintenance of the relationships between the individual data items in the dataset such as, labelling of all points, correct intersection of lines at nodes, and overshoots or undershoots. The data provider specifies that he/she has tested logical consistency and for what purpose. *Completeness* points out how complete the coverages, classifications, and verifications are. For completeness of coverage it answers questions like:

- Is the spatial data coverage complete for the entire dataset and at what percentage (eg. 98% of all streets for a particular suburb are part of the dataset)?
- Are attribute data available for the entire dataset and at what percentage?

For completeness of classification it answers questions like:

- Is the classification restricted; such as must a lake be a certain size before it will be included in the map at a scale of 1:100 000? Are clusters amalgamated?

For completeness of verification it answers questions like:

- What work was carried out to clarify the accuracies of the datasets, such as how were the spatial and attribute accuracies of the data checked?

Metadata – Access (data available in what format, and access restrictions)

Metadata is also being used to inform the data user of the format of the dataset, as well as access restrictions or legal prerequisites applying to the user. Legal prerequisites for example may require the user to enter into a licence and/or royalty agreement, while other access restrictions may be password requirements, or available network user restrictions and whether or not payment is required. However, even if no restrictions apply the spatial data provider should specify that.

4.2.2 Governmental/Organisational Duties (4)

As government departments collect spatial data in order to fulfil their administrative duties it is unclear whether they have the right to sell that spatial data for profit or at the cost of reproduction. Government departments have to obey regulations and laws in fulfilling their political mandates and obligations. For example, NSW Government agencies are required to deliver some of their services electronically. They then must report the progress of their electronic delivery program to the Office of Information Technology together with their IT Strategic Plan. They must also develop and document principles and reasons for their pricing policies.

In the current economic climate, often driven by external forces such as a downturn in the world economy, Governments expect their departments to reduce costs, operate more efficiently, and even earn their own income by selling services. However, the public perception is that because the public pays taxes they have a right to obtain the data at a fair price (or for free), just as they use most roads for free. However, even this aspect does not apply any more in many parts of the world.

A legal system is generally made up of statutes, professional standards, commonly accepted behaviours, administrative rules and court decisions. The present legal situation is not clearly defined when data sharing or selling occurs across different legal jurisdictions. Case law does not necessarily deal with every possible situation but only with individual cases. Hence case law only interprets the law where problems have occurred. This means that it is often impossible to predict the court's interpretation for a particular situation.

Governmental departments can be held accountable if they fail to protect the public information in their care, this information can also be referred to as public trust. If a government department gives public trust away or sells it below market value, then it can be viewed that they are neglecting their duty. However, governmental departments exist to serve its citizens and therefore are obligated to provide them with a public service, which may include access to spatial databases. The main question here is therefore: Are the spatial databases part of the public trust, like roads or infrastructure? Or is the provision of spatial databases a service to be given to citizens on request for free or nearly free (King, 1995)? Even if the Government has a duty to provide access to its information, there is no stipulation as to the form in which the information should be provided. That is, should it be provided in hardcopy form, or machinery binary code? If the Government incurs a financial loss by providing spatial data access should they be allowed to charge an appropriate price? And if so, what constitutes an appropriate price?

4.2.3 Ownership/Custodianship (5)

The Commonwealth of Australia supports the principle of custodianship as developed by the Australia New Zealand Land Information Council (ANZLIC, 1998d) and the Commonwealth Spatial Data Committee (CSDC, 1995). The custodianship principle, which applies to all fundamental spatial data collected by state governments, states that custodians manage the spatial information as trustees for the community to enable the integration of spatial information. Spatial data collectors become custodians of the data they collect and they must satisfy the needs of the data user in regard to spatial data accuracy, currency, storage and security. A custodian is the nominated body or person that is responsible for managing and placing conditions on datasets. Custodian and user rights and obligations are summarised in Table 4.2. A custodian is not necessarily the legal owner or copyright holder to that data. However, the custodian should ensure access to the data and protect the Commonwealth against claims from misuse of that data, where possible relying on copyright law. The Commonwealth Guideline also recognises that the extent of guideline adoption by any given agency or custodian may depend on their particular situation, including their budgetary circumstances. (CSDC, 1995)

ANZLIC suggests that private sector organisations should consider these guidelines for their own internal data management use, because the guidelines, based on experience and good practice, provide a clear and common strategic approach to managing spatial data (ANZLIC, 1998e). In support of this, ANZLIC's (1998d) custodianship policy states that:

"There are advantages in custodianship to be gained by agencies, government and industry. In following the rules and responsibilities for custodianship as set out in these Guidelines, a custodian agency is most likely to become the preferred supplier for information under its custody. This is because it will have the most accurate and reliable information. Custodianship provides a means of accountability and reliability of source for designated information within government. There can be increased confidence that the information within government is accurate, complete, identifiable and accessible. Custodianship also eliminates unnecessary duplication of capturing and maintaining spatial information which allows funds previously spent on these activities to be reallocated to higher priorities. For clients, custodianship lessens the confusion regarding sources of accurate information; they can also receive more accurate advice on the source, currency and completeness of the information."

Table 4.2: Summary of Custodian's and User's Rights and Obligations (as stated in CSDC, 1995; and ANZLIC, 1998)

Custodian's Rights	**Custodian's Obligations**	**User's Obligations, and Rights (see at end of list)**
Establish marketing conditions within Government policy for the fundamental datasets in its care (eg. Promote data use).	Determine priorities for data capture, in consultation with stakeholders.	Advise custodian of any errors or omissions detected in the information received.
Establish formal agreements with value adding agencies, including royalty arrangements, and revenue sharing.	Manage the acquisition, storage and maintenance of data.	Advise custodian of future requirements for spatial data to assist the custodian in preparing collection and conversion plans.
Feedback on information quality, copyright and intellectual property.	Ensuring data security.	Do not release the supplied spatial information to a third party unless covered by a licensing agreement specifying release criteria.
Charging for data, within Commonwealth policy.	Complying with standards.	Where a user collects specific information on behalf of a custodian it shall do this according to the standard set by the custodian.

	Provide metadata in accordance with guidelines.	Pass this information collected on behalf of a custodian back to the custodian for maintenance or storage, free of charge.
	Provide quality statements regarding source, reliability, accuracy, completeness and currency of the dataset.	When producing spatial data products from custodian's data, the user should consider the passing back of the data product to the custodian as part of their agreement for the use of the information.
	Maintain the quality of the fundamental datasets assigned to them.	Do not sell information if collected on behalf of a custodian without first obtaining the permission of that custodian.
	Facilitate data access and distribution, and ensure appropriate storage, maintenance, security and archival procedures for spatial information.	Users must always cite the source of the information when using the information in any way.
	Safeguard the Government's interest in the use of its information through licensing agreements or letters of understanding to protect privacy and confidentiality and interpretation of the information.	**Right:** Once the user has completed its obligations to the custodian agency it has the right to use the information internally as it wishes.
	Provide a level of appropriate security to protect the privacy of any personal data.	**Right:** The user should pass on to the custodian information that has been improved or upgraded as part of the process. The custodian should in turn ensure that the improved or upgraded information is made available to other users.
	Consult with users.	
	Avoid data duplication.	
	Preserve the data over time.	
	Comply with legislation.	

It may be irrelevant whether private or government organisations assume custodianship or ownership to the spatial datasets in their care. Whatever the case may be, clear rights and obligations of the data provider and the data user must be defined.

4.2.4 Economic Analysis (9)

Digital spatial data can be retained and shared with others without reducing or changing the quality of the original data. Copying digital spatial data is inexpensive and this makes spatial data an easy to copy commodity in a commercial context. Hence, the "easy to copy" phenomenon makes it difficult to stop third parties from obtaining the data and on-selling it.

The increasing competition for public funding and decreasing budgets force federal, state and local government agencies to seek revenue from their own investments and/or business plan. This revenue is often necessary to fulfil government agency's mandate and to develop their systems and maintain their data. Spatial data are one of the assets that some believe can be turned into an income producing governmental asset. Because the private enterprise is able to establish a profit from selling spatial databases, some government agencies believe they should not miss out. But how much can an agency charge for a dataset?

The next few sections will analyse the issues affecting information pricing, including the study of the spatial data benefit/cost ratio. These are:

- Benefit/cost ratio
- Cost, value, or market driven pricing
- Private versus public user
- Commercial vs. non commercial use
- Free to full cost recovery range
- Dataset considerations
  - Quality
  - Quantity

- **Benefit/Cost Ratio**

Benefit/cost ratios are important to measure the usefulness and commercial value of spatial data. If the benefits far outweigh the costs, the data are valuable and should be regarded as assets. The way in which benefit/cost ratios are determined vary and depend on the available information. However, spatial data cost-benefits can be determined in terms of the following considerations:

- Efficiency – (cost savings) brought about by its availability and use. Can be determined by a comparison of different ways to reach a certain outcome, and calculating the cost savings.
- Effectiveness – (benefits using spatial data) eg. Reduction of risk, better decision-making, and improved outcomes. May be calculated as a measure on user's willingness to pay.
- Unanticipated benefits – benefits that can be predicted, or measured after the event (Gillespie, 1992a, 1992b; Taupier, 1995).

In Australia Price Waterhouse undertook a benefits study between 1989 and 1994 commissioned by ANZLIC (Price Waterhouse Urwick, 1995). This study examined the economic gains from developing, maintaining, improving and providing access to spatial data infrastructure at a national level. As part of the review, they analysed the benefit/cost ratio for data usage and determined the ratio to be approximately 4:1 over a five-year period (1989 to 1994). Hence, for every dollar spent on spatial data production a benefit of $4 was generated.

As a basis for their study, they used a cost effectiveness approach. This approach defines the costs as:

- hardware, software, hardware and software maintenance,
- data-collection, purchase, entry, transfer and database maintenance,
- staff-training, support system, interface and system development,
- operating expenses like disks, paper.

The benefits are defined as the cost savings made by using competing methods for achieving an objective. They are not individual benefits, but rather indicators that reflect overall advantages that the data infrastructures provide. Benefits defined in a cost effectiveness approach compare cost of the existing (or preferred) method with the next best alternative.

- **Cost, value, or market driven pricing**

If an organisation knows the actual cost of producing their existing datasets, this cost could be used as the actual price. However, before establishing the pricing the next considerations should be: What value does spatial data have and what price is the market prepared to pay? The first step is to determine how economic theory determines the value of a commodity? According to Hirschleifer (1980) the value of a commodity is determined by its scarcity and demand. Hence high scarcity and high demand produce high prices, while the reverse applies to a commodity available in large quantity and low demand. The collection of spatial data is costly, but once available digitally it can be given away and kept by the original producer at the same time. Therefore digital spatial data are not scarce and it will be difficult to determine the data's values.

In market driven pricing, the seller will sell the information to the highest bidder, as in an auction (King, 1995, p.264). Another option is to use average cost pricing. Average cost pricing involves dividing the "cost of data collection and production" by the "number of buyers". To apply this pricing to spatial data would be unrealistic because it is often difficult to determine how many buyers there will be and how the number of buyers changes over time. If the number of buyers is known and this process followed, partial or full cost recovery may be applied. However, the higher the price, the smaller the number of users and hence a reduction in the social welfare would occur (Taupier, 1995, p.284; Onsrud, 1992). So the dilemma is, that if the price is too low the public trust is considered to be under valued, while if the price is too high then the public treats the charges as unfair and interprets it as denial of access (King, 1995, p.264). Taupier writes that if one is of the opinion that the Government's role is to maximise social welfare, then low pricing of spatial data is appropriate (Taupier, 1995, p.284).

- **Private versus public user**

If the data provider is a government agency should they charge other government agencies or community groups for the data? What spatial data pricing rates should be applied to private enterprises; different rates could be used for research and development, and spatial data service providers than for commercial or government users. The charge could be made dependent on the type of user and/or the added benefits the data provider could derive from the user. For example, if the user also had spatial data that was of interest to the provider, the provider may obtain the data in exchange. If the provider also worked through spatial data service providers, the provider may charge the service provider significantly less for the data, but ask for royalties from sales.

- **Commercial vs. non commercial use**

Even if the provider and the user are both government agencies, the provider may want to base its pricing on the actual data use. For example, if the data are used commercially at a certain rate, full cost recovery or a royalty may be applied. Non-commercial use such as in education, research and community, and providing service providers with the data may only attract minimal or no charge.

- **Free to full cost recovery range**

An organisation may choose to charge between nothing to full cost recovery for their spatial datasets. For example, if the data are being used for environmental protection it may be free or available at the cost of distribution, while if used for commercial purposes, it may attract commercial rates.

- **Dataset considerations**

Datasets could be priced lower if the quality and quantity is low, and high if the quality and/or quantity is high. The price charged could enable recovery of full or part costs such as data collection, manipulation and maintenance or just maintenance. An organisation must also consider the amount of data the provider is prepared to disseminate to users and to what detail. If a community group wants access to only a small amount of data, for example a map with all the local parks for a suburb, the provider may decide to give them the data without any charge. If the other extreme is the case, where a commercial organisation wants a whole database with all the various themes and dataset layers, the provider may either not give that organisation all the information and/or charge full cost recovery. The levels of detail provided may vary depending on the user, or to what use the spatial data are to be put to.

Other important issues to consider are: The intervals of updates, weekly, monthly or yearly. Rhind (1995, p.90) argues that different data suppliers will use different policies that reflect the need and best interest of the individual organisations. So, in this regard it may be difficult to develop national policies for all levels of government to follow. Particularly those covering different industry sectors such as utilities or natural resources.

4.2.5 Users' Choices, Rights and Obligations (12)

A short-term view of a user may be that data should be free, but in the long term high data quality may be far more important than the cost of acquiring it. Legal redress for loss suffered because of errors found in the data may be very costly and time consuming. If users are charged for spatial data, it is likely that they will be less cooperative in supplying data themselves for free to a national data clearinghouse, to support the notion of a National Spatial Data Infrastructure (Rybaczuk and Blakemore, 1995, p.94). The issue is whether it is more important to obtain a dataset of superior quality, or a NSDI containing a large quantity of data but of low quality. A user must make sure he/she complies with any instructions or legal statements given by the data provider.

A user may have the view that easy access to government information is part of democracy and freedom of information legislation. Easy access may be interpreted as free or near free access. However as pointed out before, under governmental duties it is debatable whether spatial data held by the Government needs to be free. Another issue concerns the user's right of free choice. As more spatial data becomes available on the Internet, the demand for particular spatial datasets may decrease. If for example, a user such as a scientist requires using spatial data to accurately model pollution effects on particular regions but uses inaccurate spatial data (freely available on the Internet) it will not be in the national interest. Hence it may not always be a choice of creating income, but a matter of importance for the development of a nation.

Users may be allowed to on-sell original spatial data without any restriction or they may be assigned such a right under licence with certain restrictions. Copies of value-added data or newly derived products might be given to the custodian. It may also be in the best interest of the custodian to ask the user to assess the quality of the spatial data.

Many spatial data access and pricing issues have been discussed in the last sections of this chapter and provide background information for developing spatial data policies. However before discussing some policies used in Australia the next section will describe the problems other nations face.

4.3 International Developments in the USA, UK, and Canada

4.3.1 USA

As budgets decline in the USA, government agencies are forced to evaluate many existing services and attempt to increase their efficiency and productivity. The USA Federal Government has taken the lead to implement efficiency and productivity improvements under the guidance of former Vice-President Gore and the National Performance Review. Another initiative is the National Information Infrastructure (NII), which seeks to develop a communication network of computers and databases to provide USA citizens with vast amounts of information. Part of that Infrastructure is the National Spatial Data Infrastructure (NSDI), which aims to promote optimal use of geographic information in support of better decision-making. However, for the NSDI to be successful, federal, state, local, private and public entities must collaborate. This collaboration is extremely important between all jurisdictional levels and private entities if policies are required to be adopted by all agencies. The past has shown that policies developed at federal level and passed down lead to poor implementation and acceptance by especially local jurisdictional levels (Tosta, 1997; Longhorn, 1998). Within the NSDI there are four key activities. These are:

- standards (identification of necessary standards and their development),
- a framework of core spatial datasets to which others can be added,
- national spatial digital thematic maps, and
- a spatial data clearinghouse. (Matsunaga and Dangermond, 1995)

The Office of Management and Budget (OMB) produces federal information policies, such as OMB Circular A-130, which guides federal information pricing practices. The circular instructs agencies to make government information available at charges no higher than the cost of dissemination, or less if the cost of dissemination creates a barrier, to enable society to benefit economically. Another approach is to make government information available via the Federal Depository Library Program, which is a partnership between over 1400 libraries and the Federal Government. The Circular also states that agencies should not restrict access by charging fees or royalties for the reuse, resale, or re-dissemination of federal information dissemination products. Their guide is based on various factors such as:

- Government information is a national resource,
- it provides the public with information about the Government's activities, and
- it is created in support of Government's operations (Matsunaga and Dangermond, 1995).

In the USA, cost recovery is not easy because of open record laws (at federal level FOI). Some States in the USA however have ignored open record laws and established cost recovery programs under local ordinances, and await Federal Government responses forcing them to amend their legislation (eg. Kansas, Ohio, and California) (Archer, 1995). Archer (1995) writes that no matter what pricing is applied to data, it is imperative that the GIS user treats spatial data as a company asset and develops company policies and procedures for its management. Otherwise valuable files could easily be misplaced, damaged, sold or given away inappropriately. He also is of the opinion that if data are available for free, then there is no incentive for further creation of useful and accessible data and information systems, which the public and economy can benefit from. This leads to governmental departments only considering what they have to do at present and not to planning for a sustainable future.

Other States in the USA have amended their legislation to enable the sale of spatial data for market fees. Arizona and Oklahoma agencies are charging market value if the data are being bought for a commercial purpose. Government state agencies in Maine can release GIS data under licence agreements and charge appropriately. Alaska for example, revised its public open records laws in 1990 to authorise state and municipal agencies to sell electronic services and products for a fee. That fee allows for the recovery of a reasonable cost of the building and maintenance of a GIS or other public information system, including recovery of the actual costs of providing the delivery of the service. New regulations on implementing the law were adopted by the Telecommunications Information Council in 1994, resolving a lot of the uncertainties in the amended law. The largest private sector data vendor has said that as a result of the new law many more datasets became available that were not accessible previously (Brown, 1995). Alaska's major GIS agency, the Department of Natural Resources (DNR), charges for their data according to the new legislation. In the financial year of 1994 it received $39,000, about 1/3 of the agency's cost of public access support. In March 1994 they revised their fees and established a three-tier pricing scheme based on the volume and type of data, and other costs. Initially the DNR included a spatial data restriction with its standard contract, prohibiting the duplication of the data for resale or distribution. But since copyright or licence protection of spatial databases were not included in the amended open records law, and due to the limited usefulness of the data to private firms, this restriction was later omitted. The DNR's contract later read:

> "To ensure distribution of the most current public information, please refer requests for data or products to the Alaska Department of Natural Resources Land Records Information Section." (Brown, 1995, p.28)

USA Federal Government information policies recognise the benefits of widely distributing (providing free or near free access) government held information as opposed to any other form of cost recovery. Some of the benefits of the policies are:

- "More effective and efficient use of resources
- Sharing of information resources between agencies and user
- Reducing the duplication of efforts
- Promoting of education, learning and research
- Promotion of the public's "right to know"
- Elimination of duplication of charges to the citizens
- Stimulation of innovation" (Matsunaga and Dangermond, 1995, p.44).

Some Departments in the USA have implemented free sharing arrangements via the Internet such as the federal Department of Natural Resources (DNR) in Iowa. DNR found that by handling user requests over the Internet they saved administration time, reduced duplication of effort, and were more effective and efficient in using DNR resources, hence stimulating innovation in the use of their databases. As a result, the public's "right to know" was fulfilled, and the accountability of Government to its citizens improved. More time was also available for the development and maintenance of DNR's databases. Matsunaga and Dangermond believe that the federal experiences provide a useful model for state and local governments to follow and improve on, when implementing information policies. (Matsunaga and Dangermond, 1995)

Perritt (1995a) agrees in principle with Matsunaga and Dangermond in that governments should not sell their datasets for more than the cost of dissemination. He argues that local governments should not establish monopolies and exploit their databases on the grounds of, for example FOI, copyright, First Amendment or unfair competition. Instead they should allow equal access to public spatial data, to enable the realization of the potential that new technology has to offer and to promote a variety of sources of public information.

4.3.2 UK

In the UK the other extreme in pricing policies exists, compared to the USA Federal Government. UK's present and previous Governments expect governmental departments to recover all their costs. One of the present UK Government's major policies outlines the importance of improving public services and reducing costs, thereby regarding citizens and governmental departments as clients. If any governmental activity can be better delivered and managed by the public sector, that service should be contracted out to the private sector. The Government did not specify what services only the state could provide (Rhind, 1995, 1998).

The Ordnance Survey (OS) is UK's national mapping agency with the duty to maintain the topographic mapping framework for Great Britain. Their main objectives are to provide national spatial data coverage required for emergency purposes; mapping needs as required by statutes and parliamentary regulations; producing commercially valuable mapping services and products; and providing expert geographical advice to the Government. OS must deliver its services as required by the user and minimize the cost to the taxpayer.

In terms of cost recovery, the Ordnance Survey (OS) recovered 72% of its full economic costs for the 1993/94 calendar year (In 1996/97, 93% (Rhind, 1998, p.6)). These figures are astonishing because they were reached despite product price reductions and savings in operating costs. The long-term goal of OS is to recover 100%

of the data production costs. The issues taken into account to develop their spatial data charging regime were:

- Creation of data is expensive, and data maintenance can be as expensive as the original collection.
- Ability to create and manage national dataset is a great skill, and those with the skill have a competitive advantage, especially when the IP rights are in their hands.
- Private sector data are usually derivatives of public sector data.
- For intellectual and economic reasons, one either tries to recover full cost, none of the cost, or part of the cost.
- Where cost recovery is implemented the revenue will enable the establishment of complete and high quality frameworks.
- Where only a few people benefit from the use of spatial data, it is fairer to apply cost recovery and the user pays rather than the taxpayer.
- Cost recovery policies require public organisations to assess their spending and priorities.
- In certain cases flat rates discriminate against those with lower purchasing power.
    - National and international legislation should overcome discriminate charging.
- Changes in data access technologies may alter charging regimes (on-line access enables larger numbers of small value transactions) (Rhind, 1995, p.91).

David Rhind, the Director General and Chief Executive of the OS in 1995 reported that although it was difficult to demonstrate OS's spatial data pricing regime, the main data products were cheaper in 1995 than in 1992. Rhind also stated that the cost of data for establishing a GIS in the city of Sheffield represented only 2-3% of the total cost, which was not a major implementation hindrance. Britain, partly as a result of its pricing regime, has a very good topographic coverage and 70% of Britain is mapped in great detail at 1:1250 and 1:2500. Data maintenance and conversion of maps from hardcopy into digital form are very costly, and it took OS about 20 years to complete the conversion of their maps in 1995 (Rhind, 1998).

Distribution methods of OS products vary. Digital data are available from: OS directly; through private sector contractors; and value-added resellers. Standard paper maps are sold through retail outlets, while specialised mapping requests are dealt with by private sector agents. As more value-added resellers use and incorporate OS data in their products, it is becoming more and more important to use licensing to obtain a financial return from OS's products (Rhind, 1998). Rhind was of the opinion in 1995 that no matter who owned OS or spatial data, that

> "revenue generation from long-lasting datasets will require protection of the Intellectual Property Rights arising from the expenditure of about USA $1 billion of taxpayers' money over the last 20 years" (Rhind, 1995, p.85).

Intellectual Property rights are discussed in more detail in Chapter 6.

Rhind (1998) based his overall philosophy on cost recovery, on the experience of the OS and other government survey and mapping organisations, and found that to be successful the following requirements had to be met:

- Government's policy must steer towards cost-recovery.
- Organisation must be accountable to the taxpayer.
- A customer focus must exist, and customer's satisfaction and organisation's efficiency must be measured, and improved if necessary;
- The population must be aware of the existence of the mapping organisation, this awareness must be measured and if necessary enhanced (eg. In Britain about 10% are aware of the OS)
- Intellectual Property Legislation must be adequate, and enforced.
- Commercial expertise in negotiation, pricing and value adding is necessary
- Historic costs of data acquisition must be viewed as sunk costs with cost recovery only concentrating on on-going maintenance and associated expenses.

4.3.3 Canada

In Canada Freedom of Information (FOI) legislation applies, but commercially valuable information is exempt. Information that is published or soon to be published is considered available in the public arena and if a potential user wants access to that information he/she must obtain it from the original published source (private or public). For example the Federal Treasury Board published a "Guide for Government

Managers" in 1991 on the dissemination of database information. It informed managers that the ongoing provision of information is expensive and should only be carried out, if there is either a direct mandate (duty to inform) to do so, or if users are willing to pay for the information. The provision of information requested by an individual should not be subsidised by taxpayers (Archer, 1995; Dando, 1995). This means that Canadian government departments only need to provide access to government held information, if that information is not available from other sources.

Many agencies in Canada seem to have expended considerable effort into developing their data-pricing. Geomatics Canada is a governmental agency within Natural Resources Canada, and is responsible for the provision of national surveys, maps, remote sensing information and technology and GIS expertise. Geomatics Canada provides information as a public service to be used for national defence, governing, the protection of Canadian sovereignty, sustainable economic development and environmental protection. The philosophy of Geomatics Canada was not to adopt the federal USA Government's policy to provide data "free" or for the cost of delivery. They also did not agree with the UK's approach of fully commercialising the sale of spatial data, because they believe that they should not function as a business. Their main responsibility was towards the Canadians (Corey, 1998).

In 1996-97 the Mapping Services Branch of Geomatics Canada overall cost recovery ratio (from topographic information and aeronautical charts and services) was 28% cost recovery versus 72% public funding. Many agencies in Canada have now adopted a partial cost-recovery model, where the users pay for part of the total cost of providing spatial data, while the rest is funded by the general taxpayer. The extra funds help to pay for part of the ongoing maintenance costs. Geomatics Canada's partial cost-recovery is based on the principle that user charges promote equity between the spatial data user and the taxpayer. It also promotes a more business like approach, thereby increasing customer service efficiency and accountability. For national initiatives the trend is to cooperate with other federal government departments, levels of government, academic institutions and industry to collect data (Corey, 1998).

4.3.4 Comparison – USA, UK and Canada

The USA's FGDC and others such as the organisations OMB and legislation in the USA advocate free or near free access to their spatial datasets. But as Nancy Tosta queries:

> "Will more data be made available if agencies operate on a cost-recovery basis? Who supplies data for environmental or social decision-making that serves the "public good"? Where are the lines between public and private sector responsibilities and incentives for data production? Who is liable for the quality of a geospatial dataset that is maintained by multiple agencies and made freely available on the Internet? Does copyright protection encourage data production and sharing? If public agency budgets for data development are decreased, will private sector data provide the basis for public decision making?" (Tosta, 1995, p.113).

On comparing the USA with the UK, Rybaczuk and Blakemore (1995, p.96) found that there is no direct causal link between availability of information and the development of intelligence in both the UK and the USA. Questions such as whether the Government can develop an information market arise. However is it in the taxpayers best long term interest for the private sector to develop those markets, as they are more interested in short term profit taking and not long term national strategic needs (Rybaczuk and Blakemore, 1995, p.100).

The plan to make governmental departments more effective and efficient, referred to as "re-engineering", is not progressing as fast as government officials in the UK and the USA hoped for. Government does not only need to reduce staff and contract out, but also examine organisational structures and governmental organisation's missions, especially on a whole-of-government basis (Rybaczuk and Blakemore, 1995, p.100). They suggest that it is best to use a partnership between governmental agencies and the private sector. For example, the OS has developed its partnership with the private sector to widen its product base, without diluting its ownership of the intellectual property. This example and some others given by Rybaczuk and Blakemore (1995), suggest that the government can save money and receive increased level of service at reduced costs, and the public value-added-value access to government information.

> "Equity is held by the owner, risk off-loaded onto those best positioned to take it, and benefits are shared. Such arrangement however can only be developed where copyright is held." (Rybaczuk and Blakemore, 1995, p.101)

As opinions and policies on data pricing differ across jurisdictions, it would be helpful to list the advantages and disadvantages of data pricing.

Reasons not to charge for data, or at a minimal cost of reproduction:

1. Data are already paid for, hence charging the user would mean, charging a taxpayer twice;
2. Cost of collection of revenue may be greater than revenue gain;
3. Maximum value to the citizenry comes from widespread use of the data through intangible benefits. Free or near free data stimulates the market and encourages economic growth;
4. Part of democracy. Citizens should have unrestricted access to information held by the government, to promote an open government. Manifested in open record laws.
5. Encourages data sharing. (Onsrud, 1998a, 1992)

Arguments against **not to charge** for data are as follows:

1. Dando argues that just because resources are obtained though public funding, it does not give any taxpayer the right to use those resources (eg. a government's departments facilities, and user fees are not uncommon eg toll roads, park admission).
2. Free data will weaken cost sharing agreements for data compilations and management (Rhind, 1992, p.17).
3. Democracy did not create the right of access to government information, but statute legislation such as the federal FOIA (Dando, 1995).

Reasons for charging:

1. Protection of the taxpayer, because only a few users acquire datasets.
2. Charging for the cost of collection, managing and packaging of data forces organisations to prioritise, encourages private sector to compete, and enables government to reduce taxes in subsequent years;

3. Governments are more prepared to part fund data collection if users are prepared to contribute;
4. Users demand value for money and hence the data quality is usually higher if data are provided for a price;
5. Charging for data will force buyers to buy only what they need;
6. Packaging, marketing and selling of data is costly (Rhind, 1995, 1992).

Arguments against **charging**:

1. Releasing government information for market fees does not contribute to an open government;
2. Discourages sharing of data

Dando (1995) compares some of the arguments on both sides of the spectrum and concludes that in some circumstances governments should be allowed to sell information to recover costs for building and maintaining databases. He says that both sides of the argument can be categorised under two themes:

- "The purpose and fundamental nature of open records laws and
- Who should benefit from government's efforts to collect and organise information" (Dando, 1995, p.32)

USA FOI legislation does not specify that the information must be provided in print, and hence maybe the government could offer browsing facilities, but not copying. FOI's fundamental nature, according to some, is in agreement with the USA federal government's prohibition of using copyright to protect its intellectual property in their data, and hence public records should be in the public domain. This view can be overturned by all other State and Local Government Departments for whom that prohibition does not apply. Many State and Local Government departments in the USA even use copyright to protect government owned intellectual property when using a cost recovery policy. (Dando, 1995)

If governmental departments were allowed to charge for their datasets at market prices, then the revenues could be used to reduce taxes, or improve the services. As mentioned previously, the Ordnance Survey (OS) in the UK recovers the cost of data, which allows the government department to provide the service that the public wants. In addition, the

OS has the most advanced national digital basemap development in the world. Dando (1995, p.35) writes in his conclusion that

> "by permitting fees to be charged to those who directly benefit, governments actually have an incentive to improve services and become more cost-effective, while generating income that benefits the taxpayers in the jurisdiction, not just a few selected users."

In conclusion to this section 4.3 on International Developments this research found that the Ordnance Survey in the UK could succeed with their cost recovery model, because it not only has the world's best available digital maps at large scale, but it also advocates the importance of relying on Intellectual Property Rights to protect its assets in their data. However, the cost of the historic spatial data that was collected and manipulated before the cost-recovery model was introduced was not included, hence making it easier to recover operational costs. If Australian organisations were to adopt such a cost recovery model, it would be necessary to first measure whether the size of the market had a significant impact. For example a small population in a rural region may not support a cost recovery model, while the population of Sydney, perhaps, would.

The Federal Government in the USA has the policy to provide data at the cost of copying or less and the policy is strengthened by Intellectual Property Legislation (more information is given in Chapter 6). This is in contrast to the UK, hence any potential access and pricing policy will heavily depend on the policy of the Government in force at the time. However, rather than adopting either extreme of the federal government departments in the USA or the OS in the UK, organisations in Australia may want to adopt a similar approach to the one used in Canada. Canada's partial cost recovery model could help pay for ongoing spatial data maintenance cost. This chapter will now review what individual Australian States/Territories and New Zealand are doing in regard to spatial data access and pricing.

4.4 Australia and ANZLIC

The Australian National Competition Policy (NCP) was newly introduced in 1995 and forms part of the Federal Government's reform. It aims to improve the efficiency of governmental departments and to reduce costs at all levels of government. The NCP's framework provides government departments with the ability to improve competitiveness and includes:

1. reform of legislation
2. implementation of government's competitive neutrality in a contestable market (neutrality in a contestable market requires government agencies to compete fairly with the private enterprise by paying taxes and rates that the government agency would normally be exempt from, only if their products are commercially viable)
3. public monopolies reform (government should have no advantage)
4. no excessive price rises
5. application of competition laws
6. commitment to NCPs reforms in key infrastructure areas such as electricity and gas, to improve efficiency, implement standards and protect the environment (Commonwealth of Australia – The Treasury, 1997-98)

The NCP meant that government agencies were not allowed to use monopolistic market powers, but instead had to compete with the private enterprise in an open market. Hence any government agency should aim to increase access to governmental information and remove any unfair advantages it has in comparison to the private enterprise.

In Australia the view of the Australia New Zealand Land Information Council (ANZLIC, 1998d) is that spatial data collected by state government agencies forms part of a State's corporate resource. Each spatial data collector becomes custodian of the data they collected and not the owner. The custodian has to make sure it satisfies the needs of the data user in regard to spatial data accuracy, currency, storage and security.

Since there are numerous custodians involved in spatial data collection there is the need for Federal Government support by way of a spatial data infrastructure. This infrastructure will provide the data provider with the technical and administrative means to distribute their datasets, and the spatial data user with standardised datasets and the means to determine a spatial datasets potential usefulness. The Australian Spatial Data Infrastructure (ASDI) is being developed at present and includes metadata standards and the development of other standards and guidelines.

As ANZLIC and the CSDC are developing the ASDI, its concepts and systems, they have to seek the cooperation of leading agencies in all States and Territories and New Zealand, but also from local governments. This may prove to be more difficult than envisioned. As mentioned in Chapter 2, a top down approach may not be successful, because the individual States have their own jurisdictional powers and hence considerable autonomy.

The next section will describe all ANZLIC members, including each Australian State/Territory and Commonwealth and New Zealand. The main agencies and/or coordinating bodies are explained, followed by a description of their current access and pricing policy or draft policy aims.

4.4.1 Australian Capital Territory

The Australian Capital Territory's (ACT's) Government Agency for land information, surveying and mapping is the ACT's Land Information Centre (ACTLIC), consisting of five units. These are the Office of the Chief Surveyor, the Spatial Data Management unit, the Mapping Office, the Drafting Services unit and the Information Delivery unit. ACTLIC organised the ACT Land Information Forum (ACTLIF) that is responsible for coordinating spatial information within the ACT. The members to the forum are executives and senior officers from across the ACT Government, comprising 21 organisations (ANZLIC, 2000a – ACT report).

ACTLIF's vision is that the industry, community and others doing business in the ACT should have easy and available access to integrated, relevant and reliable spatial information. To realise that vision, their objective is to focus on ACCESS, where ACCESS stands for Accessibility + Conformity + Content + Engagement + Sharing + Sensitivity. This focus involves various strategies such as to:

1. "Coordinate and foster collaboration on spatial information infrastructure issues across government, the private sector and the community.
2. Ensure appropriate and affordable access environments exist for spatial information.
3. Ensure appropriate and reliable spatial information is available for use.

4. Ensure that people have the skills necessary to access and use the ACT Spatial Information Infrastructure (ACTSII)" (ACTLIF).

ACTLIF is currently in recess. However The Department of Urban Services in close cooperation with ACTLIC has developed a Geographic Information Management (GIM) strategy for their department. This strategy aims to bring all geographic data held in their department into one format. This process is being investigated by the Chief Geographic Information Officer of the Department of Urban Services and NAVIGATE, a spatial systems developer and GIS consultant (ANZLIC, 2000a – ACT report).

ACTLIC also established the Land Information Industry Group of the ACT region to provide a forum for the public and industry to voice their opinion on GIS/LIS issues.

4.4.1.1 Access and Pricing Policy

The ACT has no overall government data access policy. However ACTLIC's Spatial data, unless confidential, is available for unrestricted access. Spatial data are not sold, but licensed to the user. This means that the data always remains the property of the ACT Government. Their pricing policy has recently been changed and the complete cadastre for the ACT is available for use under licence for $2,000 (as of February 2000), while previously priced at $25,000. Calculated as a price per parcel this equals 2c, but a minimum charge of $200 applies. If a user wants to on-sell the data or value-add products, a standard Value-Added Reseller agreement is required. The price for a data licence is the cost of supply (ANZLIC, 2000a – ACT report; Menzies, 2000).

Infrastructure data are usually available by negotiation with the relevant authorities. ACTLIC exchanges data with Stormwater, Electricity, gas (AGL), sewer and water reticulation and Telecom (ANZLIC, 2000a – ACT report; Dobson, 2000).

4.4.2 New South Wales

New South Wales coordinates their geospatial information strategy through a whole-of-government initiative. This initiative, manifested in the 1997 Information Management and Technology (IM&T) Blueprint, does not only include geospatial information but all government information, information technology and telecommunications.

Prior to the last New South Wales State election in March 1999, the Government Information Management Board was coordinating Government's IM&T strategies and implementations. The Office of Information Technology (OIT) of the Premier's Department developed whole-of-government IM&T policies, strategies and guidelines adopting international or Australian standards, wherever possible.

Since that election, the new Department of Information Technology and Management (DITM) was formed to oversee the three geospatial information agencies and OIT: Land Titles Office (LTO), Valuer Generals Office (VGO), and Land Information Centre (LIC). These three agencies were merged into one business agency affective since the 1 July 2000. The new government agency is called Land and Property Information NSW (LPINSW). DITM and OIT will develop spatial data management policies, which will need to comply with whole-of-government policies.

OIT is for example working with various business or service groups to develop a consistent on-line public access policy. At this stage information sharing strategies only exist for particular areas, such as Health, Human Services, Criminal Justice and Natural Resources. The natural resources strategy for example is called the NSW Natural Resources Information Management Strategy (NRIMS). NRIMS is being developed and implemented by the NRIMS Steering Group. Representatives on this group are the heads of the major NSW Government natural resource and environmental agencies. NRIMS strategies for their data access objective of maximising access to natural resources information are:

1. "Establish and develop access to natural resources data;
2. Streamline administrative processes by addressing customers' access issues of data security, privacy, liability and pricing." (NRIMS Strategy, 1999-2002)

4.4.2.1 Access and Pricing Policy

In order to make government information more accessible to the public, the NSW Cabinet has requested DITM to develop a whole-of-government policy on information access and pricing. This policy is necessary because of the need to have a comprehensive and consistent policy framework, consistent and affordable pricing, equitable public access, encourage data sharing, develop an information economy, and support an information infrastructure.

The new access and pricing policy was finalised in 2000 and passed by the Treasury and NSW Cabinet (Bullock, 2000). As of July 2000 the new policy was being send to NSW government agencies for comment. The new heavily reduced pricing policies for Queensland and New Zealand triggered the push for policy reform in NSW. "The principles in the current draft Policy are along the lines of:

- Agencies must provide reasonable access to their information
- Agencies must make their public policy information freely accessible
- Agencies must maintain some form of directory of their collections of information
- Agencies must clearly state the terms and conditions under which their information can be used
- Agencies must price their information according to a number of bases, ranging from avoidable cost to market price depending on a number of criteria
- Agencies must have a documented information pricing scheme." (ANZLIC, 2000b – NSW report)

The new policy does not distinguish between specific uses for spatial data, but the nature of the market. A government agency has to decide if the spatial data should be free or available for a price. All government agencies in New South Wales must develop and document principles and reasons for their pricing policies.

The Integrated Community Mapping and Information Support System (ICMISS) in New South Wales forms part of the clearinghouse. ICMISS is the technology allowing users access to directories such as the Natural Resources Data Directory (NRDD). Data and directories are held decentralised by the data custodian but with one centralised access point provided by ICMISS.

4.4.3 Northern Territory

The Department of Lands Planning and Environment (DLPE) is NT's principal state government spatial data agency. The NT Land Information Management Coordination

Group (LIMCG) coordinates spatial information policy, standards, projects and working groups in NT. After a restructure at the end of 1999 LIMCG reports to the Information Technology and Communications (IT&C) Sub-Committee consisting of key Chief Executive Officers (CEOs).

The Department of Corporate and Information Services (DCIS) is responsible for a whole-of-government approach to outsourcing IT services, information management and IT standards development. Apart from the overall IT strategy the issue of GIS and spatial data services is handled by DLPE. At the present time DLPE is developing guidelines to enable implementation of a revised policy framework endorsed by the Government in 1999. A primary focus is data access, pricing and licensing.

Overall the NT Government is committed to provide the public with the best available service to maximise access to government information. The framework of policy and guidelines is intended to ensure potential privacy and legal liability issues are minimised.

4.4.3.1 Access and Pricing Policy

DLPE is reviewing their pricing guidelines at the present time, aiming for completion at the end of 2000. The Access and Pricing Guidelines recognise commercial use versus non-commercial use. The charging will most likely depend not only on the use but also the user. Non-commercial use will attract the cost of transfer, while commercial use will most likely attract commercial rates (Stephens, 2000).

4.4.4 Queensland

A whole-of-government, including private enterprise and the community, approach to spatial data management and distribution for Queensland led to the creation of the Queensland Spatial Information Infrastructure Strategy (QSIIS). Cabinet approved the establishment of the Queensland Spatial Information Infrastructure Council (QSIIC), the development of the Queensland Spatial Information Infrastructure (QSII) and the necessary capital funding for the development in July 1997. (Fenwick, 1998)

QSIIC's vision is to afford Queensland's community with easy and available access to relevant and reliable spatial information, thereby improving economic benefit. To implement that vision their strategic goal is through better access, at an affordable price for information, the information industry will grow.

4.4.4.1 Access and Pricing Policy

The Queensland Government's Information Access and Pricing Standard No. 33 identified that the cost of information should be no more than the cost of provision, unless there is a statutory charge applying to the provision of the information. The cost of provision may include additional expenses to provide the service such as promotion of data, staff labour costs for providing extra service, costs for external use such as technical costs and user training, and operating costs. Cost of provision does not include the costs of collecting and maintaining data or using the information within the agency. (Queensland Department of Communication and Information, Local Government, Planning and Sport – Information Standard 33, 1999).

Implementation of Standard No. 33 by the Department of Natural Resources (DNR) commenced in July 1999 and is an ongoing process. The DNR is responsible for the spatial management of various areas such as land, water, and native vegetation. The digital cadastral database encountered the first price change. The cost for an annual licence to use the digital cadastral database for the whole of Queensland was reduced from $1.75million to $125,000, with rights to on-supply the data with no royalty payments. DNR pricing regime does not differentiate between commercial and non-commercial users, but rather spatial data uses.

"DNR pricing principles:

1. **Contribution to Queensland** – DNR pricing should support and contribute to the goals of the State Strategic Plan and DNR Corporate Plan.
2. DNR pricing should not inhibit access to information for economic value adding activity nor achievement of ecologically sustainable development.
3. **Contribution to DNR** – The aggregation of the "new" revenue stream to the Department from the Pricing Framework should match that of the "old" revenue total.

4. The Pricing Framework should ensure that access to information does not undercut statutory revenue streams to Queensland Treasury (i.e. by private providers offering discounted prices through brokering).
5. **Contribution to customers** – DNR pricing should be simple and easy to understand for customers; pricing should be seen to be "fair" by customers – as such, all customers should be viewed as equal and preferential treatment avoided.
6. DNR pricing should be certain and predictable over the next 5 to 10 years to provide distribution/brokers a reasonable planning environment.
7. Pricing should facilitate reasonable access to customers and members of the community.
8. The pricing framework will align with the development of distribution/brokerage arrangements, which enable the ultimate end user to access products and service incorporating DNR information. DNR will provide some retail presence to avoid "market failure" and ensure Community Service Obligations are met.
9. **Considerations within DNR** – DNR product and service lines are rationalised and aggregated into "like" categories using similar pricing points.
10. The provision of digital data is to be formalised under a Licence Agreement containing pricing and conditions under which another party may use the data.
11. Pricing based on the apportionment of costs is the preferred method as it reflects a more accurate usage of resources. For example, the cost of provision is based on the full value of all resources used or consumed in providing a particular products or service, average over the estimated total units of output" (Mawn and Stanton, 1999, Appendix 1)

Mawn and Stanton (1999) conclude in a paper entitled "Information Pricing: Should we give it away?" that pricing is only one component of an effective information access strategy. Other important items are quality, accuracy and currency, ease of access and use of data.

4.4.5 South Australia

The Government Spatial Executive Committee (GSEC) coordinates South Australia's Spatial Data strategies. All 10 State Government Departments have representatives on GSEC who are typically divisional directors. GSEC has to report to Senior Management Council, which consists of the Chief Executives from all State Government Departments.

The Spatial Information Committee (SICOM) coordinates operational and technical requirements and provides policy and technical advice to GSEC. SICOM provides the forum in South Australia for the exchange and dissemination of spatial data within the State. SICOM's members meet every month and represent State, Commonwealth and Local Government, academia, and the spatial private sector. South Australia launched the Spatial Information Industry Program (SIIP) in 1997 as a whole-of-government approach to reform state and local government, to develop a spatial industry with an export focus and to improve community empowerment through increased access to spatial information. SICOM, GSEC and SIIP are currently developing policy guidelines in relation to spatial information access and delivery, however a number of issues associated with privacy, ownership, custodial rights and standards still need to be resolved.

4.4.5.1 Access and Pricing Policy

The Government Policy on Information Technology 2.9 of 1996 guides access and pricing. However a whole-of-government GI access and pricing policy has not been developed, although a draft that never became a State Government policy is being used as a guideline (Jones, 2000). The cost of government data is to be determined as the cost of data dissemination (cost of transfer). If however the data has been developed to meet private use, the cost may be determined above the cost of recovery.

The philosophy behind charging at the cost of transfer is that it supports Governments policy on making data easily available, and to make government data consistent through new delivery mechanisms. Individual agencies determine their own pricing and access regime. However transfer of data between government agencies involves generally few restrictions. If data are being on-sold then data licence agreements may be used and commercial rates charged. Infrastructure data held by public utilities is used internally and not available to the public (ANZLIC, 2000c - SA report).

4.4.6 Tasmania

The Department of Primary Industries, Water and Environment (DPIWE) resulted from an amalgamation in 1998 of the Department of Primary Industries and Fisheries and the Department of Environment and Land Management. DPIWE was formed to lead Tasmania in natural resources management and in sustainable development. DPIWE consists of five units. Food, Agriculture and Fisheries; Resource Management and Conservation; Environment, Planning and Scientific Services; Information and Land Services; and Corporate Services. The Information and Land Services Division does among other things provide policy and technical advice on land information. (DPIWE, 2000)

The Land Information Coordination Committee (LICC) is a forum that provides the Government with expert advice on land information issues and coordinates land information activities. The Cabinet has recently approved LICC's role. Membership of the committee consists of 10 representatives from 5 government departments. LICC is responsible to develop strategies for the Land Information Infrastructure, to maintain it, and to facilitate mechanisms for the exchange, access, awareness and use of Land Information.

LICC established the Land Information System Tasmania (LIST). LIST is "A system for the management and delivery of integrated land-related data about Tasmania" (ANZLIC, 2000d – Tasmania report). LIST started to develop in 1998 and provides a commercial website for public enquiry on land information for Tasmania. (Mahar, 1999)

4.4.6.1 Access and Pricing Policy

DPIWE is presently developing a new pricing policy, which should be available by the end of 2000 (Twin, 2000). The main philosophy of the new pricing policy will be that the department wants to encourage third parties to use and incorporate DPIWE data into their own products, while still selling all of its own product ranges.

> "Current data costs are determined on the basis of proportioning out the cost of digital conversion over 10 user licences. The proposal, which is being put forward for consideration, is that data licence costs should be determined based on "cost of transfer" for all users. Where a user then produces a commercial product using that data, an additional royalty charge is proposed. Special cases for reduced fees will be considered by the Minister", (Twin, 2000)

DPIWE uses "data share agreements" with local government agencies and selected government business units. These agreements enable mutual sharing between government departments at no data cost to all parties involved. At present the price for spatial data is charged per mapsheet, but future charges will be based on a digital quantity measure such as megabyte of information.

4.4.7 Victoria

Land Victoria provides Victoria's whole-of-government coordination of GI. Land Victoria, a division of the Victorian Department of Natural Resources and Environment, manages land administration and geospatial information. One of Land Victoria's business groups is the Land Information Group, which is responsible for developing and managing Victoria's land information datasets, and for coordinating the development of policies that will increase the use of geospatial information. As part of their role, they have to cooperate with other government agencies to implement a State-wide strategy for the introduction of GI systems and a geospatial data infrastructure to support the land, property, natural resources industry and land information market.

Policies were formed as part of Victoria's Geospatial Information Strategy "Building the Foundations 1997-2000". That strategy aims to provide access to geospatial information for all Victorians. However some datasets such as infrastructure data, held by the utilities, is generally not available due to privatisation and commercial-in-confidence.

Land Victoria manages a whole-of-GI information website for Victoria called GI Connections, in order to promote and stimulate growth of the Victorian GI market. GI Connections contains GI products and services, data directories, map viewers, GI suppliers, Industry Events, Policies and Standards.

The existing Victorian Geospatial Information Strategy Plan (VGIS, 1997-2000) is currently being reviewed. The draft of VGIS 2000-2003 is available for comment and can be considered as the current situation. The draft VGIS has various components such a custody, metadata, spatial accuracy, access infrastructure and pricing. When the draft VGIS is endorsed a new group called Data Custodians Group (DCG) will be formed. This group will focus on operational and administrative activities, while the existing group Geospatial Information Reference Group (GIRG) will continue in its role as Government Strategic Adviser. (ANZLIC, 2000e - Victoria report)

4.4.7.1 Access and Pricing Policy

Victorias' strategic plan specifies that access must and will not be limited by price (VGIS, 2000-2003). Victoria's online service delivery program focuses on Internet access. Victoria's Government geospatial information pricing policy aims to encourage increased use by minimizing licence and delivery costs. Victoria's pricing policy also requires government agencies to gain sufficient revenue to maintain geospatial information to the standard required by users, and to increase government's accountability and transparency. Commercial charging is up to the individual organisation, while non-commercial charging is according to the above policies. The cost of the licence to use cadastre, road network and topography for the whole state is $2000 (Thompson, 2000). The same pricing regime is applied to the private and public sector. Differences may only occur if geospatial information purchasers qualify for a discount. A discount will be granted by way of a credit or a subsidy, and these will apply in the following circumstances:

Credit applies if a purchaser contributes to datasets by way of providing extra data, key data, or update information to a dataset. The amount credited and requirements to qualify for credit are set out in the provider's guidelines.

Subsidy applies if a purchaser buys the dataset for beneficial uses such as non-profit environmental or educational; or for developing critical GI dataset markets, or commercial applications advancing Victoria's Government program; or if the data aims to improve the Victorian communities quality of life. (GI Connections – Pricing Policy)

The geospatial data are not sold, but licensed to the user on an annual basis for a fee, on either a commercial use or internal use licence. Commercial exploitation of geospatial data attracts royalty payments. These payments are a percentage of the licence fee. Value-added products are included in the pricing regime.

Prices for geospatial data licences are based on the volume and frequency of use. The price incorporates a share of the real cost of maintaining the data. "Full cost" is charged if the selling price is the same as the cost to the agency providing the information, plus delivery or transfer cost.

"PL=PU*V*I where PL is the price of the licence
PU is the unit price of the information
V is the volume of information requested, and
I is the intensity of use."

The cost of information (unit price PU) is the sum of various factors divided by the estimated market. PU is the smallest amount of data and the lowest level of intensity of use

"PU=(F+N+D+I)/T where PU us the unit price of the information
F is the government finance charge (=8% of the net asset value)
N is the competitive neutrality cost, including private sector rate of return, taxes and regulatory costs
D are direct costs such as maintenance, depreciation
I indirect costs such as corporate management and accommodation costs
T estimated market (customers and concurrent users)"

If the price is reduced because of a subsidy or credit, it can be calculated as follows:
"PRL=PL-S or

PRL=PL-(S+A) or

PRL=PL-A where

PRL is the reduced price of the licence,

S is the subsidy, and

A is the credit."

The price of supplying geospatial data is additional to either above calculated price:

"Ps=M+H where

Ps is the price for supplying GI,

M is cost of the medium by which the data are supplied, and

H is all remaining costs associated with supplying information."

"A user's share of the total licence fees is based solely on the user's requirements, expressed as a volume of the data and its intensity of use. An example of a unit of volume is megabytes and intensity of use, the number of concurrent users of the data in the purchasing organisation." (GI Connections – Pricing Policy)

4.4.8 Western Australia

The Government of Western Australia coordinates its agencies' land and geographic information management through the Western Australian Land Information System (WALIS). WALIS aims to enable access to land and geographic information for the whole State. WALIS members consist of 27 State government agencies and works closely with local government, businesses, education and the community (WALIS, 2000a).

All WALIS members have signed a Memorandum of Understanding (MoU), to identify the commitments required to ensure that the benefits of sharing, cooperation and collaboration are achieved. For example by signing the MoU, members agree that:

> "All non-confidential agency land and geographic information will be made readily available and accessible to all WALIS agencies at an appropriate fee according to policies set by Cabinet." (WALIS MoU)

WALIS was established on the principle that through cooperation and collaboration, more can be achieved than through individual effort. Money could be saved by data collection coordination and sharing. As part of this vision WALIS is creating an information infrastructure, which will enable users to locate and access consistent and comprehensive spatial datasets.

WALIS strategic directions from 1999 to 2001 define 4 objectives:

1. "To be accepted as meeting the needs of Western Australian for land and geographic information.
2. Enable state-wide access to land and geographic information.
3. Ensure value for money in the acquisition and development of data.
4. Maintain, improve and protect the land information for the benefit of all users."

The first objective focuses on gaining acceptance by all Western Australians as meeting their needs for land and geographic information. A submission is to be made to the WA Cabinet recommending the establishment of a land and geographic information infrastructure as a matter of policy. It involves strategies such as producing reports and other publications, conducting surveys and organise WALIS discussion forums.

Objective number two involves improving access to information, which involves the preparation of a new data pricing policy, which will be consistent with government policies on net appropriations and competition, and improve data collection efficiencies. Access will also be improved through WA Atlas for on-line mapping (launched by the Minister for Lands on the 1st of March 2000) and Data Clearinghouse for acquiring data on-line (when security and audit standards are satisfactory). The private sector will be encouraged to become data brokers by way of a data broking policy. The WALIS data directory "Interrogator" will continue to be published annually with options for online updating to be investigated.

The data pricing policy was approved by Cabinet and came into effect on July 1, 2000. Because of lower prices the policy is expected to encourage more local authorities to use spatial data in their management and decision-making. (ANZLIC, 2000f - WA report)

Access through the data clearinghouse is being tested. However organisations in WA are resisting providing links to their data via the clearinghouse. This resistance occurs because agencies are ill-informed and believe that by providing data via the clearinghouse, they lose revenue. In times where government agencies are required to increase revenue this would be a major impediment. Some agencies also perceive the clearinghouse as a centralised data warehouse rather than a portal for users to access an agency's data on their site. This objection is being addressed through education strategies.

The third objective involves reviewing WALIS policies, standards and data licensing agreements. Data licensing agreements are currently being revised with the aim of simplification, on-line provision and data leasing. WALIS aims to enable transfer of information products among non-commercial groups without the custodian's approval. However intellectual property and liability issues need resolving. The fourth objective involves the continuous updating and quality improvement of the state's land information.

4.4.8.1 Data Pricing and Transfer Policy

This policy replaces the existing policy of February 1992. It aims to encourage use, and sharing of spatial data, reduce barriers, discourage duplication, provide equity of access and reduce costs of using spatial data held by WA Government agencies. The policy only applies to existing data, and if any editing or transformation is necessary then the data may attract extra charges.

Some of the main differences from the old policy will be that all WA state government agencies as well as local government agencies are included in the policy and not only those approved by the Minister of Lands. Extraction and distribution costs, include the costs of providing facilities, offices, equipment and consumables needed to perform the extraction and distribution. Pricing for non-commercial use depends on whether the data could have been produced in a contestable market. The pricing model can be demonstrated with the following diagram:

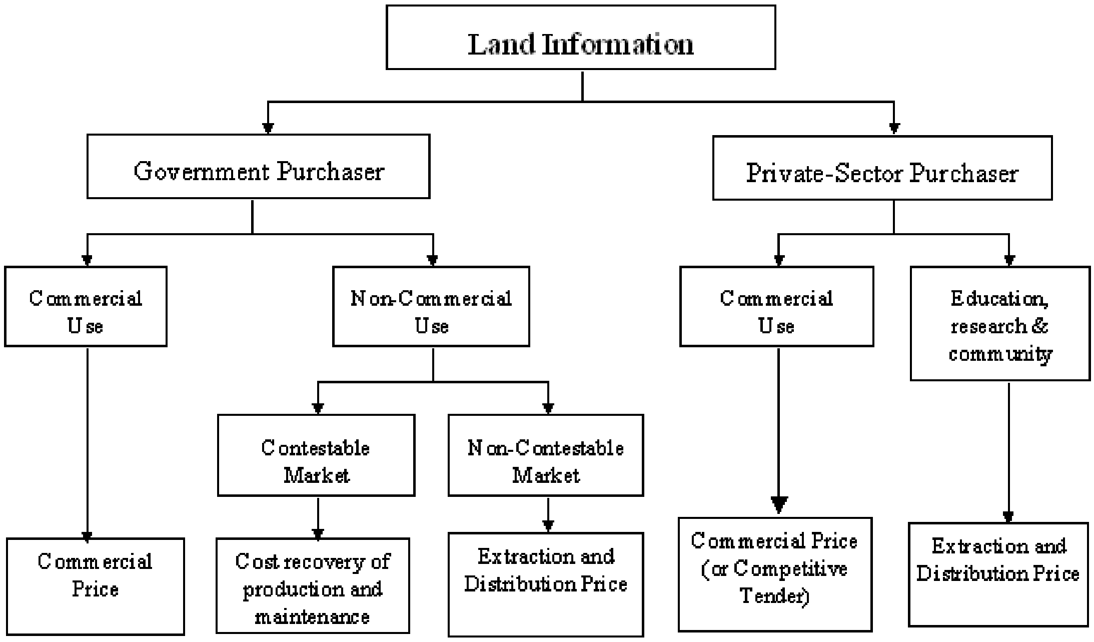


Figure 4.1: Pricing model for WA

Source: "Draft pricing and transfer policy for land and geographic information held by Western Australian State Government agencies" (http://www.walis.wa.gov.au/the_rulebook/draft_marketing_policy.htm)

The policy specifies that although each data providing government agency will have some flexibility in determining the pricing for their data, government agencies should be open to scrutiny and influenced by other agencies, because the government's general objective is to maximise whole-of-government and community benefits.

Transfers to federal government agencies will be determined the same way as to the private sector, unless the transfers are part of cooperative arrangements. Local Governments will be treated in the same way as State Governments. Transfers to education and regional or community groups will attract costs of extraction and distribution and not data capture and maintenance, provided these groups work within an approved business plan to implement government policy.

Pricing for commercial use - If the spatial data are used as an input to business activities for the purpose of generating revenue, income, or profits, including the on-selling of data it can be classified as "commercial use". If an agency provides their data regularly and frequently for commercial use, then the price should cover costs of extraction and distribution and a share of data capture and maintenance costs (the share should be determined as a proportion of an estimated share of total use). If the data provider only makes a once off or infrequent distribution, the provider can either charge as above, or negotiate a higher price to maximise the returns to Government. However the above policy can be altered to a lower or zero price if cooperative data transfer arrangements can be made, as long as it is an efficient way for state government agencies to obtain information for their own purposes.

Data for on-sellers (also referred to as data brokers) in private and public sectors must be charged at prices determined by competitive tender or by negotiation, with the objective to maximise revenues returned to Government. This policy will apply to the on-selling of the original product, or a new value-added product derived from the original product.

Pricing for non-commercial use by state and local government agencies – If there are alternative sources in the market place that could produce and maintain the same data, then the market is deemed contestable. If not, then the market is non-contestable. Certain fundamental datasets that are necessary for governmental operations and cannot be derived from other datasets are also considered non-contestable.

In a contestable market, prices should be based on recovery of costs of information production and distribution. However if cooperative arrangements can be made, the price can be lowered or changed to zero. Pricing in a non-contestable market will be based on recovery of costs of extraction and distribution.

The cost of extraction and distribution will be based on the average cost of transfer and will not include a share of collection or maintenance of data. The average cost of transfer will include direct costs and a share of all overhead costs in providing the distribution service. Direct costs are, for example: media, computer processing and freight. Overhead costs include such items as labour, capital equipment and promotional facilities.

4.4.9 Commonwealth

The need for coordination of Commonwealth spatial data management led to the development of the Inter-departmental Steering Committee on Coordination of Commonwealth Land-Related Data in 1983. With many teething problems and changing committees and names, the final and at present existing Commonwealth Spatial Data Committee (CSDC) was formed in 1992. This committee was to help administer common Commonwealth agency approaches to data management issues such as data standards, directories, distribution and pricing, avoid duplication, and develop strategies to meet spatial data demands, integrate various datasets, and be able to represent Commonwealth agencies on global, regional and national forums (CSDC, 2000).

The CSDC is comprised of a committee, a subcommittee that addresses policy coordination and technical issues, and working groups for specific purposes. Some working groups have been recently assigned to deal with components of the ASDI implementation plan. These are the ASDD National Coordination Group (reviewing strategic directions), the Clearinghouse Working Group (reviewing on-line access issues and identifying clearinghouse standards), and the Fundamental Data Working Group (identifying, auditing and recommending improvement to the fundamental datasets).

4.4.9.1 Commonwealth Access and Pricing Policy

CSDC developed the Commonwealth Public Interest Spatial Data Transfer Policy in 1995 to promote improved access to spatial data owned by the Commonwealth. That policy determined that Commonwealth agencies charge at the cost of distribution. CSDC policies are mere guidelines because the CSDC have no legislative powers. Some Commonwealth agencies did not follow the guideline and made their data freely available, for example the Environment of Australia (ANZLIC, 2000g – Commonwealth report).

CSDC members identified that a whole-of-government binding approach was needed. In 2001 a new policy is being developed with the aim of endorsement by the Commonwealth Government. The new policy will embrace

- Identification of fundamental spatial datasets;

- Development of production, maintenance, provision of metadata, use of appropriate technology and custodianship guidelines;
- Standards and transfer protocols;
- Access, pricing and copyright policy;
- Exchange of data between all levels of government and private sector for commercial and non-commercial use;
- Recommend policy implementation requirements
- Monitor effectiveness of policy

4.4.10 New Zealand

New Zealand is not separated into different states and has therefore no need for interstate coordination like Australia. New Zealand has a central government policy framework covering spatial and non-spatial data. On examination of its NSDI concept, New Zealand decided that there was no need, at this time, to have a specific central government led NSDI initiative. However Land Information New Zealand (LINZ) will monitor community needs and address any critical NSDI issues not addressed in the government policy framework. LINZ, as the government's spatial referencing agency, will provide user access to relevant, timely and accurate information, unless there are privacy and/or confidentiality issues at stake (LINZ, 2000). LINZ does not provide value-added information service (LINZ, 1999a).

LINZ, established in 1996 now comprises the core government functions of the former Department of Survey and Land Information (DOSLI), the Land Titles Office (LTO), the Office of the Valuer-General (OVG) and the government hydrographic purchase function [ex Royal NZ Navy]. The State owned enterprise Terralink NZ Limited was created in 1996 as the balance of the split of DOSLI and tenders for contestable LINZ outsourced work (LINZ, 1999b). LINZ will provide the national spatial referencing system and core spatial datasets. In terms of policy development LINZ will work with the government control agencies, State Services Commission (SSC) and The Treasury, to develop principles, guidelines and practices for managing government information for New Zealand (LINZ, 2000). These all-of-government information management responsibilities will reside with the E-Government Unit, being established within the SSC on 1 July 2000.

Cabinet approved the New Zealand Government's policy framework for government held information in April 1997. It agreed that government information should be easily available. The policy framework established the following on data coverage, pricing, ownership and quality:

- Coverage - All government data that is not subject to legislation confidentiality or privacy issues should be released.
- Pricing -
    - Free: for public policy purposes or if cost of dissemination is not feasible or cost effective.
    - Cost of dissemination: for public policy reasons and if cost of dissemination is both feasible and cost effective.
    - Cost of transformation: when cost of dissemination is appropriate and the cost of transformation unavoidable, however cost of transformation must be feasible and cost effective.
    - Full cost: when information was created for commercial purposes, and will not breach other pricing principles.
- Ownership - government produced information is owned by the government as a steward (referred to as custodian in Australia) on behalf of the public. A steward is responsible for implementing good information management practices.
- Quality - includes such issues as accuracy, relevancy, timeliness, consistency and collection for the purposes it is intended. Government departments should only collect the data that is necessary for their specified public policy, operational business or legislative purposes.

4.4.10.1 Access and Pricing Policy

LINZ followed the government policy framework. On the 10/12/99 a new Cabinet approved pricing regime for LINZ topographic data came into effect. The price for the topographic dataset at a scale of 1:50,000 for the whole of New Zealand was heavily reduced from $2million to $1,500. The DCDB is in the process of being amalgamated with the titling system on the phase 1 Land*online* to provide survey accurate data on-line. The new survey accurate product replacing the DCDB is likely to be priced at a level below that of the current DCDB, as a greater proportion of costs are already being met by the users of the Land*online* system (Walsh, 2000).

The arguments for a price reduction put to Cabinet varied. Previous topographic information pricing was regulated through copyright and license fees. The old pricing regime was set at a rate to recover the full cost of establishing the digital database from manual records, divided by the estimated expected sales plus copyright fee. However this high fee, set at $2million, prevented any client from buying the whole dataset. LINZ was also continuously criticised for imposing fees that were not in line with Government policy. Crown royalty payments were required for topographic information and others derived from it, such as aerial photographs. These payments declined in the 1998/99 financial year, due to more spatial information being available at cheaper costs over the Internet and some buyers paying royalty and others not. Prosecution of non-compliance was difficult and the lack of legal precedent made it impossible to forecast any outcome (Documentation provided by Walsh).

The new pricing regime is based on a cost of dissemination to retail agencies. Users can access topographic information through retail agencies. The new pricing regime abolishes Crown copyright payments and royalty charges. The cost of dissemination should also further the development of the private sector.

> "The benefits of the new pricing policy are already evident in facilitating environmental management in NZ and in national research that is now being undertaken by universities and Crown research agencies. The NZ Government approach of pricing information at the cost of dissemination radically frees up access to information and virtually eliminates burdensome compliance procedures and costs. Information access polices, for data which remains at a high price, in practice do little to improve effective access to that data" (Walsh, 2000).

4.4.11 Summary of Australian States/Territories, Federal Government and New Zealand Government Policies

Table 4.3: Summary of Spatial Data Pricing Policies or Draft Policies for all Australian States/Territories and the Commonwealth, and New Zealand

	GI Pricing Regime (range, non commercial **to** commercial use rate)	Applicable to non-commercial and commercial use?
ACT	** Licensed to user at cost of supply	Both
NSW	Cost of transfer **to** market value	Varies
NT	* Cost of transfer **to** market value	Varies
Qld	Cost of provision	Both
SA	** Cost of transfer **to** above cost of transfer	Varies
Tas	* Licensed to user at cost of transfer	Both
Vic	Licensed to user at Cost of transfer plus maintenance cost (for non-commercial use) (commercial pricing – up to individual organisation)	Varies
WA	Cost of extraction and distribution **to** cost of extraction, distribution and share of: data capture and maintenance cost	Varies
Federal	* Existing policy – cost of distribution, but new policy under development	Both
NZ	Cost of dissemination	Both

Note: * Policy under development
** No policy, but general current practice

Table 4.3, shows that all Australian States/Territories, their Federal Government and New Zealand Government have either recently updated their access and pricing policy/practice, or are working currently on new ones. Four out of the eight Australian States/Territories namely New South Wales, Northern Territory, South Australia, and Western Australia have different prices for different uses, which range between cost of transfer for non-commercial use, to above cost of transfer (such as market value) for commercial use. Cost of transfer is usually the cost associated with supplying the data (cost of extraction and distribution) and includes such costs as staff costs, and user training. The commercial use rates for NSW, NT, SA and WA are either set to include a share of the data capture and maintenance cost or at market value.

Queensland's information access and pricing standard no.33 determined that governmental information should be sold at no more than the cost of provision (similar to the cost of transfer). DNR, following this guideline, heavily reduced the price of their Digital Cadastral Database (DCDB) for the entire State to the user directly and via data brokers from $1.75 million to $125,000. The database is not sold, but rather licensed to the user for a year. The Australian Capital Territory and Tasmania license their data to the user at the cost of transfer, independent of the use. Victoria requires their government agencies to supply governmental spatial data as a licence to use at the cost of transfer plus some maintenance cost, applicable only to non-commercial use. If the data are going to be used commercially each government agency has the right to charge appropriately.

4.5 Survey

Following are discussions that relate the spatial data survey results, from Chapter 3, to the information in this chapter, to enable a clear analysis of the situation in Australia.

4.5.1 Access - Data Providers

When the questionnaire (see Appendix 1) asked for the most commonly used data access mechanisms, most data providers (83%) answered that they provided access as a '*Hardcopy over Counter or Mail'*. The 83% indicate that although technology is available, the overall use of digital data is not as great as expected. This is somewhat understandable, because many community uses would be for hardcopy street maps, or hardcopy maps used in real estate, for reconnaissance, bushwalking. The overall choice of items in the access question are given in Table 4.4:

Table 4.4: Data Access Question – Choice of items

Internet – E-mail	CD – Rom
www – Download	Hardcopy over Counter or Mail (maps)
www – Viewing only	Facsimile
FTP	Tape/Cartridge
Floppy disk	

The next most commonly ticked choice was '*floppy disk'* (60%), then '*e-mail'* (48%). '*Internet World Wide Web (www) download'* received 7% and '*www-viewing' only* 12%.

The preferred access mechanism promoted by organisations such as ANZLIC is the Internet via a data clearinghouse. This, according to the survey, may still take a while to develop. However, many datasets are available in digital form as the second most commonly ticked choice was '*floppy disk'* followed by '*e-mail'*. This shows that although digital data are available and potentially could be accessed via the Internet, many organisations do not have clear data access policies. The reasons for this may be that:

- the public are not demanding the data via the Internet;
- regulations and laws are unclear;
- data providers are worried about losing income or the IP rights to their data; or
- data providers are uninformed.

Many data providers may be working on these issues at present and feel that previously there was no clear leadership in this area. As well, very often political mandates are missing.

4.5.2 Cost Recovery - Data Providers

Survey respondents were asked two questions on cost recovery. The first addressed the basis for cost recovery such as *full cost recovery* versus *cost of supply*. The second question asked for the unit price charged. The outcome was that 43% of all respondents ticked *cost of supply, provision* and 15 % *Market value*. Significantly 26% ticked the box *Do not*.

Table 4.5: Data Providers - Basis for cost recovery

Basis for cost recovery	Total (258)		Federal (14)		State (56)		Local (117)		Other (71)	
	No	%	No	%	No	%	No	%	No	%
Do not	67	**26**	8	**57**	15	**27**	39	**33**	5	7
Cost of Storage medium	14	5	0		4	7	4	3	6	8
Cost of data acquisition	29	11	0		9	16	2	2	18	25
Cost of data manipulation	50	19	3	21	13	23	14	12	20	28
Cost of supply, provision	111	**43**	5	**36**	32	**57**	46	**39**	28	**39**
Market value	38	15	2	14	12	21	4	3	20	28
Full cost recovery	42	16	1	7	7	13	10	9	24	**34**
Varies depending on dataset	88	34	4	29	16	29	48	41	20	28
Other	31	12	3	21	13	23	13	11	2	3

** The highest two percentage numbers are bold*

Out of 14 responding Federal Government agencies, 8 (57%) ticked they *do not* recover any cost, while 5 (36%) indicated they charge for the *cost of supply, provision*. Out of 56 State Governments, 57% answered *cost of supply, provision* and 27% *Do not*. For Local Governments the figures were more closely related 39% *Cost of Supply, provision* and 33 % *Do not*. More Federal Government agencies did not charge for data than the ones that did charge. This was interesting because the recommended charge as per commonwealth policy guideline was "cost of transfer". The CSDC has recognised these variations and is addressing them in 2001 by developing new guidelines.

The responses to the second question revealed that the most commonly used unit price charged for datasets is based on an *hourly rate* (34%), followed by *per mapsheet* (33%) and 25% ticked the box *do not charge*, but 29% indicated that their unit price *depended on the individual dataset*, and 23% said it *depends on the user*.

Table 4.6: Data Providers - Unit price charged

Unit price	Total (258)		Federal (14)		State (56)		Local (117)		Other (71)	
	No	%	No	%	No	%	No	%	No	%
Do not charge	64	25	8	**57**	16	**29**	37	**32**	3	4
Hourly rate	89	**34**	2	14	16	**29**	33	**28**	38	**54**
Per mapsheet	84	**33**	5	**36**	17	**30**	45	**38**	17	**24**
Per megabyte of storage	9	3	1	7	4	7	3	3	1	1
Per certain scale map	17	7	1	7	4	7	7	6	5	**7**
Per parcel of Land	18	7	0		7	13	9	8	2	3
Per polygon	9	3	0		7	13	2	2	0	0
Depends on dataset	74	**29**	3	**21**	16	**29**	29	25	26	**37**
Depends on user	62	24	1	7	22	**39**	26	22	13	18
Other	39	15	3	21	9	16	19	16	8	11

** The highest three percentage numbers are bold*

The most commonly used unit prices for State and Local governments were *per mapsheet* and *Hourly rate*. However the type of unit prices charged depended to a large extent on the type of dataset and the user. The answers to this question and the previous agree that the use of digital data is not as widespread as could be expected.

4.5.3 Cost Recovery – From a Data Users point of view

The survey asks separate questions to Data Users to determine their satisfaction and problems with the data they obtained from other providers. The cost recovery question was asked to determine if more frequently used datasets were treated more commercial than other datasets.

Table 4.7 Data users perspective – Unit price charged by provider

Unit price	Total (338)		Federal (14)		State (54)		Local (190)		Other (80)	
	No	%	No	%	No	%	No	%	No	%
Do not charge	62	18	7	**50**	7	13	32	17	16	20
Hourly rate	26	8	1	7	11	**20**	9	5	5	6
Per mapsheet	105	**31**	5	**36**	9	**17**	56	**29**	35	**44**
Per megabyte of storage	23	7	1	7	5	9	8	4	9	11
Per certain scale map	17	5	1	7	2	4	9	5	5	6
Per parcel of Land	82	**24**	0		7	13	54	**28**	21	**26**
Per polygon	34	10	0		5	9	18	9	11	14
Depends on dataset	127	**38**	6	**43**	27	**50**	60	**32**	34	**43**
Depends on user	31	9	3	21	6	11	15	8	7	9
Other	67	20	1	7	15	28	41	22	10	13

** The highest three percentage numbers are bold*

The most commonly used unit prices to users were *per mapsheet*. These figures are not surprising because users most commonly used hardcopy maps. 50% of Federal Government users did not have to pay at all. By comparing with the above, this may indicate that because 57% of data providers *do not charge*, both federal providers and users may collaborate and exchange data freely. This is a most welcome solution as far as improving data quality and data range are concerned. A great percentage of users paid a unit price per parcel of land. This agrees with the answers to a general question that determined that 76% of users buy *Property Boundary data* and 50% *Ownership (cadastral) data*.

The results of the survey are in agreement with the general trend of most ANZLIC member's policies to gravitate towards lower prices (see Table 4.3).

4.6 Conclusion

This chapter reviewed factors that influence spatial data access and pricing development and found that they could be categorised under the following twelve headings:
SDI Requirements; Organisational Issues; Technical Issues; Governmental / Organisational Duties; Ownership / Custodianship; Privacy and Confidentiality; Legal Liability, Contracts and Licences; Intellectual Property Law; Economic Analysis; Data Management; Outreach, Cooperation, and Political Mandate; and Users' Choices, Rights & Obligations.

All of the above categories are important for consideration by any government agency before drawing up new strategies and policies that address spatial data access and pricing. More detail was provided on only five of these categories, namely technical issues, governmental/organisational duties, ownership/custodianship, economic analysis and users' choices, rights and obligations. With such a variety of factors it could be understandable if an organisation ended up confused and only considered some of the issues in their policy. The review of local and international initiatives in Chapter 4 showed the large variety of policies and practices being used. Often policies and practices develop, despite the above factors, because organisations have to follow government mandates, often without any consideration for aiding a better facilitation of SDIs.

As suggested by David Rhind (1997c) an SDI will function and develop best if accepted by spatial data providers and users alike, at all jurisdictional government levels and private entities. This will most likely occur if bottom-up and top-down approaches are followed. This observation agrees with the situation in the US where many Federal Government directives failed their aim of adoption by other jurisdictional government organisations, because their main approach was a top-down one. Hence various jurisdictions may resent policies that were being handed down.

Sometimes an organisation may face a dilemma when trying to incorporate SDI requirements and cost recovery strategies into their policy. Governmental organisations must not only consider all the issues affecting spatial data access and pricing, but also balance their own needs with, for example, broader national SDI needs. Individual organisations have to adhere to various needs and priorities, hence it is inefficient to draw up detailed guidelines applicable for all. A sensible strategy for the Government is to develop general mandatory guidelines, such as given by the Australian National Competition Policy, which addresses pricing objectives, standards, legal requirements and national needs.

A good spatial data access and pricing approach was achieved by Canada. Their philosophy was to use a partial cost recovery model. The users pay partly for the total cost of providing spatial data, while the taxpayer's only fund some of the cost. This is the opposite to policies of federal government agencies in the USA, which provide access to their data at low or no cost to its citizens, and copyright does not apply to federal government held information (more on copyright in Chapter 6). Many state and local government agencies in the USA do not follow the federal government agency's practice as was hoped for by the Federal Government. Instead, some state government agencies charge the user market prices. The Ordnance Survey (OS) in the UK has gone to the other extreme. The OS aims for a full cost recovery model. In 1997 they achieved a 93% recovery of its full economic costs, and in addition they produce the worlds best national digital basemap. So, all organisations and/or nations have to decide on what model they prefer, can afford, would be accepted by its clients/citizens, and whether they aim for quantity or quality in their spatial data.

The Federal Government in Australia is reviewing their access and pricing policy in 2001, but no information was available to see what strategy that policy will follow. The current policy advises federal government agencies to price government data at the cost of distribution (similar to cost of transfer). New Zealand's prices are set equal for commercial and non-commercial use at the rate of dissemination (similar to cost of transfer), without any copyright payments or royalty charges. Following this policy LINZ for example, heavily reduced the price for the topographic dataset at a scale of 1:50,000 for the whole state from $2million to $1,500. The benefits according to Walsh (Senior Policy Analyst, Land Information New Zealand and ANZLIC Contact Officer for New Zealand) were already evident. Access was more effective and environmental management and national research are benefiting.

Table 4.3 summarises current or developing spatial data access and pricing policies to demonstrate the individual Australian States/Territories, Commonwealth and New Zealand's commitment towards facilitating the development of SDIs. As most ANZLIC members are moving towards lower pricing regimes they are aiming to aid SDI development to some degree, but are still not totally meeting SDI requirements. Australia compared with other countries tends to most commonly apply a partial cost recovery model like Canada. A few departments in Australia reduced their data with the hope that the income from the sale of a large volume of low priced data will equal the sale of a small volume of highly priced data. However, the results will have to be studied over time.

Chapter 5 – Legal Issues and Spatial Data

5.1 Introduction

Part of the overall spatial data access and pricing policy are the considerations that an organisation must give to the legal risks involved when supplying spatial data to others and the available legal protection for their spatial data. Legal risks associated with the supply of spatial data to others may involve liability claims that may arise because a user has relied on inaccurate spatial data, or misused data for purposes it was not intended for and thereby suffered financial loss. Although an organisation can often not avoid being sued, even if the organisation has done nothing wrong, it is of vital importance that the organisation identifies potential legal risks and keeps them to a minimum. Not only can an organisation suffer great financial loss when being sued, but also its reputation and 'good will' can be at stake. Legal intellectual property protection offers the spatial data provider with exclusive use rights to their datasets.

Chapter 5 firstly introduces the legal framework applicable to spatial data in Australia and in particular discusses protection against liability claims. It then discusses legal risks and liability issues in maps and databases. Disclaimers are then studied and a list of disclaimers, collated from the 1998-99 Spatial Data Survey, is provided. Finally assistance is given on how to reduce and manage legal liability risks. Chapter 6 will describe intellectual property protection of spatial data.

This thesis does not intend to give legal advice to spatial data users and/or producers; it is merely intended as background material for developing future strategies. The author accepts no responsibility for any resulting action from reliance on this thesis. The law in Australia changes regularly and legal advice should be sought from the relevant legal body. The objectives of Chapter 5 and Chapter 6 are to assist agencies in their assessment and use of spatial data risk management and intellectual property protection and to develop some future strategies.

5.2 Australian Law

Australian law is derived from English law. On the 1 January 1901 the Australian colonies joined together to form the Commonwealth of Australia and the colonies became States. State and Commonwealth Parliaments develop legislation, which is interpreted and applied by the courts (Tarakson, 1995).

Although English law arrived with the first fleet two centuries ago, Australia had been populated much earlier. The first settlers of 1788 ignored local laws and rights of the aboriginal people and declared Australia as being ‘terra nullius’ (Latin for ‘no-one’s land’) and applied English law. Since that time the Australian legal system has evolved taking into account Australian conditions. The mistake of declaring Australia as ‘terra nullius’ was acknowledged by the High Court decision in the case of *Mabo v Queensland (No. 2)* (1992) 175 CLR 1 in 1992. In this case the High Court decided that the people of Murray Island in the Torres Strait continued to be owners of their lands, thereby acknowledging Aboriginals land property rights before the arrival of English law (Chisholm and Nettheim, 1997).

Currently English law does not have much presence in the Australian legal system. However until 1986 the UK had the power to pass legislation to apply in any of the Australian States or for Australia. This power finally vanished with the new Australia Act 1986 (Cth) and the Australia Act 1986 (UK). Since that time the Australian Parliaments and courts are in full control of Australian law. The only aspect of English law that remains in affect is English case law. The law of other common law countries including England remain persuasive (Chisholm and Nettheim, 1997).

Australia has a federal system of government and the Federal Government can only pass laws within the scope of the Commonwealth Constitution. This can only be overcome if the States voluntarily refer their legislative powers to the Commonwealth. The Commonwealth for example has the ability to pass laws on defence, migration, and customs duties. In some areas of law there is no clear-cut division between commonwealth and state legislative powers. In such cases the Commonwealth law prevails over State law (Tarakson, 1995).

5.2.1 Australian Law Structure

Figure 5.1 demonstrates the various levels in the Australian Law Structure. Most of these are explained in more detail below.

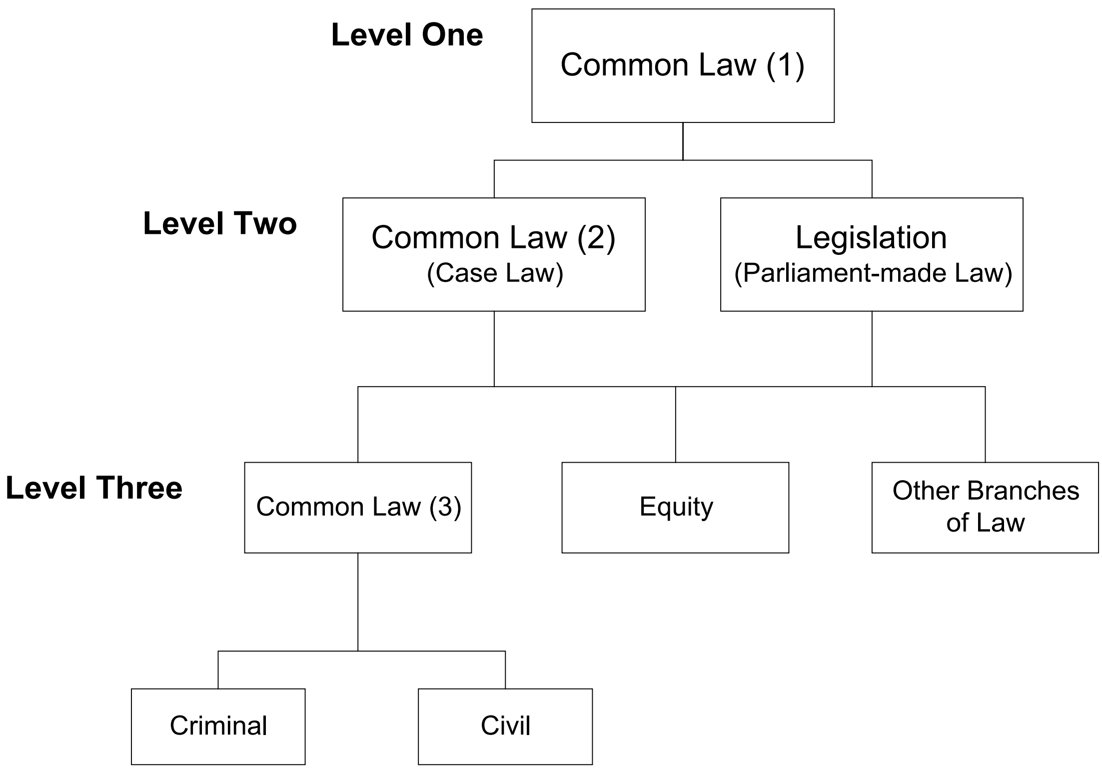


Figure 5.1: Law Structure Levels

5.2.1.1 Level One

Common Law (1) - is a type of legal system. It was developed in England and passed onto countries throughout the British Empire. Other types of legal systems around the world are Civil law, Islamic law, Hindu law, Communist law and customary systems of law such as Aboriginal law. Some regions such as Western Europe and Latin America have a Civil law system. Civil law is a complete set of laws, or codes, that are administered by judges (Cho, 1998).

5.2.1.2 Level Two

Common Law (2) - is created by the courts. Within the English and Australian legal system the phrase "common law" is used to differentiate between the rules of law developed by courts from those enacted by Parliament. Courts cannot make new rules at random, but must interpret statutes and where not possible, decide according to similar cases. Courts have to decide individual cases on their merits and evidence based on other cases; this is known as the doctrine of precedent. Precedent must be followed in accordance with the court hierarchy. Lower courts should follow decisions of higher courts, and if a similar case was judged in a court of the same rank in different states, the court's decision can be influenced by the other, but need not follow it. Australian courts decide a case on the evidence provided by the two sides through the process of cross-examination. The judge is an observer and the lawyers, running the case, call witnesses and examine them. The judge has to ensure that fair and proper legal procedures are followed, decide on whether particular evidence is allowed in court and decide, if there is no jury, on questions of what happened (Tarakson, 1995).

Legislation - is Parliament-made law in the form of Statutes and Acts. Australian parliaments are made up of a lower house and an upper house, except for Queensland. Queensland has only a single house that is called the Legislative Assembly. The lower house is called the Legislative Assembly in the States and the House of Representatives in the Federal Parliament. A State's upper house is called the Legislative Council (House of Review) and the Federal upper house is the Senate. Each level of Government has a Queen's representative - at state level, Governors and at Federal level the Governor General. Legislation can either change existing laws or enact new ones. Government, Opposition, Law Reform Commission, unions, media or other special interest groups can propose legislative changes. If the Government agrees with those changes, a Parliamentary Counsel's Office lawyer will draft the legislation referred to as a bill. Most bills start in the lower house and if passed progress to the upper house. Bills are rejected, changed or approved. An approved bill must receive Royal Assent by the Governor if it is a State bill, or Governor General if it is a Federal bill and then the bill becomes an Act. The date of operation will be specified on the bill and either be the date of assent, or as specified on the Act, or as proclaimed in the Government Gazette (Tarakson, 1995).

Acts only deal with general requirements. The Parliament delegates the detailed rules and regulations to people with the expertise to do so, for instance the Governor, local councils, and statutory bodies (Tarakson, 1995).

5.2.1.3 Level Three

Common Law (3) - is a body of law distinct from Equity. This part of English law was created by the older courts called “common law courts”. These courts dealt with crimes, property, contracts and civil actions in “tort” (private wrongs such as trespass, nuisance etc). Non-criminal matters attracted such remedies as returning property to a person or to pay damages. These remedies were called private actions and were commenced in the form of a writ (command issued in the name of the Crown). Writs today are issued by courts and have different names, such as ‘summons’ or ‘applications’. Writs were enforceable commands, either to be followed by the defendant or to be defended in court. Where people suffered a wrong by another person, with no available writ or inadequate writ, the person suffering the wrong could petition the Crown to act (Chisholm and Nettheim, 1992).

Petitions were addressed differently depending on the situation. Petitions dealing with injustices that could only be addressed by changing the law were considered by the Crown in Council in Parliament. These formed the basis for the present legislative procedures of the Parliaments. The Royal Council dealt with petitions disagreeing with common law causes of action. The Royal Council referred most of those petitions to the Lord Chancellor, who was one of the Crown’s leading ministers (Chisholm and Nettheim, 1992).

Equity - Petitions considered by the Lord Chancellor fell under the body of law called equity. The Chancellor decided the petitions on the basis of equity and good conscience, because of the inadequate coverage of the law. This led to the development of rules of equity distinct from the rules of common law. For example, the procedures and obligations of holding property in trust for someone are covered by the rules of equity. Today all courts apply both sets of common law and equity rules (Chisholm and Nettheim, 1992).

Criminal compared to Civil Law - If someone strikes a person, that action can be dealt with as a criminal offence, or a civil offence, or both. That person striking another can be arrested and tried for crime of assault and/or sued for damages in a civil action for the tort of assault (Tarakson, 1995; Chisholm and Nettheim, 1992).

A criminal matter is between the state and the individual. If a crime has been committed, the court will sentence an individual accused of the crime if he/she is found guilty. Most crimes are contained in statutes that set out the offences and prescribe maximum and minimum penalties. The police on behalf of the state will take the accused to court in an attempt to prove that the individual committed the crime. If found guilty the criminal will be sentenced. However in criminal cases the accused can only be found guilty if it is proved beyond reasonable doubt that he/she committed the crime (Tarakson, 1995).

A civil matter is between two individuals, or entities such as companies, where one takes the other to court. Civil law includes common law and equity. Civil remedies include for example damages, injunctions, and accounts of profit. Civil cases deal with issues such as neighbourhood disputes, personal injuries, and breach of contract. The finding of guilt is not as stringent for a civil matter as it is for a criminal matter. Proof is on the balance of probabilities (Tarakson, 1995). Some of the major categories of civil law are tort and contract. Both derived from the old common law courts (Chisholm and Nettheim, 1992).

Tort (French for wrong) - provides the plaintiff with remedies against unlawful conduct. If the plaintiff proves that the defendant has conducted a tort thereby injuring the plaintiff, the plaintiff can sue for damages or obtain an order to restrain the defendant from such a conduct by way of an injunction. Matters that fall under tort include, for example negligence, defamation, assault, and interfering with other people's property.

The **law of contract** deals with promises, which are usually commercial in nature. Contract law is designed to enforce promises that have been breached. The law orders parties to a contract to fulfil their promises, or in case of a breach of contract to compensate the other party or parties for the loss they suffered because of the breach.

Constitutional and Administrative Law - The law governing the structure and workings of the legal system, the system of government and the relations between the citizen and the state is loosely known as "public law". Public law includes constitutional law and administrative law. Constitutional law deals with the characteristics and functioning of the Australian Federal Constitution and the constitutions of the states. Administrative law deals with accountability of public officials (Chisholm and Nettheim, 1992).

There are many different branches of law that involve a combination of rules and procedures and are derived from common law, equity and legislation. The monthly publication Australian Current Law, for example, lists current legal developments (branches of law) under 89 headings in alphabetical order, starting with Aboriginals and Torres Strait Islanders to Workers compensation. It includes for example Contract, Damages, Industrial Law, Intellectual Property, Negligence and Product Liability (Chisholm and Nettheim, 1992, 1997).

5.2.2 Court Structure

Courts exist at federal and state levels. At the Federal level in hierarchical order there is the High Court, the Federal Court, the Industrial Relations Court, and the Family Court. At State level, the highest court is the Supreme Court, then the District/County Court and the Local/Magistrates court (Territories have the Supreme Court and the Local/Magistrates Court) (Tarakson, 1995).

The High Court hears appeals from Supreme Courts and the Federal Court and its decision is final and binding on all lower courts. The High Court also decides on constitutional matters. The Federal Court hears appeals from the Supreme Courts in Federal matters, and deals with Federal laws. The Industrial Relations Court deals with industrial matters. The Family Court deals with family matters such as divorce, property settlement and custody and access of children (Tarakson, 1995).

Local/Magistrates Courts have no juries and are presided over by a magistrate. These courts hear criminal and civil matter cases and sometimes family matters. Criminal matters are either decided there or will go to a higher court. Civil matters will only be heard if below a certain amount of money, otherwise they will be heard in the District/County Court. Appeals go to the District or Supreme Court, depending on the individual case (Tarakson, 1995).

5.2.3 Law Reform

As society and technology go through a process of change it is necessary for the Australian legal system to alter at the same time. Political processes deal with the necessary reform in case law and legislation. Law Reform Commissions and associated bodies such as lawyer's professional organisations, advisory councils, and special interest groups lobby for change. The work of the law reform commissions is very valuable and of high quality but according to Chisholm and Nettheim (1992), many proposals remain unimplemented because of the politics and resistance to change by Parliaments and bureaucracies.

As this thesis is investigating spatial data policy issues and strategies the next two sections will be on protection against liability claims and use of disclaimers.

5.3 Liability

Legal liability may arise from the provision of inaccurate data. A data provider can either be sued because of breach of contract or negligence. Liability will generally be a civil matter, but may also be criminal. Civil liability relates generally to contractual obligations or to negligent behaviour. Criminal liability is enforced by criminal courts and is a matter between a state and the individual rather than between two individuals as in a civil case.

Liability may also be of concern in privacy, which is not further considered here (Perritt, 1995b). Liability issues in regard to anti-trust laws or freedom of information laws or international jurisdictional effects are also not taken into account in this chapter. Legal liability also occurs when any of the intellectual property rights have been infringed. Intellectual property is discussed in Chapter 6. The next sections study contractual liability, and negligence, followed by spatial data liability examples, and disclaimers. Then legal liability awareness and disclaimer practices are analysed using the results of the Survey from Chapter 3, and liability risk management strategies are described.

5.3.1 Contracts

It is beyond the scope of this section to deal with contract law in detail. Hence no contract terms or sample contracts applicable to a spatial data contract are included. Only a general overview is given with regard to contractual liability.

Contractual duties and rights for all parties to a contract are set out in a contractual agreement. A contract may be in writing or implied. An implied contract may be more appropriate in case of selling goods or services. Courts and legislators have developed appropriate rules for implied contracts. If however both parties to a contract want to define their specific roles and terms, an expressed contract may be more appropriate. Any party to a contract should be certain about their rights and responsibilities to a contract before signing. To avoid legal disputes, any possible contingency needs to be considered (Cho, 1998, p.60). An implied contract, if used in the sale of a computer system, for example, may have the following implied terms

> "the seller is the lawful owner of the system, that it is sold according to a description and corresponds to that description, that the system is fit for a particular purpose and is sold as such and that it is of a merchantable quality" (Cho, 1998, p.67).

Contract terms introduced after the contract is binding can usually not be enforced. This is why for example 'shrink-wrap' licences are most likely invalid (Cho, 1998, p.70; Onsrud, 1999). In a shrink-wrap licence the product will have new contract terms written on separate wrapping inside the package only seen by the purchaser when he/she opens the box at home. For example, software disks may be wrapped and the new terms introduced on the wrapping may specify that by breaking the seal the purchaser agrees to the software licence terms. These terms may include for example that the laws in a certain Country govern the agreement.

Contracts can have exclusion clauses that limit liability. These exclusion clauses are further discussed in section 5.4 and are referred to as disclaimers. Legislators and courts have developed rules protecting consumers and therefore not all clauses will be legally enforceable. For example, if any party to a contract does not carry out their contractual responsibilities, they cannot rely on any exclusion clause protection and this may also give the other parties the right to terminate the contract altogether. If any disclaimers are unjust the court can declare a contract invalid, or delete terms (Cho, 1998, p.69). In case a breach of contract has occurred a basic principle in contract law referred to as "loss of expectation" takes place. In a "loss of expectation" the injured party should be put back into a position as if the breach had not taken place (Cho, 1998, p.88).

In order to reduce contractual legal liability exposure a formal set of guidelines should be established, not only dealing with the transfer of data externally but also internally. The set of guidelines should inform the staff of the organisation how to transfer data and what precautions to take before transfer. These guidelines may include details on:

- Under what circumstances the data could be handed out – eg, if the data are subject to freedom of information laws, or if privacy restrictions apply and what forms are required;
- Restrictions as to use and/or user – eg, if use is for academic purposes the user must sign a licence stating that the data, or any derived data will not be passed on without the approval of the organisation it originated from. It might be in the best interest of any organisation not to allow on-selling of data to third parties, because if they are injured by reliance on the data the organisation could be held liable;
- Standard forms and/or licences should be used when distributing data (Wright, 1994).

Licence or standard forms or webpage notices should clearly spell out what a data user is and is not allowed to do with the data. It should for example spell out:

- restrictions on use
- restrictions on distribution to others and period of agreement, and
- copying of data (Wright, 1994)

To further limit liability the following should be included in a contract:

- Force Majeure – Neither party shall be at fault if a problem occurred, beyond either parties control due, for example, to a flood, earthquake or riots.
- Inappropriate use – If the data are used in a way not intended, the provider cannot be held liable.

- Limit the recoverable amount – The provider can limit the amount to be recovered by the user if specified in the licence, that is liability for damages shall be limited to the total fees paid by Licensee to Licensor. (Wright, 1994)

5.3.2 Negligence

In the case of negligent behaviour, liability arises when a person suffers loss because the duty of care has been breached. Negligence is part of the law of torts. Classes of tort also include such areas as strict liability, product liability, misrepresentation, intentional harm and defamation (Onsrud, 1999, p.6). As negligence, misrepresentation and product liability are the most applicable to spatial data, they are the only ones considered here.

Negligent behaviour is behaviour that breaches the duty of care. Duty of care means that a person is not allowed to harm others or place them at risk. Negligence does not necessarily involve intent, but failure to meet a degree of care. On breach of the duty of care the plaintiff can sue the person that inflicted personal injury or property damage with his/her product. Pure economic loss is usually not recoverable under this action (Onsrud, 1999, p.6,7). If the defendant can prove that the plaintiff failed to take precautionary measures, the defendant may only be partly liable.

Misrepresentation may be made negligently or fraudulently. Negligent misrepresentation involves someone during the course of their business providing others with false information. If the person providing the information did not take reasonable care, that person is liable for the loss they caused others. If a person made the misrepresentation fraudulently, meaning that someone intentionally provided another person with false information, he/she may be liable for the loss caused to others (Onsrud, 1999, p.7).

Product liability occurs if a defective product caused damages. In the case of spatial data, the defective product may be providing inaccurate spatial data. If product liability does not exist, and only negligence theory applies, producers can escape liability if they can show that industry-wide standards are being met. Economic losses are usually not recoverable under this provision, but direct injuries such as medical expenses or loss of wages can be granted (Onsrud, 1999, p.8,9). In Australia the area of product liability is addressed under Parts V and VA of the Trade Practices Act 1974 (Cth) and in each state's fair-trading legislation (Cho, 1998, p.122).

A disclaimer of responsibility, used to limit negligent behaviour, may have no effect where the defendant is the only possible source of the information or advice (Davies, 1995). In this case the plaintiff has no other choice but to rely on the defendant's information and hence the defendant owes a duty of care to the plaintiff. The same applies when the defendant uses a disclaimer to free him/herself of responsibility when giving professional advice. In addition, if the defendant does not act in accordance with a disclaimer they use, the disclaimer is ineffectual (O'Sullivan, 1994).

If a third party is involved, the courts sometimes deny that the defendant owes a duty of care to the third party. In *San Sebastian Pty Ltd v Minister Administering the Environmental Planning and Assessment Act 1979* (1986) the court held that the Minister (State Planning Authority) was not under a relevant duty of care to the third party. The plaintiff sued the respondent for damages of loss due to alleged negligence by the State Planning Authority (the Authority) and the Council of the City of Sydney (the Council) in the preparation and publication of a plan for redevelopment of the Woolloomooloo area. The respondent, according to the plaintiff, failed to warn the plaintiff that the plan was to be abandoned. The High Court held that the defendant did not owe a duty of care to the plaintiff because of the following three reasons:

1. the plan contained no feasibility statements stating any redevelopment was feasible in accordance with the plan;
2. if defendant's financial benefit was high enough, that would be sufficient to give rise to a duty of care, however the defendant did not receive sufficient financial benefit; and
3. since the plaintiff did not request the information from the defendant, there was no duty of care existing (Davies, 1995).

Disclaimers used to limit tort liability attempt to prevent liability from arising, rather than seeking to avoid the consequences of encountered liability as in contractual disclaimers. These disclaimers are often used to avoid liability to third parties. There are no rules as to how and where to use them, however they should be placed in prominent positions and clearly spelled out (O'Sullivan, 1994).

In order to limit contractual and tort liability any organisation should not only use contracts, disclaimers and spatial data transfer guidelines, but implement an overall spatial data risk management strategy for the entire organisation, as described in section 5.6.

5.3.3 Spatial Data Examples and Case Law

Below are some examples that point out situations in which negligence does or could apply. In a similar manner to tort law in the USA, Australia addresses restrictive trade practices such as misleading or deceptive conduct and strict product liability in the Trade Practices Act 1974. Strict product liability applies when for example injury has been caused by defective information. Tort law requires proximity, which means that if a third party was indirectly harmed by another party, that injured party has the right to recover damages under the common law. In contractual liability privity is necessary, which means that only parties to the contract have legal rights and liabilities under that contract (Stewart et al, 1997).

The following case, on appeal from the Supreme Court of New South Wales at the High Court of Australia, deals with tort negligence. This case, *L.Shaddock & Associates Pty Ltd and another v The Council of the City of Parramatta* HC [1980-1981] 150 CLR 225, involved a developer and a Council. The developer's solicitor applied to the Council for a section 342 AS Local Government Act 1919 (NSW) certificate. This certificate was being used for conveyancing to determine amongst other things whether a particular piece of land was affected by, for example, a proposed road widening. In this case the certificate made it clear that there was no road-widening proposal when in fact there was. Upon reliance of the certificate the developer entered into a contract and purchased the piece of land. The court found that the Council had a duty of care and should have provided correct information. Hence the Council breached the duty of care and were liable for the erroneous information. The court also decided that the Council had to pay damages to the developer, an amount necessary to restore the developer to a position he was in before the purchase, as if he had not made the purchase.

In *Shaddock v The Council of the City of Parramatta* the court decided that if a professional body such as the Council gives advice that involves special skill, for a business transaction, then the council has a duty of care to provide correct information. If a person relies on that information, which is erroneous, and suffers damage, then the Council is negligent in tort and has breached the duty of care.

Errors in maps can have catastrophic consequences, when people depend on them. For example the CIA publicly admitted that due to using old maps and analytical misjudgements, the Chinese embassy in Belgrade was bombed on the 7th May 1999 by mistake during the recent Kosova conflict (ABC News, 1999). People's lives were lost, but who is responsible? In *Remiga v United States* 448 F. Supp 45 [1978] WD Mich, the US Federal Government was found negligent because they had not accurately plotted a broadcasting tower on an aeronautical chart. This resulted in a flight crew having a fatal plane crash.

Poor design can lead to legal liability as well. In *Aetna Casualty and Security Co. v Jefferson and Co* 642 F2d 339 (9th Cir.) [1981], the defendant Jefferson had mapped out an instrument approach to an airfield correctly, but in a way confusing or inappropriate for the user's purpose. The instrument approach to an airport was mapped in an aeronautical chart displaying two perspective views, one from above (plan view) and the other from the side (profile view). Both views appeared to be of the same scale, but in fact were different by a factor of five. The plane crashed because the pilot relied on the graphical presentation believing both views to be of the same scale. The court held that the chart was defective in graphical presentation and found the defendant liable, but the crew was also partly held liable, because a professional should not only rely on what he/she is told by a computer or chart, but also must use his/her professional judgement.

Maps used inappropriately or in ways never intended may also result in legal liability, as in the case of *Zinn v State* 112 Wis. 2 nd. 417, 334 NW 2d 67 [1983]. A US Geological Survey (USGS) map was used by a state agency to map property boundaries along a lake. Land below Ordinary High Water Mark (OHWM) of that lake was public property. The state claimed an area of private land based on a map whose scale was not large enough for such detail. The property owner who believed that her property had been inappropriately repossessed sued the state. The court held that the state was liable because it had used an inappropriate map to define private properties (Lynch and Foote, 1999).

The **Crown** can be sued in contract or in tort like any other person, the only exception being when an employee of the Crown performs a statutory duty. In this case the Crown enjoys sovereign immunity, which affords it some protection against liability claims. If Crown employees perform a statutory duty in good faith they are protected from personal liability (Cho, 1998, p.110).

Private data providers are liable if reliance on their data harms someone. Difficulties arise when data in Geographic Information Systems (GIS) is applied to new purposes. As providers find it difficult to anticipate liability claims and problems that may occur, they tend to consult lawyers on drawing up specialised contracts. These are especially important in such areas as emergency dispatch systems, car navigation systems, and in the placement of cables or pipes (Lynch and Foote, 1999).

5.4 Disclaimers

This section analyses disclaimer uses and their effectiveness. Many people in the spatial data industry rely on disclaimer clauses to protect themselves against third parties misusing any of their work. But do disclaimer clauses offer the protection the industry is seeking? Disclaimer clauses can help limit legal liability. However they do not protect the producer against any mistakes he/she made. Disclaimers can specify the standard of care that has been taken in producing a product, and/or specify the purpose for use for a product. They therefore can only inform the product user about the limitations of the product and its intended use.

Disclaimers may offer the data provider more protection for economic damages, than against liability for personal injury or wrongful death (Dansby 1993, p.11, quoted in Cho, 1998, p.100). A disclaimer cannot override any contractual obligation but can be used to state, for example, the spatial data's intended use. If the spatial data are being used inappropriately, the provider may be held negligent in case the user suffers damages upon reliance of the data, and this can only be avoided if disclaimers are being used that specify intended uses.

Harrison (1998) gives examples of the use of disclaimers. One example he cites is where an Architect wants 1 metre (m) contours and then interpolates them to 0.05m expecting any interpolated spot level to be accurate, when in fact the contours would only be accurate to + or – 0.5m. He has suggested specifying the accuracy of the work, for example: *the information is only to be used at a scale accuracy of 1:100,* or *the tree locations are only accurate to + or – 0.75m*. In case digital spatial data was being distributed on disc, he advised to use instruction files and a program tracking disk-changes to have some response in case of legal defence. In addition to the instruction file, a shrink-wrap licence could be included. This licence could bear the following seal: "By breaking this seal you acknowledge that you will read the instruction file and abide by the conditions contained therein and the copyright implied." Shrink-wrap licences however may not be valid if introduced after the purchase and sale of the product. No new contract terms may be introduced after the contract was made.

Harrison (p.16) also gave examples of Disclaimers used by his surveying firm:
"On topographic detail plans:

1. Bearings and distances are by Title and /or Deed only. No boundary investigation has been carried out.
2. Relationship of improvements to boundaries is diagrammatic only. Where offsets are critical they should be confirmed by further survey.
3. Contours shown depict the topography: except at spot levels shown they do not represent the exact level at any particular point.
4. Services shown hereon have been determined from visual evidence only. Prior to any demolition excavation or construction on the site the relevant authority should be contacted to establish detailed location and depth.
5. Australian Height Datum was established from SSM43560 (27-56m) at the corner of Smith and Jones Street.
6. For north points, where Deposited Plans (DPs) are on Magnetic Meridian (M.M.): 'the bearings on these plan boundaries are from Land Titles Office plans. They are on Magnetic Meridian. If accurate True North is required a further survey would be necessary.'

Harrison continues to give examples of disclaimers used by his firm for building set out sketches, pegouts and identification surveys, Draft Strata Plans, Subdivision Plans and Drainage Plans. On plans of proposed layout, he suggests to use statements such as: "Dimensions, areas, size and location of improvements are approximately only, subject to final survey." And when using contours "Contours shown on this plan are general and are suitable only for the purpose of this application. No reliance should be placed upon such contours for any purpose other than this application." In summary he suggests to first consider the risk involved in the work and then decide on the appropriate disclaimer.

Elgin (1995) warns surveyors that they must state on the survey plans or maps what the survey comprised and perhaps more importantly what the survey did not comprise. One of the disclaimer clauses he gives is:

> "The locations of underground utilities as shown hereon are based on above-ground structures and record drawings provided to the surveyor. Locations of underground utilities/structures may vary from locations shown heron. Additional buried utilities/structures may be encountered. No excavations were made during the progress of this survey to locate buried utilities/structures. Before excavations are begun, the following offices should be contacted for verification of utility type and for field locations: Telephone; Electricity, Water and Sewer; Cable TV; Surveyor." (Elgin, 1995, p.17)

5.5 Legal Liability Awareness and Disclaimer Practices

Before describing overall spatial data risk management strategies, this section will analyse and summarise the results from the spatial data survey in Chapter 3 with regards to legal liability and disclaimers. This brief summary aims to determine current legal liability case awareness and disclaimer practices used amongst spatial data providers and/or users.

5.5.1 Survey Results on Legal Liability

The spatial data survey discussed in Chapter 3, asked all respondents whether anyone was aware of any liability problems resulting from issues such as the provision of inaccurate data. 10% (37) answered that they were aware of legal liability cases, while 86% were not (4% did not answer this question). 6 % (23) of respondents specified and described liability cases. These are included in Table 5.1 below.

Table 5.1: Liability issues pointed out by respondents

Questionnaire, Section I - *Question 5: Awareness of any liability claims?* **10% (37 respondents) answered yes, and 6% (23) gave examples**
Mistaken geoid base for airborne geophysical survey resulted in legal action (Resolute Samantha vs World Geoscience Corporation Ltd), may have been settled out of court.
Liability of repair of damaged underground utilities, especially Telstra fibre optic.
We are ensuring our risk is minimised when supplying data. To date no cases.
A council taken to court in relation to a Local Environmental Plan zoning error.
Incorrect location or existence of utility assets.
User claimed that data was inaccurate? Water depth (spinal injury); Submerged rock (vessel damage).
As major provider of data that has property implications, the data has been challenged.
Survey company, Sydney, mid 80s. Inaccurate hydrographic surveys led to liability in engineering application.
Many around the world - see "GIS Law" Journal.
Incorrect design & construction from wrong DTM provided by surveyor.
Custodian liability.
Infrequent errors usually due to incorrect interpretation by users.
A disclaimer is attached to each map. The two contractual parties sign digital data contracts required by consultants.
Victorian Ambulance - Intergraph Public Safety.
Wrong setout of buildings.
Lawyer and Insurance.
Inaccurate or erroneous title information.
Errors in data give rise to claims arising from extra costs - particularly in design & construction spatial data.
Within government agencies, never gets to court.
Typically where data gets used for purposes other than originally intended (eg. accuracy data + - 1m, digital precision = - 0.001m).
Various cadastral reinstatements, Quarry volume calculations.
Issue of 149 certificates from council in error.
Copyright Infringement.

One of the liability issues pointed out by one of the respondents occurred in Victoria. A company named 'Intergraph Public Safety Pty Ltd' was responsible for installing a new computer aided ambulance dispatch service for the Victorian Ambulance. The contract to Intergraph was awarded in 1993 and the way in which it was awarded led to considerable controversy. One of the main problems was how Intergraph won the tender, but also the longer response times of the new systems and provision of wrong addresses led to a Royal Commission investigating the circumstances (ABC News Online, 2000).

The results of the survey indicate that not many people are aware of the liability risks involved when supplying spatial data, or that liability claims happen very infrequently. However, people may not be aware of many liability risks or claims, because most liability claims are settled out of court and no case studies or publication on the results are available to the public.

5.5.2 Disclaimer Survey Results

Out of the 258 respondents, 64% are using disclaimers when providing spatial data to users (Figure 5.2).

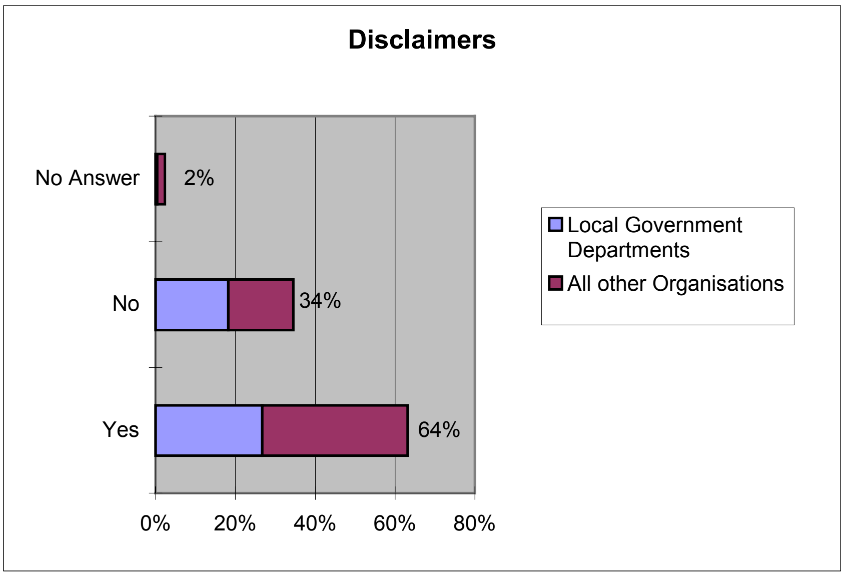


Figure 5.2: Number of spatial data providers using disclaimers.

When dividing the respondents into subgroups of Federal, State and Local governments and Private organisations, the providers that included disclaimers were 71%, 73%, 59%, and 61% respectively. Hence Federal and State Governments are more likely to rely on disclaimers than Local governments or other private providers such as Surveyors. On cross-checking this question with the question on what additional information the provider provides with the dataset, the outcome was that 64% of providers (163) used disclaimers.

Out of the 163 disclaimer providers, 68 (42%) indicated that they supply metadata with their datasets. These 68 are a large proportion of the total number of 89 Metadata suppliers out of all providers (258). Percentage comparisons among the subgroups were different to above. The number of Federal, State and Local governments and private providers that include metadata were 79%, 55%, 18%, and 37% respectively. Hence more Federal Government departments provide metadata than other subgroups. Interestingly, local government departments were by far the smallest metadata providers.

These figures show clearly that many people are either not aware of metadata, or perhaps finding it too cumbersome or expensive to use. Studying the list below, as could be expected, many disclaimer areas are similar to what should be included in Metadata. Metadata in Australia, as recommended by ANZLIC, should include: dataset information and description, data currency, dataset status, access, quality, contact information, metadata date and other required metadata information. (See Appendix 3 for a description of these categories). The similarity of disclaimers and metadata descriptions should be taken advantage of. Metadata statements could form part of a contract when selling spatial data and therefore include more detail on disclaiming liability. For example, in the 'Metadata Guidelines' from ANZLIC (1996, p67), metadata for Ecological Vegetation Classes specifies quality - positional accuracy as: Map errors of 0.5 mm to 3 mm, or 50 m to 300m are possible. This is very brief and if used as a disclaimer could include: 'The positional information is only accurate to + or – 150 m real world position. If the information is being used for purposes requiring better accuracy the data provider shall be free from all responsibilities'.

Respondents were also asked to specify the main areas covered by their disclaimers. As an example the questionnaire used the term ‘Accuracy’. Table 5.2 lists the main areas covered by spatial data provider’s disclaimers.

Table 5.2: Main areas covered by disclaimers

Accuracy	38
Accuracy, & other metadata	2
Accuracy, completeness	5
Accuracy, completeness, currency	1
Accuracy, copyright	4
Accuracy, copyright, intended use only	1
Accuracy, currency	6
Accuracy, errors, consequential damages	1
Accuracy, errors, omissions	3
Accuracy, graphical only	1
Accuracy, intended use only	11
Accuracy, intended use only, completeness,	3
Accuracy, intended use only, currency	1
Accuracy, intended use only, currency, liability	1
Accuracy, intended use only, for client only, no alteration	1
Accuracy, intended use only, origin	1
Accuracy, intended use only, origin, currency	2
Accuracy, intended use only, origin, for client only	1
Accuracy, intended use only, quality	1
Accuracy, intended use only, timeliness	1
Accuracy, Internal use only	1
Accuracy, liability	3
Accuracy, omissions	1
Accuracy, omissions, origin	1
Accuracy, origin	2
Accuracy, ownership	1
Accuracy, reliability	1
Accuracy, reliability diagram	1

Accuracy, reliability, scale	1
Accuracy, reproduction	1
Accuracy, scale	1
Accuracy, timeliness	2
Accuracy, timeliness, origin	1
Accuracy, underground services uncertainty	5
Copyright	4
Intended use only	4
Intended use only, duration, intellectual property rights, copyright, warranty, indemnity, confidentiality, and Who is using the data?	1
Intended use only, origin	1
Intended use only, scale	1
Internal use only	2
Liability	1
No unauthorised reproduction	1
Origin	2
True position to be verified	1
Use at own risk	1
Nothing specified	37
Total	**163**

5.6 Legal Liability Risk Management

When an organisation supplies spatial data to others which has been collected, digitised, or is a product of a Geographic Information Systems (GIS) application, the organisation must weigh up the risks of supplying the data with the benefits gained from doing so. An organisation should therefore develop a risk management program as part of its overall organisation's business plan. It must first identify potential risks, then quantify and assess them. Then it must develop and implement a risk management strategy and finally monitor compliance and effectiveness of the strategy.

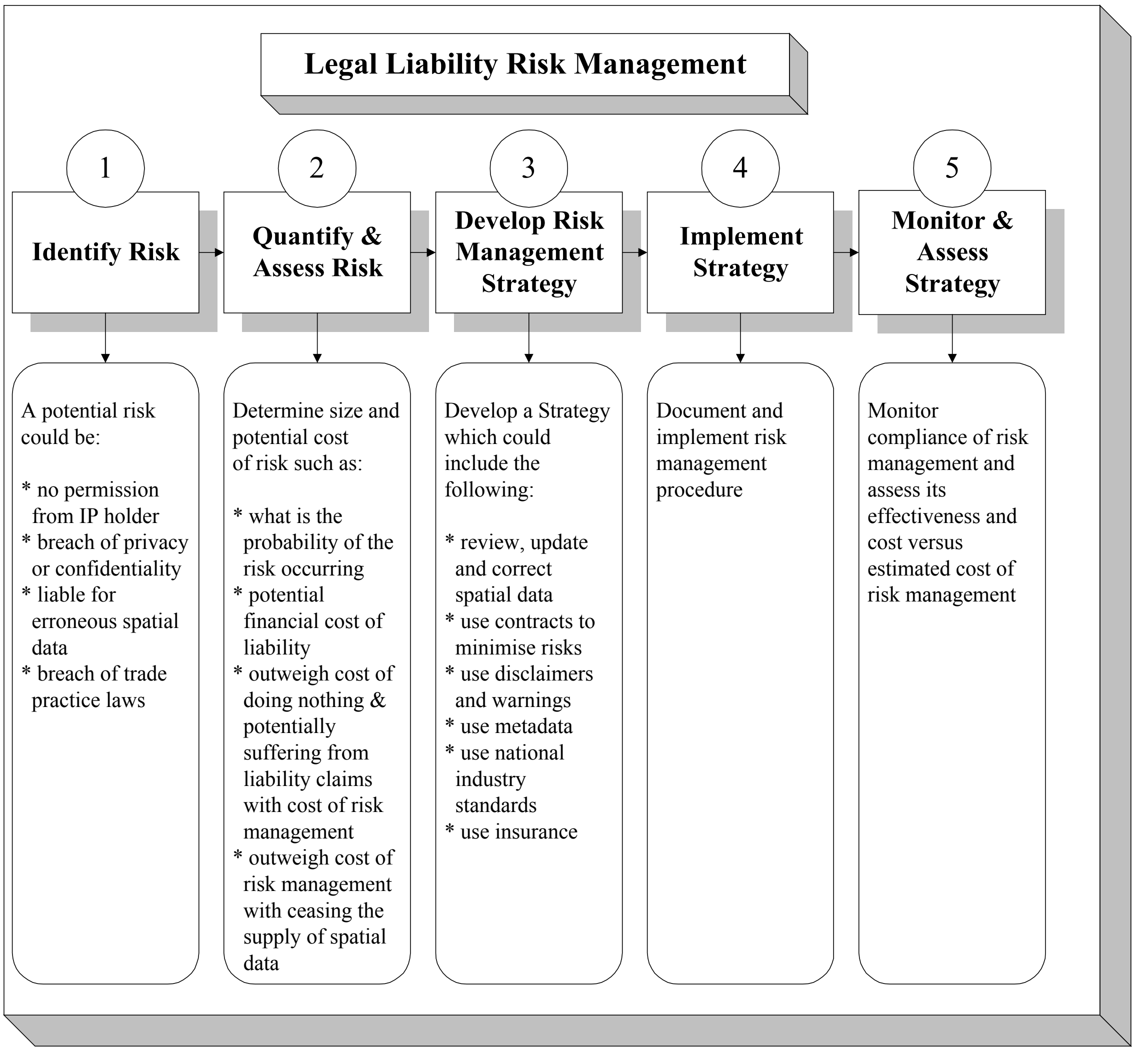


Figure 5.3: Legal Liability Risk Management

As per Figure 5.3 the organisation should (much of the information was derived from Reid at al, 1996; and Agumya and Hunter, 1999):

1. Identify the potential risk, where someone could sue the organisation if:
    a. No permission was given by the intellectual property (IP) holder to publish or distribute the data, or failure to secure IP protection such as a patent (for more detail see Chapter 6).
    b. Privacy and/or confidentiality obligations were breached (eg. If the data was collected by a government agency, and if they have a request to supply the data to someone because of freedom of information laws, the agency could be held liable if they reveal the identity of an individual. In providing the data they may breach the Privacy Act, unless the individual has consented to the use of the data).

c. The spatial data has errors, and if for example:
   i. reliance on the spatial data causes harm;
   ii. it is difficult to create the spatial data in the first place, meaning that if the organisation had to use sufficient skill and judgement, they are more likely to owe the user a duty of care;
   iii. the standard of care is measured on detection and correction procedures used by the organisation, if these do not exist the organisation may be held liable for errors in spatial data;
   iv. the provider receives significant financial benefit, it is more likely that a duty of care applies; and
   v. the organisation engages in misleading or deceptive conduct.

d. Breach of trade practice laws.

2. Quantify the risk by deciding how probable it is that a problem could occur. What is the potential cost of suffering liability claims? Outweigh the cost of doing nothing and perhaps suffering legal liability claims with the cost of implementing risk management. Identify the benefits from the supply of spatial data and compare them with the cost of implementing risk management strategies.

3. Develop a strategy that can reduce, transfer, manage, and/or accept the risk. However, if the cost associated with the risk is greater than the benefits of continuing the activity, then that activity could be ceased. The strategy could for example include the:
   a. review, update and correction of spatial data
   b. use of contracts to minimise risks
   c. use of disclaimers and warnings
   d. provision of metadata
   e. use of national industry standards
   f. use of insurance to limit or avoid legal risk

4. Document and implement risk management procedures.

5. Monitor compliance of risk management and assess its effectiveness and actual cost versus estimated cost of risk management (Reid et al, 1996).

5.7 Conclusion

Liability exposure may be reduced through good communication, contracts and good business practices, but can never be eliminated. Elimination of liability according to Onsrud (1999) is neither possible nor desirable. The public and businesses need a way to redress wrongs caused by relying on inaccurate or insufficient spatial data. Civil legal liability arising from the use of inaccurate data may either be contractual or tortious liability. Contractual liability requires privity while tort law requires proximity and not privity. The examples in section 5.3.3 point out that not only errors in spatial data may result in liability but also poor design and inappropriate use of spatial data. If the creation of the spatial data required sufficient skill and/or the provider is the only potential data provider, then the likelihood that a duty of care to others exists is greater. The same applies if the provider received a sufficient amount of money for the spatial data.

Using standards, such as technical and professional GIS standards, could reduce legal liability. Technical standards are under development not only at local, national and regional level, but also at the global level. At the national level the CSDC, ANZLIC and ASDI are developing national standards in conjunction with bodies such as Standards Australia for spatial data and metadata standards, and have, for example, produced the policies on Custodianship and Metadata. At the global level the International Organisation for Standardisation (ISO) and other global organisations are developing global spatial data and metadata standards. Using detailed contracts and disclaimer clauses as described above are also appropriate ways to reduce liability exposures. A disclaimer, for example, would be very beneficial if used to point out the spatial data's intended or non-intended use and to safeguard the provider against third parties using the data inappropriately.

The results of the survey indicate that either not many people are aware of the legal liability risks involved when supplying spatial data, or liability claims happen very infrequently. This may be because most liability claims are settled out of court and usually no case studies or publication of the results are available to the public. However, many organisations are aware of the risks involved, because 64% of all providers rely on disclaimers, indicating the need to limit legal liability. As described in this chapter the best way to limit liability is to implement a risk management strategy and monitor its effectiveness.

Chapter 6 – Intellectual Property Protection of Spatial Data

6.1 Introduction

As described in the introduction to Chapter 5, an organisation supplying spatial data must consider its legal risks when supplying spatial data to others and take appropriate precautionary measures. In addition to these measures the organisation should be aware of intellectual property rights held in their work and their obligations towards other intellectual property right holders. Section 6.2 of this chapter describes Intellectual Property Law, Sections 6.3 and 6.4 research intellectual property laws relevant to spatial data such as patents and copyright. Section 6.5 addresses international and national intellectual property reforms, while Section 6.6 gives a brief summary of the results of the Spatial Data Survey related to intellectual property protection for spatial data.

6.2 Intellectual Property Law

Intellectual property is a collective term for the various legal rights vested in creations. These rights, related to inventions such as computer software, are under statutory law: copyright, circuit layout, patents, designs, trade mark, and plant breeder's rights. Under common law, intellectual property rights are extended to confidential information, goodwill and commercial reputation.

The importance of intellectual property is well described by McKeough and Stewart (1997, p.14) as:

> "To the writer or composer or artist, their works may represent their livelihood, while to publishers they represent potential profits. To industry, inventions represent large investments of time and money - and the possible creation of enormous wealth. To businesses generally, their reputation, their name and the appearance of their goods represent their position in the market. Intellectual and industrial stock in trade is just as important as buildings or other tangible investments."

6.2.1 Legislation

Following are the various intellectual property statutory regimes, under the legislative responsibility of the Commonwealth Government, currently in force in Australia.

- **Copyright** protects the expression of information (ideas) but not the information (idea) itself in an original work in material form. It applies automatically, generally lasts for the life of the author plus 50 years and is governed by the **Copyright Act 1968 (Cth)**. **Performers rights** were introduced in 1989 into the **Copyright Act 1968 (Cth)** in Part XIA. They do not attract copyright as such because they are not fixed in material form. The rights allow the performers to restrain or take action against any unauthorised broadcast or recording of their performance.
- The **Patents Act 1990 (Cth)** grants **patents** for the exclusive right to exploit an invention for a period of up to 20 years. In return the patent holder (patentee) must publish details of the invention. However, for example, one patent requirement is that if the patent details are published before the application has been filed, the applicant has no right to gain a patent. An application for a standard, or petty patent has to be made to the Patent Office and depending on the commercial usefulness, novelty and inventiveness they may or may not grant a patent. A standard patent lasts for 20 years, a petty patent designed for appliances with a short commercial exploitation lifetime lasts for up to 6 years.
- The **Circuit Layouts Act 1989 (Cth)** provides protection for integrated **circuit layouts** (such as computer chips, silicon chip rather than stored on floppydisc) and related purposes for up to 10 years in a copyright manner.
- **Designs**, such as features of shape, article patterns that can be seen by the eye, but that do not include construction methods, maps or plans, are controlled by the **Designs Act 1906 (Cth)**. In other words, design rights protect the visual appearance of an article. The Act establishes a registration system for designs of commercial products and a monopoly may be granted for up to 16 years. Important issues may arise in connection with the construction method or principle, which may qualify

for protection under the Copyright Act 1968 (Cth).

- **Trade marks** are signs including items such as names or labels; they indicate the trader that provided a particular service or goods. In order to gain registration under the **Trade Marks Act 1995 (Cth)** the proprietor must use a mark that is distinct to his/her business and once registered he/she is entitled to restrain another proprietor to use a substantial similar or identical unregistered trade mark.
- The **Plant Breeder's Rights Act 1994 (Cth)** provides for the granting of proprietary **rights to breeders** of certain new varieties of plants and fungi and for related purposes. The period of protection under the Act is for 20 or 25 years and grants the breeder an exclusive right over their varieties (McKeough and Stewart, 1997).

6.2.2 Common Law

Trade secrets and other confidential information may be protected against use by others through the doctrine of breach of confidence (provided that information is confidential, and has not been moved into the public domain). The same may be enforced by contractual obligations of secrecy.

Goodwill between the agency and its clients may be protected by the tort of passing off. This tort backs up and extends the trade mark protection by the Trade Marks Act 1995. The tort of passing off establishes that it is unlawful for a person to "pass off" something as being produced by him/her or being associated with something from another person. Other important areas directly and indirectly impacting on intellectual property are trade practices and fair trading legislation. These will not be considered in this research.

6.2.3 Intellectual Property Law Administration

Intellectual Property policy making and administration is divided into 'Copyright' and 'Industrial Property'. Industrial property deals with such areas as patents, designs and trade marks and is administered by IP Australia, a division of the Department of Industry, Science and Resources (ISR). Copyright and Circuit Layout are administered by the Attorney-General. There is no single Department responsible for policy making in regard to overall intellectual property within the government. However the Federal Government has established the Intellectual Property and Competition Review Committee (IPCRC) in 1999, which is required to report on the effects Australia's intellectual property laws have on competition. The intellectual property rights to be included are patents, trade marks, designs, copyright and electronic circuit layouts.

The Intellectual Property and Competition Review (IPCR) was established under the Competition Principles Agreement, an inter-Governmental agreement that forms part of the National Competition Policy (IPCRC, 1999). The IPCR Committee produced an issues paper in September 1999 to stimulate public discussion. It examined the IP law system and the National Competition Policy, and identified potential consistencies and inconsistencies. Eighty written submissions were received with varying degrees of complexity. The IPCR Committee decided to publish an Interim Report in April 2000 to deal with identified issues within the terms of reference and they encouraged further written comments (IPCRC, 2000). A final report on parallel importing under the Copyright Act 1968 was submitted to Ministers on the 30 June 2000 and a final report on all other matters on the 30 September 2000 (IPCR, 2000c).

The following two sections consider intellectual property rights relevant to spatial data, such as patents and copyright, followed by an overview of international relationships relevant to intellectual property, and IP law reforms nationally and internationally. The last section gives a brief summary of IP question results from the Spatial Data Survey.

6.3 Patents

A standard patent (hereafter only referred to as patent unless otherwise specified), part of the industrial property rights, gives the owner a monopoly generally lasting 20 years (granted after 1 July 1995). Unlike copyright, that does not protect facts or information itself, patents do. A patent gives its owner the right to legally enforce his/her rights to exploit the invention. The patent regime is governed by the Patents Act 1990 (Cth) and Patents Regulations, hereafter only referred to as the Act. The patent system is administered by the Patent Office of IP Australia, a division of the Department of Industry, Science and Resources (ISR) (McKeough and Stewart, 1997; IP Australia).

A patent may be granted for any new, inventive and useful device, substance method or process. Certain creations cannot be protected using patents. These include artistic creations, mathematical models, plans, schemes or other purely mental processes (IP Australia, 1999).

Patents protect computer software methods that produce an artificially created end result of economic utility (IP Australia, 1999). IP Australia explains that:

> "the protection of such methods by correctly drafted patent claims means that any "new" program, subsequently developed by another programmer, which embodies those methods will still be an infringement of the patent."

Usually if the software only produces the solution for a mathematical problem, the software is not patentable. However if the software can be applied industrially such as in the control of an industrial process in producing vulcanised rubber, it may be suitable for a patent. Other patentable computer software examples are: software that is directed to the operation of a computer for example to improve the speed of any parts, or methods of electronic transactions, or the ability to monitor interactions of Internet sites (IP Australia).

A patent cannot directly be used to protect information (McKeough and Stewart, 1997) or spatial data. However if an information system or spatial data was used to develop an industrially useful invention, it can become part of the patent protection for the invention. An invention that provides an improved method and apparatus for producing curved images in computer graphics displays for example has been patentable (*IBM Corp v Commissioner of Patents* (1991) 22 IPR 417). In this case the Commissioner of Patents refused a patent appeal on the grounds that the invention was not a "manner of manufacture" and merely an algorithm that was not patentable. The plaintiff argued that the invention involved more than an algorithm, because the production of the curve was a product that when displayed was a physical thing having many uses. The Federal Court of Australia upheld the appeal based on the finding that an algorithm was applied to achieve the production of an improved curve image. The method of achieving that was novel and inventive, and hence entitled the developers to the protection of the patent laws.

Patent examples can be seen at the IPAustralia website, such as the patent information about the Cochlear's Bionic Ear:
http://www.ipaustralia.gov.au/ip/examples/P_case2.htm.

Petty patents provide protection for small scale innovations such as small appliances and accessories with a short commercial life. Protection period for a petty patent is a maximum of 6 years, but it is much easier and cheaper to obtain than a normal patent. A petty patent is accessed for novelty only in Australia rather than by international patent standards (McKeough and Stewart, 1997).

Patents of addition may be obtained to protect improvements or modifications of the original invention. If granted they will only last for the remaining period of the patent of the original invention (McKeough and Stewart, 1997).

6.3.1 Obtaining a patent

If the information to be patented is published before the application for a patent, a patent will not be granted. Hence, it would be advisable to use written confidentiality agreements with involved parties such as employees, advisers or business partners (IP Australia). Anyone may apply for a patent. However, the potential patent holder must be either the inventor(s); be entitled to have the patent assigned to him/her (them); derives title to the invention from either; or is the legal representative of a deceased person who falls within one of the categories (McKeough and Stewart, 1997).

Processing of a Standard Patent Application only occurs if the applicant has filed a patent request and the necessary accompanying documentation. A provisional application, only describing the invention, is made where the applicant wants a 'priority date' quickly. Thereafter the applicant has 12 months to lodge the complete application. A complete application must fully describe the invention, include the best method of performing it, and end with a claim defining the invention. Either lodging a complete specification or a provisional application can lead to obtaining a priority date. If the patent right is granted the priority date is the date on which the patent right starts (McKeough and Stewart, 1997).

The examination of a patent application by a patent examiner will only occur if the applicant makes a request to do so. For any creation to qualify for a patent, it must comply with the Patent Act 1990 (Cth) requirements. The invention must be a "manner of new manufacture" and must be novel and inventive. The acceptance of a patent application is manifested in an advertisement in the 'Australian Official Journal of Patents, Trade Marks and Designs'. At the same time some documentation of the application (creation) is made available to the public. Competitors can now examine the application and oppose the granting of the patent within three months. The grant can only be opposed on the following grounds: if the nominated person is not entitled to the patent; if the invention is not a "manner of new manufacture"; or if the content of the application does not meet statutory requirements. The Commissioner decides whether to grant the patent or not.

When the Commissioner decides that the standard patent should be granted, the patent will be sealed (granted). This must occur within 3 to 6 month of the acceptance advertisement. The term of a standard patent is 20 years, prior to 1995 it was 16 years. The start of the term is from the date the complete patent application including all specifications was lodged. The relevant court or the Commissioner may revoke a patent in part or fully (McKeough and Stewart, 1997).

6.3.2 National and International Requirements

For an invention to qualify for a patent it must be:

- A 'manner of manufacture', which is a legal term used to distinguish between patentable inventions and non-patentable ones. McKeough and Stewart (1997, p.294) interpret the meaning of 'manner of manufacture' as being the subject matter of a patent claim that must have an industrial application and have been invented rather than merely discovered;
- New;
- Be novel (new and not invented prior by someone else) and involve an inventive step that is not necessarily obvious to someone within the field of the invention; and
- Useful in that it will do what is claimed it will do (IP Australia, 1999).

To protect an invention internationally the same standard patent priority date can be used for an application made overseas, if done within 12 months. There are two different ways of applying for an international patent. The first is to apply directly with the country or countries in which the patent(s) is (are) required. The other way is to apply for an international patent and specify the required countries (IP Australia, 1999).

6.3.3 Ownership and Owner's Rights

Exclusive rights given by the patent as defined in s13(1) of the Act, give the patentee exclusive rights to exploit his/her invention or to assign these rights to another person. "Exploit" is defined in the dictionary in Schedule 1 of the Act as:

> "Exploit in relation to an invention, includes:
>
> a) where the invention is a product – make, hire, sell or otherwise dispose of the product, offer to make, sell, hire or otherwise dispose of it, use or import it, or keep it for the purpose of doing any of those things; or
>
> b) where the invention is a method or process – use the method or process or do any act mentioned in paragraph (a) in respect of a product resulting from such use;"

A patent may only be granted to the inventor, or a person assigned by the inventor or the inventor's legal representative. Ownership gives the patent holder the above exclusive rights. As the inventor has the right to the patent and not necessarily his/her employer, it may be necessary to have an employment contract defining the ownership of inventions and assignment of any right to an invention made during the time of employment. However, in the absence of a contract McKeough and Stewart (1997) state that courts have tended to favour employer ownership, as long as the invention was derived as part of the employees duties.

A patent right is part of a person's property and can therefore be sold, leased, mortgaged, given away or willed to another person. Exploitation of a patent is usually in the form of licensing the use of the invention in other products for the return of a royalty. A patent licence need not be in writing to be effective. The courts have accepted implied licences for the public to use any product that incorporates a patent invention (McKeough and Stewart, 1997).

6.3.4 Infringement and Remedies

A patent enables the holder of a patent to take action against others who have infringed his/her exclusive rights such as making, hiring, selling, using or importing the invention or authorise another person to do the same. Infringement occurs if any of the patent owner's exclusive rights have been breached.

Proceedings for Infringement may be started by the patentee or an exclusive licensee and be heard by a court. Patent litigation is usually very costly and time consuming, with an average typical cost of between $50,000 to $250,000, but can also be as high as $1,000,000 (Prime Minister's Science and Engineering Council, 1993 in McKeough and Stewart, 1997). Remedies are set out in s 122(1). The courts may award the successful plaintiff with an injunction against the defendant, and if so, choose either damages or an account of profits.

Worldwide there are more than 30 million patents with about 7% of those in Australia. Before applying for a patent it would be advisable to search the existing patents. The overall estimated cost of a patent, including Patent Attorney fees is between $5,000 and $8,000 and maintenance fees over a 20-year term are about $7,000 (IP Australia, 1999).

As pointed out above, a patent may not be granted for spatial data alone. However, if the spatial data forms part of an industrial useful invention it can be protected as part of the patent.

6.4 Copyright

This section on copyright presents firstly an overview of copyright as it applies to spatial data, followed by an overview of current copyright law reform. The section does not discuss copyright as a whole or 'fair use' of copyright, which relates to copying for purposes such as teaching, research and study, but concentrates on specific copyright issues related to spatial data as a map, or a database. This section also explores Internet and digital problems, potential changes to the copyright legislation as recommended by government advisory bodies, and national and international developments in copyright.

Copyright as part of Intellectual Property law offers legal protection over copyright material to the copyright owner. Copyright can generally be defined as an exclusive right to one's own material, without fear that someone else will copy and/or use that material unlawfully. Thus copyright is not a tangible property. The objective of this section is to direct agencies in their assessment and use of spatial data copyright to ensure that they will develop appropriate strategies. As the collection and maintenance of spatial data is very costly it is important to consider what protection copyright can offer for spatial data.

6.4.1 Copyright Basics

Copyright law in Australia is part of intellectual property law and the majority of it is contained in the Copyright Act 1968 (Cth) (hereafter only referred to as the Act), with its various amendments, and regulations, and in relevant court decisions that interpret the Copyright Act 1968 (the common law). 'Works' and 'subject matter other than works' enjoy copyright protection, if they are 'original' and satisfy other requirements of the Act. The creator of the material enjoying copyright protection is classified as the 'author' and is usually the owner of the copyright.

Copyright in Australia is generally a right to profit from one's own creation and is meant to encourage development and to reward the creator for his/her efforts.

6.4.1.1 Material Protected by Copyright

Material that is protected by the Copyright Act 1968 (the Act) falls within one of two classes, either 'works' or 'subject matter other than works'. Works includes literary, artistic, music, and dramatic works that must be expressed in material form, and other subject matter covers broadcasting, cinematograph films, sound recordings and published editions of works. A creation becomes a 'work' when it is first reduced to writing or to some other material form (Section 22(1) of the Act).

There is no procedure required to gain copyright protection, provided the material falls under the definition of the Copyright Act 1968 and qualifies for copyright protection. However, it is advisable to note the widely recognised symbol of ©, date (year) of the creation, and the name of the creator. This is required for protection in some overseas jurisdictions under the provisions of the Universal Copyright Convention (UCC).

To better understand what is protected by copyright it may help to look at what copyright does not protect. Generally these are ideas, facts, information, appearances, and procedural information. Hence it is not for example the information that can be protected, like names and addresses, but the form and expression of those.

6.4.1.2 Originality and Material Form

There is no need to be inventive to enjoy copyright protection, however the work must be 'original' and the Copyright Council in its 1996 Guide *Computer Software and Copyright* writes:

> "... a computer manual is protected in the same way as a major novel, a drawing of a piece of machinery is protected in the same way as a painting in the National Gallery of Australia, an advertising jingle is protected in the same way as the symphony."

For a work to be 'original' it must have originated from its creator (called the author). Furthermore a degree of skill, judgement and labour must have been applied and it must not be a copy of someone else's creation. It is not necessary for the material to be inventive or novel. (Eldred, 1995)

In section 10(1) of the Act,

> "'Material form', in relation to a work or an adaptation of a work includes any form (whether visible or not) of storage from which the work or adaptation, or a substantial part of the work or adaptation, can be reproduced;"

6.4.1.3 Expression of an Idea

Copyright protects only the expression of an idea and not the idea itself. McKeough and Stewart (1997) describe the expression of an idea as 'the form in which an idea is clothed'. The point of expression of an idea versus the idea itself was made in *Donoghue v Allied Newspapers Ltd* [1938] Ch 106. A journalist interviewed the plaintiff about his racing career and this information was published in several articles. The journalist also gained permission from the newspaper to publish condensed versions in another paper. Donoghue, the interviewee, assumed he was the copyright owner of the stories and that his copyright had been infringed. It was held that the plaintiff only supplied incidents in his life, while the language was that of the journalists. Hence the journalist was the author of the material in which copyright subsisted and not Donoghue. Farewell J pointed out that there is no copyright in ideas but in the particular form of language in which the information or idea is expressed.

6.4.1.4 Ownership of Copyright

The first owner of copyright in a work is the 'author' of that work (Section 35(2) of the Act). The author is the person who puts information, facts, instructions or ideas into a particular form. The person providing the idea (whether novel or not), but not the expression, is usually not regarded as the author. The same applies to a mere scribe, that person is not an author but the person dictating is.

Where two or more authors produce a collaborative work, with no possible separation of each author's contribution, each author will own an indivisible share of the copyright in the work. No author may exercise the rights without the permission of the other authors. (Australian Copyright Council, 1996)

Copyright in a work created by an employee (not a freelancer or independent contractor), while carried out as part of the person's duty of employment, is generally owned by the employer. If the employer is the government, and if created under their direction, the work will be owned by the government. It can sometimes be difficult to determine which bodies are part of a government, especially where the creator of a copyright work was a volunteer. In such situations it would be best to clarify copyright ownership in an agreement. (Australian Copyright Council, 1996)

6.4.1.5 Materials created with the aid of computers

Where a work was created using word processing software, or an artistic work (graphics, architectural plans, digital maps) using graphical software and a computer, it is difficult to determine whether copyright applies. Firstly the work must be in **material form** to be a work, further it must qualify for **originality**, which enables the attribution of ownership, and **ownership** must be determined. What is the status of those three requirements in a computer generated work? In *Roland Corp v Lorenzo* (1991) 22 IPR

245 at 252 Pincus J held that the text of a manual, created on a computer and saved onto a disk, had been reduced to a material form. However it needed to be printed out to be in 'material form'. If presented on the computer screen only it may not be classed as material form.

In *Autodesk Inc v Dyason* (1992) 173 CLR 330; 22IPR 163, the majority of the judges in the High Court said that a computer program would be 'original' if either the 'set of instructions' are original or their expression are original. Originality can sometimes be difficult to define and has a very low threshold. In computer software assisted work, such as a digital map, produced by an operator without skill but with labour, the work may not be 'original'. If the digital map was however produced with enough skill, labour and judgement it could be classed 'original'.

The author, the potential copyright owner, of a work created with a computer is generally the computer operator. However, if a new work is created through operating a program or by using data gathered by another person, the operator may only claim authorship if he/she has applied sufficient skill and labour. (Australian Copyright Council, 1996) It is however difficult to determine what amounts to sufficient!

Works made by an expert system (called 'computer-generated works'), like a computerised satellite weather information system where no human intervention is needed other than the initial programming, may not to be protected by copyright because of the lack of originality. These works may generate their data remotely sensed via satellite, and automatically analyse and display them as map images of vegetation, geological formations or weather patterns. The United Kingdom protects these works under the *Copyright, Designs and Patents Act 1988* ('CDPA'), which is the only country so far to do so, by considering the 'author' as the person that has made the necessary arrangements for the work to be created (Australian Copyright Council, 1996).

The Copyright Law Review Committee (1995) recommends an amendment to the Act to include provisions for computer-generated material as a new form of subject matter, and to define 'computer generated' as 'generated by a computer in circumstances such that there is no human author of the material', and that the protection period is 25 years from the end of the year in which the material has been made. The 'author' in computer-generated material is the person who undertakes the arrangements needed for the creation of the material. The CLRC recommended in its Draft report that the author could be one of four parties.

a) the programmer or owner of the copyright in the programs that assisted in creation of the work;
b) data provider;
c) computer/computer program user; or
d) computer/computer program owner.

6.4.1.6 Rights, Infringement and Remedies

The Copyright Amendment (Digital Agenda) Act 2000 (the CADA) became an Act when it received its Royal Assent on the 4 September 2000. CADA is intended to commence on 4 March 2001, unless proclaimed earlier. It amends the Copyright Act 1968 (Cth) to be in line with new communication technologies such as the Internet (Attorney General's Department, 2000b).

The Copyright owner of a literary, dramatic, musical and artistic work has the exclusive right (set out in section 31 of the Act) to reproduce the work in material form, whereby reproduction means photocopying, or making a computer readable digital version and others. He/she also has the right to make the work available to the public and broadcast the work or transmit it to subscribers. With the latest amendment act CADA, the right to transmit the work to subscribers will be omitted and instead a technology neutral right of 'communicating the work to the public' introduced. If the work is literary, dramatic or musical, the copyright owner also has the right to perform the work in public and the right to make an 'adaptation' (create a version) of the work. (Australian Copyright Council, 1997). The copyright owner also has the right to sell or license his/her copyright. In case the work is a computer program or a work recorded in a sound recording, the owner can commercially rent the work

The duration of copyright is generally the life of the author plus 50 years (Section 33(2) of the Act), however there are exceptions. For example, where the subject matter has two or more authors, the duration is 50 years from the death of the last surviving author (section 80 of the Act). If the work is not published while the author is alive, copyright lasts for 50 years from the first publication (section 33(3) of the Act).

For certain purposes the user may qualify to use copyright material under the 'fair dealing' provisions of the Copyright Act 1968 (Cth). These purposes include: for research or study (s 40); reporting news (s 42); criticism or review (s 41); and giving legal advice (s 43). The amount of copying is usually limited to no more than about one chapter or 10% of the edition (whichever is greater). The CADA adds that the above fair dealing provisions will apply to the new technology neutral communication right as well. A newly introduced exception to the exclusive right of reproducing temporary works will provide any Internet user with the ability to browse the Internet, thereby obtaining copies of temporary works in the cache, without breaching copyright.

Infringement of copyright takes place when a protected work, or a substantial part thereof, has been used in a way that is exclusive to the copyright owner, for example reproducing or broadcasting a literary work without the permission of the owner. A breach of copyright has also taken place when an unauthorised person authorises a copyright breach.

Remedies that are available for infringement include injunctive relief and damages, or an account of profits. If the infringement was commercial or involved distribution, then criminal penalties may also be imposed. Damages include the loss in value caused by the infringement, and/or loss of profit. Damages may also include punitive damages and injury to reputation. To stop the importation of infringing copies of a work, Customs can be notified (McKeough and Stewart, 1997).

6.4.2 Copyright of Maps

Maps, used by a variety of professions and the general public, are partly protected by copyright, but which parts are often uncertain (Cho, 1995). According to the Australian Copyright Council (1982), maps produced before the Copyright Act 1968 came into effect, are protected as literary works under the Copyright Act 1911 section 204, and can be copied under sections 49 and 50 (Jones and Prescott, 1995). Under the present statutory Copyright Act 1968, maps can be protected as either literary work or artistic work. Section 10(1) of the Act states that:

> ‘literary work’ includes:
>
> a) a table, or **compilation**, expressed in words, figures or symbols (whether or not in a visible form); and
> b) a computer program or compilation of computer programs;
>
> ‘artistic work’ means:
>
> a) a painting, sculpture, **drawing**, engraving or photograph, whether the work is of artistic quality or not;
> b) a building or a model of a building, whether the building or model is of artistic quality or not; or
> c) a work of artistic craftsmanship to which neither of the last two preceding paragraphs applies;
>
> but does not include a circuit layout within the meaning of the Circuit Layouts Act 1989;
>
> ‘drawing’ includes a diagram, **map**, chart or plan;

A map can be a literary work, being the product of a compilation, or an artistic work, being a drawing. A map will qualify for copyright protection if it fulfils the necessary requirements as specified under ‘Copyright Basics’, no matter if the map is in hardcopy or digital format. There are however uncertainties that can be demonstrated with the help of some case law. The Copyright Act 1911 was applicable in the case *Robinson v Sands & McDougall Pty Ltd* (1916) 22 CLR 124 (High Court) when maps were protected as literary work under section 35(1) of the Act. The defendant had copied a map belonging to the plaintiff but argued that the map was not an ‘original’ work because it was created from pre-existing sources. Barton J considered the labour involved in producing the plaintiff’s map and also the question of originality, and found that a cartographer, applying his ability to produce a map presenting details differently from previous maps, depending on the purpose it is used for, does enjoy copyright. The word ‘original’ within sec.1(1) of the Copyright Act 1911 was found to mean ‘not copied’, ‘not imitated’. Hence the plaintiff’s map was original for issues such as appearance, size, style and draftsmanship and enjoyed copyright. The High Court decided that the defendant's map infringed copyright, because it had reproduced a substantial part of the plaintiff's original map. However the problem is knowing what amount of information constitutes a 'substantial part' in a map. The court granted the plaintiff an injunction, delivery of all copies of infringing maps, and an account of profits.

As maps are pure graphical presentations of facts it is very uncertain if copyright applies to the individual case. Following are two examples of where copyright did protect a map. The first a case from the US *Rockford Map Publishers Inc. v Directory Service Company of Colorado*, (1985) 768 F.2d 145 and the second from Australia *Eagle Homes Pty Ltd v Austec Homes Pty Ltd* (1998) AIPC 91-385. The outcome for both cases differs, because the situation in both cases is not alike.

Rockford Map Publishers Inc. v Directory Service Company of Colorado involved two map publishers. Rockford, the plaintiff, claimed that Directory Service violated copyright laws. Directory Service claimed that Rockford Maps were produced with little effort and therefore their maps could not be copyrighted. Rockford's maps show location, size and ownership of parcels of land for rural counties. They start with aerial photographs, trace topographical features onto their maps and use legal deed boundary description (not in form of a map) to draw the boundary lines for each parcel of land. Then the owner's name is written inside the parcel and ownership changes are updated from time to time. Directory Service used Rockford's map as a template and compared the information with official records, then drew their maps on a square grid without topographical features. Rockford could tell that Directory Service used their maps as templates because Rockford inserted traps into their maps. Out of 56 traps inserted into various maps Directory Service copied 54. For example the maps below (Figure 6.1 & Figure 6.2) include bogus middle initials along the column at 2400 E and read from top to bottom spell Rockford.

This case was the first in the US District Court for the Central District of Illinois where Baker J. found that copyright did exist in Rockford's maps because they had searched through the records and turned legal descriptions into maps. Directory Service maps infringed Rockford's maps copyright because they copied Rockford's maps. Baker J further said that for Directory Service not to infringe copyright they should have assembled their own material as if there had never been a first compilation and then used Rockford's maps as a check on error only. He ordered Directory Service to turn their material and maps over to the court, not to publish any more infringing maps, and awarded Rockford statutory damages of US $250 and Attorney fees and costs of about US $22,000. On appeal to the US Court of Appeals, Easterbrook J. upheld the decision of the US District Court.

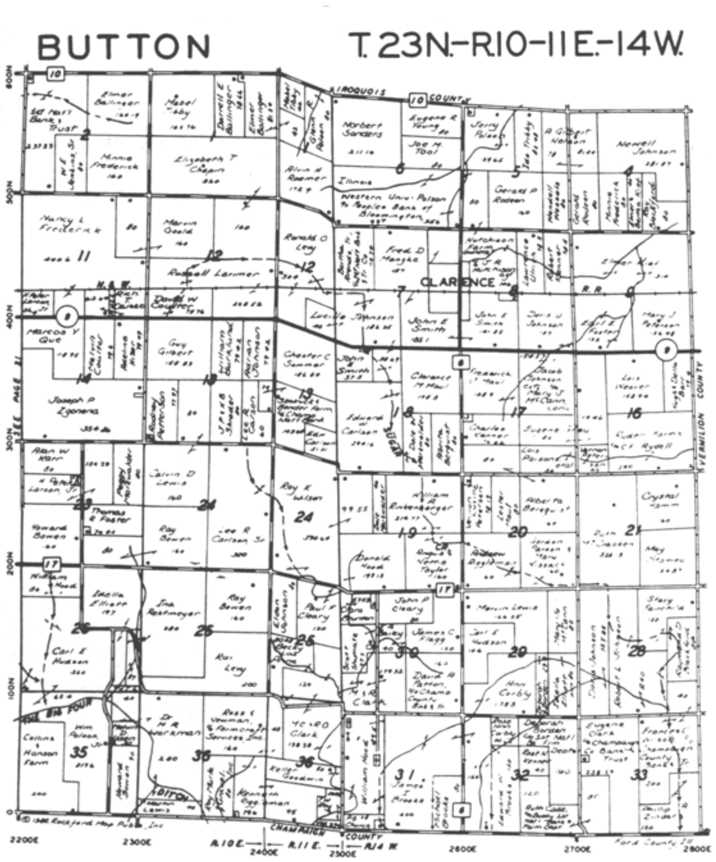


Figure 6.1: Rockford's Map (Source: 768 F2d 145)

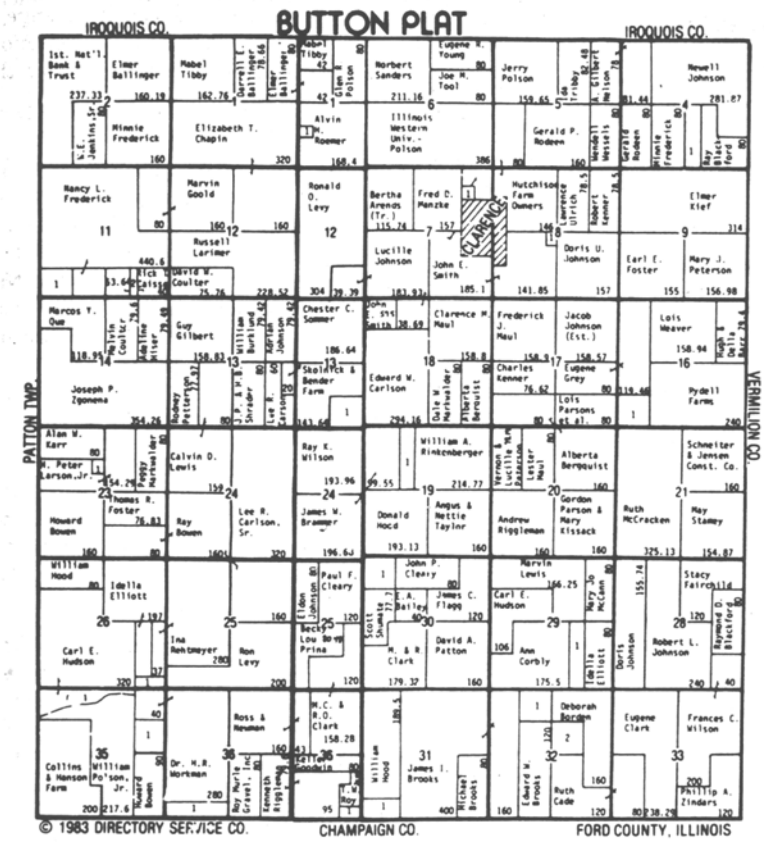
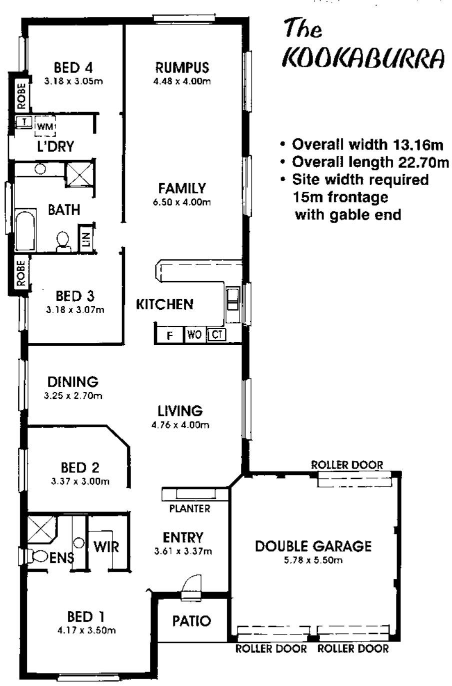


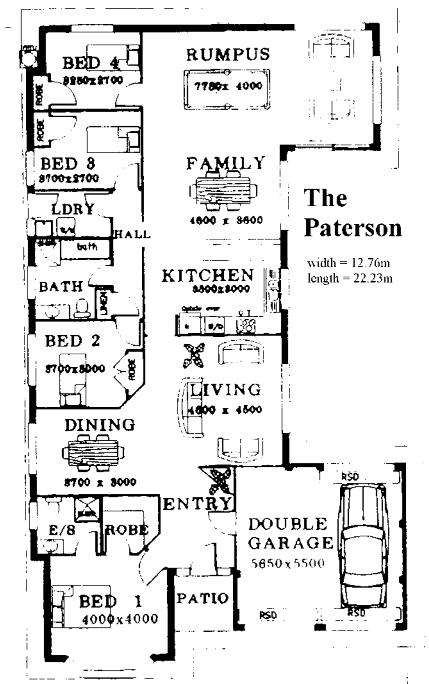
Figure 6.2: Directory Service's Map (Source: 768 F2d 145)

Eagle Homes Pty Ltd v Austec Homes Pty Ltd involved two project home builders. The plaintiff Eagle Homes claimed he owned copyright in the Floor Plans of two 'Kookaburra' homes, and that the respondent had breached Eagle Homes copyright by advertising and building homes that were substantially similar to his own. The defendant on the other hand claimed that no copyright existed in the 'Kookaburra' homes because they were not original artistic work. Further the defendant said he did not reproduce a substantial part of the drawings. The Federal Court of Australia, Branson J held that the 'Kookaburra' drawings were original artistic works and copyright existed. The defendant's work however did not infringe copyright because project homes often contain common features. Branson J found that both Austec Homes's drawings did not amount to a reproduction of a substantial part and hence dismissed the case. Below are architectural floor plans for one of the drawings involved in this case. The 'Kookaburra' being one of Eagle Homes project homes and The Paterson being one of Austec Homes project homes.

Figure 6.3 & 6.4 show the similarities in the two project home's architectural plans. Although they both are very similar, they do both contain many common features. There are only certain logical positions for placing certain rooms.

Figure 6.3 & Figure 6.4: The Kookaburra and The Paterson project homes





(Sources: Advertising brochures from Eagle Homes Pty Ltd and Austec Homes Pty Ltd)

Copyright protection becomes difficult if digital maps have been digitised from other maps with third parties using the original maps and adding value to them. In this case, to qualify for copyright protection 'sufficient skill, labour and judgement' must be applied to the production of the derived data and if a substantial part of the original map was digitised, the original map's copyright owner approval may be necessary.

6.4.3 Databases

Databases in general, whether in digital form or in hardcopy form, may enjoy protection under the Act defined as a literary work. It is difficult to determine whether a compilation is original or not. The author must demonstrate that he/she has applied some skill and labour in the selection and arrangement of the data to qualify for copyright protection (Eldred, 1995).

Individual elements of a database may be protected by copyright if they qualify:

1. Individual records, like journal articles collated into a database. These may be original themselves or substantial parts of original works.
2. Selection and/or arrangement of the data.
3. Material such as indexes not classified as entries, but that form part of the database.
4. Computer programs enabling manipulation of data in the database. (Australian Copyright Council, 1996)

Data in a database may be protected separately from the program that uses it. This was determined, but later overruled, in the case *Data Access Corporation v Powerflex Services Pty Ltd* (1996) 33 IPR 194. In this instance, the court held that the error text table in the software was not protected by copyright as a compilation. However, the compression table in the software was protected by copyright as a 'table' (Australian Copyright Council, 1996). In the same case, single words were each held to be a computer program if they caused the computer to perform a specific operation (McKeough and Stewart, 1997). The decision was overruled on appeal by the Full Court (*Powerflex Services Pty Ltd v Data Access Corporation*, Federal Court of Australia, No VG 295 of 1996, 4 June 1997, per Black CJ, Hill & Sundberg JJ). The Court held that the words or commands used in Data Access' Dataflex program were not themselves an expression of a set of instructions, hence not a computer program as defined in Section 10(1) of the Act, and were therefore not protected by copyright. The Court also overruled that the Powerflex program infringed copyright in the Dataflex macros, file structures and function keys. However the court upheld the decision that the Dataflex compression table was protected by copyright and Powerflex infringed the copyright. Later still the case was appealed to the High Court and dismissed (*Data Access Corporation v Powerflex Services Pty Ltd*, High Court of Australia, 30 September 1999, [1999] HCA 49).

If copyright does exist in the data itself, the copyright in their compilation is separate and can be held by another copyright owner. Furthermore, it is possible to enjoy copyright in the compilation of computer programs, like those used in an operating system, and separate for the individual programs as well. (Australian Copyright Council, 1996).

It is difficult to determine in what circumstance copyright protection in databases would apply because of the various interpretations in cases made by different courts. In *Sampson v Brokensha & Shaw Ltd* (1935) 37 WALR 90 it was decided that copyright did not apply to a compilation of prescribed forms. This also applied to *Smith's Newspapers Ltd v Labour Daily* (1925) 25 SR (NSW) 593 where it was held that a listing of possible winners in horse races to be held the next day, was not covered by copyright. In the case *Fairfax (John) & Sons Pty Ltd. v Australian Consolidated Press* (1960) SR (NSW) 413 it was decided that copyright existed in a list of birth and deaths announcements in a newspaper, while in *Football League Ltd v Littlewoods Pools Ltd* (1959) 1 Ch 637, (1959) 2 ALL ER 546 it was also decided that copyright applied in a chronological list of football match fixtures. (Eldred, 1995; Cho, 1995)

According to Karjala (1995), the arrangement, selection, and format in a database gives the work sufficient originality. However, the more comprehensive the database (eg. as in a compilation of various databases from different sources), the smaller the opportunity to claim originality in the information's 'selection' in the database. (Eldred, 1995)

If a compilation uses only insubstantial amounts of the original work, no copyright infringement has taken place and the creator can enjoy copyright to the new work. Under copyright law it is difficult to determine what amounts to a "substantial" part. This is however crucial in determining whether copyright was infringed or not. There are two rules to test for a "reproduction of a substantial part":

1. Where a work does contain a markedly original feature this test applies to a qualitative level even if the feature represents a very small portion of the overall work, and
2. Where the work does not incorporate originality, the test applies to the amount that has been copied, hence being a quantitative test (Stone, 1998).

6.4.3.1 Maps (as spatial databases) and Databases (attribute)

Maps can be considered as spatial databases. Spatial databases and attribute databases are both classified as 'databases'.

In the US, the courts like to use the 'sweat of the brow' doctrine to deal with databases and prefer to reject the principles of the following Feist case. The 'sweat of the brow' doctrine refers to copyright owners labour in obtaining a compilation of facts that should be recognised and protected. *Feist Publications Inc v Rural Telephone Service Inc* (1991) 20 IPR 129 in the Supreme Court of the United States, is a case where the Rural Telephone Service Company's telephone directory was copied and added to, without their permission by Feist Publications. Rural argued that their copyright in their directory was infringed. However the court held that copyright protects the author's original expression, not the underlying fact or ideas. Factual compilations organised alphabetically or by some other method lacking originality, are not protected simply on the basis that it may take effort and expense to compile them. The 'sweat of the brow' doctrine, allowing protection for factual databases lacking originality, flouts basic copyright principles by protecting underlying facts.

A similar case is *Bell South Advertising and Publishing Co v Donnelly Information Publishing Inc* 999 F.2d. 1436, involving the copying of Yellow Pages in a telephone book, where the outcome was very different. The court held that the plaintiff was entitled to copyright in those elements of the work that demonstrated original arrangement and coordination. In a case that involved maps, *Mason v Montgomery Data Inc* 967 F2d 135 (5th Cir 1992), it was decided that those maps produced by the plaintiff based on USGS maps and used, altered and modified by the defendant as part of its GIS, did not enjoy copyright protection. (Cho, 1995) However the appeal court decided differently and the court held, based on expert evidence, that the idea embodied in the plaintiff's maps could be expressed in a variety of ways, and that the selection process was applied skilfully, and it was held that copyright subsisted in the plaintiff's map.

Professor Karjala points out the problems with copyright in maps in his paper *Copyright in Electronic Maps* (Karjala, 1995). He comes to the conclusion that the Feist case caused great uncertainty in the US courts and the lower courts are trying to avoid the legal implications that the case has. However he believes that the courts cannot, in the long term, follow the strict copyright principles and the somewhat contradicting Feist case. Eventually he thinks that we will see a diffusion of 'originality' in a work from the extent that copyright protection offers, and this will agree with the 'sweat of the brow' theory.

It can be difficult to determine the copyright owner in a spatial database. This is especially so, if the data originates from firstly digitising another map, then collecting and adding spatial data, then reformatting, and then adding other providers datasets (Cho, 1995). Digitising an original map is a form of reproduction and hence the permission of the original map's copyright owner is necessary. Then for a map to qualify as a work it must be in material form. Secondly, it is necessary to demonstrate some amount of skill, judgement and labour to qualify for originality. It is important to add sufficient new material that has been selected skilfully to qualify for originality. Thirdly, for the creator of the work to enjoy the ownership rights and hence be classified as the 'author', it is necessary that the creator has demonstrated that the material originated from him/her.

To demonstrate authorship can become difficult if one considers that the added data was probably collected by a machine with human selection skill intervention, then perhaps downloaded into the computer and manipulated. So, is it the data collector that enjoys the ownership or the manipulator? If a machine did the collection and manipulation and the images are automatically displayed there may not be enough 'originality' in the creation itself, but in the computer software manipulating the creation. However the CLRC made some suggestions in regards to that issue. This is discussed above under the heading 'Materials created with the aid of computers'. If the person who collected the data demonstrated enough skill, judgement and labour to qualify for 'originality', and if the same applies to the person who manipulated the system, and to the computer software programmer, then all three will (if their material qualifies for copyright) have separate copyright protection. If the work is the result of a collaborative effort, where the individual authors contributions cannot be distinguished, the work will be a work of 'joint authorship'.

6.4.4 Digital Agenda and the Internet

The Internet, a “network of networks” (Cavazos, 1994, p.4), includes various tools such as electronic mail (e-mail), the world wide web (www), File Transfer Protocol (ftp), Internet Relay Chat, Bulletin Boards, Newsgroups and others. The www and e-mail are some of the most widely used facilities of the Internet (De Zwart, 1997, p.181) and they are the main ones considered here.

With any material published on the Internet using the www or e-mail the question arises: How are and will intellectual property rights be protected? Publications on the Internet vary greatly from advertising to academic research papers. The Internet can be used to transfer that information between users in different countries with various jurisdictions. Any publisher and user of material on the Internet should therefore be aware of implications derived from copyright law and general practice of using the Internet.

Various actions have been taken against people and companies that have infringed intellectual property law on the Internet. Cases dealing with infringement of intellectual property law on the Internet include misuse of trademarks (*MTV Networks v Curry*, 1994) and challenging the process of linking between websites (*Washington Post Co v Total News Inc*, 1997). More details of the last case is given later under the heading: ‘Screen displays and Hyperlinks’. The commonality in the above cases is that they all attempt to re-shape the copyright law in regard to

> “exclusive right of reproduction, transmission to subscribers to a diffusion service and cable programming right to on-line content.” (Hughes, 1997).

Copyright applies to digital data transferred via a communication device, for example the Internet, the same way as it does to paper copies of data. However, many Internet users ignore copyright owner’s rights by copying or downloading their intellectual property (Burley, 1996, p.26).

6.4.4.1 Internet Implications

Copyright infringement has taken place when any of the copyright owner’s exclusive rights have been breached, for example the right to reproduce the work in a material form or publish the work on the Internet. The storing of text on a floppydisc is a reproduction and therefore a breach of copyright, unless the copyright owner's permission was obtained or the action falls under 'fair dealing'. The same applies to a printout of part of the work as long as that part is a substantial part of the work. A substantial part is not necessarily a quantity measure but rather a quality one. Thus if the reproduced part has no 'originality' it will most likely not be a substantial part of the work and therefore not protected.

One implication for the Internet is that if a work has been downloaded and stored on harddisc or floppydisc, an infringement has occurred, unless the copyright owner's permission was obtained or specified, or the amount was insubstantial. Before displaying Internet material on a screen using a browser, that material is usually stored in cache memory. At the present time, it is possible that this incidentally stored material in cache constitute reproduction and hence infringement. However to qualify for reproduction under copyright law the material must be in material form, and it is arguable whether a temporary copy is in material form. The Copyright Law Review Committee (CLRC) recommends exclusion of temporary copies protection under copyright (Copyright Law Review Committee, 1995). This exclusion is now included in the CADA (Attorney General's Department, 2000b)

Any material once published on the Internet cannot simply be removed without being copied, manipulated and plagiarised by any number of anonymous Internet users anywhere in the world (Burley, 1996). There are even archives that take snapshots of the Internet, because the average life expectancy of a document is only 75 days (Henninger, 1998; Kahle, 1997; Internet Archive, at <http://www.archie.org>). The Internet by nature therefore encourages the breach of copyright laws and both creators and users of works available on the Internet should be cautious.

6.4.4.2 Publishers of Internet material

A publisher of copyright material on the Internet must either be the copyright owner or have acquired the right to publish the material by licence or assignment. It may be difficult to determine the author to a dynamic work, used in a GIS, that has been compiled from existing copyright material, and from new material produced by a GIS. In this situation, the copyright in the original individual material will stay with the copyright owners. However, the GIS configuration as a compilation may qualify for copyright protection and belong to the compiler. Any newly created material produced by the GIS technology may also qualify for separate copyright, and will most likely belong to the GIS analyst that customised the procedures to create that new material. If the altered version incorporates a substantial part of the original then permission to use the original is needed.

Altering digital material will require the permission of the copyright owner, if for example:

- The original material was reproduced;
- The altered version is an adaptation; or
- The altered version reproduces a substantial part of the original (Australian Copyright Council, 1997, p.13).

A list of links may be protected as a compilation, whereby the individual items of that list would properly not qualify for copyright protection. A list generated by an Internet search engine should be permissible to copy because that list was not created by a person but a program, while a list created by an individual who applied some creativity would not be permitted to copy because of the skill and labour applied.

Internet publishers who would like to warn users, from copying or downloading the publishers material, should take necessary precautions by inserting clear notices as to what Internet users are permitted to do with the material. A publisher may rely on copyright by placing the Copyright symbol ©, year of the creation, and the name of the author (s) (or owner (s) of copyright), including a note as to what users are allowed to do with the material. To further restrict access, technological measures such as encryption to inhibit downloading and/or printing may also be used.

6.4.4.3 Users of Internet material

In general if the copyright owner publishes copyright material on the Internet it can be implied that the material is freely available to be browsed, but not necessarily to be copied or downloaded. As a guide, if there is an expressed licence to do certain acts, these should be followed. A particular site may also be published in a way that clearly implies permission to print or download material. Otherwise, unless the use falls under 'fair dealing', the copyright owner's permission is needed to print, download or distribute the material to others.

6.4.4.4 Screen displays and Hyperlinks

Screen displays in the United States are protected under copyright law. In Australia, however, that protection is unlikely because screen displays do not exist in material form, one of the requirements of copyright law. In Germany the display on a screen may constitute publication of the work and therefore the data is protected under copyright. Hence it is important to keep in mind that various jurisdictions have different rules.

It is assumed by some people that Hyperlinks do not require the consent of the 'to be linked to site'. This view however may be inappropriate in some jurisdictions as can be seen in the dispute between Shetland Times and the Shetland News (*Scotland Times Ltd v Wills, Scot Sess-Case* 1996). Here both parties agreed that the News could only hyperlink to the Times on the condition that each News link was featuring a logo and an attribution (Henninger, 1998). Another case on the same issue

> "involved an action by a major media organisation such as CNN, the Washington Post and Time magazine against a web based news clearing house (*Washington Post Co v Total News Inc*). This case was settled and the terms of the settlement included signing a link licence, setting out the terms under which a website can provide a link to another website" (Hughes, 1997).

6.4.5 Licences

Any intellectual property (IP) right such as a patent, or a copyright work can be dealt with in the same way as any other tangible personal property. It can be assigned, licensed, sold, included in a will, mortgaged or given away.

A patent or a copyright work owner may exercise their exclusive rights or permit others to use those rights. This permission is classified as a licence and may be granted with certain provisions such as the payment of a fee or royalty. Licensing is not a transfer of ownership, but rather a use-right. Altering of the work by the licensee may be restricted by the licensor, which is not possible with an assignment. The licences may be either exclusive or non-exclusive or implied. The exclusive licence grants specified rights to the licensee with special privileges that will not be granted to any other person. The licensee has similar rights as the copyright owner has, for example to sue another person for breach of an exclusive use.

Non-exclusive licences permit the licensee to exercise one or more of the IP owner's exclusive rights in a work, the same rights may or may not be granted to more than one person. The licensor can grant the licence for a specified period and grant more than one non-exclusive licence.

An implied licence in case of a copyright work may for example, be the use of architectural plans after the architect's engagement is terminated (McKeough and Stewart, 1997, p.179). If the public wants to buy and use a product that incorporates a patented invention an implied licence can be assumed.

Assignments may be limited or full, and once granted, ownership of the specified rights is transferred. Once a full assignment has been made by the assignor the whole copyright vests with the assignee. A limited assignment results for example in a separate copyright for the purpose of being limited to one or more exclusive rights and/or a particular place and/or time.

Exclusive licences and assignments must be in writing and signed by the copyright owner. There are also two statutory licensing schemes that permit otherwise infringing acts to be done on payment of a royalty fee. One is a full record keeping scheme, while the other calculates an actual royalty based on the number of people potentially using the licence.

Where copyright exists in a published book it is usually the publisher who has the copyright assigned by the author. The publisher then deals with the commercialisation of the book and usually pays the author royalties on the books sold. To gain permission to take photocopies of a published literary work a licence from the Copyright Agency Limited (CAL) should be obtained (Attorney-General's Department, 1997, 2000a). CAL is an Australian not-for-profit copyright collecting agency. Their role is to collect fees on behalf of copyright owners by licensing the copying of works to the general public.

Where the works are exploited by being played on air or photocopied it is difficult to detect and impractical for users to pay the owners. This task is generally left to copyright collecting agencies. These are usually non-profit organisations that license, collect and distribute royalties on behalf of the copyright owners, only taking out the administration costs. These societies will also represent copyright owners in litigation cases where their member's rights were infringed. In Australia these societies act on behalf of the copyright owners in the areas of musical and literary works, and sound recordings and film.

6.4.6 Managing Copyright in Information

6.4.6.1 Copyright belonging to the organisation

The management of copyright material held by an individual organisation involves the identification of intellectual material, protection, commercialisation, record keeping and monitoring infringements of copyright (Some of the material in section 6.4.6 was compiled from information contained in: Department of Commerce and Trade WA, 1997; and from consulting work undertaken by the researcher for the NSW Government in 1998 and printed here with their permission).

The relevant director or manager of an organisation and staff should be aware of their agency's intellectual property and their exclusive rights to copyright material. They should also be aware of the use of licenses in conjunction with selling their copyright material, be aware of royalty collecting agencies and evaluate any risks associated with making any claims against people infringing their copyright.

Identify and Check Type of Intellectual Property Material - The broad nature of identification may imply that nearly all information that is created through human endeavour in an organisation could have copyright protection applied to it. The widespread use of copyright protection may therefore need to be matched to the business and commercial objectives of any organisation. The commercial potential of material may need to be identified as it may affect the type of intellectual property protection that should be used. Note that patent and registered design protection cannot be sought if the material has been moved into the public domain.

Once the intellectual material has been identified it should be protected by taking advantage of the most suitable intellectual property protection. If a form other than copyright is to be used, expert legal advice should be sought.

Protect the Material - To ensure copyright protection place on the material:

- a copyright symbol ©,
- year of the creation of that material, and
- name of the owner

It may also be advisable to give a notice in a conspicuous position that specifies the circumstances when material can be copied.

Commercialise the Intellectual Property - An organisation may expect to collect revenues from the use of their copyright material. Revenues can be generated from direct sales or from royalties paid to a licensor, often calculated as a percentage of net sales by the licensee. Licensing and collection of royalties can be administered by organisations such as the Copyright Agency Ltd (CAL). However, the commercialisation of material is broader than revenue collection and can be divided into marketing, selling and licensing, which fall outside the scope of this research. It is advisable to obtain expert commercial advice in these areas.

Record Keeping - In order to prove the ownership of copyright it is advisable to archive an original copy of the material being protected. It may also be advisable to keep a database of information relating to copyright material. The database could include information such as creation of material, duration of protection, licenses, sales and agreements.

Monitoring Infringement - Staff responsible for information should monitor the use of that information by third parties. Responsible staff need to be aware of what constitutes infringement and should know the appropriate action to take if infringement occurs. If the organisation is registered with the Copyright Agency Ltd (CAL) most of the copyright administration will be carried out by that organisation, which includes collecting royalties, manage licensing, monitor copyright infringement and deal with legal enforcement of copyright on behalf of its members.

Enforcing Copyright - Various steps are available for enforcing Copyright protection. However, negotiation should be the first step in enforcing any privileges. Legal enforcement of copyright is available and includes injunctive relief and damages, or account of profit, and in some circumstances even criminal penalties may be imposed.

6.4.6.2 Copyright belonging to others

Managing other organisation's copyright involves being aware of when that person's (organisation's) copyright has been infringed. Staff in any organisation should be aware of Copyright law requirements and what constitutes infringement. Procedures should be put in place so that staff are not put in a position where they need to infringe copyright to undertake their duties. Hence staff should be able to identify copyright material, apply rules of infringement and negotiate the use of copyright material with others.

Identify Copyright Material - The ownership of Material used by an organisation should be readily identified so that staff do not infringe copyright. The obvious indicator of copyright is the presence of the copyright symbol, author and date of authorship. However, any material that has been authored with 'a degree of skill, judgement and labour' can in principle have a Copyright claim over it.

Apply rules of Infringement - Staff need to be aware of what constitutes copyright infringement. It may be advisable to have in place an organisational structure that identifies and records the use of copyright material so that the appropriate royalties can be paid to the copyright owners. For some organisations this will be a requirement of registration with for example the Copyright Agency Ltd (CAL).

Negotiate Use - The use of material that has Copyright protection needs to be negotiated with the Copyright owner. In some cases, the owner will need to be contacted directly. If the material is registered with Copyright Agency Ltd (CAL) royalties may be paid through the (CAL).

6.5 International and National Intellectual Property Law Reforms

6.5.1 International

Australia's intellectual property law reform is heavily influenced by international organisations and agreements. These include the World Intellectual Property Organisation (WIPO) and the Trade Related Aspects of Intellectual Property Rights (TRIPS) agreement.

WIPO is an international inter-governmental organisation aiming to promote the protection of intellectual property throughout the world through cooperation among States. The Organisation is a member of the United Nations family of organisations. WIPO's three main functions are:

1. Progressive development of international intellectual property law and technical standards;
2. Assistance to developing countries; and
3. International protection registration systems.

Australia is a member of WIPO and a signatory to many WIPO international agreements. These agreements require signatories to adjust their national IP laws to be broadly compatible with the agreements. There are however no formal mechanisms to force signatories to adhere to the agreements. WIPO agreements set minimum standards rather than prescribing optimal forms of IP protection (IPCRC, 1999, p.7).

Two new treaties were developed in 1996, the WIPO Copyright Treaty (WCT) and the WIPO Performances and Phonograms Treaty (WPPT). WCT adds to the 'Berne Convention' of 1886, the major international copyright treaty for the protection of literary and artistic works. These new treaties are direct responses to the issues raised by digital technology. To enter into force, however, they each require ratification from 30 countries. As of the 15 October 2000, the Australian Government had not signed or ratified these two treaties (WIPO, 2000), but has taken considerable action to support the treaty's aims. Computer programs (in whatever form) and databases (compilations of data or other material) are included by the WCT as two subject matters being considered as intellectual creations (IPCRC, 1999, p.33).

Apart from WIPO, the most important agreement in regard to international property protection is the TRIPS agreement of 1 January 1995. This agreement created new rules for the General Agreement on Trade and Tariffs (GATT) to protect intellectual property and to govern disputes. The World Trade Organisation (WTO) was formed to oversee the new regime of trade rules and to administer effective dispute resolution. As Australia is a party to the WTO it had to adhere to the TRIPS agreement by 1 January 1996 (IPCRC, 1999, p.8).

The Internet, not owned by anyone, is governed by various societies that try to provide standardisation and regulation. One of those is the Internet Society (ISOC), an international group of researchers, users and academics that determine the network's infrastructure standards (Henninger, 1998, p.28). From an overall legal point of view there are no regulations dealing with the Internet on an international basis. ECLIPS - Electronic Commerce Law and Information Policy Strategies initiated by Charlie Bender, Director of Ohio Super Computer Centre has however formed the Internet Law and Policy Forum (ILPF) in order to develop policies on Internet usage (Sharpe, 1996, p.1).

ILPF is sponsored by the major commercial organisations of the Internet and is a non-governmental forum. It is addressing issues, which are otherwise difficult to solve on a national level. These issues are intellectual property, security, privacy, taxation, electronic payment and transactions, digital records management and transactions, jurisdiction, taxation and the resolution of Internet disputes (Sharpe, 1996, p.1-3). There are also some other international, regional and national bodies trying to develop the legal framework for the Internet.

The Global Information Infrastructure Commission (GIIC) is an independent, non-government initiative that was inaugurated in July 1995 at a meeting hosted by the World Bank. They have been established because of the gap created by traditional laws meeting the challenges of the Internet. The body's aim is to cooperate with existing bodies like the ILPF, WIPO and to force global cooperation between the private and public sector in regard to the development of information, networks and services to advance global economic growth education and quality of life. The focus is on the following areas: Commerce, Health Services, Education, Publishing, Banking and Finance (Sharpe, 1996, p.4).

The Organisation for Economic Co-operation and Development (OECD) is a Paris-based inter-governmental organisation, with Australia being one of its members. The purpose of OECD is to provide its 29 members with the ability to co-operate with each other in order to achieve the highest sustainable economic growth in their countries and improve the economic and social well-being of their populations. OECD advises its members in order to help them develop policies. Their activities in the area of Science Technology and Industry for example include the Forum on Internet Content Self-Regulation held on the 25 March 1998 in France. One hundred and fifty participants including several legal experts attended and discussed issues in the area of Internet content self-regulation. An important theme was identified as the need for ongoing education in Internet content self-regulation: of users, parents, teachers, and children about using and taking responsibility for their use of technology; of policy makers; of the business community; and finally of law enforcers. Their plans for 1998 were to begin reviewing the progress of the individual member's regulatory reform.

6.5.2 Australia

The need to approach law reform as a whole is being undertaken by the Australian Law Reform Commission (ALRC, a). This Commission inquires into and reports on laws referred to it by the Federal Attorney-General. It was established by the Law Reform Commission Act 1973 with the aim to review and consider proposals for the systematic development and reform of the law (ALRC, b). One of their responsibilities is to examine issues of trade, intellectual property, and regional regulatory harmonisation (Sharpe, 1996, p.5). Another review body, established by the Australian Federal Government in 1999, is the Intellectual Property and Competition Review Committee (IPCRC). The IPCRC had to review and report on the effects Australia's intellectual property laws have on competition. The IP rights to be included were patents, trade marks, designs, copyright and electronic circuit layouts. The final reports were submitted to Ministers in June and September 2000 (IPCR, c).

In the area of copyright law reform there are two bodies that make recommendations as to how valid the copyright protection is at the present time. These bodies are the Copyright Law Review Committee (CLRC) set up in 1983 to make recommendations to the government on Copyright issues including Computer Software Protection, and the Copyright Convergence Group (CCG) established in early 1994 to investigate copyright use in the area of broadcasting and other electronic transmissions.

In October 2000, there are draft Copyright Amendments being passed through parliament, which may be introduced later in 2000. The drafts are the *Copyright Amendment (Importation of Sound Recordings) Bill 1999*, and the *Copyright Amendment (Moral Rights) Bill 1999* and they were introduced into Parliament on the 26 May 1999 and 8 December 1999 respectively (Attorney-General's Department - e-news, 2000; Parliament of Australia). The latest Copyright Act 1968 amendments are being made by the Copyright Amendment (Digital Agenda) Act 2000 (the CADA), which received its Royal Assent on the 4 September 2000 and will commence on the 4 March 2001. The CADA is concerned with digital problems, but the unresolved area of databases is not being touched (Australian Copyright Council, 1997; IPCRC, 1999).

The CADA was a direct response to the World Intellectual Property Organisation (WIPO) Copyright Treaty and WIPO Performances and Phonograms Treaty. There were also two other recent international events that influenced Australia's Digital Agenda Bill. The passing of the *Digital Millennium Copyright Act* by the US Congress in October 1998 and the adoption of a Directive on the Harmonisation of Certain Aspects of Copyright and Related Rights in the Information Society by the European Parliament and Council in May 1999 (Parliament of Australia).

The CADA will update copyright law with the focus to continually promote creativity and at the same time allow reasonable access to digital copyright material by users. The major changes of the CADA to the Copyright Act 1968 are:

- A technology neutral right of communication to the public: for example the new right applies to works made available on the Internet, as well as works transmitted or broadcast to the public; converting material from hard-copy to digital copy and vice versa will also be covered by copyright.

- Exceptions, such as temporary copies via the Internet will be exempt from copyright protection.
- Enforcement measures such as provision of civil remedies and criminal sanctions against the manufacture and dealing in devices such as decoders unlawfully, but not in using them by copyright owners.
- Carrier and ISP liability – to limit and clarify the liability of carriers and service providers such as Internet Service Providers (ISP) for any copyright infringement by its users.
- Retransmission of free-to-air broadcasts – provision of a statutory licence scheme for the payment of remuneration to the right holders whose works are contained in the retransmitted free-to-air broadcasts.
- Issues recommended by the CLRC.
- Review in three years to ensure that the appropriate balance between copyright owners and users is maintained (Attorney-General's Department - e-news, 1999a, b; Parliament of Australia)

6.5.2.1 Databases

Non-original databases according to the Australian Copyright Council are commercially valuable, but are not the result of human skill, judgement and labour and therefore not protected by copyright. GIS databases will either fall under the definition of 'original' or 'non-original' and may either qualify for protection under copyright as a compilation or not. Copyright Act 1968 amendment recommendations were made by the CLRC in 1995 in its *Computer Software Protection - Report*. The CLRC recommends that protection be afforded to "computer-generated material" as a new class of subject matter other than works and the definition of the term computer-generated be added to the Act. The author should be the person by whom arrangements necessary for the creation of the material are undertaken. Term of protection should be 25 years from the end of the year in which the material was made.

WIPO's new approach to developing international standards for copyright protection led to the establishment of the Standing Committee on Copyright and Related Rights (SCCRR). The first meeting of SCCRR was held in Geneva in November 1998. In regard to a possible new international protection for databases the SCCRR agreed that WIPO should commission a study of the economic impact of such a protection on developing countries (Attorney-General's Department - e-news, 1999a). A second and third meeting of SCCRR in Geneva in May 1999 and November 1999 respectively had on its agenda possible additional protection for databases not protected by copyright, but no progress was made. The fourth meeting was held in April 2000 in Geneva, but databases were not on the agenda. European Countries in the European Community (EC) have the EC database directive that provides protection for non-original databases, while the USA has no agreement on the issue with several different bills being in Congress (Attorney-General's Department - e-news, 1999b).

In the EC original and non-original databases are protected under the Directive 96/9/EC as of 31.12.1997. Both type of databases are protected under copyright and a bundle of *sui generis* rights. The creation in the selection and arrangement of a database (structure) is protected by copyright. If a database was established needing a lot of work, money and effort it is protected by *sui generis* rights which do not extend to the individual data items (SCCRR, 1998, p.7,8).

In Belgium no copyright was infringed when elements were extracted from a collection of maps for inclusion into a geometrical database involving the process of vectorisation (SCCRR, 1998, p.5). The US, as mentioned previously under maps, relies partly on the 'sweat of the brow' protection, affording copyright protection for non-original databases, but only if sufficient skill, knowledge, labour, taste or judgement have been applied. In Australia contractual protection is available, however a contract cannot be extended to a third party outside the contract, and contractual protection would most likely be insufficient on a global scale.

6.5.2.2 Digital data and computer screen issues

One requirement of copyrightable material is that it must be in material form, but as mentioned previously it is debatable whether or not digital data is in material form because it is not like a book or CD. It has the ability to move around without being stored or printed, easily altered, or deleted. However if stored on a disk, according to the case *Roland Corp v Lorenzo* (1991) 22 IPR 245, the digital data is in material form. It should however be noted that the item was not part of the appeal, as pointed out in the report at (1992) 23 IPR 376 (Australian Copyright Council, 1997). Viewing of or listening to material on the computer may be copyrightable, because copyright applies to various other non material forms, for example the screening of a film, performance of a play or broadcast of music, outside the home (Australian Copyright Council, 1997).

The drawback for a GIS is that data used at home copied via the Internet may be difficult to copyright. Material disseminated in form of a book or a videotape, is copyrighted in such a way that when used in public the copyright owner's permission is needed, whereas when used in private it is not. So, permission is needed if screening a film in a cinema, but not if viewing as a video at home (Australian Copyright Council, 1997). In the past, data had to be stored on discs to be sold, while now with e-mail or the world wide web (www) these can be easily disseminated using the Internet to everyone's home. The view of the Australian Copyright Council (1997) is that where copyrighted material is published, it is the responsibility of the person who makes the material publicly available to get the permission to do so from the copyright owner.

Private use in the past occurred only on a small scale and it was largely commercial users such as radio stations, clubs and television stations that greatly benefited from playing music to the public and therefore only commercial users needed permission from the copyright owner to play their music (assuming this attracted more people, because of the additional atmosphere the music provided). However, habits such as taping music or television material, or copying computer discs by private users has become harmful, and in response, many countries applied levy fees on blank recording material such as videotapes.

The displays on a computer screen should not be regarded as a reproduction in material form, hence no copyright protection would apply, but this point is unclear. The Copyright Law Review Committee (1995) recommended an amendment to the Copyright Act 1968 in this regard to make it clear that screen displays do not constitute a reproduction in material form. The CLRC also recommends that the Act be amended to provide that the screen displays of a work stored in computer memory will not constitute a public performance of that work.

WIPO's international treaties specify that the reproduction right as set out in Article 9 of the Berne Convention applies to digital material, and to the storage of a protected work in digital form. Therefore it is up to the individual countries to deal with the reproduction right issue (Australian Copyright Council, 1997). The EC's overall view is that permanent storage of digitised material is generally a reproduction. This also applies to transient storage. Canada left it up the individual copyright owner as to what part of their work they allowed users to browse through. Australia's new CADA adds a new exception to the exclusive right of reproduction. In the new exception, browsing or viewing material on-line will not be breaching copyright.

6.6 Survey

Following is a brief summary of the Spatial Data Survey described in Chapter 3 related to Intellectual Property protection used by spatial data providers. The Survey discovered that there are more spatial data providers (out of all the providers) that do not use legal protection for their spatial data, than those that do rely on a particular intellectual property right. Out of the ones that do, the most commonly used intellectual property right was copyright. When dividing the overall respondent group into four subgroups of federal -, state -, and local government departments and all other providers, their percentages for not using any legal protection were 21%, 25%, 57%, and 48% respectively. Clearly the group least likely to seek intellectual property protection through intellectual property rights such as copyright are local government departments, followed by the all other providers subgroup. The four subgroup's reliance on copyright was 57%, 54%, 29%, and 41% respectively.

When the user respondents were asked the same question, what legal protection their spatial data providers rely on, it was discovered that majority of spatial data providers used copyright and/or licences. This was not surprising, because some users used the same datasets, as opposed to all available datasets supplied by all providers, which were used less frequently. The data users of the four subgroups of federal -, state -, and local government departments and all other providers answered that 7%, 9%, 12% and 16% respectively of data providers use '*no legal protection*', while 43%, 46%, 52%, and 54% respectively use '*copyright*' and 71%, 70%, 66%, and 50% respectively use '*licences*'. This could be an indication that the datasets referred to by spatial data users were not necessarily the same datasets as the ones provided by the overall group of providers. It is also very likely that some datasets are being used by many more users than other datasets.

6.7 Conclusion

6.7.1 International Issues and the Internet

With such a variety of international agencies such as the Internet Law and Policy Forum, Global Information Infrastructure, and Organisation for Economic Co-operation and Development all developing policies with part of their agenda being intellectual property law, and the World Intellectual Property Organisation aiming to promote the protection of intellectual property throughout the world, it is difficult to determine which policies will convey more benefits. The general perception is that the World Intellectual Property Organisation's definition of Intellectual Property is the most globally accepted. However, in today's age the harmonisation of intellectual property laws has been driven by the desire to facilitate international trade. The TRIPS (Trade Related Aspects of Intellectual Property Rights) agreement enables that combination of intellectual property rights and trade.

In Australia, national bodies such as the Australian Law Reform Commission, the Intellectual Property and Competition Review Committee, and the Copyright Law Review Committee through their discussion papers and reports are trying to coordinate national laws with international treaties. They are also endeavouring to deal with the difficulties of making them relevant to delivery systems such as the Internet. Revisions to international treaties take a long time and enforcement of intellectual property law on an international level is also difficult.

On a national level it is important that Australia's various industries that rely on some form of electronic communication collaborate to enable the development of uniform laws, regulations and standards in the area of intellectual property law and security. Rather than forming new bodies, industries in Australia including the spatial data industry, should join existing organisations such as ILPF or GIIC. Meanwhile it would be best for most Internet users to put the copyright symbol, creator and year of creation (and perhaps a copyright statement) on their intellectual creation. If creators do not want it copied by unauthorised people they must either not use the Internet (eg. www and e-mail) or use encryption devices.

Copyright applies to digital data transferred via a communication device (the Internet) just as it does to any other paper copy, even though many Internet users ignore copyright laws (Burley, 1996). Some people may assume that Hyperlinks do not require the permission of the ‘to be linked to site’. This view may be false as evidenced in the case *Washington Post Co v Total News Inc* 97 Civ 1190 (SDNY Feb 20 1997) (US). In Australia the law on this issue has not been settled.

Developers and users of Internet material should be aware of:
1. International and national standards and regulations;
2. Their own exclusive rights and obligations under copyright law;
3. The security risks to information being transferred via the Internet, and where appropriate take the necessary precautions to protect it, for example, by using encryption; and
4. Hyperlinks to other sites may require the site owner’s consent and Meta-tags must not breach laws such as trade marks law.

6.7.2 Australia

Intellectual property law rights such as patent law and copyright law may apply to spatial data. However, it is difficult to predict in what circumstances. At present only ‘original’ databases can be protected under copyright legislation. In future, a separate protection right such as the EC’s *sui generis* may be made available for non-original databases.

Any organisation using and supplying information to others should manage their own copyright and not infringe others. The management of the copyright material held by the individual organisation involves the identification of intellectual material, protection, commercialisation, record keeping and monitoring infringements of copyright. Managing other organisation’s copyright involves developing procedures that will prevent staff from breaching copyright and should include: identification of copyright material; application of rules of infringement; and negotiation of the use of copyright material with others.

Copyright, by its very nature, is an option requiring no formalities, generally lasts for the life of the author plus 50 years, and can be used to protect maps, and databases. There is however a problem with being able to forecast the decisions of the courts and hence it is impossible to know which maps or databases are protected by copyright. In many instances it may be a good idea to use some other additional protection. Future new legislation may also provide further protection.

Works called 'computer-generated works', like a computerised GIS, where no human intervention is needed other than the initial programming, appear not to be protected by copyright because of the lack of originality. It is recognised that the 'author' of such a work is the person that has made the necessary arrangements for the work to be created. However, at present there is no case law to clarify the status of such computer generated work, but the CLRC (1995) recommends for Australia to include a computer-generated work as a new class of subject matter other than those existing works in the Act.

A map can be a literary work, being the product of a compilation, or an artistic work, being a drawing. A map will qualify for copyright protection if it fulfils the necessary requirements as specified under 'Copyright Fundamentals', no matter if the map is in hardcopy or digital format. When new maps are created using copyrighted material, with the owner's permission, and are then enhanced, the new version should be copyrightable if the enhancement involved sufficient skill, judgement and labour. The protection of databases and their data is still a very controversial area, because it is difficult to interpret the various cases decided by different courts.

The computer screen is used as a display media for digital work. One question in regard to copyright is whether or not the computer screen can be classified as material form. Further if it is used in a public place, does copyright infringement occur, and if so, who is liable (Australian Copyright Council, 1996)? At present the answers to these questions are unclear. However, the Copyright Law Review Committee (1995) recommended an amendment of the Copyright Act 1968 to elucidate that a 'screen display' is not a reproduction of a work stored in computer memory, nor a public performance of it.

In a GIS pure data (facts) may be spatial or aspatial (for example demographic data). Both spatial and aspatial data in this case do not qualify for copyright protection because copyright only protects the 'expression of a fact' and not the fact itself. The more creative the features of style or colour of maps are, the more likely that copyright protection applies. However, what use is that protection if it only applies to the colours chosen and not to the much more labour intensive surveying and plotting of boundaries and contours? Karjala (1995, p.405) writes:

> "Whether or not the preparation is costly or time consuming, the value of many maps inheres in the factual information they contain and not in clever ways of presenting that information."

Copyright therefore may not protect commercially expensive components of GIS databases and outputs.

The results to the Spatial Data Survey indicate that certain subgroups and those more frequently used dataset providers rely more heavily on intellectual property protection than others. In particular federal government departments and state government departments were relying on copyright more than local government agencies and all other organisations subgroups. Within the more frequently used datasets provided by only a small group of providers, the overall reliance on '*copyright*' and/or '*licences*' (51% '*copyright*', 63% '*licences*' and 12% '*use nothing*' (see Figure 3.38)) were much higher than if provided on average less frequently (39% '*copyright*', 30% '*licences*', and 46% '*use nothing*' (see Figure 3.19)). To conclude, the survey results show that specific data provider groups and individual organisations need more education on intellectual property protection. They have no clear IP policies, and/or their overall philosophy towards their spatial data differs to other providers. However, if an organisation decides to legally protect their spatial data, all of the above-discussed issues are very relevant and have far reaching implications in terms of intellectual property protection.

Chapter 7: Spatial Data Policy Issues and Strategies

7.1 Introduction

As the thesis pointed out in Chapter 1 the purpose of this research is to compare current spatial data policies and develop future strategies with the aim to facilitate SDI development in an Australian context. An organisation intending to develop a spatial data access policy should consider and prioritise all issues involved. This will then be the basis for the development of the strategy. Firstly Chapter 7 puts forward a list of policy recommendations and secondly it applies the findings of the thesis and the Spatial Data Survey to determine the priorities for various levels of Government and private industry, for developing strategies for access and pricing policy issues in Australia. Thirdly examples are given that demonstrate how organisations deal with policy issues and to relate the developed priorities to real examples. Finally policy development theory and specific policy evaluation are described followed by a simplified example.

7.2 Access and Pricing Issues and Recommendations

As could be expected, the Spatial Data Survey in Chapter 3 confirmed that a high proportion of organisations in Australia not only provide spatial data but also use other organisations' datasets. This point is important when developing an access and pricing policy, because these organisations should include cooperation arrangements for transferring data between organisations in their policy.

As described in Chapter 4, spatial data access and pricing policies can cover many issues, including:

- SDI requirements;
- Technical issues;
- Governmental / organisational duties;
- Ownership / custodianship;
- Legal liability, contracts and licences;
- Intellectual Property Law;

- Economic analysis; and
- Spatial data users' choices, rights and obligations.

All of these eight issues were described and analysed throughout the thesis. Following is a brief summary of these issues and/or a recommended approach to their resolution.

7.2.1 SDI requirements

Chapter 2 of this thesis determined that although the individual elements and the developments of many Spatial Data Infrastructures (SDIs) are different, they are all faced with similar problems. These problems include, but are not limited to, inconsistent or unsatisfactory standard adoption and insufficient or poor documentation of quality of spatial data. Access and pricing of spatial data is often inconsistent, and many organisations seem to lack awareness of SDIs and do not foster data sharing at all. Unresolved legal issues such as potential legal liability risks associated with spatial data and non-harmonious jurisdictional intellectual property protection of spatial data also provide barriers to the SDI development. To overcome some of these problems, SDI developments have to be implemented by both top-down and bottom-up approaches. All levels of Government, the private enterprise and community groups should be involved in the SDI development process. The already developed guidelines by ANZLIC and the CSDC should be adopted where possible, but there is room for improvement. This improvement will come in the form of feedback about problems associated with implementing, managing and maintaining those policies. Therefore the development of an SDI will be dynamic and the result of many individual policies and practices, and will be potentially influenced by ANZLIC and CSDC policies. 'SDI requirements' from the SDI perspective and not the individual policy perspective are therefore as follows:

- **Organisational** - a new or existing organisation, with relevant representatives, needs to be responsible for the SDI initiative; leadership of such an organisation should be at an appropriate level; the organisation has to develop SDI priorities in conjunction with all potential user and producer groups, then implement and monitor those priorities; and the organisation has to develop training and education strategies for human resources necessary to manage and operate SDIs.

- **Technical -** Technical issues that need to be included when providing access to spatial data or data sharing include standards, metadata, transfer protocols, security issues and clearinghouses. SDI implementation requires common standards including metadata and transfer protocols. Security measures to protect providers' data from manipulation and provide secure access to the user need to be available. A clearinghouse needs to be able to link to any other clearinghouse or spatial data directory.
- **Governmental/Organisational Duties** – these duties include their legal, political, and national security obligations.
- **Ownership/Custodianship** – it would be advantageous if ownership or custodianship rights and obligations are the same, but if not they must be clearly defined.
- **Privacy and Confidentiality** - providing access to spatial data may put the individual person's right to privacy at risk, hence clear privacy laws are necessary that are in harmony at all jurisdictional levels. There must also be clear guidance on what constitutes confidential information, and what information will have to be provided under the Freedom of Information legislation.
- **Legal Liability, Contracts and Licences** – Legal liability concerns may be so great that it stops potential data providers from sharing their data, hence clear guidelines are necessary that spell out risks and their management. Contracts and licences may also be used to manage legal risks and to define users and providers rights and obligations.
- **Intellectual Property Law** – Harmonising laws are necessary on issues such as intellectual property to give data providers the same legal rights to their spatial data in all jurisdictions.
- **Economic Analysis** – SDI development requires funding from the various SDI users and spatial data pricing should be low and consistent.
- **Data management** – Data management guidelines should define how to collect, record, edit, analyse, manage, and maintain and store spatial data or how value can be added to existing data. Definitions of quality in spatial data and how to catalogue and file databases should also be included.

- **Outreach, Cooperation and Political Mandate** – Marketing and promoting spatial data and SDIs are key issues in fostering market growth, ensuring better utilisation of spatial data and SDIs and will lead to greater awareness and data sharing. Cooperation amongst agencies and Government support at high levels are also necessary to further develop and direct SDIs into a future where spatial data will become a necessity in managing sustainable development and greatly aid economic growth. Hence financial support is needed for these objectives.
- **SDI Users' Choices, Rights and Obligations** – If ANZLIC and CSDC custodianship guidelines are adopted, SDI users' rights and obligations are defined, but if not, or insufficiently defined, user guidelines should be added.
- ***Common access and pricing policies are necessary that encourage data sharing and access, and low spatial data pricing strategies should be used where possible (=individual organisations' policies).***

Individual organisations' spatial data access and pricing policies are necessary in SDI development as the policies form part of the Infrastructure. These individual policies however can sometimes pursue different goals than SDI development. For example:

- **Access and pricing** – An organisation may need to rely on an income from the distribution of its spatial datasets to meet operational running costs, whereas for an SDI to function, the data needs to be easily accessible with little or no limitations. Hence no cost or low spatial data prices are required. A fee set too high may be considered as restricting access.
- **Sharing** – A private organisation may not be interested in sharing its spatial data with others because it is commercially confidential and if shared, will give competitors the same advantages and ideas. For an SDI the more datasets that are available for sharing, the better the range of datasets for different applications.

Recommendation:

Despite the reluctance of some organisations to share data, to enable the incorporation of SDI requirements into a spatial data policy, it is recommended that an organisation should (as defined in Chapter 2 and extended with the results of the thesis):

- Use ANZLICs custodianship guidelines;

- Use common ASDI standards, technology standards and metadata guidelines and feed back any problems to standard organisers;
- Use ASDI technology and access network (Clearinghouse) for displaying or using data and maintain access to own data;
- Use government policies, guidelines and laws where applicable;
- Provide security for the spatial data user;
- Use fundamental datasets if needed by the organisation;
- Collect, maintain and update spatial data appropriate for its intended use and of high quality consistent with national spatial data specification;
- Promote data sharing and access, and use of high quality data;
- Store and index spatial data appropriately and consistently with national specifications;
- Determine the prices of spatial data to be low and consistent in accordance with state or national policies or guidelines;
- Use appropriate legal risk management and copyright strategies as described in Chapters 5 and 6;
- Promote spatial information and SDIs or support their promotion; and
- Be aware of new spatial information and SDI developments.

7.2.2 Technical Issues

An important area covered in the thesis and in the spatial data survey was metadata. Although the provision of metadata includes more than technical information, this research considered the provision of metadata as part of standards and hence technical issues. As described in Chapter 4 metadata describes the characteristics of a dataset and includes quality and access statements.

Metadata – specifically data quality

As discovered in the Spatial Data Survey, many organisations are aware of metadata and are supplying it to other organisations. The metadata question in the survey aimed to determine what additional data providers supply with their data. The choices were: *Accuracy, Maintenance, Updates, Disclaimer, Metadata, Depends on Dataset, Nothing,* and *Other*. From the results of the survey, more providers rely on disclaimers (50%)

than on the actual elements of metadata (34%). These percentages indicate that the awareness of the metadata concept is not as great as could be hoped for, it is too costly for organisations to provide metadata, and/or core metadata elements are not available for the individual datasets. Although most of the choices in the survey question are elements of metadata, the question did not aim to discover the actual awareness of spatial data users and providers as to what core elements are part of metadata and which individual ones they supply, but whether they are aware of the metadata concept and whether they supply it.

Interestingly, when looking at the answers to the questions on legal issues, such as what disclaimers data providers relied on and what main areas their disclaimers covered, the research discovered that most disclaimer areas cover the same issues as core metadata elements do. This indicates that most metadata elements could not only help to introduce a common standard defining the usefulness and reliability of a dataset, but also provide the data provider with a protection from third party liability claims as described in Chapter 5, if the metadata can be used as a contract. This issue should be further investigated in future research.

Metadata – Access (data available in what format, and access restrictions)

The survey questionnaire asked respondents to specify what technical access they provide to their datasets. Interestingly, the majority of spatial data was still being supplied as *hardcopy over the counter or by mail* (83%), followed by storing the data on *floppy disc* (60%), *e-mailed* (48%) or stored on *CD-Rom* (46%). There were however some organisations that commented on wishing to implement '*down-loading*' and '*viewing only*' via the World Wide Web in the near future. In addition, the survey was undertaken between October to December 1998 and the situation could have changed since then. However, this thesis and other current and former research indicate that there is usually not a technological reason why organisations do not supply their data on the Internet, but other unresolved issues such as:

- Lack of use of standards and lack of high quality data (including metadata);
- Lack of willingness to share data with others in digital form (part of organisational issues, as briefly explained in Chapter 4);
- Lack of adequate spatial data access and pricing policies;

- Unwillingness to follow SDI concept consistently;
- Lack of awareness and policy in many government agencies, education and the private enterprise with regards to privacy, intellectual property protection, and legal liability risks;
- Lack of awareness and policy on security of spatial data on the Internet;
- Lack of awareness on the economic values of datasets.

Recommendation:

The importance of standards and metadata has been pointed out in this research, and hence in order to overcome the above problems, and enable data to be more easily supplied and applied, it is recommended that an organisation should:

- Consistently use and comply with all relevant standards.
- Collect metadata for spatial datasets, consistent with ANZLIC metadata guidelines, and update them;
    - If more detailed metadata is required, that metadata should be collected consistently for the whole organisation and follow internationally supported standards (ed. Nebert, 2000);
- Provide metadata;
    - so that the metadata can form part of the Australian SDI,
    - it can be included in the Australian Spatial Data Directory (ASDD), and
    - it can be included when spatial datasets are transferred.
- Supply metadata for inclusion in the ASDD.

7.2.3 Governmental / organisational duties

An organisation must adhere to statutory and political obligations when developing access and pricing policies. In addition, government departments may need to proceed with caution when developing access and pricing policies. Prices set too high may be interpreted as limiting access, while if set too low, the public may interpret it as the organisation neglecting their duty to take care of the public trust. A medium-pricing regime may be the most appropriate for a governmental department. As the statutory and political obligations vary for different States/Territories, and government agencies, and private sector organisations in Australia, no list of recommendation is provided here.

7.2.4 Ownership / custodianship

It may be irrelevant whether private or government organisations assume custodianship or ownership to the spatial datasets in their care. Whatever the case may be, clear rights and obligations of the data provider and the data user must be defined.

Recommendation:

It is recommended that an organisation should:

- Decide on assuming ownership or custodianship for the data in their care;
- Follow ANZLIC custodianship guidelines; or
- Define clear provider and user rights and obligations.

7.2.5 Legal liability issues and legal risk management strategies

Anyone may be sued for legal liability, whether they have done something wrong or not. However, knowing the rights of the organisation and effective ways to manage liability exposure will help prevent claims. Before developing a legal liability prevention strategy, an organisation should firstly analyse the potential risks and develop strategies to limit those potential risks. The next steps include the implementation and the evaluation of such strategies.

Recommendation:

It is recommended that an organisation should:

- Identify, quantify and assess its legal risk;
- Develop risk management strategy, such as
    - Develop appropriate review, update, and correction strategies for its spatial data,
    - Use contracts to minimise risks,
    - Use disclaimers and warnings,
    - Collect and supply metadata,
    - Use national standards,
    - Take out insurance cover;
- Implement the strategy;

- Monitor and assess this strategy.

7.2.6 Intellectual property protection of spatial data

Any organisation using and supplying information to others should consider managing their own copyright, but must not infringe the copyright of others. Spatial databases may be protected by copyright. However, there are uncertainties as to what types and elements of a database will qualify for copyright protection. Although copyright does not require any formalities to exist in Australia, it is best to specify that it is copyright, the copyright owner, when the work was created and what the user is allowed to do with the dataset. This is important, not only to notify users that copyright exists, but also for copyright to apply internationally. As it is difficult to predict the decisions of a court as to whether copyright applies, or whether a breach of copyright took place, it is best to rely on some additional protection, such as licences and contracts and/or other means of technical protection to prevent unauthorised copying.

The management of the copyright material held by the individual organisation involves the identification of intellectual material, protection, commercialisation, record keeping and monitoring infringements of copyright. Managing other organisation's copyright involves identifying copyright material, applying rules of infringement and negotiating the use of copyright material with others.

Recommendation:

To manage intellectual property and copyright of data owned by an organisation, that organisation should:

- Identify intellectual material and determine with the help of some criteria, such as measuring the potential commercial value, whether to protect the information at all. If the decision is yes, determine the best means of protection such as copyright, but also check whether the material actually qualifies for protection;
- Apply protection to intellectual property, which in the case of copyright involves displaying:
    - the copyright symbol on the spatial data,
    - the date (year) the spatial data was created,
    - the creator's name (if employee, the company name he/she works for), and

  - a clear statement specifying what a user is permitted to do with the spatial data.
- Be aware of potential rights and obligations
- Develop marketing, licensing and selling strategies
- Keep records of the intellectual material
- Monitor and negotiate infringement

In addition, an organisation must not infringe someone else's rights. Staff in any organisation should be aware of Copyright law requirements and what constitutes infringement. Procedures should be put in place so that staff are not put in a position where they need to or happen to infringe copyright to undertake their duties. Hence staff should be able to identify copyright material, apply rules of infringement and negotiate the use of copyright material with others. In addition to copyright, an organisation may use contracts, licences, request royalties or other means of technical protection.

If an organisation decides not to rely on copyright protection, the least they should do is to add disclaimer statements to all their spatial data, specifying for example, the spatial data's intended use, and scale to minimise potential legal liability claims.

7.2.7 Economic analysis

A study commissioned by ANZLIC determined that the economic gain from data usage was about 4:1. Therefore, for every dollar spent on producing spatial data, $4.00 income was generated. Hence an organisation developing a access and pricing policy need to consider these financial benefits of spatial data, but also take into account the advantages of data for environmental protection and preservation.

Recommendation:

When an organisation determines a pricing policy it is recommended that it should:

- Decide on the importance of the sale of spatial data to the organisation and consider other advantages of the data such as its application for the protection of the environment.
- Determine the pricing of the dataset, using cost, value or market driven pricing
  - Cost - the actual cost of producing the data can include the collection, display, manipulation and maintenance of the dataset.
  - Value – difficult to determine, but depends on demand.

    - Market - the price can be based on whatever the market will bear.
- Consider pricing that differs for different users and/or uses
    - a public user could pay less than a private user; as well if the data are being used for non-commercial purposes it should cost less than if it is used for commercial purposes.
- Decide on the pricing of a dataset after considering all questions, which may be one of the following rates:
    - No charge.
    - Less than full cost recovery, based on an appropriate criterion such as cost of supply.
    - Full cost recovery.
- The data may be priced higher if it is high in quality and densely covers a specific area, and priced low or at no cost if it is low of quality, but perhaps covers a larger area.
- Decide on how much the organisation needs to recover and determine the likelihood of selling the data.

7.2.8 Spatial data users' choices, rights and obligations

As a taxpayer, a spatial data user may have the view that he/she has a right to free access to government held information. However, it may not be in his or her best interests to gain free access to the data, because the dataset may lack quality and accuracy.

Recommendation:

It is recommended that an organisation providing spatial data must:

- Provide clear statements and warnings with their dataset to inform the user of his/her rights and obligations as to what he/she is allowed to do with the dataset.

7.3 Spatial Data Policy Definition

As pointed out above and in Chapter 4, an organisation providing spatial data should not only consider the above eight issues when developing access and pricing policies but also in addition the following four (briefly discussed in Chapter 4):

- Organisational issues;
- Privacy and confidentiality;
- Data management; and
- Outreach, cooperation and political mandate.

Hence, based on the previous Chapters 2, 3, 4, 5 and 6 priorities can be constructed to meet an individual organisation's needs, as well as broader 'SDI requirements', as given in Section 7.2.1. As the thesis is heavily based on the Spatial Data Survey these priorities have not been tested in this research. Future research should focus on individual case studies analysing their access and pricing practices with respect to the twelve policy issues (Table 4.1).

If the twelve policy issues are not applicable to a particular organisation, then the access and pricing policies and the influences of the policies' development for that organisation need to be studied. An organisation may also have the following options, or mandates:

- Government mandates may influence or determine the policies and practices for the organisation.
- An organisation may decide that considering all issues may be too complex and hence choose to do nothing, that is either charge no fee for the data, or do not provide access to the data at all.
- Implement a general approach; such as distribute the data at the cost of media and $30.00 per hour staff time (for providing the information), while selling the entire database for $2,000.
- An organisation may decide to charge royalties to service providers, such as brokers and value-added-resellers, and supply the data to them for low fees.
- An organisation may decide that its infrequent sale of data does not warrant any access and pricing policy and hence either not provide access to their data or give them away for free.

However, any organisation must know that even free data may attract liability claims and hence any data should include at least some metadata, disclaimer, and copyright statements.

Research undertaken by Johnson (1995) investigated access and pricing policies used by six different counties in various states of the USA, which rely heavily on GIS. He broadly categorised the six cases into either 'open access policies' or 'cost recovery policies'. For each category he had three cases. He discovered that only one of the three recovery cases recovered significant funds. He concludes that:

> "Many proprietary GIS agencies are likely to recover little funds, even when expectations are very high. In many cases, GIS agencies may pursue cost recovery, despite legal, practical and philosophical disincentives, and find few benefits." (Johnson, 1995, p.213)

This may lead people to think that the only way to supply spatial data to others is at no charge, but a cautious approach is needed, because Johnson discovered that only one of the three open access cases provides a high level of access, due to limited amounts of data, or systems being under development, or because higher quality data are available from the private sector. He writes that open access policies also have shortfalls in efficiency and in proprietary partnerships.

Therefore, no particular policy should be followed blindly, and individual circumstances need to be analysed. Technical access to spatial data may also heavily influence access and pricing policies. It may not be worthwhile charging anything for the data, because once the data are made available, for example, on the Internet, the cost of provision is low and the cost of administration may be more than the revenue gained from the sales. Once again disclaimers, copyright, licences and/or passwords may be used before data are released, to limit access and liability exposure.

7.3.1 Spatial Data Survey Findings and The 12 Policy Issues

The results in Table 7.1 are a summary of the Spatial Data Survey, indicating current practices generally adopted by the 4 different subgroups – '*Federal Government*', '*State Government*', '*Local Government*', and '*Private Providers*' (refereed to as '*all other* *organisations*' in Chapter 3). The table will be used to determine the importance of the twelve policy issues to each subgroup. Before progressing, the 12 significant policy issues are:

1. SDI requirements;
2. Organisational issues;
3. Technical issues;
4. Governmental / organisational duties;
5. Ownership / custodianship;
6. Privacy and confidentiality;
7. Legal liability, contracts and licences;
8. Intellectual Property Law;
9. Economic analysis;
10. Data management;
11. Outreach, cooperation, and political mandate; and
12. Spatial data users' choices, rights and obligations.

Each response value in Table 7.1 has been calculated out of 10, although actual respondent numbers were much larger. This can be interpreted as 8 out of every 10 Federal Government organisations, and 2 out of every 10 local government organisations supplies metadata with their dataset to others (Item 1, Table 7.1). Hence federal government organisations are a much higher provider group of metadata than local government organisations.

Table 7.1: Spatial Data Survey Results (calculated response values are out of 10)

Note: 7/6 means for item 2, that 7 out of 10 provided digital data, and 6 out of 10 provided hardcopies.

	Subgroups – response values			
Policy Issues No.	Federal Government	State Government	Local Government	Private Provider
Technical issues				
1. Metadata	8	6	2	4
2. Digital Access / Hardcopy	7/6	6/9	4/9	4/7
3. Download / Viewing only	1/4	1/2	0/0	1/1
Legal liability issues and legal risk management strategies				
4. Awareness of Legal liability cases (yes)	1	1	1	2
5. Use of disclaimers	7	7	6	6
Intellectual property protection of spatial data				
6. (No/ copyright/ licences)	2/6/6	3/5/5	6/3/2	5/4/2
Economic analysis				
7. Cost recovery (No/ medium/ full)	4/4/2	2/6/2	3/6/1	0/6/4

7.3.2 Spatial Data Policy Issues Priorities

In order to predict the level of importance for any of the 12 spatial data policy issues (listed p.238), Table 7.1 and the results of Chapters 2 to 6 are used. These predictions are entered into Table 7.2, some entries in that Table are based on the values from Table 7.1 ranging between:

- 1 and 3 from Table 7.1 is regarded as low in Table 7.2
- 4 and 6 from Table 7.1 is regarded as medium in Table 7.2
- 7 and 10 from Table 7.1 is regarded as high priority in Table 7.2

SDI requirements

As described before, SDIs need high quality, consistent and low priced datasets. Since 4 out of every 10 federal government organisations do not charge for their data, it is assumed that their commitment to implement and support SDIs is medium. Private enterprises most likely have to rely on the income from the sale of spatial data and hence should be interested in acquiring data through an SDI. They will most likely not provide spatial data for free or at a low cost, hence private provider's contribution to the supply of low cost data is interpreted as low (Item 7, Table 7.1).

Organisational issues

Organisational issues such as revenue needs and resistance to sharing can be seen to affect all groups, and therefore are categorised as a high priority issue for all subgroups.

Technical issues

Technical issues include the use of standards and metadata. Although the issue of standards other than metadata were not addressed in the Spatial Data Survey, their use is very important, and should be given high priority.

Governmental / organisational duties

Governmental / organisational duties include legislative and political obligations that must be followed by all, hence are of high priority.

Ownership / custodianship

Rights and obligations (responsibilities) of the owner or custodian, and the user must be defined, hence this issue is of high priority to all.

Privacy and confidentiality

Although privacy legislation mainly applies to information held in the government sector, a Privacy Amendment (Private Sector) Bill 2000 is currently going through Parliament (Australian Privacy Commissioner, 2000) enabling people to make a complaint if their personal privacy has been infringed by the private sector. Trade secrets and confidential information must not be unlawfully released, or a breach of confidence may apply. Therefore, if an organisation does not want to breach privacy or release confidential information and be held liable, it must consider the issues involved and determine and eliminate potential risks. Therefore this issue deserves a high priority.

Legal liability issues and legal risk management strategies

Although awareness amongst spatial data providers of actual legal liability claims is low, the majority of providers appear to be aware of legal risks associated with the provision of spatial data and rely on disclaimers. Hence the priority of resolving or managing legal liability is medium to high (Items 4&5, Table 7.1).

Intellectual property protection of spatial data

The current use and reliance on Intellectual Property protection of spatial data is low to medium, which is an area whose importance is under-estimated (Item 6, Table 7.1). This thesis informs spatial data providers about the usefulness of copyright and the exclusive rights associated with it.

Economic analysis

Economic analysis is rated as 'low to medium' by federal government agencies, 'medium' by state and local government agencies and 'medium to high' by private data providers (Item 7, Table 7.1).

Data management

Data management refers to how an organisation collects, stores and maintains their spatial data. This information is extremely important, not only to ensure a certain spatial data quality can be guaranteed, but also to enable the documentation of metadata. Once the data user receives the spatial data and its metadata, he/she can determine whether the dataset is fit for his/her intended use. The provision of metadata and good data management practices will also enable the data provider to avoid legal liability as discussed above. Hence this item is assigned a high priority.

Outreach, cooperation, and political mandate

Marketing and promoting spatial data and SDIs are key issues in fostering market growth, ensuring better utilisation of spatial data and SDIs, and improved data sharing. Hence it is in the best interests of all individual policies to aid the outreach, by either financial or in-kind support. The same applies to cooperation and the necessary political mandate and therefore this issue should be given high priority for all subgroups.

Spatial data users' choices, rights and obligations

Spatial data users' rights and obligations should also be high on any providers' priority list. A spatial data provider should not only inform the user of his/her rights and obligations, but also be aware of the user's level of satisfaction with the dataset. The Spatial Data Survey for example discovered that 34% of users were '*moderately satisfied*', 31% were '*satisfied*', 20% '*neutral*' but 10% were '*moderately dissatisfied*'. The question on whether the acquired spatial datasets were compatible with the users system, resulted in 52% *yes* and 35% *no* answers.

Table 7.2: Spatial Data Issues Priorities for all Subgroups

		Subgroups			
	POLICY ISSUES	**Federal Government**	**State Government**	**Local Government**	**Private Provider**
1.	**SDI requirements:**	high	high	medium	low
2.	*** Organisational issues**	high	high	high	high
3.	*** Technical issues**	high	high	high	high
4.	*** Governmental / organisational duties**	high	high	high	high
5.	*** Ownership / custodianship**	high	high	high	high
6.	*** Privacy and confidentiality**	high	high	high	medium to high
7.	**Legal liability issues and legal risk management strategies**	high	high	medium	medium
8.	**Intellectual property protection of spatial data**	medium	medium	low	low
9.	**Economic analysis**	low to medium	medium	medium	medium to high
10.	*** Data management**	high	high	high	high
11.	*** Outreach, cooperate & political mandate**	high	high	high	high
12.	*** Spatial data users' choices, rights and obligations**	high	high	high	high

** denotes derived from overall thesis*

Table 7.2 lists the priorities for each of the organisation-subgroups for the 12 significant issues in developing a spatial data policy. The priorities were either derived from the overall thesis investigation (marked with *) or from the Spatial Data Survey using the information from Table 7.1. The next section relates the developed priorities to real examples and demonstrates that organisations are actually dealing with some of the issues in their policies.

7.4 Spatial Data Policy Examples

Apart from the broad 12 issues pointed out in this thesis the following issues will most likely also influence any policy, as discovered by Johnson (1995) and reinforced by the spatial data survey.

- Philosophy - Many philosophies are heavily influenced by external factors and/or government mandates, which organisations are required to follow. However, if the philosophy of an agency is foremost to serve the public, they are more likely to use an open access policy. If the focus is more on efficiency and government, the outcome is more likely to be cost recovery. The survey and results of the thesis agree with the theory. For example 50 % of all respondents indicated that '*public good was more important than revenue'*, 32% '*sell data to recover cost only'*, and 29% '*sell data for profit'*. Therefore, more respondents use or are moving towards 'open access policies' than 'cost recovery policies' in Australia. However, when analysing the 4 subgroups, it was found that (the order of percentages is as follows: % *'public good over revenue'*, % '*sell data to recover cost only'*, % '*sell data for profit'*):
    - Federal government – 86%, 29%, 21%;
    - State government – 59%, 39%, 18%. At the time of the survey the only State in Australia where more state government organisations answered that they '*sell data for profit*' rather than '*public good over revenue*' was NSW (67% '*sell data for profit*' compared with 56% that answered '*public good over revenue',* and 44% that answered '*sell data to recover cost only'*), but when the new NSW access and pricing policies will come into force this situation will most likely change;
    - Local government – 62%, 38%, 13%;

  - Private providers – 15%, 17%, 68%.
- Policy champions and political mandate - An individual organisation may favour a particular policy and hence may influence the development of a policy, or a particular political support.
- Law - The legal situation in each individual case may push a policy in a particular direction.
- Legal concerns may influence and determine policies - Doubt in the usefulness and reliability of copyright may lead agencies to use contracts and disclaimers or not sell or distribute data at all because of fear of potential legal liability claims. The clarification in this thesis should help organisations in Australia to draw up an appropriate plan.

Below is some information for each of the four subgroups used in the Spatial Data Survey, to relate the priorities developed in this research to real examples.

7.4.1 Federal Government Agencies

Federal government agencies' access and pricing policy developed in 1995 is presently being updated. The charge for spatial data is set at the cost of distribution. As the policy has no legislative power some agencies do not follow it. Environment Australia for example makes some of their data freely available over the Internet. The proposed scope of the new policy for federal government organisations includes:

1. determine fundamental datasets required to meet Commonwealth obligations,
2. develop whole-of-government guidelines,
3. maximise spatial data integration by defining technical and transfer standards and protocols,
4. develop access and pricing policy for Commonwealth data,
5. deal with data sharing between all levels of government for commercial and non-commercial use,
6. recommend administrative mechanisms of implementation,
7. monitor effectiveness of policy (ANZLIC, 2000g – Commonwealth report).

7.4.2 State Government Agencies in Western Australia

Western Australia was chosen as an example because they were one of the few Australian States that have already developed a new access and pricing policy. Their new pricing and transfer policy, applicable to all state and local government agencies in Western Australia, instructs government agencies on spatial data pricing and transfer. The policy does not apply to information subject to statutory fees and charges. The new policy includes the following recommendations:

1. Improve access and discourage duplication;
2. Private and commercially confidential data must not be released;
3. Rely on copyright to protect intellectual property. Other people's and organisation's copyright must not be breached;
4. When distributing spatial data, licences or other agreements should be used (these define rights of the licensee, and his/her obligations if the data are to be used commercially and non-commercially), in addition metadata statements should also be used. Agreements can be varied depending on user and type of use;
5. Pricing should be determined by the custodian, for transfers to Federal, State and Local Government agencies, the private sector and for research: also cooperative arrangements should be possible;
6. Consider commercial versus non-commercial use, it does not matter whether use of the data is in private or government sector, however the frequency of access matters;
7. The present philosophy is to sell spatial data to data-brokers for maximum return. However this is currently under review and may change;
8. Fundamental data are data that cannot be derived from other datasets, and they are essential to the operation of a number of agencies, e.g. Geodetic Control Network. This data are considered as being produced in a non-contestable market;
9. Pricing in a contestable market should be at a rate of recovering costs of information production and distribution.
10. State government agencies shall not compete with each other in providing the same dataset, but rather agree on one set and cooperate on its marketing (WALIS, 2000b).

7.4.3 Local Government Councils

Local government Councils need spatial data, for example, to display the location of Council's assets, to determine rates to be paid by people living within the Council area and to assist in developing, planning and controlling land use. In essence a local government agency uses spatial data as a tool and not as a commodity to be distributed to others. Hence it is very difficult to find any spatial data policies in use by local government agencies. South Sydney Council, for example, does not receive many requests for spatial data and hence does not need a comprehensive policy on spatial data distribution (Livingstone, 2000). Local government agencies in NSW are governed by the Local Government Act 1993 and other legislation. Part 2 of that Act deals with access to information, and requires a Council to make certain information publicly available. South Sydney Council is presently developing on-line access to their spatial data via the Internet, hoping to improve internal Council management and external access to digital spatial data. Pricing is currently set at, for example, $1.75 per land parcel (digital) for 1 to 10 dataset layers (Livingstone, 2000).

7.4.4 Private Enterprise

A private provider will most likely be driven by revenue gain. If there is insufficient profit, a private investor may not invest in a venture. A private organisation may be interested in supporting the nation and the environment, but if there are no direct benefits and only potential risks, the organisation will most likely not provide the necessary support. Official regulations may be necessary to force private organisations into providing consistent, for example spatial data pricing, approaches necessary for the development of SDIs.

ERSIS Australia has a website selling spatial data and only a few datasets are free. For example, a street file including parks and reserves, railways, water features, airports and bridges for the Hunter region is available for about $2,200. That dataset was created using Public Sector Mapping Agencies (PSMA) data. ERSIS uses a disclaimer below its free data on its website that specifies the following:

> "ERSIS does not warrant that the data contained on this page are free from errors. ERSIS is not liable for any support or upgrades with respect to the data. By downloading this data, the user agrees to release ERSIS, its employees,

> agents and contractors, and any person claiming under or through ERSIS, in respect of all liability for loss, damage or injury, which may be suffered by it arising from the use of the data. Copyright of the data remains with ERSIS Australia. The data must not be sold; the user shall not commercialise the data or any product or service derived from or incorporating the data, unless it has first obtained the written consent of ERSIS. ERSIS may grant or refuse its consent in its absolute discretion and may grant consent subject to any condition or conditions whatsoever, including the payment of royalties." (ERSIS, 1998)

The above examples only demonstrated that some organisations are addressing factors that influence policy development, but it is yet to be seen what actual effects these policies have on the facilitation of SDI. The next section will deal with how such spatial data access and pricing policies can be evaluated in the future.

7.5 Spatial Data Policy Evaluation

Section 7.5 briefly describes what public policies are and how they develop. Then the section points out how to implement policies and finally how such policies may be evaluated by giving a simplified example.

Public policy is difficult to define and often policy is no more than whatever governments choose to do or not to do. However some of its characteristics include:

- "Public policy is intentional, designed to achieve a stated or understood purpose;
- It involves decisions and their consequences;
- It is structured and orderly;
- It is political in nature;
- It is dynamic." (Bridgman and Davis, 1998, p3)

Public policy can be the authoritative choice of a government; a hypothesis that expresses the theories about cause and effect; and an objective of governmental action.

> "Policy is essentially an expression of the political will of a government" (Bridgman and Davis, 1998, p8).

The objective of the policies discussed in this research aim to improve data management, data sharing, legal risk management and to facilitate SDI development.

There is not much difference between private and public policies, except that private policy makers cannot call on public resource or legal forcible constraint.

Policy development can best be described as a policy cycle that starts with identifying issues followed by analysing and implementing policies to finally evaluating the policy effects (Bridgman and Davis, 1998). This research has so far identified the issues, analysed and recommended policies but not implemented and evaluated the policies, which will be beyond the scope of this research. The research did not aim to develop individual policies, but rather identify the issues and the necessary background material for individual private and public organisations to develop policies that help to facilitate SDI development and data sharing. However, the description that follows will clarify what an organisation (public or private) can do to test (evaluate) their policy.

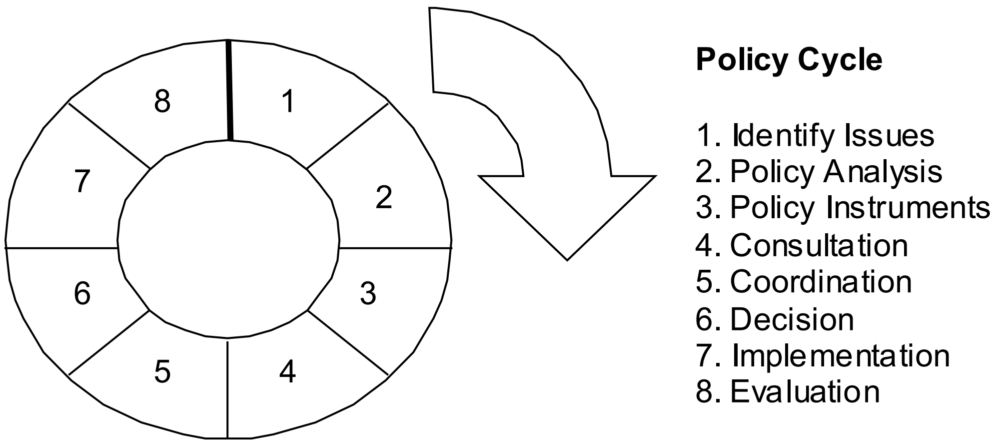


Figure 7.1: The Australian policy cycle (adapted from Bridgman and Davis, 1998)

The policy cycle (Figure 7.1) starts with identifying the issues, then the policy analysis, identifying the policy instruments followed by consultation, coordination and decision making, then implementing and finally evaluating the policy. The policy analysis aims to provide decision makers with sufficient information about the policy problem so that he/she can make an informed decision. The policy instruments in the cycle identify the appropriate type of policy, eg. Law - using legislative powers, or adjustment to internal operations. Consultation involves related agencies or parties and clients with a vested interest. Coordination is necessary if more than one organisation is involved, and needs of funding a policy and agreement on common policies arise. The policy decision will have to be made by senior management or by cabinet for a private and public policy respectively. Next, the policy needs to be implemented, whereby the policy is expressed through legislation or a program. Finally the policy must be evaluated to compare the original objectives with the outcome, because the objectives may have drifted or the goals may have been imperfect in the first instance. The evaluation must measure the effects of the policy, which may lead to an adjustment or rethink of the policy design, leading to reviewing the whole policy cycle again. (Bridgman and Davis, 1998)

Policy implementation approaches are very individualistic and depend on the situation (Younis, 1990). A top-down approach suffers from omitting the reality of policy modification; while a bottom-up may not be idealistic without the authority of policymakers. Younis argues that a combined top-down and bottom-up approach in policymaking is a worthwhile option to look at. David Rhind also suggested the combined approach at the 1997 GSDI conference as a feasible step for developing a GSDI. Implementation as in Figure 7.1 means to carry out, accomplish, fulfil, produce, and complete a policy. Implementation is a process of interaction between the setting of goals and actions geared to achieve them (Younis, 1990).

If a policy has been designed poorly it will fail on implementation, hence potential implementation problems should be anticipated and used to improve the policy design. Successful policy implementation requires a range of conditions according to Lewis Gunn (1978, cited in Bridgman and Davis, 1990, p104):

1. *no crippling external constraints,*
2. *adequate time and resources,*
3. *a suitable combination of resources at each stage,*
4. *a valid theory of cause and effect,*
5. *direct links between cause and effect,*
6. *a single implementation agency, or at least a dominant one,*
7. *understanding and agreement on the objectives to be achieved,*
8. *a detailed specification of tasks to be completed,*
9. *perfect communication and coordination,*
10. *perfect obedience.*

Unfortunately in a real world these idealistic conditions seldom happen, hence this thesis recommends to firstly consult a group of specialists and those organisations potentially involved in the policy implementation. This group should correct or add to the recommended policies from this research. Then the policies should be implemented in a pilot program testing them on government and private organisations, say two for each subgroup. Finally evaluation of the policies should take place whereby the evaluation will determine if the policy objectives have been met.

> "Ideally policy evaluation provides politicians and citizens with an intelligent basis for discussing and judging conflicting ideas, proposals and outcomes" (Frank Fischer, 1995, p.2; as cited in Bridgman and Davis, 1990, p113).

Evaluation should be continuous throughout the whole policy cycle and it should follow a standard format, whereby a steering group and evaluation team prepare terms of reference for consideration. An evaluation strategy should measure and monitor policy objectives and the findings should be analysed and recommendations made. Policy evaluation in the case of a spatial data policy should determine if the policies are appropriate, whether indeed these are necessary; whether these are efficient in meeting their objectives, are effective, and whether the policies produce worthwhile results. Do the outcomes justify the expense? Good spatial data policies can only be achieved if all information is accurate; the policies are important enough; useful; original and its implementation feasible (Nagel, 1990).

To develop an individual policy, objectives need to be defined, and strategies and actions developed to meet those objectives. After implementing the strategies, the policies need to be evaluated to establish if the original objectives have been met. In more detail an organisation needs to:

- define its vision and mission with a clear statement of their business, which provide the source for the organisation's objectives,
- define realistic objectives,
- assign a strategy and key actions to reach the objectives,

- after implementing the strategies and actions, measure the effects of the policy and compare the effects with the objectives and readjust the policy design accordingly (Kozub, 1991).

As this research thesis discovered, it is difficult to predict the actual policies potentially adopted by organisations, they depend entirely on the individual organisation's mandates and priorities. The national spatial data survey conducted in this thesis also supports this notion, as it revealed a wide variation in policies being used within the spatial data industry. A hypothetical example of a policy evaluation could be:

> *An organisation wants or needs to employ an effective cost recovery strategy that also aims to facilitate SDI development. Assuming the organisation is the custodian of their data and that any cost recovery does not breach any governmental / organisational duty. In addition it is assumed that reasonable spatial data pricing will not hinder SDI development.*

The potential outcome and evaluation of such a hypothetical example is given in Table 7.3. This example does not include all possible outcomes, as this could lead to a convoluted exercise thereby defeating the purpose of a simple demonstration. Many of the factors that influence policy development were grouped in the conclusion of Chapter 2 under: *Standards and Quality of spatial data; Access to spatial data; Pricing of spatial data;* and *Legal issues such as intellectual property protection of spatial data*. Table 7.3 below will use the same grouping of factors influencing individual policies:

- Standards and Quality
- Access
- Pricing
- Legal issues such as Copyright

Table 7.3: Policy Evaluation of a Hypothetical Cost Recovery Example

	Objective	Strategy and actions	Potential outcome and Evaluation
Standards and Quality	To achieve interoper-ability and good quality data	Use and comply with common standards and collect spatial data and metadata of high quality, consistent with national spatial data specifications; educate and train employees in accordance with the above strategy and take necessary actions.	• **No** **Outcome:** If no resources or financial support are available to comply with common standards or to collect high quality data and metadata, or cover the expenses of staff training it is most likely impossible to meet the original objective. **Evaluation:** If the objective cannot be met, the objective needs to be readjusted by matching it with the available resources and finances. • **Yes** **Outcome:** If sufficient resources are available, the standards can be complied with and both good quality data and metadata exist, or can be collected and staff can be trained accordingly then the objective should be achievable. **Evaluation:** If the objective is achievable the original objective does not need any readjusting.
Access	Easy and effective access for all potential users and avoid duplication, but without losing control of the data	Provide a spatial data node via the ASDD, provide metadata, provide the spatial data itself, and use effective intellectual property measures to not lose the control of the data.	• **No** **Outcome:** If no resources or financial support are available an organisation may not be able to provide a node or effective intellectual property protection to ensure the control over its data. They may choose not to provide the data or provide data access via e-mail and join a copyright collecting agency as a member who will administer revenue collection on behalf of its members, hence only partly meeting the objective of easy and effective access. **Evaluation:** If the objective can only be met in part, the objective needs to be readjusted by allowing the most cost effective access such as e-mail. • **Yes** **Outcome:** If sufficient resources are available the organisation can provide a node via the ASDD and use effective intellectual property measures to not lose the control of their data. **Evaluation:** If the objective is achievable the original objective does not need any readjusting.

Pricing	Full cost recovery	After determining the commercial value of the data; price the data (include the direct cost of material and human resources to duplicate and deliver the information and a special service charge *); and develop marketing strategies and join beneficial partnerships.	• **No** **Outcome:** If no resources or financial support are available it may be difficult to market the data and therefore difficult to sell, hence a part cost recovery model may be necessary. Data exchange agreements may also be very beneficial to the organisation. **Evaluation:** If the objective can only be met in part, the objective needs to be readjusted by allowing a part cost recovery model. • **Yes** **Outcome:** If sufficient resources are available commercially valuable data should be marketed and sold for market value. Data exchange agreements may also be very beneficial to the organisation. **Evaluation:** If the objective is achievable the original objective does not need any readjusting.
Legal issues such as Copyright	To legally protect the data against misuse by others, and minimise legal liability risk	Where data is commercially valuable protect the data with copyright and licences; define users' rights and obligations; keep records; monitor and negotiate infringements; and do not infringe the rights of others.	• **No** **Outcome:** If no resources or financial support are available the organisation may not be able to administer legal issues or define users' rights and obligations, but the organisation may become a member of copyright collecting agencies, thereby partly meeting the objective. **Evaluation:** If the objective can only be met in part, the objective needs to be readjusted, however an organisation needs to be aware of legal liability risks and should at least use disclaimers. • **Yes** **Outcome:** If sufficient resources are available the objective should be achievable. **Evaluation:** If the objective is achievable the original objective does not need any readjusting.

Notes:

- **No** signifies that the organisation has no or insufficient funds available to meet the objective, while **Yes** signifies that the organisation has sufficient funds to meet the objective.
- * an example of a service charge (= $64/hour) is to include the lifetime cost of the GIS, which includes the hardware, software, maintenance and personnel needed over a four-year system life (eg. $444,881.00);

- four year system life (= 4 years * 50 wks/year * 35 hrs/wk = 7000 hrs); and
- cost per hour = $444,881.00 / 7000hrs = $64.00 per hour (Lerner, 1992).

As described before, the vision and mission (or the factors that influence policy development) of an organisation provide the source for the objectives (Table 7.3 column 2) of an organisation. The objectives in Table 7.3 were chosen based on policy needs. Strategies and actions (Table 7.3 column 3) were assigned, based on best practices recommended in this thesis, to meet those objectives. Then the objectives have to be implemented and the potential effect of the policy (the outcome) has to be evaluated by comparing the outcome with the original objective and if necessary the policy design has to be adjusted accordingly (Table 7.3 column 4).

7.6 Conclusion

This chapter has developed spatial data policy issues priorities for four subgroups: federal government organisations, state government organisations, local government organisations, and private providers. These priorities were based on the analysis of the 12 major factors that influence individual policy development and discussed throughout the whole thesis. The priorities differ for the four subgroups, hence only official regulations may be able to standardise the different policies, but this principle may not be in the best interests of everyone. Even if not all issues in a policy can be made consistent to facilitate development of SDIs, it would at least be in everybody's best interest to follow and apply national standards to enable the exchange of spatial data.

Policy development is a continuous cycle that starts with identifying issues followed by analysing and implementing policies to finally evaluating the policy effects. This research recommends firstly consulting a group of specialists to determine a potential group of organisations that should participate in a pilot program and both groups should consider the policies recommended in this research. These two groups should then correct and add to the policies recommended in this research according to their individual needs. Then the policies should be implemented and finally evaluated to determine if the policy objectives have been met. An evaluation strategy should measure and monitor policy objectives and the findings should be analysed and recommendations made.

Organisations should consider all 12 policy issues (Table 7.2) discussed in this thesis, when deciding on a spatial data policy. Further research is needed to compare and monitor the two access and pricing models, classed as either 'open access' or 'cost recovery access', and record their failures and successes over time. Further research is also needed to firstly implement the recommended policies and secondly to evaluate those policies, to analyse if they were appropriate, efficient and effective in meeting the target objectives of this research. Exchange and collaboration agreements should be used wherever possible to encourage cooperation amongst all levels of government and the private sector. State or national government agencies have different needs to local or private spatial data providers. However, society's need for improved and easily accessible data to solve environmental problems, its decline in natural resources, and monitoring and reducing disaster problems remain the same.

Chapter 8 – Summary and Conclusions

8.1 Introduction

Realising the widespread use of spatial data, the need for Spatial Data Infrastructures, and the existence of many different spatial data policies in Australia, the aim of this thesis has been to determine existing spatial data policies used by spatial data providers in the area of spatial data access and pricing, and to devise new spatial data access and pricing policy strategies. To achieve the aims the thesis developed the following objectives:

i. Determine factors that influence SDI development at global, regional and national level (Chapter 2).
ii. Research SDI policy deficiencies and determine SDI requirements for Australia (Chapter 2).
iii. Survey existing practices and policies used by spatial data providers in Australia for spatial data access and pricing, including the areas of metadata provision, physical access, basis used for pricing, and legal protection (Chapter 3, and relate the outcome of the survey to Chapters 4, 5, 6 and 7).
iv. Summarise all issues involved in a spatial data access and pricing policy and study international developments (Chapter 4).
v. Review current data access and pricing policies used by Australian jurisdictions and New Zealand (Chapter 4).
vi. Review the legal framework applicable to spatial data in Australia; discuss legal liability issues in maps and databases, and review legal protection means against potential liability claims (Chapter 5).
vii. Review intellectual property laws relevant to spatial data and measure the spatial data providers' level of reliance on intellectual property law (Chapter 6).
viii. Compose a summary of policy recommendations based on the research (Chapter 7).
ix. Develop a Spatial Data Policy definition that facilitates SDI development (Chapter 7).

Section 8.2 explains the results of the investigation of these nine objectives and Section 8.3 discusses the original contribution of the thesis to the area of Spatial Data Infrastructures. Section 8.4 provides the answers to the research questions posed at the end of Chapter 2.

8.2 Evaluation of Objectives

i. Determine factors that influence SDI development at global, regional and national level

In Chapter 2 relevant factors that influence SDI development were found to be:

1. External Forces (world economy, globalisation, environmental issues);
2. Organisational Issues (operational responsibility for the SDI initiative, leadership at appropriate level, priorities, and human resources);
3. Technical Issues (standards, clearinghouse technology);
4. Governmental/Organisational Duties (legal, political, security);
5. Ownership/Custodianship;
6. Privacy and Confidentiality;
7. Legal Liability, Contracts and Licences;
8. Intellectual Property Law;
9. Economic Analysis (financing and pricing);
10. Data management (data protection and security);
11. Outreach, Cooperation and Political Mandate; and
12. SDI Users' Choices, Rights and Obligations.

ii. Research SDI policy deficiencies and determine SDI requirements for Australia

Chapter 2 also found that SDI policy deficiencies were similar at the global, regional and national levels. These deficiencies create problems similar to those faced by individual organisations trying to develop access and pricing policies. Some of the main problems with SDIs and faced by organisations developing access and pricing policies, included:

- Poor quality of spatial data;
- Inconsistent standards, or standards not being adopted;
- Inconsistent access and pricing strategies; and

- Uncertain legal protection for spatial data.

From the research in Chapter 2 it was concluded that to improve facilitation of SDIs at any level, common policies are required. These policies need to be consistent and for Australia need to incorporate the following SDI requirements:

- Use ANZLICs custodianship guidelines;
- Use common ASDI standards, technology standards and metadata guidelines and feed back any problems to managers of standards;
- Use ASDI technology and access network (Clearinghouse) for displaying or using data and maintaining access to own data;
- Abide by government policies, guidelines and laws where applicable;
- Provide security protection and secure access to spatial data;
- Use fundamental datasets;
- Collect, maintain and update spatial data appropriate for its intended use and ensure that its quality is consistent with national spatial data specifications;
- Promote data sharing and access, and use of high quality data;
- Store and index spatial data appropriately and consistently with national specifications;
- Set the prices of spatial data to be low and consistent with state or national policies or guidelines;
- Use appropriate legal risk management and copyright strategies as described in Chapters 5 and 6;
- Promote the application of spatial information and SDIs; and
- Be aware of new spatial information and SDI developments.

iii. Survey existing practices and policies used by spatial data providers in Australia for spatial data access and pricing, including the areas of metadata provision, physical access, basis used for pricing, and legal protection

The Spatial Data Survey described in Chapter 3 provides a very detailed picture of the current practices used in the spatial data industry at the date of the Survey (conducted October to December 1998). A few of the more significant conclusions are described here.

There are many spatial data providers that do not adhere to any particular policy, but often make their policies for spatial data access and pricing dependent on the individual datasets. Metadata standards are being provided by 34% of data providers. Access to spatial data is often provided in digital form, however the most common way users received their data is as a *hardcopy over the counter or by mail*. With regard to pricing many were charging '*Cost of supply, provision*', except for federal government agencies, where a majority of organisations were not charging at all. Surprisingly, legal issues such as legal liability risks were seen to be more important to federal and state government organisations than local government and private sector organisations. Intellectual property protection of spatial data was not as important to most providers as using disclaimers (64% used disclaimers). 46% added no legal statements to their data while 39% stated that the data is subject to copyright protection.

iv. Summarise all issues involved in a spatial data access and pricing policy and study international developments

Chapter 4 determined from literature review the factors that influence spatial data access and pricing policy development and summarised them as:

- SDI Requirements
- Organisational Issues
- Technical Issues
- Governmental/Organisational Duties
    - Legal
    - Political
    - Security
- Ownership/Custodianship
- Privacy and Confidentiality
- Legal Liability, Contracts and Licences
- Intellectual Property Law
- Economic Analysis (cost, value, or market driven)
    - Private vs. public user
    - Commercial vs. non commercial use
    - Free to full cost recovery range
    - Dataset
        - Quality
        - Quantity

- Data Management
- Outreach, Cooperation, and Political Mandate
- Users' Choices, Rights & Obligations

Research on local and international initiatives in Chapter 4 showed the large variety of policies and practices being used. Often policies and practices develop, despite the above mentioned factors, because organisations have to follow government mandates, often without any consideration for aiding a better facilitation of SDIs. SDI development challenges were found to be not so much of a technical nature, but rather a deficit in policies, finances and in the management of spatial data, including such issues as ownership, copyright and legal liability.

v. Review current data access and pricing policies used by Australian jurisdictions and New Zealand

When comparing the various Australian jurisdictional members of ANZLIC including New Zealand in Chapter 4, it was found that most have either recently updated their access and pricing policy/practice, or are in the process of doing so. Four of the eight Australian State/Territories have different approaches, depending on uses, and range between 'cost of transfer' for non-commercial use and 'above cost of transfer', such as market value, for commercial use. The overall trend for many state/territory authorities is to reduce the price of their datasets. However, some charge above the cost of transfer up to market value for commercial use (even if the user is a government organisation). Some states/territories tend to encourage spatial data brokers and value-added-resellers, while others prefer not to use them. Some may even license the use of the data rather than sell the data.

vi. Review the legal framework applicable to spatial data in Australia; discuss legal liability issues in maps and databases, and review legal protection means against potential liability claims

Legal liability exposure may never be eliminated, but with the use of contracts, disclaimers, standards (including metadata), good quality data management practices, insurance and a good risk management strategy the exposure to legal liability for incorrect or inadequate data will be reduced (Chapter 5).

vii. Review intellectual property laws relevant to spatial data and measure the spatial data providers' level of reliance on intellectual property law

Intellectual property protection, such as copyright can be utilised for the protection of spatial data. Although difficult to predict its reliability, it is simple to use and does not require any formalities. The 'Spatial Data Survey' discovered that more organisations do not protect the intellectual property in their data than those that do (Chapter 6).

viii. Compose a summary of policy recommendations based on the research

Chapter 7 developed a summary of recommendations from the information and the research in Chapters 2 to 6, under the following headings:

- SDI requirements;
- Technical issues;
- Governmental / organisational duties;
- Ownership / custodianship;
- Legal liability, contracts and licences;
- Intellectual Property Law;
- Economic analysis; and
- Spatial data users' choices, rights and obligations.

ix. Develop a Spatial Data Policy definition that facilitates SDI development

Section 7.2 of Chapter 7 presents a list of policy recommendations to facilitate SDI development and Table 7.2 prioritises the spatial data policy issues identified in Chapter 4 (Table 4.1) for the following four subgroups:

Federal Government Organisations, State Government Organisations, Local Government Organisations and Private Organisations. The conclusions drawn from Table 7.2 were that spatial data policy priorities differ significantly for the four subgroups, and hence development of SDIs cannot be easily facilitated without the development of official regulations or policy guidelines.

Section 7.4 relates the priorities developed in Table 7.2 to some real world examples in Federal Government, state government, local government and private enterprise. Section 7.5 discusses the theoretical development of policy and shows how this theory could apply in an organisation seeking to employ a cost recovery strategy for their data.

8.3 Contribution

The list below gives an overview of the areas where this thesis makes an original contribution to the facilitation of SDI. These areas are discussed further, below the list:

- Establishing what the spatial data policy issues are.
- Analysing and comparing SDI policy deficiencies with respect to individual organisational access and pricing policy issues.
- Researching current Australian spatial data policy practices in the areas of spatial data quality, access, cost, and intellectual property protection of spatial data by way of a national survey. This information contributed significantly to the development of future access and pricing policy strategies.
- Measuring the acceptance of existing ANZLIC guidelines such as the Metadata Guideline.
- Assisting with reducing and managing legal liability risks, when providing spatial data and documenting legal liability awareness and disclaimer practices.
- Reviewing and extending the current knowledge of intellectual property law applied to spatial data, so that an organisation may know what intellectual property law to use and how.
- Defining spatial data policies.

Establishing what the spatial data policy issues are – A comparison of national, international, regional, and global spatial data policy issues lead to the formation of a list of factors that influence SDI development. The author is not aware of these factors ever being consolidated into a single coherent statement.

Analysing and comparing SDI policy deficiencies with respect to individual organisational access and pricing policy issues – The author is not aware of such a comparison being made previously in an Australian context.

Researching current Australian spatial data policy practices in the areas of spatial data quality, access, cost, and intellectual property protection of spatial data by way of a national survey. This information contributed significantly to the development of future access and pricing policy strategies – One aim of the thesis was to provide statistics on the types of spatial data policies employed in Australia, and to analyse these statistics in order to provide direct guidance to spatial data policy developers on spatial data policy strategies.

Measuring the acceptance of existing ANZLIC guidelines such as the Metadata Guideline - Previous research on SDI development in an Australian context has usually concentrated on the design and implementation of SDIs, and rarely on actual performance measures of the ASDI or any ANZLIC guidelines. This research discovered that there is generally a lack of metadata provision, although many people seem to be aware of the functions of metadata. State, Federal and private organisations provide more metadata than local government departments. The spatial data survey also discovered that there is a lack of compatible data and that the provision and measure of data quality is inconsistent. Access to spatial data is ineffective as there are still many datasets not being distributed in electronic form. Although not a perfect measure of guideline acceptance, this research indicates that more education on the usefulness of metadata and other national guidelines is necessary.

Assisting with reducing and managing legal liability risks, when providing spatial data and documenting legal liability awareness and disclaimer practices – The strategies listed in Section 7.2.5 of Chapter 7 provide assistance in reducing and managing legal liability risks for individual Australian organisations. The results of the survey discovered that few people are aware of the legal liability risks involved when supplying spatial data, or liability claims occur very infrequently. The analysis of disclaimer practices indicated that 64% of all providers rely on disclaimers to limit legal liability, compared with only 34% of data providers using metadata. A list of areas covered by disclaimers, used within the spatial data industry, was compiled in Chapter 5 (Table 5.2). These areas were compared with metadata descriptions in Chapter 4 (Section 4.2.1), Chapter 5 and Appendix 3. This comparison lead to the discovery that many disclaimer areas are similar to what should be included in Metadata.

Reviewing and extending the current knowledge of intellectual property law applied to spatial data, so that an organisation may know what intellectual property law to use and how - The current knowledge of intellectual property law applied to spatial data was documented and the spatial data survey indicated that certain data provider groups rely more heavily on intellectual property protection than others. Overall intellectual property protection was found to be an area that is underutilized and hence spatial data providers need more education on its benefits.

Defining spatial data policies – This research is original in providing direct policy recommendations to spatial data policy developers to assist them in their individual policy formulation. It also has applied its findings to establish policy priorities for various jurisdictional government and private organisations, and formulated an example of how an organisation may evaluate its policy.

8.4 Research Questions

The next four sections will answer the questions raised at the end of Chapter 2 under the four headings:

- Standards and quality of spatial data
- Access to spatial data
- Pricing of spatial data and
- Legal issues such as Intellectual Property protection of spatial data.

8.4.1 Standards and quality of spatial data

- *How much impact do the developments from ANZLIC, such as Metadata standards have on spatial data providers and users from academic, private and public background?*

As about one third of data providers responded that they were supplying metadata, the efforts of ANZLIC and other bodies involved in publicising and promoting the use of metadata have had an impact. However the work to promote metadata still needs to be continued.

- *Are most providers aware of ASDI developments and do they follow the guidelines?*

This issue is hard to measure from the results of the Spatial Data Survey. However, as spatial data prices are being reduced and metadata is being supplied, the answer to the question is tentatively yes. More work is required to investigate this question.

- *Are data providers supplying additional data with the dataset, such as metadata or disclaimers?*

The results of the survey show that many data providers provide metadata and disclaimers.

8.4.2 Access to spatial data

- *What spatial data access mechanisms do Australian spatial data providers use?*

A majority of users request their data as '*hardcopy over the counter or by mail*'. However, many providers supply the datasets in digital form, but only very few providers use the Internet to distribute their spatial datasets.

8.4.3 Pricing of spatial data

- *What spatial data pricing policies do other Australian States' and Territories' and New Zealand's government spatial data providers use?*

Most Australian States/Territory Governments have either recently updated their access and pricing policy/practice, or are working on new ones. Four out of the eight States/Territories have different prices for different uses, which range between cost of transfer and market value. The general trend among the different State/Territory government departments supplying spatial data, is to move to lower pricing regimes.

- *Do public data providers value their spatial data as revenue producing asset, or more as the public asset that should be made freely available?*

50% of all spatial data providers specified that *public good was more important than revenue* from the sale of spatial data, but the level of charging that applied was not studied. The vast majority of federal government agencies (86%) specified that *public* *good was more important than revenue*, while 68% of all private organisations specified they sell their data for profit. It is therefore assumed that spatial data are valued to a degree.

8.4.4 Legal issues such as Intellectual Property protection of spatial data

- *What potential legal risks exist when providing spatial data to others?*

Legal liability risks associated with the provision of spatial data to others may involve liability claims that arise because a user has relied on inaccurate spatial data, or he/she has used the data in a way it was not intended and thereby has suffered loss.

- *How can an organisation protect its intellectual property in their spatial data?*

By using copyright, and/or contracts, and/or licences and clear statements specifying what the user's rights and obligations are when using the spatial data.

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Appendix 1

Spatial Data Survey Questionnaire and Covering Letter

(Survey conducted between October and December 1998)

CONFIDENTIAL

Spatial Data Provider and User Survey

I GENERAL QUESTIONS
(Section I)

1. (1) Please indicate if you use spatial data, or provide spatial data to others, or both.
Note: A spatial dataset includes a layer, theme, an application or a map.

❒ Data Provider	❒ User	❒ Both
Answer Sections I & II	**Answer Sections I & III**	**Answer All Sections**

2. (2) Does your organisation use Geographic Information Systems (GIS)? ❒ Yes ❒ No
- If Yes, how many people are working with the GIS? ____________________________
- If Yes, how many GIS spatial datasets do you use (approximately)? Please specify the number of your own datasets and those from other providers.

Themes: ___________your own ___________other providers

Applications: ___________your own ___________other providers

Maps: ___________your own ___________other providers

3. (3) Does your organisation use a Trade Mark? ❒ Yes ❒ No
- If Yes, did you register that Trade Mark? ❒ Yes ❒ No

4. (4) Did you register your business name? ❒ Yes ❒ No

5. (5) Are you aware of any Liability cases that arose from spatial data applications (eg. Provision of inaccurate data)? ❒ Yes ❒ No
- If Yes, please specify and if possible give reference. _____________________________________

____

____

6. (6) Could you please describe your organisation?

		Government
❒ Educational Institution	❒ Photogrammetry	
❒ Engineering	❒ Spatial Data Distributor	❒ State Government
❒ Environmental Group	❒ Surveyor	❒ Federal Government
❒ Manufacturing Industry	❒ Utilities	❒ Local Government
❒ Natural Resources	❒ Other, please specify ______________________________	

II DATA PROVIDER QUESTIONS
(Section II)

A Data Quality

1. (7) What additional information do **you** provide with your spatial datasets you supply to others? *(tick all that apply)*

❒ Accuracy	❒ Disclaimer	❒ Depends on dataset
❒ Maintenance	❒ Metadata	❒ Nothing
❒ Updates	❒ Other, Please specify __________________________________	

Metadata = information about data, for example when was the data created, by whom, its accuracy and reliability. Metadata aims to provide a standard that enables a consistent way to describe the content and fitness for use of a dataset.

B Data Access & Cost

1. (8) How do you provide access to your spatial datasets? (Hardcopy or Digital) *(tick all that apply)*

Internet:	❒ File Transfer Protocol (ftp)	❒ Facsimile
❒ E-mail	❒ Floppy disk	❒ Tape/Cartridge
World Wide Web (www):	❒ CD-Rom	❒ Depends on dataset
❒ Download	❒ Hardcopy over Counter or Mail (maps)	
❒ Viewing only	❒ Other (please specify) _________________________________	

2. (9) On what basis do you attempt to recover the cost of your various spatial datasets? *(tick all that apply)*

❒ Do not ❒ Cost of data manipulation ❒ Full cost recovery
❒ Cost of data storage medium ❒ Cost of supply, provision ❒ Varies depending on dataset
❒ Cost of data acquisition ❒ Market value
❒ Other (please specify) ______________________________

3. (10) What unit price do you charge for your spatial datasets? *(tick all that apply)*

❒ Do not charge ❒ Per Megabyte of storage ❒ Per parcel of land
❒ Hourly Rate ❒ Per certain scale map ❒ Per polygon
❒ Per mapsheet ❒ Depends on dataset
❒ Depends on User (please explain)______________________________
❒ Others (please specify) ______________________________

Could you please send me a price list if convenient?

C Legal

1. (11) Do you use disclaimers ? (eg. "Do not use the data other than as specified") ❒ Yes ❒ No

- If yes, could you please specify the main area's these cover? (eg. Accuracy)

____

____

Please send me examples if convenient?

2. (12) Do you allow data users to distribute or sell your original datasets to others?

❒ Yes ❒ No ❒ Depends on dataset ❒ Depends on user ❒ Depends on other

If the answer is: Depends on dataset, user or other could you please explain your policy?

____

3. (13) Do you allow data users to distribute or sell your datasets that they **added value** to?

❒ Yes ❒ No ❒ Depends on dataset ❒ Depends on user ❒ Depends on other

If the answer is: Depends on dataset, user or other could you please explain your policy?

____

4. (14) What legal forms of protection do you utilise to protect **Your** intellectual property in your spatial datasets? *(tick all that apply)*

❒ None ❒ Licenses ❒ Trade Secret
❒ Copyright ❒ Others (please specify) ______________________________

If available and only if convenient could you please send a sample blank copy of a licence contract and copyright notice you use?

5. (15) If you ticked Licenses in Question 4, what type of Licence do you use?

❒ None ❒ Internal use ❒ Commercial use
❒ Government use ❒ Non-commercial use (Education)
❒ Others (please specify) ______________________________

6. (16) If you ticked Licenses in Question 4, what main points do you include in a spatial data commercial use licence?

❒ Applicable Law ❒ Licence breaches ❒ Ownership
❒ Description of spatial data ❒ Licence Duration & Termination ❒ Parties involved
❒ Dispute Resolution ❒ Licensee's rights ❒ Royalties
❒ Indemnities ❒ Licensee's responsibilities ❒ Type of agreement
❒ Others (please specify) ______________________________

7. (17) How would you treat modified or derived work (spatial data) in a licence?

____

____

8. (18) Do you collect Royalties from users of your spatial data? ❒ Yes ❒ No

D Philosophical / Technical

1. (19) What is your organisational philosophy in regards to your own intellectual property in spatial data? *(tick all that apply)*

❒ Public good over revenue
❒ Using Copyright Collecting Societies.
❒ Sell data for profit
❒ Varies depending on user or dataset
❒ Sell data to recover cost only
❒ Others (please specify) ________________________
❒ Offering some data for free, while making income in other ways, such as advertising.
❒ Copyleft, permission to reproduce for a non-commercial purpose.
❒ Shareware, free to try the data but then buy. Traditionally not controlled, but at present timelocks are often included.

2. (20) What technical form of protection do you use to protect your spatial data? *(tick all that apply)*

❒ Encryption ❒ Passwords ❒ None
❒ Others (please specify) ____

III DATA USER QUESTIONS (answer only if you use spatial data) (Section III)

A General Questions

1. (21) What type of spatial data do you acquire from other providers? Could you please estimate what proportion do you have to add or change before the data can be used by your organisation? (eg. 0% = no change required)

Name of Other Provider / Value added in %

❒ Administrative areas ________________________________
❒ Buildings ________________________________
❒ Climate ________________________________
❒ Contours ________________________________
❒ Flora & Fauna ________________________________
❒ Geodetic ________________________________
❒ Hydrography ________________________________
❒ Maritime navigation ________________________________
❒ Natural Resources ________________________________
(eg. Forest, water, minerals, soils, vegetation, agriculture, oil)
❒ Ownership (cadastral) ________________________________
❒ Population ________________________________
❒ Property Boundaries (Cadastral) ________________________________
❒ Transport Network ________________________________
❒ Utilities (eg. Power, gas, communication) ________________________________
❒ Other, Please specify ________________________________

2. (22) How satisfied are you generally with provider's datasets?

❒ satisfied ❒ moderate satisfied ❒ neutral ❒ moderate dissatisfied ❒ dissatisfied

B Data Quality

1. (23) Are the datasets you acquired from other data providers compatible with your own system without translation (eg. format)? ❒ Yes ❒ No

- If No, could you please specify general problems and how you solved them?

____

____

2. (24) Do **data providers** supply any of the following information with their dataset to you? *(tick all that apply)*

❒ Accuracy ❒ Disclaimer ❒ Depends on dataset
❒ Maintenance ❒ Metadata ❒ Nothing
❒ Updates ❒ Other, Please specify ________________________

Metadata = information about data, for example when was the data created, by whom, its accuracy and reliability. Metadata aims to provide a standard that enables a consistent way to describe the content and fitness for use of a dataset.

C **Data Access & Cost**

1. (25) What do organisations that provide data to you charge for their datasets?

❒ Do not charge ❒ Per Megabyte of storage ❒ Per parcel of land
❒ Hourly Rate ❒ Per certain scale map ❒ Per polygon
❒ Per mapsheet ❒ Depends on dataset
❒ Depends on User (please explain)____
❒ Others (please specify) ____

Could you please send me a price list if convenient?

D **Legal**

1. (26) Indicate what legal protection means are used by data providers, from whom you buy or get data. *(tick all that apply)*

❒ None ❒ Licenses ❒ Trade Secret
❒ Copyright ❒ Others (please specify) ___________________________

2. (27) Do you sell or distribute providers spatial data, in its original form, to others?

❒ Yes ❒ No ❒ Depends on dataset ❒ Depends on user ❒ Depends on other

If the answer is: Depends on dataset, user or other could you please explain your policy?

____

3. (28) Do you sell or distribute value added providers spatial data to others?

❒ Yes ❒ No ❒ Depends on dataset ❒ Depends on user ❒ Depends on other

If the answer is: Depends on dataset, user or other could you please explain your policy?

____

Finally! **Thank you very much for taking the time to fill in this survey and mailing sample contracts, disclaimers and price lists. The information you have provided will be treated as confidential and the results of this survey will be published, excluding any names, on the following webpage: http://149.171.229.214/survey/results**

Your Contact details:

Your Name	
Organisation	
Section	
State	
Telephone	
Fax	
E-mail	
www webpage	

Would you be happy for me to do any follow up? ❒ Yes ❒ No

If you have any questions meanwhile don't hesitate in contacting me.

Please return the survey to:

Renate Mason
School of Geomatic Engineering
The University of New South Wales
SYDNEY 2052 AUSTRALIA

Ph: 9385 4187
Fax: 9313 7493
E-mail: R.Mason@unsw.edu.au

THE UNIVERSITY OF
NEW SOUTH WALES

Renate Mason
SCHOOL OF GEOMATIC
ENGINEERING

8 October 1998

"Name
Section
Department
Address
City"

Dear "Name",

Renate Mason from the University of New South Wales is conducting a questionnaire type survey and needs your input to enable analysis of the Spatial Data Industry.

This Survey looks at the Quality, Access, Cost and Intellectual Property protection associated with a Spatial Dataset, potentially used in Geographical Information Systems (GIS) or any other Spatial Information System (SIS), in Australia. A spatial dataset may be a layer, theme, or an application (configuration of various themes). A map can be either a layer, theme or an application. A layer may be a map of only arterial roads, a theme may be a map of all sized roads, or houses, while an application may include roads, houses, cadastral boundaries and underground services.

Benefits of Survey:

1. Results of survey will be published in February 1999 on www URL at: **http://149.171.229.214/survey/results**
2. "List of Disclaimers" and "Checklist for Licenses" will also be published on the same webpage;
3. Help research student;
4. Help to provide answers for the industry, research and enable development of future policies.

Instructions:
Please complete this questionnaire, tick ☑ the appropriate boxes and return the completed form by fax, mail or e-mail to the address below. If convenient could you also send sample copies of blank licence contracts and disclaimers you use to enable the development of "examples of disclaimers and a checklist for good practice license contracts".

Complete this **hardcopy** questionnaire and return it to the address below **or** fill it in directly at the following www **URL**: **http://149.171.229.214/survey/questionnaire** by 23 October 1998.

Renate Mason — Ph: 9385 4187
School of Geomatic Engineering — Fax: 9313 7493
The University of New South Wales — E-mail: R.Mason@unsw.edu.au
SYDNEY 2052 AUSTRALIA

Thank you very much for taking the time to help with this survey.

Yours sincerely

Renate Mason

Appendix 2

Samples of Respondent Numbers and Graphs of the Spatial Data Survey

Appendix 2

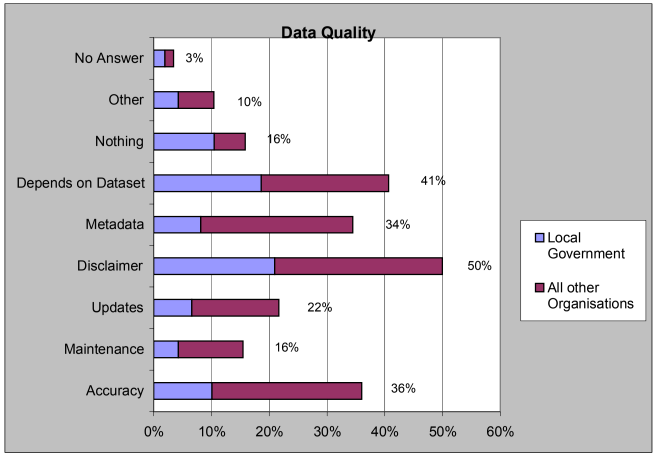
II. Spatial Data Provider Questions

A. DATA QUALITY

Question 1: Additional info provided with data-set

2 groups		
Accuracy	93	36%
Maintenance	40	16%
Updates	56	22%
Disclaimer	129	50%
Metadata	89	34%
Depends on Dataset	105	41%
Nothing	41	16%
Other	27	10%
No Answer	9	3%
Total	589	
258-589	-331	-128%
Data Provider	22	
Both	236	
Total	258	100%

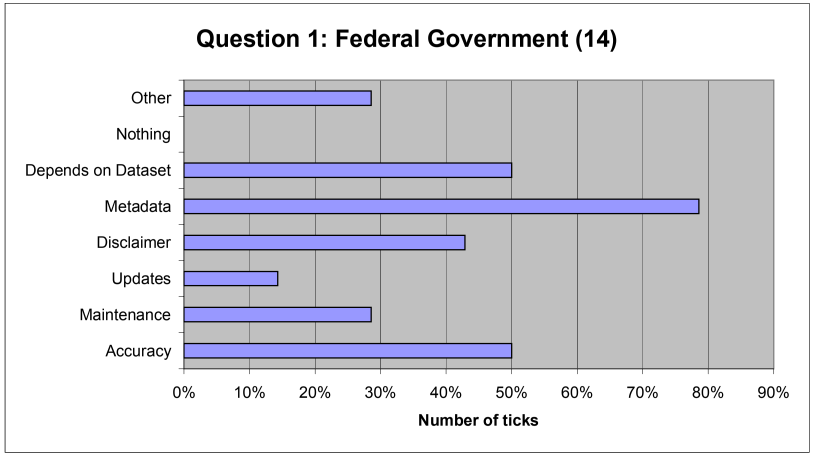
	LG	Rest		Local (	All othe	All other Organisations
Accuracy	26	67	Accura	10%	26%	
Maintenance	11	29	Mainte	4%	11%	
Updates	17	39	Update	7%	15%	
Disclaimer	54	75	Disclai	21%	29%	
Metadata	21	68	Metada	8%	26%	
Depends on Dataset	48	57	Depen	19%	22%	
Nothing	27	14	Nothin	10%	5%	
Other	11	16	Other	4%	6%	
No Answer	5	4	No Ans	2%	2%	
Total	220	369	589			
	-103	-228		-40%	-88%	
Total	117	141		45%	55%	
					100%	

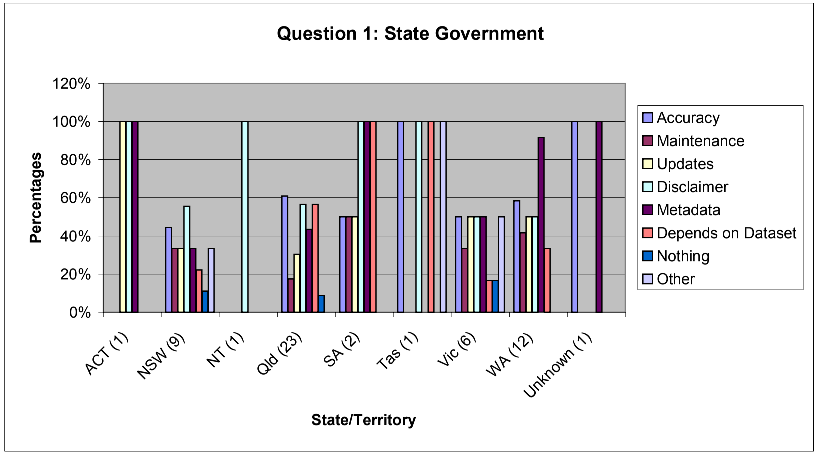


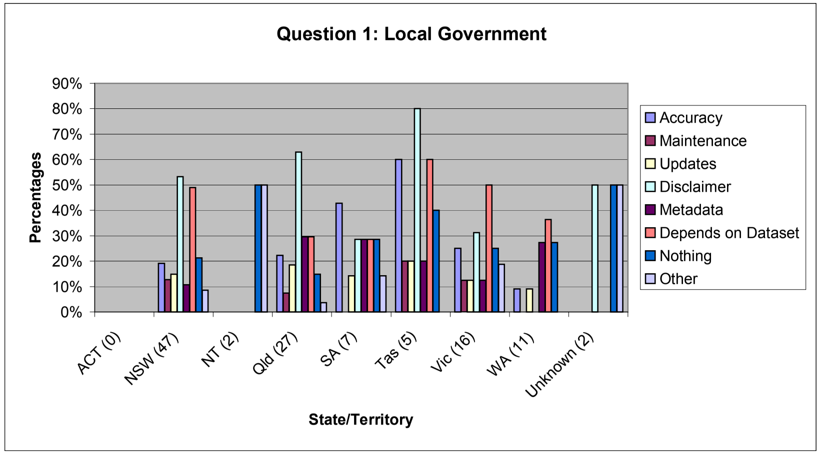
4 groups

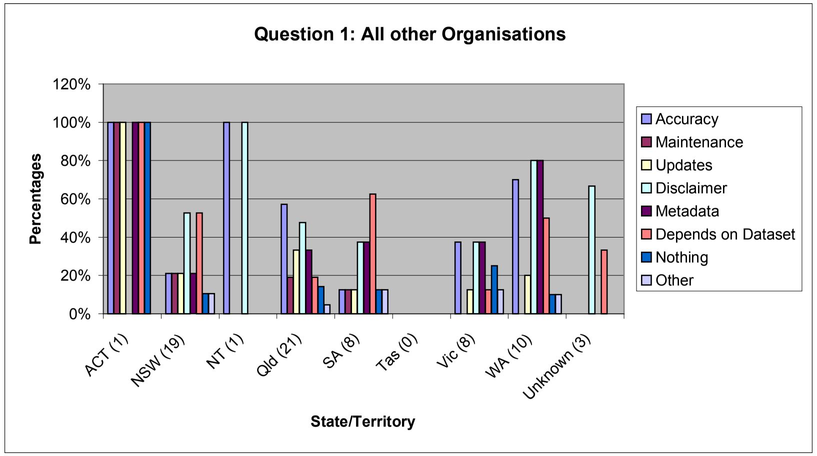
Question 1	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Unknown	Subtotal	%
Federal G.										14	100%
Accuracy										7	50%
Maintenance										4	29%
Updates										2	14%
Disclaimer										6	43%
Metadata										11	79%
Depends on Dataset										7	50%
Nothing										0	0%
Other										4	29%
State G.	**1**	**9**	**1**	**23**	**2**	**1**	**6**	**12**	**1**	56	100%
Accuracy	0	4	0	14	1	1	3	7	1	31	55%
Maintenance	0	3	0	4	1	0	2	5	0	15	27%
Updates	1	3	0	7	1	0	3	6	0	21	38%
Disclaimer	1	5	1	13	2	1	3	6	0	32	57%
Metadata	1	3	0	10	2	0	3	11	1	31	55%
Depends on Dataset	0	2	0	13	2	1	1	4	0	23	41%
Nothing	0	1	0	2	0	0	1	0	0	4	7%
Other	0	3	0	0	0	1	3	0	0	7	13%
Local G.	**0**	**47**	**2**	**27**	**7**	**5**	**16**	**11**	**2**	117	100%
Accuracy	\	9	0	6	3	3	4	1	0	26	22%
Maintenance	\	6	0	2	0	1	2	0	0	11	9%
Updates	\	7	0	5	1	1	2	1	0	17	15%
Disclaimer	\	25	0	17	2	4	5	0	1	54	46%
Metadata	\	5	0	8	2	1	2	3	0	21	18%
Depends on Dataset	\	23	0	8	2	3	8	4	0	48	41%
Nothing	\	10	1	4	2	2	4	3	1	27	23%
Other	\	4	1	1	1	0	3	0	1	11	9%
All Other	**1**	**19**	**1**	**21**	**8**	**0**	**8**	**10**	**3**	71	100%
Accuracy	1	4	1	12	1	\	3	7	0	29	41%
Maintenance	1	4	0	4	1	\	0	0	0	10	14%
Updates	1	4	0	7	1	\	1	2	0	16	23%
Disclaimer	0	10	1	10	3	\	3	8	2	37	52%
Metadata	1	4	0	7	3	\	3	8	0	26	37%
Depends on Dataset	1	10	0	4	5	\	1	5	1	27	38%
Nothing	1	2	0	3	1	\	2	1	0	10	14%
Other	0	2	0	1	1	\	1	1	0	6	8%
Total	**2**	**75**	**4**	**71**	**17**	**6**	**30**	**33**	**6**	244	100%
Accuracy	**1**	**17**	**1**	**32**	**5**	**4**	**10**	**15**	**1**	86	33%
Maintenance	**1**	**13**	**0**	**10**	**2**	**1**	**4**	**5**	**0**	36	14%
Updates	**2**	**14**	**0**	**19**	**3**	**1**	**6**	**9**	**0**	54	21%
Disclaimer	**1**	**40**	**2**	**40**	**7**	**5**	**11**	**14**	**3**	123	48%
Metadata	**2**	**12**	**0**	**25**	**7**	**1**	**8**	**22**	**1**	78	30%
Depends on Dataset	**1**	**35**	**0**	**25**	**9**	**4**	**10**	**13**	**1**	98	38%
Nothing	**1**	**13**	**1**	**9**	**3**	**2**	**7**	**4**	**1**	41	16%
Other	**0**	**9**	**1**	**2**	**2**	**1**	**7**	**1**	**1**	24	9%

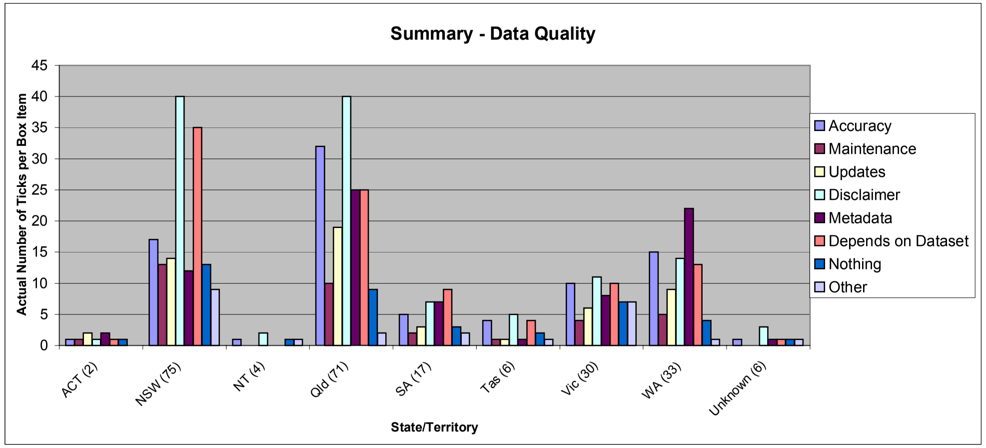
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	nknown
Federal G.									
Accuracy									
Maintenance									
Updates									
Disclaimer									
Metadata									
Depends on Dataset									
Nothing									
Other									
State G.	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Accuracy	0%	44%	0%	61%	50%	100%	50%	58%	100%
Maintenance	0%	33%	0%	17%	50%	0%	33%	42%	0%
Updates	100%	33%	0%	30%	50%	0%	50%	50%	0%
Disclaimer	100%	56%	100%	57%	100%	100%	50%	50%	0%
Metadata	100%	33%	0%	43%	100%	0%	50%	92%	100%
Depends on Dataset	0%	22%	0%	57%	100%	100%	17%	33%	0%
Nothing	0%	11%	0%	9%	0%	0%	17%	0%	0%
Other	0%	33%	0%	0%	0%	100%	50%	0%	0%
Local G.	**0%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Accuracy	\	19%	0%	22%	43%	60%	25%	9%	0%
Maintenance	\	13%	0%	7%	0%	20%	13%	0%	0%
Updates	\	15%	0%	19%	14%	20%	13%	9%	0%
Disclaimer	\	53%	0%	63%	29%	80%	31%	0%	50%
Metadata	\	11%	0%	30%	29%	20%	13%	27%	0%
Depends on Dataset	\	49%	0%	30%	29%	60%	50%	36%	0%
Nothing	\	21%	50%	15%	29%	40%	25%	27%	50%
Other	\	9%	50%	4%	14%	0%	19%	0%	50%
All Other	**100%**	**100%**	**100%**	**100%**	**100%**	**0%**	**100%**	**100%**	**100%**
Accuracy	100%	21%	100%	57%	13%	\	38%	70%	0%
Maintenance	100%	21%	0%	19%	13%	\	0%	0%	0%
Updates	100%	21%	0%	33%	13%	\	13%	20%	0%
Disclaimer	0%	53%	100%	48%	38%	\	38%	80%	67%
Metadata	100%	21%	0%	33%	38%	\	38%	80%	0%
Depends on Dataset	100%	53%	0%	19%	63%	\	13%	50%	33%
Nothing	100%	11%	0%	14%	13%	\	25%	10%	0%
Other	0%	11%	0%	5%	13%	\	13%	10%	0%


Question 1: Federal Government (14)
Other
Nothing
Depends on Dataset
Metadata
Disclaimer
Updates
Maintenance
Accuracy
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
Number of ticks


Question 1: State Government
Percentages
120%
100%
80%
60%
40%
20%
0%
ACT (1)
NSW (9)
NT (1)
Qld (23)
SA (2)
Tas (1)
Vic (6)
WA (12)
Unknown (1)
State/Territory
Accuracy
Maintenance
Updates
Disclaimer
Metadata
Depends on Dataset
Nothing
Other


Question 1: Local Government
Percentages
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
ACT (0)
NSW (47)
NT (2)
Qld (27)
SA (7)
Tas (5)
Vic (16)
WA (11)
Unknown (2)
State/Territory
Accuracy
Maintenance
Updates
Disclaimer
Metadata
Depends on Dataset
Nothing
Other

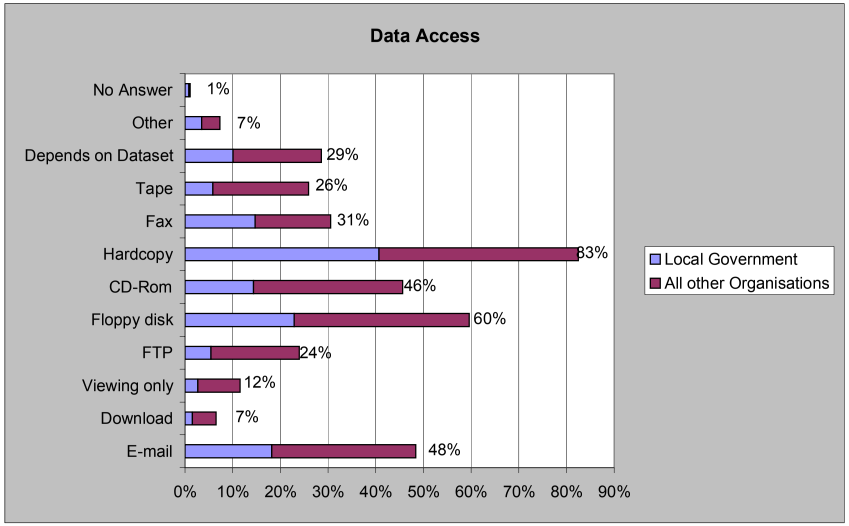

Question 1: All other Organisations
Percentages
120%
100%
80%
60%
40%
20%
0%
ACT (1)
NSW (19)
NT (1)
Qld (21)
SA (8)
Tas (0)
Vic (8)
WA (10)
Unknown (3)
State/Territory
Accuracy
Maintenance
Updates
Disclaimer
Metadata
Depends on Dataset
Nothing
Other



B. DATA ACCESS & COST

Question 1: Data access?

2 groups					LG	Rest	Local (	All other Organisations
E-mail	125	48%	E-mail	48%	47	-47	18%	30%
Download	17	7%	Downl(	7%	4	-4	2%	5%
Viewing only	30	12%	Viewin	12%	7	-7	3%	9%
FTP	62	24%	FTP	24%	14	-14	5%	19%
Floppy disk	154	60%	Floppy	60%	59	-59	23%	37%
CD-Rom	118	46%	CD-Ro	46%	37	-37	14%	31%
Hardcopy	213	83%	Hardcc	83%	105	-105	41%	42%
Fax	79	31%	Fax	31%	38	-38	15%	16%
Tape	67	26%	Tape	26%	15	-15	6%	20%
Depends on Dataset	74	29%	Depen	29%	26	-26	10%	19%
Other	19	7%	Other	7%	9	-9	3%	4%
No Answer	3	1%	No Ans	1%	2	1	1%	0%
Total	961				363	-360		
258-958	-703	-272%			-246	243	-95%	-177%
Total Provider & Both	258	100%			117	-117	45%	55%
								100%

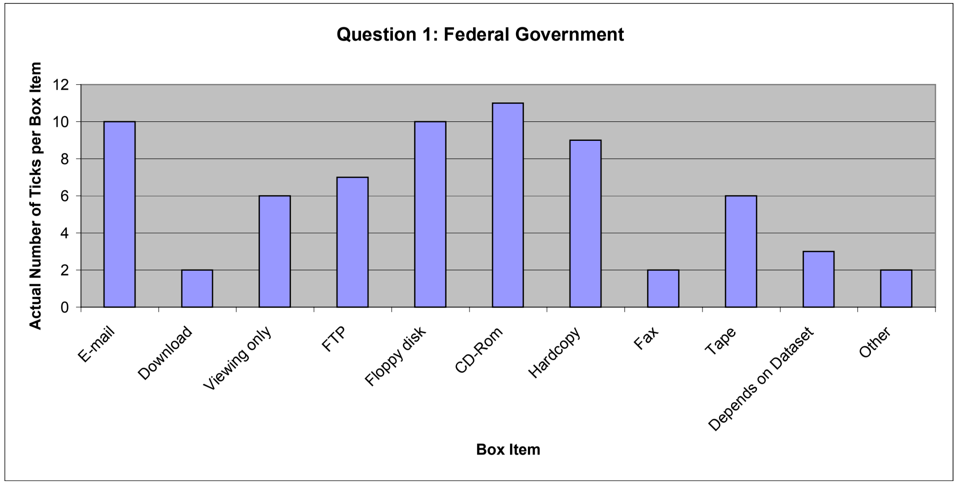


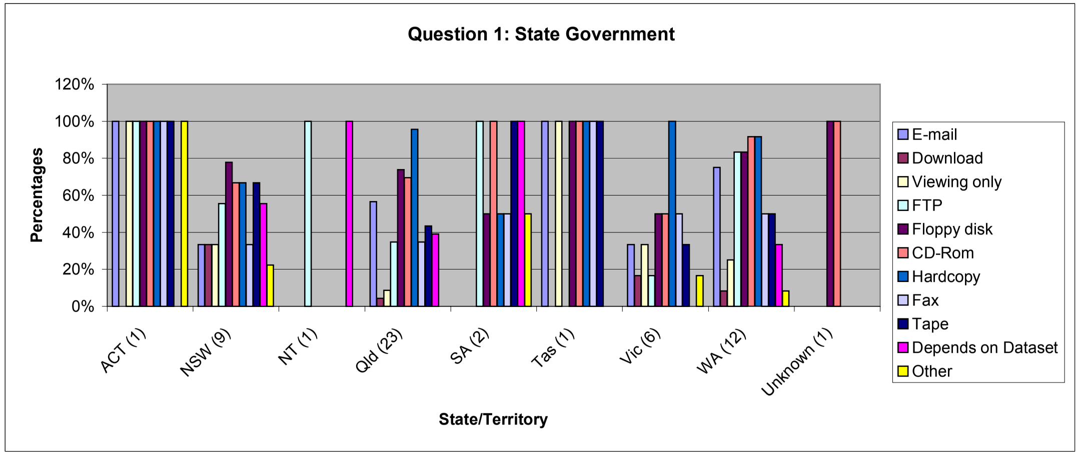
4 groups

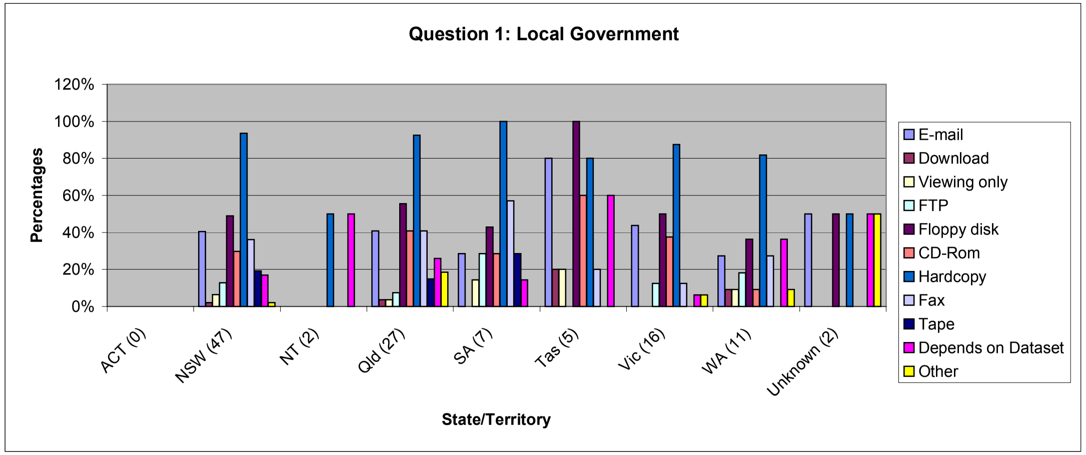
Question 1	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Unknown	Subtotal	%
Federal G.										14	100%
E-mail										10	71%
Download										2	14%
Viewing only										6	43%
FTP										7	50%
Floppy disk										10	71%
CD-Rom										11	79%
Hardcopy										9	64%
Fax										2	14%
Tape										6	43%
Depends on Dataset										3	21%
Other										2	14%
State G.	**1**	**9**	**1**	**23**	**2**	**1**	**6**	**12**	**1**	56	100%
E-mail	1	3	0	13	0	1	2	9	0	29	52%
Download	0	3	0	1	0	0	1	1	0	6	11%
Viewing only	1	3	0	2	0	1	2	3	0	12	21%
FTP	1	5	1	8	2	0	1	10	0	28	50%
Floppy disk	1	7	0	17	1	1	3	10	1	41	73%
CD-Rom	1	6	0	16	2	1	3	11	1	41	73%
Hardcopy	1	6	0	22	1	1	6	11	0	48	86%
Fax	1	3	0	8	1	1	3	6	0	23	41%
Tape	1	6	0	10	2	1	2	6	0	28	50%
Depends on Dataset	0	5	1	9	2	0	0	4	0	21	38%
Other	1	2	0	0	1	0	1	1	0	6	11%
Local G.	**0**	**47**	**2**	**27**	**7**	**5**	**16**	**11**	**2**	117	100%
E-mail	\	19	0	11	2	4	7	3	1	47	40%
Download	\	1	0	1	0	1	0	1	0	4	3%
Viewing only	\	3	0	1	1	1	0	1	0	7	6%
FTP	\	6	0	2	2	0	2	2	0	14	12%
Floppy disk	\	23	0	15	3	5	8	4	1	59	50%
CD-Rom	\	14	0	11	2	3	6	1	0	37	32%
Hardcopy	\	44	1	25	7	4	14	9	1	105	90%
Fax	\	17	0	11	4	1	2	3	0	38	32%
Tape	\	9	0	4	2	0	0	0	0	15	13%
Depends on Dataset	\	8	1	7	1	3	1	4	1	26	22%
Other	\	1	0	5	0	0	1	1	1	9	8%
All Other	**1**	**19**	**1**	**21**	**8**	**0**	**8**	**10**	**3**	71	100%
E-mail	1	13	1	9	3	\	4	7	1	39	55%
Download	0	3	0	0	1	\	1	0	0	5	7%
Viewing only	0	3	0	1	1	\	0	0	0	5	7%
FTP	1	5	0	1	3	\	1	2	0	13	18%
Floppy disk	1	15	1	12	3	\	5	7	0	44	62%
CD-Rom	0	6	0	10	4	\	2	6	1	29	41%
Hardcopy	1	12	1	14	6	\	6	9	2	51	72%
Fax	0	6	1	4	0	\	3	2	0	16	23%
Tape	0	6	0	5	2	\	1	4	0	18	25%
Depends on Dataset	1	5	0	6	5	\	1	5	1	24	34%
Other	0	0	0	2	0	\	0	1	0	3	4%

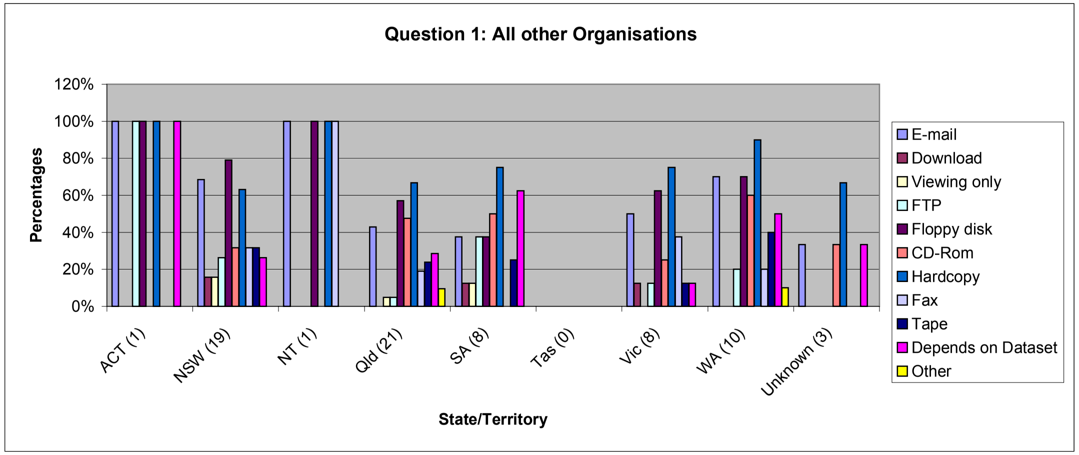
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	nknown
Federal G.									
E-mail									
Download									
Viewing only									
FTP									
Floppy disk									
CD-Rom									
Hardcopy									
Fax									
Tape									
Depends on Dataset									
Other									
State G.	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
E-mail	100%	33%	0%	57%	0%	100%	33%	75%	0%
Download	0%	33%	0%	4%	0%	0%	17%	8%	0%
Viewing only	100%	33%	0%	9%	0%	100%	33%	25%	0%
FTP	100%	56%	100%	35%	100%	0%	17%	83%	0%
Floppy disk	100%	78%	0%	74%	50%	100%	50%	83%	100%
CD-Rom	100%	67%	0%	70%	100%	100%	50%	92%	100%
Hardcopy	100%	67%	0%	96%	50%	100%	100%	92%	0%
Fax	100%	33%	0%	35%	50%	100%	50%	50%	0%
Tape	100%	67%	0%	43%	100%	100%	33%	50%	0%
Depends on Dataset	0%	56%	100%	39%	100%	0%	0%	33%	0%
Other	100%	22%	0%	0%	50%	0%	17%	8%	0%
Local G.	**0%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
E-mail	\	40%	0%	41%	29%	80%	44%	27%	50%
Download	\	2%	0%	4%	0%	20%	0%	9%	0%
Viewing only	\	6%	0%	4%	14%	20%	0%	9%	0%
FTP	\	13%	0%	7%	29%	0%	13%	18%	0%
Floppy disk	\	49%	0%	56%	43%	100%	50%	36%	50%
CD-Rom	\	30%	0%	41%	29%	60%	38%	9%	0%
Hardcopy	\	94%	50%	93%	100%	80%	88%	82%	50%
Fax	\	36%	0%	41%	57%	20%	13%	27%	0%
Tape	\	19%	0%	15%	29%	0%	0%	0%	0%
Depends on Dataset	\	17%	50%	26%	14%	60%	6%	36%	50%
Other	\	2%	0%	19%	0%	0%	6%	9%	50%
All Other	**100%**	**100%**	**100%**	**100%**	**100%**	**0%**	**100%**	**100%**	**100%**
E-mail	100%	68%	100%	43%	38%	\	50%	70%	33%
Download	0%	16%	0%	0%	13%	\	13%	0%	0%
Viewing only	0%	16%	0%	5%	13%	\	0%	0%	0%
FTP	100%	26%	0%	5%	38%	\	13%	20%	0%
Floppy disk	100%	79%	100%	57%	38%	\	63%	70%	0%
CD-Rom	0%	32%	0%	48%	50%	\	25%	60%	33%
Hardcopy	100%	63%	100%	67%	75%	\	75%	90%	67%
Fax	0%	32%	100%	19%	0%	\	38%	20%	0%
Tape	0%	32%	0%	24%	25%	\	13%	40%	0%
Depends on Dataset	100%	26%	0%	29%	63%	\	13%	50%	33%
Other	0%	0%	0%	10%	0%	\	0%	10%	0%

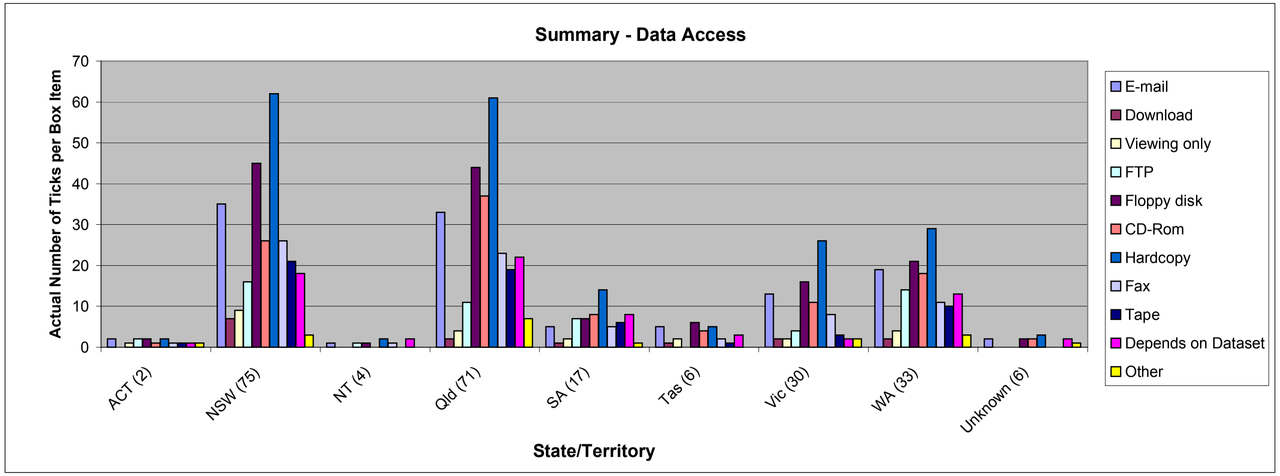
Total	**2**	**75**	**4**	**71**	**17**	**6**	**30**	**33**	**6**	244	100%
E-mail	**2**	**35**	**1**	**33**	**5**	**5**	**13**	**19**	**2**	115	45%
Download	**0**	**7**	**0**	**2**	**1**	**1**	**2**	**2**	**0**	15	6%
Viewing only	**1**	**9**	**0**	**4**	**2**	**2**	**2**	**4**	**0**	24	9%
FTP	**2**	**16**	**1**	**11**	**7**	**0**	**4**	**14**	**0**	55	21%
Floppy disk	**2**	**45**	**1**	**44**	**7**	**6**	**16**	**21**	**2**	144	56%
CD-Rom	**1**	**26**	**0**	**37**	**8**	**4**	**11**	**18**	**2**	107	41%
Hardcopy	**2**	**62**	**2**	**61**	**14**	**5**	**26**	**29**	**3**	204	79%
Fax	**1**	**26**	**1**	**23**	**5**	**2**	**8**	**11**	**0**	77	30%
Tape	**1**	**21**	**0**	**19**	**6**	**1**	**3**	**10**	**0**	61	24%
Depends on Dataset	**1**	**18**	**2**	**22**	**8**	**3**	**2**	**13**	**2**	71	28%
Other	**1**	**3**	**0**	**7**	**1**	**0**	**2**	**3**	**1**	18	7%




Question 1: State Government
Percentages
120%
100%
80%
60%
40%
20%
0%
ACT (1)
NSW (9)
NT (1)
Qld (23)
SA (2)
Tas (1)
Vic (6)
WA (12)
Unknown (1)
State/Territory
E-mail
Download
Viewing only
FTP
Floppy disk
CD-Rom
Hardcopy
Fax
Tape
Depends on Dataset
Other


Question 1: Local Government
Percentages
120%
100%
80%
60%
40%
20%
0%
ACT (0)
NSW (47)
NT (2)
Qld (27)
SA (7)
Tas (5)
Vic (16)
WA (11)
Unknown (2)
State/Territory
E-mail
Download
Viewing only
FTP
Floppy disk
CD-Rom
Hardcopy
Fax
Tape
Depends on Dataset
Other


Question 1: All other Organisations
120%
100%
80%
60%
40%
20%
0%
Percentages
ACT (1)
NSW (19)
NT (1)
Qld (21)
SA (8)
Tas (0)
Vic (8)
WA (10)
Unknown (3)
State/Territory
E-mail
Download
Viewing only
FTP
Floppy disk
CD-Rom
Hardcopy
Fax
Tape
Depends on Dataset
Other


Summary - Data Access
70
60
50
40
30
20
10
0
Actual Number of Ticks per Box Item
ACT (2)
NSW (75)
NT (4)
Qld (71)
SA (17)
Tas (6)
Vic (30)
WA (33)
Unknown (6)
State/Territory
E-mail
Download
Viewing only
FTP
Floppy disk
CD-Rom
Hardcopy
Fax
Tape
Depends on Dataset
Other

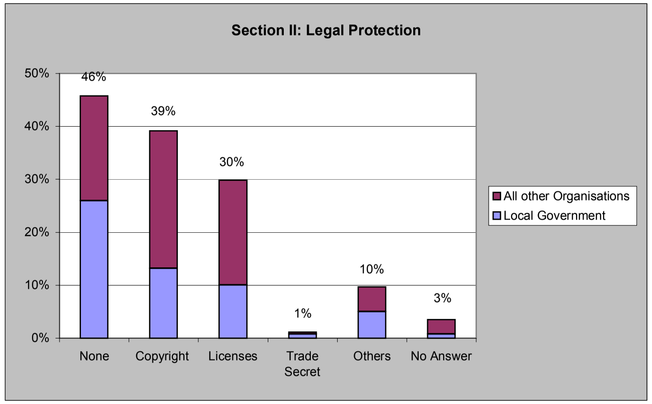
C. LEGAL

Question 4: What legal protection does your organisation utilise for its datasets?

2 groups

None	118	46%
Copyright	101	39%
Licenses	77	30%
Trade Secret	3	1%
Others	25	10%
No Answer	9	3%
Total	333	
258-324	-75	-29%
Total	258	100%

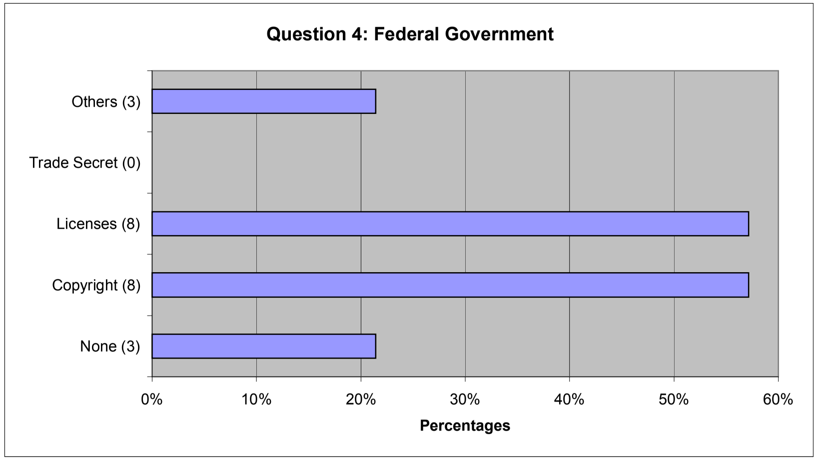
	All	**LG**	**Rest**		Local (	All other Organisations
None	118	67	51	None	26%	20%
Copyright	101	34	67	Copyri	13%	26%
Licenses	77	26	51	Licens	10%	20%
Trade Secret	3	2	1	Trade :	1%	0%
Others	25	13	12	Others	5%	5%
No Answer	9	2	7	No Ans	1%	3%
Total	333	144	182	Total		
	-75	-27	-48		-10%	-19%
Total	258	117	134	Total	45%	55%
						100%

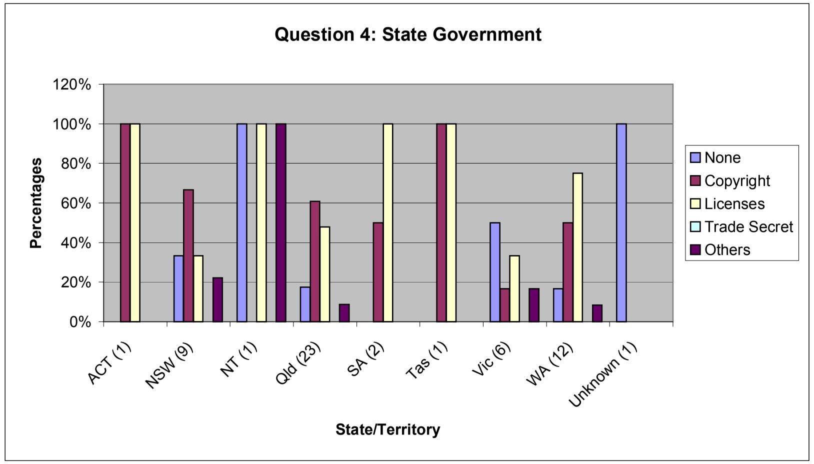


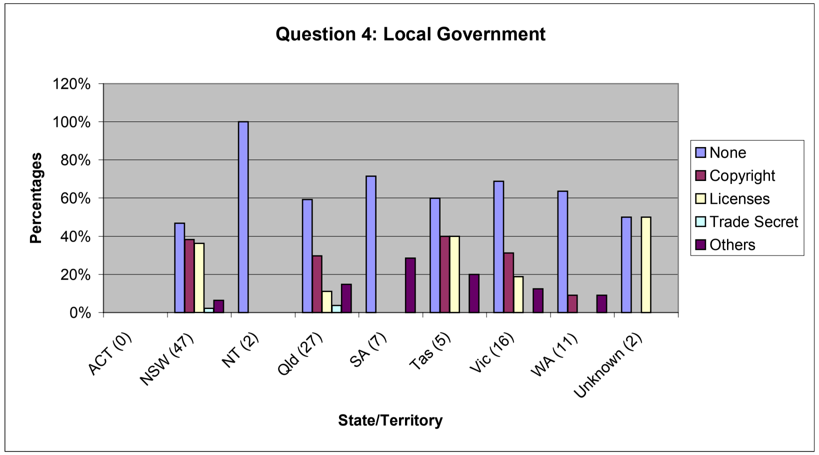
4 groups

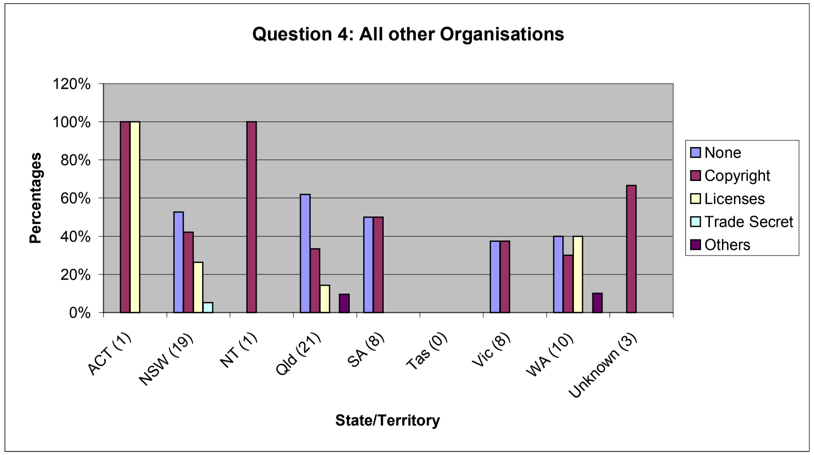
Question 4	**ACT**	**NSW**	**NT**	**Qld**	**SA**	**Tas**	**Vic**	**WA**	**Unknown**		
Federal G.										14	
None										3	21%
Copyright										8	57%
Licenses										8	57%
Trade Secret										0	0%
Others										3	21%
State G.	**1**	**9**	**1**	**23**	**2**	**1**	**6**	**12**	**1**	56	
None	0	3	1	4	0	0	3	2	1	14	25%
Copyright	1	6	0	14	1	1	1	6	0	30	54%
Licenses	1	3	1	11	2	1	2	9	0	30	54%
Trade Secret	0	0	0	0	0	0	0	0	0	0	0%
Others	0	2	1	2	0	0	1	1	0	7	13%
Local G.	**0**	**47**	**2**	**27**	**7**	**5**	**16**	**11**	**2**	117	
None	\	22	2	16	5	3	11	7	1	67	57%
Copyright	\	18	0	8	0	2	5	1	0	34	29%
Licenses	\	17	0	3	0	2	3	0	1	26	22%
Trade Secret	\	1	0	1	0	0	0	0	0	2	2%
Others	\	3	0	4	2	1	2	1	0	13	11%
All Other	**1**	**19**	**1**	**21**	**8**	**0**	**8**	**10**	**3**	71	
None	0	10	0	13	4	\	3	4	0	34	48%
Copyright	1	8	1	7	4	\	3	3	2	29	41%
Licenses	1	5	0	3	0	\	0	4	0	13	18%
Trade Secret	0	1	0	0	0	\	0	0	0	1	1%
Others	0	0	0	2	0	\	0	1	0	3	4%
Total	**2**	**75**	**4**	**71**	**17**	**6**	**30**	**33**	**6**	244	
None	**0**	**35**	**3**	**33**	**9**	**3**	**17**	**13**	**2**	115	45%
Copyright	**2**	**32**	**1**	**29**	**5**	**3**	**9**	**10**	**2**	93	36%
Licenses	**2**	**25**	**1**	**17**	**2**	**3**	**5**	**13**	**1**	69	27%
Trade Secret	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	3	1%
Others	**0**	**5**	**1**	**8**	**2**	**1**	**3**	**3**	**0**	23	9%
Check	**4**	**99**	**6**	**88**	**18**	**10**	**34**	**39**	**5**	303	

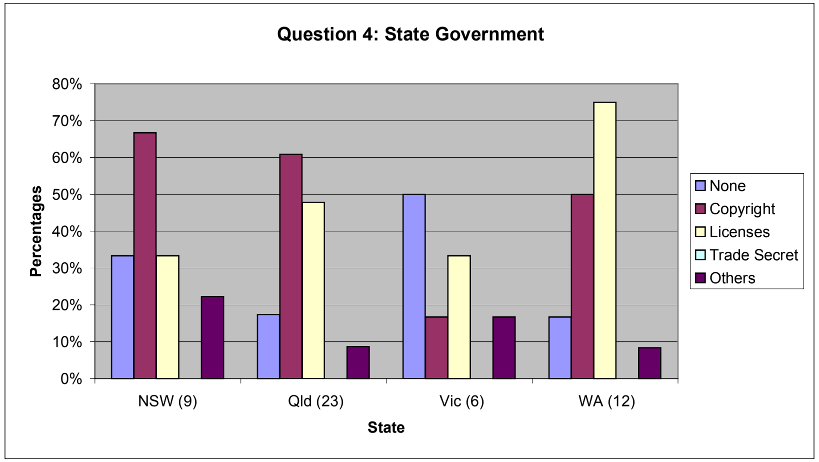
	ACT	**NSW**	**NT**	**Qld**	**SA**	**Tas**	**Vic**	**WA**	**nknown**
Federal G.									
None									
Copyright									
Licenses									
Trade Secret									
Others									
State G.	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
None	0%	33%	100%	17%	0%	0%	50%	17%	100%
Copyright	100%	67%	0%	61%	50%	100%	17%	50%	0%
Licenses	100%	33%	100%	48%	100%	100%	33%	75%	0%
Trade Secret	0%	0%	0%	0%	0%	0%	0%	0%	0%
Others	0%	22%	100%	9%	0%	0%	17%	8%	0%
Local G.	**0%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
None	\	47%	100%	59%	71%	60%	69%	64%	50%
Copyright	\	38%	0%	30%	0%	40%	31%	9%	0%
Licenses	\	36%	0%	11%	0%	40%	19%	0%	50%
Trade Secret	\	2%	0%	4%	0%	0%	0%	0%	0%
Others	\	6%	0%	15%	29%	20%	13%	9%	0%
All Other	**100%**	**100%**	**100%**	**100%**	**100%**	**0%**	**100%**	**100%**	**100%**
None	0%	53%	0%	62%	50%	\	38%	40%	0%
Copyright	100%	42%	100%	33%	50%	\	38%	30%	67%
Licenses	100%	26%	0%	14%	0%	\	0%	40%	0%
Trade Secret	0%	5%	0%	0%	0%	\	0%	0%	0%
Others	0%	0%	0%	10%	0%	\	0%	10%	0%

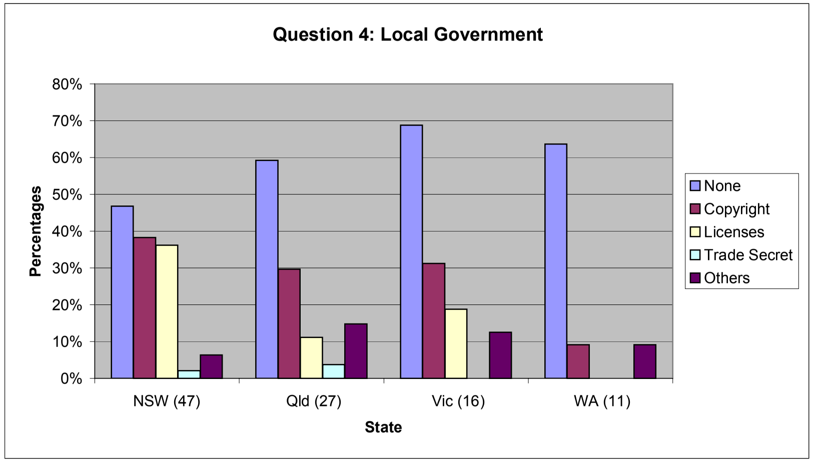

Question 4: Federal Government
Others (3)
Trade Secret (0)
Licenses (8)
Copyright (8)
None (3)
0%
10%
20%
30%
40%
50%
60%
Percentages

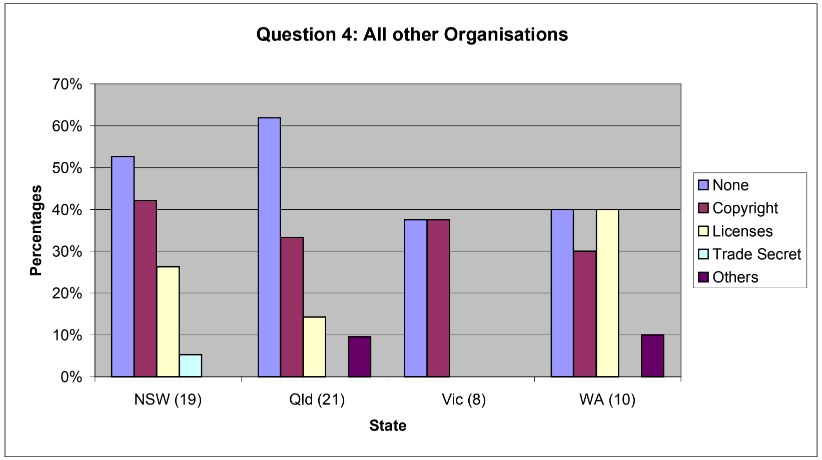

Question 4: State Government
120%
100%
80%
60%
40%
20%
0%
Percentages
ACT (1)
NSW (9)
NT (1)
Qld (23)
SA (2)
Tas (1)
Vic (6)
WA (12)
Unknown (1)
State/Territory
None
Copyright
Licenses
Trade Secret
Others

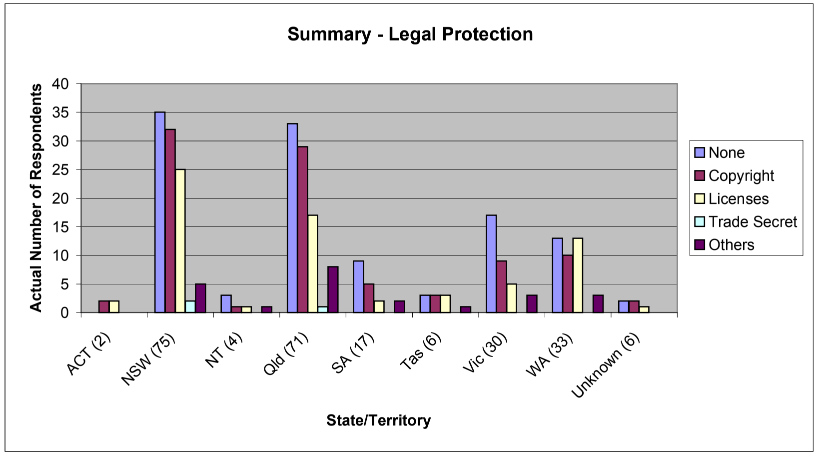

Question 4: Local Government
120%
100%
80%
60%
40%
20%
0%
Percentages
ACT (0)
NSW (47)
NT (2)
Qld (27)
SA (7)
Tas (5)
Vic (16)
WA (11)
Unknown (2)
State/Territory
None
Copyright
Licenses
Trade Secret
Others


Question 4: All other Organisations
120%
100%
80%
60%
40%
20%
0%
Percentages
ACT (1)
NSW (19)
NT (1)
Qld (21)
SA (8)
Tas (0)
Vic (8)
WA (10)
Unknown (3)
State/Territory
None
Copyright
Licenses
Trade Secret
Others


Question 4: State Government
Percentages
80%
70%
60%
50%
40%
30%
20%
10%
0%
NSW (9)
Qld (23)
Vic (6)
WA (12)
State
None
Copyright
Licenses
Trade Secret
Others


Question 4: Local Government
Percentages
80%
70%
60%
50%
40%
30%
20%
10%
0%
NSW (47)
Qld (27)
Vic (16)
WA (11)
State
None
Copyright
Licenses
Trade Secret
Others


Question 4: All other Organisations
Percentages
70%
60%
50%
40%
30%
20%
10%
0%
NSW (19)
Qld (21)
Vic (8)
WA (10)
State
None
Copyright
Licenses
Trade Secret
Others


Summary - Legal Protection
Actual Number of Respondents
40
35
30
25
20
15
10
5
0
ACT (2)
NSW (75)
NT (4)
Qld (71)
SA (17)
Tas (6)
Vic (30)
WA (33)
Unknown (6)
State/Territory
None
Copyright
Licenses
Trade Secret
Others

III. Spatial Data User Questions

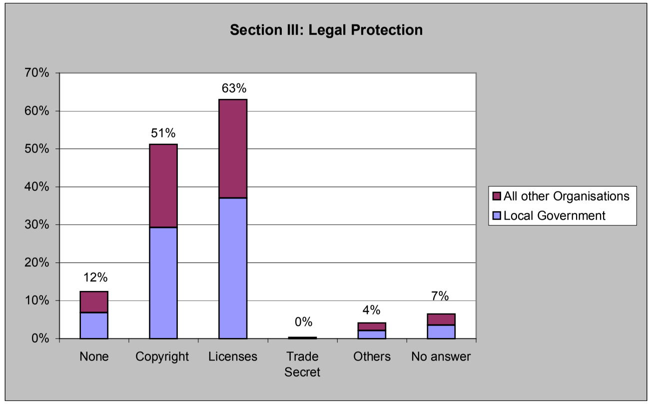
D. LEGAL

Question 1: What legal protection does your data provider utilise for his datasets?

2 groups

None	42	12%
Copyright	173	51%
Licenses	213	63%
Trade Secret	1	0%
Others	14	4%
No answer	22	7%
Subtotal	465	
338-465	-127	-38%
Total	338	100%

	LG	Rest		Local (	All other Organisations
None	23	19	None	7%	6%
Copyright	99	74	Copyri	29%	22%
Licenses	125	88	Licens	37%	26%
Trade Secret	1	0	Trade :	0%	0%
Others	7	7	Others	2%	2%
No answer	12	10	No Ans	4%	3%
Subtotal	267	198	Subtotal		
	-77	-50		-23%	-15%
Total	190	148	Total	56%	44%
					100%

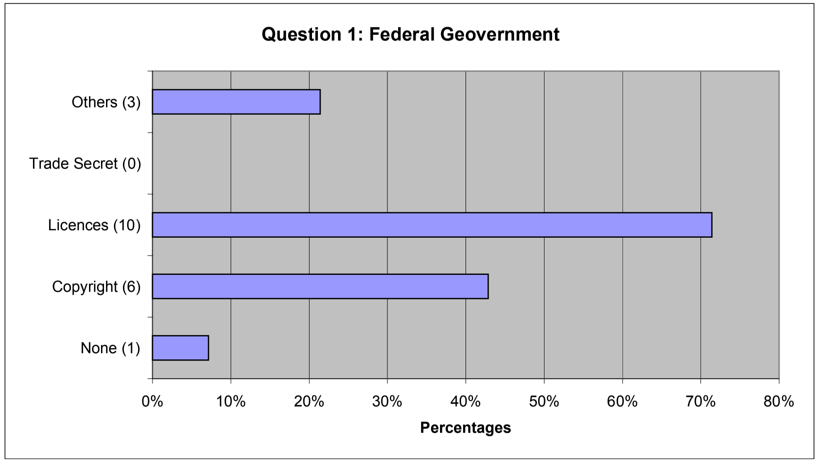


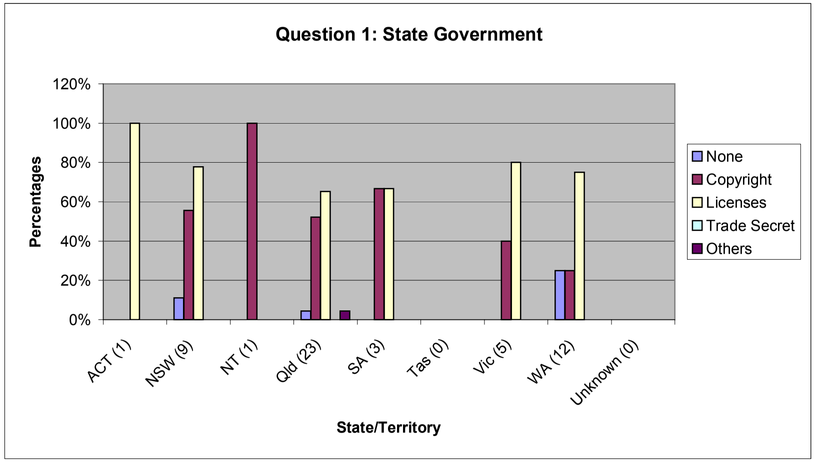
4 groups

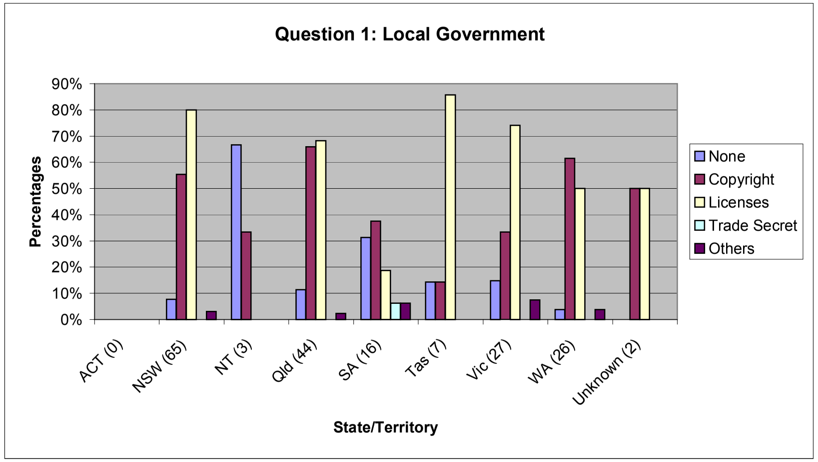
Question 1	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Unknown		
Federal G.										14	
None										1	7%
Copyright										6	43%
Licenses										10	71%
Trade Secret										0	0%
Others										3	21%
State G.	1	9	1	23	3	0	5	12	0	54	
None	0	1	0	1	0	\	0	3	\	5	9%
Copyright	0	5	1	12	2	\	2	3	\	25	46%
Licenses	1	7	0	15	2	\	4	9	\	38	70%
Trade Secret	0	0	0	0	0	\	0	0	\	0	0%
Others	0	0	0	1	0	\	0	0	\	1	2%
Local G.	0	65	3	44	16	7	27	26	2	190	
None	\	5	2	5	5	1	4	1	0	23	12%
Copyright	\	36	1	29	6	1	9	16	1	99	52%
Licenses	\	52	0	30	3	6	20	13	1	125	66%
Trade Secret	\	0	0	0	1	0	0	0	0	1	1%
Others	\	2	0	1	1	0	2	1	0	7	4%
All Other	1	24	0	20	7	0	14	12	2	80	
None	0	6	\	4	1	\	1	1	0	13	16%
Copyright	0	12	\	10	3	\	7	10	1	43	54%
Licenses	1	12	\	10	4	\	5	8	0	40	50%
Trade Secret	0	0	\	0	0	\	0	0	0	0	0%
Others	0	1	\	1	0	\	1	0	0	3	4%
Total	2	98	4	87	26	7	46	50	4	324	
None	0	12	2	10	6	1	5	5	0	41	12%

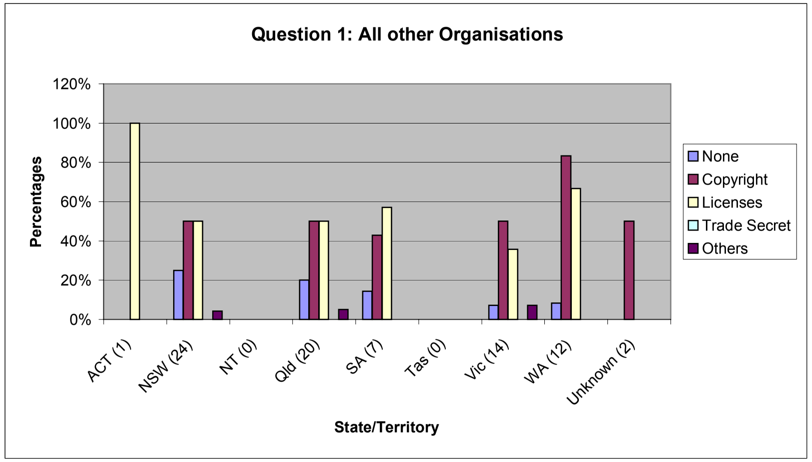
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Unknown
Federal G.									
None									
Copyright									
Licenses									
Trade Secret									
Others									
State G.	100%	100%	100%	100%	100%	0%	100%	100%	0%
None	0%	11%	0%	4%	0%	\	0%	25%	\
Copyright	0%	56%	100%	52%	67%	\	40%	25%	\
Licenses	100%	78%	0%	65%	67%	\	80%	75%	\
Trade Secret	0%	0%	0%	0%	0%	\	0%	0%	\
Others	0%	0%	0%	4%	0%	\	0%	0%	\
Local G.	0%	100%	100%	100%	100%	100%	100%	100%	100%
None	\	8%	67%	11%	31%	14%	15%	4%	0%
Copyright	\	55%	33%	66%	38%	14%	33%	62%	50%
Licenses	\	80%	0%	68%	19%	86%	74%	50%	50%
Trade Secret	\	0%	0%	0%	6%	0%	0%	0%	0%
Others	\	3%	0%	2%	6%	0%	7%	4%	0%
All Other	100%	100%	0%	100%	100%	0%	100%	100%	100%
None	0%	25%	\	20%	14%	\	7%	8%	0%
Copyright	0%	50%	\	50%	43%	\	50%	83%	50%
Licenses	100%	50%	\	50%	57%	\	36%	67%	0%
Trade Secret	0%	0%	\	0%	0%	\	0%	0%	0%
Others	0%	4%	\	5%	0%	\	7%	0%	0%

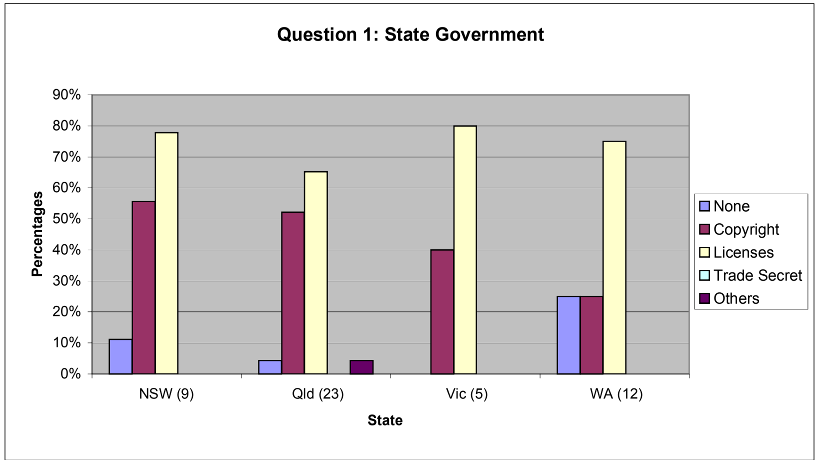
Copyright	0	53	2	51	11	1	18	29	2	167	49%
Licenses	2	71	0	55	9	6	29	30	1	203	60%
Trade Secret	0	0	0	0	1	0	0	0	0	1	0%
Others	0	3	0	3	1	0	3	1	0	11	3%

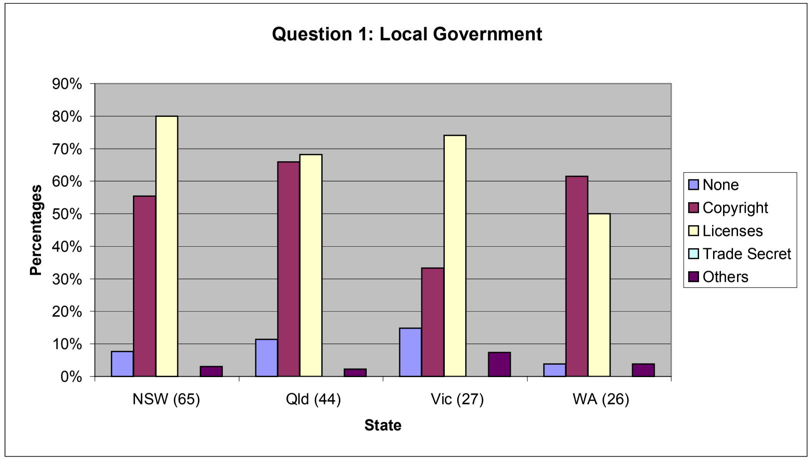


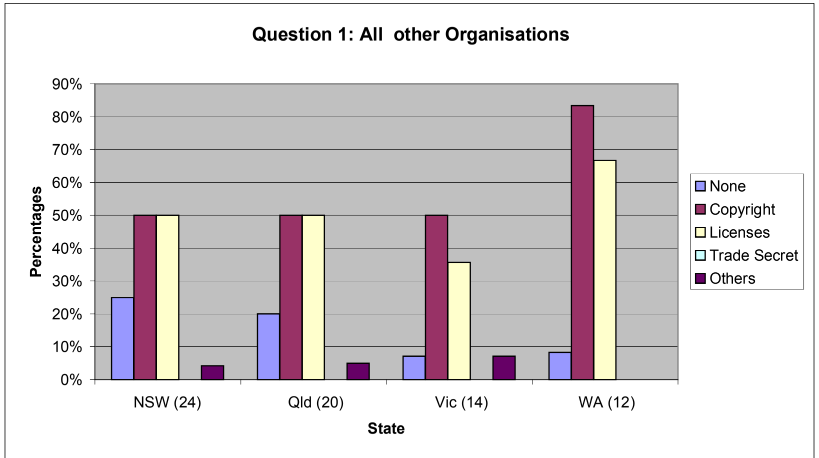


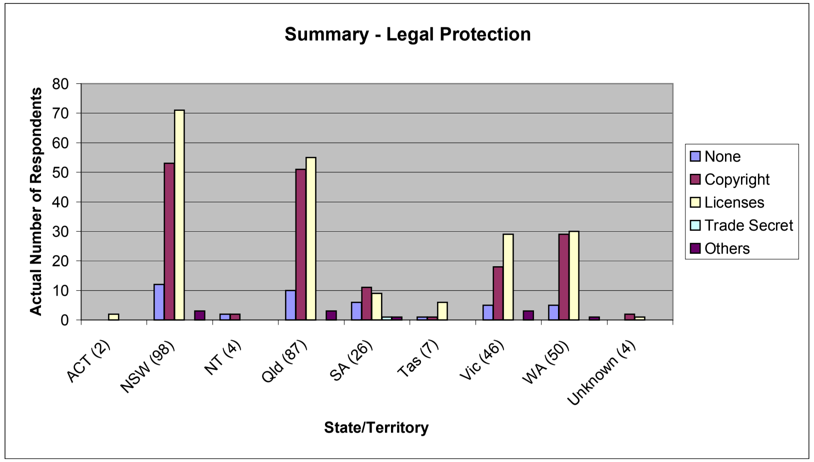





Question 1: State Government
Percentages
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
NSW (9)
Qld (23)
Vic (5)
WA (12)
State
None
Copyright
Licenses
Trade Secret
Others


Question 1: Local Government
Percentages
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
NSW (65)
Qld (44)
Vic (27)
WA (26)
State
None
Copyright
Licenses
Trade Secret
Others


Question 1: All other Organisations
Percentages
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
NSW (24)
Qld (20)
Vic (14)
WA (12)
State
None
Copyright
Licenses
Trade Secret
Others


Summary - Legal Protection
Actual Number of Respondents
80
70
60
50
40
30
20
10
0
ACT (2)
NSW (98)
NT (4)
Qld (87)
SA (26)
Tas (7)
Vic (46)
WA (50)
Unknown (4)
State/Territory
None
Copyright
Licenses
Trade Secret
Others

Appendix 3

ANZLIC – Core Metadata Elements

(Available at: http://www.anzlic.org.au/asdi/metaelem.htm)

Core Metadata Elements

for Land and Geographic Directories in Australia and New Zealand

Following are the introductory sections to the ANZLIC Guidelines on Core Metadata Elements. The complete document is available by FTP. It contains detailed descriptions of each of the core metadata elements together with worked examples. To download the full document click here.

Background

Introduction

ANZLIC's Strategic Plan for 1994 - 1997 outlines strategies to achieve these objectives. The strategy to develop and implement a national land and geographic data directory system for Australia and New Zealand is designed, "to maximise community access to land and geographic information with due regard for issues of privacy and confidentiality." However, successful implementation of a national directory will also contribute in part to the achievement of ANZLIC's other stated objectives.

Metadata is data about data. It is a description of the characteristics of data that has been collected for a specific purpose. If community access to land information is to be maximised, adequate descriptions of the characteristics of all geographically referenced datasets must be available and accessible to the community at large.

A Working Group was formed in April 1995 to work on the following tasks to improve community access to data:

- produce a Metadata Framework paper which identifies and defines the mandatory metadata elements of a national land and geographic data directory system, discussing creation, maintenance and directory custodianship issues;
- using the Metadata Framework paper, promote the concept of a national data directory system to help determine the priorities and issues for implementing a national directory;
- develop an implementation plan for a national data directory system, including procedures for transfer of metadata between jurisdictions and the national directory system;
- develop and circulate for comment, a discussion paper on national guidelines for developing land and geographic data quality, in a form suitable for developing into an Australia/New Zealand standard.

In addition to the above tasks, the Working Group was asked to advise on the feasibility, costs and benefits of developing a public domain, PC-based metadata entry software product to encourage the collection of metadata in the structure recommended by ANZLIC.

Policy on the Transfer of Metadata

In 1994, ANZLIC adopted a policy on the Transfer of Metadata. The Policy is intended to apply to the highest summary level of metadata (called core metadata) used in directory systems at the jurisdiction or national level, and not necessarily to all metadata. The Policy includes the following provisions:

- produce a Metadata Framework paper which identifies and defines the mandatory metadata elements of a national land and geographic data directory system, discussing creation, maintenance and directory custodianship issues;
- jurisdictions will contribute core metadata to the national directory at no cost;
- core metadata will be made available from the national directory to contributing jurisdictions at no cost;

- mechanisms should be established by jurisdictions to allow any potential user to access core metadata freely and readily. This does not preclude the development of "add on" services on a fee-for-service basis.

This Policy is now under consideration in each ANZLIC jurisdiction.

Achievements of the Working Group

The discussion paper, "A Metadata Framework for Land and Geographic Data Directories in Australia and New Zealand" was produced by the ANZLIC Working Group on Metadata Standards in July 1995. The paper was circulated for comment throughout all jurisdiction land information coordination structures and to a reference group of industry representatives (180 names by December 1995).

The approach taken in the discussion paper was to define, for comment, a minimum number of core metadata elements that should be used in all high-level directories in Australia and New Zealand, as the basis of a nationally consistent directory system. The reason for defining a limited number of elements was to include only those elements that a user would need to consult in determining:

- whether or not any dataset exists on the required issue, subject or theme;
- what area, generally, is covered by the dataset;
- summary information about the content and quality of the dataset to assist the user in deciding whether to inquire further; and
- a contact for getting further information.

Some 30 individuals and organisations provided feedback on the issues raised in the discussion paper. Respondents generally agreed that the establishment of metadata standards, and the setting up of a national metadata directory system for land information, are significant steps towards making geographic data more accessible.

A second draft of the paper, "Proposed Core Metadata Elements for Land and Geographic Data Directories: Version 1", was circulated for comment in December 1995. Feedback from the reference group highlighted the need for a comprehensive set of guidelines and worked examples, to specify the type of information expected for each of the core elements.

The extensive consultation process which began at the AURISA 94 conference has provided ANZLIC with the information needed to define the essential core elements of a national directory system for Australia and New Zealand. Guidelines to promote the creation of consistent descriptions of land and geographic datasets, and a run-time database tool designed to help agencies collect and format these records are key outcomes of the Working Group's activities.

Why ANZLIC is Concerned with Metadata

Levels of Metadata

Metadata for land and geographic information is required for a range of purposes and includes:

- detailed information about data collection methods, integration and analysis techniques applied to various components of source data to support the preparation of scientific reports;
- information about the accuracy of source datasets, processing history, and archival procedures to effectively manage and utilise data within custodian organisations;
- information about projection specifications, scale, and a data dictionary to accompany data transfers to other organisations;
- adequate descriptions of the content, quality and geographic extent of datasets so potential users of existing data can assess its suitability for other purposes; and
- summary descriptions of content and quality as well as contact information for inclusion in directory systems.

There is significant overlap in the type of information required for the above purposes. Data quality information is required for most purposes, but the degree of detail necessary varies. The metadata elements required to adequately describe different types of data also vary. For instance, some of the elements relevant to the description of climatic datasets are not relevant to the description of geoscience or marine datasets. The most detailed metadata and range of elements, however, is required for data management purposes within custodian organisations.

While metadata requirements vary significantly, a number of common core elements are needed for most purposes, regardless of the type of data or level of detail. Metadata required for the highest level directory systems, could be rolled up or summarised from more detailed levels of metadata held and maintained by data custodians.

These guidelines have been developed to promote a consistent standard of description for this small number of core metadata elements, that are generally common for all types of data and designed to indicate what data exists, its content, geographic extent, how useful it might be for other purposes and where more information about the data can be obtained. The purpose is to make information about all available data freely available so that existing data can be reused for other purposes if it is suitable, reducing the duplication of effort.

How the ANZLIC Approach compares with the FGDC Initiative

The US approach, developed by the Federal Geographic Data Committee (FGDC), specifies the structure and expected content of some 220 items (elements) which are intended to describe digital geospatial datasets adequately for all purposes. The ANZLIC approach is deliberately less ambitious than what has been attempted in the US. Arguments advanced in support of the more modest objective rely on experience to date with the creation of high-level directories in Australia.

Users need a level of detail, clarity and accuracy in the metadata sufficient for them to judge whether or not to make further inquiries of the contact organisation responsible for a dataset. Maintaining a comprehensive directory, however, imposes a significant burden on custodians. Experience indicates that a balance needs to be struck between these two factors.

While ANZLIC has not adopted the US approach, the Australia New Zealand framework is, as far as possible, consistent with the guidelines on Digital Geospatial Metadata produced by the US FGDC and with the Australia New Zealand Standard on Spatial Data Transfer AS/NZS 4270. The reasons for this are:

- many organisations are already using these standards for their data management activities;
- some vendors of software are providing templates and other support to the implementation of the standards; and,
- these standards are being implemented in some discipline or theme areas where there is international exchange of metadata.

Expected Audiences

The audience for this publication includes all organisations and individuals throughout Australia and New Zealand, both government and private, that have an interest in the creation, management or use of geographically related data. It is designed to be useful for describing both digital and non-digital data.

While some of the target audience may use both geographic and non-geographic data, these guidelines have been developed to apply principally to the description of geographic data. Library catalogue systems are the key source of metadata for non-geographic data.

Why These Core Elements Have Been Chosen

The core metadata elements are described in Table 1. The elements listed are the result of an extensive consultation and review process undertaken by the ANZLIC Working Group on Metadata during the past 18 months. Core elements which relate to similar information have been grouped into categories. Details of the relationship between the elements is detailed in Figure 1. The Working Group has also prepared Guidelines and Worked Examples of the core elements.

Table 1: Core Elements

Category	Element	Comment
Dataset	Title	The ordinary name of the dataset.
	Custodian	The organisation responsible for the dataset.
	Jurisdiction	The state or country of the Custodian.
Description	Abstract	A short description of the contents of the dataset.
	Search Word(s)	Words likely to be used by a non expert to look for the dataset.
	Geographic Extent Name(s)	A picklist of pre defined geographic extents such as map sheets, local government areas, catchments, that reasonably indicate the spatial coverage of the dataset.
	OR	
	Geographic Extent Polygon(s)	An alternate way of describing geographic extent if no pre-defined area is satisfactory.
Data Currency	Beginning date	Earliest date of data in The dataset.
	Ending date	Last date of information in the dataset.
Dataset Status	Progress	The status of the process of creation of the dataset.
	Maintenance and Update Frequency	Frequency of changes or additions made to the dataset.
Access	Stored Data Format	The format or formats in which the dataset is stored by the custodian.
	Available Format Type	The formats in which the dataset is available, showing at least, whether the dataset is available in digital or nondigital form.

	Access Constraint	Any restrictions or legal prerequisites applying to the use of the dataset, eg. licence.
Data Quality	Lineage	A brief history of The source and processing steps used to produce the dataset.
	Positional Accuracy	A brief assessment of the closeness of the location of spatial objects in the dataset in relation to their true position on the Earth.
	Attribute Accuracy	A brief assessment of the reliability assigned to features in the dataset in relation to their real world values.
	Logical Consistency	A brief assessment of the logical relationships between items in The dataset.
	Completeness	A brief assessment of the completeness of coverage, classification and verification.
Contact Information	Contact Organisation	Ordinary name of the organisation from which the dataset may be obtained.
	Contact Position	The relevant position in the Contact Organisation.
	Mail Address 1	Postal address of the Contact Position.
	Mail Address 2	Aust and NZ: Optional extension of Mail Address 1.
	Suburb or Place or Locality	Suburb of the Mail Address.
	State or Locality 2	Aust: State of Mail Address.
		NZ: Optional extension for Locality.
	Country	Country of the Mail Address.
	Postcode	Aust:Postcode of the Mail Address. NZ: Optional postcode for mail sorting.
	Telephone	Telephone of the Contact Position.

	Facsimile	Facsimile of the Contact Position.
	Electronic Mail Address	Electronic Mail Address of the Contact Position.
Metadata Date	Metadata Date	Date that the metadata record for the dataset was created.
Additional Metadata	Additional Metadata	Reference to other directories or systems containing further information about the dataset.

Dataset and *Description* categories provide essential information about the content of the data, the agency responsible for its collection and maintenance, and the geographic area it covers. The *Search Word(s)* element has caused concern for data providers who generally seek to use keywords that adequately categorise the specific content of datasets. The inclusion of this element, however, is intended to make it easier for non-specialist users to search directories for information categorised under broad, general subject headings.

Data Currency and *Dataset Status* categories establish the time frame of the data described.

The *Access* category is intended to provide potential users of datasets with sufficient information to determine if the data is in a suitable format or able to be transformed for their purpose. Access to some data is restricted for a variety of reasons. However, it is important that the existence of these datasets and the constraints on their use for other purposes are clearly identified in directory systems.

The inclusion of *Data Quality* elements in the highest level directory systems has been the subject of a great deal of debate within the geographic information community. It is clear that the key elements identified — lineage, positional accuracy, attribute accuracy, logical consistency and completeness — have not always been well documented in the past. Also, the meaning of some of these elements has not been well understood and some may not be relevant to some dataset types.

It has been argued that these elements are only relevant to the more detailed levels of the directory system, however, a consensus view is that data quality information is critical to determining the usefulness of a dataset for a particular application. For this reason, the national directory system must provide some information about data quality, at least a summary or overview, at the highest level. If custodians are unable to provide information for these elements they should not leave the field blank. Statements such as "Not Relevant", "Not Documented" or "Not Known" should be used.

Contact Information provides address details for the contact position in the contact organisation that is responsible for delivery of the dataset to other users.

Metadata Date establishes currency of the directory entry.

The *Additional Metadata* element provides a link to the source of more detailed information about a dataset through specific theme directory systems, such as the Marine and Coastal Data Directory of Australia ("Blue Pages"), or individual agency level directories. These more detailed directories will often supply a technical contact for listed datasets.

The Need for a Metadata Transfer Format

This document refers, above, to ANZLIC's policy on the transfer of metadata between jurisdictions. Implementation of this policy would be a simple process if all agencies organised and managed their metadata using the same relational database management system. In reality, data producers and custodians have made individual choices of software tools available or have developed their own systems. Therefore, a simple generic transfer format or formats are proposed to facilitate the transfer of metadata between current and future directory systems.

Attachment 2 to the Metadata Guidelines contains some recommendations on metadata transfer formats. Those recommendations were prepared by a consultant, AUSDEC. The Metadata Working Group has developed those recommendations further and a revised Attachment 2 is now available by FTP.

> NOTE: ANZLIC has now developed an SGML Document Type Definition (DTD) to conform to the ANZLIC Core Metadata Guidelines.
>
> Standard Generalized Markup Language (SGML) became an International Organisation for Standardisation (ISO) standard in 1985. It is used to define the structure of electronic text files or documents. It is primarily concerned with structure and not with the content of the document.

Implementation Issues

Implementation Protocols for Jurisdictions

At its meeting in Wellington early in June 1996, ANZLIC adopted several Transfer and Implementation Protocols to promote and assist the adoption of the Core Elements in jurisdictional directories and related activities.

A National Directory

Several years ago ANZLIC formally endorsed the National Directory of Australian Resources (NDAR) maintained by the National Resource Information Centre (NRIC) as the national metadata directory for Australia. No similar decision has been made in respect of a national directory for New Zealand although some theme directories are being developed there at a national level on discipline and environmental themes.

The environment has since changed in relation to high-level directories. For instance, considerable efforts have been undertaken in Queensland, Western Australia, New South Wales, South Australia, Victoria, New Zealand and in various organisations in the Commonwealth of Australia, to develop jurisdiction and theme-based directories which now must be reconciled both with ANZLIC's decision, and with the emerging consensus that high-level metadata directories should contain a common set of core elements to facilitate transfer.

There is a role for jurisdictional directories in addition to a national directory system; many users may never need a national picture of a particular theme or dataset type. The challenge is to create a sufficiently robust and responsive arrangement to provide a national picture of coverage of data without a user being forced to build up that picture from up to ten jurisdictional and multiple theme directories. Significant commitments have already been made to the collection and maintenance of jurisdictional directories. It would be quite impractical and improbable for the amount of collection and maintenance effort currently being applied to jurisdictional directories to be replicated at a national level in Australia. The objective therefore is to maximise the efforts being currently devoted to jurisdictional and thematic directories, and to develop a plan for linking these in a national directory system.

National directories for Australia and New Zealand (or, perhaps one Directory for both Australia and New Zealand) are needed and will emerge over the next few years and should ideally be accessible on-line and updated on-line, at least in part, via the Internet.

Development of a national directory system is the next main task of the ANZLIC Working Group on Metadata. Consultation with the user and information provider community will be carried out. The Working Group will be inviting several other agencies involved in metadata policy and theme directories, to join the Group to work on this development.

The Relationship between Theme Based and Jurisdictional Directories

Several sector or theme-based organisations are currently collecting metadata or considering doing so. Included among these activities is the Australian Coastal and Marine Directory project

(Blue Pages); a proposal by the Inter-governmental Committee on Surveying and Mapping for a national directory on the topography theme; and the Australian National Geoscience Information System (@NGIS).

There would be little benefit in theme-based metadata directories that contained only the highest level core elements. Development of such directories purely at this level of information is unlikely to occur as most theme directory endeavours will be collecting information at at least the Page 1 level. Nevertheless, In order to reduce duplication of effort and the collection burden on custodians, a degree of cooperation and collaboration, particularly in relation to the process of record collection, will be required between theme and jurisdictional initiatives over the next few years. The Working Group will be addressing this issue jointly with theme directory custodians over the next year. Ultimately, however, the information provided in both jurisdictional and theme directories should ideally be sourced from internal agency metadata directory systems. The proposed national directory system will be planned to provide for the maximum automation of this process.

ANZLIC has adopted a "Pages" concept as the basis for a national metadata framework where more general information is recorded at the highest level (Page 0) and additional information is recorded at lower levels (Page 1, Page 2). This concept is illustrated in Figure 2. In this concept, Page 0 consists of a set of mandatory core metadata elements sufficient to allow a user to locate all relevant and available data sets. To maintain consistency many elements are based on pre-defined selection lists, thus ensuring uniformity and the capability to exchange Page 0 metadata elements between directories. Page 0 metadata should be freely available to all users and would form the base for all directories.

Subsequent pages (i.e. Page 1, Page 2, etc.) provide the opportunity for data custodian agencies at the national, state, local government, academic, community or private industry levels to include additional information not required in Page 0. This additional information may be in the form of sub-elements of specific Page 0 core metadata elements or entirely new and unrelated metadata elements. However, in order to ensure uniformity, it is suggested that any new metadata elements should be consistent where possible with corresponding metadata elements in the FGDC Content Standards.

A conceptual indication of how the Pages Concept is the foundation of the national directory system is shown in Figure 3.

Implementation Within Jurisdictions

ANZLIC recommends that implementation of the core elements in Table 1 should commence for all new directories and for all new datasets from the date of this publication. It is, however, recognised that there is a major task ahead because datasets created in the past must also eventually be included both in custodians' metadata management programs and in directories at all levels.

Where adequate descriptions do not exist for historic datasets, custodians should endeavour to record at least the core metadata elements when upgrade programs are undertaken. Agencies that use historic datasets as a source for further analysis should endeavour to recover metadata and provide upgrades to the information contained in existing directories.

Relationship to Metadata Management Within Agencies

The need to provide dataset descriptions for inclusion in geographic information directory systems is not the key reason why data providers need to maintain metadata about their datasets. A more compelling reason is to retain corporate knowledge of the characteristics of datasets that an agency uses. The most detailed level of metadata is needed to ensure the efficient management and effective utilisation of data within a custodian agency. Metadata required for the highest level directory systems and other potential uses can be summarised or rolled up from the most detailed level of metadata that should be held and maintained by data custodians.

Experience indicates that for many organisations, thorough documentation of dataset characteristics is not a priority. Good data management practices within an organisation are dependent on the continuous documentation of data characteristics and processing history throughout the course of a data collection or creation project.

ANZLIC encourages the use of existing data for other purposes wherever possible. This can only be achieved effectively if the characteristics and limitations of existing datasets are accurately known.

Review Program

Guidelines, frameworks and standards are not necessarily complete when they are initially released. Attempts at metadata collection and development of directories, and experiences gained in entering, editing, maintaining, and most importantly, using directories based on the framework, will inevitably reveal potential improvements. This is particularly likely in the case of a metadata directory framework that is aimed at such a wide, diverse and growing field such as spatially referenced information covering all kinds of land and geographic data.

The framework will need to be monitored and perhaps amended from time to time. The first review of the list of high-level core metadata elements is expected to be undertaken by the Working Group by June 1997. ANZLIC supports a national level approach to a review and monitoring process to address the performance and acceptance of the core elements and to determine whether further policies are required to accommodate theme directories and users.

The Environmental Resources Information Network (ERIN), a Commonwealth agency, has agreed to provide a listserver to discuss metadata issues within the community at large. Users of these guidelines for core metadata elements are encouraged to provide feedback on their experiences and any suggestions for improvement through this mechanism. Subscribe to this discussion forum by sending an email containing the message, "subscribe ozmeta-l", to majordomo@erin.gov.au.

Metadata Data Entry Tool

To assist with the implementation of these guidelines, ANZLIC has developed a run-time software tool to support the collection of metadata and to ensure consistent description of core metadata elements. This software tool, based on Microsoft Access, is available for use by dataset custodians throughout Australia and New Zealand.

The Data Entry tool may be used within organisations to manage the metadata database. Copies are available from Working Group members in the various jurisdictions and from the ANZLIC Secretariat. There is no charge for the Data Entry tool.

A reconciliation between the Guidelines for completion of each Core Element and the screens in the Data Entry tool appears in the full text of the document.

The digital version of this paper and the Guidelines and Worked Examples are available via this Web site. The Guidelines and Worked Examples are also available in the on-line help in the Data Entry tool.

Agencies wishing to customise the Data Entry tool for their own use, perhaps by adding agency specific fields, can be provided with additional notes to assist this. A developer's version of the Access database will be required.

Contact Information

Further enquiries about ANZLIC, the Metadata Guidelines or the Data Entry tool should be directed in the first instance to the ANZLIC Secretariat:

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with the following text in the message:

subscribe ozmeta-l

Get the Full Text

The foregoing are the introductory sections to the ANZLIC Guidelines on Core Metadata Elements. The complete document contains detailed descriptions of each of the core metadata elements together with worked examples. To download the full document click here

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Back to Metadata Working Group

ANZLIC Secretariat

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