Positioning for Growth

Spatial Information
Industry Action Agenda

September 2001

The objective of this Action Agenda is to identify any opportunities and impediments to the progress of the industry and to develop a policy framework that will underpin growth through a commercially successful and internationally competitive Australian Spatial Information Industry.

Should you wish to comment on this Action Agenda or obtain additional copies please contact:

Spatial Information Industry Action Agenda
Department of Industry Science and Resources
Telephone: (02) 6213 7224
Facsimile: (02) 6213 7435
Email: siiaa@isr.gov.au
Website: www.isr.gov.au/agendas

ISR 2001/062

ISBN 0 642 72170 X

Contents

Goals for the Spatial Information Industry

Foreword by the Minister

"Ready and timely access to spatial information—knowing 'where' people and objects are—is essential to Australia's continued development in the information age. It is a critical tool in informed decision-making on key economic, environmental and social issues.

While the spatial information industry has played an important role in Australia's development since pioneering times, in recent years several new applications have pointed the way to further exciting technological advances. The widespread availability of global positioning systems, high resolution remotely sensed imagery, high bandwidth mobile phone technology and powerful portable computers have transformed the industry.

Australia's future prosperity depends to a significant extent on how well our industries compete in the global information economy. I believe that the spatial information industry has the potential to deliver enormous benefits to Australia. Global demand for spatial information-based services is growing rapidly, and Australia must capitalise on those expanding markets.

This Action Agenda sets out a vision for the spatial information industry and identifies strategies to remove impediments to industry growth and participation in the global information economy. The Australian Government is committed to working with the industry and other levels of government in implementing the actions recommended in this report.

A high degree of commitment from the industry to achieving a strong, sustainable and internationally competitive spatial information sector in Australia has been crucial to the development of this Action Agenda. I would like thank the members of the Steering Group for the effort, time and financial resources which they have put into the process.

I commend this report to you."

Nick Minchin
Minister for Industry, Science and Resources

Industry Statement

The Australian Spatial Information Industry is truly set for growth.

From pioneering times there has been a strong recognition within Australian society of the value of maps and map-based information. This strong historical culture of valuing spatial data has continued and has led directly to the development of one of the best surveying, mapping and remote sensing industries in the world.

Spatial analysis is indisputably recognised as essential to help resolve the world's environmental problems and better manage dwindling resources. Spatial information and associated location-based services are now also recognised globally as key drivers for growth in the information technology sector.

Australia has all the ingredients to respond to these challenges and establish itself as a world leader in the innovative provision and use of spatial information.

This Action Agenda report therefore comes at a critical time. It provides a blueprint for change, a chance for the industry as a whole to leverage its strengths and to capitalise on globalisation.

The improved communication, goodwill and clear signs of change that have already been generated through the Action Agenda process provide a great deal of optimism. It is now essential that the private and public sector components of the industry continue the momentum and seize this historic opportunity to actually realise the vision of becoming a global leader.

Walter Mayr
Director Product Development & Services, MapInfo Australia and Chair, Steering Group.

The Spatial Information Industry Action Agenda Steering Group

Left to right: Guy Perkins, *ESRI Australia*; Peter Holland, *AUSLIG*; Elizabeth O'Keeffe, *ANZLIC & Land Victoria*; Stuart Nixon, *Earth Resource Mapping*; Walter Mayr (Chair), *MapInfo Australia*; Tony Wheeler, *Sinclair Knight Merz*; Patricia Kelly, *Department of Industry Science and Resources*; James Curnow, *Alexander Symonds*; Bernie Moriarty, *QASCO*; Brian Button, *Agrecon*.

The Spatial Information Industry's Vision

'Australia will be a global leader in the innovative provision and use of spatial information.'

Executive Summary

Spatial information describes the location of objects in the real world and the relationships between objects. The spatial information industry encompasses the broad disciplines of remote sensing and photogrammetry, mapping and surveying, land administration and geographic information systems, together with related software development and provision of value-added services. Practical applications include environmental monitoring, mobile location-based services, customer relationship management and the management of natural resources, assets, land and emergencies.

Spatial information describes the location of and relationships between objects in the real world.

Solutions using spatial information and technology have broad applications across many industries, giving the Australian spatial information industry the potential to offer the nation enormous benefits. A strong, competitive spatial information industry is capable of providing innovative products and services that can secure the growth of business, assist in sound environmental decisions and identify areas of social inequity, particularly in regional areas. Accurate, comprehensive spatial information enables the economy to capitalise on the efficiencies gained from improved planning, the fair allocation of resources and decisive infrastructure development.

Solutions using spatial information offer great economic, social, and environmental benefits.

International market studies indicate that global expenditure on spatial information is in the order of $A34 billion a year and growing at a rate of 20%. The Australian spatial information industry has turnover in excess of $1 billion. The surveying services part of the industry is growing at 11% a year but the 'New Economy' part is growing very strongly at an average of about 40% a year. The industry and government have recognised the need to develop policies for the industry. The industry has already moved to leverage any prospective growth with the recent founding of the Australian Spatial Information Business Association (ASIBA), bringing together into one industry body the allied disciplines that trade in spatial information products and services. Allied professional associations have also moved forward through the formation of the Spatial Sciences Coalition. With this demonstration of commitment, the spatial information industry is well on its way in *Positioning for Growth*.

The spatial information industry is high growth.

The Industry's Vision

'Australia will be a global leader in the innovative provision and use of spatial information'.

Achievement of this vision will require a strong spatial information industry in which the business, government, academic and research sectors collaborate effectively, and actively contribute to national policy development.

Such an industry will position itself as a world leader through the creation of world class intellectual property marketed globally through a coordinated export strategy.

The industry is a specialised component of the information technology industry. It is non-polluting and has a high growth rate. A strong information infrastructure also provides the platform for the development of high value software. A united and focused industry in Australia would achieve economies of scale and could fully capitalise on the latest technologies and global markets so as to achieve the vision of becoming a world leader.

Five Goals for the Spatial Information Industry

The Goals, Strategies and Actions set out in this Action Agenda are the means for the private business, academic and government sectors to work together to achieve the Vision. The Action Agenda identifies five goals as central to the future success of the industry. These can be summarised as:

- **Develop a Joint Policy Framework**
- **Improve Data Access and Pricing**
- **Increase Effective Research and Development**
- **Evaluate and Reform Education and Skills Formation**
- **Develop Domestic and Global Markets.**

These areas of reform are of equal importance and are not listed in any specific order of priority. Each goal has one or more associated strategies and a number of actions that will be needed to attain it.

Develop a Joint Policy Framework

Government policy settings must allow businesses to prosper.

For the industry to invest in its future with confidence, it must operate under a policy framework that encourages a mutually beneficial relationship between business and government. The strategy defined to reach this goal is to influence Commonwealth, State, Territory and local Governments to develop a policy framework that meets government objectives and allows businesses in the industry to prosper. This is particularly important for the spatial information industry because of the large amount of fundamental data which is produced by government and the historically high level of public sector activity in the spatial industry.

A key initiative in this area is the formation of a single association to represent private business interests within the industry, to be known as the Australian Spatial Information Business Association (ASIBA). The success of this initiative is extremely important for the implementation of the Action Agenda. It will be largely up to ASIBA to represent business in implementing the joint actions with government and academia.

The creation of formal linkages between private industry and government will be an important part of reforming the policy framework, in particular the linkage between ASIBA and the Australia New Zealand Land Information Council (ANZLIC). These

linkages are a prerequisite for the joint development of industry policy recommendations. Key policy issues are for:

- a clear definition of the roles of public and private sector activity in the provision of spatial information at all stages of the supply chain; and
- strengthening the private sector through industry development initiatives.

Improve Data Access and Pricing

Data is an essential factor of production.

The fundamental datasets provided by government are an essential factor of production for all spatial information businesses. The second goal is to increase the net economic benefit from the industry by maximising the use, distribution and creation of these publicly funded spatial information products and services.

The strategy identified by this Action Agenda is to encourage Commonwealth, State, Territory and local Governments to adopt data policies which increase the creation and use of public spatial information. To this end, an important recommendation of this Action Agenda is for business and government to develop jointly a common approach to spatial data access and pricing, and formulate a copyright policy that maximises the benefits to Australia. The industry considers that this will be achieved through the pricing of data at a maximum of the cost of distribution, with minimal copying and royalty restrictions.

The Action Agenda stresses that there must be recognition by all levels of government that spatial information is a component of fundamental economic infrastructure and that public spatial data provision must be funded accordingly. Improving business access to all public spatial information will be a key driver to the domestic growth of the industry, which in turn creates stronger enterprises, better positioned for expansion of their operations internationally.

Increase Effective Research & Development

Improved collaboration is a key to increasing R&D.

It is well recognised that innovation is a principal driver of economic growth. For the spatial information industry to capture growth, it must enhance its capability to conduct effective research and development. The Action Agenda identifies the need to create an innovative, strong and high value-added industry. The accompanying strategies are to increase innovation and R&D in the industry, improve the commercialisation of R&D, and maximise collaboration between the public and private sectors.

There is a significant amount of funding available for innovation through existing government programs, including the Commonwealth Government's Innovation Statement, *Backing Australia's Ability*. This Action Agenda recommends that ASIBA, and other industry bodies as appropriate, should work with government to promote innovation programs to the industry, and to highlight the initiatives of particular relevance to small and medium business enterprises.

The Action Agenda recognises the value of the extensive public sector research currently conducted. However, it has identified the need to improve partnering arrangements with CSIRO, academia and other government research bodies in the exploitation of publicly funded intellectual property relating to spatial information.

The Action Agenda recommends that the Commonwealth Government look at how to enhance coordination of research and development activity across agencies.

Evaluate and Reform Education and Skills Formation

A strong skill base is essential for growth.

The contribution of human capital is of fundamental importance to any service industry. To meet this need, the Action Agenda has as its goal the creation and maintainance of a highly skilled, relevant and innovative workforce. This goal is supported by a strategy designed to ensure the availability of the skills required by the industry. The industry considers that there is a need to promote employment prospects in the spatial information industry to potential applicants approaching tertiary education.

The Action Agenda recommends collaboration between ASIBA, other industry and professional bodies as appropriate, the Department of Industry, Science and Resources and the Department of Education, Training and Youth Affairs to encourage the teaching of basic spatial information concepts at the high school level. This Agenda also recommends identifying initiatives which can be used to benefit the industry through improved skills formation at the tertiary level.

To facilitate these initiatives, the Action Agenda advocates a number of initiatives by the industry, including providing greater access to spatial data and spatial technologies by educational institutions.

The ability to recruit from overseas to address skill shortages has been an issue with the industry in the past. The changes announced in *Backing Australia's Ability* were designed to address these problems and will be subject to on-going monitoring.

Develop Domestic and Global Markets

The industry needs to develop new markets, both domestic and overseas.

A prime objective for the industry is to expand the domestic market and provide a base to create a highly profitable and competitive export industry. Two strategies have been identified that will fulfil this ambition.

The first strategy is to expand the industry to its maximum potential within Australia. This will require implementation of the other initiatives identified in the Action Agenda. It will also require increased industry participation in alliances and joint ventures to build and promote industry capabilities. This involves partnerships of various forms between businesses that, at other times, may be strong competitors.

The second strategy is to create a major increase in the Australian spatial industry's international market share. Key actions under this strategy include development of a capability register for Australian businesses, greater cooperation between business and

government in bidding for overseas contracts, identification and elimination of trade barriers, and identification of target markets for industry expansion. If businesses engage government and universities for the secondment of key resources, it will ensure that we improve our international competitive position by offering the best capability available.

Implementation and Resource Issues

The Action Agenda implementation process will commence in 2001-02, with a progress report required by the Commonwealth Government at the end of that year. A more detailed evaluation will take place in late 2003.

Industry must be the primary driver of change.

Consistent with the Action Agenda's emphasis on industry as the driver of change, it will be largely up to the newly formed Australian Spatial Information Business Association to oversee the implementation of actions which are primarily the responsibility of business, and represent business in the implementation of joint actions with government, professional organisations and academia.

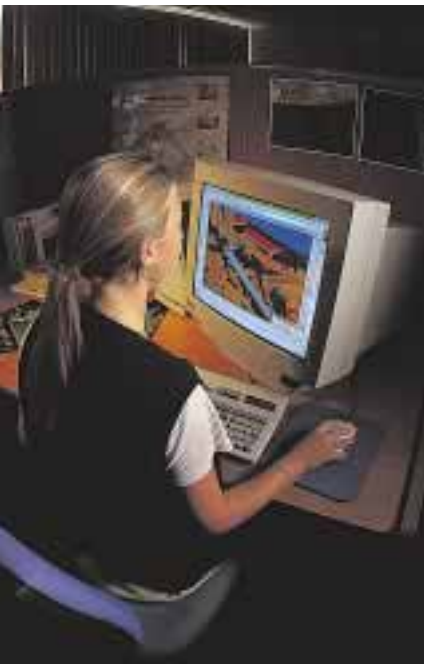
The States and Territories will also need to be involved in implementation of the Action Agenda, which will occur primarily through the Australia and New Zealand Land Information Council (ANZLIC) and related agencies.

Funding for initiatives will come primarily from relevant existing programs. The Commonwealth Government's response to the Productivity Commission Inquiry into Cost Recovery by Commonwealth Agencies will also have major implications for the industry. A rationalisation and reduction in cost recovery activities would have substantial benefits for the industry. Any other initiatives would need to be considered in the context of Commonwealth, State and Territory budgets in 2002 and subsequent years.

Summary of Recommended Actions

No.	Recommended Action
Goal 1: Develop a Joint Policy Framework	
5.1	Creation of improved formal linkages between business and government
5.2	ISR to assist ASIBA in identifying possible sources of funding
5.3	Creation of improved linkages between business and research agencies
5.4	Definition of industry and government activities and supply chain roles
5.5	Monitoring of government policy development to encourage government to give appropriate recognition to the industry in policy initiatives
5.6	Commonwealth government to note strong industry support for draft recommendations of the PC inquiry into Cost Recovery
5.7	Endorse and encourage greater contracting out by government of activities which can be performed effectively by private sector
5.8	Review coverage and appropriate handling of *prima facie* breaches of competitive neutrality principles
5.9	Resolution of cost of Internet and mobile phone bandwidth issues
5.10	Industry support for Professional Standards Legislation

Cadlite: Australia-wide cadastral data – Landmark



3D visualisation - Sinclair Knight Merz Pty Ltd

Summary of Recommended Actions - continued

Goal 2: Improve Data Access and Pricing

6.1 Develop common approach to data access, pricing and copyright policy

6.2 Note industry support for the recommendations of the IDC into Spatial Data Access and Pricing

6.3 Industry to develop a privacy code of practice.

6.4 Identification and cataloguing of fundamental datasets and related standards

6.5 Industry position paper on appropriate public vs private sector activities

6.6 Adequate funding of fundamental public data provision

6.7 Consider funding of pricing and access reform in Budget context

6.8 Increase efficiency of public data collection

6.9 Improve on-line availability of data

Goal 3: Increase Effective Research and Development

7.1 Partnering arrangements with public research agencies

7.2 Commonwealth government to examine barriers to commercialisation

7.3 Commonwealth Government to improve R&D coordination

7.4 Develop proposals for Cooperative Research Centres

7.5 Promote available government innovation programs

7.6 Improve industry knowledge of how to secure venture capital and commercialise research

Goal 4: Evaluate and Reform Education and Skills Formation

8.1 Survey and evaluate industry skill requirements

8.2 Identify existing government programs which can be used to benefit industry

8.3 Encourage teaching of spatial information concepts in schools

8.4 Improve access to spatial information for educational institutions

8.5 Expand award and scholarship schemes

8.6 Internet-based information dissemination

8.7 Identify ways to increase teaching of GIS in schools

8.8 Establish national mechanism to ensure continued relevance of curricula

8.9 Monitor visa issues

Goal 5: Develop Domestic and Global Markets

9.1 Develop Australia's areas of competitive advantage

9.2 Promote value proposition of industry capabilities

9.3 Develop an industry capability register

9.4 Develop alliances and joint ventures

9.5 Assist firms to identify appropriate fora to promote the industry

9.6 Improve collaboration on bidding for major overseas contracts

9.7 Promote assistance available through Austrade and Invest Australia

9.8 Ensure government is kept informed of major overseas projects

9.9 Promote industry interests and capabilities in overseas visits

9.10 Identify and eliminate or reduce barriers to trade

9.11 Promote available government programs to industry

Box 1.1: Spatial Information Applications

The use of spatial information is ubiquitous in our society. Perhaps its most readily identified application to the lay person is mapping. Production and publication of mapping products, terrestrial and marine, digital and raster, is one of the core activities of the industry.

Digital map – AUSLIG

Hydrographic chart – Australian Hydrographic Service

Raster map – AUSLIG

In the provision of infrastructure, the spatial information industry is a key resource in all stages of the development process. In the initial stages of needs detection, demographic data can be integrated with digital infrastructure maps to quickly highlight areas where resources are critically deficient. Spatial information products and services can then be used in the environmental impact studies and the planning and construction phases, both in terms of the application of the engineering works and in the resolution of land title issues. The use of spatial information does not cease once the development is complete. It continues to be used in managing public assets so as to maintain their intended level of operation and viability.

Spatial information can be applied to assist in diagnosing community needs in many areas. These would include the appropriate provision of telecommunication services and roads and rail networks across regional Australia. It would include optimising the location of airports and the setting of flight-paths. In the context of community services such as banking, health and education services, the spatial information industry can provide definitive facts on accessibility and participation, ensuring greater fairness in the management of the public purse.

The spatial information industry also has a critical role in the management of our fragile environment. Companies use satellite imagery to classify land use and to assess land degradation and tree-clearing. Such expertise can significantly contribute to the National Dryland Salinity Program. Archived spatial information, such as old aerial photography and satellite imagery, can be used to monitor environmental change. In agriculture, spatial information is used for measuring crop performance and yield forecasts. Spatial information products and services are also a critical requirement in disaster mitigation and in emergency management situations.

In business services, the spatial information industry has the potential for high growth rates. There are many untapped markets in the areas of customer prospecting and customer demographics. Effectively locating assets and facilities so as to service customers better and take advantage of commercial opportunities is now recognised as vital to business success. Consequently, spatial information and analysis capabilities are becoming a standard part of corporate information systems, which is driving a whole new growth segment of the industry.

Internet-based applications of spatial information – Geomatic Technologies Pty Ltd

Spatial information also provides an important perspective on a wide range of economic, social and statistical data. Key statistical collections, such as the population census, have a spatial dimension which is essential to their use for detailed analysis of community trends.

The use of positioning systems such as GPS enables the tracking and location of objects and individuals in real time. In conjunction with mobile communications, this is providing the catalyst for another huge market in location-based services that can provide information that could range from the location of the nearest restaurant to optimising emergency services management. The emergence of high bandwidth mobile connections to the internet will allow for the greater access and innovative sharing of spatial information, further enhancing the possibilities for industry growth.

Mapping dryland salinity – ERIC Pty Ltd

1 Introduction

The desire to understand our surroundings has been with us from before the beginnings of recorded history. In order to survive, communities had to know the location of life's basic necessities. This was critical to the early Australians, both in our indigenous and non-indigenous communities. As European exploration and recording of the unforgiving Australian environment progressed, surveyors and cartographers were held in high regard for their exceptional efforts.

The early surveyors and maritime navigators logged the position of countless important features, ranging from the location of arable land to the position of dangerous reefs. Equipped with their sextants and compasses, theodolites and links, these early geographers mapped the natural and man-made environments with exceptional skill. The legal delineation of the land for the purposes of housing, agriculture, mining, transport and governance was pivotal to the successful birth of our nation.

The equipment used in those pioneering days was a far cry from that of the modern practitioner. Over the past four decades technological developments have changed the face of the industry. The analogue theodolite and chain have been replaced by electronic total-stations that can accurately measure angles and distances and record them to generate digital maps or plans. The substitution of satellite navigation equipment for the sextant and compass has not only affected hydrographic efforts, but also topographic applications. The application of data gathered through the use of space and airborne imaging systems is gaining significant recognition for many uses, especially in mineral exploration, environmental monitoring and agricultural assessments. The blend of digital demographic, topographic and environmental data into computer-based, geographic information systems (GIS), is a fundamental activity for many spatial information analysts. Much of the work undertaken by spatial specialists supports reliable decision-making that has political, economic or environmental ramifications.

More recently, with the surge in the use of the Internet, GPS and mobile communications, the modern spatial information industry has the potential to emerge from its sound historic roots as a progressive and important part of Australia's new economy. Just as the industry was pivotal to the early achievements gained by the builders of our young nation, the spatial information industry is again playing a crucial role in Australia's future success (see Box 1.1 on Spatial Information Applications).

Spatial information is an essential component in nation-building.

New technologies have changed the face of the industry.

Mobile GIS – ESRI Australia

The Action Agenda aims to facilitate growth …

The overall aim of this Action Agenda is to remove impediments, create synergies and help bond these recent and emerging technologies with the solid core of the old surveying and mapping industry. This will create a dynamic new Australian spatial information industry that is an integral part of the global information economy.

… and provide a mechanism for industry and government to work together.

The announcement that the Commonwealth Government would assist the spatial information industry through an Action Agenda was made on 24 May 2000, by Senator Minchin, the Minister for Industry, Science and Resources. The Action Agenda is intended to provide a mechanism for industry and government to work together to develop a vision of where the spatial information industry should be positioned globally in five to ten years. The Action Agenda also identifies the changes that will be required to capture future opportunities for growth in the industry and sets measurable outcomes and specific actions for both government and industry to effect those changes.

Action Agendas are a key part of the Government's long term strategy to develop Australian industry over the next decade. The Action Agenda strategy has a number of major goals:

- to improve the competitiveness of Australian business;
- to ensure an efficient business environment;
- to maximise the national benefits of research and innovation;
- to expand market access for Australian business;
- to increase productive investment in Australia; and
- to manage resources sustainably.

Action Agendas are only established where an industry commits to making the process work and is keen to implement change.

The major focus of the Government's strategy is on linking industry, education, science, and innovation to produce leading edge products and services, boost exports, achieve sustainable economic growth and deliver improvements in living standards for all Australians. The strategy recognises that boosting growth in particular sectors will require the joint efforts of industry and government. It is essential that Action Agendas are industry-driven. For this reason they are only established where an industry demonstrates high levels of commitment to making the process work and is keen to implement change. Particular emphasis is placed on industry itself identifying the actions and tasks that it will take to realise its full potential.

The Government provides the support framework.

The Government's role is to act as a catalyst for change by providing the support framework to help implement change and assist with specific policy actions. Action Agendas take a whole-of-government approach and provide a framework for coordinating and integrating a range of government policies. A critical component of the Action Agenda is to set the tasks industry and government must undertake to achieve targeted outcomes, and assign responsibility and priority for these tasks.

A workshop was held to scope the industry and to help define the issues confronting it.

The initial step in the Spatial Information Industry Action Agenda was to conduct consultation with key industry participants. A workshop was held on 7 September 2000 at the Commonwealth Parliament House to take a preliminary look at the spatial information industry (see Appendix 1 for a list of participants). The workshop sketched

High resolution satellite image of Melbourne – © SpaceImaging.com

the bounds of the spatial information industry, the broad policy issues confronting it and a vision for the future. Thirty-seven industry representatives attended the meeting, speaking on behalf of a broad range of spatial information industry sectors.

The workshop resolved to define the participants in the spatial information industry as being those in the business of trading location-based information products and services. The delegates characterised the industry as embracing spatial data collectors and managers, the value adders and distributors and the providers of the technology employed by the industry, both 'soft' and 'hard'. The workshop also described the role of the public sector as providing the 'soft' spatial infrastructure, through fundamental datasets, essential to the success of the spatial information industry. An important outcome of the gathering was the recognition of the need to establish a peak business council or association that would represent spatial information private businesses to government.

A Steering Group was selected to provide strategic direction and leadership for the Action Agenda.

To ensure a high level of industry involvement and ownership, a Steering Group was selected by the Minister for Industry, Science and Resources on 3 November 2000, to provide strategic direction and leadership for the Action Agenda. Membership of the Steering Group was on a purely voluntary basis and the members of the group all invested significant amounts of money, time and effort in the development of the Action Agenda. This report represents the culmination of their efforts toward the successful development of the Spatial Information Industry Action Agenda. Most members of the Steering Group will continue to be involved with the Action Agenda in the implementation phase through their involvement with ASIBA and ANZLIC.

Asset management – Sinclair Knight Merz Pty Ltd

Navigation – Australian Hydrographic Service

Remote communities – Sinclair Knight Merz Pty Ltd

Disaster management – QASCO Pty Ltd

2 The Industry's Vision

'Australia will be a global leader in the innovative provision and use of spatial information'

Spatial information is a key component of day-to-day life.

The Information sector is a core economic driver, and is one of the three main growth industries of the 21st century. Spatial information is a fundamental component of day-to-day life. Australia maintains and produces spatial information worth billions of dollars. Studies have shown the return on this investment to be as much as five-fold because spatial information is a fundamental input to many other forms of industry.

The term 'spatial' refers to the location of objects in the real world, but also encompasses an object's relationship to other things. This 'relationship' implies distribution, connectivity and an explanation of the interaction with surrounding phenomena. For example, how far a school is from the location of a home, the home's proximity to public transport, and the route taken to access those facilities, are examples of spatial information. Spatial information can be referenced on a map, or stored in a database. When presented in its graphical form, it provides immediately understandable information. It communicates 'where' an event, person or object is located. It underpins the effective understanding of information by the general public, professionals and decision-makers.

Spatial information provides an input to many other industries.

Since colonial times, spatial information has been essential for the effective allocation and management of land and marine environments. The industry has broadened substantially since then to include many other disciplines, such as environmental science, engineering, computer science, planning, geography and information technology. The information is now being applied to many more applications than just the allocation and management of land. These include:

- **Location-based services,** which can provide a range of diverse information through mobile communication media;
- **Business services,** including Customer Relationship Management;
- **Intelligent transport systems,** which use spatial information for logistical analysis and routing;
- **Telecommunications carriers,** who depend on digital elevation models and land use classifications derived from satellite imagery to design and optimise their wireless networks;

- **Defence organisations,** which depend on accurate digital maps providing three-dimensional real world views of the terrain for security and monitoring, mission planning and training simulators;
- **Solutions to the world's environmental problems,** such as global warming, land degradation and salinity. Collection, analysis and management of spatial information is essential for managing and monitoring the natural environment;
- **Infrastructure development,** such as roads, railways, ports, airports, pipelines, cables and mines;
- **Planning, design and ongoing management of the nation's assets;** and
- **Planning, provision and maintenance of social services**, such as health, education and emergency services to meet community needs.

Location-based services, business services, intelligent transport systems, telecommunications, tourism and environmental monitoring are all rapidly growing global markets with a large requirement for spatial information and software analysis and design tools.

The Action Agenda has identified five key goals.

The Goals, Strategies and Actions set out in this Action Agenda are the means for industry and government to work together to achieve the Vision. The goals and underlying strategies and actions identified as being central to the future success of the industry fall into five broad categories. These are:

- **Develop a Joint Policy Framework**
  To ensure a mutually beneficial relationship between business and government.
- **Improve Data Access and Pricing**
  To maximise the use, distribution and creation of publicly funded data products and services.
- **Increase Effective Research and Development**
  To create an innovative, strong and high value-added industry.
- **Evaluate and Reform Education and Skills Formation**
  To create and maintain a highly skilled, relevant and innovative workforce.
- **Develop Domestic and Global Markets**
  To expand the domestic market and provide a base to create a highly competitive export industry.

These areas of reform are of equal importance and are not listed in any specific order of priority. Each strategy has a number of actions that facilitate in attaining the defined goals.

Achievement of the industry vision will require a strong spatial information industry in which the business, government, academic and research sectors collaborate effectively and actively contribute to national economic and social policy development.

Such an industry will be high-growth and non-polluting. It will be able to achieve economies of scale and fully capitalise on the latest technologies and global markets. It will position itself as a world leader through the creation of world class intellectual property marketed globally through a coordinated export strategy.

3 Industry Structure

Summary

- The spatial industry in Australia is worth over one billion dollars annually.
- The industry is largely made up of small and medium enterprises (SMEs).
- Estimates of the size of the global industry range up to $A34 billion, with an annual growth rate of 20%.
- To maintain its share of world markets, the Australian industry will need to expand its market development activities significantly.

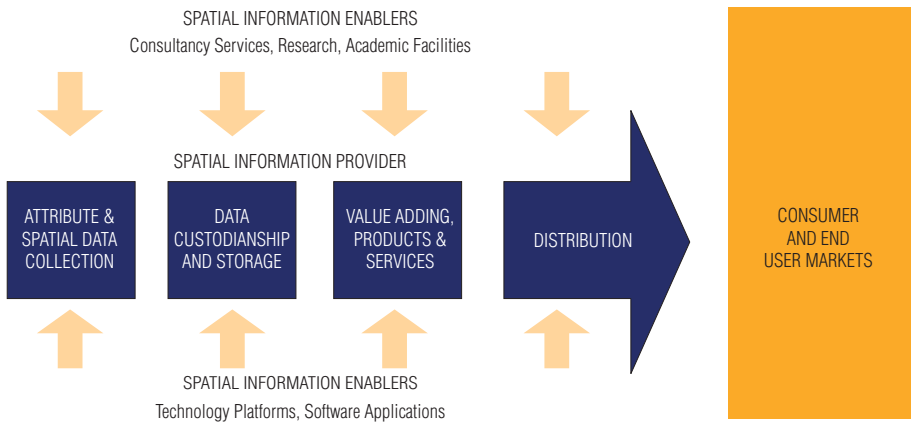
Industry Size

Spatial Information is a key enabling technology with applications across many industries.

Solutions using spatial information and technology have broad applications across many industries. The core of the spatial information industry is still the *Surveying Services* industry class (ANZSIC 7822), which also includes aerial photography, satellite imaging and mapping. The broader industry also includes firms that develop and market specialist equipment and software for use by the rest of the industry, and firms that integrate spatial technologies with communications and information technology.

As is the case with many other industries, the spatial information industry is structured around a 'supply chain' or 'value chain'. This means that some sectors of the industry are dependent on other sectors for intermediate inputs. In particular, data capture feeds into many other industry activities.

Box 3.1: Spatial Information Value Chain



Source: ANZLIC Industry Development Standing Committee

Many of the technology enablers and value adders in the industry identify themselves as part of information and telecommunications services, transport services, services to agriculture, services to mining or infrastructure management, while firms developing and marketing computer software can be allocated to either manufacturing or computer consultancy services depending on their scale of operation. There is also a substantial amount of spatial industry activity in the public sector.

This makes it very difficult to get an accurate picture of the size of the industry. Latest estimates by the Australian Bureau of Statistics (ABS) put the total operating income of the Surveying Services industry at $926 million in 1998-99.

The Australian Spatial Information Industry is at least a $1 billion industry.

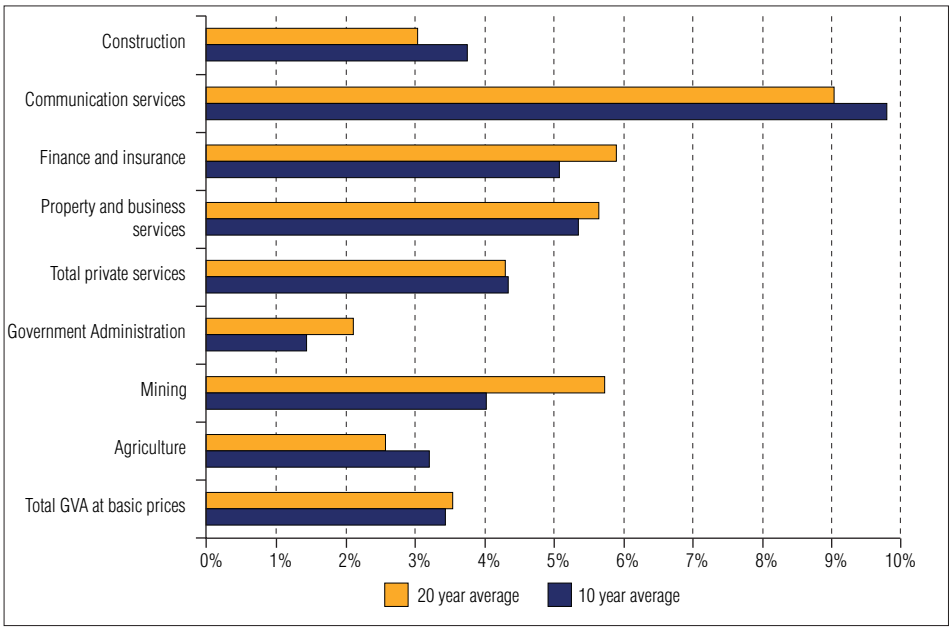
A survey of major spatial industry firms not included in *Surveying Services* was carried out by CTG Consulting and funded by ANZLIC in May and June 2001. The survey estimated sales revenue in this sector of the industry at $150 to $200 million annually with average growth of almost 40% a year for the past three years and employment growth of 45% a year.

A survey by Corporate GIS Consultants valued the spatial information industry at $800 million in 1999-2000 and estimated that it would grow to $2 billion by 2005. Given the vague nature of the definition of a number of segments of the spatial information industry, this correlates well with estimates from other sources.

Growth in key sectors of the industry has been rapid in recent years.

According to ABS estimates, gross income in the surveying services industry grew at an average of 11.3% a year over the six years to 1998-99. This is high compared with most other industries (see Chart 3.1), but is outstripped by growth rates in many industries which include parts of the spatial industry other than surveying services. For example, the ABS estimates that gross income in the Computing Services Industry, which includes a number of major spatial industry firms, grew at an average annual rate of 16.9% in the six years to 1998-99.

Chart 3.1: Average industry growth rates



Source : ABS 5206.0

Remote Sensing Industry

In October 2000, the Department of Industry, Science and Resources (ISR) released a report on the remote sensing industry prepared by PricewaterhouseCoopers. The remote sensing industry as defined in that report is likely to have some overlap with the surveying services industry, particularly in the areas of aerial photography and photogrammetry, but picks up a number of value adders who see themselves as mainly providing services to agriculture or mining. It also covered some activities of the major GIS and image processing software providers.

A survey carried out for the PricewaterhouseCoopers report estimated the size of the remote sensing industry in Australia at $45 million revenue in 1999-2000, 60% of which was generated in the private sector.

Quickbird 2 – Digital Globe

Industry Structure

The industry comprises mainly small firms.

The industry mainly consists of small firms. In surveying services, the average number of persons employed per enterprise is 4.8 (according to IBIS data); in the remote sensing area, the number is 5 (according to the PWC report). The Consulting Surveyors Australia has estimated that around 70% of its member firms have 20 or fewer employees. Similarly, the PWC report found that around 90% of firms in that sector of the industry had 20 or fewer employees. The CTG survey included a number of larger firms in the industry but there are still very few employing over 100 staff.

The Government sector has traditionally been the main collector of spatial information.

The industry has historically been very dependent on government involvement. Government has been the main collector of data, particularly cadastral and topographic data, and large scale government programs— such as national mapping— have been an important source of demand in the industry. Demand for traditional surveying services has largely followed overall trends for residential and non-residential construction, investment in new mining projects and engineering construction. Even where the government has not been the primary customer, the need to meet government regulations has been a primary driver of demand.

Small size is an impediment to industry development.

The small size of most of the firms in the spatial information industry, and its historical dependence on government business, present a number of industry development issues. Industrial organisation theory suggests that where barriers to enter an industry are low and set-up costs are largely exogenous, concentration ratios can be very low. That is, the industry will be composed of a large number of small competing firms. However, when set up costs are endogenous, which means expenditure has a significant impact on demand for the firm's product, then concentration ratios tend to be higher. The most common examples of endogenous set-up costs are marketing, and research and development. These types of expenditure are becoming more important in the spatial information industry, so theory predicts that the average size of firm in the industry will tend to become larger over time.

The industry is likely to become increasingly global. A number of overseas-based multinational companies have set up subsidiaries in Australia in recent years and are seeking to expand their business in the region. This is likely to involve partnerships

The industry is becoming increasingly global.

with and acquisitions of smaller local firms. Some Australian firms have also expanded into world markets, both through the Internet and by setting up overseas subsidiaries or offices. Another likely driver of the creation of larger businesses is the amalgamation of firms operating in predominantly spatial activities with other multi-disciplinary consultancies containing related professional disciplines. Over time the industry must move from its historical 'cottage industry' structure to become a more mature industry with a strong basis in R&D and marketing. This Action Agenda is largely about how to facilitate and accelerate that change.

First-mover advantage will become extremely important.

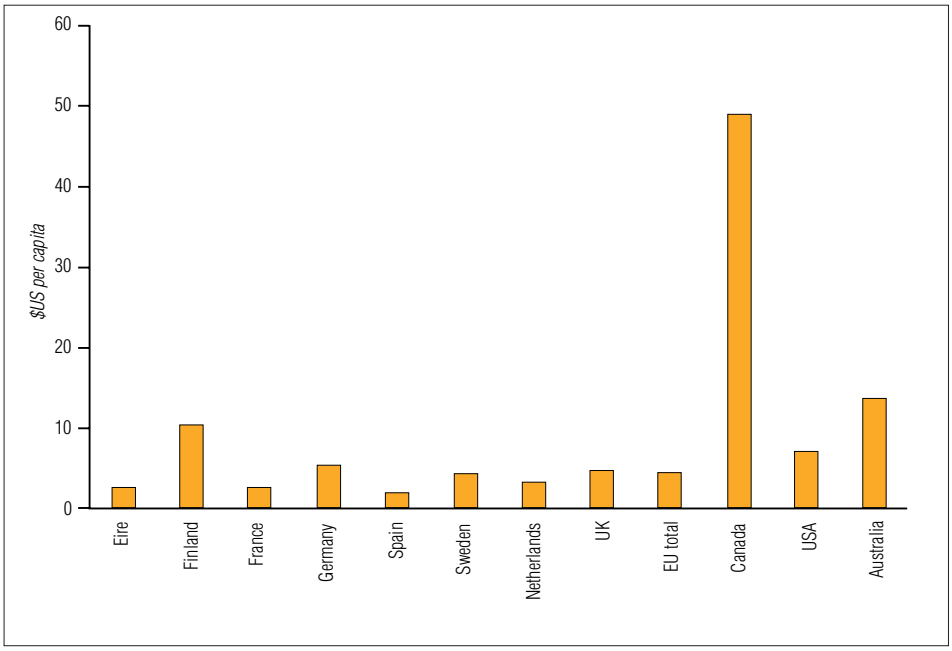
'First-mover' advantage will also become extremely important for the industry. A number of firms have successfully established a first-mover advantage in areas as diverse as the construction of sensing hardware, development of innovative software and development of agricultural forecasting techniques. Anecdotal evidence suggests that these firms are experiencing considerably stronger growth than the average for the industry.

International Market Size

International estimates for the spatial information industry suffer from problems of timeliness, scope and consistency. Estimates are available for most of the larger developed countries but the origin and derivation of these are often unclear due to a lack of availability of primary source documents. The scope of estimates ranges from 'sales of data only', through the size of the 'GI and GIS market' to 'total economic activity'. In most cases the most recent estimates available are from the mid-1990s.

Estimates for the 'GI and GIS industry' compiled by the European GI2000 project are given in Appendix 2. An interesting perspective on these figures is obtained by looking at the size of the industry in *per capita* terms for each country, see Chart 3.2. The chart also includes a figure for Australia using the IBIS data for 1997-98 for the whole of the surveying services industry.

Chart 3.2: Spatial industry income per head of population



The most striking result is the relatively large size of the industry in Canada in *per capita* terms. The high value for Canada compared to other nations may reflect Canada's high level of activity and investment in remote sensing technology, in which Canada has been building and launching satellites and supporting software for global markets.

The latest estimate by the Canadian Geospatial Data Infrastructure (CGDI) of the size of the world industry—$C20 billion ($A34 billion), with a growth rate of 20% a year—is also considerably larger than the GI2000 estimates in Appendix 2. This could reflect differences in scope, more timely data (given the very high estimated growth rates), or a combination of these and other factors.

The industry is worth $34b globally and is growing at 20% a year.

Outlook

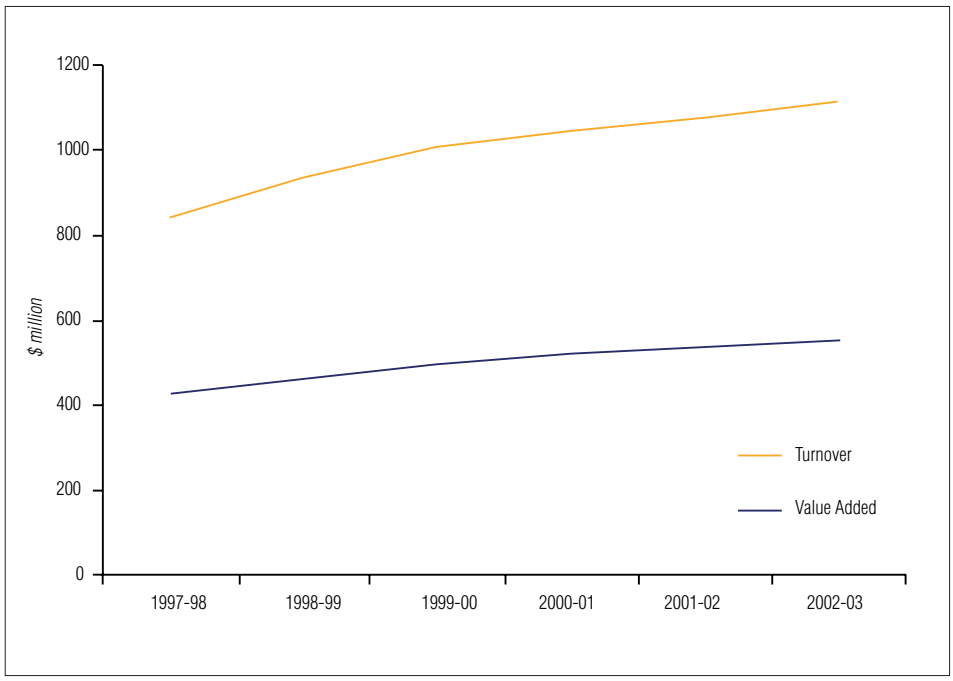
The difficulty of producing satisfactory growth forecasts for an industry like spatial information which is undergoing rapid transition, is highlighted by forecasts currently available from IBIS and Econtech.

The performance of industries in transition is hard to forecast.

The standard forecasting techniques used by both firms are based on historical relationships, which overstate the reliance of the industry on trends in the dwelling and non-dwelling and engineering construction areas, and understate the importance of emerging areas including telecommunications, infrastructure services, business and financial services.

Available forecasts are based on historical relationships.

Chart 3.3: Spatial industry growth projections



Source: ECONTECH

Growth forecasts prepared by ECONTECH for the OUTLOOK 2001 conference suggest that growth will average only 3.5% a year over the next three years to 2002-03.

Forecasts published by IBIS are slightly stronger, with industry turnover in the surveying services industry forecast to increase at an average annual rate of 4.6% over the next four years.

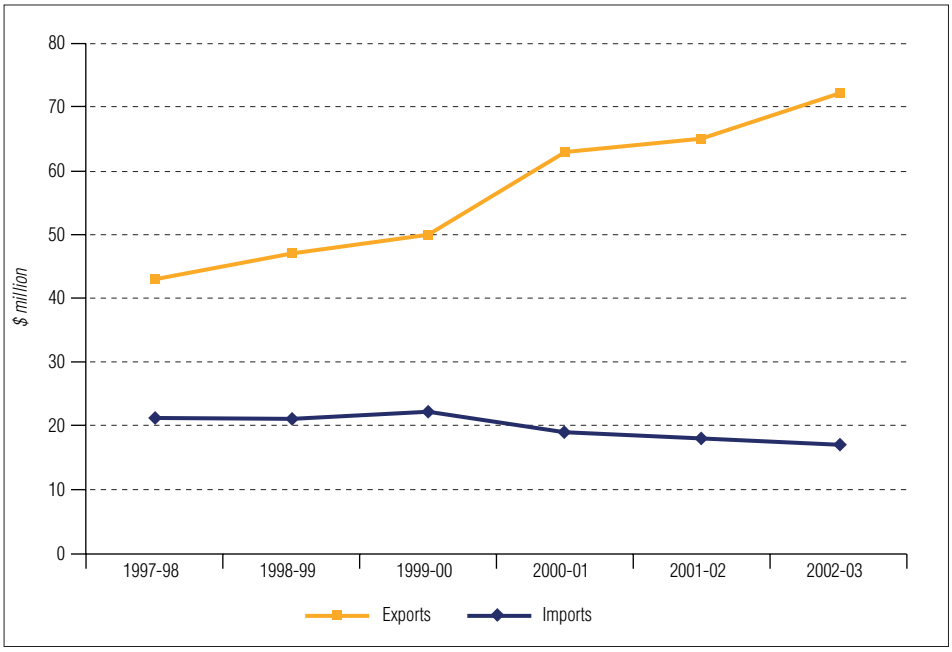
Compared with the estimate of the likely world growth in the Geomatics/GIS industry of 20% by CGDI, such growth rates are clearly inadequate to maintain Australia's market share.

Published forecasts understate industry growth potential.

The earlier discussion highlighted the high growth rates of some sub-sectors of the industry, so there is reason to believe that published forecasts significantly understate the true potential of the industry. The high growth sectors of the industry are averaging annual growth in revenue of 40% and will progressively make up a larger share of the total industry, which will significantly boost the overall industry growth rate.

The export forecasts prepared for OUTLOOK 2001 by ECONTECH are for growth of 25.5% in 2000-01 and average growth of 12.8% over the three years to 2002-03. This compares with estimated average growth of 6.9% a year in the preceding three years. See Chart 3.4.

Chart 3.4: Spatial industry trade projections

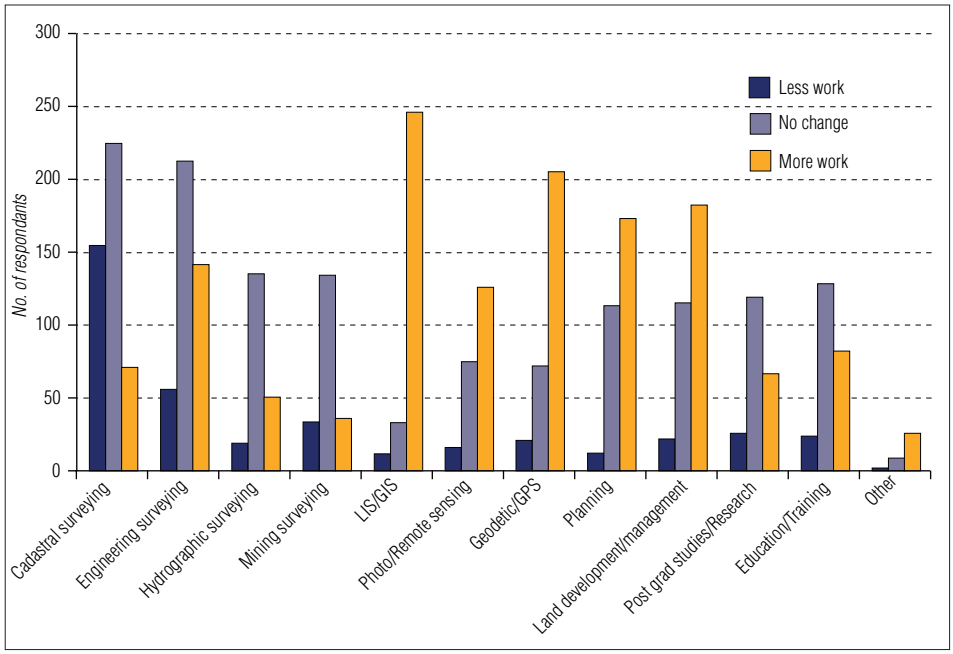


Source: ECONTECH

The industry will increasingly need to develop private sector and export markets.

If industry growth is not to be limited by government spending, which has been increasingly constrained in recent years, the industry will need to develop private sector and export markets for its products, and develop new products to meet the demands of those markets.

Chart 3.5: Industry growth areas

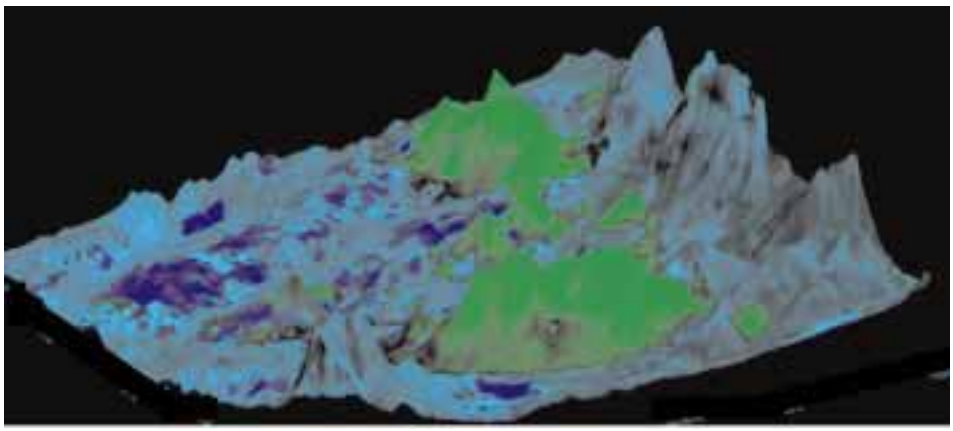


Source: ISA

The industry is already changing significantly.

A recent survey of members by the Institution of Surveyors, Australia shows clearly the changes in the nature of work occurring in the industry. Chart 3.5 shows the results of a question which asked members to look ahead five years and indicate where they felt there would be changes in the different activities within the industry. It shows clearly an expected decline in the relative importance of the traditional area of cadastral surveying and an increase in importance of the high-tech areas of GIS, geodesy/GPS and remote sensing. Planning and land development/management are also expected to increase in importance.

The recent trend towards increasing importance of innovation and marketing in the industry will therefore need to continue at an accelerating pace.



3D mineral map using hyperspectral data – CSIRO and AIGLLC

Tourist information – MSIA

Using GPS – Landmark

Native title mediation – National Native Title Tribunal

4 Goals, Strategies and Actions

This section describes the *Goals, Strategies and Actions* that the Spatial Information Industry, including private business, academia and government, will need to accomplish in order to achieve the vision defined by this Action Agenda.

Industry has agreed that the goals and underlying strategies and actions identified as central to the future success of the industry fall into five broad categories. The Steering Group has defined the goals and strategies that underpin each category. These are shown below:

Five key issues confronting the industry have been identified.

Goal	Strategy
Develop a Joint Policy Framework	
To ensure a mutually beneficial relationship between business and government.	Business to engage with Commonwealth, State, Territory and local Governments to assist in developing a policy framework that meets government objectives and allows business to prosper.
Improve Data Access and Pricing	
To maximise the use, distribution and creation of publicly funded data products and services.	Influence Commonwealth, State, Territory and local Governments to adopt data policies which increase the creation and use of public spatial information.
Increase Effective Research and Development	
To create an innovative, strong and high value-added industry.	To increase industry innovation and R&D, improve commercialisation of R&D and maximise collaboration between the public and private sectors.
Evaluate and Reform Education and Skills Formation	
To create and maintain a highly skilled, relevant and innovative workforce.	To ensure that the skills required by the industry are available.
Develop Domestic and Global Markets	
To expand the domestic market and provide a base to create a highly competitive export industry.	Grow the industry to its maximum potential within Australia. Significantly increase the Australian spatial information industry's international market share.

The industry goals listed within this report are of equal importance and are not listed in any specific order of priority. Each strategy has a number of actions that help attain the defined goals. The next five chapters present these actions in detail.

Australia will be a global leader in the innovative provision and use of spatial information.

5 Policy Framework

Goal: To ensure a mutually beneficial relationship between business and government.

Strategy: Business to engage Commonwealth, State, Territory and local Governments to develop a policy framework that meets government objectives and allows business to prosper.

Responsibility for Implementation:

Industry and professional associations, particularly the Australian Spatial Information Business Association (ASIBA) and the Spatial Sciences Coalition; Commonwealth, State, Territory and local Governments and government bodies, including the Australia and New Zealand Land Information Council (ANZLIC) and associated agencies will be jointly responsible for implementation.

Recommended Actions:

5.1. Create formal linkages between business and government agencies, in particular ASIBA and ANZLIC. Position ASIBA with the private sector equivalent status to ANZLIC in terms of providing advice and policy recommendations to Government.

5.2. ASIBA to work with the Department of Industry, Science and Resources to identify government programs under which it may be eligible for funding.

5.3. Create improved linkages between business and the universities, research agencies, and research and professional associations.

5.4. Joint development by government and industry of policies which define the roles of the private and public sectors at all stages of the supply chain and define the boundaries of spatial information activities that should be performed by Government.

5.5. Industry bodies to monitor government policy development to ensure that industry interests are taken into account in any major statements and to seek change where necessary.

5.6. Commonwealth government to note that the industry supports the draft recommendations of the Productivity Commission Inquiry into Cost Recovery by Commonwealth Government Agencies as fundamental to the future success of the industry.

5.7. All levels of government to develop standardised contracts and encourage the contracting out of activities which can be performed effectively by the private sector.

5.8. Industry associations to work with Commonwealth and State Competition Authorities to address issues of Competitive Neutrality of public sector business enterprises.

5.9. Industry bodies to work with the Department of Communications, Information Technology and the Arts and with telecommunications companies to clarify and address the issue of the cost to the spatial industry of Internet and mobile bandwidth in Australia.

5.10. ASIBA to write to the relevant State Ministers supporting the expansion of professional standards legislation.

Funding Support:

- The recommendations in the Productivity Commission draft report on Cost Recovery by Commonwealth Agencies have potentially large funding requirements which will need to be considered in the Budget context following the government response to that report.

Timeframe:

- The creation of linkages and development of policy proposals should progress rapidly with the formal establishment of ASIBA. Substantial progress should be achievable in the first year.

Role of Government

Understanding the role of government in the spatial industry is important.

Government is a key stakeholder in the spatial information marketplace, acting in the community interest as a consumer, coordinator and establisher of standards in the industry. Understanding these different roles is important to ensure that the policies and guidelines for industry development will succeed.

Firstly, Government has a strategic interest in ensuring that spatial data generated through economic activity is developed as an information resource to be exploited for the benefit of the community. This strategic interest is manifested by:

- Investing in the information framework referred to as the spatial data infrastructure (SDI);
- Providing custodian facilities that maintain spatial data sets; and
- Developing standards for access, transfer and pricing of spatial data that enable an efficient data distribution model.

Reflecting laser-based field data capture – Rapid Map Global

Secondly, Government is a major consumer of spatial information, and needs to acquire spatial data to support the business of government.

Thirdly, Government provides a regulatory function to ensure that community interests are maintained by developing policies that address privacy and security issues related to improper use of spatial data.

As the industry matures, it is necessary to examine the participation of government and its ongoing role. Wherever possible, government should consider alternatives to direct involvement in commercially competitive activity and be prepared to provide support in cases of market failure and where community service obligations exist.

The Australia New Zealand Land Information Council (ANZLIC) is the peak coordinating body across government jurisdictions. For more detailed information on ANZLIC, see Appendix 3. The industry considers that ANZLIC needs to reinforce its position as the primary point of contact for business with all levels of government and all agencies within each level, not just the agencies represented on the Council.

Formation of the Australian Spatial Information Business Association (ASIBA)

A new private business association has been formed by the industry.

A key initiative in the development of the relationship between business and government has been the formation of a single association to represent private business interests in the industry. The new association is called the Australian Spatial Information Business Association and was formally incorporated on 3 July 2001.

Any organisation that is a 'business involved in spatial information activities' will be encouraged to join the new association. It is anticipated that organisations as wide-ranging as multi-national IT companies, utilities and small environmental practices will join the new group.

ASIBA has a number of core areas of focus.

The drivers for the new industry association deliberately emphasise business. The new industry association will focus on outcomes for the spatial information industry business sector, as opposed to standards, professions and technology. The new association will primarily focus on:

- representing private companies' interests in growth and profit;
- the commercial interests of its members;
- providing value to members through facilitating industry growth;
- being the private sector voice for the Australian Spatial Information Industry;
- attaining equivalent status to ANZLIC; and
- achieving outcomes for its members.

The function of the Association must be to provide services that meet the needs of its constituents. The Association can only do that by:

- understanding the larger issues that affect the industry nationally and internationally;
- listening to its members' needs and developing appropriate services and policies;
- understanding the issues peculiar to each State and Territory, as well as Commonwealth issues;
- influencing Commonwealth, State and Territory Governments to channel expenditure to areas that:
  - lead to national consistency and efficiencies gained by common practices;
  - develop key spatial data infrastructure; and
  - reduce duplication across State and Commonwealth agencies;
- cooperating with and influencing other industry Associations; and
- working closely with the tertiary education sector.

Surveying total station – Landmark

Therefore, an effective Association must think and act nationally, but it must also eventually deliver some specialist local services to its members. Due to the cost of establishing multiple locations simultaneously, the association will commence operations in Canberra, where it will initiate some of the most important functions. As the membership increases, the funds will become available to increase the number of services provided and establish local offices in each capital city.

ASIBA will have the vital task of overseeing the implementation of the Action Agenda.

The success of this initiative will be extremely important for the implementation phase of the Action Agenda post-June 2001. It will be largely up to the business association to oversee the implementation of actions, which are primarily the responsibility of business and represent business in the implementation of joint actions with government and academia.

Creation of formal linkages and a strong relationship between ASIBA and ANZLIC is of primary importance. It is essential to position ASIBA with the private sector equivalent status to ANZLIC to provide advice and recommendations to Government. Other linkages between ASIBA and the CSDC, Public Sector Mapping Agencies (PSMA) Australia, other State and local government representative bodies and private sector interests are also important.

Action 5.1

Create formal linkages between business and government agencies, in particular ASIBA and ANZLIC. Position ASIBA with the private sector equivalent status to ANZLIC in terms of providing advice and policy recommendations to Government.

Action 5.2

ASIBA to work with the Department of Industry, Science and Resources to identify government programs under which it may be eligible for funding.

Land titles systems old and new – LandVic

Creation of the Spatial Sciences Coalition

The Spatial Sciences Coalition will facilitate increased collaboration between professional associations.

In June 2000, the Australasian and Urban Regional Information Systems Association (AURISA), the Mapping Sciences Institute Australia (MSIA), the Institution of Surveyors, Australia (ISA), the Remote Sensing and Photogrammetry Association of Australasia (RSPAA) and the Institution of Engineering and Mining Surveyors Australia (IEMSA) met in Melbourne to discuss the possibility of sharing information and resources. The meeting considered various proposals, including ones for joint conferences, joint publications, joint seminars and educational functions.

Follow-up meetings were held in September and December 2000. It was agreed to establish the Spatial Sciences Coalition to develop and implement a plan for increasing collaboration between the associations over the next few years. The coalition is not a new organisation. It is a method the associations have identified to help manage joint initiatives. A working group made up of representatives from each of the associations has been established to manage separate projects.

The membership of the Coalition is not seen as fixed. The meeting extended an invitation to other associations to become involved.

A major function of the Spatial Sciences Coalition is the professional development of its individual members. The industry considers that the professional bodies will be the primary link with universities and research and development agencies on R&D and education and skill formation issues.

Action 5.3

Create improved linkages between business and the universities, research agencies and research and professional associations.

Significant Government Policy Issues

The Action Agenda has identified priority areas for policy reform.

The Action Agenda process has identified a number of areas of government policy where the industry supports either policy reform, acceleration of policy changes which have already been announced, or better compliance by Government with existing policy initiatives. The more important of these are examined below.

Industry Development

The relationship between government and industry is extremely important for the success of the spatial information industry. Government is the supplier and custodian of many fundamental datasets and is also an important purchaser of spatial services and a potential competitor for the industry in the provision of services.

The roles of the public and private sectors must be clear.

Industry considers that it is extremely important that the roles of the public and private sectors should be clear at all stages of the supply chain. This requires the boundaries of public and private sector activity to be clearly defined.

Checking coordinates – Landmark

Agreed fundamental publicly funded data must be readily available to set standards and with minimal restrictions on use by the private sector in value-added products. The point at which government withdraws from the value chain in favour of the private sector must also be clear. The industry favours a policy whereby government does not compete with the private sector in the provision of value-added products and services. These issues are closely related to data access and pricing, contracting out and competitive neutrality, which are all discussed in more detail below.

Action 5.4

Joint development by industry and government of policies which define the roles of the public and private sectors at all stages of the supply chain and define the boundaries of spatial information activities that should be performed by Government.

Industry development can also be fostered by a close relationship between industry and government so that the spatial information industry's concerns are taken into consideration when broader government policy statements are being developed.

Action 5.5

Industry bodies to monitor government policy development to ensure that industry interests are taken into account in any major statements and to seek change where necessary.

A closer and more cooperative relationship between industry and government will also increase the scope for secondment of personnel from within government to assist on particular projects. This can be very important in bidding for major overseas projects where there are points allocated to personnel based on their experience, and where government involvement is often regarded as a significant plus. There are also staff development benefits from secondments which provide personnel with a greater breadth of experience across the private and public sectors of the industry.

An interesting case study of how a formal relationship between industry and government can be developed is the Queensland Spatial Information Infrastructure Strategy, see Box 5.1

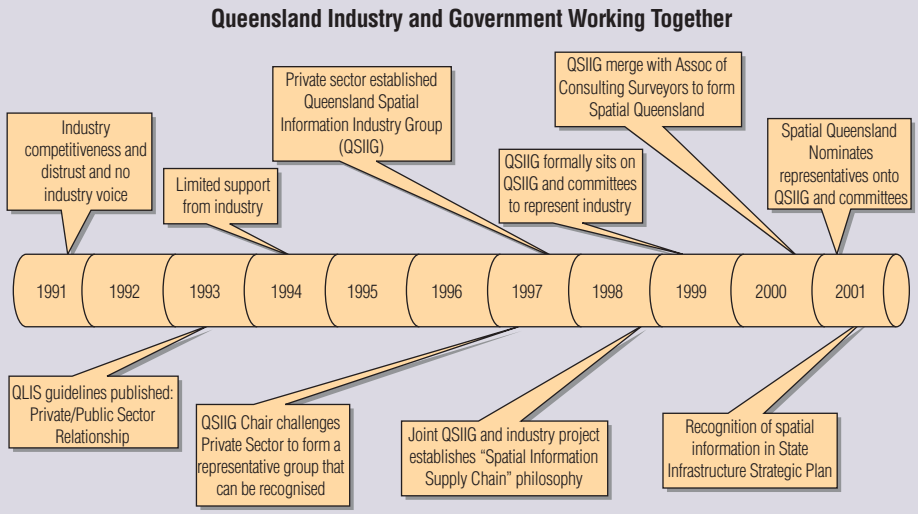
Data Access and Pricing

Data access and pricing is probably the single most important government policy issue for the industry.

This is probably the single most important government policy issue for the industry and is discussed in detail in Chapter 6. Data is one of the primary factors of production for the spatial industry and, as such, any constraint on the availability of data, either through quantitative or legislative restrictions, or through the use of monopoly power in pricing, reduces the industry's profitability and ability to contribute to economic growth.

Besides the Action Agenda, there are at least three other major policy processes which will have an impact on data access and pricing:

Box 5.1: The Queensland Spatial Information Infrastructure Strategy



The Queensland Spatial Information Infrastructure Strategy provides an example of a formal consultation process between a State Government and private industry which participants consider has worked well. A brief history of the development of QSIIS is shown in the diagram above. Important features of QSIIS are:

- a formal planning regime where participants from the three tiers of government, private sector and academia can identify their roles;
- a consistent Vision of easy access to relevant and reliable integrated spatial information;
- a detailed Action Plan with clear responsibilities for implementation;
- a set of Business Environment Principles which set out the roles of government and business in the spatial information value chain;
- an Information Office which facilitates the supply chain;
- dedicated resources to lead and drive the Strategy; and
- a government willing to open the opportunities for marketplace development.

- the ongoing work of the Spatial Data Infrastructure Standing Committee of the Australia New Zealand Land Information Council (ANZLIC), PSMA Australia and the associated work of the Intergovernmental Committee on Surveying and Mapping (ICSM).
- the report of the Interdepartmental Committee on Commonwealth Spatial Data Access and Pricing, which will have important implications for the availability of a number of significant Commonwealth Government datasets. The Action Agenda team has worked closely with the IDC in developing its recommendations.

- the Productivity Commission Inquiry into Cost Recovery by Commonwealth Government Agencies, which presented its draft report in April 2001.

It will be incumbent on ASIBA to maintain pressure for reform of spatial data access and pricing arrangements through its anticipated close relationship with ANZLIC and other activities. The industry considers that it is important that these reforms be implemented without compromising the quantity and quality of the datasets provided by the public sector.

Cost Recovery

Government cost recovery policies have major implications.

Government policy on cost recovery has implications for data access and pricing as noted above but also has wider implications for the spatial information industry. In particular, the industry considers that the practice of setting targets that require agencies to recover a specific proportion of total costs is forcing agencies such as CSIRO to compete directly with the private sector and is limiting their ability to collaborate effectively.

The industry strongly supports the draft PC recommendations.

Accordingly, the industry strongly supports the findings and draft recommendations of the Productivity Commission draft report into Cost Recovery by Commonwealth Government agencies.

Action 5.6

Commonwealth government to note that the industry supports the draft recommendations of the Productivity Commission Inquiry into Cost Recovery by Commonwealth Government Agencies as fundamental to the future success of the industry.

Contracting Out

The industry supports wider application of competitive tendering and contracting to spatial industry activity.

In the longer term the industry strongly supports a policy approach which would see all commercial spatial industry activity performed by the private sector. The industry considers that the appropriate role for government is project management, and setting quality and standards, while the private sector is better at producing solutions for the end-user.

The industry sees the principles set out in the Commonwealth Government's Competitive Tendering and Contracting Policy as an important step in the right direction and strongly endorses their application to the spatial industry at all levels of Government.

The Competitive Tendering and Contracting Branch is located in the Department of Finance and Administration (Finance). Its role is to encourage:

- greater and more effective use of CTC;
- a streamlined government purchasing framework;
- improved SME access to the government marketplace; and
- improved quality of service for customers of the Australian Public Service.

Complaints about Commonwealth Government procurement activity not meeting the guidelines can be addressed to the Purchasing Advisory and Complaints Service (PACS), a part of Finance.

The industry supports the use of standard contracts.

The industry also considers that contracting out of government projects to the private sector could be streamlined by the adoption of standard contract conditions across government jurisdictions.

Action 5.7

All levels of government to develop standardised contracts and encourage the contracting out of any of their activities which can be effectively performed by the private sector.

Competitive Neutrality

Under the principle of competitive neutrality, significant government businesses should not have competitive advantages or disadvantages relative to their private sector competitors simply by virtue of their government ownership.

Competitive neutrality is important to prevent unfair competition by government businesses.

The principle of competitive neutrality does not extend to competitive advantages arising from factors such as business size, skills, location or customer loyalty. Further, the application of competitive neutrality is always subject to the proviso that the benefits of doing so outweigh the associated costs.

The application of competitive neutrality exposes government business activities to the same types of costs and commercial disciplines faced by the private sector so that government and private businesses compete on a similar footing.

In April 1995, the governments of Australia agreed to implement nationwide competition policy reforms under the National Competition Policy (NCP). The agreement added further impetus to the reforms in competition policy that most Australian governments had been pursuing.

One of the elements of the NCP - the Competition Principles Agreement (CPA) - outlines key policy reforms to promote more effective competition across the economy. Under Clause 3 of the agreement, governments agreed to consider introducing measures to achieve 'competitive neutrality' between significant government businesses and private businesses and to establish a competitive neutrality complaints mechanism.

All levels of government have agreed to implement competitive neutrality principles.

The National Competition Council (NCC) is currently conducting the third tranche assessment of Government's progress with implementing National Competition Policy and related reforms. In the *NCP - Third Tranche Assessment Framework* the NCC states that:

'The Council is looking for competitive neutrality principles:

- to be in place for all government business activities which have a significant impact on their relevant market(s), to the extent that the benefits from implementation outweigh the costs; and

- all transitional arrangements, such as phased introduction of competitive neutrality to smaller State and Territory businesses and local government businesses, to be substantially complete.'

The extension of competitive neutrality principles to educational institutions presents some particular problems. The activities of universities are not directly subject to executive control by government but the Council of Australian Governments has endorsed a 'best endeavours' approach in such circumstances to assessment under the CPA.

Industry bodies could seek to add their own voice to this process by pressing for universities to adopt an agreed code of conduct in return for commitments by industry on such matters as sourcing of data for teaching purposes, funding of cooperative research and provision of scholarships.

Again in the *NCP - Third Tranche Assessment Framework* the NCC states that:

'The question of how to apply competitive neutrality principles to universities is being considered at an inter-jurisdictional level. Jurisdictions have established a working group comprising representatives of the higher education sector to develop a protocol in relation to university activities and competitive neutrality policy.

The work to date indicates that universities are at various stages in developing their own competitive neutrality arrangements.'

Following completion of the third tranche assessment in July 2001, the NCC is scheduled to conduct an annual review of progress.

A complaints process has been set up.

Under the Competition Principles Agreement (CPA), governments have an obligation to investigate allegations of non-compliance with competitive neutrality policy and report annually on those allegations.

Compliance with competitive neutrality principles by government agencies has been an issue of significant concern to the spatial information industry and a number of *prima facie* cases of non-compliance have been drawn to the attention of the Action Agenda. The Action Agenda does not have the power to investigate these and has in each case suggested that they be drawn to the attention of the relevant complaints offices.

The complaints process is a potential way of ensuring that businesses not currently required to comply with competitive neutrality principles are drawn into the compliance net. In the *NCP - Third Tranche Assessment Framework* the NCC states that: 'Some jurisdictions use their competitive neutrality complaints mechanism to investigate concerns that a business has not been exposed to competitive neutrality (with the possibility of a recommendation to the Minister that competitive neutrality principles be applied).'

The necessary mechanisms to address spatial industry concerns about compliance by government businesses with competitive neutrality principles are largely in place. It is incumbent on the industry to use these effectively. There is a potential role for ASIBA in informing businesses of the complaints mechanisms and presenting a cohesive industry view to the annual review of progress under the NCP if necessary.

Action 5.8

Industry associations to work with Commonwealth and State Competitive Authorities to address issues of Competitive Neutrality of public sector business enterprises.

High cost of Internet and Mobile Telephone Bandwidth

The industry considers that the cost of bandwidth in Australia is too high.

A number of existing and emerging applications of spatial information are heavily dependent on the availability of competitively priced communications bandwidth. Spatial industry firms which distribute large image files over the Internet are some of the highest intensity users of Internet bandwidth in Australia. Similarly, the distribution of image data to mobile services in the provision of location-based services is a very high intensity use of the mobile network.

For the average consumer of broadband services, Australian prices and availability compare favourably with the leading countries. However for the high-end user, particularly businesses with large bandwidth requirements, some significant differences remain which affect their bandwidth costs.

The current business model used by the Australian telecommunications industry is one of an up-front fee plus a usage charge based on the volume of data transferred. This differs from a number of major overseas providers, including the US, which have a fixed charge for access. A report prepared by Earth Resource Mapping for the Action Agenda argues that the Australian telecommunications business model results in significantly higher bandwidth costs for the spatial industry in Australia and adversely affects their ability to compete with overseas-based data providers.

The Department of Communications, Information Technology and the Arts (DCITA) has been working with the multi-media industry to address similar issues. The Advanced Networks Program provided $40 million to develop solutions to some of the problems faced by high-end users.

The Action Agenda considers that a formal consultative arrangement should be established between the spatial information industry and DCITA to investigate further the issues of how the current charging regime affects the competitiveness of the spatial industry and how the industry's problems in this regard might be addressed.

Image on mobile service – Intergraph Australia

Action 5.9

Industry bodies to work with the Department of Communications, Information Technology and the Arts and with telecommunications companies to clarify and address the issue of the cost to the spatial industry of Internet and mobile bandwidth in Australia.

Occupational Association Legislation

The industry supports the expansion of occupational association legislation.

Following the introduction of the *Professional Standards Act 1994*, the Institution of Surveyors NSW Inc., the Association of Consulting Surveyors NSW Inc., and the Australian Consulting Surveyors Insurance Society Limited have created a scheme to limit professional liability for the surveying profession, under NSW legislation.

To facilitate the scheme, a new Association called the Professional Surveyors Occupational Association NSW Inc (the PSOA) was formed in 1996. The Scheme is known as *The Professional Surveyors Limitation of Liability Scheme* and is governed by *The Professional Standards Act (NSW) 1994*.

When the *Professional Standards Act 1994* was first introduced it was expected that the concept of limited liability would be one which all States would accept as an advantage for professionals. However, a major provider of professional indemnity insurance for surveyors in New South Wales advises that 20% of claims are now based on the *Trade Practice Act 1974*. As a Commonwealth Act this means that the limitation of liability does not apply.

The industry supports adoption of similar legislation in other States and Territories and adoption of measures to prevent the use of the *Trade Practices Act 1974* to circumvent the legislation.

The Australian Competition and Consumer Commission considers that Section 52 of the *Trade Practices Act 1974* provides essential protection for consumers from misleading or deceptive conduct. The issue of the difference between professional negligence and misleading or deceptive conduct is one which affects a number of other professional services industries and is probably best resolved by the courts on a case-by-case basis.

ASIBA and other industry associations could usefully monitor court rulings on this issue and keep members informed of developments.

Action 5.10

ASIBA to write to the relevant State Ministers supporting the expansion of professional standards legislation.

High resolution satellite image – © SpaceImaging.com

6 Data Access and Pricing

Goal: To maximise the use, distribution and creation of publicly funded data products and services.

Strategy: Influence Commonwealth, State, Territory and local Governments to adopt data policies which increase the creation and use of public spatial information.

Responsibility for Implementation:

Change will be the primary responsibility of the Commonwealth, State, Territory and local Governments and government bodies, including ANZLIC. ASIBA will need to maintain pressure for change, achieve political support and develop arguments to support the benefits of policy change to the Australian economy.

Recommended Actions:

6.1. Joint development by government and industry of a common approach to spatial data access, pricing and application of copyright policy in respect of the licensing of spatial information which maximises the benefits to Australia.

6.2. Commonwealth government to note strong industry support for the recommendations of the IDC on Spatial Data Access and Pricing, including pricing of data at a maximum of the cost of distribution and relaxation of copyright licence restrictions on the use of fundamental public spatial datasets.

6.3. Industry to develop a draft code of practice covering privacy issues.

6.4. A joint project by ASIBA, ANZLIC, ICSM and PSMA Australia to define and catalogue what are to be regarded as fundamental public datasets and make these available to agreed standards.

6.5. Industry bodies to liaise with government to determine what is regarded as future public sector spatial information infrastructure versus private sector activity.

6.6. Recognition by all levels of government that spatial information is a component of fundamental economic infrastructure and that public data provision should be funded accordingly.

6.7. Reform of government pricing and access policies for the provision of spatial information should be considered as priority issues. Any need for additional funding should be considered in a Budget context.

6.8. Request ANZLIC to work with ASIBA to develop recommendations on ways to increase the efficiency of the collection of public spatial data across the nation.

6.9. The Commonwealth and States/Territories to work with industry to resolve outstanding business issues in implementing a national on-line fundamental spatial data delivery infrastructure.

Funding Support:

- Actions 6.6 and 6.7 imply a need for a considerable increase in the public funding of fundamental spatial data if its potential economic benefits are to be fully realised. Specific initiatives will need to be considered in the Budget context.

Timeframe:

- The definition and cataloguing of key data should be able to be progressed rapidly. Substantial progress should be achievable in the first year.
- Reform of government pricing and access policies for the provision of spatial information should be considered as a priority issue in the next and subsequent Budgets.

Publicly funded datasets are a critical factor of production for the industry.

The fundamental datasets provided by government are a critical input to all spatial information businesses. The spatial data collected and produced by Government agencies include geodetic control, topographic and thematic maps, satellite images and aerial photography, and digital information—such as cadastral infrastructures, administrative boundaries, topographic data and digital elevation models.

The innovative use of fundamental datasets facilitates an overall rise in the productivity of the economy.

Other spatially referenced datasets provided through the public purse include environmental, native title, agricultural, atmospheric and geophysical information, hydrographic and aeronautical data and charts, defence maps and socioeconomic datasets. These datasets are collected primarily for public administration and policy development but are also used by spatial businesses to develop products and services. This activity directly facilitates an overall increase in the efficiency of business and thus leads to a rise in the productivity of the economy.

A number of impediments have been identified by the industry. These acknowledged barriers to growth in the industry are:

- the lack of a whole-of-government approach to the access and pricing of public data;
- *prima facie* evidence of monopoly pricing regimes by some government agencies;

A number of barriers to growth have been identified by the industry.

- the restrictions on the use of publicly funded data through copyright and licence conditions imposed by government custodians;
- the lack of a clear definition and catalogue of fundamental public data;
- a lack of private sector input into the direction of infrastructure spending for future public sector spatial information;
- inadequate public funds to gather and maintain fundamental spatial information;
- scope to increase the efficiency of public sector data collection; and
- a lack of on-line availability of spatial data.

These barriers are explained in more detail within the following sub-sections.

Whole-of-Government Access and Pricing

There is a no cohesive, whole-of-government approach to the access and pricing of publicly funded spatial information.

A key impediment to the growth of the spatial information industry is the lack of a cohesive, whole-of-government approach to the access and pricing of publicly funded spatial information. This barrier to progress permeates all three administrative tiers of government, where each jurisdiction has developed an individual approach to the calculation of the price of similar spatial datasets.

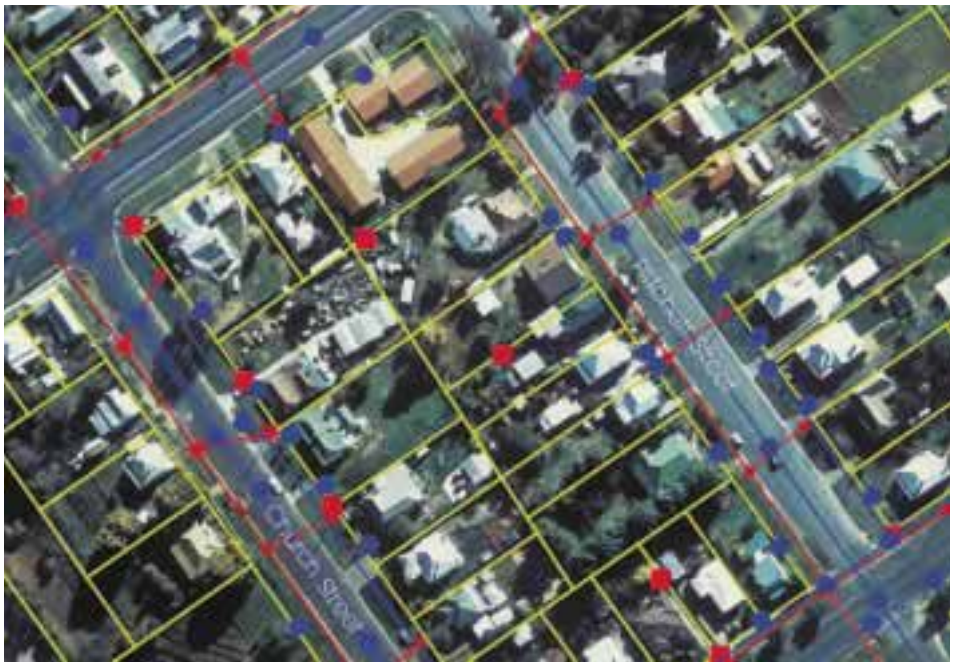
Current data access and pricing policies act as a disincentive to pursue new market opportunities.

The mechanisms to search and access spatial data held in the archives of many government agencies also lack consistency. Many important government datasets that could be used effectively by the private sector are held in archives, hidden from public view or, if catalogued, have no clear guidelines for access by the private sector. These data access and pricing restrictions impose higher transaction costs on the industry. This acts as a disincentive to pursue new spatial information market opportunities and hence impedes the growth of the industry.

ANZLIC has a draft national agreement on the transfer of land-related data.

The Commonwealth, State and Territory Governments recognised the need to standardise the access and pricing of publicly funded spatial information and established the ANZLIC *Draft National Agreement on the Transfer of Land-Related Data* in 1995. This agreement was to provide a nationwide approach to the distribution and pricing of land-related data. The agreement stipulates that for non-commercial environmental management purposes, data will be provided at cost of transfer. The document defines the cost of transfer as:

> *The cost actually incurred in transferring the data. It will generally include computer processing costs, cost of consumables, distribution staff costs and associated overheads. Such overheads might include royalties payable by the custodian to the data owner. The costs of collection, maintenance or upgrade of data are not components of cost of transfer.*



Merged orthophotography, property boundaries (cadaster) and underground services – Sinclair Knight Merz Pty Ltd

Although ANZLIC is the peak council for the coordination of public spatial data management in Australia and New Zealand, it has little or no executive power nationally or within each member's respective jurisdiction. It also does not cover all State and Territory agencies with an interest in spatial information. In 1994 the Australian Local Government Association was invited to participate in ANZLIC as an observer, but has largely remained an inactive participant. Consequently, the agreement did not gather the momentum required for an effective national implementation. Moreover, the agreement was principally aimed at the transfer of data between government agencies and not between government and business. This led the State of Victoria to reject the agreement, citing that it did not embrace the State's competitive neutrality principles. Also, the definition of the cost of transfer stated above was interpreted and implemented differently by each agency.

Businesses are confronted with numerous pricing and access policies across different jurisdictions and government agencies.

Those spatial information businesses that operate at a national level are therefore confronted with a government sector that implements different pricing and access policies for the provision of spatial data, not only across different jurisdictions, but also within the same jurisdiction. The increased interest from the business sector in producing Australia-wide products and customer solutions is creating pressure for reform. For example, there have been significant changes in the pricing of digital cadastral database (DCDB) products over the last year. Chart 6.1 shows the current situation alongside prices quoted to the Action Agenda earlier in 2000. Note that the two sets of prices may not be strictly comparable and should be seen as illustrative of a trend. The current prices quoted are the average per-parcel price when the whole State or Territory datasets are purchased, however some jurisdictions were unable to quote on this basis in the earlier survey.

Reducing data prices can actually increase revenue.

A significant issue for government in implementing lower prices has been the potential impact on revenue. The case study of the impact of the change in pricing regime for cadastral data in Victoria and Queensland described in Box 6.1 shows that total revenues can actually be increased by a competitive pricing structure. This is a result of two influences:

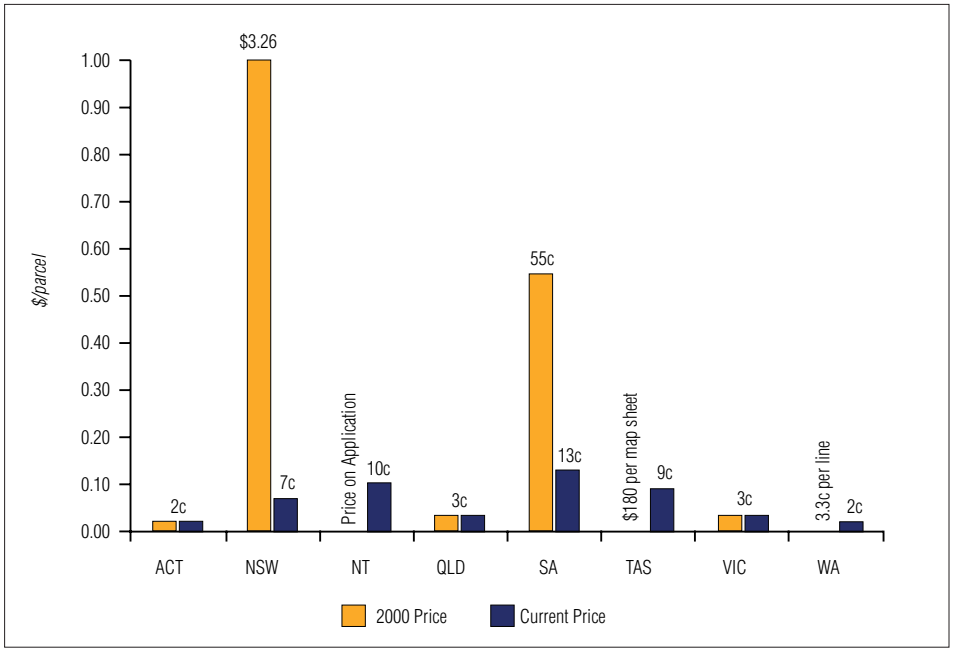
1. In line with the predictions of economic theory, the demand for data appears to be more elastic in the long-run than in the short-run as new products are developed which use the more competitively priced data. Revenues from direct sales of data in Victoria have therefore recovered over time.

2. The reduction in the price of data stimulates a real increase in industry gross product, not just a switch in consumer spending. This is because data is an input to the production process and not just a consumer good. This additional economic activity is subject to the Goods and Services Tax, which, under the terms of the Commonwealth and States financial agreement, flows back to the States and Territories.

Better access to data is just as important as lower prices.

The price of data is, however, only one part of a broader issue. Access is at least as important. Formal restrictions on the use and secondary distribution of data are imposed in most jurisdictions through copyright and licensing arrangements. The detail of these has major ramifications for the development of value-added applications by private industry. The Queensland policy is one of the least restrictive and has been widely acclaimed by the industry (see Box 6.1). Problems with access to data due to

Chart 6.1: DCDB prices charged by each State and Territory.



Source: ANZLIC and State and Territory Governments

administrative inefficiency are also an issue for the industry, with considerable delays in obtaining data reported for some jurisdictions.

ANZLIC has agreed to a policy statement on public spatial data management.

In a more recent development, ANZLIC agreed to a policy statement on spatial data management in April 1999. This policy statement establishes a set of principles for the responsible management of spatial data as a critical national resource and commits all jurisdictions in Australia to cooperate in the implementation of the Australian Spatial Data Infrastructure (ASDI). The policy applies to all forms of fundamental spatial data; the collection, management and use of fundamental spatial data in the national interest, whether application is at national, regional or local levels; and the use of fundamental spatial data by governments, industry and the community.

The principles include access, conformity and quality, content, industry engagement, avoidance of duplication and sensitivity. Access is defined as all sectors of the community having easy, efficient and equitable access to fundamental spatial data where technology, data formats, institutional arrangements, location, costs and conditions do not inhibit its use. Industry engagement is defined as partnerships between industry and government being promoted to develop industry skills, maximise the use of spatial data resources in both public and private sectors and encourage the development of an innovative and competitive value-adding industry in Australia.

CSDC has a public interest spatial data transfer policy.

In 1995 the Commonwealth Spatial Data Committee (CSDC) also developed a Public Interest Spatial Data Transfer Policy. The CSDC is the peak forum for Commonwealth portfolios with interests in the collection and use of spatial data. It is represented on ANZLIC and supports the ANZLIC strategy to actively encourage and facilitate the efficient and effective use of government spatial data. The policy permits nominated

Box 6.1: Case study of Victoria and Queensland

The recent experience of both Victoria and Queensland in reducing dramatically the price of their digital cadastral (property boundary) data demonstrates that this need not be at a net cost to government revenue. Indeed, once the indirect effects on revenue of increased industry activity (particularly through the GST) are taken into account, it is likely that the change has produced a net gain. The main gains are, however, in industry activity and its flow-on effects for incomes and employment.

In both Victoria and Queensland, marketing of digital cadastral and related datasets was initially based on a high margin/low volume model. However, over time progressively fewer inquiries were being received and fewer licences issued. It was becoming obvious that the market was saturated and that larger players were prepared to either stay with out-of-date data, or to maintain their previously purchased data in-house. This represented a double threat—no revenue base, and competing maintenance paths and map bases, effectively confusing industry participants and further increasing the difficulty in exchanging data between users (differing levels of currency, accuracy and reliability).

Both the Victorian and Queensland governments therefore decided to develop a low margin/high volume model. There are significant differences between the models, with the Victorian model being based on a very low up-front cost and ongoing royalty payments and the Queensland model on a higher up-front cost but no royalties. Both represent a very significant reduction in cost and an easing of secondary distribution arrangements compared with the previous system.

In Victoria, the impact of these changes on revenue was an initial further fall, followed by a recovery in demand for data. In Queensland, a small initial fall was mitigated by a change in charging arrangements, which actually produced a revenue peak in 1999-2000. A fundamental result of the economics of consumer demand is that price elasticities are generally greater in the long run than the short run, so this steady recovery in revenue is what would have been expected. The recovery in revenues in Victoria has been assisted by the launch of two new products featuring roads and topographic data. A third new product covering address data is expected to be launched in the near future. Demand for digital cadastral products in both states is expected to expand rapidly as further innovative uses for the more competitively priced data are developed. As noted above, such an outcome would be qualitatively consistent with economic theory but the exact magnitude is impossible to predict.

The most important impact has been the dramatic increase in the volume of data sold. In Victoria, the number of licences or 'seats' has increased from around ten before the price reductions to about 600. In Queensland, over 75 licences to distribute and value-add to the data have been issued, whereas under the previous arrangements no whole-of-state sales were made at the then commercial rate.

Charts 6.2 and 6.3 show the falling trend in sales revenue in both Victoria and Queensland, as markets became saturated in the mid-1990s, and the recovery after the change in charging policy.

Chart 6.2: Revenue and volume of DCDB sales - Victoria

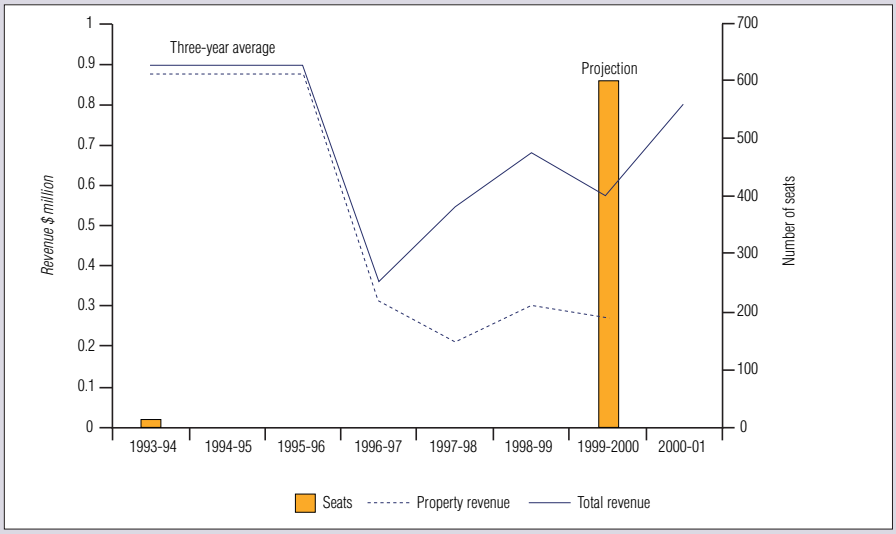
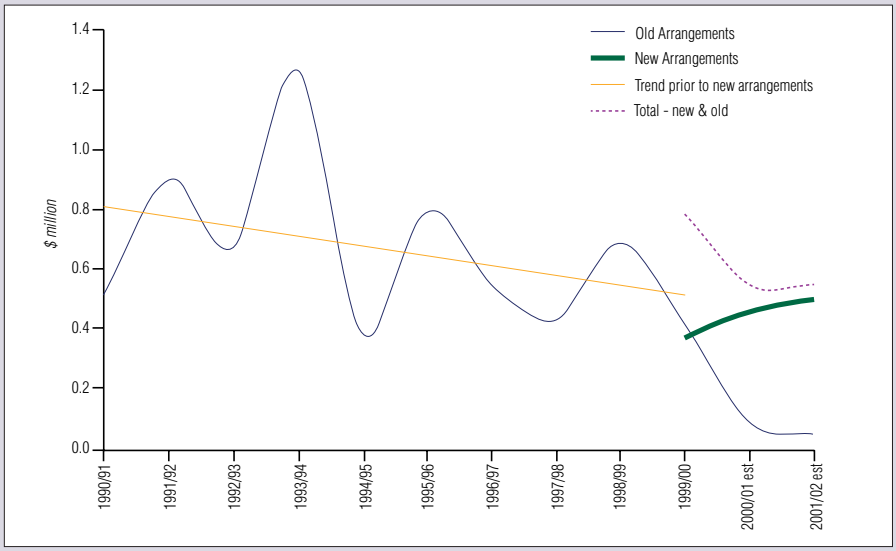


Chart 6.3: Revenue from DCDB sales - Queensland



The extent to which the industry has been stimulated by the price reductions is still being assessed but the impact is likely to have been large, given that the use of data has increased by a factor of around 60 in Victoria, and a whole new market has emerged in Queensland. Anecdotal evidence supports this view.

The introduction of the Goods and Services Tax has resulted in an important second round revenue effect in that the services produced by the spatial industry are in general subject to GST which will flow back to the States under the terms of the agreement between the Commonwealth and States. This means that demand for data does not necessarily need to be elastic for a price cut to result in an increase in State revenues overall. The amount of additional business activity generated by lower data prices can offset a moderate fall in direct data sales revenue.

public interest spatial datasets to be made available at a nominal price, equal to the *average cost of transfer*, which is defined as:

> *The cost of providing copy of the existing master dataset to a user. The actual cost will depend on factors such as the agency's distribution structure and the format in which the data is stored. The original collection costs are not included. Any upgrade or further processing of public interest data to meet specific client needs may be subject to additional charges.*

CSDC has revised its policy through the IDC on Spatial Data Access and Pricing.

Like ANZLIC, the CSDC recognised the need to revise its policy. It has recently been reviewed by an Interdepartmental Committee (IDC) on Spatial Data Access and Pricing. This committee was formed to develop a whole-of-government policy for submission to Cabinet. The IDC has developed recommendations for coordination arrangements, fundamental dataset definitions and lists, and policies on pricing and access.

ASIBA must advise ANZLIC and the CSDC on a common approach.

With the ANZLIC and CSDC mechanisms in place, it is essential that ASIBA provides an ongoing commitment to advise these bodies on the views of the private sector. It will also be important for ANZLIC to engage local government more effectively. Through these mechanisms, the industry can then encourage Commonwealth, State, Territory and local Governments to have a common approach to the access of public data with an unambiguous pricing scheme, applicable equally to all customers.

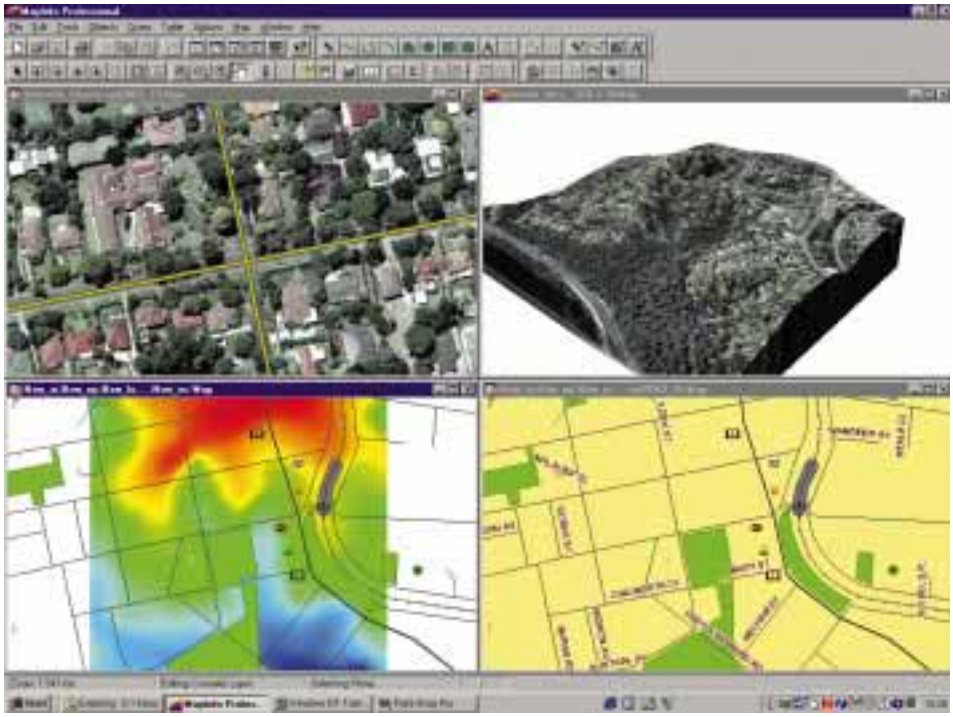
The recent draft report on Cost Recovery released by the Productivity Commission raised the issue that it may be unconstitutional for a government agency to recover costs for products and services beyond a reasonable 'fee for service' because this would constitute taxation (which cannot be imposed without specific legislation).

The industry strongly supports the draft PC recommendations on data pricing.

The report also recommended that the practice of the recovering agencies' operating costs via charging for services should be discouraged, and that instead agencies should be provided with adequate funding sufficient for their core activities and for product development. The two key draft recommendations in this area are:

> *PC Draft Recommendation 6.6*
>
> *The core activities of information agencies (which may include some defined level of dissemination) should be wholly budget funded and not subject to cost recovery.*
>
> *PC Draft Recommendation 6.7*
>
> *Non-core activities of information agencies should be charged at marginal (incremental) cost, where relevant, at prices in keeping with competitive neutrality principles.*

This industry strongly supports these draft recommendations. Their adoption would imply that fundamental data collected by governments would be available to all users free of charge and non-core collections would be available at cost of distribution to all users.



Alternative presentations of data using GIS – MapInfo Australia Pty Ltd

Copyright and Licensing

Government spatial information is licensed for use, not sold. Government agencies can control commercial exploitation by imposing copyright and other licence conditions. These licences usually grant the licensee a non-exclusive, non-transferable licence to use, reproduce, adapt and print the spatial information, and to combine it with other data held by the licensee. They also usually limit the free use of the data to personal use or use within the licensee's organisation. The commercial use of the data, or commercialising any product or service derived from the licensed spatial information, is usually prohibited unless permission to do so is granted by the government custodian of the data, and this may involve payment of licence fees or royalties to the custodian.

Government agencies protect their products from commercial exploitation by imposing copyright and licence conditions.

Commonwealth copyright is administered by InfoProducts, a part of the Department of Finance and Administration (Finance). The Commonwealth of Australia asserts its copyright in all published material produced by, or under the direction and control of, the Commonwealth. One of the fundamental principles followed by InfoProducts in the administration and protection of copyright in Commonwealth publications is:

Commonwealth copyright is administered by InfoProducts.

> *The appreciation of political and departmental sensitivities to any proposed usage or restrictions on reproduction ensuring the Commonwealth receives an equitable share in revenue generated from commercial use of intellectual property owned by the taxpayer.*

Imposition of these copyright and licensing conditions is seen by the spatial information industry as significantly impeding the exploitation of a publicly funded resource. One argument in favour of reviewing policy regarding the imposition of charging for copyright licences and imposing conditions in respect of spatial data is that

Copyright and licensing conditions are seen by the industry as significantly impeding the exploitation of a publicly funded resource.

spatial information has public good characteristics in that it is non-rival. Thus the intervention of government in restricting the use of these goods causes a significant market failure. The industry has often cited the situation in the United States as providing an ideal environment since their Copyright Act disallows the copyright of public works. Section 105 of the US Copyright Law states:

United States copyright laws prohibit the copyright of US government works.

> *105. Subject matter of copyright: United States Government works*
>
> *Copyright protection under this title is not available for any work of the United States Government, but the United States Government is not precluded from receiving and holding copyrights transferred to it by assignment, bequest, or otherwise.*

This policy has been a major catalyst for the private spatial information industry in the United States to grow and become a significant player in the global spatial information market.

The Australian spatial information industry suffers from not being able to leverage a public asset through maximising its use.

The Australian spatial information industry suffers from not being able to leverage a public asset through maximising its use. The industry views government spatial information as a factor of production. The increased use of government spatial information will therefore generate a greater return to the taxpayer through higher industry growth and the ensuing uptake of spatial technologies by the general business community in Australia.

The Commonwealth IT/IP Guidelines, released on 8 February 2001 (available at http://www.dcita.gov.au/ip), provide some guidance to decisions regarding intellectual property (including copyright) in information products such as spatial information. Whilst relating mostly to IP in IT created under contract, the guidelines make some general comments. The guidelines note at paragraph 3.41 of the policy that, where possible, IT-related IP with market prospects should be available for commercialisation or exploitation by Australian firms. It also provides that distribution should be for the ultimate benefit of consumers; it should not be managed so as to promote anti-competitive behaviour or outcomes.

The industry supports the relaxation of copyright restrictions on spatial data.

The industry strongly supports the relaxation of copyright restrictions on the use of fundamental spatial data provided by the public sector. The industry also considers that it is important that this be implemented without compromising the quantity and quality of these datasets. There are already examples of agencies which have relaxed restrictions on particular datasets, for example the QSIIS Business Environment Principles and the ACRES Licence Conditions for Landsat Data (see Box 6.2). The industry recommends that other government agencies review the need for restrictions on a case-by-case basis.

Government may need to retain some control over secondary distribution.

In some instances it will be appropriate for government to retain some control over secondary distribution of data and value-added products which use that data. One danger of a very liberal redistribution policy is that the ancestry of the data becomes unclear and it may be used for purposes for which it is not suited (for example, AUSLIG would not recommend using the 9 second DEM to support low-flying aircraft). Many agencies have put a lot of effort into comprehensively documenting data products and clearly indicating limitations and purposes for which products are not suited as well as

Box 6.2: ACRES Licence Conditions

The text below is a portion of the *Licence Conditions Covering Landsat ETM+ and MSS Data and Data Products Supplied by the Australian Centre for Remote Sensing*. It provides an example of how the Action Agenda's proposed copyright conditions could be framed.

Where the agreement incorporating these Conditions involves the purchase of LANDSAT ETM+ and MSS data the following licence conditions shall apply in respect of those items.

The Commonwealth grants to the Purchaser a non-exclusive licence to use, display, reproduce and adapt the Licensed Data or Licensed Data Product and to make a Derived Product, subject to these licence conditions.

The Purchaser acknowledges that the Licensed Data or Licensed Data Product is a special, unique and valuable product in which the copyright and other applicable intellectual property rights vest in the Commonwealth of Australia.

The Purchaser shall not remove, obscure or interfere with any copyright notice or trademark notice affixed to, incorporated in or otherwise applied in connection with the Licensed Data or Licensed Data Product as supplied to it. In addition, the Purchaser undertakes to reproduce in similar fashion any such notice in connection with any copy of the Licensed Data or a Derived Product made by the Purchaser.

Purchasers are entitled to copy and distribute Landsat ETM+ and MSS Data.

This Licence may be terminated immediately by notice in writing to the Purchaser for breach of any of these Licence Conditions.

In the event of termination the Purchaser undertakes to return to ACRES on behalf of the Commonwealth all copies of the Licensed Data, and any derived products made by the Purchaser.

Landsat 7 – NASA/AUSLIG

those for which they are. One mechanism to try reduce the risk of inappropriate end-use is to make it a condition of the original purchase that this 'metadata' must not be separated from the spatial data in any subsequent re-distribution (see for example, the AUSLIG licensing conditions for Landsat 7 redistribution in Box 6.2).

Australia is also subject to international agreements and conventions relating to some datasets, such as International Hydrographic Office restrictions on dissemination of hydrographic data, imposed to ensure that data integrity and quality are maintained.

Privacy concerns are also potentially an important issue for the industry. Some sectors of the community may consider the maintenance of records by industry for customer relationship analysis to be an intrusion of privacy. Similarly the ability of location-based services to be used to monitor the activity of individuals raises potential privacy concerns. The industry can not afford to neglect these issues and should work to develop a code of practice covering privacy issues.

GIS in local government – MapInfo Australia Pty Ltd

Action 6.1

Joint development by government and industry of a common approach to spatial data access, pricing and application of copyright policy in respect of the licensing of spatial information which maximises the benefits to Australia.

The industry considers that this will be achieved through pricing of data in line with the Productivity Commission's draft recommendations with minimal, or preferably no, copying and royalty restrictions.

Action 6.2

Commonwealth Government to note strong industry support for the recommendations of the IDC on Spatial Data Access and Pricing, including pricing of data at a maximum of the cost of distribution and relaxation of copyright license restrictions on the use of fundamental public spatial datasets.

Action 6.3

ASIBA, and other industry bodies as appropriate, to develop a draft code of practice addressing privacy issues.

Fundamental Public Data

Government needs to provide the certainty that business investment is not compromised through unexpected government competition.

A significant impediment to growth for the industry is the lack of a clear definition of what constitutes a fundamental dataset that should be provided by government. Agreement on a detailed list of spatial information products and services to be provided by government would provide the private spatial information industry the certainty to develop new spatial products and services, with the understanding that government would not compromise business investment through future government competition. Without this delineation, there is a risk of the public sector providing data in competition with the private sector or, alternatively, of a lack of supply of critical datasets that act as factor inputs demanded by the industry.

Some examples of fundamental datasets at the Commonwealth, State and Territory, and local government level are:

- land administration boundaries, land tenure, land use development zones and geocoded street addresses;
- small scale topographic, oceanographic and geological map data;
- marine and coastal boundaries;
- digital elevation models and bathymetry;
- medium resolution imagery;
- transport datasets for road, rail and aviation;

- geodetic control networks and geoid models; and
- statistical boundaries.

The list would need to distinguish between core and non-core data.

In line with the draft Productivity Commission recommendations, the list would need to distinguish between data produced as a result of core activities of agencies, which should not be subject to cost recovery, and that produced through non-core activities, which should be charged at marginal cost or, where relevant, at prices consistent with competitive neutrality principles.

The development of a list needs to acknowledge that government priorities for data collection will vary over time and between jurisdictions. An alternative approach which would give greater flexibility would be to agree on a current list of fundamental datasets and on a set of principles to be applied when new datasets become important for government applications. The QSIIS Business Environment Principles provide an example of this second approach.

Development of data standards also needs to be accelerated.

Along with the listing of fundamental spatial datasets is the need for ANZLIC to accelerate the development of standards that apply to these datasets. This would relate to currency, quality, formats and accuracy.

Another related issue is the need to address which datasets should be acquired using Government facilities. This is a particularly important issue for the remote sensing sector. The process of defining and cataloguing fundamental datasets should also cover this issue.

ANZLIC defines fundamental data as:

> *Spatial data for which there is a justified need for national consistency by multiple users in order for those users to meet their objectives. A fundamental dataset may comprise a number of compatible databases maintained by custodians in several jurisdictions.*

In a Working Paper produced in March 2001, the CSDC defined fundamental data as:

> *The datasets for which several government agencies and/or industry groups require a consistent national coverage in order to achieve their corporate objectives and responsibilities. Fundamental datasets are the building blocks of the ASDI.*

The CSDC is also preparing a list that defines those datasets which the Commonwealth Government views as fundamental or as public goods.

Australian Height Datum – AUSLIG

One consistent national coverage that underpins the ASDI are the core datasets produced by PSMA Australia. The many fundamental datasets produced by the Commonwealth, State and Territory jurisdictions are assembled together into one national spatial dataset.

Dialogue between ASIBA and Government is essential to define which datasets should be considered fundamental.

The definitions and list provide an initial structure for the private spatial information industry to address. A more definitive list and definition with the appropriate tests to determine which datasets should be regarded as fundamental will be necessary to finalise the policy. Ongoing consultation with ASIBA will also be essential to keep the list up-to-date with new datasets.

It will not be easy to achieve agreement on what constitutes the fundamental data that the public sector should provide. Each jurisdiction is likely to have its own view on what constitutes fundamental data. This is an area where industry very much needs the

strong and united voice which the formation of ASIBA can provide, so that it can negotiate with ANZLIC and with individual jurisdictions on an equal footing.

Action 6.4

A joint project by ASIBA, ANZLIC ICSM and PSMA to define and catalogue what are to be regarded as fundamental public datasets and make these available to agreed standards.

Private Sector Input for Future Public Datasets

Private sector input into the definition and scope of any potentially new fundamental spatial information will be important.

With changes in government policy and improvements in technology, the spatial information required by industry to complete commercial projects efficiently also changes. Governments are also faced with this dilemma. A recent example is the changes to environmental policies. These changes have increased the need for temporal and spatially related environment data.

It is important that when these needs arise, there is private sector input into the definition and scope of any potentially new fundamental spatial information. ASIBA can act as the conduit to access the opinion of the private business community in this regard.

Action 6.5

Industry bodies to liaise with government to determine what is regarded as future public sector spatial information infrastructure versus private sector activity.

Inadequate Public Funds

The inadequate coverage and currency of some spatial datasets supplied by the public sector affects industry growth.

A further impediment that affects the growth of the industry is the inadequate coverage and currency of some spatial datasets supplied by the public sector. A case in point at the Commonwealth level is the national topographic map series.

Government-produced topographic maps provide an example of an appropriate use of public funds. They are characterised as a public good for two main reasons. Firstly, the benefits of maps, like national parks and forests, can be enjoyed and used by many people without diminishing the value received by all. Secondly, it is in the best interests of the nation to make mapping data widely available at low cost because it maximises the benefits and opportunities for all citizens and businesses.

Most nations recognise the benefits of government-based mapping programs.

Most nations around the world have recognised the need for and benefits of publicly funded mapping programs, as they are important to the growth of commerce, a sound national defence, and the quality of life of individual citizens. Earlier this year, the U.S. Geological Survey chartered a study to determine how to '… put truly current information into the hands of our customers … in a cost effective way'.

Mapping data also directly support and are required for many functions that are a responsibility of government. These functions include national defence, emergency response, border control and security, public land and natural resource management, and environmental monitoring.

The Bathurst Declaration 1999 by the International Federation of Surveyors has United Nations endorsement. This declaration recognised that land administration and central spatial data infrastructure are essential to sustainable development.

1:100 000 topographic map – AUSLIG

AUSLIG's small-scale and medium-scale topographic mapping programs (collectively referred to as the national topographic map series) provide Australia with its only national topographic mapping coverage at 1:100 000 scale, 1:250 000 scale and smaller scales. Since the first coverage of the 1:100 000 scale mapping program was completed in 1989, funds allocated for mapping activities have only enabled AUSLIG to provide national coverage of maps and data products at 1:250 000 scale and smaller. The true utility of the 1:100 000 scale map collection is now at 40% with the median age of the maps now well over 20 years. Provision of this digital map data is critical in establishing the fundamental topographic reference layer for the industry. The passage of time and changes in technology have eroded the utility of this important factor of production for the spatial information industry.

Each State and Territory has larger scale mapping programs, typically 1:25 000 and larger. The 1:100 000 series is recognised as the most appropriate scale for a wide range of applications by agencies including the National Farmers Federation, Australian Mining Industry Council and many local governments. Strengthened coordination of mapping activity by the States and Territories and by AUSLIG could potentially increase the value to industry and the community from these core mapping datasets.

A central role for ASIBA will be to petition Government in the maintenance of public funds to ensure that all fundamental spatial information datasets provided by Government do not lose their value to business or the general community.

A key role for ASIBA will be to petition Government for the adequate provision of spatial information.

Action 6.6

Recognition by all levels of government that spatial information is a component of fundamental economic infrastructure and that the development and dissemination of public data must be funded accordingly.

Action 6.7

Reform of government pricing and access policies for the provision of spatial information should be considered as a priority issue in the next and subsequent Budgets.

Efficiency of Public Data Collection

Better use of public funds can be achieved by increased efficiency of spatial data collection.

The industry sees two issues involving the efficiency of public data collection, both resulting from poor coordination between public sector agencies:

1. Different agencies collecting essentially the same data, either because existing data has not been collected to the required standards or simply because they are unaware of each other's activities.

2. Different agencies using similar technologies to collect different data in the same area, when, with better coordination, a single data collection exercise could collect both lots of data.

Improvements in this area could result in both increased value to government generally and some rationalisation of disparate data collections. The WALIS data capture program developed by the ILIP Taskforce has addressed this issue successfully and could be used as the model.

Action 6.8

Request ANZLIC to work with ASIBA to develop recommendations on ways to increase the efficiency of the collection of public spatial data across the nation.

On-line Availability of Public Data

Easy, efficient and equitable access to fundamental data is important

The benefits from public sector investment in fundamental spatial data will be maximised when the community and industry gains access to that data in an easy, efficient and equitable manner. In providing such access it is important that technology requirements, data formats, institutional arrangements and contractual conditions are all considered—thereby ensuring maximum accessibility for the end-user.

On-line access can help achieve this.

On-line provision can improve access to data, particularly where data can be made available 'on demand'. One of the recommendations of the Commonwealth IDC on Spatial Data Access and Pricing is that fundamental data be provided free of charge over the Internet. Combined with the Commonwealth Government's On-line principles of 'integrated service delivery', 'whole of government' and 'single point of entry' this will facilitate ease of access to Commonwealth spatial data.

It should be recognised that this recommendation only applies to making fundamental spatial datasets available free on-line. Full cost of transfer can still be charged for customised services and the provision of value-added products which are potentially in competition with the private sector would be subject to competitive neutrality principles. Where the joint public and private funding of spatial data production occurs, on-line availability should be determined on a case-by-case basis.

The Commonwealth, States and Territories have made considerable progress in their respective implementations of on-line service delivery. The technical issues are relatively easily overcome. Resolving the institutional issues will be the real challenge and will

require formal and on-going dialogue between the sectors. The key business issue is the supply chain roles of the different players, both private and public, in the dissemination of this information to the user community, which has been discussed in Chapter 5.

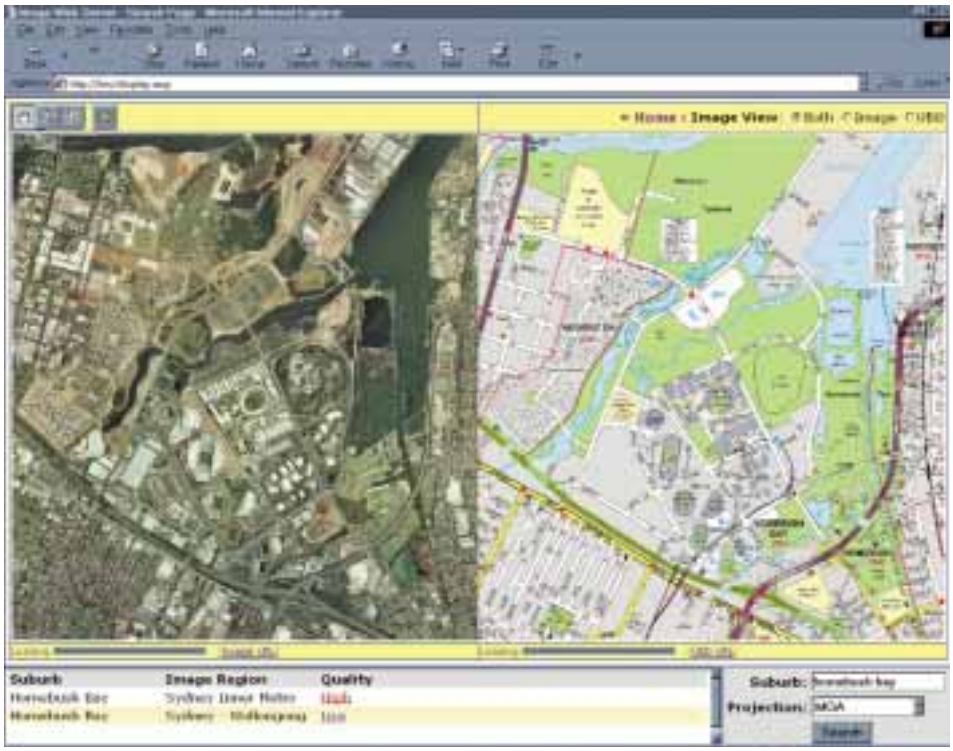
There is also scope for the private sector to gain greater publicity for its products through participation in the Australian Spatial Data Directory (ASDD). This would improve the ability of potential customers to find data products and understand their appropriate uses through access to the relevant metadata. The industry considers that the effectiveness of the ASDD in this regard could be significantly increased through a greater emphasis on providing up-to-date information on how to obtain the data as well as providing up-to-date metadata. A link to the data source is an integral part of the ASDD but anecdotal evidence suggests that it does not always provide all the information required by a potential purchaser.

Satellite dish – AUSLIG

There may also be scope for integrating industry capability information with information from the ASDD in the context of the Clearing House being developed by ANZLIC as part of the Australian Spatial Data Infrastructure (ASDI). This would help put potential customers in touch with firms that could develop integrated spatial solutions to meet customer needs.

Action 6.9

The Commonwealth and States/Territories to work with ASIBA, and other industry bodies as appropriate, to resolve outstanding business issues in implementing a national on-line fundamental spatial data delivery infrastructure.



Logistics planning for the Sydney Olympics – Earth Resource Mapping

Box 6.3: Online Mapping for Customer Prospecting at Toyota Australia

Toyota Australia is working to boost sales by improving its customer prospecting. Using a range of applications from location-based solutions and services provider MapInfo, Toyota Australia has created an online mapping system that offers dealers a graphical depiction of motor vehicle sales within their individual sales territories or prime market area (PMA). The system also enables Toyota Australia to analyse sales performance on an overall, regional and dealer-specific level.

'The result is an accessible and easy-to-use prospecting and business intelligence tool,' says Garry Hora, Toyota Australia's national sales operations manager. 'We had our strongest second half on record, which was at least partly attributable to our deployment of the mapping system in July. Second half sales put us over the top to beat out GM and win the number one market position for the year.'

Motor vehicle dealers in Australia historically have had a single, unwieldy source of market information: the industry's monthly report, V-Facts, a thick paper stack of motor vehicle sales data. Owing to its density and delivery format, the document is not for the faint-hearted or time-pressed. 'Dealers are entrepreneurial. They are generally not inclined to go through reams of paper,' says Hora, who ran a dealership earlier in his career. 'So prospecting has often been untargeted or based on assumptions about market and buyer characteristics, rather than actual knowledge.'

Hora became convinced that a simple, visual presentation of sales data and customer demographics would enhance prospecting. He keyed in on mapping technology as a way to liven static information. Hora immediately noticed a few vital design points: the technology needed to be Web-enabled, easy to operate with minimal training requirements and highly adaptable to meet the evolving needs of dealers and the organisation.

The aim of location-based applications is to furnish companies with another set of data points that are descriptive—and predictive—of customer and prospect behaviour. In this respect, the software is different from and incremental to more traditional geographic information systems (GIS) that typically do not attempt to use spatial information to address non-spatial issues.

Enabling dealers to see the performance of their own PMA was a key requirement that emerged from early discussions. It was identified that dealers should be able to access an array of sales information at a high level of specificity. It was also important that individual dealers were confident their PMA was not available for viewing by other dealers. Each dealer logs on using his or her own user name and password.

Another security-driven requirement was the decision to deliver the mapping system via the Toyota intranet. Other requirements spelled out what types of data dealers would be able to access, such as vehicle characteristics and competitor sales.

Since Toyota's system was deployed, dealer reaction has been positive. Toyota's mapping system has already significantly improved the prospecting capabilities of dealers, Hora asserts. 'Dealers can see numbers of vehicles sold by their franchise and by the dealerships of competitors within their PMA. They can drill down to view types of cars, price points, market shares, buyer profiles and competitor analysis information,' he explains. 'It's a great step forward from a ream of paper used mainly to keep the door open against the wind.'

Hora admits that it's difficult to gauge the returns on investment on something like this. He points out, however, that the company's sales performance offers a reasonable indicator of dealers' prospecting success. He gives at least partial credit to the mapping system for generating a record-breaking sales volume during the second half of 2000.

Adapted from a destinationCRM.com article (Customer Relationship Management)

7 Research and Development

Goal: To create an innovative, strong and high value-added industry.

Strategies: To increase industry innovation and R&D, improve commercialisation of R&D and maximise collaboration between the public and private sectors.

Responsibility for Implementation:

Change will be the primary responsibility of industry and professional associations, particularly ASIBA, the Spatial Sciences Coalition and individual firms in cooperation with public sector research agencies and academic institutions.

Recommended Actions:

7.1. Joint initiatives to engage in and establish partnering arrangements between the spatial information industry, universities and other publicly funded research organisations in the exploitation of intellectual property relating to spatial information.

7.2. Commonwealth Government to examine barriers to commercialisation, and assess the effectiveness of current incentives, as announced in *Backing Australia's Ability*.

7.3. Commonwealth Government to work to improve the coordination of research and development across Commonwealth Government agencies.

7.4. Industry bodies to develop joint proposals for dedicated CRCs to encompass the spatial information industry with CSIRO, universities and other research agencies.

7.5. Industry bodies to work with government to promote elements of all government innovation plans to help strengthen research and development in the industry. Highlight the initiatives of particular relevance to SMEs.

7.6. Industry bodies to work to improve knowledge in the industry of how to secure venture capital and commercialise in-house research through a targeted series of education programs.

Funding Support:

- The Commonwealth Government's Innovation Statement, *Backing Australia's Ability*, contains a number of initiatives which can be used to the benefit of the industry in addition to existing innovation support programs.

Timeframe:

- Initiatives which depend on liaison, on existing innovation programs or on initiatives announced in *Backing Australia's Ability* should be able to progress rapidly.

Innovation is a principal driver of economic growth.

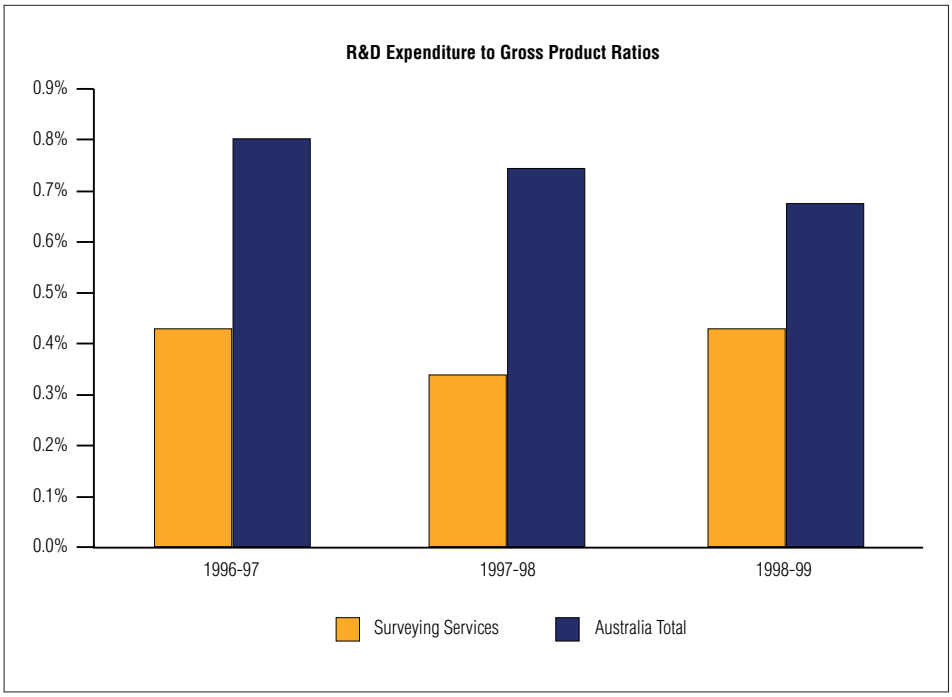
Innovation is a principal driver of economic growth. Generating new ideas through research and development and turning them into commercial successes is a key factor in the future prosperity of any nation. Because the spatial information industry enables other industries to improve their business outcomes, the quality and quantity of research and development performed by the spatial information industry is crucial to growth in the productive output of the whole economy.

Assessing the amount of R&D performed in the spatial information industry suffers from the same data problems as assessing the size of the industry more generally. ABS data shows the *Surveying Services* industry to be a relatively low investor in R&D compared with the economy as a whole, but it has not suffered the same decline in recent years. Chart 7.1 describes the R&D expenditure to gross product ratios for the *Surveying Services* industry compared with the Australian total.

R&D performed by the industry is crucial to growth in the productive output of the whole economy.

In contrast to this, the survey by CTG Consulting of major spatial industry firms not included in *Surveying Services* showed R&D to be around 16% of total expenditure in 2000-01, with a growth rate of almost 10% a year.

Chart 7.1: R&D expenditure to gross product ratios for the surveying services sector compared with the Australian total.



It will be important for the industry to exploit some of the $2.9 billion announced in Backing Australia's Ability.

On 29 January 2001, the Prime Minister, the Hon John Howard MP, announced the Innovation Statement, *Backing Australia's Ability*. This program supports innovation in Australia with a comprehensive portfolio of innovation programs to the value of $2.9 billion over five years. It will be important for the spatial information industry to exploit these programs to the maximum extent possible.

In order to address the shortage in private spatial research and development, the industry has identified a number of areas that should be targeted:

The industry has identified a number of areas that should be targeted to increase R&D.

- improved leveraging of public intellectual property relating to spatial information through the establishment of collaborative arrangements between industry, CSIRO, other research organisations and academia;
- improved industry access to public development funds through the joint promotion of Government innovation plans;
- an increase in the number of Cooperative Research Centres that encompass the spatial information industry;
- effective communication of research and development activities across all sectors of the industry; and
- a targeted series of education programs to improve the industry's knowledge and skills in securing venture capital and commercialising in-house research.

Collaborative Arrangements

An international study of the relationship between innovation and collaboration concluded that the majority of innovative firms (86% in Australia) are also collaborative firms, and that in the innovation process large firms collaborate more than small firms. The study also found that most collaboration in Australia is supply chain related (with suppliers and customers), but collaboration with universities and research centres was also important.

An international study concluded that the majority of innovative firms are also collaborative firms.

CSIRO studies have found that typically $1–5 million, within a one to two year period, is required to progress CSIRO pre-commercial technology through to a product delivery stage. As a rule of thumb, if a company spends 10% of its turnover on the development of new products, then the company would require a turnover of $10–50 million to commercialise intellectual property generated by CSIRO. As there are very few firms in the spatial information industry that meet these criteria, collaboration between businesses—as well as between business, public research agencies and the academic sector—will be essential to capitalise on any private or public R&D investment.

Collaboration between businesses, public research agencies and the academic sector will be essential to capitalise on any private or public R&D investment.

The industry has recognised that although many firms are innovative, others do not have the fiscal critical mass to undertake comprehensive research and development. It also acknowledges that a great deal of research in spatial information science is conducted by public research centres and academia. However, the private sector finds it difficult to access the results of this research.

The private sector finds it difficult to access the results of publicly funded research.

To improve access to publicly funded research and development, the industry has decided on an action to engage and establish partnering arrangements between the private spatial information industry, CSIRO, other research agencies and academia in the exploitation of intellectual property relating to spatial information. This collaboration could be performed through spin-off companies, or by means of licensing or franchising public IP. The recent doubling of funds for the Australian Research Council from the Innovation Statement, with an additional $736 million over five years, also makes collaboration with universities more attractive for the private sector.

The recent doubling of funds for the ARC should make collaboration with universities more attractive for the private sector.

ARIES (artist's impression) – CSIRO

Action 7.1

Engage in and establish partnering arrangements between the spatial information industry, CSIRO, academia and other publicly funded bodies in the exploitation of intellectual property relating to spatial information.

Commercialisation of Research

As well as increasing the amount of innovation and R&D in the industry, it will be important to improve the effectiveness of the commercialisation of that R&D. The industry recognises that it should be generating fresh income through the creation of new intellectual property and new customised products, rather than from the simple resale of government fundamental datasets.

In the past, the industry reports that it has encountered problems gaining access to the results of research and development carried out by public sector agencies. Among the issues raised is that the rate of return expected by public sector research agencies has frequently been excessive given the amount of work still required to develop a commercial product.

Instead of competing with industry, CSIRO and universities should work to establish collaborative arrangements with SMEs.

The industry considers that, instead of directly competing with the private sector, CSIRO and other research agencies and universities should work together to establish collaborative arrangements with private small and medium enterprises. This approach could both provide diffusion of technology from public research institutions to the private sector and financial returns to the taxpayer from the leveraging of public IP.

In response, CSIRO argues that it has invested a good deal of time in engaging with industry but has had mixed success with the spatial information industry. One issue it has identified is the small size of most firms in the industry, which has resulted in a limited capacity to exploit the benefits of technology transfer. Another is the high degree of competition between SMEs, which has limited the scope for joint sponsorship of R&D.

The industry welcomes the announcement in *Backing Australia's Ability* that the Commonwealth Government will examine barriers to commercialisation of Government-funded research and assess the effectiveness of current incentives.

The industry considers that, as part of this process, the Government should look at more innovative approaches to commercialisation—possibly including less reliance on up-front payments by industry in return for a continuing royalty stream.

The Government should investigate the concept of an on-line register of public research.

The industry also supports the development of an on-line register of public sector research by the Commonwealth Government as part of this process. One way of efficiently applying the scarce R&D resources available to the industry is to provide better information on research activities in train. This would assist industry participants to access any related research activities. It would enhance the possibilities for collaboration and resource sharing. It could also be used to identify areas of common focus and sectors which would benefit from the establishment of a Cooperative Research Centre.

Action 7.2

Commonwealth Government to examine barriers to commercialisation, and assess the effectiveness of current incentives, as announced in Backing Australia's Ability.

Action 7.3

Commonwealth Government to improve the coordination of research and development across Commonwealth Government agencies.

The industry is critical of the cost recovery conditions imposed on CSIRO and academia.

A number of spatial information companies that are leading innovators have been openly critical of the budgetary constraints placed on CSIRO and the academic sector, especially where a proportion of their budget must be secured from commercial activities. Due to these constraints, CSIRO and many universities actively compete for tenders against private sector companies in the spatial information industry. The agencies involved are generally subject to competitive neutrality policy, but the industry questions why business activities which could be performed by the private sector are being performed by these agencies.

The Productivity Commission report into cost recovery by Commonwealth Government agencies has made a number of recommendations which, if adopted, would go a considerable way towards addressing this issue.

> *PC Draft Recommendation 6.2:*
>
> *As a general principle, cost recovery arrangements should apply to specific activities, not to the agency which provides them.*
>
> *PC Draft Recommendation 6.3:*
>
> *The practice of setting targets that require agencies to recover a specific proportion of their total costs should be discontinued.*

Action 5.6 in this report, recommending that the Commonwealth Government note strong industry support for the recommendations of the Productivity Commission, extends to cover this issue.

Cooperative Research Centres

The CRC program has been enhanced, providing greater access to SMEs.

Another avenue for the development of the industry's R&D capabilities can be through the Commonwealth Government Cooperative Research Centres program. This program has recently been enhanced in the Innovation Statement, with an 80% increase over the next 5 years at a cost of $227 million. More flexibility will also be incorporated so that larger CRCs can be established. Small and medium enterprises are also provided greater access to the program.

While a number of Cooperative Research Centres make use of spatial information technology, currently no CRCs are dedicated solely to spatial information technologies. The industry has recognised that it is important to take advantage of the recent improvements to the CRC program and to assist spatial information companies in

ASIBA will act to coordinate CRC applications within the industry.

collaborating to establish CRCs that encompass the spatial information industry. The industry recommends that the Australian Spatial Information Business Association be the central point from which assistance and coordination of applications can emerge.

Historically, the establishment of a CRC has typically required identification of around $1 million a year in cash contributions from the relevant industry and a further amount of in-kind contributions. The small size of the firms in the spatial industry has consequently presented a barrier to participation in CRCs. The extent to which the new arrangements will help solve this problem will not be clear until the details of the changes are announced.

Action 7.4

Industry bodies to develop joint proposals for dedicated CRCs to encompass the spatial information industry with CSIRO, universities and other relevant agencies.

Accessing Public Innovation Programs

A range of Government incentives has been designed to encourage quality research and development in all sectors.

Backing Australia's Ability is aimed at fostering the further development of innovation in the Australian economy. A range of incentives has been designed to encourage high quality research and development in all sectors and to provide our universities with the facilities they need for research to flourish. Those relevant to the spatial information industry are as detailed below.

1. Greater incentives for business to increase its investment in research and development including:
   - a new premium R&D tax concession rate of 175% for additional, labour-related, R&D expenditure;
   - a tax rebate, equivalent to the R&D Tax Concession, to help the growth of small companies in tax loss; and
   - providing $535 million over 5 years to continue R&D START grants to support businesses undertaking R&D.
2. An expansion of the Cooperative Research Centres Program, linking business, public research centres and universities and giving small and medium enterprises greater access.
3. Doubling the value of the Commercialising Emerging Technologies (COMET) Program, to provide early assistance to help firms commercialise their innovation.
4. The introduction of a $100 million Innovation Access Program to help business (especially small and medium enterprises) access the best technology and science from both Australia and overseas.
5. The commercialisation of new agribusiness products, services and technologies to be further developed.

6. The impacts of new business tax arrangements, particularly entity taxation, on venture capital investment to be monitored.

7. A strengthened system for protecting Australia's intellectual property.

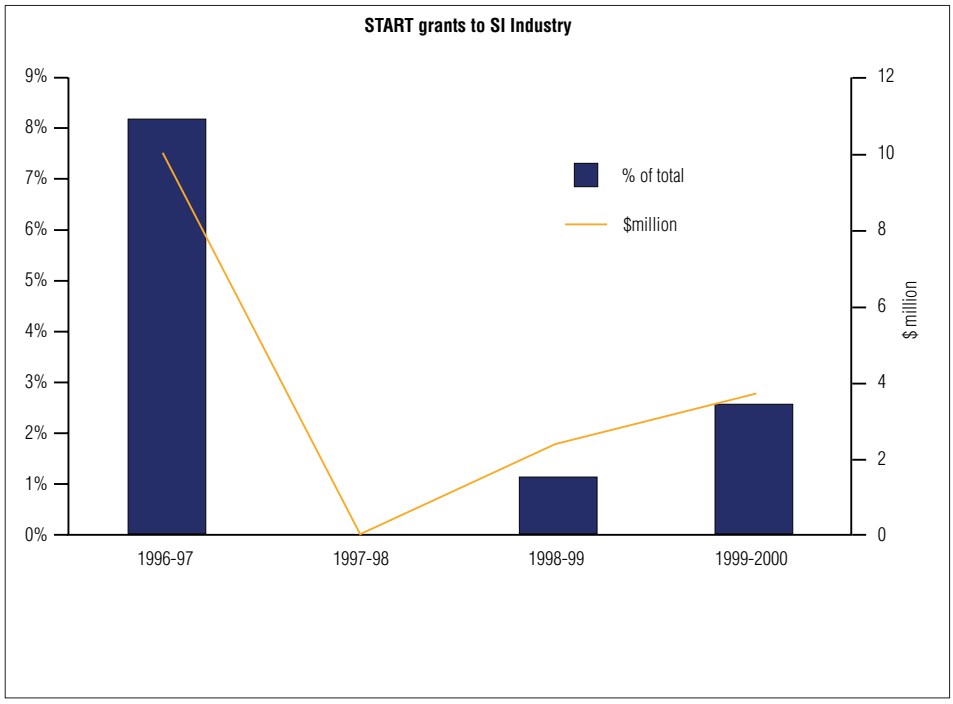
8. Schemes to attract more people with the right skills from overseas to work alongside our brightest talent.

One particular initiative which the industry should consider is for ASIBA to apply for funding under the Innovation Access Program to develop a technology roadmap for the industry. Technology roadmapping is a process to assist firms and sectors identify their future technological and product needs. A detailed guide to creating a technology roadmap is currently being prepared by the Commonwealth Department of Industry, Science and Resources.

The industry is an intensive user of the R&D START program, relative to its size.

An analysis of grants made under the R&D START program shows that up to 60% of private sector R&D expenditure in spatial information over the past year was funded by START grants. This is only an approximate figure because grant money may be spent over a number of years and the precise definition of R&D used by survey respondents is not clear. The data shows that the industry is an intensive user of the START program, relative to its size. Chart 7.2 depicts the START funding awarded to the spatial information industry since 1996. START funding to the industry averaged 2.5% of total grants under the program, while even a broad definition of the industry still puts its share of total industry gross product at 0.1% or less.

Chart 7.2: The proportion and value of R&D START grants awarded to the spatial information industry.



ASIBA and Government will jointly promote elements of all public innovation support plans to the industry.

Use of other innovation support programs by the spatial information industry is very limited. In order to increase the exploitation of these programs, the industry recommends that ASIBA and Government jointly promote elements of all government innovation plans to the industry. This will ensure that all participants of the spatial information industry are fully aware of all public funds available for their R&D activities. It is also recommended that ASIBA provide assistance to their members in applying for these R&D grants from Government.

The scope for the industry to take advantage of the Linkage-Projects component of the Australia Research Council's National Competitive Grants Program should also be investigated. Linkage-Projects supports collaborative research projects between higher education researchers and industry, and identifies an allocation to projects of benefit to regional and rural communities. Proposals must contain an industry contribution, in cash and/or in kind.

Action 7.5

Industry bodies to work with government to promote elements of all Government Innovation Plans to help strengthen research and development in the industry and highlight the initiatives of particular relevance to SMEs.

Venture Capital and Commercialisation Skills

The conversion of a fully developed product derived from research to a final deliverable spatial solution requires skills in securing venture capital and the knowledge to commercialise it. The industry has acknowledged that firms suffer from a lack of knowledge and skills in these areas.

ASIBA will help its members gain access to COMET and training in securing and applying venture capital.

The Commonwealth Government's Commercialising Emerging Technologies (COMET) will aid in the development of these skills. COMET was developed in response to a need for support that enables individuals, early growth stage companies and spin-off companies from research institutions to manage innovation and its commercialisation. It provides support for key steps in the innovation and commercialisation process in order to assist the targeted groups to bring their product to market. The assistance provided under COMET is designed to support a variety of paths to commercialisation, for example: capital from venture capital funds; debt; licensing; and joint ventures or strategic alliances.

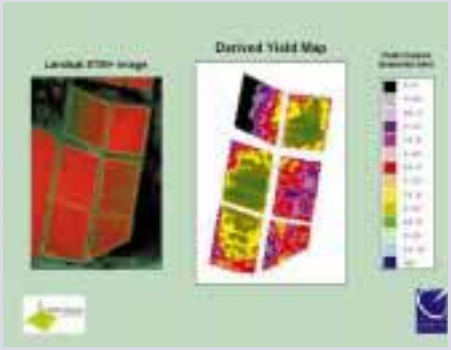
A key role for the Australian Spatial Information Business Association will be to ensure that its members have access to COMET and access to training in securing and applying venture capital.

Action 7.6

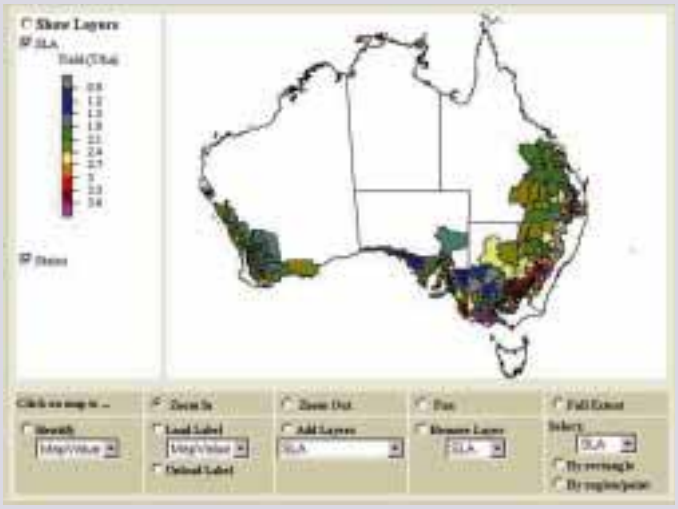
Improved knowledge in the industry of how to secure venture capital and commercialise in-house research through a targeted series of education programs organised by industry bodies.

Box 7.1 Using START to Commercialise an Innovative Product

Agrecon is an R&D company specialising in applications of satellite imagery and other spatial and temporal data for agricultural and environmental resource management. Research began in 1992 to produce yield estimation maps for cotton fields with industry-wide commercial products being released in 1996. Agrecon acknowledges that the move from research and development stage to commercial production was greatly assisted by a two-year $1M AusIndustry R&D Core START Grant awarded to it in 1999.



Agrecon has continually refined its commercial yield estimate products for the cotton industry. The latest development has been the implementation of an Internet-based ordering system which commenced in January 2001. The ordering system is unique in that growers are able to use linked maps and images to locate and identify individual fields on their properties. The system also allows growers to store geographically referenced, field-specific agronomic information while on-line. Yield variability maps derived from high resolution satellite imagery show farmers an estimated yield for every 25x25 metre section of each field. This information is readily integrated into precision farming software or precision steering systems using GPS. Satellite-based yield information products can be combined with other spatial information including soil variability maps, elevation maps, plant nutrient analyses and a variety of agronomic observations, to assist in the diagnosis of problems during the growing season. Yield maps enable farmers and agronomists to assess within-field variations, improve lower-yielding areas and facilitate objective crop damage insurance assessments. Average yield values per field can also be used to predict the total tonnage that will be harvested, improving farm financial and logistical planning.



In October 2000, Agrecon launched its Crop Forecasting System, the first of a series of national Monitoring, Assessment and Prediction Systems (MAPS). MAPS provides a powerful yet user-friendly interface fronting a comprehensive and nationally consistent database, allowing users to obtain a range of spatial and temporal information relating to their particular industry via the internet. The Crop Forecasting System has both historical and regularly updated climatic data, satellite imagery, and crop information summarised for every Local Government Area in Australia. Crop forecasts produced by Agrecon's unique modelling procedures are also available for up to 20 different crops for every fortnight during their growing season. For the local subscriber, growers can compare the progress and forecasts for the current season to previous years with known outcomes. Corporate subscribers can map the spatial variability in climate, crop health and production forecasts across the entire country, assisting in risk management planning for commodity handlers and traders, insurance risk assessors and finance providers, input suppliers and for government monitoring.

Box 7.2: Using START to maintain a 'first-mover' advantage

R.I.A TerraSystems is a Melbourne-based company whose experience illustrates some important points in achieving, exploiting and maintaining a 'first-mover' advantage.

The R.I.A. MapPad product integrates mapping software with links to a GPS receiver and GPRS mobile phone technology to provide on-line access to data. The software runs on the Windows CE platform and offers access to scalable maps, enabling users to zoom in and out without losing resolution. Users can also track their movements in real time via GPS, as well as log data, illustrations, digital photographs and audio, while recording the exact location entered. A key feature is the ability to use data directly from a desktop or mainframe GIS system, using an industry-standard format, thus eliminating the need to convert to unique portable formats.

A major breakthrough for R.I.A. was the access to international markets provided by a strategic partnership with one of the dominant multi-national corporations in the GIS industry. In early 2000, ESRI purchased 25% of R.I.A. and was awarded exclusive distribution rights for the MapPad software, which was renamed ArcPad. The ESRI relationship brought many major projects and partners.

Securing a 'first-mover' advantage is only the start. Soon after ArcPad was launched in March 2000, other major GIS companies also promoted developments in mobile computing. In such a dynamic market as mobile computing, survival depends on maintaining world leadership. Ongoing R&D is essential to this. In particular, R.I.A. is targeting the emergence of the mobile Internet as a vehicle for their mapping/GPS concepts.

With the aid of an AusIndustry START grant, R.I.A has recently embarked on a major project to develop its technology into a new product called MapTel—mapping on 3G mobile phones. The START funding support has helped R.I.A. to maintain a high level of R&D without awaiting the royalty stream generated from the worldwide sales of ArcPad.

START funding can be very helpful for accelerating the development of innovative products but R.I.A. makes the point that maintaining a 'first-mover' advantage requires a virtuous circle by which a successful product generates revenue, part of which is then used for the development of the next generation product.

R.I.A.'s experiences has led it to conclude that commercialisation of technology requires product champions within both the development team and customers—without which the introduction of new technology often becomes too hard.

8 Education and Skills Formation

Goal: To create and maintain a highly skilled, relevant and innovative workforce.

Strategy: To ensure that the skills required by the industry are available.

Responsibility for Implementation:

Industry and professional associations, particularly ASIBA and the Spatial Sciences Coalition; Commonwealth, State, Territory and local Governments and academic institutions will be jointly responsible for implementation.

Recommended Actions:

8.1. Industry and professional bodies will survey and evaluate the skills required for industry and work with government and educational institutions to develop a consistent national industry education policy, with greater involvement of industry and professional organisations in curriculum development.

8.2. ISR and DETYA to collaborate with industry in identifying initiatives in *Backing Australia's Ability* which could be used to benefit the industry through improved skills formation at the tertiary level.

8.3. Industry and professional bodies will work with government to encourage the teaching of basic spatial information concepts at the high school level.

8.4. The industry can stimulate capability by allowing greater access to spatial information relevant to tertiary and secondary courses.

8.5. Industry bodies can participate in helping to expand awards and scholarship schemes for tertiary and secondary students.

8.6. Industry to develop an Internet-based resource for the dissemination of information for a non-technical audience.

8.7. ISR and DETYA to collaborate in identifying ways to increase the penetration of GIS teaching into upper secondary school curricula and in identifying which of the initiatives announced in *Backing Australia's Ability* could be used for this.

8.8. Industry and professional bodies to work with government to establish a national mechanism to ensure the continued relevance of all tertiary and secondary courses.

8.9. Industry and professional bodies to monitor the impact of the revised visa application arrangements and report back in the Action Agenda implementation process

Funding Support:

- The Commonwealth Government's Innovation Statement, *Backing Australia's Ability*, and existing innovation programs contains a number of initiatives which can be used to the benefit of the industry.

Timeframe:

- Actions that rely on initiatives announced in *Backing Australia's Ability* or existing innovation programs should progress rapidly.

One of the key factors in the long term growth and success of an industry is the training of its staff.

One of the key factors in the long term growth and success of an industry is the training of its staff. Without appropriately skilled staff, organisations and industries cannot grow to their full potential. Education is particularly important in a service-based industry such as the spatial information industry. The product of this industry is not always tangible; instead, it often lies in the skills, knowledge and experience of individuals.

The following chapter focuses on those secondary and tertiary studies that influence the development of the spatial information industry.

Tertiary Education

The industry regularly comments on the lack of suitably educated people to employ.

The spatial information industry makes regular comment on the lack of suitably educated people to employ. In the GIS sector of the industry, it is not uncommon for 50% of new employees to have no spatial training and to learn their spatial skills on the job. One GIS business found that the most useful graduates came from the former double degree in information technology and surveying at the Queensland University of Technology. This business will now source its new staff predominantly from IT courses, rather than use geography graduates who typically have few software development skills.

Course content may need updating to better meet industry needs.

These comments raise important questions: is the material presented in the universities that teach spatial information is completely appropriate? Are enough people studying in spatially based fields to satisfy industry demand?

At the university level, there appear to be two distinct schools of spatially-based subjects: geography and surveying/cartography. Geography is the larger of the two areas with 1 022 students commencing study, at all levels, in 1999. In comparison, surveying/cartography had 364 students commence study at all levels in the same year. A detailed table of statistics is in Appendix 2. In addition, general science and engineering degrees can have a spatial component, which cannot be identified from aggregate data.

In 1999, spatially based courses were attracting about 0.65% of all students starting university.

The total number of students commencing studies in 1999, at all levels, was 213 120. This means that the spatially-based subjects (geography and surveying/cartography) are attracting about 0.65% of commencing university students.

The total numbers of all students studying geography and surveying also constitute only a small proportion of the total student number. Of a total of 544 146 students studying at all levels of higher education, some 2 825 are studying geography and 1 154 are studying surveying/cartography. A breakdown of these figures is provided in Appendix 2.

The industry constitutes only around 0.1% of GDP. It therefore has a high share of tertiary students relative to its share of GDP but it also has higher than average skill requirements, so this is to be expected.

A Comparison Over Time

It is difficult to determine how these figures compare over time because the Department of Education, Training and Youth Affairs has changed the way in which it collects and displays higher education statistics. In 1991, surveying and engineering were counted together. This makes a direct comparison with current figures difficult.

In 1991, there were 534 538 students enrolled in all levels of tertiary study. Of these students, 40 207 were enrolled in engineering and surveying. A breakdown of this figure, by level of course, is provided in Appendix 2.

By comparison, in 1999, there were 1 154 continuing students enrolled in all levels of tertiary surveying and 31 861 students continuing studies in engineering. The combined student load for engineering and surveying is 33 015. This is well short of the 40 207 studying engineering and surveying in 1991, and equates to a drop of just under 18% in eight years.

Between 1991 and 1999, the number of students enrolled in engineering and surveying fell by 18%.

University Enrolments

On 10 January 2001, the Action Agenda sent a survey to ten universities identified as offering spatial studies. This survey requested information on student enrolments in spatial studies. The universities contacted were:

A survey was sent to a sample of universities offering spatial studies.

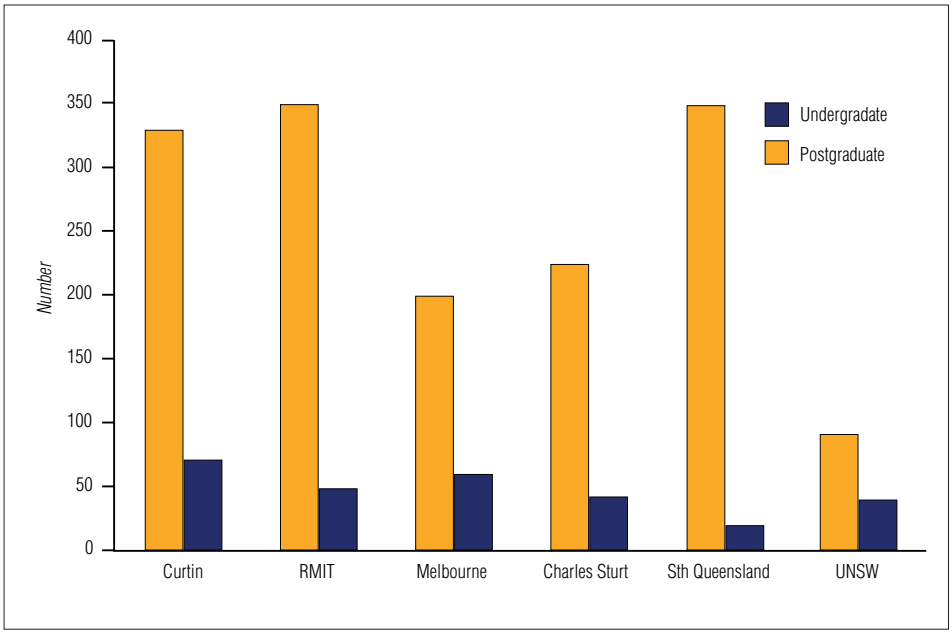
Curtin University	Charles Sturt University
University of South Australia	Queensland University of Technology
Royal Melbourne Institute of Technology	University of Tasmania
University of Melbourne	University of Newcastle
University of Southern Queensland	University of New South Wales

Six responses were received. They were from Curtin University, University of New South Wales, Royal Melbourne Institute of Technology, University of Melbourne, University of Southern Queensland and Charles Sturt University. The results of this survey are shown in chart 8.1. Note that there is a large degree of subjectivity in what different institutions reported as spatial studies. Comparisons between institutions are therefore potentially misleading. The main point of the exercise was to get some indication of how many students study degrees with a significant spatial component.

One important result of the survey is that spatial studies, as defined by the participating universities, is much more broadly defined than geomatics and surveying, in line with broader industry trends. This is reflected in the total number of students reported, which is considerably larger than the DETYA figures for surveying reported above. This poses an important question of the extent to which the decline in surveying courses has been offset by increases in areas such as Geographic Information Science, Spatial Information Science and Environmental Science (which is regarded by the university involved as a spatial science subject). Unfortunately, a much more comprehensive exercise would be required to answer this question.

Spatial sciences courses encompass much more that surveying.

Chart 8.1: Student Numbers in Spatial Technology Courses (selected institutions)



Anecdotal evidence provided to the Action Agenda by the tertiary sector supports the view that the apparent decline in surveying is being offset by growth in other areas of the spatial sciences. For example, in at least one university, GIS is being taught as part of computer science, with double degrees available between GIS and both geology and geography.

The industry often considers that there would be benefits from rationalisation of the tertiary institutions offering spatial courses.

The industry often considers that there would be benefits from some rationalisation of the number of tertiary institutions offering spatial courses. An examination of the list of universities surveyed suggests that there would be considerable problems in rationalising the number of courses. Some of the smaller faculties are the only ones within a particular State, for example South Australia and Tasmania. Where a State has several institutions offering spatial subjects there is generally a difference in teaching approach which would make the merging of courses difficult. For example, Charles Sturt University has a very strong emphasis on Environmental and IT applications of spatial information, while the University of New South Wales is strongly focussed on geodesy and GPS, and Newcastle offers more of a focus on engineering.

Proposals for rationalisation which involve redirecting funding between institutions present difficulties because funding is allocated to institutions not subjects. So if an institution closed its spatial sciences course, the money would be redirected to other courses at that institution, not to spatial sciences courses at other institutions.

Rather than rationalising the tertiary sector, it would be preferable to better align tertiary courses with the needs of industry.

The Action Agenda recommends that, rather than seeking to force rationalisation on the tertiary sector, it would be preferable to work with the existing institutions to align the content of tertiary courses more closely to industry needs. In addition, extra funding for tertiary teaching of key enabling technologies is provided in *Backing Australia's Ability*.

Another issue which has been raised is the need for students in other disciplines, particularly Management and Business Studies, to gain a greater awareness of the contribution which spatial information technology can make. Many emerging applications of spatial information technology, such as consumer relations management and location-based services, have powerful business management applications.

The Mapping Sciences Institute of Australia, the Institution of Mining and Engineering Surveyors and the Institution of Surveyors Australia have together established Spatial Sciences Accreditation Australia (SSAA). The mission of SSAA is to provide a framework of standards, policies and guidelines to enable assessment and accreditation of individuals, organisations and institutions working in the fields of Spatial Sciences. The Association of Surveying and Mapping Lecturers Australia (ASMLA) has close links with the SSAA and also has an important role to play in achieving the goals and actions set out in this chapter. This work could serve as a starting point for a broader exercise to survey and evaluate the skills required by the industry.

Differential GPS – Charles Sturt University

Action 8.1

Industry and professional bodies will survey and evaluate the skills required for industry and work with government and educational institutions to develop a consistent national industry education policy, with greater involvement of industry and professional organisations in curriculum development.

Action 8.2

ISR and DETYA to collaborate with industry in identifying initiatives in Backing Australia's Ability which could be used to benefit the industry through improved skills formation at the tertiary level.

Vocational Education and Training

The VET sector is also an important source of spatial science skills.

Vocational Education and Training (VET) is also an important source of skill formation for the Spatial Sciences. As is the case in the Universities, it is hard to get an accurate estimate of the number of students studying spatial sciences because of the diversity of applications.

The only spatial science which is explicitly identified in the available statistics on the VET sector is surveying, which had 1 609 course enrolments in 1999, compared with the 1 154 enrolments in tertiary level surveying. This underlines the importance of the VET sector to the industry.

The VET sector has recently put in place spatial competencies which have been endorsed by the industry. Qualifications will be in Spatial Information Services and may indicate an area of specialisation as appropriate, eg surveying.

High School

The low uptake of spatial studies at the tertiary level is a serious issue for the industry.

The low number of students qualifying in spatial studies at the tertiary level is a problem for the long term viability of the spatial information industry. As the average age of surveyors and other spatial professionals increases, the industry will start to die out without new people joining.

One strategy is to increase the numbers of students studying spatial subjects at high school and to enhance its content.

One approach to this problem is to increase the numbers of high school students studying spatial subjects and related skills, such as maths, computer science and geography. Technologies such as GPS, GIS and satellite imagery are new and innovative. They have the potential to attract students who have an interest in technology and computers away from other IT fields. These students should be the target for the industry.

In order to attract students well-versed in IT and technology, greater emphasis needs to be placed on GPS, GIS and other emerging technologies. This is not happening at the moment. It appears that those who set the maths and geography curricula are largely unaware of these technologies. An examination of years 11 and 12 geography syllabuses and curricula of South Australia, New South Wales, Victoria and the Australian Capital Territory reveals an under-utilisation of most modern spatial information tools.

GIS in secondary college – Landmark

Of the states examined, South Australia is the only one to make reference to GIS. This reference is in itself relatively insignificant within the context of the overall document. At least it is encouraging to note that all of the examined syllabuses included the use of various forms of imagery, including satellite imagery.

The focus of the various syllabuses is on more traditional areas of geography, such as interpreting maps, representing data, and field skills. While these are all very important and useful skills, they are not leading students to study spatially-based subjects at the tertiary level.

This situation is changing. Some secondary schools in the ACT have begun teaching GIS topics. This is a very positive step in the full development of spatial curriculum. The Institution of Surveyors Australia, in partnership with the University of Tasmania, has produced an education package to introduce spatial sciences to mathematics students in years 10 to 12. Following a successful trial, the package is now being implemented in Victoria with an Australia-wide launch expected in 2002.

There have also been a number of teaching aids developed specifically for remote sensing education.

The GIS in Schools Competition, run by AURISA, is furthering the application of GIS in secondary schools.

One program which attempts to further the application of GIS in secondary schools is the *GIS in Schools Competition* run by the Australasian Urban and Regional Information Systems Association (AURISA), a member of the Spatial Sciences Coalition. The GIS in Schools Competition is aimed at encouraging students in senior secondary school to become involved in applying geographic information systems (GIS) to a variety of spatial analytical problems. This competition encourages schools and students to use GIS technologies in new and innovative ways. Schools complete projects of their own design that use GIS to solve real world problems. Some of the areas examined include environmental monitoring, property analysis, geo-demographic market analysis, and the management of utility facilities.

While this program seems to be meeting its goal of increasing knowledge of GIS in high schools, it is nevertheless facing challenges. In South Australia, the most important issue which has arisen is that GIS is outside the curriculum of high school geography and related subjects. It has also been identified that the spatial information datasets required to effectively teach GIS are often difficult to access due to the budgetary constraints of the education sector. These issues cause a lack of knowledge of GIS, its application and its capabilities among teachers.

Spatial information datasets required to effectively teach GIS are often difficult to access.

This issue is not unique to South Australia. As noted earlier, no State examined specifically includes GIS or other such technology in its secondary school geography syllabus. Overall though, this competition appears to be an excellent way to introduce high school students to the new directions in which the spatial industries are heading.

Action 8.3

Industry and professional bodies will work with government to encourage the teaching of basic spatial information concepts at the high school level.

Action 8.4

The industry can stimulate capability by allowing greater access to spatial information relevant to tertiary and secondary courses.

GIS day 2000 – ESRI Australia Pty Ltd

Action 8.5

Industry bodies can participate in helping to expand awards and scholarship schemes for tertiary and secondary students.

Action 8.6

Industry to develop an Internet-based resource for the dissemination of information for a non-technical audience.

Action 8.7

ISR and DETYA to collaborate in identifying ways to increase the penetration of GIS teaching into upper secondary school curricula and in identifying which of the initiatives announced in Backing Australia's Ability could be used for this.

Action 8.8

Industry and professional bodies to work with government to establish a national mechanism to ensure the continued relevance of all tertiary and secondary courses.

Immigration and Visa Issues

The ability to recruit staff overseas has been an issue of the industry.

The ability to recruit staff from overseas within a reasonable timeframe to address shortages of skilled labour has been an issue for the industry in the past. Anecdotal evidence from the industry suggests that recent experience has been more favourable, with some industry contacts speaking very favourably of the speed of Australian processes relative to the rest of the world.

A second issue has been the ability of employers to recruit graduates with overseas citizenship without lengthy processes.

Because most of the graduates and other potential employees of interest to the industry have qualifications primarily in the areas of Information and Communications Technology, it should be possible to use the initiatives announced in *Backing Australia Ability* under *Attracting ICT Workers* to address these issues.

Action 8.9

Industry and professional bodies to monitor the impact of the revised arrangements and report back in the Action Agenda implementation process.

GIS day 2000 winners, Adelaide – ESRI Pty Ltd

9 Market Development

Goal: To expand the domestic market and provide a base to create a highly competitive export industry.

Strategy: Grow the industry to its maximum potential within Australia.

Responsibility for Implementation:

Industry bodies, particularly the Australian Spatial Information Business Association (ASIBA); individual firms and government agencies involved in commercial spatial industry activities.

Recommended Actions:

An essential prerequisite is to implement the other recommendations of the Action Agenda in order to develop the domestic industry as a solid base for overseas expansion.

9.1. Industry to work with government and academia to identify and develop Australia's areas of competitive advantage in the spatial industry.

9.2. Industry bodies to promote the benefits and value proposition of the industry's capabilities to peak industry groups.

9.3. Industry to develop a capability register of Australian spatial businesses.

9.4. Private businesses, both domestic and foreign, to work to develop alliances and joint ventures for local and overseas work. Industry bodies to encourage joint ventures.

9.5. Industry bodies to assist firms to identify fora to promote the capabilities of the spatial information industry and collaborate on promotion.

Funding Support:

- Some funding may be available through existing programs.

Timeframe:

- Industry development initiatives will be largely ongoing. The Action Agenda implementation strategy will monitor progress at the end of each year. Capability register to be developed by June 2002.

Strategy: Significantly increase the Australian spatial information industry's global market share.

Responsibility for Implementation:

Industry bodies, particularly the Australian Spatial Information Business Association (ASIBA); individual firms and government agencies involved in commercial spatial industry activities.

Recommended Actions:

9.6. Industry to work with government to coordinate firms and encourage greater cooperation between business and government in bidding for overseas contracts—'Team Australia'.

9.7. Industry bodies, particularly ASIBA, to promote the assistance that Austrade and Invest Australia can offer to firms in overseas markets.

9.8. Industry bodies and individual firms to ensure relevant government agencies are aware of major trade initiatives to enable promotion of Australian interests.

9.9. Government ministers to actively promote Australian spatial information businesses where appropriate in meetings with representatives of overseas governments and agencies.

9.10. Industry to identify any barriers to trade or market entry and work with DFAT to develop a strategy to eliminate or reduce trade barriers.

9.11. Industry bodies to work to increase industry knowledge of government programs such as Export Market Development Grants and other forms of available support.

Funding Support:

- Some funding may be available through existing Austrade and Invest Australia programs.

Timeframe:

- Industry development initiatives will be largely ongoing. The Action Agenda implementation strategy will monitor progress at the end of each year.

Aerial photograph of Kata Tjuṯa – AUSLIG

Domestic Market Development

Solutions using spatial information provide an enabling technology which has applications in many other sectors. The challenge for the industry is to develop and market applications which meet customer needs, including future needs. This is clearly a substantial task and the goals and actions identified earlier in this report will be essential inputs.

Earlier goals and actions are essential prerequisites to industry development.

Prerequisites to industry expansion:

- **Supportive and cooperative government policy framework.**
- **Access to fundamental data at low cost and with minimal restriction on reuse.**
- **Increased innovation and research and development.**
- **A highly skilled and innovative workforce.**

In addition, there are other actions which are directly relevant to market development. These are detailed below.

Developing industry capability

The Australian spatial information industry already has a strong capability in a number of key areas, including:

The industry has areas of strong capability …

- land titling, where the Torrens system is widely acknowledged to be the best in the world;
- system integration; and
- data collection.

The industry has high quality skills and an excellent research base, although this Action Agenda has identified some problems with fully exploiting these. The industry is also developing 'first-mover' advantages in a number of high value-added niche markets. To achieve the industry vision of being a global leader does not mean that we have to be a global leader in every aspect of spatial information technology, but it will require the Australian industry to be at the cutting edge in a wide range of activities.

… and high quality skill and research bases.

To achieve this, the industry must identify and exploit its areas of competitive advantage in global markets. This will require both formal processes, such as technology road-mapping, and effective collaboration between private, business, government and research agencies.

The industry needs to exploit its areas of competitive advantage.

Action 9.1

Industry to work with government and academia to identify and develop Australia's areas of competitive advantage in the spatial industry.

Developing new markets requires a considerable investment of time and resources.

Developing new markets requires a considerable investment of time and resources. Investment in market research is required to identify market trends and opportunities, investment in research and development is required to develop or customise products for the target market, and investment in marketing and advertising is required to sell those products to the target market.

Strategic mergers, alliances and joint ventures will be keys to success.

The high investment requirement means that small firms, acting alone, will commonly not have the resources to successfully develop new markets. It is therefore likely that successful firms will be the ones who pursue strategic mergers, alliances and joint ventures, both with other private sector firms and with public sector and academic sources of research work. A range of models are available and it may take some trial and error to find out which are the best.

The Spatial Australia initiative in South Australia provides one possible model of how a collaborative arrangement between small firms can be structured (see Box 9.1).

A useful first step would be for ASIBA, and other industry bodies as appropriate, to develop a capability register of Australian spatial business to assist businesses in identifying potential partners for joint ventures and other forms of collaboration.

Action 9.2

Industry bodies to promote the benefits and value proposition of the industry's capabilities to peak industry groups.

Action 9.3

Industry to develop a capability register of Australian spatial businesses.

Box 9.1: Spatial Australia

Spatial Australia is an industry cluster headquartered in South Australia focussed on creating an environment where companies cooperate to provide a leading edge, world standard, multi-discipline spatial information service. It includes firms experienced in the fields of engineering, project management, computer systems design, surveying, information technology and software supply, human resource development, and education and training.

Spatial Australia is regarded as the industry leader in South Australia and recently delivered the 'Spatial Information Industry Action Plan' to the State Government. The action plan will engage the whole industry and has strong industry commitment. Its purpose is to enhance and develop the growth of the industry over the next two years through a series of strategic actions focussed on stimulating export, job and skill expansion, increased delivery of on-line services, transition to the information economy, and increasing intellectual property assets through research and development.

Action 9.4

Private businesses, both domestic and foreign, to work to develop alliances and joint ventures for local and overseas work. Industry bodies to encourage joint ventures.

Delivering an integrated product

Integrated products will be a key to success.

A key to success in many new markets will be the ability to develop and deliver an integrated product to the customer. Firms will need to be able to provide solutions rather than simply retail products and pre-packaged services. This further reinforces the need for them to be capable across the whole range of skills required to produce and market a solution, or alternatively to be part of a consortium which has that capability.

One indicator of the extent of value-adding in an industry is the ratio of turnover to the cost of data inputs. This is usually referred to as the value-added multiplier and gives a direct measure of the relative importance of value-adding and raw data in a final product. Values for maturing businesses in the spatial information industry are typically between 5 and 8, while ratios in excess of 20 are possible at the high value added end of the industry. Comparisons of ratios over time need to be interpreted with care, however, because a significant change in data prices, as has occurred with DCDB data, can distort trends.

Promoting the industry

The industry needs to lift its trade promotion efforts.

The diversity of emerging applications for spatial information means that the traditional industry fora for trade displays or industry conferences are likely no longer to be adequate. The industry will increasingly need to target the conferences and trade displays of potential customer industries. This is likely to be prohibitively expensive for many small and medium firms and collaborative arrangements will be necessary to share the cost.

Action 9.5

ASIBA and other relevant organisations to assist firms to identify fora to promote the capabilities of the spatial information industry and collaborate on promotion.

Export Market Development

Benefits of exporting

Exporting contributes positively to a country's economy.

Exporting contributes positively to a country's economy not only on the macro level, but also on the micro level. Many firms make the mistake of believing they cannot compete in international markets. However, all firms face international competition not only in export markets, but in domestic markets as well.

Exporting offers companies many additional opportunities that they can not obtain from domestic markets. These include:

Dryland Salinity in China – OPCV

- increased sales opportunities;
- some export markets may offer increased profit opportunities;
- added sales volume may lower production costs;
- lower production cost may increase profitability;
- competing in foreign markets should contribute to increasing the company's overall competitiveness;
- improving the status of the company by competing in a foreign market;
- reducing risks by selling to diverse markets;
- compensating for seasonal fluctuations in domestic sales;
- finding new markets for products with declining domestic sales potential, thereby extending the product's life cycle;
- exploiting opportunities in untapped markets;
- taking advantage of high-volume purchases in large markets overseas;
- testing opportunities for overseas licensing, franchising or production;
- research and development costs can be offset against a large sales base; and
- selling in different markets can dampen fluctuations in business cycles.

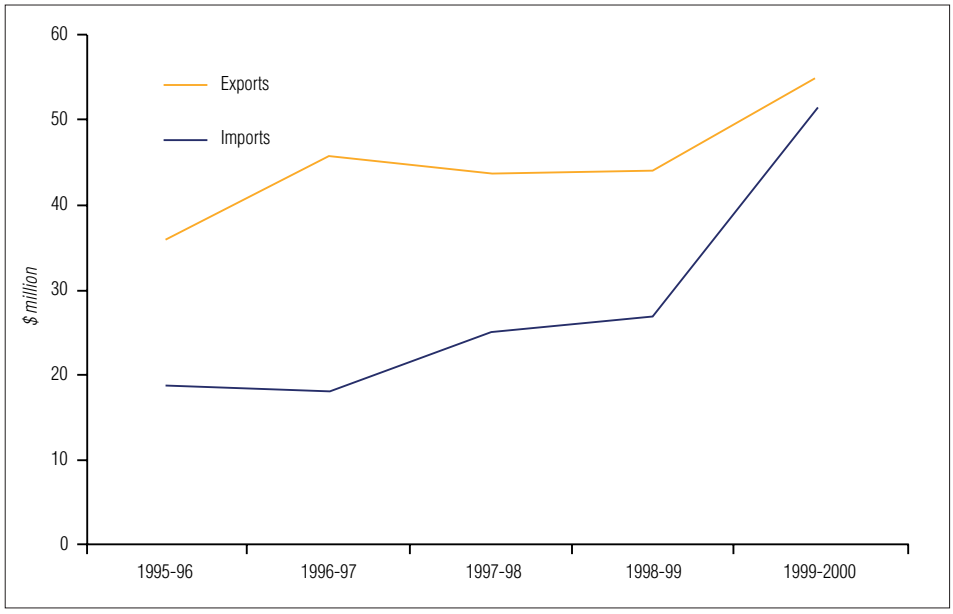
The exports of the spatial information industry can broadly be divided into two categories: merchandise exports and service exports. Merchandise exports are tangible products, such as rangefinders, theodolites and other surveying and remote sensing instruments. Service exports include surveying services, custom software, land administration advice or the interpretation of satellite imagery.

Merchandise trade

Australia is a net importer of surveying and related instruments, with imports typically almost double exports. It is likely that the majority of exports are re-exports, as we know of only a few small-scale Australian manufacturers of specialist instruments.

Australia is a net importer of surveying and related instruments.

Chart 9.1: Trade in surveying and related instruments



Source: ABS unpublished data (AHECC 9015)

Services exports

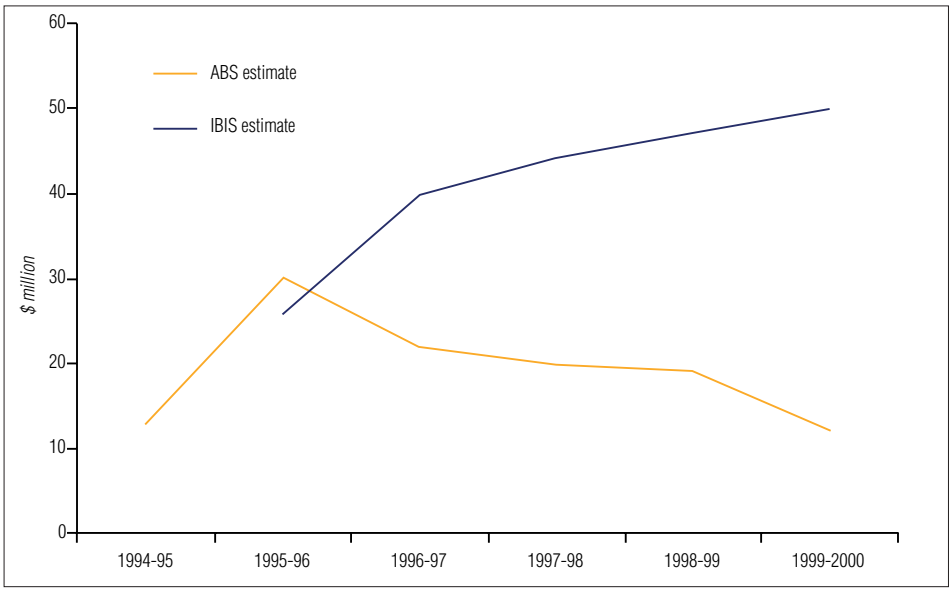
Figures for exports of spatial information services are difficult to come by. There is a large gap in the figures available from the Australian Bureau of Statistics (ABS), the Department of Foreign Affairs and Trade (DFAT) and other sources such as IBIS Business Information.

Available data on services exports show conflicting trends.

The ABS does not provide a breakdown of the exports of most spatial products, only *Surveying Services*. IBIS also only provides figures for surveying. This leaves a large part of the industry without definitive export figures. There is also a significant difference between the ABS and IBIS estimates of exports of surveying services which we have been unable to resolve as both sets of estimates in theory relate to the Surveying Services (ANZSIC class 7822). There is a marked difference in the historical trend as well as the level.

In 1999-2000, ABS estimates of exports of Surveying Services totalled $12 million. This is a fall from the peak of $30 million experienced in 1995-96 (see Chart 8.2). As services exports for 1999-2000 totalled $28 219 million, the surveying services share was less than 0.1%.

Chart 9.2: Australia's Exports of Surveying Services and Royalties (A$ million)



Source: IBISWorld, ABS 5363.0 1999-2000.

Surveying in Bangladesh – OPCV

These data differ greatly from that collected by IBIS Business Information. In its report *L7822 Surveying Service (March 2001)*, it estimates exports of Surveying Services at $50 million in 1999-2000. The Action Agenda was unable to resolve the reasons for this large difference in both trend and level of the two sets of estimates. The difference underpins the need for better data on this industry which was noted in chapter 3.

Education exports are an increasingly important component of Australia's services exports. In 1999-2000, total education exports were valued at $225 million, or 8% of total services credits, and have grown at 30% a year over the past five years. Anecdotal evidence indicates that education exports from the spatial information industry have shown a similar trend but detailed figures are not available.

Exports in the Remote Sensing Sector

One area of the spatial information industry on which more information is available is the remote sensing sector. The PricewaterhouseCoopers study noted in Chapter 3 reported an aggregate of nearly $11 million in export revenue, comprising both services and merchandise, over the 12 months prior to the survey. This is shown below.

Remote Sensing Export Revenue

Sector	Export Revenue $A 000
Private Sector	5 415
Commonwealth Government	5 175
State Government	0
Universities/education	200
Total	10 790

Aggregate export remote sensing revenue is relatively small, though it represents 24% of total revenues generated by the remote sensing industry. Commonwealth Government exports are mainly derived from the CSIRO and, to a lesser extent, satellite imagery sales by ACRES.

Private sector export revenues were earned by sales of both products and services. Products exported included airborne sensors and software and services included acquisition of airborne data as well as applications projects.

Potential Export Areas

Aid-funded land administration projects are an important export opportunity.

Much of the scope to expand exports to developing countries is derived through bidding on projects funded by international aid agencies. These include AusAID, the World Bank and the Asian Development Bank.

These projects are often quite large; for example, a project for the land titling of Thailand was worth $80-90 million over 15 years. Land titling has historically been the major type of aid-funded project, however resource and environmental industry projects are starting to become more common as the environment becomes more of an issue. This is illustrated by a recent project in Bangladesh, which used GIS to map industrial pollutants.

Land titling in Indonesia – Land Equity International

Australia's participation as a contributor to the World Bank gives Australian firms the opportunity to compete for World Bank projects. Australian firms overall have been very successful in this regard, with procurement payments to Australia estimated at $446 million in 1998-99 compared with contributions of $132 million. Land administration has been identified as a priority area by the World Bank which will open up significant further opportunities for firms in the Australian spatial information industry.

Austrade can assist in providing advice on World Bank procurement processes, identifying tenders and providing a first point of contact in potential markets.

Better collaboration in bidding for tenders is needed.

In the past, there have been concerns with multiple, uncoordinated bids being submitted for major, aid-related, tenders. Action agenda consultations suggest that this has diminished in recent years, as some clear market leaders have emerged. There remains a need for greater collaboration generally to improve the chances of winning major tenders.

A substantial amount of work on overseas marketing for the industry was carried out in the mid-1980s by the Australian Surveying and Mapping Industry Conference (ASMIC). This work reflects the structure of the industry as it was then, with its focus on surveying and mapping, but many of the findings and recommendations are still applicable today and should be considered by the industry when developing marketing strategies.

Action 9.6

ASIBA and ANZLIC to work with Austrade to improve collaboration between business and government in bidding for major overseas contracts.

Austrade can help.

Exports to developed countries are more likely to grow through the development of a high quality product, followed by the identification of specific markets for that product. Alternatively, where a firm already has a presence in a particular market it may be possible to identify opportunities in that market and develop custom products.

Again there is assistance available through Austrade to identify target markets, identify potential marketing opportunities, such as trade fairs, and identify potential local partners for joint ventures. Major firms and consortia need to make contact with Austrade to determine what forms of assistance can be used.

Action 9.7

ASIBA and other relevant organisations to promote the assistance that Austrade can offer to firms in overseas markets.

Government ministers can also help promote our interests overseas.

Government ministers can also assist in promoting Australian interests overseas. Whenever a Minister makes an overseas visit, he or she is provided with briefings on major areas of Australian interest. Improved communication between the industry and government officials is required to ensure that relevant officials are aware of major overseas projects, so that visiting ministers can promote them as appropriate.

Action 9.8

ASIBA, other relevant organisations and major firms to ensure that relevant government departments are kept informed of major overseas projects.

Action 9.9

Government Ministers to promote Australian spatial industry interests and capabilities where appropriate in overseas visits.

General Agreement on Trade in Services (GATS)

The industry can benefit from trade liberalisation.

The General Agreement on Trade in Services (GATS) was an important outcome of the Uruguay Round of multilateral trade negotiations. The GATS entered into force on 1 January 1995 and provided, for the first time, a multilateral framework of rules for trade in services and a timetable for progressive liberalisation. It applies to all services, except for most air transport services, and those supplied in the exercise of government authority. GATS is relevant to all modes of service delivery, including the cross-border supply of services (as in the case of electronic commerce) and services supplied through the establishment of an office or joint venture overseas.

While the November-December 1999 World Trade Organisation (WTO) Ministerial in Seattle failed to launch a comprehensive round of trade talks, the mandated services and agriculture negotiations are now underway. The negotiations will advance market access in sectors such as financial services, telecommunications, professional services and electronic commerce.

Barriers to trade in spatial information services might include:

- discrimination in favour of domestic firms, e.g. in tax rates or the application of domestic regulation;
- restrictions on investment, including foreign equity caps and requirements to enter joint ventures;
- residential or citizenship requirements for accreditation as professionals;
- limitations on the number of foreign service providers or limitations on the total value of transactions or assets; and
- non-transparent procedures or unnecessary delays either in the licensing of foreign suppliers or in decisions about visa applications.

This latest round of discussions on the GATS provides an important opportunity for the concerns of the industry, particularly of those members facing barriers to trade, to be reflected in Australia's position on the GATS. Firms should actively advise DFAT of barriers to entry in overseas markets. Tel (02) 6261 2048, e-mail services.negotiations @dfat.gov.au

Mineral exploration – Earth Resource Mapping

Action 9.10

ASIBA and other relevant organisations to work with DFAT to identify barriers to trade or market entry and to develop strategies to eliminate or reduce them.

Barriers and Impediments to Exporting

There are several factors which can directly impede the spatial information industry's export capacity. Some of these factors clearly reflect the realities of doing business in an international marketplace, but some of them reflect the nature of the domestic industry and the domestic market.

The industry needs to address impediments to exporting.

For the spatial information industry there are a range of impediments that need to be focussed upon and addressed. Potential impediments nominated by the industry include:

- small firm size (i.e. lack of a critical mass);
- a lack of desire to enter export markets;
- a lack of knowledge of global opportunities;

- a lack of knowledge of global competitors and global pricing;
- a lack of recognition overseas of Australian expertise; and
- competition from multiple State Government Agencies for international tenders.

Government services are available.

Successfully addressing these impediments will require work from various areas, Commonwealth and State governments, businesses and industry associations.

There is a range of Government services available to businesses. A few of the key initiatives are listed below.

- Export Market Development Grants Scheme (EMDG) - EMDG provides assistance to Australian SMEs capable of seeking out and developing export business. Qualifying applicants can receive partial reimbursement for the costs of overseas representation; marketing visits; communications; free samples; trade fairs; literature and advertising; and hiring short-term consultants.
- Export Access Program - This program is designed to assist those SMEs with limited or no export experience to become involved in exporting on a sustainable basis. Whilst administered by Austrade, the program is delivered by a network of private and public export advisers. It provides a comprehensive package of training and practical assistance for a one-off fee of up to $500.

  Firms from all industry sectors can apply for Export Access assistance, but must meet certain eligibility criteria in order to demonstrate they have the capacity to meet the market demand they create and to conduct follow-up market visits to retain or expand their market share.
- Industries may be able to benefit from the industry programs provided by the Department of Industry, Science and Resources (ISR), particularly the *Value Chain Management Program*, *Technology Diffusion Program*, *R&D Start*, and even the *Cooperative Research Centres (CRC) program*.

Gaining benefit from the involvement with existing CRCs is an option available to some industries, especially as CRCs increasingly have an export-orientation and tend to attract industry participants committed to innovation and excellence.

Action 9.11

ASIBA and other relevant organisations to help promote available government assistance programs to firms in the industry.

Drawing the Industry together to enter new markets

There are ways to reduce the cost of entering new markets.

There are a number of mechanisms a company can use to reduce the costs and difficulties of entering new markets. The most common forms traditionally have been strategic alliances, licensing and networks. Recently the Internet has also proved to be a highly valuable export development tool.

Strategic alliances and joint ventures

When two or more enterprises agree to work together to advance a particular aspect of their business, such as entering a new export market or producing a new product for export, they have a strategic alliance. As long as there are clear net benefits from working together, the alliance will succeed—even with members that are competitors in the domestic market. Some issues for firms to consider when collaborating are listed in Box 9.2.

There are a number of reasons why a strategic alliance can be an effective means of entering a market, including the creation and exploitation of synergies; improved technology transfers; product diversification (through combining product catalogues); and sharing risks and costs. In addition, an alliance can bring together complementary skills and assets, as well as allowing smaller companies to attain the critical mass necessary to enter foreign markets effectively.

Box 9.2: Issues for firms to consider when collaborating

- Potential partners should be thoroughly researched so that a 'good partner' is found.
- Intellectual property should be protected.
- Contracts should proscribe each partner's use of commercially sensitive knowledge gained during the course of the alliance.
- Profit-sharing arrangements should be specified in the contractual arrangements.
- Contracts should specify which legal jurisdiction/legal system will apply.
- Contracts should state which language is deemed 'correct'.
- The arrangement should be managed effectively by building trust, and learning from partners.

A joint venture is a particular type of strategic alliance that normally involves a partner in the foreign market. Some countries, such as China and Vietnam, will only allow foreign firms to export to or invest in the country if they have local distributors or partners. Elsewhere, firms elect to establish joint ventures or other collaborations in order to access a local partner's knowledge of market conditions, culture, language, and political and business systems.

Urban development study in Bhutan – OPCV

Licensing

Licensing is a contractual arrangement that gives ('licenses') one company the rights to another company's technological know-how, design and intellectual property, in return for royalties or other kinds of payment. Soft drinks and small electrical appliances are commonly manufactured under licence. The licensing arrangement includes strict

controls on both manufacturing standards and the intellectual property associated with the product.

Licensing can be a useful arrangement for firms that want to establish a market presence quickly, or without significant financial outlays. However, control may be lost over manufacturing and marketing, and adequate arrangements to protect trademarks and intellectual property are imperative.

Networks

A business network is a group of firms that collaborate actively, albeit often informally, to seek new business opportunities at a regional, national, or international level. Through the network, firms can enhance export market penetration and develop their industries. State governments will often have programs aimed at facilitating networks between exporters.

Internet

The advent of e-commerce has altered the business model in important respects, by creating new sources of revenue, new and much less cumbersome routes to market, new alliances and synergies between businesses, and new supply chains and fulfilment models.

Surveying in Antarctica – Sinclair Knight Merz Pty Ltd

Box 9.3: 3D Mineral Exploration in Northern Africa

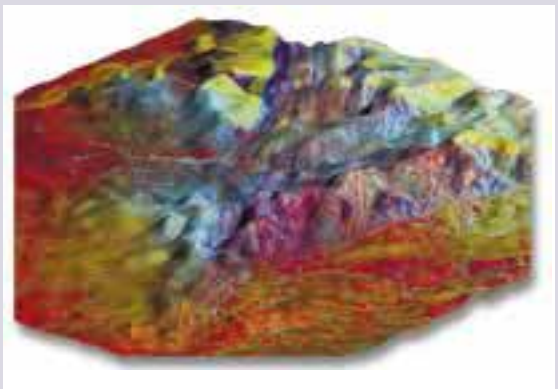
Encom Technology Pty Ltd, Australia, is a Sydney-based firm active in international mineral and petroleum exploration projects. A recent project for base metal exploration in Northern Africa integrated satellite data with aeromagnetic and electromagnetic geophysical survey images.

With the terrain relief of some 3000 metres, the project area presented some special problems. The Landsat data was acquired at around dawn, and as a result much of the scene has extensive shadows cast from the high mountain terrain. This is excellent for mapping structures with surface expression, but the shadows dominate any contrasts that could be associated with changes in rock type or alteration associated with mineralisation events. Evidence of the terrain shadows is easily seen in the Landsat image. Computer processing techniques can be used to reduce the shadow effect substantially. The effectiveness of the shadow elimination procedure is evident in the Abrams ratio image. This image highlights a major unconformity with Cretaceous rocks (yellow) over Proterozoic basement (blue-red).

Landsat image

Abrams ratio image

Although the Landsat scene indicates dramatic terrain relief in the project area it was difficult to assess the relative relief across the scene. Encom decided that visualisation of this relationship would be much easier in 3D with the Abrams ratio image displayed over terrain. Data downloaded from the EROS data centre at the USGS was used to build a digital terrain model for preliminary evaluation. The modified Abrams ratio image was then combined with the elevation data using ER Mapper to produce a 3D perspective view, which could be rotated and tilted in real time. This allowed Encom to zoom into particular areas and concentrate on delineating the geological units.



Land titles adjudication – Land Equity International

Surveying total station – Land Equity International

10 Action Agenda Implementation

Successful implementation of the Action Agenda Recommendations will require action in the areas detailed below.

Industry

Implementation will be driven primarily by the industry.

Consistent with the aims of the Action Agenda process, the implementation of the agenda will need to be driven primarily by the industry. The newly established Australian Spatial Information Business Association (ASIBA) is expected to take a lead role, with support from other industry and professional organisations as appropriate. The member organisations of the Spatial Sciences Coalition (SSC) are expected to make a major contribution to a number of actions under the Education and Skill Formation and Research and Development goals.

State, Territory and local Governments

ANZLIC will also have an important role in implementation.

At the State, Territory and local Government level, the Australia New Zealand Land Information Council (ANZLIC) will have primary responsibility for implementation of the Action Agenda, although the Intergovernmental Committee on Surveying and Mapping (ICSM) has primary carriage of technical standards. The establishment of an office with an Executive Director as agreed at a recent ANZLIC meeting provides essential resources for administrative tasks, including those proposed through the Action Agenda. Other channels of influence are through meetings of the Industry Ministers and the Council of Australian Governments.

Commonwealth Government

An evaluation will be conducted by ISR.

The evaluation of the Action Agenda implementation phase will be conducted by the Department of Industry, Science and Resources. The Department will report on the progress of implementation at the end of 2001-02 and 2002-03. The Department will also work with ASIBA, the SSC and other industry and professional organisations as appropriate to facilitate implementation of any Actions which require Commonwealth government cooperation. The cooperation of other Commonwealth Government Departments will be required in implementing the Action Agenda.

Academic and Research Agencies

The cooperation of the academic and research sectors will also be required.

The cooperation of the academic and research sectors will also be required for the successful implementation of the Action Agenda. The lack of an overall policy coordinating body for this sector will present some communication problems. The SSC member organisations, in conjunction with other organisations such as the ASMLA, covers much of this sector but lacks executive power. Progress will therefore be dependent on the goodwill of the agency and faculty heads.

Detailed Implementation

Develop a Joint Policy Framework

5.1. Creation of formal linkages between business and government agencies, in particular ASIBA and ANZLIC. Positioning of ASIBA with the private sector equivalent status to ANZLIC in terms of providing advice and policy recommendations to Government.

Responsibility: Joint ASIBA and ANZLIC.
Funding: Not required.
Timeframe: High level formal structures in place by December 2001.

5.2. ASIBA to work with the Department of Industry, Science and Resources to identify government programs under which it may be eligible for funding.

Responsibility: Joint ASIBA and ISR.
Funding: Not required.
Timeframe: Examination of existing programs complete by June 2002.

5.3. Creation of improved linkages between business and the universities, research agencies and research and professional associations.

Responsibility: Joint ASIBA, SSC and individual universities and research organisations.
Funding: Not required.
Timeframe: Significant progress in establishing links with major organisations by June 2002.

5.4. Joint development by government and industry of policies which:

- Define the roles of the private and public sectors at all stages of the supply chain; and
- Define the boundaries of spatial information activities that should be performed by Government.

Responsibility: Joint ASIBA and ANZLIC.
Funding: To be investigated under 5.2.
Timeframe: Industry position paper by June 2002.

5.5. Industry bodies to monitor government policy development process to ensure that industry interests are taken into account in any major statements and to seek change where necessary.

Responsibility: ASIBA and other industry bodies as appropriate.
Funding: Not required.
Timeframe: Ongoing. Assessment to be on a case-by-case basis.

5.6. Commonwealth government to note that the industry supports the recommendations of the Productivity Commission Inquiry into Cost Recovery by Commonwealth Government Agencies as fundamental to the future success of the industry.

Responsibility: Commonwealth.
Funding: Implementation of the PC recommendations will need to be considered in the Budget context following the release of the final report and government response.
Timeframe: Final PC report due in August 2001.

5.7. All governments to endorse and encourage the contracting out of activities which can be effectively performed by the private sector and the standardisation of contracts.

Responsibility: All government agencies.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on progress.

5.8. Industry associations to work with the Commonwealth and State Competition Authorities to address issues of Competitive Neutrality of public sector business enterprises.

Responsibility: ASIBA and other industry associations as appropriate, Commonwealth and State Competition Authorities, National Competition Council.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on industry perceptions of progress. The NCC is also required to report annually on progress under the NCP.

5.9. Industry bodies to work with the Department of Communications, Information Technology and the Arts and with telecommunications companies to clarify and address the issue of the cost to the spatial industry of Internet and mobile bandwidth in Australia.

Responsibility: ASIBA and other industry associations as appropriate, DoCITA.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on progress.

5.10. ASIBA to write to the relevant State Ministers supporting the expansion of professional standards legislation.

Responsibility: ASIBA.
Funding: Not required.
Timeframe: Letters by December 2001. The Action Agenda will report on progress in achieving the expansion.

Improve Data Access and Pricing

6.1. Joint development by government and industry of a common approach to spatial data access, pricing and application copyright policy in respect of the licensing of spatial information which maximises the benefits to Australia.

Responsibility: CSDC, ANZLIC, ASIBA and agencies as appropriate.
Funding: Funding of specific changes, where necessary, will need to be considered by the Commonwealth and States in their respective budget processes.
Timeframe: Ongoing. The Action Agenda will report on progress.

6.2. Commonwealth government to note strong industry support for the recommendations of the IDC on Spatial Data Access and Pricing, including pricing of data at a maximum of the cost of distribution and removal of copyright restrictions on fundamental public spatial datasets.

Responsibility: Commonwealth government.
Funding: Implementation of the recommendations can be commenced without additional funding. Funding of full implementation will need to be considered in the Budget context.
Timeframe: Ongoing. The Action Agenda will report on progress.

6.3. Industry to develop a draft code of practice covering privacy issues.

Responsibility: ASIBA and other industry associations as appropriate.
Funding: Could be investigated under 5.2.
Timeframe: Draft by June 2002.

6.4. A joint project by ASIBA, ANZLIC, ICSM and PSMA Australia to define and catalogue what are to be regarded as fundamental public datasets and make these available to agreed standards.

Responsibility: ASIBA, ANZLIC, PSMA and other agencies as appropriate.
Funding: Not required.
Timeframe: Draft of agreed list by June 2002. Implementation of availability and standards will be ongoing. The Action Agenda will report on progress.

6.5. Industry bodies to liaise with government to determine what is regarded as future public sector spatial information infrastructure versus private sector activity.

Responsibility: ASIBA, ANZLIC, PSMA and other agencies as appropriate.
Funding: Not required.
Timeframe: Draft industry position paper by June 2002.

6.6. Recognition by all levels of government that spatial information is a component of fundamental economic infrastructure and public data provision must be funded accordingly.

Responsibility: Commonwealth, State and Territory, and local governments.
Funding: Will need to be considered by individual jurisdictions in their Budgets.
Timeframe: Ongoing. The Action Agenda will report progress.

6.7. Reform of government pricing and access policies for the provision of spatial information should be considered as a priority issue in the next and subsequent Budgets.

Responsibility: Commonwealth, State and Territory, and local governments.
Funding: Will need to be considered by individual jurisdictions in their Budgets.
Timeframe: Ongoing. The Action Agenda will report progress.

6.8. Request ANZLIC to work with ASIBA to develop recommendations on ways to increase the efficiency of the collection of public data across the nation.

Responsibility: ANZLIC, ASIBA and other industry associations as appropriate.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on progress.

6.9. Government to work with ASIBA and other industry associations as appropriate to resolve outstanding business issues in implementing a national on-line delivery infrastructure for fundamental data.

Responsibility: ANZLIC, ASIBA and other agencies as appropriate.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on progress.

Increase Effective Research and Development

7.1. Joint initiatives to engage in and establish partnering arrangements between the spatial information industry, universities and other publicly funded research organisations in the exploitation of intellectual property relating to spatial information.

Responsibility: Research agencies, ASIBA, SSC and other agencies as appropriate.
Funding: Could be investigated under 5.2.
Timeframe: Ongoing. The Action Agenda will report on progress.

7.2. Commonwealth Government to examine barriers to commercialisation, and assess the effectiveness of current incentives, as announced in *Backing Australia's Ability*.

Responsibility: Commonwealth government
Funding: Not required.
Timeframe: In train. A report is expected later in 2001.

7.3. Commonwealth Government to work to improve the coordination of research and development across Commonwealth Government agencies.

Responsibility: Commonwealth government
Funding: Initiatives in train will not require additional funding. Funding for development and maintenance of an on-line register of public research would need to be considered in the Budget context.
Timeframe: Some processes are in train. A report is expected later in 2001. ISR will carry out a scoping study of the on-line register proposal by June 2002 as part of the Action Agenda.

7.4. Industry bodies to develop joint proposals for dedicated CRCs to encompass the spatial information industry with CSIRO, universities and other research agencies.

Responsibility: Research agencies, ASIBA, SSC and other agencies and individual firms as appropriate.
Funding: Funding is available through existing government programs.
Timeframe: A call for applications for funding under the CRC program is expected to be announced later in 2001 or early in 2002.

7.5. Industry bodies to work with government to promote elements of all Government Innovation Plans (for example, the Commonwealth Government's Innovation statement, *Backing Australia's Ability*) to help strengthen research and development in the industry. Highlight the initiatives of particular relevance to SMEs.

Responsibility: ASIBA, other industry associations and other agencies as appropriate.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on progress.

7.6. Industry bodies to work to improve knowledge in the industry of how to secure venture capital and commercialise in-house research through a targeted series of education programs.

Responsibility: ASIBA, SSC and other agencies as appropriate.
Funding: Not required.
Timeframe: Prominent venture capitalists will be invited to make presentations at industry conferences in 2001-02.

Evaluate and Reform Education and Skill Formation

8.1. Industry and professional bodies will survey and evaluate the skills required for industry and work with government and educational institutions to develop a consistent national industry education policy, with greater involvement of industry and professional organisations in curriculum development.

Responsibility: ASIBA, SSC and other agencies as appropriate.
Funding: Could be investigated under 5.2.
Timeframe: Ongoing. The Action Agenda will report on progress.

8.2. ISR and DETYA to collaborate with industry in identifying initiatives announced in *Backing Australia's Ability* that could be used to benefit the industry through improved skills formation at the tertiary level.

Responsibility: ISR, DETYA, ASIBA, SSC and other agencies as appropriate.
Funding: Not required.
Timeframe: Assessment of initiatives by June 2002.

8.3. Industry and professional bodies will work with government to encourage the teaching of basic spatial information concepts at the high school level.

Responsibility: State and Territory governments, ASIBA, SSC and other agencies as appropriate.
Funding: Will need to be considered in the context of individual State and Territory Budgets. Funding for some initiatives may be available through existing government programs.
Timeframe: Ongoing. The Action Agenda will report on progress.

8.4. The industry can stimulate capability by allowing greater access to spatial information relevant to tertiary and secondary courses.

Responsibility: ASIBA, SSC and other agencies as appropriate.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on progress.

8.5. Industry bodies can participate in helping to expand awards and scholarship schemes for tertiary and secondary students.

Responsibility: ASIBA, SSC and other agencies as appropriate.
Funding: To be negotiated between industry associations and individual firms.
Timeframe: Ongoing. The Action Agenda will report on progress.

8.6. Industry to develop an Internet-based resource for the dissemination of information for a non-technical audience.

Responsibility: ASIBA, SSC and other agencies as appropriate.
Funding: Could be investigated under 5.2.
Timeframe: Significant progress by June 2002.

8.7. ISR and DETYA to collaborate in identifying ways to increase the penetration of GIS teaching into upper secondary school curricula and in identifying which of the initiatives announced in *Backing Australia's Ability* could be used for this.

Responsibility: ISR and DETYA
Funding: Not required.
Timeframe: Assessment of possible applications of existing initiatives by June 2002.

8.8. Industry and professional bodies to work with government to establish a national mechanism to ensure the continued relevance of all tertiary and secondary courses.

Responsibility: Commonwealth, State and Territory education departments, ASIBA, SSC and other agencies as appropriate.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on progress.

8.9. Industry and professional bodies to monitor the impact of the revised visa application arrangements and report back in the Action Agenda implementation process

Responsibility: ASIBA, SSC and other agencies as appropriate.
Funding: Not required.
Timeframe: The Action Agenda will report on the impact of changes.

Develop Domestic and Global Markets

9.1. Industry to work with government and academia to identify and develop Australia's areas of competitive advantage in the spatial industry.

Responsibility: ASIBA and other associations as appropriate.
Funding: To be investigated under 5.2.
Timeframe: Identification and commencement of any initiatives which can be funded under existing programs by June 2002.

9.2. Industry bodies to promote the benefits and value proposition of the industry's capabilities to peak industry groups.

Responsibility: ASIBA, other industry associations and other agencies as appropriate.
Funding: Could be investigated under 5.2.
Timeframe: Ongoing. The Action Agenda will report on progress.

9.3. Industry to develop a capability register of Australian spatial businesses.

Responsibility: ASIBA, SSC and other agencies as appropriate.
Funding: Could be investigated under 5.2.
Timeframe: In place by June 2002.

9.4. Private businesses, both domestic and foreign, to work to develop alliances and joint ventures for local and overseas work. Industry bodies to encourage joint ventures.

Responsibility: Individual firms, ASIBA and other agencies as appropriate.
Funding: Could be investigated under 5.2.
Timeframe: Ongoing. The Action Agenda will report on progress.

9.5. Industry bodies to assist firms to identify fora to promote the capabilities of the spatial information industry and collaborate on promotion.

Responsibility: ASIBA, other industry associations and other industry associations as appropriate.
Funding: Could be investigated under 5.2.
Timeframe: Ongoing. The Action Agenda will report on progress.

9.6. Industry to work with government to coordinate firms and encourage greater cooperation between business and government in bidding for overseas contracts—'Team Australia'.

Responsibility: Government agencies, particularly Austrade, ASIBA and other agencies as appropriate.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on progress.

9.7. Industry bodies, particularly ASIBA, to promote the assistance that Austrade and Invest Australia can offer to firms in overseas markets.

Responsibility: ASIBA and other industry associations as appropriate.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on progress.

9.8. Industry bodies and individual firms to ensure relevant government agencies are aware of major trade initiatives to enable promotion of Australian interests.

Responsibility: Individual firms, ASIBA and other agencies as appropriate.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on progress.

9.9. Government ministers to actively promote Australian spatial information businesses where appropriate in meetings with representatives of overseas governments and agencies.

Responsibility: All government departments.
Funding: No required.
Timeframe: Ongoing. The Action Agenda will report on progress.

9.10. Industry to identify any barriers to trade or market entry and work with DFAT to develop a strategy to eliminate or reduce trade barriers.

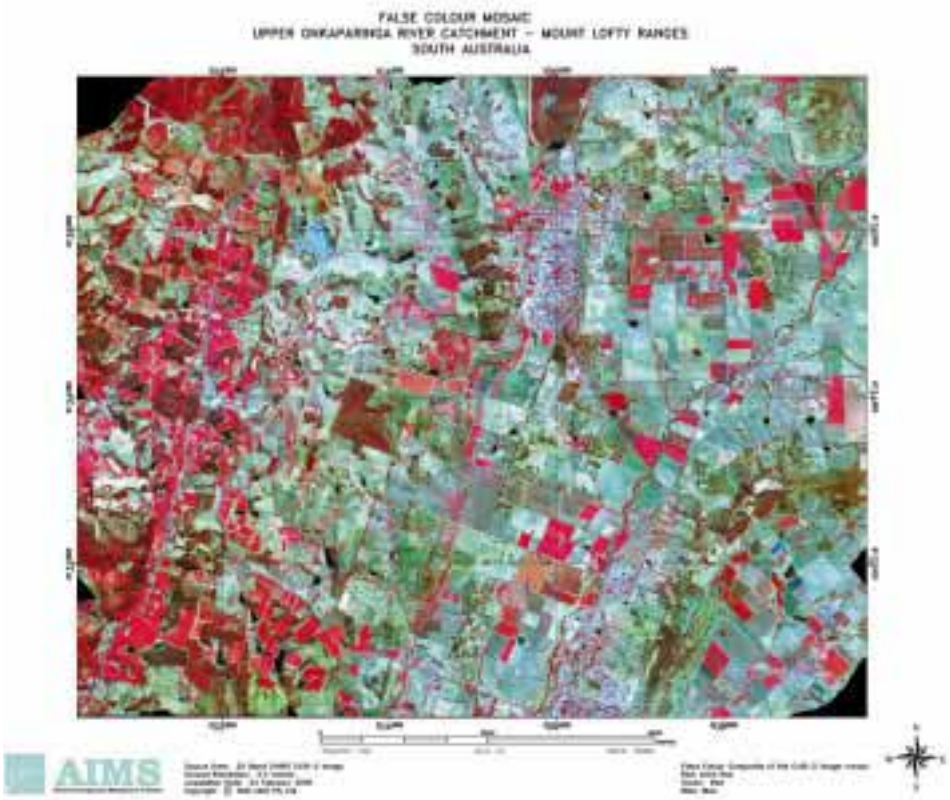
Responsibility: DFAT, individual firms, ASIBA and other agencies as appropriate.
Funding: Not required.
Timeframe: Ongoing. The Action Agenda will report on progress.

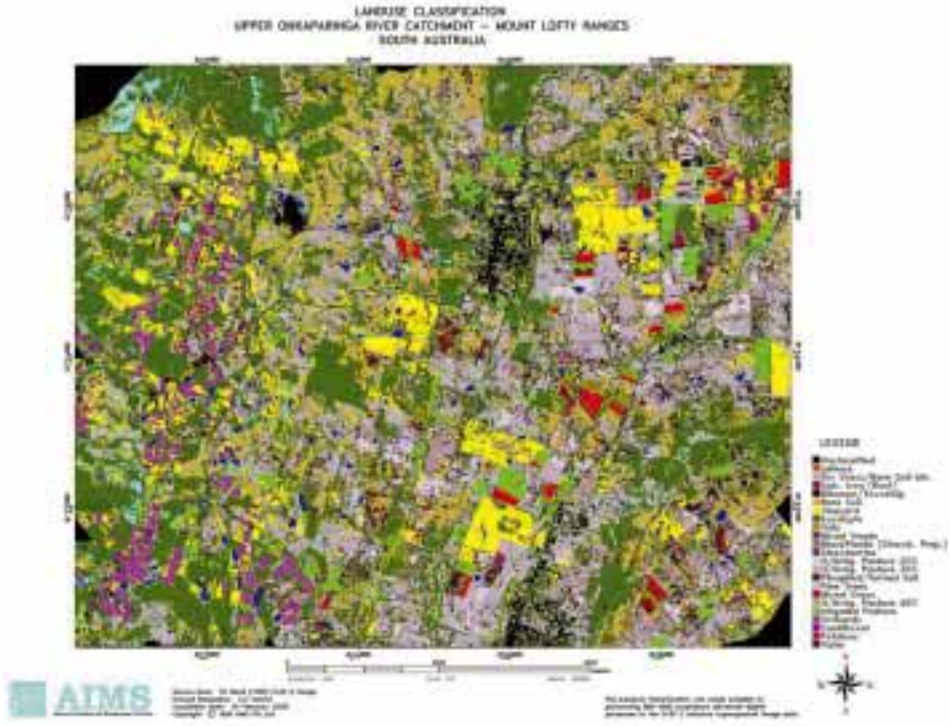
9.11. Industry bodies to work to increase industry knowledge of government programs such as Export Market Development Grants and other forms of available support.

Responsibility: ASIBA, other industry associations and other agencies as appropriate.
Funding: Not required.
Timeframe: A seminar is planned for the AURISA meeting later in 2001.

No.	Recommendation	Implementation	Agency	Completion
Develop a Joint Policy Framework				
5.1	Creation of improved formal linkages between business and government	Industry/Government	ANZLIC	June 2002
5.2	ISR to assist ASIBA in identifying possible sources of funding	Industry/Government	ISR	June 2002
5.3	Creation of improved linkages between business and research agencies	Industry/Government/ Research Agencies	Government research agencies/ Universities	June 2002
5.4	Definition of industry and government activities and supply chain roles	Industry/Government	ANZLIC	Ongoing
5.5	Monitoring of government policy development to encourage government to give appropriate recognition to the industry in policy initiatives	Industry		Ongoing
5.6	Commonwealth government to note strong industry support for draft recommendations of the PC inquiry into Cost Recovery	Commonwealth		June 2001
5.7	Endorse and encourage greater contacting out by government of activities which can be performed effectively by private sector	Government	All	Ongoing
5.8	Review coverage and appropriate handling of *prima facie* breaches of competitive neutrality principles	Industry/Government	Commonwealth and State Competition Authorities	Ongoing
5.9	Resolution of cost of Internet and mobile phone bandwidth issues	Industry/Government	DoCITA	
5.10	Industry support for Professional Standards Legislation	Industry/ States		June 2002
Improve Data Access and Pricing				
6.1	Develop common approach to data access, pricing and copyright policy	Industry/Government	ISR/ ANZLIC	June 2002
6.2	Note industry support for the recommendations of the IDC into Spatial Data Access and Pricing	Government	Cabinet	June 2001
6.3	Industry to develop a privacy code of practice.			
6.4	Identification and cataloguing of fundamental datasets and related standards	Industry/Government	ANZLIC/ICSM/PSMA	June 2002
6.5	Industry position paper on appropriate public vs private sector activities	Industry		Dec 2001
6.6	Adequate funding of fundamental public data provision	Government		Ongoing
6.7	Consider funding of reform of pricing and access in Budget context	Government	ISR	May 2002
6.8	Increase efficiency of public data collection	Government	ANZLIC/CSDC	Ongoing
6.9	Improve on-line availability of data	Industry/Government	ANZLIC/CSDC	Ongoing

Increase Effective Research and Development			
7.1 Partnering arrangements with public research agencies	Industry/ agencies	Research agencies	
7.2 Commonwealth government to examine barriers to commercialisation	Commonwealth	ISR/DETYA	In train
7.3 Commonwealth Government to improve R&D coordination	Commonwealth	ISR	June 2002
7.4 Develop proposals for Cooperative Research Centres	Industry		Mar 2002
7.5 Promote available government innovation programs	Industry		June 2002
7.6 Improve industry knowledge of how to secure venture capital and commercialise research	Industry		Dec 2001
Evaluate and Reform Education and Skills Formation			
8.1 Survey and evaluate industry skill requirements	Industry		
8.2 Identify existing government programs which can be used to benefit industry	Industry/Government	ISR/DETYA	June 2002
8.3 Encourage teaching of spatial information concepts in schools	Industry/Government	ISR/DETYA	June 2002
8.4 Improve access to spatial information for educational institutions	Industry		June 2002
8.5 Expand award and scholarship schemes	Industry		
8.6 Internet-based information dissemination	Industry		Dec 2001
8.7 Identify ways to increase teaching of GIS in schools	Industry/Government		
8.8 Establish national mechanism to ensure continued relevance of curricula	Industry/Government		
8.9 Monitor visa issues	Industry		June 2002
Develop Domestic and Global Markets			
9.1 Develop Australia's areas of competitive advantage	Industry/Government/ Academia	ISR/ Research agencies	Ongoing
9.2 Promote value proposition of industry capabilities	Industry		June 2002
9.3 Develop an industry capability register	Industry		
9.4 Develop alliances and joint ventures	Industry		June 2002
9.5 Assist firms to identify appropriate fora to promote the industry	Industry		
9.6 Improve collaboration on bidding for major overseas contracts	Industry/Government	ANZLIC	Ongoing
9.7 Promote assistance available through Austrade and Invest Australia	Industry		June 2002
9.8 Ensure government is kept informed of major overseas projects	Industry		Ongoing
9.9 Promote industry interests and capabilities in overseas visits	Government	All/ISR/DFAT	Ongoing
9.10 Identify and eliminate or reduce barriers to trade	Industry/Govt	DFAT	Ongoing
9.11 Promote available government programs to industry	Industry		Dec 2001





Multispectral satellite image together with vegetation map derived from the image – Ball AIMS

Appendix 1

Action Agenda Consultation

Scoping Workshop held at Parliament House, Canberra

A workshop was held on 7 September 2000 at Parliament House to discuss the spatial information industry, its scope, any major issues facing it and the visions for its future. Thirty-seven industry representatives attended the meeting, speaking on behalf of a broad range of spatial information industry sectors. The attendees of the workshop were:

Clive Freegard	AASA
Brian Button	Agrecon
Ian O´Donnel	AGSO
Peter Tomlinson	Airesearch Mapping
Jim Connolly	AURISA
Ken Bullock	AURISA
Peter Holland	AUSLIG
Jeff Miller	Ball AIMS
William Lyons	Boeing Australia
Dave Hocking	Consulting Surveyors Australia
Malcolm Lester	Consulting Surveyors Australia
Mark Watt	CTG Consulting
Chris Malouf	CSIRO
Mike Clarke	CISRO
Matt Bolton	Environment Australia
Clive Poole	Earth Resource Mapping
Rob Gourlay	ERIC
Guy Perkins	ESRI Australia
Mike Stapleton	Fisher Stewart
Bill Richards	Fugro Survey
Bernie Fitzpatrick	Geoimage
Mark Judd	Geomatic Technologies
Jim Curnow	ISA
Malcolm McCoy	ISA
Tony Jowett	ISR - SIIAA Taskforce

Daniel Jaksa	ISR - SIIAA Taskforce
Alistair Taylor	ISR - SIIAA Taskforce
Drew Clarke	ISR - AusIndustry
Patricia Kelly	ISR - S&EI Division
Bruce Thompson	Land Victoria
Elizabeth O´Keefe	Land Victoria/ANZLIC
Tony Wheeler	Sinclair Knight Merz Pty Ltd
Richard Lindsay	Mapinfo Australia
Walter Mayr	Mapinfo Australia
Graham Baker	Mapping Sciences Institute
Peter Bowen	Mapping Sciences Institute
John Mobbs	PSMA
Bernie Moriarty	QASCO
Dennis Puniard	RSPAA
Bryan McLennan	SITE
Gail Kelly	Space Imaging
Michael Kenneally	Spatial Australia
John Trinder	University of NSW
Jeffery Bentley-Johnston	Facilitator
Cameron Forbes	Office of the Minister for ISR

Oblique aerial photograph of Brisbane – Airesearch Mapping

Appendix 2

Statistical Annex

The last ABS survey of the surveying services industry was in 1992-93. IBIS information services have updated this from such alternative data sources as are available. In addition, we have been able to obtain data on research and development spending from the ABS as a special data service. These data are summarised below.

Surveying services industry

Key Statistics (constant 1998-99 prices)

	1996-97	1997-98	1998-99
Turnover ($m)	786.0	844.0	927.0
Industry Gross Product ($m)	405.0	433.0	463.0
No. Employed	9126	10039	10541
Wages & Salaries ($m)	311.0	328.0	346.0
No. of Enterprises	2025	2120	2215
R&D Expenditure ($'000)	1739	1457	2000
Exports ($m)	41.0	45.0	47.0
Imports ($m)	21.0	21.0	21.0

Note: data based on ANZSIC classification 7822.
Source: ABS Special Data Service, IBIS business services.

In addition, the Department has released a report on the remote sensing industry prepared by PricewaterhouseCoopers. This is likely to have some overlap with the data on the surveying services industry, particularly in the areas of aerial photography and photogrammetry, but should pick up a number of value-adders who see themselves as services to agriculture or mining. It also covered some activities of the major GIS and image processing software providers.

Remote sensing industry

Key Statistics (1999-2000)

	Private Sector	Commonwealth Govt	State Govt	Unis
Revenue ($m)	27.1	14.6	2.5	1.1
No. Employed	305	153	36	28
No. of Entities	60	5	7	7
R&D Expenditure ($'000)	6400	2600	..	625
Exports ($'000)	5415	5175	0	200
Imports ($'000)	8790	2415	..	..

Note: data based on self-identification

Source: The Australian Remote Sensing Industry, AGPS, October 2000.

This still leaves a gap in coverage of the broader industry in the areas of hardware manufacture and software development and marketing.

The table below shows the range of estimates available for the 'GI and GIS industry' compiled by the European GI2000 project (An exchange rate of 1ECU = $US 1.104 was used by GI2000).

Country	Market Figures (x 10^6 ECU)	Source
Finland	50 - 250	ProGIS report, 1997
France	157	Coopers & Lybrand, 1997
Germany	198 - 453	Various, see GI2000 website.
Spain	36 -71	Coopers & Lybrand, 1997
Sweden	36	Coopers & Lybrand, 1997
Netherlands	51	Coopers & Lybrand, 1997
UK	254	Coopers & Lybrand, 1997
EU Total	1 360	Sittard, Geobit conference 1997
Canada	1333	Geomatics Canada ($C2b)
Latin America	590	Canadian Govt estimate
USA	1 600 - 1 900	Various, see GI2000 website.
World	5 380	Daratech 1996 ($US6b)
	4 529	Sittard, Geobit 1997, ($US5b)

Education statistics

Number of students commencing studies in Spatial Information in 1999.

	Geography	Surveying
Doctorate by Research	69	18
Master's by Research	21	16
Master's by Coursework	48	8
Other Post-graduate	55	18
Bachelor	792	275
Associate Degree	0	13
Other Under-graduate	5	12
Enabling	0	0
Non-award	13	2
Cross Institutional	19	2
Total	1 022	364

(DETYA, *Students 1999: Selected Higher Education Statistics*)

Total number of students studying Spatial Information in 1999.

	Geography	Surveying
Doctorate by Research	230	56
Master's by Research	44	37
Master's by Coursework	85	16
Other Post-graduate	87	31
Bachelor	2 325	952
Associate Degree	0	37
Other Under-graduate	8	21
Enabling	1	0
Non-award	18	2
Cross Institutional	27	2
Total	2 825	1 154

(DETYA, *Students 1999: Selected Higher Education Statistics*)

Total number of students studying Engineering and Spatial Information in 1991.

	Engineering and Surveying
Higher Doctorate	1
PhD	1 218
Master's by Research	1 077
Master's by Coursework	1 533
Postgraduate Qualification	210
Graduate Diploma – New Area	922
Graduate Diploma – Extension Area	690
Graduate Certificate	20
Bachelor's Postgraduate	27
Bachelor's Honours	678
Bachelor's Pass	31 442
Diploma	107
Associate Diploma	2 195
Other Award	50
Enabling Courses	37
Total	40 207

(DEETYA, *Selected higher education statistics, 1991*)

Melville Waters – Earth Resource Mapping

Appendix 3

ANZLIC

The Australia New Zealand Land Information Council is the peak council for public sector spatial data management in Australia and New Zealand. It has ten members: one from each Australian State and Territory, a Commonwealth representative and a New Zealand representative. There is no local government representation. The Council directs its activity in three areas:

Industry Development

To stimulate the development of a robust and commercially viable national private sector spatial industry providing a range of spatial information services to government, other industries and the community for improved business decision-making, social well-being and environmental sustainability.

Policy Development

The development of public sector policy guidelines and procedures relating to spatial data management that are consistent across jurisdictions. Assessment of ANZLIC's success in this work must be made in the context that Australia and New Zealand are independent nations; that Australia is a federation of States and Territories, each with legislative powers in regard to land and spatial data management; and that ANZLIC has no legislative basis or executive powers.

Spatial Data Infrastructure

To promote the development of national spatial data infrastructure (SDI). This is achieved by promoting the development of standards and protocols needed to implement the SDI. The development of a metadata standard has been of prime importance in this area.

For more information on ANZLIC see its website at www.anzlic.org.au.

PSMA Australia

PSMA Australia is the operational arm of ANZLIC. It originated with the formation of a government consortium in 1993 to create an integrated national digital base map for the National Census. Following the completion of the base map in 1996, the PSMA made it available to be licensed for commercial purposes.

PSMA Australia is represented by each State and Territory government and the Commonwealth. It has recently been established as a government-owned corporation. The purposes of the company are:

1. to coordinate, assemble and deliver national products from jurisdictional Data Sets, and to achieve the widest possible use of the PSMA Data Set;
2. to contribute to the establishment of the Australian Spatial Data Infrastructure;
3. to promote Australian land information knowledge, expertise and technology which may be marketed both in Australia and overseas;
4. to consider the viability of further joint operations;
5. to investigate the feasibility of entering into collaborative arrangements with other persons; and
6. to undertake any future developments and operations which are either economically viable or which result in a public good, and which are agreed by the Board and within the purposes of the PSMA.

For more information on the PSMA see its website at www.psma.com.au.

CSDC

The Commonwealth Spatial Data Committee was formed in 1992 to facilitate Commonwealth coordination in the management of Commonwealth spatial data. The objectives of the CSDC are:

1. To maximise the benefits of spatial information by:
   (a) enabling the effective and efficient use and wide dissemination of spatial data through adoption of common procedures, standards and criteria;
   (b) avoiding duplication of effort and cost in the collection and management of spatial data;
2. To contribute to and promote the development of a national spatial data infrastructure:
   (a) through working with State/Territory jurisdictions and their agencies,
   (b) through interaction with industry.

The CSDC members represent the following Commonwealth agencies:

Department of Industry, Science and Resources, Australian Geological Survey Organisation, Environment Australia, Bureau of Meteorology, Department of Defence, CSIRO, National Native Title Tribunal, Australian Hydrographic Office, Australian Bureau of Statistics, Murray Darling Basin Commission, Department of Agriculture, Fisheries and Forestry - Australia.

The IDC on Commonwealth Spatial Data Access and Pricing is recommending new and improved coordination arrangements at the federal level. It is recommended that CSDC be replaced by:

- a CEO-level executive policy group responsible for evaluation of access and pricing policy implementation, strategic planning, reporting to the Minister, and representing the Commonwealth on ANZLIC (through the Chair);
- a technical management group comprising representatives from a number of Commonwealth agencies, which would be responsible for implementing approved work plans; and
- an Office of Spatial Data Management with dedicated resources, which would be responsible for providing support to executive policy and technical management groups, and providing a single point of contact for whole-of-Commonwealth dealings with industry and the States and Territories.

For more information on CSDC see its website at www.csdc.gov.au.

ICSM

The Intergovernmental Committee on Surveying and Mapping was established by the Prime Minister, State Premiers, and the Chief Minister of the Northern Territory in 1988. Prior to 1988 a similar body, the National Mapping Council (NMC), had coordinated cooperative Commonwealth, State and Northern Territory mapping programs since 1945.

ICSM is now comprised of senior representatives of Australia's Commonwealth, State, Territory and defence agencies responsible for surveying and mapping. New Zealand is also a member of ICSM and their members represent both New Zealand civil and defence mapping.

The ICSM aims to:

- avoid unnecessary duplication; and
- provide a consistent and modern approach to surveying, mapping and charting for national development and defence.

The ICSM also assists Australia and New Zealand fulfil their obligations to the international surveying, mapping and charting community.

Within ICSM the following groups carry out projects and research and provide advice to ICSM in their special fields of expertise:

- ICSM Geodesy Group;
- ICSM GDA Promotions Working Group;
- ICSM Cadastral Data Group;
- ICSM Street Address Working Group;
- ICSM Topographic Data Working Group;
- ICSM Tides and Sea Level Working Group;
- Committee for Geographical Names in Australia; and
- Permanent Committee on Tides and Mean Sea Level.

For more information on the ICSM see its website at www.anzlic.org.au/icsm/index.html.

Parliament House Canberra – Airesearch Mapping

Appendix 4

Industry and Professional Associations

Spatial Sciences Coalition

The Spatial Sciences Coalition was formed in September 2000 and has a current membership as listed below.

AURISA

The Australasian Urban and Regional Information Systems Association Incorporated is a principal source of information in the Australian, New Zealand and Asia-Pacific Region for urban and regional information systems with an emphasis on spatial information systems policy, applications and technology. The association has wide spatial information industry representation and is a member of peak councils and other coordinating bodies such as the Information Industry Roundtable and national standards committees.

AURISA services its members through the dissemination and sharing of knowledge about urban and regional information systems, not only to its members but also to decision-makers and the general public, through publications and seminars, workshops and conferences. It also advises on education, training and research in urban and regional information systems.

For more information on the MSIA see its website at www.aurisa.asn.au.

IEMSA

The Institution of Engineering and Mining Surveyors Australia Incorporated represents Engineering and Mining surveyors in design, construction, maintenance and development of Australia's natural resources. These surveyors perform the surveying and mapping activities to support sound conception of planning and resourcing on a vast range of local, national and international development projects.

IEMSA was formed in 1986 by the amalgamation of three surveying organisations:

Institution of Mining and Engineering Surveyors Western Australia

Institution of Engineering Surveyors Queensland

Australian Surveying Association.

The history of these bodies can be traced back to 1914. It continues to evolve and grow and has reached out to have International connections with similar bodies in Britain, USA, Canada, New Zealand and South Africa. IEMSA is Australia's representative in the International Society for Mine Surveying (ISM).

The mission of IEMSA is that it will promote the benefits and values of surveying to the public and ensure its members have adequate skills and a professional attitude to conduct its business in an effective and efficient manner.

For more information on IEMSA see its website at www.home.aone.net.au/iemsaust/.

ISA

The Institution of Surveyors, Australia is the professional organisation which represents surveying, land information and spatial information professionals throughout Australia. It represents over 3,800 members in Australia and overseas who are active in the private, public and academic sectors.

The ISA was formed in 1952 by the federation of Institutions then existing in the six Australian States. Divisions of the ISA were subsequently formed in both Territories, making the present total of eight Divisions coinciding with State and Territory boundaries.

The primary objective of the Institution is to empower its members to strive for excellence in the application of the science and practice of surveying for the benefit of society.

For more information on the ISA see its website at www.isaust.org.au.

MSIA

The Mapping Sciences Institute, Australia is a learned society, established in 1952 to engender the professional development of individuals and organisations involved in the mapping sciences. MSIA is a non-government organisation with a National Council and seven Divisions based on the Australian States and Territories.

The MSIA has a philosophy to promote the theory, practices and understanding of all facets of the mapping sciences through the collegiate strength and expertise of its members.

For more information on the MSIA see its website at www.mappingsciences.org.au.

RSPAA

The Remote Sensing and Photogrammetry Association of Australasia is the professional association in the Australasian region encompassing the science and applications of remote sensing and photogrammetry.

Remote sensing is the observation of the earth by instruments from remote platforms, either airborne or spaceborne. Photogrammetry is the science of the measurement of the earth and its features from the imagery acquired by these platforms.

The Association caters for the interests of professionals who are actively involved with these technologies and their applications. Membership is open to academics, research scientists, practitioners from government at all levels, and private or public enterprises involved the application of the technology or the supply of products or services to the industry.

RSPAA actively represents the interests of members to government and industry bodies. It caters to members' interests through a regular quarterly newsletter, a biennial conference, local and national seminars and workshops. The RSPAA is also affiliated with international and regional associations and societies and represents members' interests in regional and international forums through these affiliations.

For more information on the RSPAA see its website www.rspaa.com.au.

Other Industry and Professional Bodies

ACSA

The Association of Consulting Surveyors Australia is an independent, not-for-profit organisation dedicated to the continued development of a prosperous private sector of the surveying profession which provides services of the highest quality for the benefit of society.

ACSA is responsible for those aspects of professional practice and business matters of particular concern to, and which impact upon, the private sector. It deals with the issues of competition, profit, fees, costs, insurance, quality assurance; and represents its members in negotiations with government, clients, unions, suppliers and other like associations. It has a membership of almost 800.

For more information on ACSA see its website at www.surveying.org.au.

AASA

The Association of Aerial Surveyors, Australia Incorporated was formed in 1982 and incorporated in 1989 under the Victorian Associations Incorporation Act, to advance and protect the interests and status of private companies actively involved in all aspects of aerial surveying, photogrammetry and related services.

AASA encourages governments to adopt improved policies and practices for the procurement of aerial surveying and mapping services. The Association also supports a government relations programme to assist the government to formulate and implement policies which enhance the business climate in which AASA members operate. The four chapters that comprise the AASA deal with state and local government matters. The Federal Executive concentrates on national and overseas matters as well as taking overall responsibility for the coordination of AASA affairs.

Since 1992 AASA has been a Participating Group within the Association of Consulting Surveyors Australia where it takes a leading role in matters concerning aerial surveying, photogrammetry and mapping services.

For more information on AASA see its website at www.aasa.org.au.

GITA

GITA Australia/New Zealand is a learning forum focused on the exploitation and benefits of using automation technologies in the management of infrastructure assets. Organisations involved with the integrated use of these technologies for the management of assets include utilities, transportation, communications, oil and gas, waste and government agencies.

GITA Australia/New Zealand is an international affiliate of GITA, headquartered in the US, which had its origins as AM/FM (Automated Mapping and Facilities Management) International. In the early 1980's senior executives of major utilities met annually to discuss, review, and share ideas on the technological management of infrastructure assets. AM/FM technology was used initially to automate mapping processes and manage facilities through spatial representation.

Since these early origins, AM/FM became a generic industry acronym that was broadened to cover all areas of geospatial information, including management of "customer facing" services such as networks, service fleets, call centres, outages and repairs, as well as internal functions of marketing and engineering asset management. Since then, GITA has spawned affiliations in Europe, Asia, Japan, South America, India, Australia and New Zealand.

After 15 years, AM/FM International became GITA, the Geospatial Information & Technology Association, as part of a repositioning of the association to reflect its direction and market position for the 21st century.

For more information on GITA see its website at www.gita.org.au.

IMTA

International Map Trade Association members are the companies that create and sell maps, atlases, globes and map-related products. The IMTA fosters and promotes the sales, usage, awareness and understanding of maps and map-related products. It provides a forum for its members to learn about the map industry and exchange ideas and

information. The IMTA gathers and provides map industry statistics and education to enhance member and public awareness.

For more information on the IMTA see its website at www.maptrade.org.

Spatial Australia

The South Australian Spatial Information Industry Cluster, known as Spatial Australia, is a group of competing, collaborating and interdependent companies, based in Adelaide South Australia, engaged in the spatial information industry.

Spatial Australia offers solutions and resources for projects of all sizes and for all industry types.

Spatial Australia is an industry initiative supported by the government of South Australia, formed to create an environment where, through a collaborative approach, companies cooperate to provide a leading edge, world standard, multi-disciplined spatial information service.

The South Australian Spatial Information Industry Cluster provides a single initial point of contact for public and private sector organisations requiring the expertise of cluster members. Spatial Australia can match purchaser requirements with the creation of joint ventures among cluster members.

For more information on Spatial Australia see its website at www.spatial.org.au.

Aquaculture – Airesearch Mapping

High quality spatial information is essential for major engineering projects – Sinclair Knight Merz Pty Ltd

Appendix 5

Acronyms

ABS	Australian Bureau of Statistics
ANZLIC	Australia and New Zealand Land Information Council
ANZSIC	Australia and New Zealand Standard Industrial Classification
ASDI	Australian Spatial Data Infrastructure
ASIBA	Australian Spatial Information Business Association
ASMLA	Association of Surveying and Mapping Lecturers Australia
COMET	Commercialising Emerging Technologies
CPA	Competition Principles Agreement
CRC	Cooperative Research Centres
CSDC	Commonwealth Spatial Data Committee
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTC	Competitive Tendering and Contracting
DCDB	Digital Cadastral Database
DETYA	Department of Education, Training and Youth Affairs
DFAT	Department of Foreign Affairs and Trade
Finance	Department of Finance and Administration
GIS	Geographic Information System
GPS	Global Positioning System
GST	Goods and Services Tax
ICSM	Intergovernmental Committee on Surveying and Mapping
IDC	Interdepartmental Committee
ISR	Department of Industry, Science and Resources
NCC	National Competition Council
NCP	National Competition Policy
PACS	Purchasing Advisory and Complaints Service
PSMA	Public Sector Mapping Agencies
QSIIS	Queensland Spatial Information Infrastructure Strategy
SDI	Spatial Data Infrastructure
SME	Small and Medium Enterprise
SSAA	Spatial Sciences Accreditation Australia
VET	Vocational Education and Training