A Strategy Framework to Facilitate Spatially Enabled Victoria

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Abstract

Spatial Information is at a critical turning point in its development. More people are using it for a wider range of purposes, including social networking; technology is changing the way we communicate with each other; there are new ways of thinking about 'location'; and big corporate players are entering the market and are starting to drive standards. At the same time, all levels of government, business and the community face significant challenges in producing and using products and services in environmentally and socially sustainable ways. Spatial information has an integral part to play in developing solutions to these challenges. But this cannot be achieved without a clear strategy and a framework that harnesses everyone's skills and expertise.

Victoria is fast being recognised as a leader in many aspects of State SDI development in Australia and internationally. The Victorian Spatial Council – which is the peak body that provides a coordinated approach to policy and development and management of spatial information – has recently painted the emerging landscape for spatial information in Victoria. Through the Victorian Spatial Information Strategy 2008-2010 it highlights some of the changes occurring in spatial information and technology and the key challenges they pose, and sets the broad themes for facilitating the whole spatial information community's participation in that landscape. VSIS is a basis for delivering spatially enabled Victoria. At the same time, it considers that spatial information should be seen as part of the wider information resource created by and available to society. It presents a challenging agenda and the strategic framework it sets out lays the foundation for fulfilling the promises that are held out by the developments it describes.

This paper aims to present and discuss VSIS, its development process and its role in connecting all levels of government, the private sector, utilities, academia, the professions and a wider community from a spatial data perspective. The paper starts with a discussion on the importance of having a spatial information framework in the context of spatially enabled society and then discusses the central role VSIS plays in facilitating the spatially enabled vision in Victoria. The paper then highlights a range of activities and processes to be undertaken across

all disciplines and sectors to facilitate framework development. This includes aspects of design, creation, governance and processes involved in developing an enabling platform, and the overall relations between different challenges to facilitate spatial data activities. The results and lessons learned from the development of the strategy can be used and applied in other jurisdictions, at both national and global levels.

Keywords: spatially enabled, framework, participation, engagement

1.   INTRODUCTION

In Victoria, the spatial information community[1] has recognised that all its members have a role to play in developing a Spatial Data Infrastructure, and that a high level of engagement by all sectors is a pre-requisite for achieving a 'Spatially Enabled Victoria' – one where 'place' or 'location' is automatically considered in every decision that we make.

At the same time, 'Spatial Data Infrastructure' (SDI) is evolving into 'Spatial Information Infrastructure' (SII), as we move away from a focus on the production and delivery of data to the way it is being used, whether as products and/or services[2], and the strategic and policy requirements for meeting the needs of those of who use it.

So why do spatial enablement and SDI/SII have such an important role? Some reasons are suggested below.

- Society is changing rapidly and is facing many challenges, such as environmental pressures, economic crises, ensuring equitable provision of services. By linking solutions to location, spatial information can be a 'unifying medium' between the multi-disciplinary approaches needed to address these challenges.

- Providers of spatial information are facing increasing demands from technological developments that are providing the capacity to deliver greater volumes of data to users. As a result, we can expect the demand for immediately available and accurate spatial information to continue to increase.

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1. The term 'spatial information community' is used to refer to all sectors involved in spatial information – ie the three levels of government, the private sector, utilities, academia and the professions, while 'spatial information industry' refers to the private sector members of the community.
2. The scope is also being expanded to incorporate 'resources' – data, products, services and processes.   This will be discussed later in this paper.

In tandem with this progress is the potential for the gap between existing and required quality to widen as reliance on spatial information grows, and as it becomes increasingly applied in automated systems.

On the other hand, a solution may come from the advent of the 'participatory web' represented by Web 2.0, 'collective intelligence' and 'neogeography'. These technologies may provide new opportunities to bridge the resourcing gap for providers of spatial information by making government, the community and the private sector 'co-producers' of it.

- Big corporations are having a significant impact on the shape of the spatial community, and their ability to put products on the market quickly is starting to drive the standards for collection and dissemination of spatial information.

- The use of Radio Frequency IDs, GPS, WiFi and the like are facilitating the tracking of people and goods at previously unthinkable levels of precision.

Examples of already existing 'spatial enablement' are numerous – in delivering services and engaging with the community online through e-Government and e-Democracy, wherever they are located; in responding to emergency and security incidents; in the use of sensors to manage health care by tracking patient movements; in the way we manage the impact of our activities on agricultural land, such as managing farming inputs and yields at very precise intervals using global navigation satellite systems and wireless technologies.

Together all the examples above are creating a paradigm shift in spatial information, providing a significant opportunity to bring it into the information mainstream rather than it remaining confined to specialist users.

It is in this environment that Victoria has developed its most recent spatial information strategy – the Victorian Spatial Information Strategy 2008-2010 (VSIS) – with the goal of creating a 'Spatially Enabled Victoria'.

The critical role that the strategy plays in achieving such a goal is in creating the frameworks that enable all sectors of the spatial information community to be highly engaged and their efforts integrated – within and between organisations and levels of government, and between the public and private sectors. When this engagement is in place,

- they will work together to implement the required frameworks and standards;
- they will create clusters to build the critical integrating technologies that will support the effective use of spatial information to create 'spatial enablement';
- policies, legal and regulatory frameworks can be brought into the twenty first century; and

- innovation will be based on 'systems' or 'network' based designs, meaning that the whole spatial information community will be involved in working together to devise solutions to problems or developing new products or services, rather than looking at them in isolation.

Without such engagement, the spatial community will not be the one setting the agenda for spatial enablement; rather change will be imposed on it by others. VSIS makes it clear that

"If we do not create such an environment, and there is no plan and no standards, the risks are that the value and benefits of spatial information will continue to be visible to and taken up by only a few; there will continue to be rapid development and deployment of new services and products but they will not be capable of being integrated, with the result that information and administrative costs will continue to grow; and our capacity to create a spatially enabled society will be reduced" (Victorian Spatial Council, 2008a).

So, what can SDI and SII do to support spatial enablement? And how is Victoria creating it?

VSIS provides a blueprint by setting out the requirements for the framework and engagement that will enable spatial information realise its potential.

The following pages will show how Victoria is addressing these questions by:

- Sketching the evolution of Victoria's SDI, and illustrating the challenges to be addressed so that it can continue to be relevant, and
- Setting out why frameworks are important to creating a spatially enabled society, and show how they have been applied.

The paper will conclude with some remarks on the further evolution of the SDI in Victoria and Australia.

2. VICTORIA'S SPATIAL DATA INFRASTRUCTURE

Victoria's approach to developing its SDI has mirrored the development of SDIs in the rest of the world. Like others, its definition has evolved, the institutional arrangements have adapted to meet changing circumstances, and it is now faced with the challenge of keeping up with and integrating changes in technology and the way information is being used into its design and implementation.

2.1 Defining Victoria's SDI

There are a number of ways in which SDIs have been defined. Victoria's incorporates the following components, which are similar to those used in most if not all SDIs:

• Data, including metadata
• Policies and standards
• Technology
• Capacity building
• Institutions – including the relationships required to ensure wide participation in setting the direction for development of the SDI. These institutions also provide the frameworks necessary to ensure the appropriate integration of all components so that spatial information can be made available and used.

Victoria has tried to take a practical approach to first defining then developing its SDI, based on the starting point that to realise the benefits of spatial information it must be accessible and able to be used:

"The key to achieving the benefits that spatial information provides is the availability of and access to it. Such information must not only exist, it must be easy to identify who has it, whether it is fit for the purpose at hand, how it can be accessed and whether it can be integrated with other information" (Victorian Spatial Council, 2005).

A Spatial Data Infrastructure therefore facilitates discovery, access and use of spatial data for decision making:

"The SDI is an enabler – in simple terms, a mechanism for making data available and for sharing and exchanging it to enhance the achievement of social, environmental and economic goals. …Behind SDIs are the myriad of activities that create the conditions in which that sharing and exchange can take place, ie the development of the data, technology, policies, institutional arrangements and capacity building (ie equipping people to use the technology and information)" (Victorian Spatial Council, 2005).

This definition of SDI by Victoria has evolved over a 15 year period through four spatial information strategies, with the 2004-2007 strategy being the fullest articulation of the principles and policies that will be adopted to ensure spatial information is able to be found, accessed and used. Its evolution to 2007 is summarised in Table 1 (Victorian Spatial Council, 2008a).

Victoria's SDI assists data providers by creating a set of organising principles for data management.

It is now the core of Victoria's *Spatial Information Management Framework*, which is Victoria's best practice approach to managing and providing spatial information. This Framework is based on the premise that the successful application of spatial information should be underpinned by a sound management approach that guarantees it is available and able to be used effectively.

Table 1: Development of Victoria's spatial information management framework

1993	Core spatial information identified
	Government-wide planning methodology introduced
1997-2000	Core data improved
	Spatial management framework put in place – policy, infrastructure, awareness, distribution, business systems
	Core principles for managing spatial information introduced – metadata, quality management, privacy, liability, licensing, pricing, custodianship
	Coordinating and cooperative arrangements between key stakeholders established
2000-2003	Spatial information management principles further codified
	Introduction of the concepts of 'framework' and 'business' information
	Role of custodians defined
	Framework datasets identified and custodians assigned
2004-2007	Best practice principles for spatial information management extended to custodians of all spatial datasets
	Custodianship formally identified as the basis for spatial information management
	Holistic spatial information management framework defined
	Victorian Spatial Council established

It provides a holistic approach to managing spatial information in Victoria, encompassing the

1. *institutional arrangements for developing spatial information* – governance, custodianship
2. *requirements for creating and maintaining spatial information* – framework and business information, data quality
3. *mechanisms for making spatial information accessible and available* – metadata, awareness, access, pricing and licensing, privacy
4. *strategic development of technology and applications*

The Framework allows for the management of these elements in an integrated way to provide an environment for the effective use of spatial information. It is supported by policies and guidelines that provide the formal requirements for implementing the framework, and tools and resources to support those responsible for that task (Department of Sustainability and Environment, 2001; Victorian Spatial Council, 2006a, 2006b, 2006c, 2006d, 2006e, 2006f, 2007a, 2007b, 2008b).

2.2   Evolution of Victoria's SDI

The evolution of Victoria's SDI has followed a similar course to others, and like them it can be divided into two generations. In the first, the focus was on development of the 'foundations' – data and databases, metadata, and access mechanisms. In the second, there has been a wider range of stakeholders involved (cooperation between the public, private and academic sectors are now features of the institutional arrangements for the SDI) and development of distributed capacity to discover and access spatial information.

The development of Victoria's SDI is now based on a fully coordinated and cooperative approach between all sectors.

Responsibility for spatial information policy development in Victoria rests with the Victorian Spatial Council, which was set up in 2004 to support the advancement of Victoria's social, economic and environmental goals through the provision and application of spatial information. It does this by providing a coordinated approach to policy, development and information management, and facilitating opportunities for partnership building, collaboration, cooperation and education.

It operates under a participatory governance model established by the Victorian Spatial Information Management Framework. Under this model, all sectors of the spatial industry are represented through the peak bodies for business, government, academia and the professions, as well as key interest groups, to ensure all interests can be addressed.

All sectors therefore have a role in setting Victoria's strategic direction for spatial information and implementing policies and standards for the whole spatial information community (Victorian Spatial Council, 2006a).

In broad terms, government's primary role is to establish policies, standards, and the management framework and principles, manage and provide fundamental data, and support development of new products by the private sector; the private sector develops value added products and services, develops markets, promotes new products, undertakes R&D, and manages its data according to the spatial information management framework; and academia's key role is to provide education and undertake R&D (Victorian Spatial Council, 2008a).

2.3   Victorian policy development environment

The Victorian Spatial Council's activities and the development of Victoria's SDI take place in the context of a wide range of activities, both in Victoria and at a national level in Australia.

Current debates at all levels of Government, the private sector, academia and the community centre on the need for national responses to pressing issues such as climate change, water provision, infrastructure development and innovation, with solutions needing to cross jurisdiction boundaries. The importance of information to inform decisions in each of these areas is unquestioned. Our challenge will be to ensure that that information is available and of a quality that supports those decisions.

For example, as elsewhere around the world, there are calls on the State and national governments to open access to public sector information, including spatial information.

In Victoria, the State Parliament's Economic Development and Infrastructure Committee is conducting an *Inquiry into Improving Access to Victorian Public Sector Information and Data*, which is due to report in June 2009.

This Inquiry is looking into the potential economic benefits and costs to Victoria of maximising access to and use of Government information, the potential and risks of licensing models such as Creative Commons and open source developments, and the use of technology to support discovery, access and use of Government information (Parliament of Victoria, 2008).

At the same time, a recently concluded major review of the national innovation system (Cutler, 2008), has argued that

> "good information is crucial to the efficiency of markets and to the ability of discerning consumers to drive innovation by providers. Governments can promote good information flows both by finessing the 'rules of the game' in markets and by ensuring that the information and other content that they fund is widely and freely available to be used by consumers, and to be re-used and transformed into new value-added products by firms further down the production chain" (p.81).

In this, as in other forums in Australia, the objective is to support development of new products and services by the private sector. To achieve the information flows that will drive innovation by that sector, the review calls on the Australian Government to develop a national information strategy to 'maximise the flow of

government generated information, research and content for the benefit of users including private sector resellers of government information' (p.95).

There is a debate about how the term 'freely available' is applied – whether information is free of cost (or supplied at marginal cost) or freely or easily accessible. If the respective governments accept the view that access to public sector information should be the former, we can expect that there will be implications on the development of SDIs, and particularly the capacity of government to continue to resource the development and delivery of the data that forms such a significant part of them.

In relation to spatial information more specifically, the national government is leading initiatives in creating frameworks for address management and licensing of Government information; and developing national elevation and land tenure datasets, and environment and water resources information systems.

The challenge for the States such as Victoria is that they have traditionally been responsible for information collection and management in these areas, and are now being asked to supply information to support these developments under terms and conditions that satisfy the national agencies leading them. Without agreement between all parties, there is the risk that these agencies will develop their own information and systems to support them, resulting in proliferation of resources at enormous cost to the community. (On the other hand, they may also provide opportunities for the States to transfer responsibility for some core data over to these agencies, providing the potential for a more consistent national approach to their management, development and availability.)

To manage the implications of these developments, Victoria's SDI will need to be flexible, capable of providing relevant and fit for purpose information, and based on platforms that support the exchange of that information.

2.4   The challenge for SDI development in the future

Despite the advances in SDI development in the last 20 years, they have not addressed the needs of many potential users. There are many reasons, but among the most visible have been difficulties in obtaining information (for example, because of poor access and distribution mechanisms or high costs), in understanding and applying it (for example because potential users do not have the requisite knowledge or expertise), and/or difficulties in or the high cost of processing and applying it (for example, because they lack the necessary hardware or specialist software or specialist staff to use it).

As Craglia et al (2008) express it, SDIs

"have a focus on data search, retrieval, and access, which then needs processing by experts in the different domains. Their appeal to non-expert users is therefore limited, until such time when many services are developed on top of these infrastructures to process the data and return information understandable and relevant to non-experts."

Since those early days in the evolution of SDIs, the pace of change in society has quickened and advances in technology have increased the availability and accessibility of spatial information. Examples of the recent developments cited by Craglia et al (2008) include 'geobrowsers', visualisation; Cloud computing; Volunteered Geographic Information, 'Crowd sourcing', 'neogeography'; social networking; Web 2.0; and geosensor networks. The trend of these developments has been to make spatial information available to more and more people.

The challenge for the traditional approach to SDI then, is to keep up with these developments and take advantage of the possibilities they provide. In particular, they should learn from the developments led by the private sector, outside the traditional SDI structures, which are expanding the availability of spatial information and the 'architectural possibilities' that are now available (Craglia et al, 2008).

In Victoria, the spatial information community has been dealing with similar issues, ie how to keep its SDI relevant to a growing range of users and uses of spatial information, and ensure its development keeps pace with changes in technology such as those described above.

The next part of this paper describes the ways in which the latest Victorian Spatial Information Strategy has set out the challenges to be addressed and its response to those challenges.

Reflecting the discussion in the earlier pages, the Strategy's message is that without an appropriate integrating framework – one that harnesses the possibilities from the new ways of using technology, as well as the resources and talents of all members of the spatial community and the wider community more generally – the contribution that spatial information can make to resolving the challenges we all face will not be realised.

The concluding section will foreshadow how SDI is about to be taken a step further – for Australia as a whole, and in which Victoria will play its part. This is in development of a 'spatial marketplace' to deliver information from producers to users.

3. THE FRAMEWORK FOR SPATIALLY ENABLING VICTORIA: THE VICTORIAN SPATIAL INFORMATION STRATEGY 2008-2010

The Victorian Spatial Information Strategy 2008-2010 (VSIS), published by the Victorian Spatial Council in May 2008, is a comprehensive description of the current spatial information environment in Victoria – what it calls 'painting the landscape' facing the spatial information community.

This landscape is encapsulated in a series of challenges and opportunities – how current technology developments are impacting on the use of spatial information, but also how, by harnessing the capabilities of everyone to develop and promote its potential, that information can play a significant role in dealing with society's challenges.

At the same time, it sets out a range of activities – the responses to these challenges and opportunities – that will continue the evolution of Victoria's SDI, in particular the framework for managing spatial information, making data available and sharing it, and the roles of and relationships between the members of the spatial information community.

The theme that has underpinned the development of VSIS is that the availability of spatial information through a growing range of sources and the creation of new ways of presenting and applying it, present the traditional spatial information community with challenges to which it must respond if it is to remain relevant.

During the development of VSIS, stakeholders were asked to consider three questions:

- what these changes, and the pace at which they are occurring, mean for the data producers, vendors, and GIS experts in government, the professions, business and academia that make up the traditional spatial community,
- what strategic and policy directions are needed to meet these challenges, and
- whether the existing spatial information management framework is capable of generating the right responses to them

The resulting document sets out the themes for facilitating the contribution of spatial information in responding to the challenges provided by an increasingly complex and rapidly changing world.

Its clear message is that we can't develop spatial information in isolation from the many developments that are taking place outside the traditional spatial information community and that are enhancing or making use of it, such as social networking, web 2.0, sensors, etc.

The Strategy is a significant evolution from Victoria's four earlier strategies, which focused on building spatial datasets and setting out the principles for managing them (as shown in Table 1). However, it embeds those principles solidly within it by building on the framework they created and placing that framework at its centre.

It extends the development of the SDI as it has occurred in Victoria to setting out the relationships between the members of the spatial information community, the roles of all its members, supporting collaborative development of spatial information, and the standards and policy settings required, including releasing and sharing data.

Among the challenges VSIS has identified are

- being in a position to respond to and take advantage of the pace of change that is occurring in the use of spatial information, and the competition in the market place
- finding ways to encourage data managers to release their data to wider audiences, by addressing barriers such as copyright and liability
- encouraging partnerships between all levels of government, business and academia to develop new products and services
- having a robust and consistent approach to data management to support its use and exchange, and maintain and improve data quality
- finding new ways to broaden the spatial information skills base
- establishing a governance model that facilitates participation and collaboration and creates a flourishing spatial information community

In response to these challenges, the key objective of VSIS is putting in place the right policy frameworks to ensure the best use of spatial information, as well as the engagement of all sectors – those elements identified as underpinning spatial enablement in the earlier part of this paper.

The response is set out in four integrated strategic directions.

1. Creating a framework in which the use of spatial information can flourish – focusing on the accessibility of spatial information, supporting participation, promulgating appropriate standards and establishing mechanisms for delivering and sharing spatial data.

Under the Strategy, the framework will incorporate:

- standards – based on open sources, independent of technology vendors; consistent with national and international standards; and developed in consultation with users
- clear articulation of the roles of all sectors
- a whole of Government approach to data management, delivery, sharing and access – government agencies working together rather than operating in competition, or duplicating each others' efforts.
- legislation that will stipulate requirements and establish best practice for delivering spatial data – consolidating the multiplicity of provisions relating to the provision and management of information, to streamline and simplify them and modernise the information management environment to reflect the requirements and capabilities of digital technology.

2. *Adopting an inclusive approach to the management of spatial information* – encouraging new approaches to maintaining the quality and currency of spatial information by harnessing the skills and expertise of users and communities of interest to share in the updating and maintenance cycle.

The demands on content providers is growing as a result of wider use, to the extent that they are not always in a position to keep up with users' expectations or have the up to date 'on the ground knowledge' of changes occurring at the local level.

The development of Web 2.0 is enabling contributions to the updating and maintenance of data from any interested party.

The Strategy recommends that standard editing environments, on-line tools for metadata creation and management, and tools for notifying changes or modifications to attributes be developed.

At the same time, however, it acknowledges that such an 'open' approach can have its limitations. Therefore, a number of preconditions will need to be met to make such a model viable, such as mechanisms for managing and verifying contributions, standards against which contributions can be measured, and clear definition of roles, including what will be expected of data custodians.

3. *Developing the spatial information community through collaboration and partnerships* – recognising that growth in the spatial information community will come through the combination of individual strengths through collaboration and partnerships.

One of the defining features of the spatial information industry in recent times has been the entry of big corporations into the market place, as well as the buying up of smaller/traditional businesses by larger companies.

These developments present challenges for Victoria's industry to define its position in this expanding and global market.

In response, VSIS recommends

- Adopting partnerships based approaches
- Clearly defining the roles of industry sectors
- Creating clusters and networks to build additional capacity
- Entering into alliances outside the traditional spatial information industry
- Building on the base infrastructure/platform developed by Government to develop new services and products by the private sector, and
- That Government should support industry by providing access to its spatial data to enable the latter to develop new services delivering that data.

4. *Maintaining the foundations for spatial information management* – ensuring that spatial data is being managed and made available in a way that facilitates and encourages its use.

Underpinning these objectives will be a robust and consistent approach to the management of that data to support its use and exchange.

The data needs to be available, accessible and clearly understood by users. This will require:

- Ensuring data is fit for purpose
- Licensing models that facilitate access
- Development of technical solutions that encourage accessibility
- Awareness raising
- Enabling data to be 'discovered'
- Availability of the data

The starting point will be series of principles that will govern data management:

- all spatial information being managed by an identifiable 'custodian'
- a consistent approach to managing spatial information
- networks that support custodians performing their roles
- A Whole of Victorian Government approach for access to and sharing of data

4. IMPLEMENTING THE FRAMEWORK FOR SPATIAL ENABLING VICTORIA

The key element in giving effect to Victoria's framework for spatially enabling Victoria is the participation of all sectors of the spatial information community.

The most obvious way this is happening is the Victorian Spatial Council. As described earlier, its role is to provide a coordinated approach to spatial information policy and management, and facilitate opportunities for a greater strategic focus, partnerships, collaboration, cooperation and education

Its members come from all sectors of the spatial information community, who represent the peak bodies for business, government, academia and the professions, as well as key interest groups. It operates under a participatory governance model. Under this model, each sector has a specific role to play and Governance Guidelines set out how participation will occur (Victorian Spatial Council 2006a).

More specifically, in implementing VSIS, the Council's role is as a communicator, advocate, educator, facilitator and supporter or sponsor of demonstrator initiatives that show off the potential for spatial enablement.

The success of the framework for spatial enablement will also rely on the way we manage and make data available. Spatial data is the fundamental ingredient that underpins the quality of the new products being delivered. Having a robust management approach, ensuring data is fit for purpose (including quality and accuracy), discoverable, accessible, and available; that people are aware of it; and that it can be integrated from various sources (whether within and between organisations, states and nations) will ensure that information is able to be used.

Government will also be a key actor in implementing the framework. The Strategy sets out a number of specific actions for Government to undertake, such as leading the development of standards; adopting whole of Government approaches and principles that encourage the availability and release of agencies' data; developing legislation to modernise the management regime for spatial information; and supporting private industry by providing access to its spatial data, facilitating the commercialisation of new products and services, and making its base infrastructure/platform for the supply and delivery of spatial data available.

The framework will also depend on collaborative arrangements between Government, the private sector and academia. Already a variety of partnerships are in place to deliver products and services. Examples of current initiatives include: development of a 'notification and editing service' to enable users to

communicate instances of errors in data directly to custodians via a managed on-line workflow system; a joint venture between a private company and Government to publish topographic map books for emergency services purposes based on core topographic data, and sell them commercially; the establishment of a State-wide network of Continuously Operating Reference Stations for positioning purposes through agreements with site hosts from all levels of Government, the private sector and the community sector; and the coordinated acquisition of aerial imagery and elevation products across Victoria through purchase partner arrangements.

Together all the examples outlined above demonstrate the range of activities across the spectrum of data, policies and standards, technology, capacity building and institutions that are delivering Victoria's SDI and creating a framework for a spatially enabled Victoria.

In turn, these and other efforts must be supported by activities that will clearly define the framework and ensure it is understood. The Strategy sets out the priorities for achieving this goal as:

- Ensuring senior decision makers in Government and the private sector are aware of and understand spatial issues and their potential.
- Developing a vision and an underpinning architecture for what a spatially enabled Victoria might look like.
- Creating new governance arrangements that reflect the importance of a spatially enabled Victoria.
- Developing standards and authorising frameworks that will enable the market to develop new products and services.
- Establishing programs and processes that build on new technologies.
- Driving for consistency in key public and private sector agencies, such as common standards and expected performance levels.

5. CONCLUSION

The development of a spatially enabled Victoria will be underpinned by the shape of its SDI. And the SDI must continually evolve if it is to remain relevant to the needs of users, able to contribute to meeting the environmental, social and economic challenges facing society, and open to the potential offered by new technology. It will be by drawing on the expertise of the whole spatial information community, and from the wider community more generally, that we will be able to ensure that this evolution will continue to meet the goal of facilitating access to and use of spatial information.

To harness those efforts, a comprehensive integrating framework is needed. In Victoria, such a framework has most recently been articulated by the Victorian

Spatial Information Strategy 2008-2010. It has four defining features: creating frameworks for facilitating use of spatial information and for spatial information management (frameworks within a framework), encouraging the use of the new participatory approaches offered by technology to deliver the quality of information users are demanding, and adopting collaboration and partnerships as the basis for supporting the growth of the whole spatial community.

It is now the challenge for the Victorian Spatial Council to shepherd the evolution of Victoria's SDI toward that goal.

6. AFTERWORD: THE FUTURE OF SDI

The next stage in the evolution of the SDI will be focusing on developing an infrastructure that is at once accessible to non-specialist users, is capable of supporting transactions between suppliers of data and users, and allows easy publishing, distribution and discovery of and access to spatial information.

This is occurring at the national level through ANZLIC-the Spatial Information Council, the national body comprising the Australian jurisdictions and New Zealand.

It has adopted the following requirements for new developments in the Australian Spatial Data Infrastructure: they must

- be developed jointly by the public, private, academic and community sectors, and build on the existing capacities of all participants, rather than develop something entirely new
- be accessible to users in government, the private sector and the community
- widen its coverage from information to services, and from human use to machine to machine, application to application and service to service capability
- take advantage of technological and institutional developments outside the confines of the State SDIs, facilitating access to a greater variety of options for implementing simple, cost effective and more relevant solutions
- incorporate all spatial 'resources' into its ambit, ie data: conventional spatial datasets; products: static products such as maps; services: software systems that support interoperable machine-to-machine interaction over a network; and processes: such as the OGC Web Processing Service (WPS) designed to standardise the way GIS calculations are made available to the Internet.

These goals form the basis for defining a regional 'Australia-New Zealand Spatial Infrastructure'. As currently envisaged, this infrastructure will provide a 'marketplace' that will support:

- finding and accessing spatial resources, as defined above
- publishing and marketing these resources, and
- gathering of intelligence from the spatial market place to facilitate bringing together suppliers and users for the development of new spatial resources

The impact on the Victorian SDI will be that its capabilities must be available for the market place to function.

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