

**New Zealand  
Geospatial Office**



## Geospatial Data Standards Project: A role for government in the coordination of geospatial data standards

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## REPORT TO THE GEOSPATIAL EXECUTIVES GROUP

### 1. PURPOSE

The Geospatial Executives Group approved a project on Geospatial Data Standards under a Terms of Reference dated 5 March 2009.

The purpose of this paper is to report to the Geospatial Executives Group on the recommendation flowing from that Geospatial Data Standards Project. The recommendation is that a coordination function for geospatial data standards be placed in the New Zealand Geospatial Office (NZGO).

As part of the project, research and analysis was presented to and discussed with an Advisory Group of 20 people from the geospatial sector - a mixture of government, industry, and academia. The project was run using an advisory group process on the basis of Chatham House rules to facilitate free and frank feedback.

In addition to the purpose above, this paper sets out as an appendix, a summary of the:

- Research and analysis done for 3 papers prepared for discussions with the Advisory Group, namely:
  - Problem identification & government objectives (identifying market failure conditions, national interest arguments and public value opportunities).
  - Current position in New Zealand and internationally (looking at Australia, the United Kingdom and the United States of America, and New Zealand domains outside of the geospatial sector).
  - Intervention tools & options for a role for government in geospatial data standards.
- Feedback from discussions held at three meetings and other communications with the Advisory Group.

See the attached **Glossary** for the full names referred to in this paper as acronyms or abbreviations.

We acknowledge the observations, expertise and experience of the Advisory Group members (and others) and thank them for their contributions.

## 2. EXECUTIVE SUMMARY

Perhaps no other industry has such an enormous investment in data as the geospatial sector.<sup>1</sup> Over decades, governments and businesses worldwide have spent tens of billions of dollars collecting and maintaining geospatial data. Leveraging this investment is critical to meeting ongoing geospatial information requirements for government, businesses and the community.<sup>2</sup>

Importantly, geospatial data is a crucial input into other key areas of investment, which rely on it in their decision-making, eg physical infrastructure, like roads, telecommunications, bio-security, resource management, etc, and for determining efficient and effective government services.

According to the New Zealand Institute (an independent think-tank) New Zealand needs to reposition itself ahead of other countries coming out of the recession by government investing in areas that "... boost business innovation and **its translation into higher value products and productivity enhancing business processes**".<sup>3</sup>

This is probably correct overall, but in the area of geospatial data standards, New Zealand is already behind the international curve. Hence, it is more a matter of catching-up and positioning appropriately than repositioning. However, given the advantage of small size and relative cohesiveness it is possible to catch-up quickly.

In addition, given the present state of the New Zealand economy this catch-up should, through necessity as well as good practice, be undertaken by government in concert with other participants in the geospatial sector using *high impact, low cost* initiatives – value-for-money initiatives. Investment in ensuring that geospatial data standards are established and encouraged in data production is an area where both catch-up and value-for-money can be achieved.

The Advisory Group members commented that New Zealand has good geospatial data resources, but they are scattered, inconsistent, and not always in a form that renders them immediately useful. The Advisory Group agreed that without a participatory spirit to the use of standards, especially for interoperability and access to datasets, things are unlikely to change. However, bringing existing datasets into compliance with standards is arguably a second step after deciding what the standards should be.

Initiatives relating to geospatial data standards are particularly important to underpin economic growth and improve productivity because standards facilitate better deployment of geospatial information assets. In other countries initiatives relating to geospatial data standards suggest that they contribute greatly to higher value products and to enabling productivity enhancing business and government processes. Standards do this by producing the best practice guidelines for achieving efficient, effective and relevant repeatable processes.

New Zealand is relatively rich in spatial data assets, but not all are immediately useful. With a bit of help, geospatial data standards in New Zealand can be better coordinated. This would

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<sup>1</sup> Carl Reed, Open GIS Consortium White Paper, 14 June 2004, "Integrating Geospatial Standards and Standards Strategies into Business Process"

<sup>2</sup> As above

<sup>3</sup> As reported in an article in [www.stuff.co.nz](http://www.stuff.co.nz) on 29 April 2009; and as reported on Radio New Zealand Morning Report 6 May 2009. Plus this approach was also expressed as a way of increasing economic growth and productivity in "Time for better connections: A review of the role of standards development, and standards conformance infrastructure, in promoting innovation in New Zealand", 2005 by Innovation & Systems Ltd for the Ministry of Economic Development; and the MED "Standards Report" May 2007 and the "Report on the Outcomes of the Standards and Conformance Infrastructure Review" May 2007.

lead to better harmonisation (ie similar content) and synchronisation (ie similar timing of uptake) of repeatable processes to:

- Reduce duplication of effort (leading to reduced input costs)
- Increase process efficiency (leading to process cost savings and increased productivity)
- Free-up resources to produce higher value products (helping with economic recovery and growth)
- Facilitate straightforward interchange of information within and between economic sectors and levels of government as well as the (tertiary) education sector.

Plus, the case for government involvement in geospatial data standards is reinforced:

- By international experience - Countries with well developed spatial data infrastructure have included a function for coordinating geospatial data standards.
- Due to the structure of the New Zealand geospatial data sector - Unlike many other sectors (where industry makes up the lion's share of activity), in the geospatial sector local and central governments are the scale producers, being heavily involved in geospatial data collection and maintenance for use across their core activities. Any government effort put into coordinating geospatial data standards would be rewarded by a direct reduction in government spending and a commensurate increase in performance improvements. It would also provide niche market opportunities for small-medium enterprises as data value adders and distributors.

In looking closely at New Zealand organisations and processes currently operating in the geospatial data standards area it becomes clear that an overall structure does exist. What is missing only represents small gaps in that structure. A new expansive "whiz-bang" solution is not required. What is required is a small, nimble, and relatively easy to set up and low cost initiative that fills those gaps to provide high impact – an operational front-office function rather than strategy and planning. The gaps identified amount to a coordination role, which is currently not there, and the mechanisms to produce and inculcate standards use among the sector, which are not there yet either.

Note, while the word 'coordination' is used for the role, the role would involve rather more than mere coordination – as one Advisory Group member stated – "the whole ball of wax needs attention (which standards, how are they relevant, how to customise them, how to propagate their use, etc)". However, for simplicity the word 'coordination' has been settled on as the overall descriptor.

Comparing what is happening in New Zealand to the approaches taken in the United Kingdom, Australia, the United States of America, and Canada, what is missing in New Zealand is a coordination function at the national level. A centralised function that acts as a lynchpin to *coordinate* geospatial data standards using existing local organisations and processes that connect with regional organisations and processes that link into international organisations and processes.

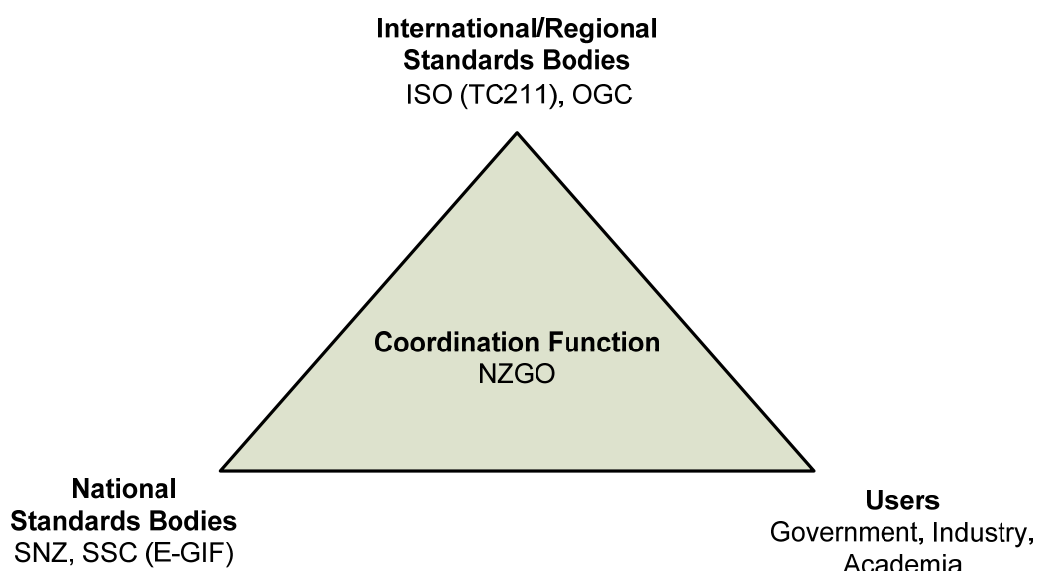
Other countries have a sector specific coordination function at a national level (or in the case of the US, federal (FGDC and NGDI) and state levels), which act as a lynchpin between geospatial data standards development, drivers and users. For instance, the FGDC, which is

made up of the 50 states of the United States of America, has geospatial data standards coordination functions in each state (the coordinating body is federal). For INSPIRE, the European Union has geospatial data standards coordination functions in each member country. This would be similar (but not identical) to ANZLIC having geospatial data standards coordination functions in each member country (New Zealand and Australia). Currently, New Zealand has no such formalised function.

In New Zealand, the recommended coordination function would connect (triangulate) the three existing parts of the existing infrastructure –

1. Standards bodies like ISO, ANZLIC, SNZ, SSC (E-GIF).
2. Government, industry and academia involved in standards development and use.
3. All producers and users of geospatial data (basically that is government, industry, and academia as all are producers and consumers of each other's datasets).

Coordination is the key part that is missing – it is this gap that needs to be filled.



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Having identified conditions of market failure, national interest arguments, and public value opportunities; researched the position in New Zealand and internationally; and discussed types of initiatives with Advisory Group members from government, industry and academia – the coordination function floats to the top.

The coordination function option is preferred against continuing with the status quo because without it geospatial data standards would not improve to the level needed to:

- Assist physical infrastructure projects in New Zealand.
- Attract businesses like Google to New Zealand.

Geospatial information is a necessary input for those types of projects and those types of businesses, so it is necessary to keep geospatial data standards up-to-date to meet their needs.

In short, five main points have come out of this project:

1. NZGO should not reinvent the wheel (in terms of Standards development and distribution), but focus on bridging coordination gaps within the sector. SNZ, as the national Standards body, is well positioned to partner with NZGO to:
  - Provide a Standards development/maintenance 'engine'.
  - Act as the primary distribution channel and portal for geospatial standards solutions.
  - Ensure NZGO led coordination is consistent with and fits into national strategies around standards and conformance.
2. State sector 'value-for-money' and best use of scarce resources to address identified market failures can only really be achieved if there is much greater coherence across New Zealand geospatial standardisation activities - which in turn requires clarity and common understanding of standards development, sponsorship and coordination roles.
3. Ensuring New Zealand's voice is heard in the international standards community to further New Zealand's needs (eg with ISO) requires some initial focus from NZGO, SNZ and ultimately sector funding.
4. How best to support the wider New Zealand community of volunteers and experts, whose collective efforts effectively underpin the entire standards world, is a material consideration for NZGO, and has been incorporated in the design of the recommended coordination function.
5. Given the significant level of participation of government both as a producer and user of geospatial data, government involvement in the area of geospatial data standards is not only essential to improving things, it will directly assist government in increasing its own productivity providing commensurate reductions in government spending.

The detail of the recommended coordination function is set out next. The rationale for the coordination function recommendation is contained in the Appendix in three sections:

1. Definition of Standards.
2. An Analogy – Road Rules.
3. Summary of Project Papers and Discussion.

### **3. RECOMMENDATION - Geospatial Data Standards Coordination Function**

#### **3.1. The coordination function**

The result of the Geospatial Data Standards Project is a recommendation that NZGO undertake a geospatial data standards coordination function. The suggested function is operational in nature – a front-office activity. It would operate as the lynchpin to triangulate the three existing areas of organisations and processes for geospatial data standards already in existence in New Zealand, regionally, and internationally.

Geospatial data standards coordination functions are currently used in other countries as a key part of their Spatial Data Infrastructure to underpin productivity improvements and increase economic growth in the geospatial information sector. However, such a coordination function is currently not present in New Zealand and it is unlikely that, at this stage, the market will be able to provide it. More to the point, the geospatial community itself cannot provide it. Had this been the case, there would have been more progress evidenced on this front.

The coordination function is crucial because it will fill the gaps in the existing New Zealand geospatial data standards structure of organisations and processes.

#### **3.2. Coordination function main tasks**

The coordination function would have three main tasks:

1. **Facilitate communication** among the stakeholders in the geospatial data standards area nationally, regionally, and internationally to improve the development and acceptance of geospatial data standards in New Zealand.
2. **Improve visibility** of geospatial data standards in New Zealand through providing a distributable listing/cataloguing of them and by assisting with information flow to the sector.
3. **Encourage uptake** of geospatial data standards in New Zealand by endorsing (ie branding) geospatial data standards agreed to through standards consultation and consensus processes, run by NZGO where simple, and run by SNZ where more complex.

As stated in the executive summary, while the word ‘coordination’ is used for the role, the role would involve rather more than mere coordination – as one Advisory Group member stated – “the whole ball of wax needs attention (which standards, how are they relevant, how to customise them, how to propagate their use, etc)”. However, for simplicity the word ‘coordination’ has been settled on as the overall descriptor.

#### **3.3. Who provides the coordination function?**

The coordination function needs a home. The place that floats to the top is a government department that is already heavily involved in the geospatial data standards space. The government department identified in this regard is LINZ because:

- LINZ is already involved with ANZLIC and international standards bodies arguably to a greater degree than other government departments – there is expertise and existing connections, which are significant, strong and valuable.

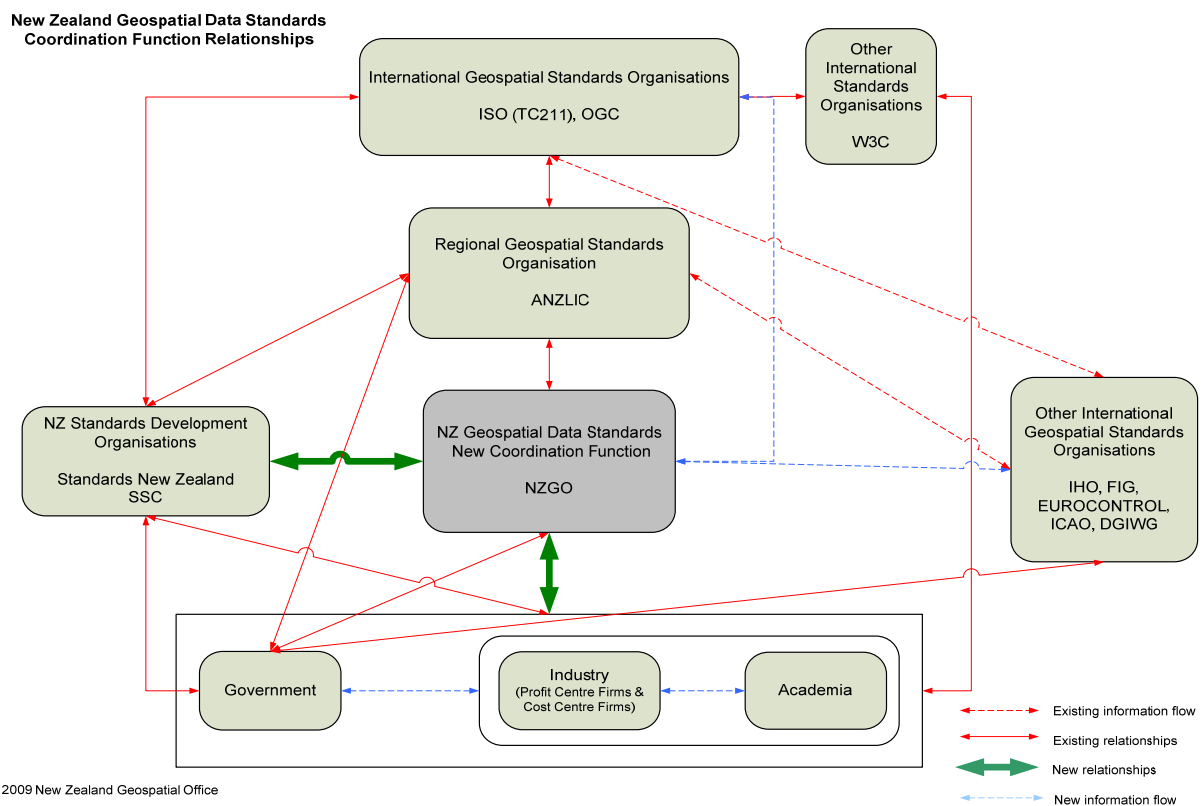
- LINZ holds a number of datasets and regulator functions that rely on geospatial data standards.
- It would reduce set-up and administration costs by placing the coordination function within the already operating NZGO, which is part of LINZ, but not currently funded to perform a geospatial data standards coordination function.

The Advisory Group members picked LINZ as their preference, as long as there is good coordination with and representation from the various participants in the sector – for example, on a management or steering committee, which would in turn liaise with SNZ, SSC, and ANZLIC. This issue is largely addressed by the recent governance restructure of NZGO, the Geospatial Executives Group and Geospatial Steering Committee. The Geospatial Steering Committee will fulfil the management/steering role, and having NZGO as the coordinator should address the concerns relating to improved participation by industry and academia.

The NZGO coordination function would operate as the lynchpin to triangulate the three existing areas of organisations and processes for geospatial data standards involving all parts of government, industry and academia. The Advisory Group agreed with this, as long as NZGO is given the mandate to proceed and some functional means (ie money and people) to be able to coordinate efforts.

### 3.4. Where does the coordination function fit?

#### NZGO Coordination Function Diagram



The diagram above shows how the coordination function at NZGO would fit with the organisations in the existing geospatial data standards area in New Zealand, regionally, and

internationally. The model works off the concept of having feeder organisations providing input and expertise.

- At the centre is ANZLIC, with Australian and New Zealand membership.
- Above ANZLIC are international organisations like ISO, OGC, and W3C.
- To the right side of ANZLIC are the international organisations that are outside the scope of NZGO tasks, but still provide information flow.
- Below ANZLIC is the coordination function within NZGO.
- Below NZGO are government agencies, industry and academia providing input and expertise.
- At the left of NZGO is SNZ and SSC (E-GIF) performing operational aspects of standards development, and brokering engagement with the wider Standards community.
- SNZ, as New Zealand's member body, is also there to coordinate efforts with ISO.

The direct connections between government agencies and ANZLIC would remain, as would the existing relationships between government agencies, industry, and academia and international and other regional bodies like ISO, OGC, W3C, IHO, ICAO, etc.

Note, the process functions undertaken by SNZ are undertaken by other country Standards organisations. (For example, the Standards Council of Canada serves as the administrative arm of ISO TC-211 delegates. Its Web communications portal is used to discuss issues of geospatial standards relevance and this provides others with a direct path into the ISO private Web in Geneva).

### **3.5. What would the coordination function do?**

The geospatial data standards coordination function would:

- Utilise existing organisations and relationships in the geospatial data standards area.
- Build on the informal and formal processes that already exist for geospatial data standards.
- Provide a point of contact for existing organisations involved in geospatial data standards and those reliant on the outcomes of that work.
- Facilitate connections between people and organisations that are able to work on geospatial data standards adoption, adaptation, development and maintenance with existing standards organisations like SNZ, eg by assisting with sourcing voluntary members for SNZ expert committees from industry, academia and government.
- Assist with negotiating funding or sponsorship of geospatial data standards from government agencies and industry to pay for a standard to be developed where, for instance, SNZ processes are required.
- Scan the horizon for new geospatial data standards coming out and the fitness for purpose of existing standards through NZGO's contact with the organisations in the

diagram above. This would be done in partnership between NZGO and sector participants to identify the evolution of the two above bullet points.

- Promulgate/promote geospatial data standards that are formally and informally accepted for use or that are used in New Zealand (where there they are in conformance with international standards), including through establishing and maintaining a catalogue of existing geospatial data standards. (Note – as a sideline this is a central function of a SDI, so doing this would also create one of the building blocks of a New Zealand Spatial Data Infrastructure - NZSDI).
- Focus on geospatial data standards relating to data access, interoperability and integration, metadata and file structures (but not standards relating to specialised areas like, for instance, geodetic data).
- Provide a solution to the problem of the existing lack of standards endorsement for geospatial purposes (ie sector specific endorsement) by branding those geospatial data standards formally endorsed by NZGO. This would add to the level of confidence in the standards, and would be complementary to standards endorsed through SSC (ie E-GIF) and by SNZ. While many of the standards are branded by SNZ, which is acknowledged as a prominent brand, SNZ has over 3000 standards on its “books”. This presents the issue that geospatial data standards may be getting “lost in the crowd” so are not as visible as they could be. This could, however, be resolved through promotion of a ‘mini-catalogue’ covering both Standards and industry standards solutions with SNZ acting as a service partner with NZGO. Also E-GIF deals with standards across sectors, and has expressed its encouragement for the development of a geospatial sector specific standards coordination function as has occurred in other sectors, like the health sector.
- Negotiate service, promotion and access arrangements with SNZ for cataloguing existing and new geospatial standards endorsed by NZGO – see above.
- Coordinate discussion and wider engagement among government, industry and academia on “lesser consensus” standards proposed for endorsement by NZGO that do not require the same development rigour as national Standards.

### **3.6. What would the coordination function NOT do?**

The coordination function would NOT do the following. It would:

- NOT be a “standards development shop”. There is no need for it to run the process for adoption, adaptation, development, or maintenance of standards, since there are already organisations with expertise, mandate, and existing infrastructure that operates well (eg SNZ, ANZLIC, SSC – E-GIF).
- NOT be a regulatory function. The coordination function would not develop regulations in the area of geospatial information, so the standards developed would be voluntary unless codified through the legislative process. The added benefit of not having a regulation making function is that the risk of ‘regulatory creep’ is removed – legislation would not be part of the coordination function proposed, but would be left to the relevant government departments using existing policy and legislative development processes.
- NOT replace existing relationships, which are currently working well. Particularly, the direct relationships between government departments, industry and academia

and regional and international organisations like ANZLIC, IHO, ISO, OGC and W3C that are necessary to core business practices and for dealing with unique or innovative industry developments. For example, SNZ's links to and national member status with ISO, LINZ's membership on ICSM, IHO, FIG etc, firms involved in OGC, W3C like Eagle Technology or Intergraph, and firms like EGL, Koordinates, and Terralink providing products to New Zealand organisations.

- NOT be used to solve problems with standards development timing and volume caused by lack of funding. Funding issues are not specific to geospatial data standards, but to all standards (both "standards" and "Standards" – ie informal and formal, aspirational or regulatory guidelines, voluntary and mandatory, created organically or harvested by actively seeking industry/user consensus). However, issues relating to encouraging use/compliance will have to be addressed by NZGO through non-regulatory solutions to some extent; otherwise adopting a standard is an empty gesture – if no-one uses it (see Definition of Standards section).
- NOT replace New Zealand's international relationships dealing with ICT, which are in the most part conducted through private companies, central government and regional and international organisations.
- NOT deal with specialised areas, like geodetic standards. NZGO would only deal with standards that refer to the geospatial area as a whole. Although, there would still be information flows between the coordination function and those specialised areas.

### **3.7. Coordination function operational structure & cost**

#### **3.7.1. Structure & cost**

At a high level the coordination function structure and budget recommended is as follows:

- Establish coordination function within NZGO over 2009-2010.
- One FTE staff.
- Base funding of approx. \$400,000 for year one, then approx. \$200,000 per annum.

#### **3.7.2. Funding**

##### **Year one**

An estimate of the year one base funding is approx. \$400,000 as follows:

- \$100,000 one staff salary
- \$40,000 for staff travel costs, attending conferences, training
- \$35,000 for overheads
- \$175,000 for set-up of list/catalogue (incl. copyright costs), web technology and design costs, and branding.
- \$50,000 consulting experts where needed (on a short-term basis).

The catalogue, brand and technology costs could be spread over longer than one year – they would not have to be met on day one. Also, these costs may be lower depending on how big or small, simple or complex the function is. In fact the function could be established without this cost, perhaps delaying much of it to year three – it could build over time. This approach would require strong management of sector expectations. Industry enthusiasm, and hence willingness to assist, may wane if there is a long delay.

The ideal (but not the necessity) would be to load the costs in the first year to enable tangible action to be taken to meet existing expectations based on the sectors current needs and to immediately capitalise on the goodwill established during this project.

### **Year two and onwards**

An estimate of the year two and ongoing base funding is approx. \$200,000 per annum as follows:

- \$100,000 one staff salary
- \$35,000 for overheads
- \$25,000 for staff travel costs, attending conferences, training
- \$20,000 for maintenance of list/catalogue (incl. costs of copyright), web technology and design costs, and branding.
- \$20,000 consulting experts where needed (on a short-term basis).

The funding would be in addition to the current operating costs of NZGO. To give the role sufficient independence to perform the functions required, the additional funding should be quarantined so it is solely for the coordination function and related activities. The funding would not be used to directly sponsor the development of any specific standard through SNZ or SSC (E-GIF), but rather ensure the coordination function is sufficiently resourced to support the successful roll out of NZGO's strategic standardisation objectives.

This base funding for the recommended coordination function would likely have to come from the government departments that are members of the Geospatial Executives Group, being those most likely to benefit from the recommended coordination function.

These estimates are based on the cost of running the:

- Health sector standards function at the Ministry of Health, which costs around \$500,000 per annum (and has three staff members, but started with two).
- Education sector standards function at the Ministry of Education, which is more limited and costs around \$200,000 per annum (and has one staff member).

### **3.7.3. Staffing**

Crucially, the main coordination function person needs to be a natural connector first, and a geospatial maven (expert) second. It is an operational role with a front-line focus. It is a role that requires action rather than behind the scenes strategy and planning. The person would need to feel confident in looking inside NZGO and LINZ, but more importantly, outside NZGO and LINZ to help identify who should be brought to the table and how the sum of the parts could exceed the whole.

Building and maintaining a collaborative community of people and institutions including partnering with private sector organisations, local and central government, and to assist internationally with competence building in relation to geospatial data standards is the main component of the function.

Hence, the coordination function needs to be done by a person not only having geospatial knowledge (so they can talk sensibly with sector participants here and internationally, and weigh up competing interests and purposes), but by a person able to build strong and comprehensive communication links with and between industry, government, and academia. The Advisory Group agreed with this suggestion.

#### **3.7.4. Alternative staffing option**

An alternative option for staffing suggested by the Advisory Group is that the staffing could be front-loaded with two staff to speed-up the process of cataloguing existing standards for endorsement by NZGO and to promulgate/promote those standards. The second staff member would then drop off from the second year onwards, depending on progress made to date. The main staff member would lead and the other staff member would assist during the establishment period of the first year. The two staff would report to the Geospatial Custodian as the leader of NZGO. The Advisory Group preferred this approach as they believed it is more than a one person job. An additional staff member for year one would cost an additional \$70,000-\$100,000.

#### **3.8. The standards development process - outsourcing**

The standards development process would be mostly outsourced to SNZ, where the standard is not otherwise done through E-GIF. Given the user-funded business model government operates for the national Standards body, the cost of using SNZ would need to be met through external sponsorship. Funding would be sought for the standard being considered from those in central and local government, and industry, who are interested in the standard being endorsed by NZGO.

Standards or guidelines merely adopted by NZGO using online consultation or a working group process that provides consensus would not need to be outsourced to SNZ, but would be run by the staff member appointed to the coordination function within NZGO. Negotiating copyright access where the standard is already held by SNZ or ISO (through SNZ's membership of ISO) would still need to be dealt with – and paid for.

#### **3.9. Prioritisation of standards**

The suggested sponsorship model above addresses the issue of prioritisation – ie which standards to look at first. Support for a standard would be gauged by the enthusiasm for financing its transition through the SNZ standards development process. This is likely to be a commercial decision for industry, but for government agencies the decision would be based on wider criteria like national benefits, practical considerations, regulation, trade facilitation, and internal considerations (eg what projects are first-order priority for the government).<sup>4</sup>

#### **3.10. Commercial aspects – dealing with copyright issues**

ISO standards are sold to help fund the very process that leads to their development. ISO members, like SNZ, also adopt the international standards as national standards and sell these to help fund their own respective national standardisation activities and recovery costs of

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<sup>4</sup> Criteria set out by the Ministry of Economic Development in "Standards Report" May 2007

operation. Therefore, protection of copyright is, on many levels, fundamental to the sustainability of the international standardisation system.<sup>5</sup>

Copyright infringement occurs when intellectual property is reproduced, performed, broadcast, translated or adapted without the express permission of the creator or the group/individual licensed to handle the material in question.

The Standards Council, through its operating arm SNZ, is the primary standards development body in New Zealand. SNZ is New Zealand's member of ISO – ISO will only allow one organisation per country to be a member. This membership makes SNZ the only agency able to produce standards labelled as a "New Zealand standard".<sup>6</sup> Also, standards produced by SNZ and ISO standards accessed through SNZ are subject to copyright and can be charged for.

SNZ has a number of geographic information standards in the national Standards catalogue. These Standards are subject to copyright. The existing geospatial data standards held by SNZ cannot be published by NZGO without negotiating a suitable commercial arrangement with SNZ to do so. How NZGO's relationship works with SNZ is a matter of contract negotiation and would require additional funding above that noted in this recommendation subject to the terms agreed. For example, SNZ is well positioned to provide cataloguing services in the form of a mini-catalogue of NZGO endorsed geospatial data standards that it hosts, but has the look and feel of the NZGO brand and website, and also links into the SNZ web-shop so ISO or SNZ standards can be purchased by users.

For the recommended NZGO geospatial data standards coordination function to work well, it will need to consider and address all of these issues.

### **3.11. The standards endorsement process**

An example of the coordination function in action is set out below. The approach will require some fine tuning – by following the procedures and protocols already in place for the establishment of standards in other organisations world-wide – but represents the basic outline of this aspect of the coordination function.

#### **The process**

- A government agency or industry participant in the sector suggests to NZGO, or NZGO identifies that, a particular standard be considered, adopted, adapted, (or much less commonly, developed).
- NZGO canvases whether other agencies and those in industry and academia are interested in the standard.
- NZGO seeks funding/sponsorship for the development of the standard from those interested and willing to meet the cost, where a SNZ process is required to facilitate an expert committee, public consultation and consensus.
- NZGO engages SNZ (if required) to run the expert committee, consultation and consensus process. Otherwise, if a SNZ process is not required, NZGO would provide the forum for discussion of the standard (eg online consultation or a working group process) and this would link back into ANZLIC or to ISO – if the standard is regional or international in scope.

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<sup>5</sup> See ISO, IEC "Copyright, standards and the internet" Brochure

<sup>6</sup> As above.

- If SNZ is used, NZGO assists in getting voluntary members for the SNZ expert committee from government, academia, and industry. If SNZ is not used, NZGO facilitates (either online or through working groups) discussion between government, academia and industry.
- Once the standard is approved through SNZ or through the NZGO online consultation/working group process, NZGO endorses the standard, catalogues it on the NZGO online catalogue, and sends out information to the sector and regionally (to ANZLIC) by email with news of the endorsed standard.
- Following endorsement by NZGO, NZGO would monitor, to the extent possible (given its level of funding), any changes that may be required to the standard over time, through contact with other organisations in the model. If maintenance is required then the standard goes through the standards endorsement process again, but only in relation to the changes required.

### Standards examples

Examples of standards problems raised by the Advisory Group are:

- A lack of a uniform, properly structured and address-matched national street network, which is a fundamental layer for many forms of spatial data application. A number of the Advisory Group members stated that in many regions they were yet to find one that can be used (eg for vehicle routing), without additional processing. Nation-wide standards are needed to address such an issue. The above process could assist with this.
- The Emergency Services and Government Administration framework (ESA) Core Location Data Specification, which was designed in 2001, has largely not been used. The ESA was created to unambiguously define all the commonly needed location features, their relationships, and the minimum data characteristics needed to facilitate locating and verifying locations anywhere in New Zealand. One member of the Advisory Group stated that they had tried to use the ESA, but could not find anyone to audit their compliance, which was required by their client as part of the project risk management process. The Advisory Group thought there were two main reasons for these failures.
  - Firstly, the ESA is not “owned” or “endorsed” by any particular government agency so has no identifiable authority behind it.
  - Secondly, a schema was not developed to allow an auditing process to occur.

In other words, through lack of a “home” the ESA stalled – it was created, but not made operational and it has not been maintained.

### 3.12. Other tasks

Other tasks undertaken by the coordination function would include:

- Having an online best practice geospatial data standards/guidelines list, eg cataloguing existing standards/guidelines that are endorsed by NZGO (initially those not requiring the standards process above and going-forward adding more once endorsed), and those suggested for endorsement, but not yet endorsed (ie a standards/guidelines waiting list).

- Sending out material on geospatial data standards – periodically as well as one-off.
- Facilitating workshops on geospatial data standards, if appropriate and within budget.
- Preparing and maintaining contact lists of interested parties.
- Assisting in communications among areas of government, industry and academia involved in geospatial information.
- Liaising with ANZLIC, SNZ and SSC (E-GIF) on their approach to and requirements for, standards and standards development processes.
- Negotiating service and copyright agreements with other organisations, eg SNZ
- Staying up-to-date with market intelligence using information flows within NZGO and to other organisations in New Zealand, regionally and internationally.
- Attending and reporting back to the community on applicable conferences each year.

### **3.13. What would success look like?**

One important indicator of success for the coordination function is uptake of geospatial data standards in the sector. However, this is difficult to measure and NZGO has no direct control over it happening. A suggested gauge for this though would be case studies – stories posted on the NZGO website showing how the standards have helped in new product production, reduced costs, improved interoperability and access to data, etc. For example, best practice exemplars; see Geoconnections for success stories

<http://www.geoconnections.org/en/aboutGeo/successStories>. One member of the Advisory Group stated that Geoconnections should be a model for the NZGO.

The commonly applied public sector measures of performance can also be used. For instance, customer surveys, number of contact points with the sector, brand awareness, hits on website, levels of participation statistics (of government, industry and academia), number of requests for additional standards to be put through the endorsement process. These would be developed along with performance metrics applying for all the work done by NZGO, and as contained in the Statement of Intent for LINZ in relation to NZGO.

### **3.14. How does the coordination function fit with other proposed initiatives?**

To future proof the recommendation, it was compared with other initiatives in the standards area that could potentially replace it in the immediate future. One such initiative is that being undertaken by the Ministry of Economic Development (MED) in relation to standards and conformance infrastructure in New Zealand.

Flowing from the MED review is the proposed Standards and Accreditation Bill, which is yet to have its first reading in the House. The explanatory note to the Bill states that the Bill:

- Renames the Standards Council using its current trading name 'Standards New Zealand'.
- Updates the Acts concerning the Standards Council.
- Modernises and simplifies the governance arrangements by separating the Standards Council's governance and technical advisory functions.

- Requires SNZ to establish technical advice structures (called 'sector advisory boards' (SABs)) to improve the strategic direction of standardisation in New Zealand.

These SABs must be established for various sectors, as determined necessary by SNZ, to advise SNZ on standards priorities in New Zealand. The functions of each SAB are to:

- Develop and recommend strategies for standardisation in the sector and inform SNZ of those strategies.
- Recommend to SNZ a programme for ensuring that standards relating to the sector are reviewed and kept up to date.
- Advise SNZ on technical questions relating to standardisation in that sector.

While this SAB function may be similar in some respects to the recommended geospatial data standards coordination function, it should not stop the coordination function from proceeding. This is because:

- The Bill is still in its early stages, and may not proceed.
- Even if the Bill is passed, we understand from SNZ that the geospatial information sector will not be one of the first cabs off the rank, and in fact, may never have its own SAB. Other sectors will take priority, for instance, the review notes management and business: building and construction; electrotechnology; gas; communications, IT, and e-commerce; environment, and safety and material.
- The design, function, and operation of SABs are still being developed by SNZ and MED – these discussions would be informed by emerging coordination initiatives led by agencies such as NZGO.
- The coordination function recommendation provides wider functions than the proposed SABs, so even if a geospatial SAB is established, the roles would not overlap – NZGO would be the feeder organisation to the SAB which would be needed in any event.

### **3.15. Conclusion**

In summary, the recommended coordination function would:

- Focus on the main tasks of facilitating communication between government, industry and academia, and improving visibility and encouraging uptake of geospatial data standards.
- Work closely with SNZ and SSC (E-GIF) to develop, promulgate and promote geospatial data standards.
- Fit with other standards initiatives such as work by MED on standards and accreditation.
- Be placed with NZGO as part of LINZ.
- Be funded separately by the members of the Geospatial Executives Group.

Geospatial Data Standards Project: A role for government in the coordination of geospatial data standards

Report to Geospatial Executives Group

## **APPENDIX**

# 1. DEFINITION OF STANDARDS

Before getting into the discussion section of the paper, it might be useful to look at a definition of standards – as used by the geospatial industry – and compare that to a definition used for regulatory purposes (which in essence are standards too).

## 1.1. Definition for this paper

For the purposes of this paper, the multi-dimensional definition of standards set out by Yeung and Hall (2207) (see the extract below) is used as a general conceptual framework for explaining the classification, development, and implementation of standards. Note, however, that to others in government the Regulatory Pyramid set out below may be in mind rather than the definition set out by Yeung and Hall (2007). This may explain some of the miscommunications that occur between some parts of government and the geospatial industry and academia when discussing standards.

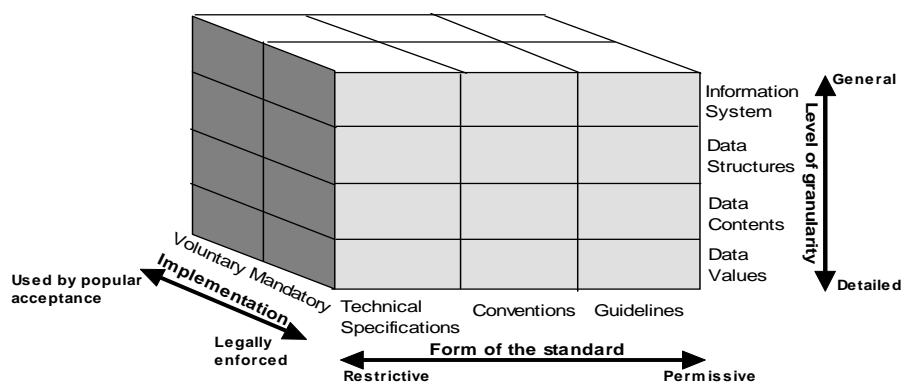
## 1.2. Extract Chapter 5 - Definition of standards

Here is an extract from Chapter 5 of “Spatial Database Systems: Design Implementation and Project Management” by Albert K.W. Yeung and G. Brent Hall, 2007, on the definition of standards.<sup>7</sup>

“The term ‘standards’ has been defined by different standards organisations in different ways. For example, the concepts and notions of standards as adopted by the International Organization for Standardization (ISO), the American National Standards Institute (ANSI), the British Standards Institute (BSI), and the Standards Council of Canada (SCC). Using these organisations and their interpretations, standards can be best defined as follows:

A document or collection of documents, usually but not always published, that establishes a common language, terminology, accepted practices and levels of performance, as well as technical requirements and specifications, that are used consistently for the development and use of products, services and systems.

A standard can be documented in different forms, implemented in different ways, and used to describe different things at different levels of detail. Hence, a better way to understand the multi-faceted nature of standards is to define them using a three-dimensional matrix (below) whose cells are defined by the above factors and are explained below.



<sup>7</sup> We have obtained permission from the author, Dr. Brent Hall, to publish the extract. Brent Hall is a member of the Advisory Group for this project.

## Forms of Standards

Standards generally take three forms that vary from being very restrictive and specific to relatively permissive and general in application:

- Technical specifications are the most rigid and exacting of all standards and, if followed correctly, will yield consistent and identical results.
- Conventions, also called rules or protocols, are more flexible and more accommodating of variations in implementation, and will yield similar but not necessarily identical results.
- Guidelines are the most flexible type of standards that aim to provide a broad set of criteria against which the quality and performance of products, services or systems can be measured and evaluated.

## Forms of Implementation

Standards can be implemented using two approaches:

- Mandatory, where standards are implemented through government legislation and regulations; and
- Voluntary, where standards are implemented through consensus and popular acceptance by the user community.

## Level of Granularity

This dimension of the standards matrix, which describes how detailed the subject of a standard is described, is product- or service-specific. In the case of spatial databases there are four levels of interrelated standards that progress from information system to data values, namely:

- Information system standards, which apply generally and broadly to depict the overall architecture of a system, including the roles of and interrelationships among its hardware, software and data components.
- Data structure standards, which define the way by which data are physically and logically represented in the system.
- Data content standards, which provide the rules for representing each element defined in the data structure covering, for example, formats for dates, times, quantities and addresses, punctuation and capitalisation, and required and optional inclusion of specific items in the standard.
- Data value standards, which are also called object or feature catalogues, provide lists or tables of terms, names, classification codes and other types of permissible values that are allowed for a particular element defined in a data content standard."

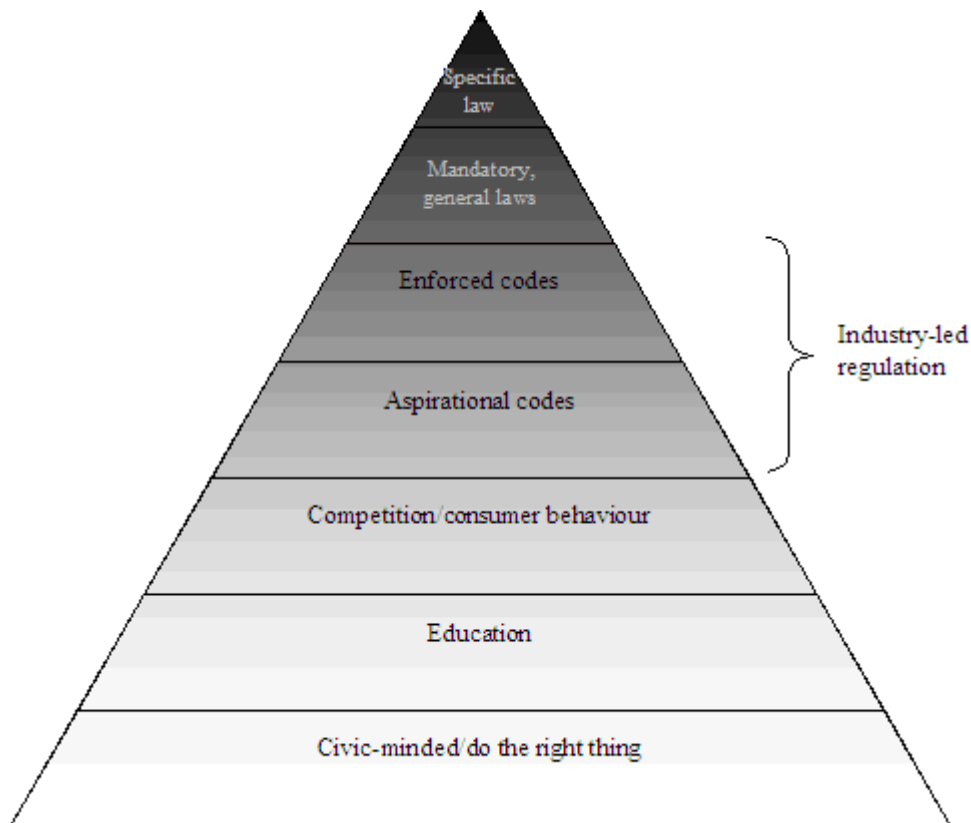
**End of Extract**

### 1.3. Regulatory concepts used to define standards

The explanation provided by Yeung and Hall (2007) accords with similar work done for regulatory design purposes used more generally by government in relation to regulation (both government imposed and industry-led self-regulation), which in essence are standards.

Using a policy development approach, the regulatory environment can be modelled in terms of a pyramid, showing the increasing level of intervention in a particular market. The pyramid also shows the extent to which regulation is binding on market participants.<sup>8</sup>

#### The Regulatory Pyramid



(This pyramid is adapted from Ian Ayres and John Braithwaite, *Responsive Regulation: Transcending the Deregulation Debate*, Oxford University Press, 1992 and Australian Consumers' Association, *Submission to Australian Competition and Consumer Commission Discussion Paper "Guidelines for Developing Effective Voluntary Industry Codes"*, October 2003 by the Ministry of Consumer Affairs, NZ)

Under this model, at the lowest levels the regulatory pyramid implies only a limited role for intervention in a market. Businesses are a part of society, and as such, they are motivated by the impulse to "do the right thing". However, it may be necessary to educate businesses and consumers on their respective rights and responsibilities.

The lower levels of the pyramid also take into account the effect of competition in influencing trader and consumer behaviour. Competition acts to constrain any bad behaviour from firms. Through their choices about suppliers and products, consumers drive the promotion of dynamic and efficient markets. In a competitive market, firms must respond to customer demand if they wish to continue in business. Where competition is not sufficiently present, for

<sup>8</sup> This section is largely taken from the Review of Industry-Led Regulation, Discussion Document July 2005, Ministry of Consumer Affairs, New Zealand

example, the market is subject to a monopoly or duopoly, further intervention may be necessary. This could be in the form of general anti-competition legislation, such as the Commerce Act.

The pyramid shows that market interventions should build on each other to achieve the appropriate mix. Where social mores, combined with education, in a competitive market, are not sufficient to create an environment in which transactions occur with confidence, regulatory intervention in the market will be needed.

Industry-led regulation begins to appear in the middle of the pyramid. Codes of practice are a means of setting out the relationship between businesses, and between businesses and consumers in a more formal way.

"Aspirational codes" refer to those schemes which set out the standards industry will strive to achieve, but do not provide any effective methods for enforcing the code, or holding firms to those standards. While aspirational codes have a role in influencing the behaviour of firms, there are no mechanisms for compelling compliance with the scheme.

The next stage up the pyramid involves stronger intervention in the market. The distinction between aspirational codes and enforced codes is on the extent to which the regulatory scheme is binding on market participants, rather than the process by which the scheme was developed.

The difference between an enforced code and an aspirational code refers to whether there is a mechanism for hearing complaints or enforcing the scheme in such a way that decisions are binding on scheme members. This could be through an industry-run scheme or it may be through a co-regulatory scheme, where there is some government involvement in enforcement.

Where industry-led tools are not effective in a market, it will be necessary for the government to take action to promote an environment in which transactions can occur with confidence.

Mandatory requirements of general application cover those laws and standards which apply generally to all businesses. These provide a legislative safety net, but do not necessarily address the specific problems in particular markets.

The top point of the pyramid involves legislation governing a specific market. This stage is considered the most powerful tool in the regulatory pyramid for influencing the behaviour of market participants.

The appropriate mix of regulatory tools will depend on the circumstances of the specific market. In particular, whether industry or government is better placed to set regulatory standards and enforce compliance will be an important consideration in choosing the best regulatory tool.

#### **1.4. Regulatory pyramid interaction with spatial definition of standards**

Standards, as defined by Yeung and Hall (2007) fit into the regulatory pyramid at the four top levels: specific law, mandatory general laws, enforced codes and aspirational codes. Examples of standards for each section are:

- Specific law – Legislation imposed by parliament under statute, through the Office of the Surveyor General

- Mandatory general law – Crown copyright under the Copyright Act 1994.
- Enforced codes – The New Zealand Geodetic 2000
- Aspirational codes –
  - The Emergency Services and Government Administration Framework (ESA) Core Location Data Specification
  - Standards mandated, specified or recommended by ANZLIC, ISO, etc.

Most markets work using a combination of the levels of the regulatory pyramid. Each level has specific regulatory tools that address issues of monitoring and enforcement of compliance – from hard incentives like penalties or fines under legislation (ie punishment models) to soft incentives like reputational consequences or expulsion from an industry association for failure to comply under the aspirational code.

## 2. AN ANALOGY – ROAD RULES

To try to understand the area of geospatial data standards, we came up with the road rules analogy. While not an exact match, this analogy broadly illustrates the purpose of standards in relation to geospatial data.

When motor cars were first invented, road rules already existed to deal with horse and carriage traffic. These rules were mostly informal and often regional. With this new invention came increased traffic volume and vehicle speed. Also, vehicles could more easily travel longer distances taking them to other regions and driving was less specialised. Hence, there were more owner-drivers, and more vehicles being driven across regions where the rules were different. These changes meant driving became hazardous - accidents between cars were frequent. As there were limited standards (road rules) to deal with this change in practice, something needed to be done.

What happened was that a few people got together to standardise the road rules and develop additional ones. For instance, for giving way to crossing traffic and to the rights of way on one-lane bridges. Over time these rules became codified in each country, but local conventions and practices still continue to develop over time. Hence, the process of standards development is continuous – new standards are developed to address new circumstances and existing standards are maintained to stay up-to-date with current practices.

At a high level the road rules are the same in each country, for instance, keep to one side of the road - but there are regional differences. In some countries the rules require driving on the left hand-side and others the right-hand side of the road. There are also local differences where local practices deal with unique or local circumstances. This is standardisation in action. This story is like any standards story, and it is similar to the geospatial data standards story.

Taking the concept further, using the analogy of road rules to explain the geospatial data standards approach, where standards are the road rules, the three existing components are:

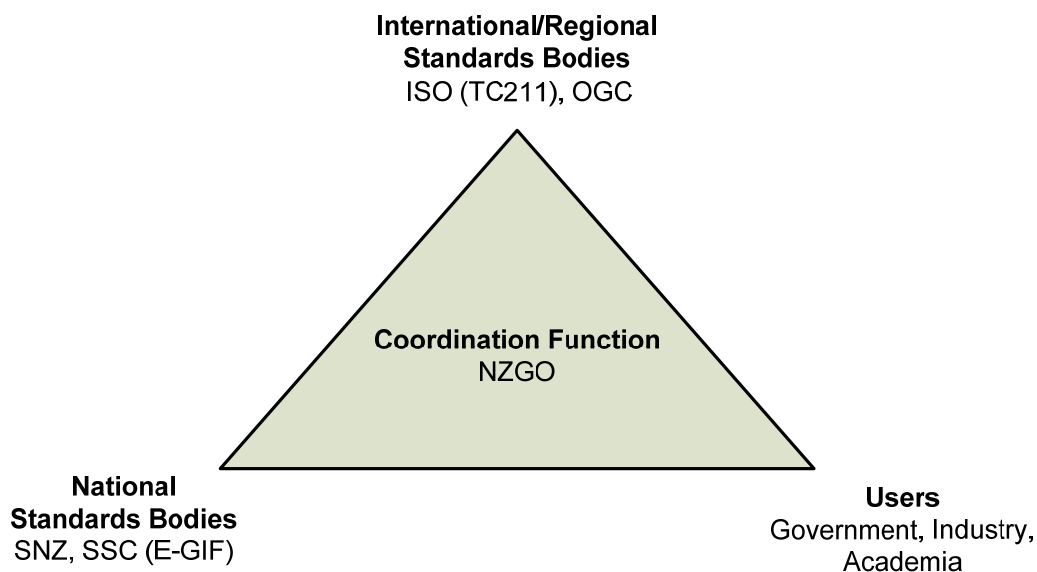
- Road rule producers – For instance, E-GIF, SNZ, ANZLIC, LINZ which are linked into ISO, OGC, W3C, IHO, etc. The producers are organisations having the operational capability to develop the road rules:
  - undertaking the processes for development, adaptation, adoption, and maintenance;
  - sourcing inputs from existing market practice and national, regional or international common practice, and (much less frequently) to deal with issues arising out of unique or local conditions; and
  - formalising existing rules in conjunction with the producers through input from voluntary experts and all other contributors through consultation and consensus.
- Car drivers – For instance, central and local government (eg LINZ, Wellington City Council), academia and research organisations (eg universities, CRIs), industry (eg private companies, associations, non-profit organisations) and regional bodies (eg ANZLIC). The drivers are those wanting road rules established either through consensus or formalised in some way to make driving:
  - faster (so they don't have to negotiate with other cars each time they drive)

- easier (so they can predict other driver actions enabling them to concentrate on where they are going rather than the process of driving)
- less costly (so they can avoid duplication of effort in dealing with other drivers)
- safer (through reducing the risk of an accident with other cars)
- meet local conditions (recognising that road quality, size, use levels, other conditions, and vehicle type may differ within a region and internationally).
- Car passengers – For instance, all data producers and users, ie government agencies, industry, and academia. The passengers are those in the cars that rely on others to use the road rules so they can get where they want to go faster, with less risk and at less cost.

Road rules is a fair analogy with some roughness around the edges. For instance, many of the organisations are not producers of standards as such (eg ANZLIC), but coordinators, facilitators, contributors, and custodians (along with everyone else). The standards producers are the higher level organisations like OGC, ISO with inputs from delegates of the coordinators, contributors feeding into the standards.

However, where the match exists is that technology has increased traffic volume and speed, more people are owner-drivers and information travels across wider regions. This necessitates more region-wide standardised rules to make using the information faster, easier, less costly, safer, and to meet local conditions.

The component missing from New Zealand's geospatial data "road rules" approach is the coordination function between the road rule producers, the drivers and the passengers, which enable development, access to, and use of efficient, effective and relevant road rules. In the geospatial data sector, the missing function is coordination between the existing organisations - standards development organisations (producers), the standards drivers, and the standards users (passengers).



### 3. SUMMARY OF PROJECT PAPERS & DISCUSSION

#### 3.1. Background & Context

##### 3.1.1. Why is geospatial information important?

Government decision-making requires careful consideration of multiple pieces of information from a variety of perspectives. Geospatial information tools can provide decision-makers with an additional perspective on their business data which enhances policy-making and better positions the government to deliver on its key priorities.<sup>9</sup>

The New Zealand industry is made up of small, highly skilled organisations based on New Zealand's early awareness and utilisation of land-based data, and there are currently few barriers to entry in the geospatial marketplace. However, despite this early lead and lack of barriers, New Zealand's advantage has been overtaken by other countries. For instance, some state that New Zealand is not as far advanced in the effective use of geospatial information as other nations like Australia and Canada.<sup>10</sup> Although in saying this, the industry here is tight and there is a lot of local cooperation within user communities. This is one of the advantages of being small.

In terms of value, a study of the Australian geospatial sector done in 2007 by ACIL Tasman estimates that geospatial information contributes A\$6.4 billion to A\$12.6 billion dollars to Australia's GDP per annum.<sup>11</sup> This was the first attempt globally to put a value on the use of geospatial information.

NZGO is currently undertaking a project on the economic value of spatial information for New Zealand. Preliminary estimates of this value have been stated as being close to \$300-400 million with a potential of a \$2 billion contribution to New Zealand GDP per annum (noting that the estimate does not include government-funded areas like health and emergency services/public/safety).<sup>12</sup>

In terms of the New Zealand Geospatial Strategy, the case for government focusing on geospatial data standards is strong, as a large amount of all government activities have a geospatial (location) element.<sup>13</sup> Also, central and local government, and Crown Research Institutes (CRIs) are major collectors of geospatial information. Yet, the information is held in various forms, access is variable and sometimes charged for (which may not remain appropriate given the open source nature of the sector).

Realistically the collectors (and primary users) of the information will have to continue to collect and maintain the information. However, there is a role for central government in maintaining a standardised view of all the information for consistent quality and access by

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<sup>9</sup> For instance, mapping and surveying as a basis of property rights is a basic service all governments provide to allow society to survive and the economy to work. See Dr Peter Abelson, February 2008, *Public Economics: principles and practices, Second Edition*

<sup>10</sup> Hon. Gary Nairn, Report for New Zealand Trade and Enterprise, "Spatially Enabling New Zealand Society", July/September 2008

<sup>11</sup> As above. An interesting question in this regard is what proportion is the contribution from the private sector and what is the contribution by government? It might be a useful guide for how much focus should be given to improving standards and coordination for private business to produce these benefits.

<sup>12</sup> As above

<sup>13</sup> A New Zealand Geospatial Strategy, January 2007, [www.nzgo.govt.nz](http://www.nzgo.govt.nz); also note that it has been estimated that between 60% and 80% of all data held by UK government departments is geospatial, where this is defined as any data that has associated with it some geographical referencing, including referencing to the national grid, postcodes, latitude/longitude or defined areas such as parliamentary constituencies – see Coopers and Lybrand, External Paper for Ordnance Survey, May 1996, "Key economic characteristics of information"

encouraging and enabling a move from the silo approach to a federated approach to standards.

There are some datasets here that could and should be maintained nationally with others given more regional/local focus (more grassroots in terms of collection and management). This is where national standards are important, so that the local databases can be assembled from the bottom and reassembled at smaller scales quite seamlessly.

Broadly stated, the benefits of increasing and using geospatial information better are pervasive. Examples include<sup>14</sup>:

- Agriculture – yield monitoring, whole farm planning, resource management, pest and disease management
- Forestry – inventory management, yield monitoring, canopy health mapping, operations management, carbon footprint/emission units measurement
- Fisheries – fishing tracks, habitat mapping, fisheries management
- Mining/resources – geological mapping, predictive exploration, planning/developing and managing operations
- Property and services – property promotion, planning, engineering, architecture, asset management, insurance
- Construction – building and road planning and design, project management, aid for architects, engineers and fabricators
- Transport and storage – logistics, route selection, itinerary planning, transport planning, vehicle tracking, traffic monitoring & mgmt, transport operations in rail and air, intelligent transport systems, road utilisation.
- Utilities – asset management, planning/constructing pipelines, powerlines, generators and storage facilities
- Communications – network planning, asset management, address management, route planning (postal)
- Government – asset management, service delivery, infrastructure planning, defence, emergency services, risk management, biosecurity, resource management, conservation, compliance and regulation
- Retail, Tourism etc.

Given the amount and quality of geospatial information already in existence, which is mostly government owned, the development cost to better access and utilise that geospatial information may be lower than most alternative investments by government.<sup>15</sup> However, this will depend on what proportion of the development costs are fixed costs and what proportion are variable. A one off fixed development cost with very low incremental costs should provide good scalability, which would provide a justification for bearing these costs. Whereas, high variable development costs may make the justification more difficult.

Predicting a high rate of return on investment is not as simple as “if we build it, they will come” or “open the door, then all can enter”. There are significant risks in this approach. For example, as the Government of Ontario discovered with its pay to join, top down warehouse-oriented geospatial data approach - which members of the Advisory Group stated failed to meet the spatial data needs of the province.

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<sup>14</sup> New Zealand Geospatial Office, Results of the exploration cafe consultation, December 2008

<sup>15</sup> As above

### 3.1.2. Role and effect of ICT on geospatial information

The discussion of governance and public access to geospatial information takes place within the context of information and communication technology (ICT). The production, use and distribution of geospatial information are automatically affected by ICT developments, which are characterised by interrelated technical, organisational and managerial innovations.

This position is affecting the structure and network of public and private geospatial information providers, and how, where and for how much their geospatial information can be produced, used and distributed. It is against this background that geospatial information infrastructures are developing.

Standards start with the data creator, and the information technology need in that regard is not great – almost anyone with a GIS and some knowledge of how to use it can create spatial data. Hence, the state of ICT at any point in time is not all that relevant. However, as new ICTs evolve, the need for new standards evolve such as mobile GIS, temporal data standards, the semantic geospatial Web, spatial RFID, sensor Web standards etc. These are evolving all the time, and as such the need for new and extensions to existing standards evolves with them.

### 3.1.3. Why look at standards?

#### Background

There are four main actions relating to setting standards: adopt, adapt, develop and maintain; and for some standards, a fifth and sixth: monitor compliance and undertake enforcement. The latter two are very difficult, if not impossible, to achieve as:

- Undertaking enforcement is ultimately up to the data creator / modifier / end user.
- Monitoring compliance is tricky where there is open data, because open data means basically open access and this is difficult to monitor in terms of use.

Across many sectors the process is that the standards set are:

- adopted without amendment from market practice or standards developed internationally; or
- adapted from market practice or standards developed internationally; or

(The latter approach is recommended with only making amendments where they are relevant to local conditions and needs)

- entirely new, being developed due to an innovation in the market or due to unique local circumstances

(This is not commonly recommended as the overheads are too high and the task of getting from nowhere to a workable standard set (and there are probably 50 or so different types of standards for geospatial data) would take forever)

All adopted, adapted and developed standards must then be maintained to remain up-to-date with advancements in technology, changes in market circumstances and product innovations, and to fix any unintended negative consequences resulting from a standard that are only identified from its use. This is a key advantage to being harmonised with existing international standards such as those created and maintained by ISO/OGC. In this context it is

important to have representation from New Zealand on ISO TC211 and to have some form of membership of OGC – in order to stay abreast of and contribute to standards development.

Additional actions that relate to some standards only, are monitoring for compliance and undertaking enforcement. These occur depending on the status of the standard and where it falls on the regulatory and commercial spectrum – whether it is:

- Mandatory (through government legislation) – Advisory Group comment: However, this does not really help as the government can realistically only successfully legislate and ensure that standards are adopted for itself. Government could require all users of government created spatial data sets agree to update any 'derived products' – effectively anything created from government supplied data – using the national standards; and if a user fails to do so they would forfeit future access to source data. However, this would be very difficult to enforce and ultimately self-defeating.
- A professional practice standard (ie that must be met to retain membership of a profession) - Advisory Group comment: This is an interesting angle that could be pursued through organisations such as the ISS or New Zealand organisations such as the NZ Institute of Surveyors, IPENZ, NZIP etc. But it is still very difficult to enforce regarding data.
- An industry best practice standard (ie agreed through an industry body as best practice) - Advisory Group comment: However, the problem here and in many other places is that there is no single industry body.
- Voluntary (ie recommended by a government agency, industry participant, or international body) - Advisory Group comment: If it is purely voluntary, few will do it, ie the standards will by and large be ignored unless users are educated as to why use of standards is important.
- Required for use of a product (eg through contract terms for the use of proprietary or patented products) – Advisory Group comment: However, this contradicts the concept of openness.

Enforcement can take different forms. For example, imposed through punishment models legislated by government (eg fines), self-regulated by industry (eg expulsion from membership of an industry body or being 'struck off' from a profession), or imposed commercially under product use contracts (eg using termination, liquidated damages and penalty clauses). However, a punitive approach is not particularly useful in an open standards market.

### **The case for standards**

Standards are considered<sup>16</sup>:

- To make an important contribution to national and international competitiveness.
- To support the innovation capability of enterprises for products and management by creating objective and internationally recognised parameters, targets and yardsticks for business activity.
- To create business and political added value as they are drawn up in coordination with corporate expertise and in consensus with all sectors of society.

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<sup>16</sup> Dr Axel Nawrocki, CEO, Hansa Luftbild AG, OGC Bd of Dr, 9 August 2005 Directions Magazine, "The Impact of International Standardization"

- Important instruments to achieve technical, political and managerial objectives. They greatly contribute to deregulation and can complement legal and economic parameters in a targeted and flexible manner.
- The precondition for economic success and innovation by standardising the basic elements of technology and management. This is because standardisation can minimise transactions costs as data does not need to be reworked for each transaction to make it compatible with the internal use, and information asymmetries can be reduced as there is less requirement to monitor the quality of the data. Both promote efficiency.
- Important for safety and protection of quality.

However, standardisation reaches its natural limits when it begins to curtail the freedom which fuels innovation.<sup>17</sup> For instance, commentators argue it seems likely that both rather old and rather new standards constrain innovation – the first because it locks the innovator into legacy systems and the second because it challenges the innovator.<sup>18</sup>

In addition, there is a non-linear relationship between the constraining role of standards and the number of standards. Models suggest that as the number of standards relevant to a sector increases, producers are less likely to find standards as an impediment, but after a point, more standards increase the constraint on innovation.<sup>19</sup> This position is relevant whether the standards are open source, proprietary, mandatory or voluntary. Although, this is only a problem if standards are seen to be inflexible and stationary, ie not subject to growth, change and evolution relative to the coordination work of an overseeing body such as ANZLIC in Australia and New Zealand or ISO / OGC world-wide in the case of geospatial data standards.

Hence, a policy approach to standards that considers the concept of “as little as possible, as much as necessary”<sup>20</sup> goes some way to balancing the strengths and weakness of standardisation in relation to productivity and innovation. This is because it considers ‘close enough’ and principles-based standards rather than being limited to exact and prescriptive standards. Exact and prescriptive standards focus on the ‘how’ rather than the ‘what’ and tend to relate to present day preferences, so act as a roadblock to meeting new or disruptive preferences. Long-run value is obtained through the diversity ‘close enough’ and principle-based standards provide.<sup>21</sup>

#### **3.1.4. Why look specifically at geospatial data standards?**

##### **What are geospatial data standards?**

Geospatial data standards provide a systematic framework for ordering, describing and transferring geospatial information. A variety and range of standards are relevant. Some are high-level abstract standards and can apply widely. Some come from international standards organisations and describe how geospatial data standards should be constructed or provide high-level dictionaries for them. Others (which conform to the higher ones) can apply to New Zealand or to a specific domain such as emergency services or earth sciences.

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<sup>17</sup> As above

<sup>18</sup> As above

<sup>19</sup> DTI (Department of Trade and Industry now BERR) UK, Economics Paper No 12, June 2005, “The Empirical Economics of Standards”

<sup>20</sup> Approach taken by the New Zealand Office of the Surveyor-General in terms of its optimal regulation goal.

<sup>21</sup> See John Cantwell, Department of Economics, University of Reading, UK, “Innovation, Profits and Growth: Schumpeter and Penrose”, 2001

These standards (among other things):

- Model geospatial information (so that for instance, features described as “road”, “two lane road” or “bridge” have specific meanings and clearly defined relationships to each other)
- Specify metadata (which describe geospatial data) so that people and machines can get accurate systematic information about what sets of geospatial data actually contain and how the data can / should be used
- Specify how geospatial information can be transferred across the internet or a local area network between different computers (so that machines can request and provide geospatial information seamlessly).

### **The influence of Spatial Data Infrastructures (SDI's)**

In addition to the case for standards listed earlier in this paper, geospatial data standards - particularly open geospatial standards - are a key component of a spatial data infrastructure (SDI) as they contribute to geospatial information being created, discovered, accessed, shared, combined, re-used and maintained. Without standards the concept of a SDI is weakened but not defeated, as a good SDI should be able to cope with heterogeneous data documentation and types.

As yet there is no generally agreed upon definition of SDI due to its multiplicity, complexity and dynamic nature.<sup>22</sup> However, the concept and implementation of SDIs are a lot clearer now than they were even half a decade ago. There is quite a lot written about SDIs, and a lot known about its implementation. By way of background and at a high level:

- The SDI concept is the vehicle used to explain the relationship between technical developments in ICT and the fundamental datasets, organisations providing data, and constraints and limitations of geospatial information use and distribution.
- Internationally, developing a SDI has been a common approach to addressing market failure conditions, national interest arguments and public value opportunities.
- The word infrastructure is used to promote the concept of a reliable, supporting environment, analogous to a road or telecommunications network.
- The term SDI is often used as shorthand for the relevant base collection of technologies, policies, **standards**, criteria and people that facilitate the availability of, and access to, useable geospatial data.
- The SDI concept seeks to support the sharing and optimal use of geospatial information in a national, regional or local context by means of a set of standards of national, regional or local scope (geographical names, administrative boundaries, etc.), certain thematic datasets (soils, hydrology, vegetation, population, etc.) and metadata standards, to describe in a consistent manner each of the SDI holdings.
- A SDI is used to provide a basis for geospatial information discovery, evaluation, download and application for users and providers within all levels of government, the commercial sector, the non-profit sector, academia and the general public.

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<sup>22</sup> Asmat Ali, Directions Magazine, 24 May 2008, “NSDI Implementation Strategies”

Where a SDI is developed, investigation of issues around standards is important, but it is only a part of the picture, so cannot be fully isolated as a subject of discussion. While geospatial data standards are important, as being a part of the picture, they must also be viewed within a wider context of geospatial information objectives and frameworks, and other components of a SDI.

### 3.1.5. Who is involved with a SDI and geospatial data standards?

The community of interest within a SDI, and impacted by or involved in geospatial data standards, can be categorised as follows.

**At an international level** - Governments, corporations and industry bodies collectively providing guidance to globally enable interoperability and access to information to promote individual and community economic, social and environmental progress.

**At national and macro-level** - National government politicians/politics providing policy direction on information acquisition and distribution, including the regulations and (economic and financial) conditions for acquisition and distribution, such as privatisation of government bodies, general pricing and cost-recovery strategies.

**At institutional level** - National surveys or organisations providing framework data, including national mapping agencies, national cadastres and (public) registers agencies, and national surveys on geology, soils, hydrography, etc.

**At product mediation level** - Geospatial information service centres, defined here as a facility or organisation that is the intermediary (“broker”) between the information suppliers and the information users for specific applications. Such a service facilitates the integrity of access to the required information through ensuring the efficacy of technical services as well as the administrative, data security and financial services necessary to mediate between information suppliers and information users. Although, information suppliers should exist at any level – and some would argue that they are best situated at the grassroots level where they can feed information across to other users at the same level and upwards to other levels as well as receive certain datasets from higher levels with more general mandates.

**At public level** Users of the geospatial information, where a distinction can be made between the intermediate (value-adding) users or organisations and the end users (beneficiaries) of the information. Although, end users are not just beneficiaries – they are also data creators.

Please note that while the list is a hierarchy, it is non-linear. This means the interactions between each of these communities can occur directly and indirectly. For instance, a user may deal with a survey organisation directly rather than go through a product intermediary, or both.

## 3.2. Government objectives

The government objectives for geospatial information fall within the wider New Zealand Geospatial Strategy. The strategy and its relationship with geospatial data standards are as follows.

### 3.2.1. New Zealand Geospatial Strategy

The New Zealand Geospatial Strategy was developed to coordinate and manage [better] the use of New Zealand's geospatial resources across all tiers of society. It provides the context and guidance for the future development of geospatial information in New Zealand.

#### Vision

The vision of the New Zealand Geospatial Strategy is:

"Trusted geospatial information that is available, accessible, able to be shared and used to support the safety and security of New Zealand, the growth of an inclusive, innovative economy and the preservation and enhancement of our society, culture and environment."

The Advisory Group agreed this vision is appropriate.

#### Goals - what is the Strategy trying to achieve?

The four goals of the Strategy are:

**Governance** - To establish the governance structure required to optimise the benefits from government's geospatial resources.

**Data** - To ensure the capture, preservation and maintenance of fundamental (ie priority) geospatial datasets, and set guidelines for non-fundamental geospatial data.

**Access** - To ensure that government geospatial information and services can be readily discovered, appraised and accessed.

**Interoperability** - To ensure that geospatial datasets, services and systems owned by different government agencies and local government can be combined and re-used for multiple purposes.

The Advisory Group noted two issues with the goals:

- The term 'standards' does not figure in these goals. Instead, 'guidelines' is used. It is unclear whether this is deliberate.
- Goal 2 is potentially problematic as it does not refer to a custodian or a source of anything. Goal 1 clearly states 'government's geospatial resources', but goal 2 is general. If the onus is not on government then who is it on – users/collectors of spatial data? If it is on government, then government should lead by example by adhering to the use of standards in the construction of geospatial data assets. Government again figures in goal 3.

### 3.2.2. How do geospatial data standards relate to the vision and goals?

Geospatial data standards are a central element in achieving the vision and goals of the New Zealand Geospatial Strategy. Ideally they should be made explicit in the statement of the vision and goal somewhere – otherwise they are buried. However, some statements in relation to standards are noted. These are:

A key principle that has been identified to guide decision-making for achieving the vision is that geospatial information is collected once to agreed standards to enable use by many. However, one Advisory Group member noted that "collected once" is not quite

right because data are collected repetitively (well most data, some not so often) and even after data creation there is enhancement, modification etc going on all the time.

- The data goals depend on standards to ensure the capture, preservation and maintenance of fundamental (priority) geospatial datasets, and set guidelines for non-fundamental geospatial data.
- The access goal depends on standards to ensure government geospatial information and services can be readily discovered, appraised and accessed. Actions under that goal are:
  - Develop and maintain metadata in accordance with an agreed geospatial metadata standard, and align with international standards.
  - Make fundamental geospatial datasets discoverable and accessible according to agreed policies and standards. (A number of Advisory Group members noted this could be done through an open SDI portal).
  - Encourage public agencies to make their non-fundamental datasets discoverable and accessible according to best practice policies and standards. (A member of the Advisory Group commented that this statement is good as it is the grassroots multi-level data creation and exchange concept. The member stated that it will actually encourage spatial data generation and use rather than hold it back).

The submissions on the strategy made by Local Government New Zealand and the E-Local Government Strategy Project Team stated

“This is a priority intervention. It will promote greater use of geospatial information by agencies and the community, and this will help build greater awareness of (and support for) improved data management including the application of common standards.”

### **3.3. Problem identification**

#### **3.3.1. Overview**

It is widely recognised internationally that to maximise the economic, social and environmental benefits of investment in geospatial information, a country must move from raw data to value-added products. It has been identified that the barriers to this occurring include<sup>23</sup>:

- Immature institutional arrangements and user/provider relationships
- Inconsistencies in the availability and quality of geospatially referenced data
- Inconsistent policies concerning access to and use of geospatially referenced data
- Incomplete knowledge about the availability and quality of existing geospatially referenced data
- Lack of best practice in the utilisation of enabling technologies.

In New Zealand, one hypothesis about high-level problem identification in relation to geospatial information is that some of these barriers may, in part, be due to insufficient

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<sup>23</sup> See [www.anzlic.org.au/infrastructure](http://www.anzlic.org.au/infrastructure)

coordination, harmonisation, and synchronisation in geospatial data standards. Standards are one input that can assist with access and interoperability. Hence, insufficient coordination, harmonisation, and synchronisation in geospatial data standards may be restricting the efficient and effective access to, and use of, geospatial information.<sup>24</sup>

A number of the Advisory Group members felt that until the formation of NZGO there was no organisation that was in a position to do any of this. Formation of NZGO is seen as fundamental to making any progress of any sort with this venture in New Zealand. Having formed NZGO, they consider it is important that Government give it clear a mandate to take action; to proceed.

Four market failures<sup>25</sup> have been identified in relation to geospatial data standards: public goods, externalities, and information asymmetries.<sup>26</sup> Broadly stated, geospatial information has special economic characteristics which means that governments are often involved with its collection and provision. Many geospatial data standards are a form of public good and are associated with external benefits. Since public goods and externalities are associated with market failure, there will likely be a role for government in the geospatial data standards area.<sup>27</sup>

National interest arguments and public value opportunities, not purely concerned with economics, provide an additional value stimulus for government involvement in geospatial data standards.<sup>28</sup> The main stumbling block with geospatial data standards is their enforcement/routine use, ie getting people to use the standards in their data collection and documentation.

### 3.3.2. Market failure

Markets really only make good sense when there are goods to be exchanged (bought and sold or traded). In the case of the geospatial "marketplace" the good is information, or in its unrefined state – data. Raw data are difficult to sell unrefined – there has to be some value added (such as good documentation) to make the data attractive to a client or user. This value is in the form of quality and content in the case of spatial data. Once these ingredients are there the 'market' will function – people will create, obtain, enhance, use, pass on, and reuse data.

There is also a market for geospatial data standards – this is the reason they are able to be sold by standards bodies. For instance, SNZ and ISO apply charges for the use of a standard,

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<sup>24</sup> See New Zealand Geospatial Strategy and information on E-GIF – [www.ssc.govt.nz](http://www.ssc.govt.nz), [www.e.govt.nz](http://www.e.govt.nz)

<sup>25</sup> Commonly, there are six conditions under which markets are not Pareto efficient. These conditions are called market failures, and they provide a rationale for government activity. The most common market failures are, failure of the market structure to deliver efficiency (monopolies, oligopolies), public goods (goods that will not be supplied by the market because there are no commercial incentives to do so, or if they are, an insufficient quantity are supplied, because they are non-rival and non-exclusive), externalities (where the actions of one individual impose a cost or benefit on another individual which is not borne or received by the first individual), information failures (due to information asymmetries and bounded rationality). The two less common market failures are incomplete markets (where despite the cost of provision being lower than the amount individuals are willing to pay, the goods are not provided by the market) and unemployment and inflation disequilibrium. See Joseph E. Stiglitz, *Economics of the Public Sector, Third Edition*, 2000

<sup>26</sup> Also see Coopers and Lybrand, External Paper for Ordnance Survey, May 1996, "Key economic characteristics of information"

<sup>27</sup> Coopers and Lybrand, External Paper for Ordnance Survey, May 1996, "Key economic characteristics of information"; and Joseph Stiglitz, 2000, *Economics of the Public Sector Third Edition*; and Dr Peter Abelson, February 2008, *Public Economics: principles and practices, Second Edition*

<sup>28</sup> See Mark Moore, *Creating Public Value, Strategic Management in Government*, Harvard University Press, 1995; and Coopers and Lybrand, External Paper for Ordnance Survey, May 1996, "Key economic characteristics of information"

eg on the SNZ website shop the ISO 19110:2005 Geographic information – Methodology for feature cataloguing standard costs: retail \$281.75 NZD (ex GST) or members \$225.40 NZD (ex GST).

Copyright applies to standards, which enables the owner to restrict access to them. Copyright is the exclusive legal right given to the originator or their assignee for a fixed number of years, to print, publish, perform, use, etc, and to authorise others to do the same. That authorisation can have a fee for use attached to it – hence the existence of a market.

While there is much talk about open source standards and free access, largely the standards market does not operate that way. Standards development and maintenance has to be paid for – even if only to cover operational expenses where the technical experts provide their services voluntarily, free of charge. This funding is raised in a number of ways, for instance, through sponsorship, membership fees, and fees for use per standard.

### **3.3.3. Is there market failure in the geospatial data standards market?**

There are three likely market failure conditions relating to geospatial data standards<sup>29</sup>: public goods, externalities, and information asymmetries. These are discussed as follows.

Note, the Advisory Group considered that competition is not a particularly useful concept in this environment. Rather, one of sustainable mutual support mediated by a guiding agency is the way to achieve and manage a geospatial ‘marketplace’ where data become the currency.

#### **Public goods**

The defining characteristic of a public good is that consumption of it by one individual does not actually or potentially reduce the amount available to be consumed by another individual. It is likely that the commercial incentives for a firm to provide such a service or product are absent.

Public goods are often associated with market failure in a competitive economy because they do not always deliver efficiency and welfare-maximisation. These types of market failure typically lead to under-provision of a public good creating an incomplete market<sup>30</sup> and outcomes which are not welfare-maximising. This provides the justification for some form of government involvement in the market, either in terms of economic regulation, ownership of geospatial information providers, or assistance with market mechanisms.<sup>31</sup>

In a free market it is difficult to extract revenue from geospatial data standards users. Key reasons are highly dispersed user benefits and high costs of collecting revenue compared with the income generated. Geospatial data standards are usually a near public good in that<sup>32</sup>:

- The marginal cost of supply to an additional person is low, falling close to zero with new technology (although this may actually be pricing problem<sup>33</sup>)
- Use does not deplete the availability to other users

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<sup>29</sup> This section references - Coopers and Lybrand, External Paper for Ordnance Survey, May 1996, “Key economic characteristics of information”; and Joseph Stiglitz, 2000, *Economics of the Public Sector Third Edition*; and Dr Peter Abelson, February 2008, *Public Economics: principles and practices, Second Edition*

<sup>30</sup> See Joseph Stiglitz, 2000, *Economics of the Public Sector Third Edition*

<sup>31</sup> As above

<sup>32</sup> Coopers and Lybrand, External Paper for Ordnance Survey, May 1996, “Key economic characteristics of information”

<sup>33</sup> In a commercial setting willingness to pay becomes important where each person could be charged a different price to access as the same data because each person will have a different willingness to pay (sometimes called Ramsey pricing)

- There are potential issues relating to free-riding and to the extraction of revenues.

## Externalities

Externalities arise where production or consumption of a product by one individual imposes costs on and/or delivers benefits to other individuals, in which case, prices do not reflect the full costs or benefits in production or consumption of a product.

An important feature of markets where externalities are present is that output levels resulting from free market provision will not be optimal. In markets with external benefits, there is often under-provision and under/over pricing because a private provider will take no account of the wider social benefits or costs when setting prices, since the private provider does not obtain any financial benefit or incur any financial loss from the wider social benefits and costs.

The provision of geospatial data standards is not a pure public good, but there are important external benefits associated with:

- Ensuring consistency (producer externalities)
- Providing multiple users access (network externalities)
- Promoting efficiency of decision-making (consumer externalities)

Lack of geospatial data standards can cause inconsistency between different datasets or between data for different geographical areas, particularly through the use of proprietary instead of open standards, which can raise transaction costs and restrict innovation by increasing the cost of using data and limiting the range of applications (ie create uncertainty and inefficiency).<sup>34</sup>

For example, co-ordination between the emergency services can be important when major accidents occur and costs can be saved on infrastructure projects when all users share the same underlying dataset. Collecting data on a consistent basis can help to raise the value of the individual datasets.<sup>35</sup>

Also, there can be many hidden costs associated with using geospatial information that does not conform to agreed standards. These costs are incurred as a result of necessary tasks, such as extensive manual correction, data translation and transformation, sending data offshore and going through a long-winded, costly process to send data back and fourth between third-party contractors. Examples include – data integration or data migration projects – pulling together data from multiple sources or upgrading a base reference mapping.<sup>36</sup>

Creating efficiencies in data use through published standards and quality assurance prior to the decision-making stage is beneficial, as decisions can be made with the confidence that data are of a sufficient standard upon which to make a decision.

Despite the benefits, the process of agreeing and publishing standards, and defining standards for data specification, can be outweighed by its time consuming and costly nature, especially given the development of historic information on different bases. This is the stumbling block, ie no-one wants to take the time to document data unless there is an understood benefit from

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<sup>34</sup> See Dr.ir.HenkJ de Vries, RSM Erasmus University, the Netherlands, 2006, "International Standardisation as a Strategic Tool: Standards for business – How companies benefit from participation in international standards"

<sup>35</sup> As above

<sup>36</sup> As above

taking the time to do this. However, there may still be some incentives for the market to produce and follow geospatial data standards.<sup>37</sup>

Overall, common standards are needed, but will not alone produce consistent datasets. If common standards are agreed but not followed, there is a danger of fragmentation. Whether any geospatial information problems can be addressed satisfactorily through standards will depend on the<sup>38</sup>:

- Complexity of the issues involved with agreeing geospatial data standards.
- Costs associated with complying with geospatial data standards including the conversion of legacy datasets.
- Distribution of costs and benefits between producers, and between producers and consumers.

### **Information Asymmetries**

Information asymmetry occurs in transactions where the interests of the parties to the transaction are not aligned and one party has more or better information than the other, causing less than optimal decisions. The asymmetries create an imbalance of power in transactions which can cause the transactions to go awry. Examples of this problem are:

**Adverse selection** - Where a party does not chose the optimal product or customer.

**Moral hazard** - Where a party does not bear the full consequences of their actions.

**Principal-agent problem** - If the interests of the agent and principal are not aligned where the agent has more information about its actions or intentions than the principal (since the principal cannot perfectly monitor the agent), the agent has an incentive to act inappropriately.

#### ***Adverse selection***

Adverse selection refers to a market process in which less than optimal results occur when buyers and sellers have asymmetric information (ie access to different information). In that process the inferior products or customers are more likely to be selected.

This can apply to geospatial data standards where, for instance, a buyer cannot determine or compare the usability of geospatial information if there are no agreed standards applied to that information. The buyer then has to use inferior criteria to decide on their use/purchase, which may lead to them using/purchasing geospatial information that is less than optimal for their purposes. Alternatively, a seller of geospatial information may be unable to accurately predict the types of users of the geospatial information where there are no standards applying to its use, exchange, or transfer, which may lead to the seller supplying a range of customers that are less than optimal for them, for instance, in achieving return on investment.

Addressing market failure can provide opportunities as well as solve problems. For instance, for information asymmetries, an example in action relates to the new generation of location-based applications and services that are predicted to change radically the way people work

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<sup>37</sup> Joe Francica, Directions Magazine, 5 January 2009, "Geospatial Perspectives on the Global Economic Meltdown: Industry Executives Offer Advice"

<sup>38</sup> Coopers and Lybrand, External Paper for Ordnance Survey, May 1996, "Key economic characteristics of information"

with mobile devices including cellphones, smartphones and mobile broadband-powered laptop computers.<sup>39</sup>

Mobile messaging models are still basically one-dimensional. Users receive messages at a time and place not always of their own choosing, without context, or in a place where they cannot efficiently act on them. 'Location-smart messaging' is the term used to describe a new generation of mobile applications that are tipped to expand the real time, relevant connections and communications between people and organisations.<sup>40</sup> As a result of this there is the need to develop new (or extend existing) standards for the management of this information – as it is likely to become more compelling and basically more everything – more voluminous, more diverse, more current etc.

Just as Web 2.0 transformed the Internet from static to active, essentially breathing life into lifeless pages, smart-based messaging aims to transform mobile messaging from one-to-four-dimensional. A standards-based online service provider model migrates traditional barriers associated with accessing and manipulating data, providing real time access to mapping and environmental content, enabling producers and users to focus on value-added applications and processes.<sup>41</sup>

The main difference between location-smart messaging and traditional location-based service solutions is that the traditional solutions cannot make sense of the information they deliver in terms of what it means to the user or recipient of the information. If personalisation is combined with location-smarts and then integrated with pattern recognition, mobile technology becomes more intelligent and resourceful. It would be possible for an individual user to anticipate future events and make better choices with more positive outcomes, and hence overcome some of the information asymmetries that relate to traditional location-based services.<sup>42</sup>

Examples of location-smart applications are - helping users find the least congested commute; warning users about a snow storm; prompting users to update a report after a customer visit; to enable efficient car pooling or delivery routes for business products; or encouraging people to leave on time for a flight. These types of applications, which enable improved efficiency in the economy, rely heavily on quality geospatial information which is easily discoverable, accessible, interoperable and useable.<sup>43</sup>

### ***Moral Hazard***

Moral hazard is the prospect that a party insulated from risk may behave differently from the way it would behave if it were fully exposed to the risk. Moral hazard arises because an individual or organisation does not bear the full consequences of its actions, and has a tendency to act less carefully than it otherwise would, leaving another party to bear some responsibility for the consequences of those actions.<sup>44</sup>

For example, an individual not responsible for ensuring other applications can access or use the geospatial information may, once the information is used for its main purpose of collection,

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<sup>39</sup> As above

<sup>40</sup> As above

<sup>41</sup> As above

<sup>42</sup> As above

<sup>43</sup> As above

<sup>44</sup> Coopers and Lybrand, External Paper for Ordnance Survey, May 1996, "Key economic characteristics of information"; and Joseph Stiglitz, 2000, *Economics of the Public Sector Third Edition*; and Dr Peter Abelson, February 2008, *Public Economics: principles and practices, Second Edition*

be less vigilant about adhering to common standards that allow interoperability. This is because the negative consequences of less interoperable information are (partially) borne by the other users. Moral hazard is sometimes used to refer to moral hazard which occurs without conscious action.

Moral hazard is related to information asymmetry, a situation in which one party to a transaction has more information than another. The party that is insulated from risk generally has more information about its actions and intentions than the party paying for the negative consequences of the risk. More broadly, moral hazard occurs when the party with more information about its actions or intentions has a tendency or incentive to behave inappropriately from the perspective of the party with less information.

In the case of geospatial data standards, the geospatial information supplier (who has more information about its own actions and intentions) has lower incentives to comply with standards in collecting and maintaining the information where they do not pay for the negative consequences of not applying the standards. For instance, if the negative consequence of failing to comply with agreed standards relating to identifying objects like roads or bridges in maps is borne by emergency services rather than the producers of maps, the producers have lower incentives to comply with the standard.

### ***Principal-agent problem***

Principal-agent is a special case of moral hazard, where one party, called an agent, acts on behalf of another party, called the principal. The agent usually has more information about its actions or intentions than the principal does, because the principal cannot perfectly monitor the agent. In that case, the agent may have an incentive to act inappropriately (from the viewpoint of the principal) if the interests of the agent and the principal are not aligned.

An example of the principal-agent problem for geospatial data standards is where compliance with a new geospatial data standard is costly or difficult, and where the user does not become readily aware of new standards. The agent may be tempted to delay changing to the new geospatial data standard, which is undetected by the user. The producer delay may cause user delay in creating innovations or product improvements that are important to maintaining the user's market position, return on investment, or in fact, solvency. The actions of the agent mean that the market is not operating efficiently and effectively.

A number of the Advisory Group members commented that this is a major problem, ie the lack of awareness and the level of investment of time in reinventing or trying to understand the work of others.

### **3.3.4. Are there other reasons for intervention?**

#### **National interest arguments**

Additional arguments, more concerned with returns to society, are also made for collection and provision of geospatial information by government. They include<sup>45</sup>:

- Protection of life and limb
- Promotion of democracy
- Protection of the rights of individuals

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<sup>45</sup> Coopers and Lybrand, External Paper for Ordnance Survey, May 1996, "Key economic characteristics of information"

- Support for minority groups in a population
- Equity
- The need to maintain confidentiality of data collected
- A basic need to meet government functions
- A basic ingredient for timely and more accurate decision making

Clearly, geospatial data standards are part of the need to meet government functions.<sup>46</sup> However, all of the national interest arguments are in some way or another important to determining the overall policy stance to geospatial data providers (in particular, the approach taken to cost recovery)<sup>47</sup>, and so consequently, geospatial data standards.

The successful exploitation of geospatial information, where multiple products are spun off from a core database with components up-dated at different moments in time from multiple input sources each with different characteristics, may indicate the need for government involvement in geospatial data standards.<sup>48</sup> However, this does not only have to be the mandate or responsibility of government. It can equally apply to all involved in the process of geospatial data creation and exchange.

Involvement in setting, maintenance and promulgation of geospatial data standards, as well as its existing control or ownership of geospatial information, can be done in concert by the participants – government, industry and academia. There is a need to look beyond just government to consider all levels and dimensions of data creation and use. However, strong government involvement is still necessary where legal liability issues arise from use of databases, particularly since the databases will often relate to legacy data, ie data that have been inherited from previous operations.<sup>49</sup>

Many of the geospatial datasets in New Zealand are collected and maintained by government for government purposes (which may involve only one or a limited number of government users, eg data on electoral boundaries). This means that the datasets may not be well targeted to, and there are limited incentives to comply with standards that will enable private innovation where that has not been the focus for the geospatial dataset. Not all data sets are necessarily relevant to users other than government, but most should be.

However, the value of innovations to date derived from the dataset are not directly captured by the government supplier, and hence not recorded and considered in base-line reporting. This means that the indirect value to the wider economy created by government activities does not show up in government department performance measurements and outcomes reporting. There are limited incentives for government departments to consider improving that indirect value.

It is thought to be in the interests of business to invest in contemporary geospatial tools in tough economic times because the speed of spatial analytics (eg for building, delivering and

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<sup>46</sup> Mapping and surveying as a basis of property rights is a basic service all governments provide to allow society to survive and the economy to work. See Dr Peter Abelson, February 2008, *Public Economics: principles and practices, Second Edition*

<sup>47</sup> McKenzie Podmore Ltd for land Information New Zealand, 24 October 2003, "LINZ titles and Survey Products: Are they public goods and is there a rationale for government to subsidize the products"; and Coopers and Lybrand, External Paper for Ordnance Survey, May 1996, "Pricing by public bodies and economic regulation"

<sup>48</sup> Coopers and Lybrand, External Paper for Ordnance Survey, May 1996, "Key economic characteristics of information"

<sup>49</sup> As above

calibrating site location models) matters when isolating opportunities and mitigating risks.<sup>50</sup> Some state that the contemporary tools are hundreds, if not thousands of times faster than traditional map-based services and some state they are able to do the work of five people.<sup>51</sup> This suggests that investing in contemporary geospatial tools is a simple decision. However, that investment may be curtailed by the reduced incentives for compliance with standards that create value not captured by the producer entity.

Failure to seek or comply with standards may over time contribute to lower levels of discoverability, accessibility, interoperability and usability, which may further contribute to less than optimal productivity and lower levels of innovation. This is one of the most pervasive reasons why standards should be identified and used.

### **Public value opportunities<sup>52</sup>**

One thing the private sector tends to not readily pursue is public value.<sup>53</sup> Public value is the value to society created by the consumption of a product that is beyond the value captured by a provider or a consumer. It is a value-based rationale for government intervention rather than a profit-based rationale. Public value is created through a transformational approach to government's role, which allows government to pre-empt or predict future preferences.

The government targets its involvement in areas to assist new preferences come about. This action is intended to promote both profit-seeking behaviour by the private sector and value-seeking behaviour by the public sector (see the Organisation Progress Model later in this paper). The intervention is intended to get a country "ahead of the curve".

In the private sector, businesses create two different types of value for two different types of customer. Upstream, business delivers returns on shareholder investment. Downstream, business sells products that are useful, aesthetically pleasing, or status enhancing to the consumer.

Similarly, there are two different types of value for two different types of customer in the public sector. Upstream, there are those who comprise the authorising environment – eg those who pay or advocate for government involvement. Downstream, there are customers who receive products or benefit from public sector operations. The downstream customers are part of the public sector organisation's 'task' environment, ie the activities the organisation undertakes.

However, even where there is a clear role for government this does not mean that direct provision by government is the only, or even primary, route through which public value will be created. Public value does not preclude the role of private enterprise and competition in achieving social outcomes. Instead, it provides a framework in which selected market forces can help to improve public sector performance.

A public value perspective presents a justification for government activity by recognising:

- Firstly, that citizens want government to take action to bring about or to prevent certain courses of action (ie a value-based rationale for intervention).

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<sup>50</sup> Joe Francica, Directions Magazine, 5 January 2009, "Geospatial Perspectives on the Global Economic Meltdown: Industry Executives Offer Advice"

<sup>51</sup> As above

<sup>52</sup> Sarah Mehrtens, Consultant for Land Information New Zealand, August 2007, "Public Value Proposition Project: Phase One"

<sup>53</sup> See the Public Value Framework discussion by Mark Moore, *Creating Public Value, Strategic Management in Government*, Harvard University Press, 1995

- Secondly, a public sector organisation is primed to spot linkages in information in which it deals and to navigate the way in generating new preferences<sup>54</sup> rather than merely fulfilling existing ones. This being achieved by making use of the expertise gained in providing the public value not captured by the private sector (since the private sector will only produce expertise to the level where it can receive private value).
- Thirdly, a public sector organisation can provide competence-based assistance to the private sector through filling knowledge gaps that increase the speed of innovation and product-to-market time in particular areas. The competence-based theory of vertical integration and competition<sup>55</sup> widens the boundaries of the firm to capture any under-utilised government expertise resource for the benefit of individuals and the community.<sup>56</sup> It works to broaden the market place for New Zealand nationally and internationally, with government and the private sector acting in concert to enhance private goals and achieve government objectives.

In terms of geospatial data standards, the value-based rationale provides a reason for government involvement, particularly, given government's existing level of involvement in geospatial information collection and maintenance. This is because standards can help government meet public value opportunities by filling knowledge gaps, providing competence-based assistance, and meeting citizen preferences for action in the area of geospatial data standards (as identified by the New Zealand Geospatial Strategy).

### 3.4. Current position

#### 3.4.1. Overview

There are various organisations involved in geospatial standards in New Zealand and internationally. Also, the New Zealand government, through various departments and agencies, provides input through membership or interested party (observation) status with standards bodies regionally and internationally. The relationships between the organisations are extensive and often complex.

New Zealand, and the jurisdictions looked at, all have similar mechanisms involving the establishment of an expert committee/group, public consultation, review, agreement and publication for the development of formal and informal standards. Some of these mechanisms are specifically set up for geospatial data standards and others deal with standards generically (so can include the development of geospatial data standards).

High level work has started on the options for government's focus on federated information through central government initiatives (eg e-Government, e-GIF) and these can be linked into the further work being done under this project and others by NZGO.

Other sectors in New Zealand have addressed standardisation issues in their market by setting up a sector specific body (or committee) that coordinates the development of sector specific standards. Some of those bodies are run by government; some are run by the industry in that sector (through member associations). The bodies are largely supported solely by or through a combination of funding from central government, direct sponsorship from particular agencies

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<sup>54</sup> Adam Morgan, *Eating the big fish: How challenger brands can compete against brand leaders*, 1999.

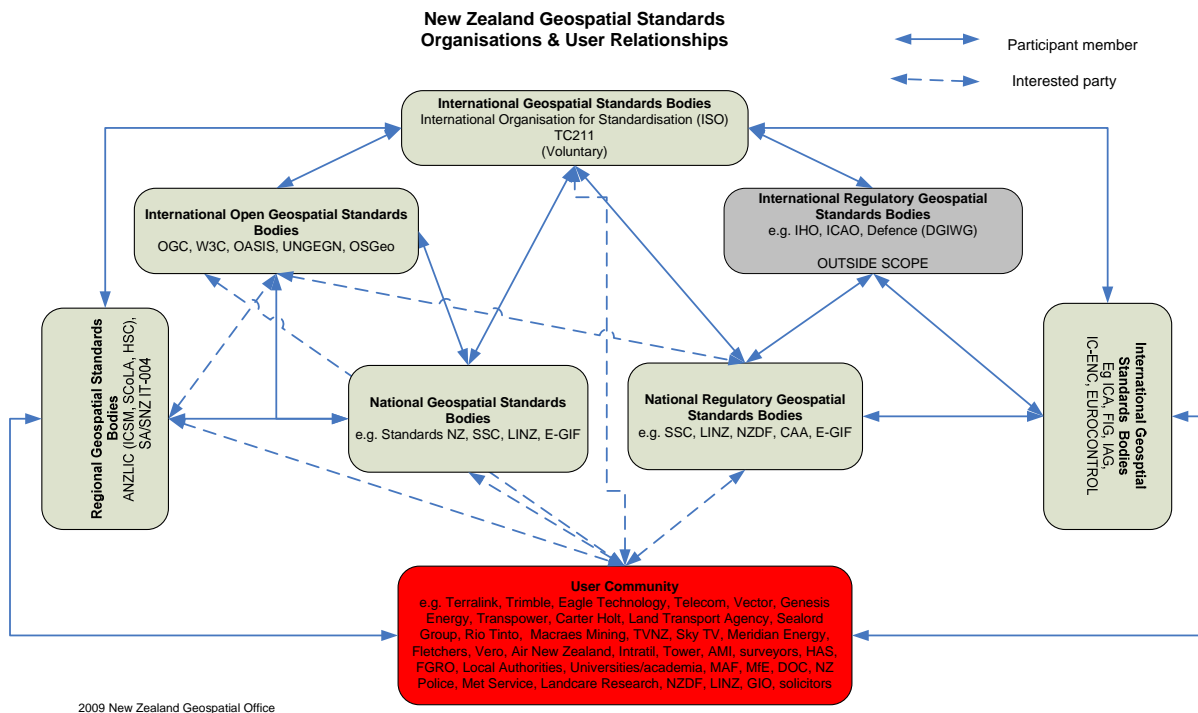
<sup>55</sup> Eric Pfaffmann, "How does a product influence the boundaries of the firm? A competence-based theory of vertical integration and co-operation", Hohenheim University, Center for International Management and Innovation, Stuttgart, 1998

<sup>56</sup> See Virgile Chassagnon, University of Lyon, France, "The nature and boundaries of the firm as an 'organisational entity': power as a complementary unit of analysis to contract and property", April 2006

and private sector organisations, and direct sponsorship per standard. Much of the work is done, however, by volunteers from the industry.

### 3.4.2. New Zealand

Detail of the New Zealand organisations and processes for geospatial data standards, and the domain searches of types of approaches taken in other New Zealand industries, is available on request – it is contained in paper 2 prepared for the Advisory Group meeting 2. Also, see the New Zealand Geospatial Standards Organisations and User Relationships diagram below.



### 3.4.3. International - case studies Australia, United Kingdom, USA

The jurisdictions were chosen because they have similar legal systems to New Zealand (Australia, United Kingdom); or have a close regional relationship with New Zealand (Australia); or present a strong influence internationally (United States of America). While Canada has been suggested for reference, given the time and resources available it was not fully researched and reported in the paper for the Advisory Group – although its organisations and processes were discussed.

Detail of the Australian, United Kingdom and United States of America organisations and processes for in geospatial data standards, is available on request – it is contained in paper 2 prepared for the Advisory Group meeting 2.

Also, see Annex one, two and three setting out diagrams of arrangements in those jurisdictions.

### **3.5. Intervention tools and options**

#### **3.5.1. Showing the way and partnership**

Supporting known geospatial information requirements is only one way to contribute to productivity and economic growth. Another important way is to focus on broadening and diversifying the geospatial sector by building on the ability of certain departments within government to act as a 'navigator' in some areas.<sup>57</sup> Firstly, there is an opportunity for long-term gains for New Zealand in terms of transformative industries like the geospatial sector where government can show the way. Secondly, a key option is to broaden and diversify the geospatial information community to include those not currently or traditionally involved by enhancing the range of available experiences and the kinds of people who might be inspired to take part.

Identifying which government agency is best placed to act as a catalyst is the first step. Once done, prioritisation of tasks becomes important. To split solutions for decision-makers into priority areas, a programme relies heavily on its partners. These partners are private companies, academia (universities) and other government agencies, etc.

Devoting time and energy to establishing and nurturing partnerships is important because they anchor the success of the coordination role for government's involvement in geospatial data standards and other parts of a spatial data infrastructure. This is especially the case where online resources are used to support the function of standards development and to bring the geospatial community together to agree on policies and standards that simplify data licensing, access, use, exchange, transfer and sharing.

By filling the role of coordinator, the government would be assisting itself and the geospatial community in New Zealand to pull in the same direction to do more in less time at less cost. There is no need to set up a complex infrastructure outside of that already in existence in New Zealand. What is needed though is a thorough understanding of the information needs and challenges of decision-makers in the three areas – broadly categorised as industry, government and academia.

#### **3.5.2. Promoting national use**

Strongly advocating the use of national standards by encouraging technology developers, solutions developers, and data suppliers to adhere to national geospatial data standards endorsed centrally can greatly enhance the value of a spatial data infrastructure for New Zealand. This is because standardised data or applications accessible via the infrastructure from one provider can then easily be layered or used with those from another. This interoperability works to produce richer and more useful information than a single dataset can provide.

A winning approach taken internationally under this type of coordination function is for the standards that the coordination function assists in advocating are commonly international geospatial data standards. This characteristic means that the applications developers and data suppliers can easily export their technologies, data, and expertise to other countries adhering to the same international standards.

Also, government's significant investment in geospatial datasets can be utilised by the private sector to grow the economy through exports and value-added products, and by government to improve internal process efficiency reducing government spending over time.

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<sup>57</sup> Adam Morgan, *Eating the big fish: How challenger brands can compete against brand leaders*, 1999

### **3.5.3. Engagement with industry and academia, size of industry and the presence of industry associations**

#### **Market structure**

One obvious gap in the New Zealand geospatial information set-up is the low levels of connection with industry and academia, particularly, in the area geospatial data standards. These are two parts of the sector that are heavily relied on in geospatial data standards development in other countries. These links tend to be there currently, but they are informal. However, a number of the Advisory Group members stated that New Zealand is not particularly different to many other countries in this regard.

While the coordination function assists in having standards negotiated and developed by government agencies at the central and local government levels domestically and feeds into regional organisations that deal with governments and standards bodies internationally, it is also used to bring industry and academia into the process.

#### ***Involving academia***

In other countries, academia is relied on because it educates the next generation coming up through the ranks (so it can promulgate knowledge of the existence and use of standards), the research and knowledge held by academics and their peers in other countries (which they can access) and the data collection and maintenance they do, is a highly valuable input.

#### ***Involving industry***

While the parts of industry that sell geospatial information products (like the GIS companies and data value-add providers) are engaged in the geospatial data standards area, the size of these firms is currently small to medium (although some are connected to large international firms).

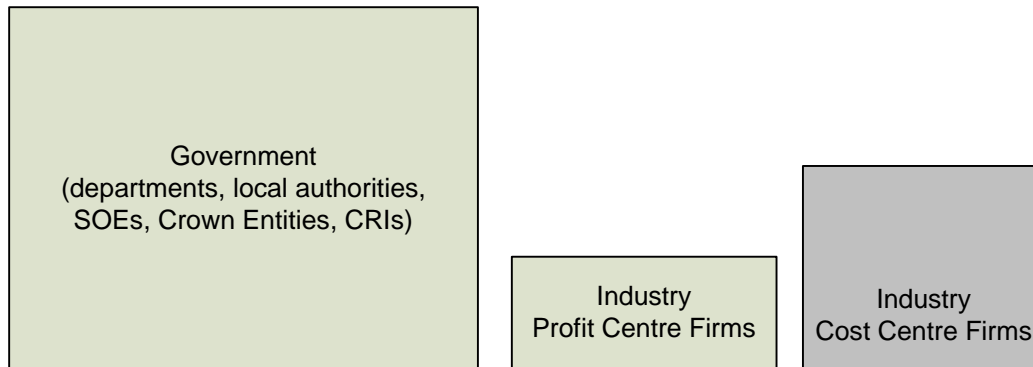
In this sense, the sector appears to lack private firm scale players. However, there are large firms in New Zealand that use geospatial data, but not necessarily as a centre-point of their operation. These firms are generally those using geospatial data only as an input into their final product like telecommunications, insurance, electricity, and road building companies. These firms do not appear to be heavily involved directly in the geospatial data standards area.

In other words, where geospatial information is part of the inputs of a product, it is a cost centre for the firm. Where the main product itself is geospatial information it is a profit centre of the firm. Most of the profit centre firms are small, whereas many of the cost centre firms are large. For instance, geospatial information is an input into risk analysis for insurance policy pricing so is seen as a cost centre of the firm not a profit centre of the firm. The profit centre in an insurance company is the part that sells insurance policies. This is also the position for large organisations such as utilities and transport firms.

To date much of the engagement with industry appears to have been with profit centre firms not cost centre firms. This means on the face of it the industry appears small, when in fact this is not the case. Also, given estimates of future growth in the geospatial information area, it is unlikely to be the case over time.

## ***Relative size of the private sector***

### **New Zealand Geospatial Information Market Structure**



2009 New Zealand Geospatial Office

As shown by the above diagram, the largest player is government due its significant involvement in the collection and use of geospatial data to undertake its core functions. This means the market looks different to many other markets of predicted growth and productivity in New Zealand.

At this stage government's control over the underlying assets (ie the geospatial datasets) and government's consultation engagement with only profit centre firms makes it appear as if the biggest winner from any initiative in standards would be government, so the initiatives should be undertaken by government. Since both central and local government cumulatively are significant managers of their own assets with significant investment in spatial data, the argument is that government has the most to gain because it is the biggest user and producer.

However, if the composition of the market is looked at differently to include cost centre firms and due to the prospects for profit centre firm growth and productivity in this area – government's role should not be a "solo" affair – especially in the long term.

Nevertheless, government's involvement will remain significant due to its reliance on geospatial information for things like emergency services, road infrastructure planning, resource allocation decision-making and people interaction with geographic locations. This tends to be the role that has been taken elsewhere in the world. With a lot of other geospatial data made available through the private sector.<sup>58</sup>

It should also be noted that government is significantly involved in utilities companies, eg electricity, through the state owned enterprises model. This means government is a shareholder in a significant part of the cost centre firm segment of the geospatial sector.

### ***Only government can do it***

In other sectors, government consultation/engagement with industry often occurs through industry associations or professional bodies/societies. One hurdle to getting engagement with the cost centre firms is that they do not normally join industry associations – this is the experience in other sectors. This is because the product that the association relates to is only

<sup>58</sup> See for example dmti in Canada <http://www.dmtispatial.com/> - basically all they do is on-sell value added data. They started from nothing about 10 years ago and are now the biggest spatial data on-seller in Canada. Check their partners links <http://www.dmtispatial.com/partners/index.html>

an input for cost centre firms' products - the input is not their core business and has no customer connection.

Sector associations and professional bodies/societies that deal with standards development are normally set up in relation to a product which has customer connections, eg banking, insurance, electricity, financial advice, legal advice, accounting, or surveying (profit centre firms).

Associations and professional bodies/societies are not set up for inputs (cost centre firms). Also, for professional bodies/societies, it is not firms which are members, but people holding the relevant professional qualification. However, this is not true for OSG – which is basically made up entirely of firms (both cost centre firms and profit centre firms), and institutions, organisations etc, although it is costly to be involved.

With the emerging industry association, SIBA, cost centre firms may be encouraged to join. It is early days with the association so some time is needed for it to gain momentum, and the Advisory Group members expressed interest in trying to get cost centre firms involved more. Until the association grows significantly, a coordination function would not be possible for anyone but government – the market would not be able currently to provide the solution.

Here is the geospatial information market shown diagrammatically to emphasise that government is the scale player – data producer and user. While the private sector looks relatively small this is only because commonly New Zealand has only really considered the impact on and consulted with, profit centre firms. If cost centre firms are included the private sector is much bigger.

#### **3.5.4. Economies of scope and LINZ as the appropriate agency for the coordination function**

##### **NZGO governance arrangements**

The current bundling of activities within LINZ and those of the coordination function provide a kind of coherence that makes sense at the operational level. This is due to LINZ's position as the custodian of several key national geospatial datasets. The new role would add to LINZ's current position and that position can work to "cross-pollinate" standards activity within the geospatial sector.

While this makes good sense, a couple of the Advisory Group members commented that it might be seen by some as a positioning grab by LINZ. However, this is the wrong way to look at the proposal. Although LINZ would house the function it would be undertaken by the NZGO and be done in accordance with the New Zealand Geospatial Strategy.

Also, as a separate business unit in LINZ, NZGO has a level of independence in the nature of an arms-length relationship, due to its governance structure. NZGO answers to the Geospatial Executives Group – made up of eight Chief Executives (all from other government agencies) and must consult with the Geospatial Advisory Committee in undertaking its operational functions.

##### **The influence of LINZ current activities**

The relationship among various activities and capabilities, as well as their individual and distinct contributions is essential. In the business world, organisational strategists talk about economies of scope. The idea being that the value of an organisation depends to some extent on the degree to which it can capture the advantages of combining particular kinds of activities

in the same organisation. A core activity makes a significant independent contribution to the mission of the organisation and, at the same time, makes each of the other activities of the organisation effective.

The operational capability and organisational capacity within LINZ makes it the appropriate agency for the coordination role - especially, since it houses the New Zealand Geospatial Office – but it cannot readily do this without a mandate, without staff dedicated to the role and without budget.

Alternatively, the coordination function could be placed in another government department or be taken out of LINZ and put into a separate entity. However, the administrative costs of running a separate organisation would amount to duplication, and other government departments do not have as much of a match with existing functions in relation to geospatial information or existing connections with other geospatial standards organisations nationally, regionally and internationally.

The Advisory Group members agreed that placing the coordination function in another agency, or creating a separate entity, made no sense as both would require a lot of retooling and restructuring for it to happen.

Also, having NZGO as a separate unit within LINZ means that any specific funding above baseline funding for LINZ that NZGO uses can be quarantined for NZGO's use through the budget process. This means there is limited governance benefit to be obtained from separating NZGO into a stand-a-lone entity for the purpose of a coordination function.

### **How does economic growth occur and how does that impact on the coordination function?**

There are hazards in focusing too narrowly on a limited set of activities and purposes. The way to secure long run performance in an organisation is to adopt profit-seeking behaviour, in addition to profit-maximisation behaviour. The difference between these behaviours is that:

- Profit-maximisation relates to trying to squeeze more value out of what you currently do against what customers currently demand (ie existing capabilities against existing market preferences). Hence, profit-maximisation focuses on cost-cutting, process efficiency, marketing, and customer satisfaction; *whereas*
- Profit-seeking relates to developing new products and creating customer demand for them (ie new value by pre-empting and shaping new preferences using knowledge gained through undertaking present activities, and adapting those activities to meet new preferences). Hence, profit-seeking focuses on brand, design, innovation, networking, and technology.

These two approaches are taken in the private sector to grow their market share and ensure continuous competitive advantage. The private sector does not only focus on cost-cutting, process efficiency, marketing, and customer satisfaction to improve profits by getting more out of what they currently do. They also use brand, design, innovation, networking and technology to seek more profit.

The public sector does the same thing by working on cost-cutting, process efficiency, targeting access to services and customer satisfaction in relation to its current activities to improve productivity, and by working on brand, design, networking, technology and innovation to assist with economic growth. In the public sector it is called value-maximisation and value-seeking.

There is a danger in a recession that both the private sector and the public sector focus solely on profit/value-maximisation and not at all on profit/value-seeking. While profit/value maximisation increases productivity, it is only profit/value-seeking that will grow the economy. Hence, there are opportunity costs in narrowing activities to profit/ value-maximisation. For example, not making use of the integration capabilities that occur where specialised knowledge and skills across a number of different but connected areas are held in one or a number of organisations.

Also, in only doing profit/value-maximisation, synergies can be lost and innovation reduced. This is because:

- Innovation is caused by the cumulative synthesis of seemingly disparate information taken from connected areas of knowledge. Ideas are “in the air”, so innovations are achieved at the same time across the world, but only in places where the same advancements have been made to date. New products are built on new products so that innovation is a continuous activity.
- Innovations are not related to individual system components but result from the synergistic effects of the interacting elements. While on the face of it there appears to be some duplication or redundancies, the diversity of knowledge created by a wide number of connections can stimulate innovative strategies to problem solving. It also provides the organisational flexibility required to deal with increased complexity and dynamics.<sup>59</sup>
- Economies of scope are obtained from the fusion of interrelated capabilities.
- There is also a role for the internationalisation of economic activity by building new capabilities through knowledge exchanges and cooperative learning, and utilising cross-border networks for the establishment of new value-generating activities.<sup>60</sup>

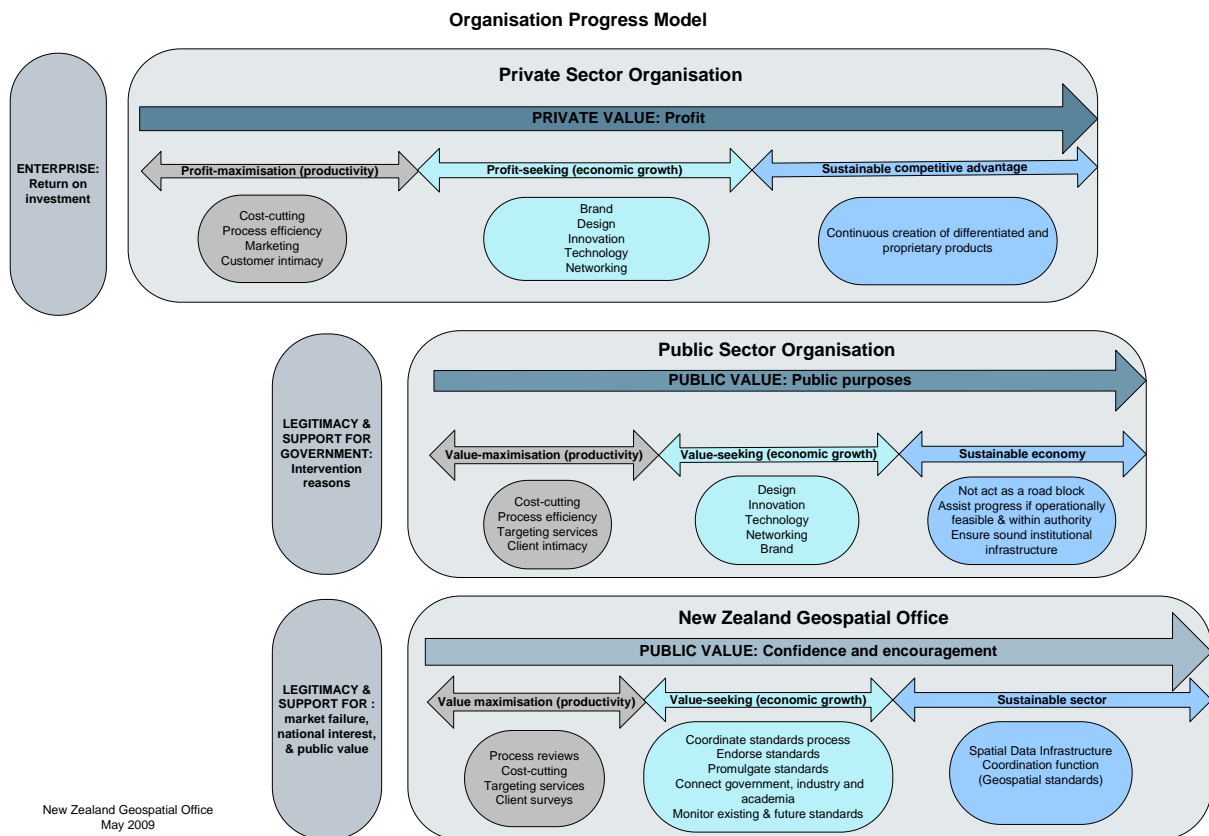
Government needs to focus on value-seeking just as much as the private sector needs to focus on profit-seeking, and since government’s role in the geospatial information sector is significant, this is even more important. There is strong rationale for government’s involvement in geospatial data standards through brand, design, networking, and technology, and innovation central government should stimulate economic growth, i.e. provide a basis for it, and others should be able to leverage this stimulus actually to do private sector profit-seeking.

This is where the geospatial standards coordination function comes in. It would assist New Zealand being up-to-date with advancements, and in this case standards, that underpin productivity and economic growth. See the Organisation Progress Model below.

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<sup>59</sup> See Michael Hulsmann and Christine Wycisk, University of Bremen, Germany, “Autonomous Cooperation – A way to Vitalize Organizations”, 2007

<sup>60</sup> See John Cantwell, Department of Economics, University of Reading, UK, “Innovation, Profits and Growth: Schumpeter and Penrose”, 2001



## What is the counterfactual?

Looking at the counterfactual – what happens if we “doing nothing”, ie retain the status quo?

Where no one is currently undertaking the coordination function and the market (at this stage) is not likely to be able to step in, geospatial data standards development, promulgation and use is unlikely to improve. New Zealand will fall further behind in this process. Some might say ‘who cares, it doesn’t affect me’, but it does in many subtle ways. This lack of improvement will, over time, affect the progress of other important sectors which rely on geospatial information on their decision-making, eg physical infrastructure and government services. Without the coordination function, improved interoperability, access and integration of geospatial data will be slower.

In short, the New Zealand Geospatial Strategy will take longer to meet – wasting opportunities for New Zealand that will no doubt be seized by other countries with more advanced information flows. New Zealand will be further behind in producing new value-added products and in improving productivity and achieving economic growth using its valuable geospatial datasets and information assets.

### 3.5.5. Performance measurement

A part of the challenge of measuring performance in the public sector is deciding where along the value chain measurement efforts should be concentrated. The differences between organisational capacity and operational capabilities on one hand, and inputs, activities, outputs and outcomes on the other, are important to providing information for setting future strategies. However, the organisation should also measure its performance by considering its ability to strengthen the industry as a whole.

It is important to recognise that policy-making is a complex response to more or less specifically articulated developments. Even the participants may not fully understand how and why decisions were reached; they may even disagree about what happened. This will continue to be the case. Delivering value lies in part in the effective implementation of the initiative and on the advocacy and leadership undertaken by NZGO and LINZ as a whole.

'Autonomous coordination' describes processes of decentralised decision-making in federated structures. It focuses on coordination of the autonomous organisations and processes. A system is autonomous if its decisions, relations and interactions are not dependent on external instances - they are operationally closed.<sup>61</sup> This position is the case in the geospatial information sector. Without efforts to coordinate, the decision-making will remain in silos.

To achieve federated geospatial information there needs to be a country level coordination function that works with the other feeder organisations in the geospatial data standards area, along with other operations in a spatial data infrastructure. In this context the coordination function is very important and there is no other possible candidate to step in and do this. The important thing is for NZGO is to not to make the same mistakes that were made elsewhere. To avoid expensive failures by starting too big and trying to do too much.

### **3.5.6. What would success look like?**

For government, investing in coordinating knowledge, partnerships and adoption of geospatial standards will underpin productivity and economic growth in New Zealand. Working as a catalyst or in a navigator role by coordinating geospatial data standards development along with other initiatives in the geospatial information area makes sense. It is more than just productivity and economic growth though – it is also about doing things properly and effectively. Even if there are no demonstrable economic returns on doing things in a coordinated way, it still makes sense from a data management perspective. Building and maintaining a collaborative community of people and institutions including partnering with public sector organisations, and local and central government, and to assist internationally with competence building in relation to geospatial information will improve inputs into decision-making.

The coordination function needs to be done by people not only with geospatial knowledge but people with strong and comprehensive links with industry and other public sector organisations. The people need to be natural connectors first, and mavens second. Good connectors look both inside and outside the organisation to help identify who should be brought to the table and how the sum of the parts could exceed the whole.<sup>62</sup>

Beyond the formal structure of the organisation there are partners and co-producers who can help NZGO to achieve its goals. These include members of the existing geospatial community who receive information from LINZ or are interested in using geospatial information, as well as other central, regional and local government agencies that use geospatial information to help achieve their purposes, and academia researching and working on the area (academics are also data producers don't forget). Hence, the work NZGO does with its partners and co-producers is an important aspect of its success.

However, performance cannot easily be measured quantitatively other than some metric that would account for the number of national, regional and local spatial datasets that become

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<sup>61</sup> See Michael Hulsmann and Christine Wycisk, University of Bremen, Germany, "Autonomous Cooperation – A way to Vitalize Organizations", 2007

<sup>62</sup> William D Eggers & Stephen Goldsmith, *Governing by Network: The New Shape of the Public Sector*, 2004

compliant to national standards within a period of time. Starting at the top maybe and working down. However, documenting data that are undocumented is a big job. Success would be having all spatial data in New Zealand compliant with internationally accepted geospatial standards – and all new datasets that are developed being compliant from the start. This is something that NZGO has no direct control over – so while a measure it is not one that directly relates to NZGO's influence.

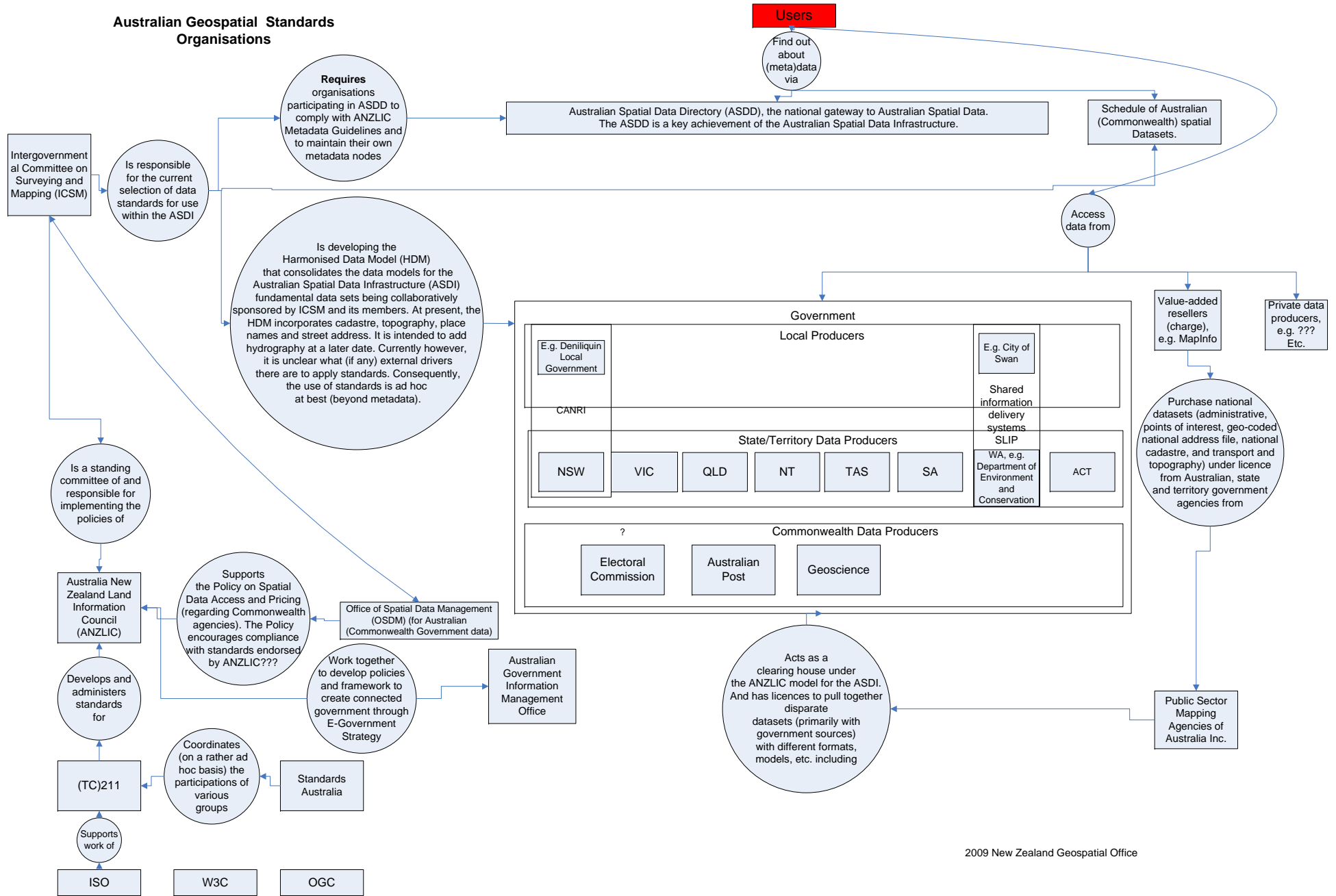
Another measure is the number of standards endorsed by the NZGO per year. Being realistic though this will not be huge. One Advisory Group member has stated that there are thirty or so standards in the geospatial domain and not all need be addressed at once. This view seems to have been endorsed by other members of the group.

The standards development process undertaken through other organisations in the model takes time, and cataloguing existing standards to endorse will not happen overnight. However, promulgation of existing standards as well as getting industry and academia more involved will improve outcomes. Increasing the level of response and use by industry and government may be a better target. A particular tool is to look at the case studies presented by industry showing endorsed standards in action – progress occurring.

In undertaking the coordination function, the levels of government may need to be broken out as there are clear differences in terms of function between them. Local governments develop for example their own local assets databases (roads, water, gas etc) and sometimes these are too different from other places to become standardized easily. Plus the way in which simple things like address matching is done differ from place to place – for instance, in Dunedin one member has not been able to find a properly coded single line street network – for vehicle routing etc, as the Dunedin City Council does not see this as a need for them (the address is in the parcel layer). The member stated that they "...could extract this and attach it to the road network – and others in the industry have done some work on this – but it would be nice if there was some agreed upon standard."

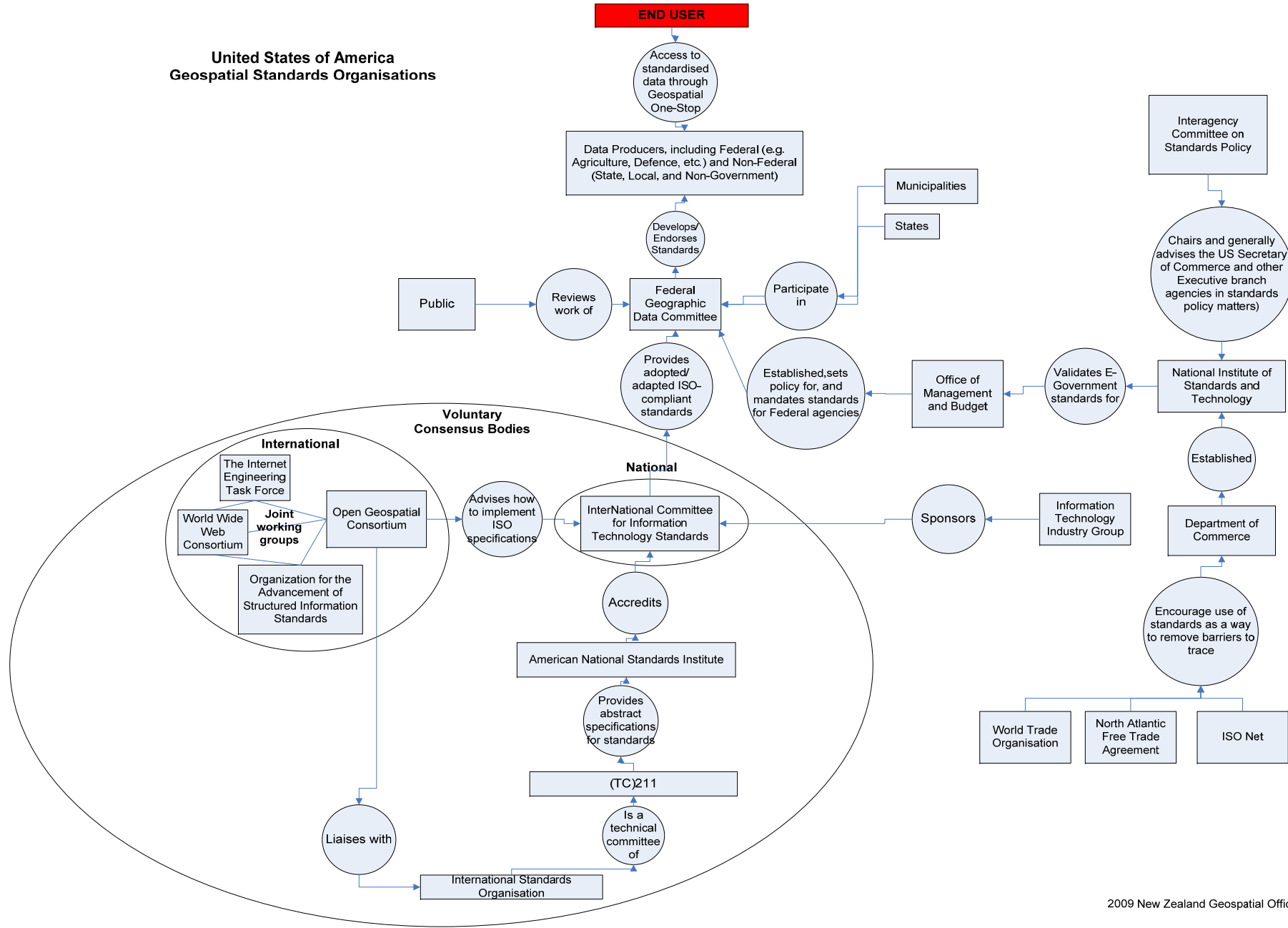
# Annex One - Australia

## Australian Geospatial Standards Organisations



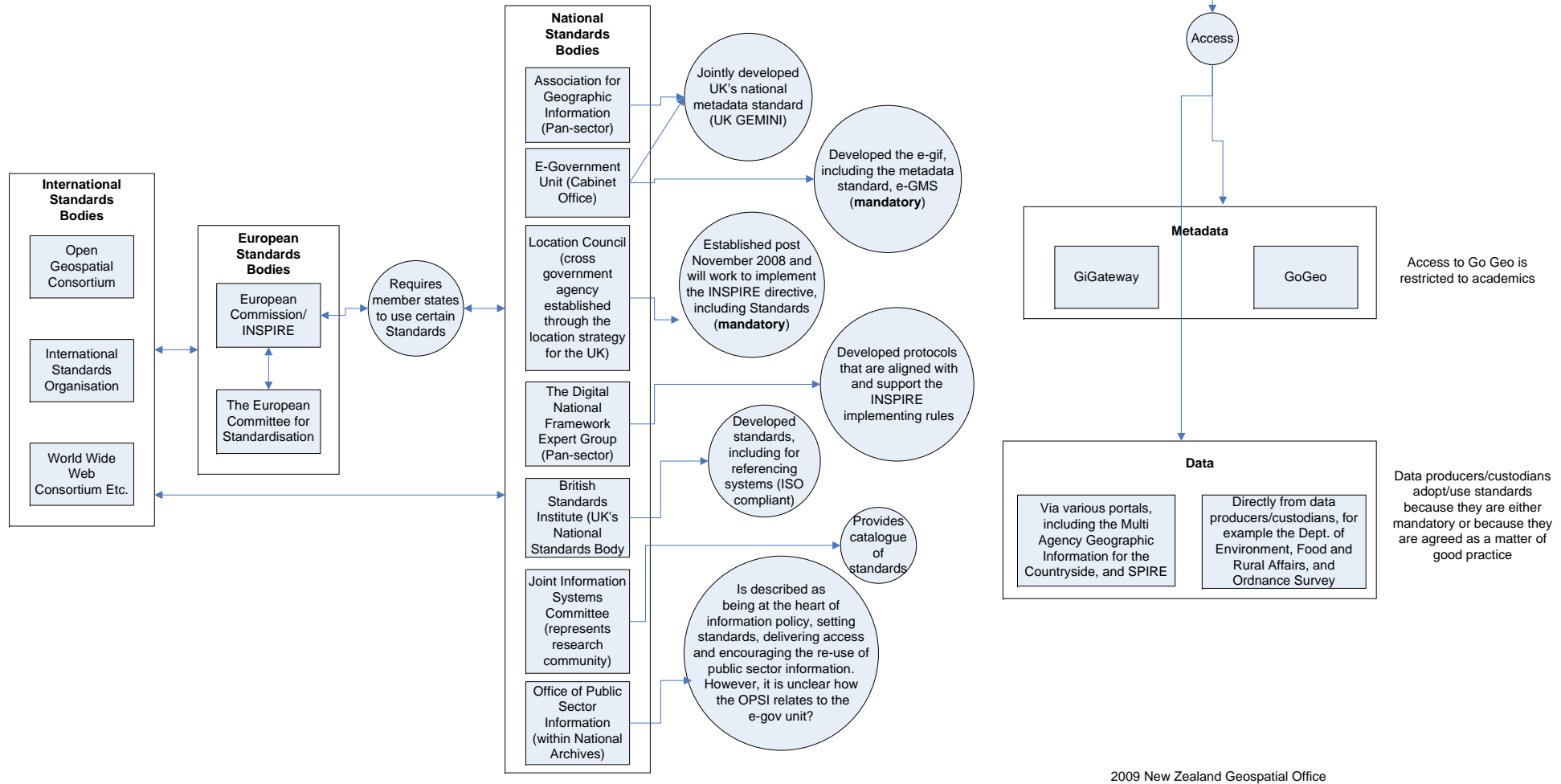
# Annex Two - United States of America

## United States of America Geospatial Standards Organisations



# Annex Three - United Kingdom

## United Kingdom Geospatial Standards Organisations



2009 New Zealand Geospatial Office

International/European and National Standards Bodies commonly work together have overlapping membership

## Glossary

ANZLIC	Australia New Zealand Land Information Committee
AHSC	ANZLIC All-Hazards (Emergency Management, Counter Terrorism &Critical Infrastructure Protection) Standing Committee
DGIWG	Digital Geospatial Information Working Group
EM&GFSC	ANZLIC Emerging Issues and Geospatial Futures Sub-Committee
ESPG	OPG Surveying and Positioning Committee
EUROCONTROL	European Organisation for Safety of Air Navigation
FIG	Fédération Internationale de Géometres
GEG	Geospatial Executives Group
GIS	Geographic Information Systems
IAG	International Association of Geodesy
ICA	International Cartographic Association
ICAO	International Civil Aviation Organization
IC-ENC	International Centre-Electronic Navigational Charts
ICSM	Intergovernmental Committee on Surveying and Mapping
ICT	Information and Communications Technology
IEC	International Electrotechnical Commission
IHO	International Hydrographic Organization
ISCGM	International Steering Committee for Global Mapping
ISO	International Organization for Standardization
ISO TC-211	ISO Technical Committee 211 on Geographic information
LINZ	Land Information New Zealand
MED	Ministry of Economic Development
MWP	ANZLIC Metadata Working Party
NGDI	National Geospatial Data Infrastructure (US)
NZGO	New Zealand Geospatial Office
SA/SNZ IT – 004	Standards Australia New Zealand Joint Committee
SCoLA	ANZLIC Standing Committee on Land Administration
SCUFN	GEBCO Sub-committee on Undersea Feature Names
SIBA	Spatial Information Business Association
SDI	Spatial Data Infrastructure (also NZSDI, NZ Spatial Data Infrastructure)
SNZ	Standards New Zealand
OASIS	Organization for the Advancement of Structured Information Standards
OGC	Open Geospatial Consortium
OGCA	Open Geospatial Consortium Australasia
OGP	International Association of Oil & Gas Producers
OsGEO	Open Source Geospatial Foundation
OSGeo-AustNZ	Australia-New Zealand local chapter of the Open Source Geospatial Foundation
UNGEFN	United Nations Group of Experts on Geographical Names
UNGIWG	United Nations Geographic Information Working Group
W3C	World Wide Web Consortium