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COUNTRY REPORT ON CARTOGRAPHIC ACTIVITIES IN NEW ZEALAND

Paper submitted by New Zealand**

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** Paper preapared by Land Information New Zealand, Wellington, New Zealand (http://www.linz.govt.nz)

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1. INTRODUCTION

This paper comments on a selection of cartographic issues and activities in New Zealand from a public sector perspective at the national level. Comment is also provided on the implementation of resolutions from the 14th United Nations Regional Cartographic Conference for Asia and the Pacific held in Bangkok in 1997.

The overall jurisdictional/national responsibility for geodetic and cadastral survey, land titles, Crown lands, valuation, and topographic and hydrographic information rests with Land Information New Zealand (LINZ), a central government department.

The private sector survey and mapping industry is heavily involved in the provision of spatial information products and services in New Zealand. The industry delivers a wide range of products and services' including aerial surveying, specialist map production and consultancy services both nationally and internationally. In addition, the trend for the New Zealand government (via LINZ) to outsource the collection, storage and dissemination of core land and seabed information has increased opportunities for private sector companies to undertake this work. Local and regional government outsourcing is providing similar opportunities.

2. INTERNATIONAL DIMENSION

LINZ undertakes activities in an international context where this:

- is required to meet international obligations;
- supports agreed foreign policy initiatives;
- confers benefits to the community in terms of the quality and cost effectiveness of services;
- where benefits are gained from adopting international standards and practices.

As examples of these:

- LINZ manages its hydrographic activities in the context of the framework provided by the International Hydrographic Organisation (IHO). New Zealand has been assigned areas of IHO charting responsibility and manages its hydrographic data in terms of IHO standards and procedures.
- LINZ's activities in Antarctica are managed in the context of the framework for New Zealand's involvement in Antarctica.
- LINZ's Land*online* programme has been based on a close examination of comparable work undertaken by Canada and Australian states.
- Topographic, cadastral and geodetic activities are closely aligned with those of Australia through participation in the initiatives of the Intergovernmental Committee on Surveying and Mapping (ICSM).
- Alignment of New Zealand and Australian hydrographic policies, standards and raster chart distribution.

- LINZ participation in ANZLIC (Australia New Zealand Land Information Council.

- LINZ supports the work of various United Nations agencies through the provision of advice and assistance as needed to the relevant lead New Zealand government agencies. For example, input on relevant aspects of Agenda 21 and the work of the UN Commission on Sustainable Development (CSD) is provided to the Ministry for the Environment (http://www.mfe.govt.nz) and the Ministry of Foreign Affairs and Trade (http://www.mfat.govt.nz) who manage New Zealand's relationship with the CSD.

3. STEWARDSHIP OF INFORMATION

In 1997 the Government approved a policy framework for Government held information. The framework sets out stewardship principles covering such aspects as:

- what information may be collected;
- the quality and pricing of information;
- privacy;
- confidentiality;
- intellectual property rights;
- access;
- integrity of processes;
- liability; and
- preservation.

LINZ is applying these principles in developing information management policies and practices appropriate to its land and seabed information responsibilities.

Topographic Information

Pricing

In October 1999 the Government agreed that the pricing principles of the policy framework should be applied to LINZ's topographic information, i.e. pricing at the cost of dissemination. By contrast the previous pricing regime had been either based on what the market could bear or, in the case of digital topographic data, sought to recover the cost of computerising the mapping systems with the additional imposition of an arbitrary copyright fee. The original price of digital topographic data effectively denied access to the data to all but the select few clients who were able to afford small portions of the database.

The new cost of dissemination pricing structure came into effect on 10 December 1999 and involved the removal of the map copyright fee on all topographic information and a reduction from $2m to $1,500 in the price charged for the entire 1:50,000 digital topographic database. As a consequence, timely up to date topographic information is now affordable to

all sectors of the community including government research agencies, environmental management agencies and the general public.

Mapping

LINZ completed the population of the NZ Topographic Database in 1999. This provides vector coverage of New Zealand at a nominal scale of 1:50,000. The database is produced by the government for defence, emergency services and constitutional purposes. It is subject to ongoing maintenance, with routine extractions from the database, for external clients, being made on a 4 monthly basis.

A new map projection and sheet layout for New Zealand will be introduced during the next two years. NZ Map Grid does not directly correlate with the new geocentric datum (NZGD2000) and this is creating problems for clients using GPS technology. The grid is unique to New Zealand and does not conform to those associated with globally recognised projections. The inclination of the country relative to north and south means that there is not an ideal replacement. Inevitably compromises will be made between universality and scale distortions at the extremities.

Ten government departments, including LINZ, are collaborating to rationalise data collection and database management and maintenance. Agreements have been reached on the collective purchase of data and sharing of costs. Working Groups are developing common policies, standards and methods of distribution for the 19 core government databases that the departments manage. An essential requirement is the ability to integrate data held by all of the departments.

LINZ continues to produce 1:50,000, 1:250,000 and smaller scale mapping for aeronautical charting, reconnaissance, recreation and educational purposes. These are also made available in digital form. Mapping of the land surrounding the Ross Sea in Antarctica remains a priority although there are a number of difficulties associated with the acquisition of field control and mapping logistics. Maintenance of the Pacific Islands mapping that fall within New Zealand's jurisdiction has continued. The lack of accurate positioning and azimuth for some islands remains a concern and spatial adjustments are being made, as improved co-ordinates become available.

Hydrographic Information

Pricing

Pricing topographic information at the cost of dissemination has raised expectations that other LINZ information will be brought under the same pricing regime. LINZ is currently developing proposals to Government to apply the pricing principles to hydrographic information, although it is not anticipated that this will result in any major adjustments to pricing schedules.

Full cost recovery for hydrographic charting has never been possible because the price of surveys is high and the sales of charts are relatively low. This has

meant that past pricing practices have indirectly led to the application of figures that reflect the concept of dissemination costs. The new policy will provide a more explicit framework that can be used to determine the price of new products such as raster charts.

Charting

The responsibility for the purchase of core bathymetric and hydrographic data was transferred from the Royal New Zealand Navy to LINZ in 1996. Since that time LINZ has developed and implemented a programme to provide up to date charting of all coastal areas, shipping lanes, harbour entrances and ports. All charts have been transformed to WGS 84 datum and any with soundings recorded in fathoms replaced.

Two surveys have been undertaken using a Multi Beam Echo Sounder (MBES) and another two using airborne laser techniques. Multibeam data of the principal shipping lanes will be used to produce vector Electronic Navigation Charts (ENCs).

The whole of the New Zealand chart portfolio will be converted to raster format by 1 July 2000. This is required as the manual repromat used in the past has begun to deteriorate and maintenance has become less cost effective. Raster charts and monthly up dates will be made available to mariners as an addition to the Australian SeaFarer product. This will be marketed as a joint Australia/New Zealand initiative in accordance with regional distribution principles adopted by the International Hydrographic Organisation.

Valuation Information

Organisational Change

Up until 1 July 1998 Valuation New Zealand, a Government department, was responsible for maintaining valuation information for each valuation district and was the sole provider of all rating valuations.

On 1 July 1998 the Valuation of Land Act 1951 was repealed by the Rating Valuations Act 1998 and the provision of rating valuations became contestable. Valuation New Zealand was split into the Office of the Valuer-General (housed within LINZ and responsible for setting standards for rating valuations), and Quotable Value New Zealand, a Government owned service provider of rating valuations. Local authorities (District and City Councils) became responsible for maintaining their own district valuation information and assumed the authority to purchase rating valuations from a service provider of their choice.

Devolution of the National Property Database

Until the end of 1999, national valuation information was held in the national property database (NPD). The NPD comprised electronic information and paper records of the physical and quantitative characteristics of each rateable property in the New Zealand.

From 1 July 1998, when the Government ceased being responsible for rating valuations, the requirement for the government to hold and maintain valuation information also ceased. In June 1998, the Government agreed that the Valuer-General should devolve the data in the NPD to local authorities.

As each territorial authority took responsibility for its data from the NPD it also became the owner of that data. Commercial users requiring up-to-date valuation information must now negotiate to receive updates from territorial authorities.

4. METADATA

The "availability" principle of New Zealand's policy framework for Government held information requires government departments to make information available easily, widely and equitably to the people of New Zealand (except where such availability is specifically limited by legislation).

The compilation of discovery level metadata is central to making information widely and easily available.

Complying with this principle requires Government information to be readily discoverable, with the Internet being identified as the primary means by which to facilitate discovery. Discoverability is achieved by ensuring the availability on the Internet of structured summary documentation on all information holdings in accordance with internationally accepted standards, i.e. 'metadata'. The ability to locate all Government information and services on the Internet is a key element in moving to an electronic Government environment. In this context LINZ is currently leading a project aimed at ensuring that all Government agencies compile discovery level metadata for all significant information resources and services and that this metadata is made readily accessible on the Internet to all potential users. Implementation if approved will be strongly linked to the development of the New Zealand Government On-line Internet site (www.govt.nz) and the integrated development of all Government Internet sites.

As a member of the Australia New Zealand Land Information Council (ANZLIC) LINZ has contributed to the development of ANZLIC metadata guidelines for spatial information. These ANZLIC guidelines have been a significant input into the development of a suite of International Standards Organisation (ISO) standards for geographic information. New Zealand will continue to use ANZLIC as an effective means of keeping abreast with international developments in the field of metadata standards for spatial information.

5. SURVEY INFRASTRUCTURE

The New Zealand survey system provides a national spatial reference framework for the accurate location of land and seabed rights and resources.

The spatial reference framework is based on a national network of survey control marks, including trig stations, connected to the global reference framework. LINZ administers the survey system primarily to provide for the reliable identification and definition of land boundaries for recording land rights for Crown, Maori, leasehold and freehold tenures. The system also facilitates the integration of other land and geographic information for activities such as:

- defining administrative boundaries;
- resource management;
- mining and marine licences;
- location of utilities;
- topographic mapping and hydrographic charting;
- the location of marine and air navigation aids both nationally internationally
- determination of New Zealand's national and economic zone boundaries.

Geodesy

1998 saw the development of a 10-year Geodetic Strategic Business Plan to provide goals and direction for development of New Zealand's geodetic system. A key goal of the strategy is the development of a new geocentric datum, New Zealand Geodetic Datum 2000 (NZGD2000). This datum became operational in August 1999 and replaces NZGD49.

NZGD2000 is defined in ITRF96 (International Terrestrial Reference Frame) at epoch 2000.0. The generalised motion of points in New Zealand with respect to the ITRS have been modelled:

- to ensure that Land Information New Zealand can generate epoch 2000 co-ordinates from observations made at other times; and

- to allow other specialised users to generate up-to-date co-ordinates for times other than the reference epoch.

Three and seven parameter transformations and a 20km-spaced grid file have been developed to enable transformations between NZGD49 and NZGD2000. Ongoing contribution to the Asia, Pacific Regional Geodetic Network campaigns has been provided through the provision of data from GPS permanent tracking stations in New Zealand.

Ongoing development of the N.Z. datum is currently concentrating on the survey of geodetic cadastral control (5th Order) to support the Land*online* project (refer section 11) and development of Survey Accurate Digital Cadastral areas. A further initiative currently being implemented is the development of a GPS permanent tracking network across New Zealand to monitor the dynamics of the datum and support continued development of the spatial infrastructure.

Development of the new datum has necessitated a revision of cadastral and topographic mapping projections in New Zealand. Twenty-eight meridional

circuits, defined in terms of NZGD2000, have been adopted for cadastral surveys to replace the 28 circuits defined in terms of NZGD49. A decision on a new projection to replace the New Zealand Map Grid is currently being considered with a decision to be made by June 2001.

Investigation of the options for integration of the numerous vertical datums in New Zealand into one national vertical datum and development of an enhanced geoid model for New Zealand are currently under study. A report on options and method of development is due by June 2001.

Specialised high precision surveys continue to be made to monitor crustal deformation in New Zealand by the Institute of Geological and nuclear Sciences, universities, and international collaborators.

Further information on the LINZ geodetic programme can be found at the LINZ Web site http://www.linz.govt.nz/services/surveysystem/geodetic/.

Cadastral Surveying

The extent and location of boundaries of rights and interests in land are defined and documented by registered land surveyors, mainly in the private sector. They submit records of surveys to LINZ for validation against existing records. LINZ maintains registers of rights and interests in land and undertakes checks to ensure new rights do not conflict with existing rights. This ensures certainty and security as to the extent of land rights and interests irrespective of tenure.

New Survey Regulations 1998 were introduced to facilitate the use of new technology. The aim of the new regulations is to be more performance based rather than prescriptive.

A new Cadastral Surveyor Accreditation and Audit System introduced 1 July 1998 is a significant change to the quality assurance process in terms of its impact on cadastral surveyors and on LINZ. The new system focuses on quality assurance by placing greater reliance on surveyors maintaining the required standards for surveys when lodging plans with LINZ and less emphasis on detailed checks by LINZ.

The objectives of the Cadastral Surveyor Accreditation and Audit System are to

- Reduce the time taken to approve plans for accredited cadastral surveyors;
- Place more reliance on the proficiency and responsibility of the certifying surveyor;
- Align plan approvals to the legal responsibilities of surveyors;
- Develop a more appropriate quality assurance model for the survey system;
- Maintain the integrity and efficiency of the Survey System.

Currently access to the extensive cadastral survey records held by LINZ is facilitated by a computerised spatial index, the Digital Cadastral Database (DCDB). This will be superseded by a new "Land*online*" system (see below) which will automate many of the survey and title processes and provide for on-line access to survey and title records. Land*online* is to be implemented progressively in each of the LINZ regional offices over the next two years.

For more information see http://www.linz.govt.nz/structure/business/sg/

For a comprehensive overview of cadastral reforms in New Zealand see

Bevin, Tony, 1999 "Cadastre 2014 Reforms in New Zealand" *New Zealand Institute of Surveyors & FIG Commission VII Conference, Bay of Islands, October 1999.*

http://www.linz.govt.nz/services/surveysystem/osgpublications/

6. ELECTORAL

LINZ provides spatial database and street address data for the management of electoral enrolment, statistical mesh-blocks and electoral boundaries.

7. GEOGRAPHIC NAMES

The process of accepting or rejecting geographical names within New Zealand is the responsibility of the New Zealand Geographic Board *Nga Pou Taunaha o Aotearoa*. The Board recognises that place names should be the product of careful and informed decisions.

Constituted under the New Zealand Geographic Board Act 1946, the Board is an independent body responsible to the Minister for Land Information.

The Surveyor-General is Chairman of the Board, which comprises seven members appointed under the Act. They have responsibility for naming in New Zealand including the Kermadec, Chatham, Auckland and Campbell Islands and the Ross Sea region of Antarctica and within the territorial waters of New Zealand.

The functions of the Board are:

- to adopt rules of naming
- to examine cases of doubtful spelling
- to investigate and determine the priority of discovery
- to collect original Maori place names for recording on official maps
- to encourage the use of original Maori place names
- to determine what foreign names should be replaced by Maori or British names
- to investigate any proposed alteration of a place name or any proposed new name
- to make any inquiries and recommendations on any matter referred to it by the Minister

The Board undertakes to assign place-names for small urban settlements, localities, mountains, lakes, rivers, waterfalls, harbours and any other natural features. Local authorities name streets and roads and National parks and reserves are named by the Department of Conservation who consults with the Board.

8. DELIMITATION OF THE CONTINENTAL SHELF

LINZ has commenced a seven-year programme to survey the outer limits of the New Zealand continental shelf to gather data for a submission to be made under the UN Convention on the Law of the Sea (UNCLOS). Following ratification of UNCLOS New Zealand has until 2006 to submit the co-ordinates of the outer limits of its continental shelf beyond 200 nautical miles. Under UNCLOS New Zealand exercises sovereign rights over the seabed resources of the continental shelf. The submission will not result in any change to New Zealand's Exclusive Economic Zone (EEZ). The EEZ will remain as the outer limit to which New Zealand has rights to water column resources such as fish stocks.

9. ANTARCTICA

International Co-operation

LINZ's responsibilities for the provision of core land and seabed information services extend to the Ross Sea Region of Antarctica. As with its predecessor LINZ manages its geodetic survey and topographic mapping programme in conjunction with the United States Geological Survey (USGS). In August 1999 the USGS and LINZ signed a new Arrangement for co-operation.

Topographic Mapping

Topographic mapping has recently been completed for the Dry Valleys area and the immediate focus will now be the mapping of Ross Island.

Geodesy

LINZ is currently implementing a new geodetic datum that will provide for the ready spatial integration of data which was not possible with the fragmented incompatible datums developed prior to the era of satellite based global positioning systems. This datum will have similar defining parameters as NZGD2000.

Hydrography

LINZ is also investigating options for hydrographic charting to support New Zealand's stewardship of the Ross Sea Region. Priority is being given to examining options for a chart for the Cape Hallett / Balleny Islands area in view of the passage of ships through that area en route to McMurdo Station

10. ELECTRONIC GOVERNMENT

Electronic government (e-government) refers to the international move to shift governments from industrial age institutions to institutions and structures capable of responding to the challenges of the information age.

The vision for electronic government in New Zealand (announced on 28 September 1999) promises New Zealanders fundamental change. Objectives set for achievement by 2005 include:

- The ability to record voluntarily a change of name, address or other personal information once, with all Government systems dependant upon this data being updated automatically.
- Improved engagement of citizens in policy and decision-making.
- New Zealand Government Online (http://www.govt.nz) evolving to provide the comprehensive single point of access to all Government information and services.
- Online registration of any information required by Government, at any time, from anywhere.
- All Government accounts receivable and payable able to be transacted online.
- All Government forms available online.

As previously noted LINZ is leading a government wide metadata project that will play a critical role in facilitating the discovery of Government held information and thereby the effectiveness of the New Zealand Government On-line Web site as the entry point to all Government information and services. Similarly other LINZ initiatives such as promoting common definitions and standards for topographical, hydrographic and cadastral data and associated common sourcing and collective purchasing will contribute to the overall efficiency of Government and are now being managed in the context of the move to E-Government.

Achieving e-government promises diverse benefits. If achieved, it will introduce significant and exciting innovation in public sector systems, structures and processes. As well as delivering better and more efficient Government, it will provide active state sector leadership and an additional stimulus for developing a knowledge-based economy in New Zealand.

For further information on the New Zealand's electronic government initiative please refer to http://www.ssc.govt.nz/documents/evision/

11. AUTOMATION OF LAND TITLES AND SURVEY BUSINESS FUNCTIONS (Land*online*)

LINZ is part way through a major information technology project, known as Land*online*, which will integrate and automate many of the survey and titles business functions carried out by the department. The project is being undertaken in two stages. The first, which will enable the department's customers to access information in the survey and titles databases remotely, is

scheduled to be implemented incrementally across the country over a two year period commencing in Dunedin in April 2000.

The second phase will be built over the period June 2000 to June 2002 and will enable surveyors and conveyancers to electronically lodge documents with the department. The benefits of an integrated and automated survey and titles system include significantly reduced costs to customers of accessing core survey and titles data and of having transactions processed. It will also enable the bulk of land transactions to be processed within 24 hours resulting in flow on benefits to the wider economy.

(For more information see http://www.linz.govt.nz/services/landonline/)

12. DEVELOPMENT OF AN OCEAN STRATEGY

Work on the development of an ocean strategy intended to be the basis for integrated management of New Zealand's oceans has commenced.

In October 1999, the Government agreed to the development of an overall strategic framework to enable the integrated management of New Zealand's marine interests. An officials' group, including LINZ and led by the Department of Prime Minister and Cabinet, has commenced work on bringing together a strategy for oceans. The strategy is intended to include a vision, goals and principles that will enable a collaborative integrated approach to New Zealand's ocean management.

13. IMPLEMENTATION OF RESOLUTIONS ADOPTED BY THE 14TH UNRCC-AP

Resolution 1: Funding For Spatial Infrastructure Programmes.

Prior to 1997, LINZ presented a number of policies to the NZ Government that established a clear mandate for New Zealand topographic and hydrographic information infrastructures and secured a commensurate level of funding (LINZ became fully appropriated for these functions in a manner independent of any revenues generated. Such revenues pass automatically to the Government).

Since 1997 attention has been devoted to data pricing issues and aspects of cost recovery. Specifically: -

- Pricing of topographic information. This reduced the price of core 1:50,000 topographic data from $1.8 million to $1500 for a copy of the entire database. The new price is based on the cost of dissemination only.

- Recovery of standard setting and audit costs. Some Business Groups will recover these costs from the industries they regulate. Core topographic standard setting and audit will continue to be funded by the Crown, as it is the principle client for the service.

In 1996 the Government approved a separate business case for LINZ to automate the cadastral survey and title processes. This project now known as Land*online* will be implemented progressively on a region by region basis over the next two years commencing in Dunedin in April 2000. There will be significant infrastructure benefits of computerising these core land information data sets.

Resolution 8: Asia and Pacific Regional Geodetic Project.

New Zealand has contributed to the Regional Geodetic Network Project by means of data from a number of permanent GPS tracking stations.

Resolution 9: Graphic Components In Connection With Digital Map production.

LINZ has produced extensive policies, standards and data dictionaries for all of the mapping and charting it produces. Where possible the standards have been aligned with international requirements as defined by authorities such as ICSM and the IHO. New Zealand topographic standards have been closely integrated with those of Australia.

The relevant LINZ standards are available to the public and can be provided to Conference participants if required. Most LINZ standards are published on the LINZ Internet site http://www.linz.govt.nz

Resolution 10: Standardisation of Digital Mapping Databases.

LINZ actively monitors the progress of TC 211 and the initiatives of the Open GIS Forum. These standards are incorporated into LINZ strategies as the criteria are promulgated.

New Zealand supports the use of international standards where appropriate.

Resolution 11: Development of the Global Map.

New Zealand fully supports Global Mapping initiatives and has agreed to contribute its 1:1 million mapping. We are prepared to participate at Level B which means we will convert our own data to the required format and provide ongoing maintenance. Resources are not available to assist other countries that do not possess a digital mapping capability.

Resolution 13: Workshop on Land Rights etc.

New Zealand hosted a FIG Commission VII meeting and Workshop in October 1999 and had input to the Bathurst Declaration.

Resolution 14: Spatial Data Infrastructure.

LINZ has produced a policy on its role in the ongoing development of the National Spatial Data Infrastructure.

Ten New Zealand departments have agreed to develop common standards for 19 core government databases and voluntarily comply with them. They have also agreed to jointly purchase and share data. The ability to integrate data from different departments is considered to be critical.

New Zealand cadastral and geodetic survey systems and the topographic mapping systems share a common spatial reference framework that facilitates a wide range of GIS applications.

Resolution 15: Linking Mapping with Wider Spatial Infrastructure.

New Zealand always has had the capability to link cadastral and topographic data through a common geodetic system and mapping grid. Problems experienced are: -

- Large-scale topographic mapping is undertaken by the private sector. Cadastral co-ordinates are based on surveys which span more than 100 years so discrepancies due to tectonic movement and local anomalies can cause difficulties matching to large scale topographic mapping co-ordinates which are normally more homogeneous.

- There is some localised cadastral datum shifts throughout New Zealand that need to be taken into account when matching these data sets.

- Discrepancies can occur where a property falls on the edge of two meridional circuits.

The solution used has been to relate both data sets to either the grid or the geodetic control points and undertake an informed local datum shift if it is needed.

It is expected that improved cadastral co-ordinates as a result of the new Land*online* project will facilitate closer alignment of cadastral and large-scale topographic data.

Resolution 16: Updating Map Inventories.

New Zealand is able to provide inventories of its maps and charts.

Resolution 19: Involving non-governmental organisations in the development and provision of cadastral systems.

In New Zealand non-governmental organisations such as the New Zealand Institute of Surveyors (NZIS) are extensively involved in initiatives to improve the efficiency of New Zealand's cadastral system. Private sector surveyors normally undertake cadastral surveys.

Resolution 20: Strengthening non-governmental organisations.

LINZ enjoys a mutually beneficial relationship with a wide number of non-governmental organisations with interests in the activities and responsibilities

of the department. LINZ values the input of these organisations and will continue to maintain these links.