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INTEGRATION ACTIVITIES OF NEW ZEALAND

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Integration Activities of New Zealand

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1 Introduction

The integration of geospatial data in New Zealand has changed radically over the last three decades. This has been due to many factors, but most notably to international technology developments, international and national standards and frameworks initiatives as well as changes in the policies and roles and responsibilities of central and local government agencies. Integration activities are dependent on the effective availability of data that can be integrated and the business objectives of the end user. To obtain an understanding of some of the underlying issues of data integration in New Zealand it is necessary to look at the history of key elements of the New Zealand spatial data infrastucture, the policies impacting on those elements and end user application environment.

2 The History of Spatial Referencing

Polynesian settlement was established in New Zealand by 1300 AD along with its own concepts of geographic referencing. The development of European geo-referencing systems commenced with the arrival of the European explorers. Firstly with the arrival of the Dutch explorer Abel Tasman in 1642 and then with the British explorer James Cook from 1769. While the spatial referencing of the New Zealand coastline by these early European explorers vastly increased the wider international geographical knowledge of our remote country, the precision of their coastline definition is evidence of the limitations of the sea-based positioning of the day.

European settlement commenced in earnest in the early 1800s and with it an escalating demand for topographic, cadastral and resource data. These earlier European surveys used astronomical fixes to establish local datums. Increasing requirements for consistent national positional accuracy led to the establishment of a national datum in 1949. Subsequently, more recent requirements for consistent international positional accuracy to facilitate data integration led to the development of the New Zealand Geodetic Datum 2000 (NZGD2000). NZGD2000, has a geocentric origin and is compatible with global positioning systems.

3 The Cadastral Survey Data Infrastucture

Individual survey plans provide the building blocks for the New Zealand cadastre. The first national cadastre was provided by the Record Map series, which graphically combined all individual survey plans. The individual sheets of this map series varied from 1:10,000 scale in central city areas to 1:50,000 scale in remote rural areas and presented the cadastral parcel fabric of New Zealand and provided a public counter index to records. The Record Map series was hand digitised in the latter half of the 1980s to form the Digital Cadastral Database (DCDB).

The limited spatial accuracy of the DCDB was gradually enhanced with the coordinate entry of new survey plans and the associated "rubber sheet" adjustment of surrounding land parcels. However, there were limitations in the extent to which the spatial accuracy of the DCDB, so critical to data integration, could be enhanced by this approach.

In 1997, the government made the decision to develop Landonline, the New Zealand automated survey and titles system. This system automates the approval of new survey plans and the registration of land title transactions. To support this functionality Landonline was populated with all of New Zealand's core geodetic survey, cadastral survey and land rights and interest data. In the case of the cadastral data infrastucture this necessitated the capture of survey data directly from each and every survey plan to establish the national survey accurate cadastre.

The roll-out of the survey accurate cadastre around 2001 provided the opportunity to review the pricing of this information in the context of new information management principles approved by the government in 1997. The pricing of the DCDB had been largely based on what the market could sustain and was equivalent to NZ$800,000 per annum per user agency for national coverage. Pricing of the new survey accurate data was set at the marginal cost of dissemination and resulted in a price of NZ$270. While the Crown retained copyright it no longer required the payment of royalty fees where the data was passed on to third parties or to be notified of such transactions. The literal freeing up of this data was justified on the basis that the wider benefit to the economy by far outweighed the narrow benefit of revenue generation from the few parties who could formerly afford the data.

4 National Topographic Mapping and Aerial Photography

The first national medium scale topographic mapping of New Zealand was provided from the 1940s at an Imperial scale of 1:63,360 (1 mile to 1 inch). This mapping was highly variable in its accuracy, being in part derived from plane table survey techniques. Despite the fact that some of the topographic features were mis-registered by up to 800 metres in terms of the national yard grid on which the series was based it was never-the-less, a major step forward at the time.

From the 1970s the 1:63,360 topographic mapping was progressively replaced by topographic mapping at a scale of 1:50,000. This map series was based on photogrammetric analysis using high quality aerial photography. It used the unique New Zealand Map Grid (NZMG), which was optimised for the main land areas of New Zealand and had a nominal positional accuracy of ±20 metres. However, the NZMG had serious limitations in offshore areas and also being internationally offset (by some 40 - 160 metres) was not compatible with modern global positioning systems.

As a result New Zealand has moved to holding its 1:50,000 topographic infrastructure on NZ Geodetic Datum 2000 and proposes to release a new printed map series based on the Transverse Mercator projection. The New Zealand topographic database is available online as Topoonline which presents the information in a Web Mapping Services compliant format, both in terms of the NZMG projection and the New Zealand Transverse Mercator (NZTM) projection.

The 1:50,000 scale national topographic map series integrates features displayed on the maps with official geographic names as determined by the New Zealand Geographic Board. The New Zealand Geographic Board Act 1946 is undergoing review at the present time. An aim of the new legislation is to integrate under the jurisdiction of the Board, official naming of geographic features (including undersea features) in New Zealand, on the continental shelf and in the Ross Sea region of Antarctica.

The aerial photography undertaken for national mapping purposes ranges from low altitude 1:15,840 scale photography in the 1940s with its high level of planimetric distortion through to the modern era of high altitude 1:50,000 photography. Also in recent years the process of 1:50,000 map compilation has involved the development of orthophotographs at a scale of 1:25,000. These orthophotographs have proven popular with a wide range of users and provide a convenient planimetrically correct base on which to reference geospatial information.

The application of the 1997 government information management pricing principles in this area, over six years ago, resulted in the price of a copy of the national structured vector topographic database falling from some NZ$1.8 million to NZ$1,500. In addition, as for cadastral data while the Crown retains copyright it no longer requires the payment of royalty fees where the data is passed on to third parties.

5 Natural Resource Mapping

Mapping of the New Zealand's natural resources was undertaken mainly by New Zealand central government agencies until the 1990s. At that time the economic reforms that had commenced in the late 1980s led to the Resource Management Act 1991 which shifted a large proportion of the resource management roles and responsibilities of central government to local government (at both regional and territorial level). This was followed by the Crown Research Institutes Act 1992, which established a range of research agencies in place of the former government research department. These research agencies hence took over the most of the remaining natural resource data compilation activities of central government.

The central government science agencies that existed prior to 1992 undertook considerable national level mapping of soils, geology, vegetation, erosion and land use capability. With the advent of the more commercially focused Crown Research Institutes this national level activity slowed. The impact is that a significant proportion of the national level resource data predates 1992 and has been at least originally compiled on base mapping which limits the resolution at which it can be integrated with data compiled on new global positioning system base mapping.

Regional government undertakes considerable natural resource data compilation, but as this is funded by local ratepayers it is appropriately limited to that required to meet local resource management objectives. In earlier times regional government received significant funding from central government to undertake resource data compilation activities and along with that funding came conditions that the compilation be in accordance with national data standards which amongst other things aimed to facilitate data integration.

6 National Policies and Frameworks

In 1983 a New Zealand Cabinet paper set out the problems and issues associated with the ad hoc development of geospatial information across the New Zealand government. These included impediments to data integration. It resulted in a unit being set up to coordinate the development of such systems based on the controls of the day, i.e. input funding controls. This attempt was largely marginalised, mainly by the move to the funding of government agencies according to the delivery of identifiable outputs aligned with government outcomes and specific objectives of the government of the day.

In the mid-1990s the government set up the E-Government Unit to facilitate the movement of central government into the new electronic environment. The initiatives managed and championed by the unit raised the profile of interoperability, including that of geospatial data. This resulted in the establishment of the E-Government Interoperability Framework, which, in addition to adopting international standards, has also championed the New Zealand Geospatial Metadata Standard and the geospatial data specification required for emergency services and government administration.

The New Zealand Government Geospatial Strategy is now in its final stages of government approval. It sets out a vision and principles for the development of the New Zealand geospatial data infrastucture and provides for the establishment of a small Geospatial Office to drive developments. One of the first tasks of the Geospatial Office will be to develop a work programme consisting of the initiatives necessary to implement the strategy. However, the actual funding and implementation of each of these initiatives will depend on the outcome of a business case analysis of each initiative.

6 The New Zealand Approach to Integration

As outlined above, New Zealand geospatial data is compiled in accordance with specific business case benefits. Central Government intervenes in the New Zealand spatial data economy only to the extent that is necessary to meet government business objectives. Even then, it outsources work to the private sector to the extent that it is appropriate and cost-effective. The government integrates geospatial data only where this is required to meet its own business requirements. The government philosophy beyond this is to provide its data in accordance with interoperability standards and with metadata that clearly identifies its limitations. By pricing most of this data at the cost of dissemination the net result is that government data is readily available for all other parties to integrate in accordance with their specific end use objectives.

Local government has been a major beneficiary of the new central government approach and particularly appreciates the ready access to the survey accurate cadastre. It commonly integrates the cadastre with imagery and topographic mapping and where difference are challenged in court contracts a surveyor to substantiate the data which invariably upholds the accuracy of the cadastre.

All parties face significant data integration issues where they are dealing with data of different or inconsistent accuracy and especially where this has been compiled against older less accurate mapping on different projections. Consequently, an understanding of the limitations of this data is critical, with much of this being conveyed by metadata. However, some resource mapping requires a fundamental understanding of the mapping philosophies used in trying to portray high level of variability, such as of vegetation and soils in the real world.

In New Zealand the integration of geospatial data is typically based on either the relational linkage of data to existing spatially defined polygons, or the visual overlaying of data, or a combination of these two approaches.

The most common application of the use of existing polygons to integrate data is the linkage of land titles, valuation and statistical data to the land parcels of the cadastre. This, as with the visual integration of data, is now invariably undertaken in an electronic environment.

In New Zealand the private sector is at the leading edge of geospatial data integration, especially in the case of 3-dimensional portrayals. However, its capacity to achieve this position is underpinned by government outsourcing activities and the ready availability of government data on which this sector of the economy can build added value products and services.