



Cadastral Reform

An ICSM Discussion Paper

Prepared by

Andrew Jones

Manager, Spatial Policy and Management
Department for Environment, Heritage and Aboriginal Affairs
South Australia

Chris Rowe

Surveyor General
Department for Environment and Land Management
Tasmania

Peter Kentish

Surveyor General
Department for Administrative and Information Services
South Australia

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1. Introduction

Australia owes much to its cadastral systems. For more than a century, they have delivered certainty and security to the nation's land markets. Their value, while frequently understated, is clearly evidenced by the nation's social and political stability. In many ways, they are the quiet achievers of the nation's economic and social institutions.

The success of Australia's cadastral systems has stemmed from their demonstrated ability to satisfy a fundamental societal need. The maintenance of that success has stemmed from their capacity to evolve with society. Invariably, the evolution of community needs has been matched by appropriate changes to the cadastral systems, enabling rather than inhibiting new developments. The introduction of strata titles and community titles are excellent examples.

Australia has witnessed massive technological and social changes during the last twenty-five years. Some of these changes have been gradual. Others, however, have been radical and have fundamentally changed the way business is transacted. Given these developments, it is appropriate to consider the issue of future cadastral reform against the broader background of developments within society. The purpose of this paper is to probe this issue further and to promote debate in relation to the subject.

2. Cadastral Reform Vs Technological Change

It is useful to make a distinction between cadastral reform and technological change.

- Cadastral reform is a process through which the principles governing the nature and purpose of the cadastre are amended or revised. Such reform is prompted by a change to society's belief or value system, necessitating a similar change to its governing, regulating or implementing institutions. The changes may be evolutionary or

revolutionary. The introduction of a legal coordinated cadastre would be a clear example of cadastral reform.

- Technological change is concerned with the technical implementation of cadastral systems. It changes how things are done rather than why they are done. The outcome is the same but is achieved more quickly or efficiently. The replacement of manual drafting with computer assisted drafting is an example of technological change.

Technological change may be a catalyst for reform. However, it is not a substitute for reform. Reform is driven by a societal need. Technology may be the enabling mechanism for delivering the reform.

3. Drivers for Reform

From the outset, it should be stated that drivers for cadastral reform in Australia do not stem from any fundamental failing in the nature of the cadastre. On the contrary, in 1999, Australia's cadastre continues to fulfil its core functions, supporting a vibrant market in land dealings. There are, however, drivers for reform which derive from the consequences of the information revolution. They relate to the acquisition, storage, dissemination and interpretation of cadastral data, and have implications for the administration and practice of cadastral surveying. They can be categorised into four groups as follows.

3.1 Capture of Information - Availability of Measurement Technology

Positioning technology and digital mapping is no longer confined to groups of expert users. Low-cost GPS units and GIS systems are increasingly finding their way into domestic and businesses usage. As the accuracy of GPS improves, so will the demand for spatially accurate digital mapping, including cadastral mapping. There will therefore be a rising client expectation regarding the accuracy and availability of cadastral data.

3.2 Access to Information - Private and Public Interests in Land

Interests and constraints on land are derived from both private and public sources. In Australia, private interests are registered on a Title document. However, public interests have no single summary, being administered by a myriad of public bodies. Increasingly, there will be a demand for a single source of (or gateway to) all land information. A future cadastral system will need to satisfy this demand.

3.3 Delivery of Information - The Digital Revolution

The advancing tide of computerisation and digital technology through the nation's homes and businesses is raising expectations regarding the delivery of information. Future commercial success will largely be dependent on the ability to deliver information via the Internet or other digital media. The availability of appropriate cadastral information in digital form will be increasing regarded as indispensable.

3.4 Market for Information - Globalisation

As companies and financial institutions evolve into global entities, there will be a growing demand for uniformity among world's land administration systems. The adoption of a common cadastral model will become increasingly desirable. Investment and transactions will be preferred in countries that conform with such a model. National prosperity will become tied to international conventions.

4. A Vision for the Future - Cadastre 2014

In 1998, Commission 7 of FIG published a document entitled "Cadastre 2014, A Vision for a Future Cadastral System" by Jurg Kaufmann and Daniel Steudler. The document defined Cadastre 2014 as:

"... a methodically arranged public inventory of data concerning all legal land objects in a certain country or district, based on a survey of their boundaries..... [Legal land objects] are defined either by private or by public law"

A land object is defined as being a piece of land in which homogeneous conditions exist.

The Cadastre 2014 document makes six statements about the development of cadastres during the next twenty years. They are as follows:

Statement 1 - Cadastre 2014 will show the complete legal situation of land, including public rights and restrictions!

Statement 2 - The separation between maps and registers will be abolished!

Statement 3 - The cadastral mapping will be dead! Long live modelling!

Statement 4 - Paper and pencil-cadastre will have gone!

Statement 5 - Cadastre 2014 will be highly privatised! Public and private sector are working closely together!

Statement 6 - Cadastre 2014 will be cost recovering!

Statements 1 and 2 foreshadow significant reform in the way the cadastre is perceived and operated. Both are considered further below.

Statements 3 and 4 are primarily concerned with technological change rather than fundamental reform. They reflect the migration from traditional drafting and recording techniques to computer based systems. While providing the conditions for cadastral reform, they are not of themselves cadastral reform.

Statements 5 and 6 imply significant reform to the bureaucracy and financial structures supporting cadastral administration. While these are major issues, they are outside the intended scope of this paper and will not be discussed further.

4.1 The Concept of Land Objects

"To me, in this context, [the cadastre] means and refers to land in comparatively small parcels, to land as an economic or social unit.for the most part looking at land as the property of individuals, private or public, in lots which have usually at some stage been defined on a plan of survey."

Law Relating to Land Boundaries and Surveying, A.G. Brown, 1980

The quotation from Brown reflects the traditional view of the cadastre in Australia. It is centred on the land parcel that has been created by a survey plan and which has a title deed summarising any legal interests. Cadastre 2014 describes such parcels as being legal land objects based on private law.

Cadastre 2014 proposes that the concept of the cadastre should be taken one step further. It points out that there are publicly imposed constraints on land through mechanisms such as mineral exploration licenses, water protection legislation, native title, land use planning and topographically related restrictions (for example, flood planes). These are defined on public plans and topographic maps rather than title documents. Yet they affect the use and disposition of the property as much as the endorsements on the title.

The polygons defining the extent of publicly imposed constraints are referred to as public land objects. Their conceptualisation gives rise to an expanded model of the cadastre, comprising multiple layers of public and private land objects. Each layer (legal parcels, fiscal parcels, exploration licenses, planning zones, etc.) is legally independent of the others and is administered by an appropriate agency. However, when brought together, they provide a cadastre which

displays all interests in land, both private and public.

Public interests will be spatially determined for each parcel, necessitating the fixing of all legal land object boundaries in a common spatial reference system.

4.2 Separation Between Maps and Registers

Cadastre 2014 notes that historically, surveyors have handled the spatial aspects of the cadastre, while conveyancers have handled the process of registration. This has often resulted in two different organisational units dealing with the same matter, the work being subdivided in accordance with required skills.

The revolution in digital technology has potential to reform this situation. The ability to rapidly aggregate spatial and textual information about land has the potential to streamline processes that require technical input. Specialist opinion will only be needed for the more complex cases. In such circumstances, the division between surveyors and conveyancers could be seriously changed, possibly leading to formation of an amalgamated professional grouping.

5. Issues

There are a number of issues that arise from the preceding discussion. Prominent among them is whether Cadastre 2014 represents a viable model for the reform of the Australian cadastre. Certainly there are some persuasive reasons supporting its adoption, most notably:

- Cadastre 2014 has achieved a degree of international acceptance. It therefore has the potential to provide the global model for the cadastre.
- Australia is already well advanced in implementing many of the concepts that Cadastre 2014 espouses. Implementation does not represent a major diversion from existing strategies. Moreover, the fundamental concepts appear to have received a degree of endorsement by the Institution of Surveyors Australia.
- Other countries have a lower level of maturity as regards Cadastre 2014. There is potential for Australia to assist implementation in those countries.

Regardless of whether Cadastre 2014 is adopted or not, community (Australian and international) pressures for ongoing cadastral reform will continue, reflecting the accelerating pace of change in wider society. Accordingly, it is ICSM's view that the following cadastral reform issues need to be addressed in the coming years.

5.1 A Universal Cadastral Model

Noting the globalisation trend, Australia should actively subscribe to the development of a universal cadastral model that can be applied in all parts of the world. It should undertake this activity as part of its contribution to Global Spatial Data Infrastructure activities. Given the country's recognised expertise in cadastral systems, it is appropriate that it plays a lead role in this area.

5.2 Multi-Layer Cadastre

ICSM supports the multi-layer cadastral model proposed by Cadastre 2014. In particular, it endorses the concept of private and public land objects and will actively pursue the expansion of cadastral record systems to incorporate both private and public interests in land. The National Cadastral Data Model will reflect this development.

It should be noted that practical implementation of this reform will be dependent on information technology. In particular, it will require the ability to integrate spatial data drawn from distributed databases and thus spatially determine the public

interests over a private parcel of land. This technology is already available and will continue to grow in its utility.

5.3 Definition of Land Objects by Coordinates

At the present time, the redefinition of cadastral boundaries in Australia is based on a hierarchy of evidence which has evolved from common and case law. Data, including coordinates, occupy the lower part of the hierarchy, monumentation and evidence of intent taking precedence.

The storage of land objects in computer databases will necessitate the description of boundary points in terms of a geodetic coordinate system. This is not a new concept, Australia's digital cadastral databases (DCDBs) already storing information in this manner. However, it is conceptually different to the principles applied in boundary redefinition.

At present, Australia's DCDBs are mostly of graphic accuracy. This limits their utility in legal and similar applications. In the coming years, an accessible survey-accurate cadastre will increasingly be demanded to support engineering, planning and land administration applications. Ultimately, this could lead to the adoption of coordinates as *prima facie* evidence of boundary position (a legal coordinated cadastre). This would represent a fundamental reform of the law relating to boundary definition.

ICSM recognises the need for the accuracy and methodology of land boundary positioning to remain appropriate to the needs of society. It therefore encourages debate on:

- a spatial cadastral model based on the identification of land objects by coordinates,
- the evolution of that model into a legally authoritative system underpinning security of title.

5.4 Spatial Framework

The integrity of a multi-layer cadastre is dependent upon the establishment of correct spatial relationships between the component layers. For example, the relationship between a land parcel and a mining exploration license may only be identifiable by overlaying a parcel boundary map with an exploration license map (digitally or manually). The ability to do this is dependent on both being available in a common coordinate system to a level of spatial accuracy that satisfies the intended purpose.

This, in turn, relates to the geodetic component of the Australian Spatial Data Infrastructure (ASDI). ICSM, therefore, strongly endorses the use of the GDA94 in the determination of all cadastral layers, providing a unified geodetic and cadastral framework through which all spatial information can be integrated.

5.5 Impact on Practitioners

Cadastral surveying has long been the subject of jurisdictional regulation and control. In part, this has been manifested through:

- the licensing or registration of practitioners (following a specific regime of examination and practical experience),
- the examination of surveyor's plans at official land registries to ensure legal and technical integrity.

Licensing/registration is frequently portrayed as a mark of professional competence and thus a form of protection to the wider community. This being the case, it is questionable why survey examination by land registries should be

necessary. If the licensed practitioners are regarded as professionally competent, why should there be a government-sponsored examination process to protect them from the consequences of their errors?

It is worth noting that the practice of engineering and mining surveying is deregulated and that surveyors in those fields assume full professional responsibility for the integrity of their surveys. It is also interesting to note that engineering and mining projects often involve much larger capital investments than cadastral projects.

Licensing/registration is frequently viewed as a 'barrier to entry' to the surveying profession. It should not also serve as a psychological 'barrier to exit' by practitioners. Its protective influence must not discourage the exploration or adoption of new philosophies, methodologies and technologies. While licensing/registration is one way of implementing standards, it is not necessarily the only way.

It should be noted that the advent of a legal coordinate-based cadastre would remove a large part of the current rationale for licensing/registration. It would also remove much of the need for survey examination, requiring surveyors to take a much higher level of responsibility for their work. It would not, however, remove the need for practitioners to be competent, nor would it remove the need for discipline specialists.

Clearly it is appropriate to encourage debate regarding the future reform of surveying administration in Australian jurisdictions. It is proposed that this be pursued and that particular emphasis be placed on competency certification for operation within a coordinate-based cadastre.

5.6 Implications for Professional Groups

The land-related professions have traditionally functioned as distinct entities, liaising when appropriate to accomplish specific outcomes. It is debatable whether this is an appropriate structure for the future. The growing ability to access and update integrated land-related information raises questions regarding segmentation of the professions. Is it appropriate to move away from relatively narrow professional streams and develop a more broadly-based multi-skilled profession?

Clearly this is a contentious issue. Traditional organisational boundaries and perceived ownership of skills will fuel an inevitable resistance to change. However, given the impact of information technology and the trend towards multi-skilling in the nation's workforce, it is appropriate that the question of amalgamated professional structures be placed on the agenda for further discussion.

