

**ACHIEVEING SUSTAINABLE DEVELOPMERNT OBJECTIVES
THROUGH BETTER MANAGEMENT OF PROPERTY RIGHTS,
RESTRICTIONS & RESPONSIBILITIES**

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KEY WORDS: property rights, restrictions, responsibilities, sustainable land management

ABSTRACT

The existing management of property restrictions and responsibilities poses a major barrier to achieving sustainable land management. Administrative responses have concentrated on organising information rather than achieving the original policy objectives of good land management. Disparate management of individual restrictions has made it extremely difficult to develop and evaluate the effects of land policy. The management of land and natural resources must be far more collective. The complex set of private and public interests that apply to land must be consolidated, simplified and made easily accessible to all. Restrictions on land need special treatment and must be understood in the context of a thorough analysis of existing regulatory regimes and management systems. Key characteristics of each restriction must be assessed, including spatial extent, impact on tenure and reason for creation. These characteristics enable us to determine the importance of a restriction and develop an appropriate administration tool that enables achievement of sustainability.

INTRODUCTION

The number of restrictions and responsibilities that control land use and development has rapidly increased over the last fifty years. Unlike the management of ownership, the administration of these new interests is ah-hoc and lacks integration. The new Land Management Paradigm (Enemark et al, 2004) demands that land and resources be managed holistically: a new model for the management of property rights, restrictions and responsibilities is required.

This paper describes the preliminary findings of ongoing research into the problematic management of property restrictions and responsibilities. The aim is to refocus the issue as one of land management, rather than one of information organisation. A preliminary framework for categorizing the different types of restrictions and responsibilities is provided: such a framework can guide future administrative responses. Also discussed are a number of institutional, regulatory and policy issues that relate to restrictions and responsibilities. To date, these issues have received minimal attention: achieving sustainable land management will require that these issues be addressed.

A BACKGROUND TO THE LAND MANAGEMENT PARADIGM

Sustainability theory now underpins the policy objectives of many developed countries. The philosophy promotes the equitable distribution of *economic* and *social* wellbeing amongst the community. The wellbeing must be sustained over many generations while maintaining the quality of the *environment* (FIG, 1999).

Land Administration has an important role to play in the achievement of these policies. Earlier Western land management paradigms that saw land only as a commodity for wealth generation must be modified (Ting et al, 1999). These systems separated the administration of land into isolated institutions and concentrated on recording only the legal and fiscal arrangements that related to land (Enemark et al, 2004). This led to the creation of many incompatible spatial/non-spatial information sets which record variations of the same thing: parcel location, ownership, use and value. Replication is costly and creates administrative voids: in order to achieve sustainability objectives there must mechanisms for linking the management of ownership, land use development, environmental conservation and other forms of property regulation. Land administration systems must become far more integrated. The operations of the four core functions: land tenure, land valuation, land use and land development, should be driven by a single sustainable land policy and underpinned by a spatial information infrastructure that provides the fundamental and authoritative spatial information sets, particularly cadastre and address (Figure 1).

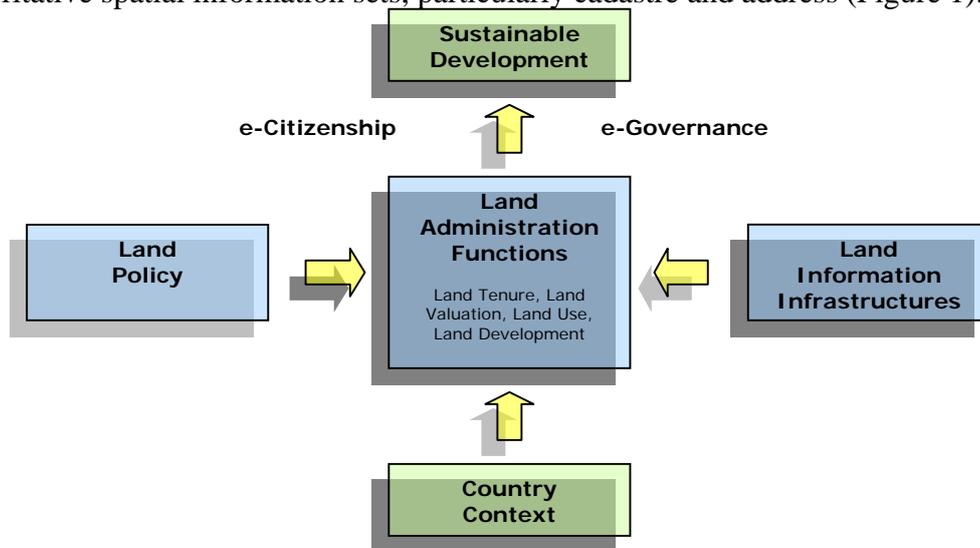


Figure 1: The Land Management Paradigm (Enemark et al, 2004)

This new Land Management Paradigm will allow for the practical implementation of sustainable land policies: better land tenure and valuation systems will continue to generate economic wealth through taxation and land transfer; better tenure systems will strengthen social cohesion through the provision of tenure security; and integrated land development and use systems will limit environmental degradation of land for the benefit of the wider community (Enemark et al, 2004).

THE ROLE OF ICT AND SPATIAL INFORMATION

To overcome the historical lack of integration between Land Administration Functions the new Land Management Paradigm will require heavy investment by

governments in ICT and geo-coded information. ICT allows for easy transfer of information between government departments and the public. Geo-codes link disparate datasets using the spatial attribute and as could be used to integrate the large amount of information required for the development of land policy (Figure 2) and the undertaking of any land related commercial, residential or agricultural development. Better decision making would result through enhanced environmental and social impact analysis of proposed developments. Geo-coded information also offers huge possibilities to other governmental and societal activities: spatial information will assist the policy creation and administration of areas as diverse as health, taxation, education, taxation, defence and immigration.

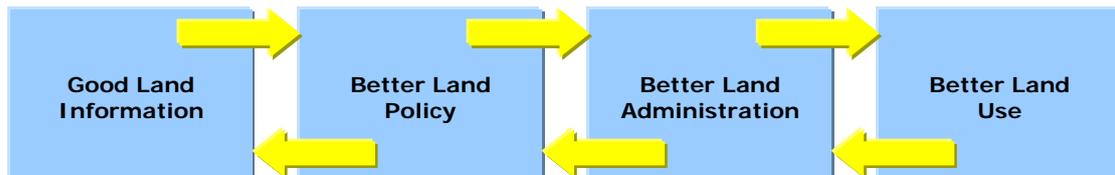


Figure 2: Sustainable Development is not attainable without good land information (FIG, 1999)

RESTRICTIONS & RESPONSIBILITIES: BARRIERS TO THE VISION

Enemark et al's (2004) model offers a simple theoretical model to base our future land management systems on. However, in reality land administration systems are far more complex and the vision of complete integration is still largely unrealised. Even though there have been vast improvements in the data, standards and access regimes that comprise land information infrastructures, they have yet to produce substantial integration between land administration functions. Offsetting advances in ICT is the regulatory explosion in new land related legislation that has emerged over the last 50 years.

The post-WWII era presented a number of challenges to traditional Land Administration Systems. Population growth through birth and migration and the heavy industrialization of farming processes placed massive pressures on land. This led to the emergence of social movements that focused upon the environmental, rather than economic, dimensions of land use (Ting, 2002). These civil rights and sustainability movements drove the creation of legislative and management regimes that could exist independently of ownership registration while protecting land for the benefit of all (Wallace, 2004). Governments are continuing to embrace sustainable development policy and the number and complexity of laws and regulatory systems is increasing (Lyons et al, 2004).

There is still much debate over whether the legislative regime is valuable or even necessary. What is more certain is the inefficiency of the administrative regime: legislation is created in an ad-hoc manner and the institutions which administer the regulations are not integrated. The laws have undermined the vision of a single registry as the depository of all interests in land. Unlike the centralized management and law making related to the ownership layer, the creation of restrictions has been reactionary, ad hoc and non-centralized. The legislative restrictions are valuable; however, they work outside existing land administration systems. A title no longer reflects all interests in land and many interests are not secured or easily accessible.

There is now clear consensus that an information management problem exists; however the solution is contentious. Free market economists have called for a reduction in restrictions, to let the market manage land, but would such a system be reliable? Would it simply advance the land exploitation that has occurred for the last one hundred years? Some land administrators advocate a complete overhaul of the systems, in an effort to regain control and recentralize management, but is the cost and institutional upheaval of such a system justifiable? Others suggest that we extend title registration system to incorporate restrictions; however, these systems were designed for the management of private rights. Do we really want to tamper with the traditional registry? Or would a shift away from the parcel approach reap greater rewards? Furthermore, some restrictions are actually already managed well. While the solutions have some merit, they do not address the real issue: *creating an administrative regime that will enable the achievement of sustainable land management.*

DEVELOPING A BETTER UNDERSTANDING OF THE PROBLEM: VICTORIAN CASE STUDY

Thus far, the problem has been discussed on a broader level without being broken down into component parts. No attempt has been made to develop an analytical framework or ontology for restrictions and responsibilities. Consequently solutions proposed for the administration problems have been complex, expensive and government focused: end-user requirements, private sector involvement and emerging spatial information and communication technologies have not received enough attention. These proposed solutions will not adequately assist the provision of sustainable development.

It is proposed that a concise definition and classification model for restrictions and responsibilities needs to be established. For each classification appropriate management models can be developed. To develop the ontology and accompanying management models, the following methodology (Figure 3) was proposed and undertaken.

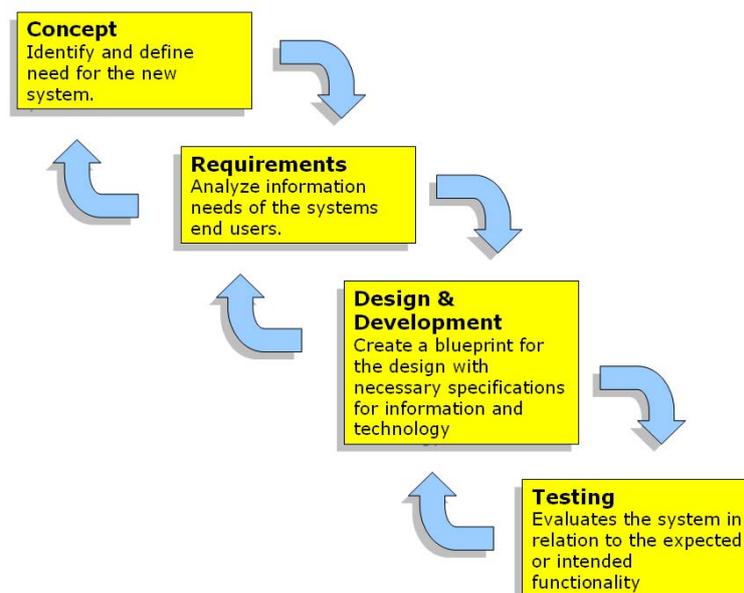


Figure 3: Methodology for Development of Restrictions & Responsibility Ontology

To date, conceptualisation is complete and the requirements phase has commenced. Analysis will be conducted in a number of different areas. Previous projects based on restrictions and responsibilities management have concentrated on developing government driven management solutions. While this is important, it is also crucial to consider the role end-users and new information technologies can play: these are the main drivers for change. International initiatives also merit consideration. Therefore, this project will consider the Australian provider and user sides, emerging Geo-ICT and European initiatives, using the Netherlands as the illustrator. Figure 4 illustrates these four areas of analysis. Collectively they will provide the inputs for the Design and Development phase.

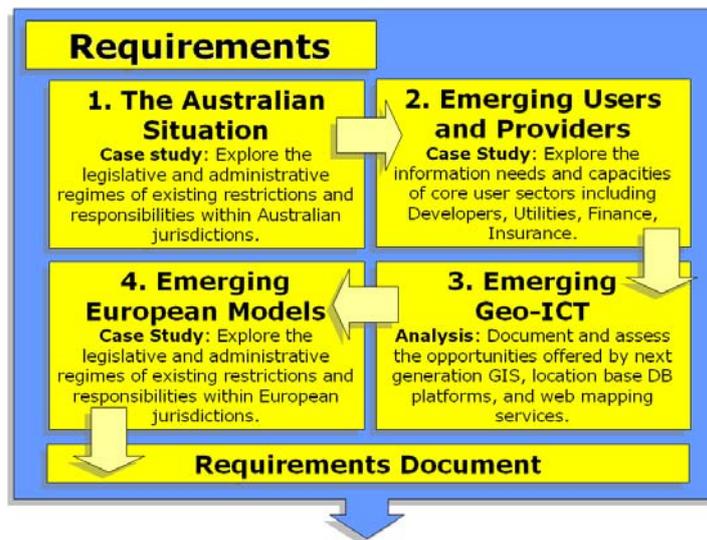


Figure 4: The Four Analysis Areas of the Requirements Phase

The Australian state of Victoria was chosen as the primary case study jurisdiction. The first stage of the case study concentrated on assessing the impact and management of all of the restrictions and responsibilities in Victoria at a State, Federal and Local government level. Table 1 identifies the different criteria considered in the analysis. The results of this analysis have been used to develop the preliminary classification model.

Table 1: Criteria for Assessing Statutes

Category	Criteria	Possible Values
Policy Level	Legislative Origins	National, State, Local, Body Corporate, Unlisted
	Type of Legislation	Proscriptive, Descriptive
	Period of Creation	1950 ◇ 2000
	Driver for Creation	Government, Public Driven
	Type of Land Affected	Urban, Rural, Marine Environment, Commercial, Residential, Ind, Agr
	Type of Interest Created	Right, Liberty, Power or Immunity (Cole and Grossman, 2002)
Management Level	Type of Administration Body	Minister, Government Department, Local Council, Statutory Authority
	Private Sector Involvement	Public Private Partnership, None
Operational Level	Allocation Method	Systematic, Sporadic
	Registration Method	Single Register, Multiple Registers, Negative Register, No Register, Torrens, Deeds

	Update Method	On request, None
	Removal Method	Time Based, Request Based, None
	Level of ICT	Automated Online, Automated Onsite, Paper Based
Public Access Method	Price to access	Transaction Fee vs. Cost Recovery vs. Nothing
	Access Point	Automated Online, Automated Onsite, Onsite, Unavailable
	Altering Information	Online, Onsite, Unavailable
Impact on Rights System	Tenures Affected	Private vs. Public vs. Communal vs. Open Access
	Relationship to the Cadastral Map	Parcel Based, Non-Parcel Based
	Relationship to Land Registry	Recorded in Registry, Link to Registry using ID, No Relationship
Spatial Elements	Spatial Unit	Parcel (Polygon), Network, Points, Lines, None
	Identifier	Parcel ID, Property ID, Council Number,
	Mapping Status	Complete Automated Online Map, Incomplete Automated Online Map, Automated offline Map, Paper Based Map, None

Smaller case studies will be conducted on emerging users and providers of restrictions information. Emerging users include the utility sector, development sector, finance, insurance sectors, local councils, emergency agencies and agriculture. These case studies will concentrate on identifying the information needs of these sectors and determining innovative tools for restrictions and responsibility management. Industry bodies will be surveyed to gain an understanding of information needs. Individual organizations will be consulted to assess any innovative management solutions.

A smaller case study and testing environment will also be drawn from one European jurisdiction. These case studies will concentrate on identifying any innovative tools for restrictions and responsibility management. Western European jurisdictions have highly accurate and relatively complete cadastres. This supports their holistic management of restrictions and responsibilities. This case study will occur later in the project cycle- it will be used to test the universality of the preliminary classification and management models developed from the Australian case studies. Selection of these case studies will occur further into the project. It is envisaged criteria for selection will be similar to the Australian case studies. The most likely candidate at this stage is The Netherlands, a world leader in modern day land administration with high level of international engagement, and novel approaches to administration.

PRELIMINARY FINDINGS: NEW UNDERSTANDINGS OF RESTRICTIONS AND RESPONSIBILITIES

a) Relating restrictions and responsibilities to rights: redefining ownership and understanding competing property interests

There is little consensus on a theoretical definition of property restrictions and responsibilities. Given the importance of restrictions and responsibilities in social, economic and environmental terms it might be expected that a detailed and clear definition would exist. However, while much of the literature across the disciplines of economics, law and land administration refers to land based restrictions and responsibilities, there is no prevailing definition and consequently no classification system.

An analysis of property restrictions and responsibilities is inseparable from one of property rights. Lyon's et al (2002) believe the term "property rights" has many different definitions. Some commentators interpret the term to relate only to "real property" or definitions in particular legislation. Others view property rights as

generic- encompassing access rights, use rights and entitlement rights; and some believe these terms have their own specific meanings. In relation to restrictions and responsibilities, there are two main lines of arguments: the first defines the term to incorporate restrictions, responsibilities and controls; the second divides the term into separate entities. These discussions might seem trivial; however, it is these disparate definitions that make building an appropriate administration system so difficult. The composition of a right in combination with the physical characteristics of the resource and the nature of the transactions within it play a key role in determining the most effective system for titling and registration (ACIL Tasman et al, 2004).

At a practical level, most definitions of property rights advocate the conferral of three qualities (Sheehan and Small, 2002):

1. Exclude: the ability to exclude others;
2. Withdraw: the ability to receive income or benefits; and
3. Alienate: the ability to sell or alienate the interest.

In this way property rights can be seen as comprising a ‘bundle’ of individual opportunities. Authors disagree on the number of individual rights; however, all definitions include the three listed above as a minimum. Tan’s (2002) definition uses the bundled approach, maintaining that property is merely a legal entity and defines the relationship between a legal person and the resource in question (Figure 5).

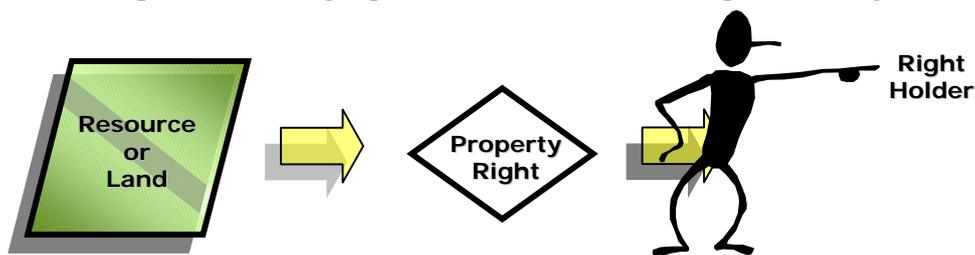


Figure 5: Traditional Approach to Property

The belief that rights, including property rights, are generated only by government is known as *legal positivism* (Sprankling, 1999) (Figure 6).



Figure 6: Functional Theory of Property

This idea has been extended: a property right only exists when the community supports and protects the exclusive use and enjoyment of that entitlement (National Competition Council, 2001). Property rights are now considered legal statements that relate three entities: the resource, the owner (what they can/can’t do) and the non-owners (what government and other citizens can/cannot do) (Figure 7). This third entity, ‘non owners’, is important in relation to restrictions and responsibilities as it is

the reason they exist. It is this complex three-way relationship that administration systems must now attempt manage holistically.

In contrast to legal positivism, *natural law theory* suggests that rights arise in nature as a matter of justice and independent of law: the role of government is to enforce rights not create new ones (Sprankling, 1999). Natural law theory has been central to European philosophy for millennia; however, its influence has gradually diminished with legal positivism prevailing in the modern day (Sprankling, 1999).

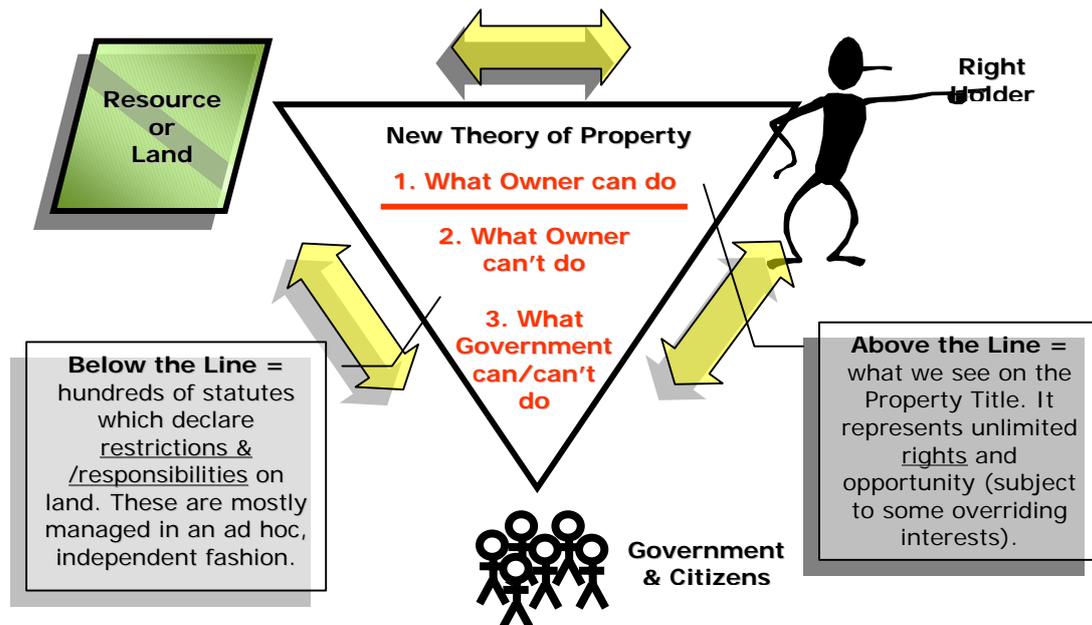


Figure 7: New theory of property right incorporating restrictions and responsibilities

It is important to distinguish between property 'rights' and 'ownership'. There is often great confusion when debating property rights because terms such as 'property', 'property rights' and 'owner' are interpreted so differently (ACIL Tasman et al, 2004). It is generally the right to exclude that defines a legitimate owner, even though rights of exclusion are only one of the many rights that can be attached to a resource. Property rights can include any of the three above mentioned rights, while outright ownership will typically encompass all of them (ACIL Tasman et al, 2004). Depending on an individual's or group's tenure they will hold a different number of individual rights.

It is possible for different people to hold the same type of right over the same area of land (Table 2). Tenure theory is often used to define the level of property rights held by an individual. Four primary tenure types are defined: private, public, communal and open access (Prosterman, 2001). Each classification can be further subdivided: for example, leases and mortgages are sub classes of private tenures.

Table 2: Bundles of rights associated with position (Ostrom and Schlager, 1996)

	Owner	Proprietor	Claimant (Tenant)	Authorised User	Authorised Manager	Authorised Entrant
Access	X	X	X	X	X	X
Management	X	X	X	X	X	

Withdrawal	X	X	X	X		
Exclusion	X	X				
Alienation	X					

The above framework can be used to classify different statutory restrictions. The majority of government created restrictions convey the rights of access and management to statutory bodies or other private citizens (e.g. licenses/permits) thus creating “Authorised Managers” and “Authorised Entrants”. It should be noted that many statutory restrictions offer withdrawal, exclusion and even alienation rights (e.g. Australia’s Land Acquisition Act). In this way restrictions and responsibilities can be seen as collections of rights that vest in someone other than the owner i.e. government or other private citizens.

An administrative response should be in proportion to the type of tenure created: higher levels of interest need more security and their status should be available to all. In Australia the bundle of rights equating to ownership is registered and secured by the state government using the Torrens form of registration. This is expensive to, but appropriate, given the importance of the ownership layer. However, not all types of tenure need such extravagant methods of administration nor could it be afforded.

The above definitions (bundles of rights) and classification model (tenure theory) have greatly assisted the management of property rights; however, they have not been properly applied when designing administrative responses for restrictions and responsibilities. Thus restrictions and responsibilities have been managed in an ad hoc manner: some recorded on the Torrens title, others recorded in a range of different registers, some spatially defined, others not spatially defined, or others- not recorded at all, particularly if they do not relate to individual private parcels.

Wesley Newcomb Hohfeld’s ‘system of jural relations’ is another framework that suggests restrictions and responsibilities are nothing more than property rights seen from a different stakeholder’s perspective (Table 3). The system provides a good description for the relationship between rights and restrictions/responsibilities (collectively referred to as duties). Hohfeld expressed concerns about the vague definitions of rights: the term was being “used indiscriminately to cover what in a given case may be a privilege, a power, or immunity, rather than a right in the strictest sense” (Cole and Grossman, 2002). Hohfeld’s jural relations suggest that in order to establish a right (as opposed to some other, lesser, interest) one must be able to identify the corresponding duty (or restriction) that someone else “possesses”.

Table 1.2: Hohfeld’s System of Jural Relations (Cole and Grossman, 2002)

Elements	Correlatives	Opposites
Right	Duty	No Right
Privilege	No Right	Duty
Power	Immunity	Disability
Immunity	Disability	Liability

Hohfeld’s system raises a number of interesting points. Firstly, as previously stated, a person’s perception of a right might vary according to how that right affects them. It might actually be perceived as a form of restriction. Nonetheless sound administrative

systems for managing both rights and duties (restrictions/responsibilities) are required. Furthermore, not all interests in land are as strong as a right and therefore deserve less secure administrative systems. Conversely, some infringements are not restrictions and therefore do not warrant as much administrative attention: for example, the ‘privilege’ of a cadastral surveyor to enter someone’s private property, while highly important, need not be recorded on the title; the long term minimal impact on the land owner does not warrant the administrative expense. Finally, governments must recognise that when they place a duty on a particular parcel they are not only creating a corresponding right for the community, they are tampering with the notion of property ownership, the fabric on which all western economies are based.

Ting et al (1999) provide another method for defining restrictions and responsibilities. The evolution of restrictions from the agricultural and rural restrictions used by the ancient Romans through to modern day zoning, environmental regulations and native title legislation are traced. This provides historical context to the creation of restrictions (Figure 8) and is useful for understanding the current relevance of the restriction and their corresponding administrative response.

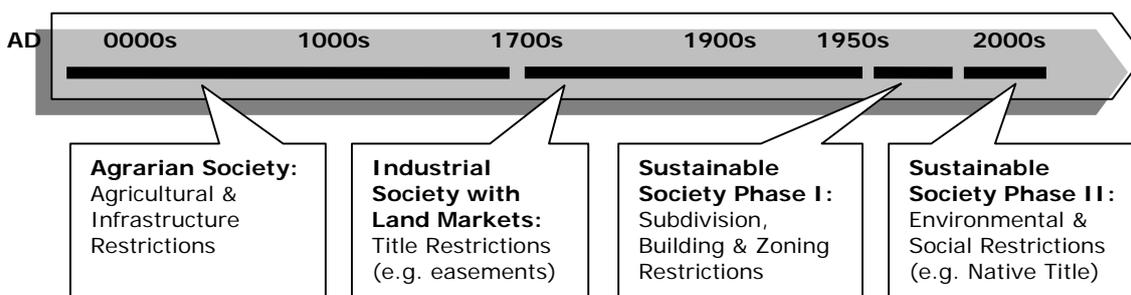


Figure 8: The Evolution of Land Related Restrictions (extended from Ting and Williamson, 1999)

To summarise, existing definitions of rights, restrictions and responsibilities have been complicated by changing societal perceptions. Recent developments in land property- such as the evolution of governmental land-use planning controls- suggest that the previous theories of property as an unrestrained set of rights are now inadequate (Small, 2002). As discussed earlier, most property rights are subject to some form of regulation. Even those rights recorded in a Torrens register are not immune from subsequent legislative or regulatory modifications (ACIL Tasman et al, 2004). Restrictions and responsibilities are now inextricably linked to our theories of property rights and ownership. Sustainable land management demands that these similar concepts be dealt with in a holistic manner.

b) Classifying restrictions and responsibilities: understanding the tenure and spatial elements

Having placed restrictions and responsibilities in a theoretical framework of property rights it is worth refocusing on the administration of the interests. Governments have created hundreds of different restrictions and responsibilities in legislation and divided their management across many different departments and statutory authorities. Attempting to reorganise and recentralise the management of all these interests would be impractical and expensive. The areas of immediate concern, those

restrictions which impact on the achievement of sustainability objectives, should be addressed first. Assessing the spatial extent of each restriction is a useful way to determine its importance in the context of the whole jurisdiction.

Restrictions and responsibilities can impact spatially on a jurisdiction in a number of ways (Figure 9). The ownership layer can be used to compare the extent of different layers. The ownership layer covers an entire jurisdiction: all land must have a private, crown or communal owner attached to it. Similarly, a Blanket Restriction applies to an entire jurisdiction: land acquisition laws are examples. Blanket restrictions require minimal administration. A Single Parcel Restriction applies to a single parcel, property or small area and usually requires minimal administration. The Melbourne Cricket Ground Land Act is an example.

A Patchwork Restriction may or may not apply to any given land parcel. Licenses, permits and many environmental land use agreements fit into this category. Large amounts of administration are required for these restrictions and in the past this has been disparate and problematic. Non Parcel Restrictions do not relate to a single parcel, however, they can still be spatially identified. Examples are restrictions on utility infrastructure and in the marine environment. In the past these restrictions have not been administered spatially: much opportunity exists for more integrated management in this area.

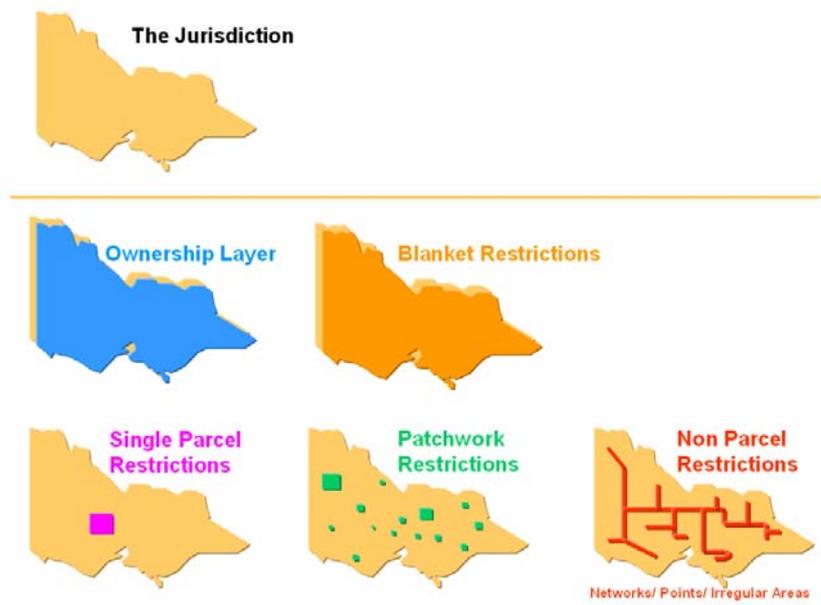


Figure 9: The Spatial Extent of different Restrictions and Responsibilities

The impact that a restriction has on different tenures also offers a guide as to the type of administrative response that is required. As mentioned previously, all tenures can be classified as Crown, Private, Communal or Open Access. A regulatory restriction may impact on all or a single one of these tenures. In western countries it is most important to concentrate on administering those restrictions which relate to private tenures. By simplifying, consolidating and making available the restrictions that apply

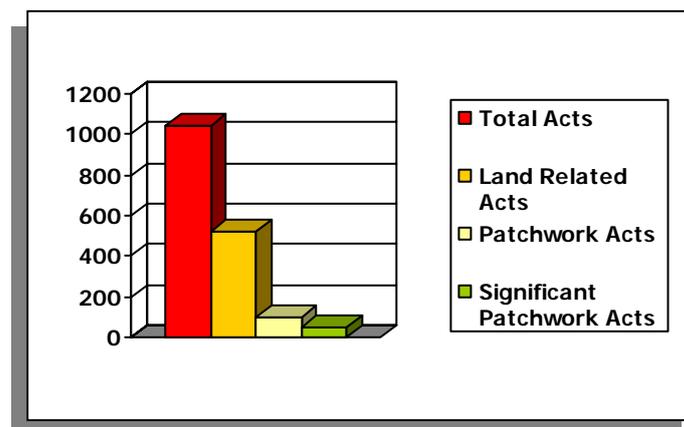
to private lands, permitted land development will occur more efficiently and there will be better enforcement of those who do wrong.

Tenure(s) Impacted by Restriction

		Crown	Private	Communal	Open
Spatial Extent of Restriction	Blanket	e.g. Coastal Management Act	e.g. Land Acquisition Act	e.g. No selling Communal Lands	X
	Patchwork	e.g. Alpine Resort Mngmt Act	e.g. Ag and Chemical Use Act	e.g. Proposal to Lease Communal Lands	X
	Specific	e.g. MCG Land Act	e.g. CityLink Act	e.g. Mabo Case	X
	Non-Parcel	e.g. Electrical Safety Act	e.g. Non-Real Property	X	X

Figure 1 n

Of the 1045 laws in the Victorian Statute Book (August 2005), 523 of them regulate activities on land. These first two types of restriction (Blanket and Specific) account for ~80% of the 523 and this reduces the size of the perceived problem greatly as these laws require minimal administration. The remaining 100 laws are either Patchwork or Non Parcel and of these, only ~50 appear to have a large impact on private land related activities (Graph 1). Administrative responses should now concentrate on organising the management of these 50 *more important* regulations as occurred in the Netherlands after a similar study was conducted.



Graph 1: Land Regulations in the Victorian Statute Book

FUTURE RESEARCH DIRECTION AND QUESTIONS

a) Extending the Case Study: Other Levels of Government and End User Requirements

To date, the case study has only considered the laws in the Victorian statute book. This will not provide a complete list of restrictions that might apply in the jurisdiction. Australia is a federation of states and therefore other levels of government can also place restrictions over the same land and resources. A complete understanding of restrictions that apply can only be gained by looking at the statute books of these other levels of government: federal government laws, local government by-laws and body corporate restrictions will need to be included in the case study. The regulatory environment is even more complicated than this as will be shown below.

Analysis of statutes provides for a good understanding of the number and range of different laws that need to be administered; however, it does not offer an understanding of the requirements of those members of the public and private sector who are impacted by the laws and their administration. Different private sector industries have varied land information needs (Figure 11). To understand these end-user requirements interviews and surveys will be conducted. Private sector industries including agriculture, utility management, property development and insurance will be considered key stakeholders.

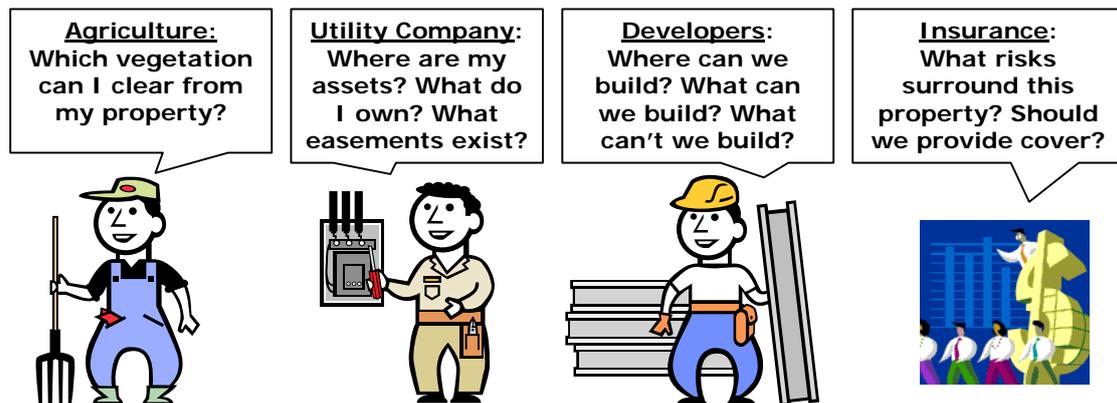


Figure 11: End-Users are interested in efficient administration and easy access to information

b) Overcoming regulatory voids, overloads and failures

There are a number of restrictions and responsibilities that can not be found in the statute books. Developments should not be built on old land fill sites, parks should not be created on grounds where toxic chemicals were stored and never cleaned up, land locked land should not be transferred without the new owner understanding the situation. These restrictions are *implied* but not always registered or even regulated against. These trouble cases that receive regular media attention, however, it is difficult to determine how many different types of cases might exist. Clearly regulatory reform is required: simplification, consolidation and easy access to information are necessary.

Another important issue is regulatory failure: legislation is written but not necessarily followed and therefore policy objectives are not achieved. In Queensland tree clearing legislation was ignored by many in the agricultural sector in the late 90s. Reasons for failure included farmers lacking location information and being economically better off by not following the laws. There are many more examples of land related regulatory failure and the reasons for them should be understood. If lack of

information turns out to be a common reason then spatial technologies can play an important role in overcoming problems, however, if neglect of laws is simply because they are deemed unfair or have low risk of being caught out, then an administrative response can do little to rectify the problem.

Another issue needing consideration is the acceptability of the many new regulations that have emerged over the last 50 years and whether creating a system to manage these new interests will only encourage more regulatory overload. While there does need to be controls on land to achieve sustainable land management, perhaps there also needs to be controls on those who have the power create laws. A set of guiding principles regulating the creation of a land restriction is a possibility here, although more thought is required.

c) Lessons from Europe: Netherlands Case Study

The Netherlands will be used to test whether the classifications and management models are transferable. The Netherlands is a world leader in modern day land administration with high level of international engagement, and novel approaches to administration. Management options for restrictions have been under consideration since the early nineties. New laws introduced in 2002 left management of restrictions with the individual authorities responsible for their creation, however, registration was linked with the cadastre using 'flags'. The Cadastre now acts as an integrated system which links the different restriction information that relates to individual land parcels.

Another interesting case from Netherlands involves the Supreme Court ruling that telecom cables should be considered as immovable property. The ruling will influence the way these cables are dealt with in taxation and registration within the Cadastre (Kap, 2005). A strong case for a registration of cables has been developed. The private and public sector processes of asset management, disaster management, minimizing excavation damage, assessing liability for damage and legal security will all utilize the information set. In earlier times a single centralised register would have been considered, however, developments in ICT and increased capacity within utility companies offers new solutions.

Using the Dutch rule of horizontal accession, ownership of the cables running under properties can be registered in the name of the utility company. Different utility organisations would be the custodians and maintainers of the spatial data and the information could be linked using web architecture. Achievement of these integrated systems was assisted by the development of a broad scale topographic map (1:1000). A proposed next step could be to see the networks of cables as separate legal entities, without a necessary connection to a ground parcel other than through coordination. This is a novel approach and certainly a move away from the parcel based approach. The private sector maintains the spatial datasets; however, management and access is still holistic and integrated.

d) The Compensation Issue: The Need for Policy

Another central issue arising from the property restriction debates is that of compensation. The Australian constitution provides government with the power to extinguish ownership within the jurisdiction in return for just compensation. However, the steady stream of new property related restrictions impacting on, but not extinguishing ownership, have resulted in no compensation being provided- even

when value has diminished. While more recent legislation in Victoria does provide for the provision of compensation where a particular right has been brought out by an authority, the issue remains largely unresolved across Australia. However, there are lessons to be learnt from international experiences.

Robertson (2003) describes the case in the State of Oregon in the USA. In 2000, a small group of land owners sponsored a citizen-initiated referendum called Measure 7, which aimed to have landholders compensated for any loss in value of their land whenever the State or council passed a restriction on property rights. The majority of voters agreed with the proposal and Measure 7 succeeded. The effect of the proposal was dramatic. It was estimated the cost to the State and local councils would be \$US 54 billion annually in compensation. At this estimate, it was calculated that in 15 years, the State would have paid as much in compensation as the total value of all property in the State. Even at lower estimates taxes would have had to rise significantly in order for government to continue to provide services.

As the number of property restrictions and responsibilities continues to increase the issue of compensation will need more attention. Whenever the ownership layer is impacted there will be perceived winners and losers. Ensuring that regulatory and administrative solutions are perceived as 'just' will go along way to them being successful.

CONCLUSION

The existing management of property restrictions and responsibilities poses a major barrier to achieving sustainable land management. Administrative responses have concentrated on organising information rather than achieving the original policy objectives of good land management. Disparate management of individual restrictions has made it extremely difficult to develop and evaluate the effects of land policy. The management of land and natural resources must be far more collective. The complex set of private and public interests that apply to land must be consolidated, simplified and made easily accessible to all. A thorough analysis of existing regulatory regimes and management systems is required. Key characteristics of each restriction must be assessed, including spatial extent, impact on tenure and reason for creation. These characteristics enable us to determine the importance of a restriction and develop an appropriate administration tool that enables achievement of sustainability.

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