

Investigating the Benefits of Land Administration Information to Natural Resource Management

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Key words: land administration, natural resource management, land administration information, natural resource information, governance.

SUMMARY

This paper provides an overview of the information required for natural resource management, and an assessment of the capability of land administration information to support natural resource management decision-making.

The international move towards sustainability has impacted on natural resource management. It has been widely acknowledged that widespread changes to land use and land management practices are required to improve the condition of natural resources and for biodiversity conservation. Several authors have argued that improved information on natural resources condition, and the impact of land management practices will improve natural resource management decision-making. However, even with sound information at scales suitable for decision-making, poor decisions can still be made. Accurate and reliable information, coupled with improved governance provides an opportunity for significant improvements to decisions on land use.

This paper will consider the information required for natural resource management decision-making at the landholding level, limitations in the existing information, barriers to improving information quality and quantity, and the connection between governance and decision-making. This will provide a basis for investigating how land administration information, in conjunction with natural resource information, can improve decisions on land use and land management practices. This investigation uses the Australian state of Victoria as an example to illustrate the points made.

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1 INTRODUCTION

International publications, such as ‘Our Common Future’ in 1987, the ‘Rio Declaration’ and ‘Agenda 21’ in 1992, and the ‘Johannesburg Declaration’ in 2002, have created recognition that concerted efforts are needed to implement sustainable land use and land management practices to minimise further harm to natural resources and biodiversity. Maintaining and enhancing the quality of our soils, rivers and oceans; availability of fresh water; and the maintenance of biodiversity have emerged as key issues globally [World Bank, 2001], and in Australia [Natural Resource Management Scientific Advisory Group, 1999].

It has been widely acknowledged that widespread changes to land use and land management practices are required to improve the condition of natural resources and for biodiversity conservation [Gorrie and Wonder 1999, Yencken & Wilkinson 2000, United Nations General Assembly 2002]. One of the keys to improving land use is the creation of an environment where land users understand the implications of poor land management practices, the recommended best practices for their land holding, and the benefits in adopting these recommended best practices. Various market-based policy instruments may be used to encourage changes in land use or land management practices, but they do not guarantee that the land user will make decisions that reflect the best social, economic and environmental outcome for their land-holding. Where land degradation exists, market failure is said to have occurred, and in these circumstances regulation may be effective if enforced. Education and training also have a role in influencing changes to land use and land management practices. Reliable information about the effect of land management practices on the environment, the income derived from the land-holding, and the social cost of change can help to improve the decision-making regarding land use. However, governance is at least as important to decision-making as information as it involves creating institutions, statutory provisions and policies necessary to respond to inappropriate land use, whilst providing support for those who wish to implement recommended land management practices.

The World Bank environment strategy [World Bank 2001] defined natural resource management as “the utilization of natural resources such as land, water, air, minerals, forests, fisheries, and wild flora and fauna”, and argued that natural resources should be used in a sustainable manner to enhance human welfare. The goal of sustainable land use is a component of sustainable development and is one of the key objectives of natural resource management. The Bathurst Declaration [UN/FIG 1999] argued that the availability of reliable information about land and its resources degradation is an issue vital to responding to global issues affecting land, including environmental degradation.

The Johannesburg summit plan of implementation called for actions at all levels to “integrate existing information systems on land-use practices by strengthening national research and

extension services and farmer organizations to trigger farmer-to-farmer exchange on good practices, such as those related to environmentally sound, low-cost technologies, with the assistance of relevant organizations” [United Nations General Assembly, 2002b]. This call for improved information and for strengthening the capacity of local organisations to disseminate information is relevant in Australia.

This paper will argue that sustainability is not only dependent on sound information, but also on sound and effective governance. Poor decisions can be made even if sound and reliable information at decision-making scales is available. The combination of improved governance and sound information, however, provide a solid foundation for decision-making.

2. LIMITATIONS IN NATURAL RESOURCE MANAGEMENT INFORMATION

Agenda 21 called on governments at the appropriate level to “strengthen information, systematic observation and assessment systems for environmental, economic and social data related to land resources at the global, regional, national and local levels and for land capability and land use and management patterns” [UN Sustainable Development, 1992]. The following section provides a review of the information required for natural resource management in Australia, and the limitations in that information.

In Australia, several authors have commented on the need for improved information on ecosystem processes, the amount and condition of natural resources, and the impact of land management practices [Industry Commission 1998, NRMSAG 1999, Gorrie and Wonder 1999, NLWRA 2002d]. Both catchment management and the development of natural resource management policy require a comprehensive understanding of the manner in which ecosystems function within a catchment [NRMSAG 1999, Gorrie & Wonder 1999]. Of interest to policy-makers is information on the amount, condition and location of natural resource degradation, areas in which there is a risk of further degradation, and areas in which the economic and environmental cost of degradation are highest. This information is needed at the catchment and sub-catchment level to allow policy makers to develop responses to natural resource degradation and loss of biodiversity. If policy makers seek to develop responses on individual properties (through regulation or land use planning for example) they will require information about natural resource degradation and the risk of further degradation on each land-holding. Information on the impacts on land management practices is required by policy-makers to decide which practices are more sustainable [NRMSAG 1999, Gorrie & Wonder 1999]. Catchment management requires an understanding of the existing patterns of land use across a catchment. Mapping of land use is carried out at scales of 1:25,000 upwards and is suited to catchment management decisions. Mapping of existing land management practices at the sub-catchment level can assist catchment management and improve the understanding of the impact across a catchment of widespread changes to land management practices. Information on loss of biodiversity allows catchment authorities to devise strategies to improve species numbers. The NLWRA [2001e] noted “Accurate information at the species level is also required, to more confidently describe the distribution, density and trend of threatened native species, and of significant introduced species”.

Landholders require information at the sub-catchment level on the condition of natural resources, the location and amount of degradation, and the risk of further degradation, to allow them to understand the risk to their landholding. They also require a reasonable understanding of the condition of natural resources such as soils, surface water and groundwater on their landholding. The NLWRA [2002b, p58] argued that if information on how the ecosystem functions at the sub-catchment level was available, individual landholders could establish how the ecosystem processes within their landholding relate to the ecosystem processes within the catchment. Landholders require information on the impact of land management practices on the natural resource base. The decision to change land management practices often involves deciding between two or more options with the practices modelled to predict the impact on natural resources and biodiversity. The landholders also are concerned with the economic returns derived from each alternative land management practice and the modelling must include economic considerations.

The existing information on interactions and landscape functions at the landholding level is insufficient to understand fully the impacts of land management practices. Much of the data is at a catchment scale and allows general targets to be set for the catchments, however these targets may not be valid for many individual landholdings. The implications are that natural resource management policies and strategies are based on generalized information that may not be reasonably applied at the landholding level. This has led to the introduction of remedies intended to respond to natural resource issues that have not had the intended affect. Improved data at the landholding level are needed to determine the role of each landholding in reaching these targets.

There is a lack of availability of data to the landholders at relevant scales and relevant to their specific circumstances. This is partly due to the landholders' lack of technical expertise in using digital spatial data, and it is partly due to the lack of information available at the landholding level. The existing information channels do not generally provide information in a format that suits the landholders. Much of the existing information is of a general nature and does not relate to their particular situation, and local farming groups and individuals such as extension officers have to relate it to the landholder's particular situation. Much of the existing information in Victoria has been collected for use in specific projects and therefore is not consistent, easily available or readily understood. Spatial data derived from satellite imagery currently has limitations when used at the individual land-holding scale for analysis and modelling, however recent research and development and improvements to the technology are making remote sensing more viable for application at the landholding level.

A barrier to the widespread availability of information is the reluctance of agencies to release their information because of privacy legislation, fears of the information being used inappropriately, and intellectual property policies. Agencies are reluctant to release data that is collected on land resources or vegetation resources using taxpayer funds, because they are afraid of how it may be used.

There are many financial barriers to improving the information available for natural resource management decision-making. Discussions the authors have had with policy-makers in Australia indicate that the existing funding for natural resource and environmental issues is

not sufficient for government to resolve all the natural resource degradation issues. The staff involved in managing information systems often lack the resources necessary for development of significant information systems with access to comprehensive data. These limitations in resources involve funding, staffing levels, the quality of infrastructure, and insufficient data gathering. Limited government funding means that future data collection will need to be undertaken in areas identified as at high risk of degradation, or identified as priority areas due to the potential economic or social costs of the degradation. There are opportunities for government agencies to improve the efficiency and effectiveness in the operation of information systems. They need to use the finite resources available in a more strategic manner. For example, the strategic collection of data across all government departments would reduce the duplication of effort that currently exists.

The information available for natural resource management decision-making is limited at the landholding level and there are several barriers to improving this information – the most significant being limited government funds directed towards data collection and analysis. This discussion provides a background for assessing how land administration information can assist natural resource management decision-making, and for considering the benefits of integrating natural resource and land administration information.

3. THE IMPORTANCE OF ENVIRONMENTAL GOVERNANCE

The *Bathurst Declaration* advocates the importance of reliable information, and especially spatial data to support decision-making for natural resource management [UN/FIG 1999]. However, even with reliable information, there is no guarantee that effective, responsible, reliable, legitimate or ethical decisions will be made by the decision-makers. The old saying “lies, damn lies and statistics” can be applied to information for natural resources decision-making, as decision-makers are able to select the information suited to a particular argument being put forward.

Therefore, it is important to also consider the framework within which decisions about natural resources are made. Decision-making is part of the broader requirements of governance. The UNDP/UNEP/WB/WRI [2003] suggested that environmental governance concerns “who is responsible, how they wield power, and how they are held accountable” and noted that it is:

“the essential human element of ecosystem management, with the task of interpreting the needs of all stakeholders within the biological realities of the ecosystem itself. Exploring how alternative methods of decision-making can bring about different-and-better-outcomes is a starting point for improving ecosystem management”

It is important to not confuse “governance” with “government”. Government, which is the political institution, is clearly part of the overall governance framework. For natural resource management, government is generally the ultimate legitimate authority for decision-making. However, from time to time, governments may miss-use their legal mandates and make inappropriate decisions for the management of natural resources. Within Australia, a review of the implementation of the 1992 National Strategy for Ecologically Sustainability

Development (ESD) found many commitments, policies and programmes, but a lack of “good policy practice”, inadequate implementation, and poorly co-ordinated institutional arrangements [Productivity Commission 1999]. Essentially, these are matters of effective governance.

A framework for environmental governance, applicable to natural resources management, has been developed by the World Resources Institute (WRI) in conjunction with the United Nations and the World Bank [UNDP/UNEP/WB/WRI, 2003]. This framework comprises the following seven elements:

1. Institutions and Laws
2. Participation Rights and Representation
3. Authority Level
4. Accountability Level
5. Property Rights and Tenure
6. Markets and Financial Flows
7. Science and Risk

A close inspection of these elements reveals that most can be related to aspects of land administration. In other words land tenure security, effective land use planning, and effective land valuation can underpin effective environmental governance. The first principle of good governance is concerned with the quality of the institutional, statutory and policy frameworks. The community consultation process undertaken with strategic land use planning can assist with providing “participation and rights of representation” for all stakeholders. The “authority level” and “accountability level” are important and there is a need to improve the capacity of local government and catchment authorities to improve governance and natural resource management decision-making. The need for secure and unambiguous “property rights and tenure” are discussed later in this paper, whilst property valuation is an element of “markets and financial flows”. “Science and risk” is especially relevant to this paper as there is a need for ecological and social science to be incorporated into land administration processes.

As the above framework indicates, governance is broader than the mere process of decision-making. Through this framework, it can be seen that environmental governance goes beyond the actual decisions on management of natural resources and encompasses the entire decision-making framework.

Dovers *et al* [2001] argued that sustainability demands the integration of three dimensions:

- *ecological considerations*: the maintenance of essential ecological processes and life support systems, and the protection of biodiversity;
- *social considerations*: human health and well-being, equity, social justice, public participation; and
- *economic considerations*: economic growth, efficiency and diversification, international competitiveness, cost-effective policies”.

Effective governance involves consideration and application of the ‘triple-bottom-line’ approach to sustainability. Many of the approaches to natural resource management have been pre-occupied with the economic aspects of the triple-bottom-line and would appear to largely ignore the social and environmental elements. The WRI framework for environmental governance, however, can be viewed as having incorporated the triple-bottom-line.

4. INVESTIGATING THE BENEFITS OF INTEGRATING LAND ADMINISTRATION AND NATURAL RESOURCE INFORMATION

The Bathurst declaration [UN/FIG 1999] noted the importance of reliable information, providing a backdrop for the investigation in this paper:

“If relevant and good decisions are to be made by public authorities, private resource users or community bodies, they must be based on sound information about the land and environment in order to contribute to sustainable development. This in turn requires the articulation of principles for the development and operation of land information and cadastral systems, as well as land registration systems which give effect to the principles of sustainable development” [UN/FIG 1999].

There has been little evidence of the benefits of applying land administration information to sustainable development possibly due to the time lag between land administration data gathering and the use of the information. In Victoria at present the digital cadastral map-base (‘Vicmap Property’) is used as a primary spatial data layer in many applications, and land tenure information is used in specific projects. Information on the value of landholdings is considered in policy development, the land use zoning information is also used to some degree. However, apart from these examples, the current use of land administration data in natural resource management is limited. The disconnection between the land tenure information over public and private lands is of most concern at the interface between freehold and crown land where decisions are made that can affect both. On public land a common query relates to the tenure or management status of areas subject to leases or licenses and this information could be more easily accessible. Improved information is also needed on cultural issues such as native title and other indigenous interests – especially on public land.

The land administration system can also assist natural resource information delivery through land use planning community consultation processes, and Internet portals such as Victoria’s ‘Land Channel’ (www.land.vic.gov.au). Improvements in the quality of the land administration information – such as aligning the boundaries of land tenure and land use planning datasets, providing comprehensive information on property rights, and combining land tenure information on public and private land – could increase its usefulness to natural resource management decision-makers. However, the Bathurst declaration seems to imply that greater benefits to sustainable development can be achieved, and opportunities exist through improvements to land administration information, and the integration of land administration with other information about the land and environment.

The links between natural resource management and land administration exist, but could be further developed. For example, integrated catchment management and land use planning should work in unison to achieve the common goals of ecosystem management and land use control. Information on natural resource condition can help the land use planning process,

and information derived during the land use planning process can assist natural resource management. Information on existing land use at sub-catchment scales is important to both land use planning and catchment management. Property valuation could benefit from improved knowledge of natural resource condition and the valuation process allows opportunities for verification and provision of information at the landholding level to natural resource management decision-makers. Both land use planning and property valuation involve extensive and regular data collection at the landholding level. Accurate property level information on natural resource degradation can inform the real estate market and relevant stakeholders such as financial institutions resulting in market pressure on landholders to respond. The land administration information could also include clear and definite details of the extent of property rights and responsibilities.

There is potential for the integration of natural resource management processes and information, with land administration processes and information, to benefit natural resource management. This integration would provide natural resource management with a more multi-disciplinary approach and could fall within a whole-of-government approach to sustainable development. The following sections explore these issues and provide examples of the benefits of integrating land administration and natural resource information, and the benefits to natural resource management.

4.1 By Clearly Defining Property Rights and Responsibilities

Providing secure property rights has been identified as important to developing markets in which the resources on land are used by those that value them the most [de Soto 1993, Feder 1999, World Bank 2001]. Raff [1999] noted, “in most parts of the world, as a matter of civil law, title to land is held subject to implicit social and environmental responsibilities”. Bullard [2002] argued, “the means to maintain sustainability will be enhanced if land owners are encouraged to undertake their responsibilities”.

An issue that is causing extensive debate at present is related to the amount of access landholders should have to resources, and how greater certainty of property rights can be achieved. The limits of rights to use natural resources, and the responsibilities with regard to the use of these resources are significant issues. Rural land users want their rights to resources maximised and clarified to allow long term planning and to reduce conflict over the use of resources. Society requires that the use of these resources be sustainable and so limitations are placed through restrictions on the use of resources. Making information readily available would allow landholders to have a clearer understanding of their obligations, and sets the bounds of allowable activity. This information along with greater understanding of the extent of degradation, and the role of a landholding in catchment processes, may also help to develop a stronger stewardship ethic amongst landholders.

Water has been identified as an increasingly scarce resource [Riddell & Palmer 1999, World Bank 2001] and we will need to develop more efficient use of water resources. One solution being employed by various natural resource management agencies is to establish trading rights over water resource allocations, and the trading of water entitlements has been established in Victoria. Closely tied to this is the need to identify partial rights over resources

in the manner applied to forest resources or groundwater. Policy reform in these areas is seen as fundamental to implementing change [Gorrie and Wonder, 1999]. Much of the recent focus in the management of water supply has been to separate water rights from land ownership. In Australia, a significant driver has been micro-economic reform, especially in relation to competition policy, with the Council of Australian Governments taking a lead role.

Mitchell et al [2003] argued that a new model for the provision by government of information on the social and environmental rights and responsibilities associated with land ownership is needed. Providing information on all the rights and responsibilities related to land could benefit the State economically through the reduction in conveyancing costs and more efficient land markets, socially through increased wealth, and environmentally through less disputes over the allocation of natural resources and reduced impacts of land use.

The property rights and responsibilities of landholders are often complex and detailed information on these is not easily accessible. There is a need to provide this information in a manner that allows a landholder to readily find the information specifically pertaining to their landholding. The Internet provides opportunities for the dissemination of this information to landholders. Opportunities also exist for this information on property rights to be contained in covenants recorded on freehold titles, or crown land leases and licenses. A limitation in this approach is that the administrative overhead with tradeable property rights (such as water supply rights) may be too high. An alternative could be to register an environmental management plan for a landholding as a covenant on the title. This plan would include clear details of property rights and responsibilities.

Deininger [2003] argued that property rights to land “need to be administered and enforced by institutions that have both legal backing and social legitimacy and are accessible by and accountable to the holders of property rights”. Effective governance of property rights is critical to their adherence.

4.2 Improving Land Use Planning and Land Development

One of the strongest links between land administration and natural resource management centres around how the land use planning system could effect changes to land use, and land management practices. There is a strong tradition of private property interests overlaid by control over land use through the planning system. A distinction needs to be made between the control of land use and land management practices. Land use planning has not traditionally controlled the management of land – only changes to the use and development of land. Changes to land use are much harder to achieve than changes to land management practices.

Land use planning is suited to resolving conflicting agendas of various stakeholders and bringing together the scientific information from various disciplines, and it involves extensive community consultation. The community consultation processes allow the various environmental, social and economic trade-offs to be considered. The planning system has the potential to assist the implementation of catchment management strategies and targets.

Integrated catchment management and land use planning need to work in unison to achieve the common goals of improvements in catchment condition and land use control.

The Victorian land use planning system contains regulatory mechanisms for controlling changes to land use. These include state policies, relevant zones and overlays, and related legislation. Planning permits can include conditions that applicants adhere to codes of practice to ensure control over specific actions. For example, there may be codes of practices for clearing of native vegetation, or harvesting timber on agroforestry areas. Government can also reserve land for public purposes, acquire land, and assist with the assembly of fragmented land. The zoning arrangements are used to restrict the development of prime agricultural land into residential lots.

The current statutory mechanisms provide an opportunity for exerting an influence over land use to encourage sustainable practices, however they are not used extensively. There are limitations in the capacity of local government to make the decisions required to effect these changes. Local government in Victoria often lacks the political support, funding, experienced staff, and knowledge of natural resource management issues to pursue sustainable land use. Changes to the land use planning institutional, statutory and policy frameworks are required for it to be effective in ensuring unsuitable land use practices are prevented. These changes, along with improvements in natural resource information available to land use planners, will provide a basis for effective governance and remove many of the barriers to land use change.

4.3 By Considering Natural Resource Degradation in Property Valuation

At present the information gathered for property appraisals for the calculation of rates payable, is held by local government and not made publicly available. In Victoria, local government contract valuers to determine the valuations for the rating process. These valuers use aerial photographs and gather information about zoning, encumbrances, and water rights. This information is supplemented with information on soil types, vegetation types, and pasture condition [Valuer General Victoria, 2002]. The valuations are undertaken in a batch process, which provides limited time to investigate natural resource condition on a landholding.

If accurate and reliable property level information on soil type and condition, vegetation areas and types, and extent of degradation were available to the public the sale price of properties is more likely to be based on a consideration of this information. This would inform the valuation used in the rates calculation. A by-product of valuers using reliable natural resource information is that they could verify this information for each landholding and store it in look-up tables, along with other related attributes such as farm improvements.

Linking information on the valuation of property and the condition of natural resources has several potential benefits for natural resource management. The assessment of property value would be improved by accurate property-level information on natural resource condition – especially soil condition – and the impact on productivity. Spatial information on the valuation of property, linked to information on the condition of natural resources could have commercial applications. For example, information of this type made publicly available

would be of interest to financial institutions, with the expectation that they exert an influence over the land management practices of landholders.

There are other potential benefits in making the information publicly available. Making the valuation data available could improve the public confidence in the valuation process, resulting in transparency in the valuation process. If this valuation information also included details of the area of productive land, and areas of degraded land, the link between land degradation and reduction in property value would become more obvious. This would provide an incentive for landholders to deal with the risk of degradation on their properties.

Under the current Victorian rate assessment system improvements to land condition have both financial incentives and disincentives for landholders. The improvement in natural resource condition leads to an improvement in the property value due to an increase in the productive capacity of the land. The improvements to the productive capacity of the landholding also increase the income derived from the landholding. This provides a positive signal to the landholder and a positive financial incentive to improve natural resource quality. The resulting increase in property value also causes an increase in the rates payable, providing a disincentive to the landholder. While, altering the basis for calculating rates to remove this disincentive should be a priority for government, it is likely that the greatest financial incentives to landholders will come from the improvements to income and property value. Therefore, removing the financial disincentives in the rates calculation, and informing the landholder of the economic benefits of improving natural resource condition will lead to changes to land management practices.

Information on valuation and natural resource condition could assist natural resource managers identify the properties in which degradation or potential degradation will have the greatest economic impact, informing government spending. It would be also possible for natural resource managers to identify positive economic outcomes related to improvements to natural resource condition.

Opportunities also exist to take advantage of the regular data collection undertaken by valuers in the local government valuation process to add to the natural resource data. This valuation of properties is calculated every four to six years and provides important temporal information. For example, valuers could be contracted to collect specific property level data based on strict protocols, or verify existing natural resource data.

5. CONCLUSION

Improvements to natural resource management decision-making are required to achieve widespread changes to land use. With greater knowledge of natural resource issues, the land administration functions of land tenure security, land use planning and land administration can support these improvements. Improved governance is also critical to achieving changes in land use. This paper has presented three examples of how the integration of natural resource and land administration information could improve natural resource management decision-making, leading to improvements in land use. Each of these examples also considers matters of environmental governance. As a result, it could be argued that land administration

is a significant element of the overall governance framework for natural resources management.

Cadastral systems have the potential to play a role in underpinning all elements of the triple-bottom-line. Land administration information recorded against land parcels can be used to support policy formulation in a wide range of economic, social and environmental contexts [Bell 2003]. The cadastre can provide a robust definition of interests in land and the associated natural resources, and may effectively be utilised in all aspects of the triple-bottom-line. However, for these benefits to be realised improvements are required in the capacity of the institutions to make the decisions, and the information on which the decision-making is based. Opportunities exist in using technological advances to improve spatial data infrastructures however the greatest advances are likely to occur when government agencies develop the capacity and political will to make difficult decisions about land use based on reliable information.

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BIOGRAPHICAL NOTES

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Ron Grenfell has been actively involved in teaching and research related to Land and Geographic Information Systems for more than twenty years. His current role is Business Development Manager for the School of Mathematical and Geospatial Sciences at RMIT University, where he is concentrating on the commercial application of intellectual property arising from research in geospatial science.

Keith C. Bell was the Surveyor General of the Australian State of Victoria from 1999 until 2003. During this time he was also the Chairman of the Surveyors Board of Victoria and the Registrar of Geographic Names. He was also a Commissioner for Electoral Boundaries for the State of Victoria and a member of the Australian Electoral Re-distribution Commission. Outside of government now, Keith is Innovations Manager for the Geospatial Science Initiative and also works as a international development consultant for the World Bank and United Nations specialising in land reform projects advising on institutional development, land administration and land policy. Keith's research interests are in governance for sustainable land and water management. He is the Australian delegate to FIG Commission 7 Cadastre and Land Management.

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