On recognizing land administration as critical, public good infrastructure

Rohan Bennett a, b, *, Nilofer Tambuwala b, Abbas Rajabifard b, Jude Wallace b, Ian Williamson b

a UNU School for Land Administration Studies, Faculty for Geoinformation Science and Earth Observation, University of Twente, Enschede 7500AE, The Netherlands
b Department of Infrastructure Engineering, The University of Melbourne, Parkville, 3010 Victoria, Australia

ABSTRACT

Failure to recognize land administration systems as infrastructure creates potential funding and maintenance problems. Wider economic, social, and environmental benefits of effective land administration are consequently put at risk. Land administration must be recognized as critical, public good infrastructure. An evaluation method for testing land administration as an infrastructure is developed and applied. The method utilizes tools for defining and classifying infrastructure, public goods, and critical infrastructures. Arguments for land administration as infrastructure are revealed to reside within the land administration discipline: mainstream views regularly fail to recognize the argument. Reasons include the internal focus of scientific disciplines, the failure of land administrators to engage across disciplines, the global disparity of approaches to land administration, and the lack of visible or physical presence for land administration infrastructure. The results of three empirical studies support the notion that land administration is a critical, public good infrastructure. It concluded that infrastructure funding and maintenance regimes need to be depoliticized, potentially through the development of evidence-based metrics, that land administrators must continue to promote land administration outwardly, and that the evaluation approach be extended and enhanced for use in directed land administration projects and studies.

© 2012 Elsevier Ltd. All rights reserved.

Introduction

Generally speaking, land administration systems are not recognized as infrastructure. Despite the efforts of land administrators to suggest otherwise (NRC, 1993; Groot, 1997; Coleman and Nebert, 1998; Finley et al., 1998; McLaughlin, 1999; Williamson, 2001b; Enemark, 2001; Bogaerts et al., 2002; Anestad et al., 2006; Roberge and Kjellson, 2009; Williamson et al., 2010), the core literature dealing with infrastructure design, construction, management, and finance regularly fails to include land administration systems (c.f. Rainer, 1990; Niskanen, 1991; World Bank, 1994; Targowski, 1996; Borgman, 2003; Howes and Robinson, 2005; Nickolov, 2005; OECD, 2006; Brooks and Menon, 2008; Underhill, 2010; Weber and Alfin, 2010). The lack of recognition also exists in practice. In the contemporary context across many developed countries, key government agencies and projects dealing with infrastructure provision regularly fail to consider land administration systems. Examples include Australia (Infrastructure Australia, 2008), the United States (Moteff et al., 2003), the United Kingdom (Infrastructure UK, 2010), Germany (Bundesministerium des Innern, 2009), and the Netherlands (Luijff et al., 2003).

The failure to recognize land administration systems as infrastructure creates at least two distinct problems. First, the public exposure and funding channels available to more recognized infrastructures such as public transport and water supply networks become difficult to access. Williamson (2001a,b) explains how the significant policy focus afforded to physical infrastructures is disproportionate to the attention given to land administration infrastructures, the systems that underpin their design and construction. Second, the need to apply flexible or adaptive management approaches to land administration systems is not recognized. Adaptive management ensures learning, rehabilitation, regeneration, and decommissioning programs are built into the lifecycle of an infrastructure (c.f. CMP, 2007). The concept first gained prominence in the field of natural resource management (Bormann et al., 1999; c.f. Holling, 1978). In the context of land administration these approaches are essential: people-to-land relationships and their management regimes must be dynamic (Van der molen, 2002). Without adaptive management, infrastructures stagnate, decay and eventually fail. Williamson (2001a,b) relates how many land administration systems were not adapted from 19th century management paradigms and are unable to play the integrative role crucial to modern economic management, urban planning, and environmental management. The prevailing outcome is that recognized benefits inherent to land administration are put at risk: gains in public capital created through transaction fees and taxation are threatened (Dale and
McLaughlin, 1999); growth of private wealth enabled by effective markets in real property, mortgages, and complex commodities is jeopardized (Wallace and Williamson, 2006a,b); the stability and order provided by secured land tenures is potentially compromised (Feder and Nishio, 1998; Deininger andBinswanger, 1999; Deininger, 2003); and the ability to make sustainable decisions relating to the environment is weakened (UN-FIG, 1999). Further, the secondary benefits of accessible and affordable land information within a society are also put at risk: good governance, transparency, social inclusion, effective disaster management, and spatially enabled societies, amongst other things, are more difficult to achieve if static, inadequately funded land administration systems prevail.

Given the importance placed on infrastructures in contemporary society, this paper begins with the premise that land administration must be better recognized as core, public good, critical infrastructure. The aim is to explore and determine the status of land administration as infrastructure. Further, it attempts to understand why awareness has been lacking and how this might be overcome. A review of theories linking land administration and infrastructure is undertaken. Inadequacies identified lead to a detailed examination of the infrastructure concept including tools for defining infrastructure (Star and Ruhleder, 1996), critical infrastructure (Motef et al., 2003), and public goods infrastructure (Kaul et al., 1999). The tools are applied to land administration systems in a number of independent studies. The synthesis of the reviews and studies reveals the reasons for poor recognition of land administration as infrastructure. Approaches for overcoming the lack of recognition are also provided. The conclusion summarizes key findings.

Evaluating land administration as an infrastructure

The notion that land administration systems are infrastructures was tested through two literature reviews, three discrete observational studies (using recognized evaluation tools), and a subsequent qualitative synthesis (Fig. 1). The first literature review examined existing arguments for land administration systems as infrastructure. The second studied definitions and uses of the term ‘infrastructure’ in other disciplines. An appreciation of the gaps in dialogues across disciplines was gained. The literature review findings informed the design of three discrete evaluations. In each, a different tool for defining infrastructure was applied to the land administration context. Respectively, these were Star and Ruhleder’s (1996) infrastructure dimensions, Kaul et al.’s (1999) public good axes, and Motef et al.’s (2003) critical infrastructure criteria. The three studies made use of sample data relating to the land administration arrangements of various countries and regions. Key data sources included: Land Equity International’s global comparison of land administration systems (Land Equity, 2006; Burns, 2007), the International Property Rights Index Report (Dedigama and de Soto, 2009), the Economic Freedom of the World Annual Report (Gwartney et al., 2010), and The World Bank Doing Business indications (2010) relating to property registration (http://www.doingbusiness.org/data). Accordingly, the following regional groupings were used: East Asia and Pacific, Eastern Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, OECD, South Asia and Sub-Saharan Africa. These mirrored the groupings used in the contemporary World Bank studies (2010). It should be noted that the number and type of individual sample countries varied for each study: appropriate data was not available on all countries for all studies. Combined, the results of the three studies tested the notion of land administration as an infrastructure. This analysis took place in the synthesis phase.

Contemporary arguments for land administration as an infrastructure

The term land administration gained prominence in the mid-1990s. It is generally defined as the collection of processes run by government, using public or private sector agencies, related to managing land tenure, land value, land use, and land development (UN-ECE, 1996; UN-FIG, 1999; Dale and McLaughlin, 1999; Williamson et al., 2010). Land administration systems implement land policies in support of sustainable development and include institutional arrangements, legal frameworks, processes, standards, land information management and dissemination systems, and technologies required to support allocation, land markets, valuation, control of use, and development of interests in land (Williamson et al., 2010).

The vast majority of literature linking land administration with the infrastructure concept emerges from within the land administration discipline itself. In most cases, use of the term is cursory and not explored in depth. Within the discipline the term began appearing in the mid to late 1990s. Finley et al. (1998) used the term ‘land information infrastructure’ to describe the new land administration system being developed in the Canadian province of New Brunswick. McLaughlin (1999) in his work on
land administration and globalization identified the emerging need for a ‘common property infrastructure’ with standardized tools, processes, and language. Driven by globalization, consumer demands, standardized approaches to mapping, and the rise of the Internet, these rejuvenated cadastral systems would move beyond traditional clientele to act as an enabling infrastructure for the many emerging land-related services of government. These works link the term infrastructure to the earlier concept of the multipurpose cadastre (c.f. McLaughlin, 1975; NRC, 1980).

The emergence of the term in land administration was also a result of the popularization of the spatial data infrastructure (SDI) concept of the mid 1990s. SDIs aimed to provide easy access to spatial data to multiple, geographically distributed stakeholders (Williamson et al., 2003; Rajabifard et al., 2010). Spatial data would be sourced from various agencies. Both technical and non-technical (policy, legal, institutional and social) elements were essential to the concept. Many land administrators were involved with SDI-styled projects during the 1970s and 1980s (Coleman and Nebert, 1998), however, it was the National Research Council’s publication Towards a coordinated spatial data infrastructure for the nation (NRC, 1993) that popularized the term and provided international traction. The document comfortably aligned with the integrated set of information strategies being pursued by the Clinton administration and this created much exposure. The publication dealt with land administration information and emphasized the important link between SDIs and cadastres: cadastres, the engine of land administration (Williamson et al., 2010), were a core part of the urban fabric datasets integral to a successful SDI. Subsequent NRC publications continued the theme (c.f. NRC, 1994, 2001, 2003, 2007).

In the European context, Groot (1997) also established the link between SDIs, land administration, and infrastructure. Descriptions of how SDIs were central to the delivery of the emerging concept of sustainable land management (SLM) were provided. Groot’s model reveals a duality of roles for land administration in SDIs, simultaneously acting as a provider of framework datasets and also as a unique user application. Groot (1997) also highlighted the importance of softer elements within SDI design: policies, standards, and licensing were perhaps more important to consider than technical elements. Aanestad et al. (2006) provided similar analysis and goes further to define SDIs as public infrastructure assets.

For a range of reasons an institutional gap between SDIs and land administration emerged in a number of countries throughout the 2000s: an international standard for the organizational and technical relationship between land administration and SDIs failed to synthesize. Whilst land administration was heavily integrated with the SDI programs in some countries (e.g. Netherlands, Sweden), in others, the relationship was contentious. Accordingly, very generalized models of SDIs emerged (c.f. Williamson et al., 2003). At any rate, the lack of commonality across nations helped undermine the notion of land administration as central to SDIs or as infrastructure in their own right.

Land administrators continued to push the infrastructure concept into the 2000s. Williamson (2001b) and Enemark (2001) used the theme of sustainability to make clear arguments for land administration as an infrastructure. Land administration systems, in their own right, needed to become a broader infrastructure to support economic, environmental, and social decision-making. Despite their inadequacy for the task in many cases, the data they held was essential for enabling implementation and monitoring of emerging projects relating to mega-city administration, coastal management, and environmental preservation. Importantly, the infrastructure would be jurisdiction specific, made up of the land administration tools most appropriate for the context. The notion here was to move the land administration concept away from the concept of a single function performed by a single entity for a single purpose: land administration infrastructures were collections of policies, laws, institutions, agencies, functions, and data that underpinned the governance of all land related activities.

The post cold war expansion of the European Union, particularly across central Europe, provided enhanced recognition of land administration as a fundamental infrastructure for modern market-based economies (c.f. UN-ECE, 1996). Bogaerts et al. (2002) described how the Acquis Communautaire (Acquis), the rules for entering the European Union, demanded that effective cadastres and land administration were instituted prior to entry. The cadastre would underpin an integrated administration and control system, effective land markets, protection of property rights, and documentation of public and private rights. In turn these tools delivered, respectively, a common agricultural policy, institution building, an effective free market, protection of human rights, and environmental sustainability.

In more contemporary times, Roberge and Kjellson (2009) and Williamson et al. (2010) again mounted the argument for land administration systems as infrastructure. Roberge and Kjellson (2009) suggested that:

“Today, most cadastral registers around the world are linked to both the land value/ taxation area and the area of securing legal rights in land. Therefore, it makes sense to talk about cadastral systems or property rights infrastructures rather than just cadastre. These infrastructures include the interaction between the identification of land parcels, the registration of land rights, the valuation and taxation of land and property, and the control of present and possible future use of land.”

Roberge and Kjellson’s (2009) discussions gave new impetus for the argument: they wrote within the context of the emerging global financial crisis emanating from the mortgage market collapse in the United States. The multipurpose missions of cadastres including property rights security, economic growth, taxation and environmental management were central to the argument. Simple dictionary definitions were used to argue for the cadastre as an infrastructure, however, like earlier works, the work does not engage on the broader debate on the nature of infrastructure.

In summary, despite the considerable amount written arguing for land administration systems as infrastructures, the case tends to reside within the discipline. The argument is far more obscure to the mainstream. There are many reasons for this and examination of the core literature dealing with infrastructure provides some answers.

Existing definitions and models of infrastructure

The term ‘infrastructure’ was first used in the 18th century to describe the tracks and rights of way required for train networks to function (Groot, 1997). Over the centuries the term evolved to include many shared structures and services: water supplies, sewage networks, electricity grids, and road networks for example. The term was reserved for public assets that aided production and public-policy discussions that focused on investment and maintenance of public works. There was acceptance that shared infrastructure made society more livable (Pappas, 1990). In general, the infrastructures were visible networks on the landscape: more abstract services such as geodetic frameworks or land registries were not generally included. Moreover, many countries in the 19th century ran, and still run, privately insured deeds systems: the view that a country or state needed an overarching, publicly run system of registration and information provision was not necessarily agreed upon. These historical disparities between countries provide some explanation as to why land administration systems were not considered alongside more tangible infrastructures such as highways and electricity networks.
The term gained renewed prominence in the 1980s following the publication of Choate and Walter's (1981) *America in Ruins: The Decaying Infrastructure*. Impetus had been created for examining future infrastructure requirements. In 1987 the NRC, in *Infrastructure of the 21st Century*, introduced a formal definition of the term, expanding its meaning to include:

> “the operating procedures, management practices, and development policies that interact together with societal demand and the physical world to facilitate the transport of people and goods, provision of water for drinking and a variety of other uses, safe disposal of society’s waste products, provision of energy where it is needed, and transmission of information within and between communities.” (NRC, 1987)

Despite not being included within the discussion, this definition provides a strong argument for land administration as an infrastructure: a modern requirement of all land administration systems in developed countries is that it should enable ‘transmission of (land) information within and between communities’.

Literature on the design and technical construction of city-scale infrastructures also emerged. These came from the fields of architecture, design and urban planning and focused on built environments. Rainer (1990) provides one such example. The discourse of the works is not related to land administration systems. The discrete nature of technical disciplines and government structures generally thwarted integrated approaches until the widespread uptake of networked information systems.

A much larger body of literature dealing with the economics of infrastructure investment and finance also emerged. Contemporary examples include the works of Howes and Robinson (2005), the OECD (2006), Weber and Alfén (2010), and Underhill (2010). The focus was on strategic decision making in relation to infrastructure, rather than dealing with the nature of any specific infrastructure. At any rate, little recognition or mention is made of land administration systems. Where mention of land is made, it is generally in relation to unlocking its value to fund more traditional forms of built infrastructure (cf. Peterson, 2009).

A related body of literature emerged dealing specifically with infrastructure investment in developing economies (World Bank, 1994; Merna and Njiru, 2002; UN-ESCAP, 2007; Brooks and Menon, 2008). The World Bank (1994) report focuses on economic infrastructure including public utilities (power, telecommunications, piped water supply, sanitation and sewage, solid waste collection and disposal, and piped gas), public works (roads, dams, canals), and other transport sectors (railways, urban transport, ports and waterways, and airports). Infrastructure is described as an ill-defined umbrella term that relates to activities dealing in ‘social overhead capital’. Both technical and economic features are included. Land administration systems are not included within these descriptions.

Land administration systems, however, are the subject of much literature relating to developing economics. The term ‘infrastructure’ is utilized, however, the definition is not fixed and freely interchanged with ‘system’. The argument goes that sustainable built, natural, and social environments can only be established within a country that organizes land tenure. North and Thomas (1973) provided a version of the argument in their identification of the existence of property rights as the main cause for some societies to be much better off than others. Important works by Deininger and Binswanger (1999) and De Soto (2003) support the notion. Deininger and Binswanger (1999) argued for secure, transparent and enforceable property rights as a vital requirement for investment, economic growth and poverty alleviation. However, as mentioned, these discussions are generally outside the infrastructure debate.

Differentiation between ‘hard’ and ‘soft’ infrastructures also emerged. Physical assets such as transport, energy and communication networks were described as ‘hard’ infrastructures. ‘Soft’ infrastructures included all the basic institutions, information and values that make up modern society (Stough, 2003). For market economies, this included not only essential services such as legal and accounting systems, but also the cultural attitudes that promoted a mutual desire to transact or maintain continued relations (Niskanen, 1991). Arguably, land administration systems exhibit both hard (survey marks, coordinated reference stations (CORS), and geodetic stations) and soft characteristics (the institution of property, land information).

The fusion of information and communication technologies brought the term ‘information infrastructures’ to the forefront of infrastructure discussions (Targowski, 1996; Weill and Broadbent, 1998; Barbua et al., 2001; Borgman, 2003). Communication networks were increasingly recognized as critical to economic growth and development (Barbu et al., 2001). Information infrastructures included traditional information systems at large-scale and widely distributed through the use of telecommunications technology (Anastad et al., 2006). The World Bank regarded the related policy, legal and institutional frameworks that facilitate the convergence of technologies, services and markets, as part of this infrastructure (Barbu et al., 2001). As discussed above, SDIs were also considered one of these integrated information infrastructures.

Throughout the 1990s and 2000s a number of approaches emerged to enable definition of infrastructures. Star and Ruhleder (1996) provide a robust example. Emerging from the discipline of information science and management, they offer eight dimensions to enable the assessment of an activity as an infrastructure: embeddness, transparency, reach/scope, learned as part of membership, links with conventions of practice, embodiment of standards, built on an installed based, and becomes visible upon breakdown. The eight dimensions aim to provide a generic verification for the existence of an infrastructure. The dimensions are yet to be tested against the notion of land administration systems.

Another approach relates to the concept of critical infrastructures. Critical infrastructures gained in prominence following the events of 911 in the United States in 2001. The awareness led to the establishment of the Department of Homeland Security. Originally any:

> “Infrastructure so vital that their incapacitation or destruction would have a debilitating impact on defense or economic security”

was classified as critical (Clinton, 1996). Subsequently, the term expanded to include assets such as national monuments, which if damaged could cause significant loss of life or adversely affect a nation’s morale (Motef et al., 2003). Telecommunications and information networks, energy and water systems, health and emergency services and transportation networks, among others, have all been classified as critical under Homeland Security’s criteria (Motef et al., 2003; Nickolov, 2005). Land administration systems have yet to be tested against these criteria.

The debate relating to public good infrastructures provides another approach. In 1776, the economist Adam Smith recognized public goods as the existence of certain goods that have great benefit to society, but cannot provide significant economic profit within a market structure. Private individuals or organizations could not provide these goods. The term gained renewed prominence in the 1990s and 2000s, particularly with UN agencies (Kaul et al., 1999; Kaul and Mendoza, 2003) and development banks (cf. ADB, 2002). They defined public goods as those that are non-excludable and non-rival in consumption (Fig. 2 bottom left quadrant). They could benefit many or all, and use or consumption by one person did
not prevent consumption by another. Other goods exhibit other natures, for example: club goods (private parks or roads), common property (community facilities or parks), or private goods (private cars).

Based on these criteria, Anestad et al. (2006) discussed the implications of SDIs as public goods particularly within the health care industry. However, though SDIs can be understood as public good infrastructures using these criteria, land administration systems are yet to be tested.

In summary, various lines of infrastructure literature fail to mention land administration systems. Reasons include: the silo mentality of disciplines; the failure of land administrators to fully engage across disciplines; the fractured approaches to land administration globally; and the lack of a visible or physical presence for land administration. A range of new approaches for defining infrastructure are now available, however, these are yet to be applied in the land administration context. This analysis is undertaken in the sections that follow.

Testing land administration against the infrastructure dimensions

The results of the test against Star and Ruhleder’s (1996) infrastructure dimensions are presented in Table 1. Fourteen countries were tested against the eight criteria. Where possible, multiple countries from each regional grouping were tested. Analysis was based on the methodology used in the World Bank’s Doing Business indications reports (World Bank, 2010). An assessment of each country against the eight dimensions based on the perceptions of an expert panel in the realm of comparative land administration, and impressions from Land Equity (2006) and Burns (2007), was undertaken. The scope was limited to only the formal land administration systems within a country: accurate data on informal or non-government recognized land administration systems were not available. This restriction means results are conservative. A very strong argument for inclusion of informal systems existed; however, the necessary data was not available. The study was also limited to the national level: countries where land administration lies at lower levels (for instance many federations – Australia, India, Switzerland, United States) received generalized analysis and results. In the case of Australia and Switzerland, historical developments mean state and cantonal systems are relatively similar and generalized results can be considered more or less appropriate. The United States has some homogeneity across states due to the heavy use of title insurance; however, along with India these results should be treated with a fair degree of caution. Indeed, the somewhat esoteric nature of Star and Ruhleder’s (1996) infrastructure criteria means all values would be open to further conjecture and debate with a larger, more diverse, group of experts. Finally, only ‘yes’ or ‘no’ values were recorded: it was deemed inappropriate to use further divisions as the data and method for making such distinctions was not available.

A number of points are worth making about the table. Of the 14 countries, 7 were found to exhibit all 8-infrastructure characteristics. These included all OECD countries, South Africa, Thailand and Armenia. This provides a strong case for the premise that using this approach, land administration is an infrastructure. Moreover, it helps demonstrate the link between the status of land administration as an infrastructure within a country and its subsequent economic development. Further, all countries were deemed to exhibit varying levels of at least 4 of the 8 criteria. An analogy can be made here with GLTN’s (2008) continuum of land rights: whilst some countries have the complete set of infrastructure characteristics in place, many others are at varying stages of construction (or potentially decay).

Countries whose land administration systems failed to exhibit the complete set of infrastructure dimensions tended to be economically poorer and generally subject to more social unrest. However, this study alone cannot provide a causal link. The most problematic criteria were found to be embeddedess, transparency, embodiment of standards and visibility upon breakdown. These problems most likely relate to: historical developments with land administration in those countries (that is, colonial systems and fragmented approaches within countries); failure to integrate contemporary land administration projects with customary or informal approaches; a general distrust of land administration systems by the citizens due to corruption, inbuilt bias towards elites, and generally a lack of good governance. The result is that public participation is low and the formal system or fledgling infrastructure does not integrate well with other structures and social institutions.
Instead, standards set by social behavior apply in informal transactions at the local level and do not reflect a standardized approach to processes in formal systems at a national level.

In summary, formalized land administration systems can, and in many cases do, exhibit the complete set of infrastructure dimensions as described by Star and Ruhleder (1996).

Testing land administration as a public good infrastructure

The results from the study utilizing Kaul et al.’s (1999) public good axes are presented in Fig. 3. Data points were derived from quantitative measures provided by The World Bank’s Doing Business report (World Bank, 2010). The metrics deal with regulatory aspects of business climate in various economies. The original study was published in 2003 and updated periodically. This study made use of the 2010 increment. It is internationally recognized as an objective and extensive knowledge product that benchmarks regulatory reform. Of the 11 business indicators explored in the World Bank study, Registering Property was utilized. From this, the y-axis, rivalry of use, was derived through the use of Time (days), the time to lodge on the land administration system. Higher lodgment times were deemed to represent a higher rivalry of use. The rational here is that lengthy land administration lodgment processes generally impeded the public good nature of the system. If lodgment takes too long, the system is ignored or decays in accuracy through duplication in an informal manner. The land administration system is no longer a public good asset but takes on the characteristic of exhausted common property. The x-axis, excludability of use, was derived through the use of Cost (% of property value), the cost to lodge on the land administration system. Higher lodgment costs indicate higher excludability of use. The rational being that high access costs exclude those who cannot afford lodgment: land administration becomes a tool for the wealthy elite. It is not a public good; rather, it is a club good. In summary, if a land administration system exhibited ‘relative’ low costs and times for lodgment, it was considered a public good infrastructure. However, where this ‘relative’ line should be drawn is subjective and represents a limitation of the study.

The World Bank dataset enabled 178 countries to be plotted. The graph is divided into quadrants. The intersection of the axes is derived from the upper quartile of all lodgment times and the upper quartile lodgment costs for all countries. The upper quartiles were considered the highest values of rivalry and excludability that would still enable the land administration systems to be considered a public good. The approach arguably produces a broad definition of public good and its appropriateness should be the subject of further discussion. It also needs to be stated that each axis represents a continuum and therefore the relative space between points endows meaning. Finally, both axes are extended to negative values on the graph. Clearly, no lodgment time or cost can be negative, however, this graphical approach was taken in order to maintain relative to the shape of Fig. 2.

A number of points can be drawn from the graph. First, a significant number of economies (59%) deliver low registration times and costs in a relative sense (that is, the public good quadrant). Generally, these countries correspond to economic and regional

<table>
<thead>
<tr>
<th>Country</th>
<th>Embeddedness</th>
<th>Transparency</th>
<th>Reach/Scope</th>
<th>Learned as part of membership</th>
<th>Links with conventions of practice</th>
<th>Embodiment of standards</th>
<th>Built on an installed base</th>
<th>Becomes visible upon breakdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Asia &amp; Pacific</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
</tr>
<tr>
<td>Indonesia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern Europe &amp; Central Asia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Armenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolivia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle East &amp; North Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iran</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OECD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>England</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Asia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Namibia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
groupings of wealthier nations. Using this approach, a strong argument can therefore be made that land administration can, and does, perform as a public good.

Second, a smaller, but not insignificant number of countries do not exhibit the characteristics of a public good infrastructure using this approach. Land Equity (2006) and Burns (2007) provide a number of reasons as to why this outcome might be expected: formal land administration systems in these countries are generally in a developmental stage, are subject to corruption, or have been disrupted or impeded through war and civil unrest. For instance, in many sub-Saharan African countries, initiatives to establish formal land administration infrastructures have achieved limited results due to lack of resources and limited funding. Consequently, the registries often hold uncertain and unclear information. Customary and informal systems of land administration still dominate here in many urban and rural areas. Similarly in Latin America there are still large-scale informal land holdings in both urban and rural areas. Here institutional issues, particularly the separation of powers between the registry and mapping or cadastral arms of government create an information asymmetry that impedes the operation of the land administration infrastructure. Corruption within the large, central land administration institutions in many Asian countries plays a major role in increasing the lodgment cost and time of land transactions. Overall, it is expected that these land administration systems would not be performing as public good infrastructure. Ongoing initiatives to reform land administration systems in these countries support this view.

In summary, these findings support the view that established, formal land administration, where they are functioning effectively, acts as a public good infrastructure.

**Testing land administration as a critical infrastructure**

The results from the study based on Moteff et al.'s (2003) critical infrastructure criteria are presented in Table 2. Moteff et al.'s (2003) argument is that an infrastructure, such as land administration, need only satisfy a single criterion to be considered critical. Data utilized in the study included the comparison of land administration systems by Land Equity (2006) and Burns (2007), the International Property Rights Index Report (Dedigama and de Soto, 2009) and the Economic Freedom of the World Annual Report (Gwartney et al., 2010). The same regional and economic groupings as the infrastructure dimensions were also utilized.

In terms of the economic security criterion a number assumptions and indicators were used. Dedigama and de Soto (2009) link property rights to economic security. Similarly, Feder and Nishio (1998) provide evidence that land registration has led to better access to formal credit, higher land values, higher investments in land, and higher income in many countries. In this case study it is assumed that economic security derived from formal registration of property rights applies only in regions that have established formal land markets. In many developing countries transactions in land and property often occur via informal agreements. For instance only 1% of the property market in Africa is considered formal, and in the Latin America and the Caribbean the magnitude of the informal market is still unknown (Land Equity, 2006; Burns, 2007). Where informal land markets dominate, formal land administration systems are not seen as vital to the status quo of existing economic security and prosperity.

With respect to public health and safety criteria a number of assumptions and indicators were used. Land administration is considered to be vital to public health and safety in all regions tested in this study. This is derived from various published works. Gwartney et al. (2010) show the impact of economic freedom that comes from secure property rights, among others, on joblessness and public safety. Tibaijuka (2010) emphasized the need for better management of informal settlements within cities, stressing that:

“the urban divide... will become a major threat to social stability, and thus to global peace and security.”

Land Equity (2006) link secure access to land and tenure security to achieving food security. Furthermore, Harden (1968)'s The Tragedy of the Commons argues that if an asset is not owned, there is no economic incentive to prevent it from abuse. This applies in the absence of tenure security and well defined property rights. Thus, the existence of a formal land administration system
promotes public health and safety and the lack of one impedes it. Both cases argue for land administration as critical infrastructure in this aspect.

With respect to the national morale criteria, the following assumptions were used; the definition of national morale is taken from Miller (1941) as:

“the degree of confidence held by all of the people in the ability of the nation to cope with the future.”

Particularly in the OECD countries where there is high public confidence and participation in land administration processes, the loss or decay of such a system would disable the property market and bring economic progress to a standstill. This would result in significant loss of national morale. The global financial crisis of the late 2000s, triggered in part by poorly administered land markets, provides a contemporary example.

In relation to national defense a number of assumptions and indicators were used. Up until recently land administration was not perceived as critical to national security, particularly in developed nations. However, the rise in anti-terrorism activities during the 2000s resulted in large-scale people relevant spatial data, such as the parcel and property layers, being increasingly used. Additionally, the need to better enable natural disaster mitigation, preparedness, response and recovery has also resulted in emergency management agencies requiring land administration data. In developing nations, the importance of land administration for national defense is clearer. There is an increasingly important role for land administration to deliver human security in post-conflict areas (Lewis, 2004; Wakhungu et al., 2008; Leaning and Arie, 2000; Törhönen and Palmer, 2004). Moreover, a side effect of land administration projects in a number of developing countries, particularly in the Asian context, has been to minimize conflict between landholders.

A number of points can be made from the table. Most crucially, the land administration systems of all regions are considered critical infrastructure: each region achieves at least one criterion. Moreover, in most regions, more than one criterion is achieved. Further, the health and safety criterion is achieved in all regions.

The land administration systems of wealthier regions (OECD) achieve all criteria. That is, the infrastructure is ‘critical’ for more than one reason. It is multipurpose in the true sense of McLaughlin’s (1975) multipurpose cadastre. The economic security criterion is confirmed by Dedigama and de Soto (2009) and other land economists (Feder and Nishio, 1998). The notion that OECD countries use land administration to boost morale is more contentious. The assumption is that secured property rights and private wealth, the corner stone of many OECD countries, lead to stronger economies and subsequent individual and national pride. The validity of this notion requires further empirical testing, as does the notion that land administration delivers national defense.

In summary, using this approach, land administration can be considered a critical infrastructure for public health and safety in all countries, to economic security in wealthier developed or developing countries that have a dominant formal land market; and to national morale and national defense in OECD countries where public confidence in the ability to undertake secure land transactions is high and vital to economic progress.

### Synthesis of findings: land administration as an infrastructure

**Infrastructure needs to be depoliticized**

The term infrastructure has a diverse range of uses, exhibits a subjective quality, and appears open to manipulation. In contemporary times the term has been politicized: interest groups use it to further various causes. This appears particularly evident in the context of large-scale financial investments undertaken by governments and the investment-bankers. Although the long-term returns are large for society, land administration systems represent a small outlay and return for these interest groups. The result is land administration receives less attention in literature, reports, and political discourse relating to infrastructure. Despite this, design and implementation often costs many millions of dollars to countries involved.

An ongoing aim for land administration policy makers should be to depoliticize the term infrastructure, or at least its provision. The funding and maintenance regimes of critical, public good infrastructure need to be decoupled from the short-term electoral cycles of governments and the financial interests of investment banks. This is a great challenge in the contemporary era where sustainable infrastructure systems are of great public interest, political and infrastructure provision systems are closely coupled, and large amounts of public infrastructure are often funded initially through private sector capital. However, evidence based approaches as described in this paper provide a potential starting point.

**Land administration must continue to look outwards**

Whilst land administrators have been actively arguing for land administration as an infrastructure, the case has resided within the discipline. The argument is far more obscure to the mainstream. The case for land administration as an infrastructure needs to pervade the wider infrastructure discourse. This is a difficult task: land administration systems do not exhibit a visible or physical presence like other infrastructures. A more unified or coherent approach is required, potentially led by national and international professional bodies. There is a need to overcome the lack of shared definitions and understandings of the roles of land administration. Land administrators needs to continue to promote a multidisciplinary approach. The International Federation of Surveyors (FIG) has made great strides in these areas since the early 1990s; however, further dissemination of this work outside the land administration discipline is required.
Land administration is an infrastructure

Despite being excluded from wider discussions on infrastructure, all three tests validated the notion that land administration is an infrastructure. Formalized land administration systems can, and in many cases do, exhibit the complete set of infrastructure dimensions as described by Star and Ruhleder (1986). Established, formal land administration systems, where they are functioning effectively, act as public goods in accordance with Kaul et al.’s (1999) axes. Land administration is also a critical infrastructure as described by Motef et al. (2003). It delivers public health and safety, economic security, improves national morale, and can support national defense. In general, these results complement and confirm (using recognized frameworks) the arguments made by land administrators, land economists, and land policy experts since the mid 1990s.

Evaluation approaches can be further enhanced

There exists potential to extend and enhance the evaluation approach outlined. The limitations were highlighted throughout the paper. At any rate, the synthesis provides a starting point for understanding land administration as an infrastructure. The approach has utility in individual countries and land administration systems at lower levels. It could be utilized by land administrators, in conjunction with pre-existing evaluation approaches, to produce indicators of land administration projects and their achievement of project deliverables and infrastructure requirements.

Conclusion

Using the approach developed in this paper, the status of land administration systems as infrastructures was explored and confirmed. The evaluation approach developed enabled testing of the notion: all three studies revealed that formalized land administration systems adhere to the requirements of infrastructure, public goods, and critical infrastructure. It was surmised that infrastructure funding and maintenance regimes need to be depoliticized, potentially through the development of evidence-based metrics, that land administrators must continue to promote land administration outwardly, and that the evaluation approach be extended and enhanced for use in directed land administration projects and studies.

Land administration systems deliver public capital, private wealth, stability, order and improved environmental outcomes. They are critical, public good infrastructure. Failing to recognize land administration as infrastructure impedes funding and maintenance regimes and puts the benefits of the systems at risk. Land administration systems need to be better recognized as infrastructures, at high levels of governments and across the wider community.

Acknowledgements

The authors wish to acknowledge the support of the Australian State Governments of New South Wales, Victoria, and Western Australia, and PSMA Australia Limited for their support towards the research underpinning this paper. They also wish to acknowledge the support of the researchers and students at the Centre for SDIs and Land Administration at The University of Melbourne.

References


