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Land administration as an academic discipline: to be, or not to be

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Key words: land administration, academic discipline, interdisciplinarity, cadastre, land registration

SUMMARY

This paper examines the status of land administration as an academic discipline. An evaluation approach for validating areas of study as academic disciplines is described. The approach is then applied to land administration. The following attributes are found to exist: formal definitions, a common knowledge base, structural elements on university level, graduate programs and students, both academic and professional associations, textbooks, discipline specific lingo, some icons and visible scholars, some researcher self-identification with the discipline, some accepted rules, recurring conferences, and a strong interaction between academia and the field of practice. The following attributes are found to be wanting: unifying theories, procedures and methods of inquiry, a unique cluster of research problems, a shared vision, recurring journals, and a truly worldwide research community. In summary, at best, land administration represents a discipline in formation. Alternatively, it can be considered an emerging area of interdisciplinary study, however, still primarily based in the areas of land registration (land lawyers) and cadastre (geodesists/surveyors). It is concluded that scholars, including those beyond the traditional fields, and practitioners must work more collaboratively to overcome the areas of weakness. In doing so, the utility of land administration in assisting with the delivery of broader societal goals will be enhanced.

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1. INTRODUCTION

The status of land administration as an academic discipline is unclear. Whilst Williamson et al. (2010) view land administration 'as a coherent, unique discipline', Zevenbergen (2009) argues that 'much more conceptual understanding and description of land administration will be needed'. This lack of consensus is not surprising: land administration is a relatively new term in education and research. According to Williamson et al. (2010) it was first mentioned by the United Nations Economic Commission for Europe (c.f. UNECE, 1996). In the subsequent 17 years much new land administration research and many new educational programs have emerged, however, recognition of the term in the formal academic environment is still lacking. This paper attempts to address the uncertainty. It aims to address the following question: what is the nature of land administration as an academic discipline?

A useful tool to answer the research question has been found in a framework applied by Scholl (2008) for the evaluation of the disciplinary nature of e-governance. This framework is used for both the description and analysis of land administration as an academic discipline. To provide the information for the framework, a general literature study has been carried out. Insight into scientific research production and research community was obtained by a bibliometric search.

2. THE NATURE OF ACADEMIC DISCIPLINES

To answer the question posed in the introduction, the concept of a scientific discipline needs further explanation. According to Scholl (2008) 'disciplines are scholarly communities that define which problems should be studied, advance certain central concepts and organization theories, embrace certain methods of investigation, provide forums for sharing research and insights, and offer career paths for scholars. A discipline is a particular branch of learning or body of knowledge whose defining elements - i.e., phenomena, assumptions, epistemology, concepts, theories and methods - distinguish it from other knowledge formations'. In this text the term land administration domain is used to refer to the broad professional and intellectual 'landscape' of land administration, with its large body of facts (Repko, 2008) and phenomena.

Scholl (2008) in an attempt to qualify e-governance research as a legitimate discipline, used the following indicators and dimensions of what defines a discipline: 1) a formal definition of a discipline, 2) a common knowledge base, 3) a unique cluster of research problems, 4) unifying theories, 5) accepted procedures and methods of inquiries, and 6) a shared vision of the study domain's significance. Scholl (2008) further includes collateral indicators such as 7) structural elements on university level (departments, schools, colleges), 8) graduate programs and students, 9) a worldwide research community, 10) both academic and professional associations, 11) journals and recurring conferences, 12) researcher self-identification with

the discipline, 13) icons, that is, leading and visible scholars, 14) textbooks, 15) expressed allegiance to the discipline via artifacts and accepted rules (of, for example promotion), 16) discipline specific terminology, and 17) strong interaction between the academic discipline and its field of practice. This set of indicators serves as a useful framework for assessing the disciplinary nature of land administration. As such, the paper is structured as per Table 1.

Table 1. Indicators and structure of the paper

Scholl's (2008) indicators	**Structure of paper**
• A formal definition	Land administration defined • A formal definition of land administration • Related concepts
• Common knowledge base • Unifying theories • Shared vision of the domains significance	The knowledge base • From cadastral and land registration systems • Towards land administration • Significance of the land administration domain
• Both academic and professional associations • Terminology/discipline specific lingo • Strong interaction between academic discipline and the field of practice	The professional field • The professionals • Professional organizations
• A unique cluster of research problems • Accepted procedures and methods of inquiries • A worldwide researcher community • Journals and recurring conferences • Icons (visible/leading scholars) • Researcher self-identification with the discipline • Expressed allegiance via artefacts; accepted rules	The research community • Leading scholars • Institutes • Themes • Methods • Journals
• Structural elements on university level • Graduate programs and students • Text books	The university programs • Overview of programs • Textbooks

3. LAND ADMINISTRATION DEFINED

3.1 A formal definition of land administration

An overview of common land administration definitions is provided in Table 2. For each definition the focus of interest and key aspects are included with the aim of placing the definitions in a broader context. The UNECE (1996) definition, with its reviewed version of 2005 (UNECE, 2005), is one of the most frequently used. Nevertheless, a series of other definitions appear in the literature.

Table 2 reveals changes over time in how land administration is defined: the narrow definition focusing on land information processes grows into a broader land management concept. Additionally, the goal moves from underpinning land markets towards supporting sustainable development and good governance.

Table 2. Common definitions of land administration

Author	Definition	Focus of interest	Key aspect
UNECE (1996)	The process of recording and disseminating information about ownership, value, and use of land when implementing land management policies	Land market Market economy Eastern and Central Europe	Land information systems
Dale & McLaughlin(1999)	Those public sector activities required to support the alienation, development, use, valuation, and transfer of land	Land market Market economy	Public administration
FAO (2002)	The set of systems and processes for making land tenure rules operational. It includes the administration of land rights, land use regulations, and land valuation and taxation. Land administration may be carried out by agencies of the formal state, or informally through customary leaders.	Land tenure security Developing countries	Formal and informal land administration
UNECE (2005)	The process of determining, recording and disseminating information about ownership, value, and use of land when implementing land management policies	Land market Market economy Good governance	Systems maintenance; e-services
Williamson, et al., (2010)	The processes run by government using public- or private-sector agencies related to land tenure, land value, land use, and land development	Sustainable development	Land management
Williamson, et al., (2010)	The study of how people organize land. It includes the way people think about land, the institutions and agencies people build, and the processes these institutions and agencies manage.	People-to-land relationship: Land tenure	Land management

The analysis gives the impression that a 'mature' definition of land administration, accepted by the professional and scientific community, has not yet arrived. It is therefore worthwhile to have a closer look at the development of the land administration knowledge base.

3.2 Related concepts

Before considering the knowledge base, it is worth noting that in the land administration literature a range of related, similar and overlapping concepts are evident. Examples include: land information systems, cadastral systems, land registration systems, land administration systems, land administration functions, land management information systems, land information infrastructure and land information management. This list further includes concepts such as geospatial data infrastructure (GDI), spatial data infrastructure (SDI), with national (NSDI) and global (GSDI) versions. It is suggested this aspect of the land administration domain relates to the origins from which it emerged: cadastre and land registration (or registry). These are, according to Zevenbergen (2002), very confusing terms 'for which no universal definitions exist'. Although according to Çağdaş & Stubkjær (2009) land administration as a discipline has been promoted to overcome this situation, however, it is suggested that the boundary of the discipline remained uncertain.

4. THE KNOWLEDGE BASE

4.1 From cadastral and land registration systems

Cadastre and land registration systems are at the heart of land administration and shaped its development. Both systems deal with large-scale documentation of land units in maps and records (Larsson, 1991). Historically, land records have been established to serve two main purposes. First, as 'fiscal' records, primarily for the public sector, they have served as the basis for the full and accurate taxation of land. Second, as 'legal' records, primarily for the private sector, they have served as registers of ownership and other land rights (Larsson, 1991). Publicity of land information was an important function of the early cadaster and land registration systems (Larsson, 1991). Cadastres and land registration systems have developed differently in different countries and regions (Williamson et al., 2010). Historical developments determined the way land documentation was organized in a cadastre or a land registry or a combination of these systems (Larsson, 1991; Zevenbergen, 2002). The different applications of the cadastre, are also referred to as the fiscal, juridical (or legal) and multi-purpose cadastre (Zevenbergen, 2002). The multipurpose cadastre was formalized in the 1970s and aims to bring together the different functions of land administration and serve multiple users (FIG, 1995).

While the cadastre is a kind of land information system, land registration is the process of recording interests in land. Land registration puts in principle the accent on the relation subject-right, whereas cadastre puts the accent on the relation right-object. In other words: the land registration answers the questions as to who and how, the cadastre answers the questions as to where how much (Kaufmann & Steudler, 1998). Both concepts are closely linked, and, as it seems, one cannot do without the other. Land registration and cadastre usually complement each other, they operate as interactive systems (Kaufmann & Steudler, 1998). Nevertheless, cadastre and land registration functions are often performed by two or more different agencies (Williamson et al., 2010; Zevenbergen, 2009).

Other core components traditionally related to the cadastre and land registration include *surveying* (Dale & McLaughlin, 1999; Williamson et al., 2010), *laws and regulations* (c.f. UNECE, 1996; Zevenbergen, 2002) and *valuation and taxation* (c.f. Dale & McLaughlin, 1988).

4.2 Towards land administration

In the 1990s the twin concept of 'cadastre and land registry' evolved into 'land administration'. Several developments contributed to this change and paved the way for the new discipline of land administration. These included the issues of *land information silos* (Dale & McLaughlin, 1999; Larsson, 1991; Williamson et al., 2010; Zevenbergen, 2002; Zevenbergen, 2009), *new integrated systems* (Dale & McLaughlin, 1999; UNECE, 1996; Williamson et al., 2010; Zevenbergen, 2002), *holistic and systems approaches* (Dale & McLaughlin, 1999; Zevenbergen, 2002; Zevenbergen, 2009), *information and spatial technology* (Dale & McLaughlin, 1999; Enemark, 2002; FIG, 1995; Kaufmann & Steudler, 1998; Zevenbergen, 2002), *the land management paradigm* (Bennett et al., 2008a, 2008b;

Deininger, et al., 2010; FIG, 1999; Fourie, et al., 2002; UNECE, 2005; Williamson, et al., 2010), *the RRR's* (Bennett et al., 2008a; Bennett et al., 2008b), *access to land and security of tenure* (De Soto, 1990, 2003: Enemark & Williamson, 2004; Fourie et al., 2002; van der Molen, 2001), (De Soto, 1990, 2003) *SDI and spatially enabled society* (Williamson, et al., 2010, 2011) and *3D Cadastre* (Stoter, 2004; Stoter et al., 2011).

From the synthesis above, it can be seen that land administration theories tended to develop from two different streams: a) the information management stream with land information systems, SDI, NSDI and GSDI and supporting e-governance; and b) the land management direction driven by the imperative of sustainable development including resource management and land use planning and development. Within these two streams a particular branch of land administration refers to the formalization of informal land tenure to provide economic growth in Asian, Latin American and African countries.

Land administration emerged from, and is still strongly based on, the cadastre and land registration and related disciplines. The emergent properties of the new discipline land administration, however, are not commonly agreed upon and indicate in different directions with different disciplines involved. In other words, land administration is characterised by multiple perspectives and is based on multiple disciplines.

4.3 Significance of the land administration domain

The societal aims of land administration change over time as mentioned by Van der Molen (2001, 2010). Contemporary concerns relate to climate change and disaster management (van der Molen, 2010) and land grabbing (Cotula et al., 2011). Table 3 indicates the societal aims of land administration; the table further summarizes different aspects and/or approaches to contribute to the mentioned societal aims.

Table 3. The societal aims of land administration

Societal aims	**Aspects and references**
Economic development	• The regularization of the land market (UNECE, 1996; Dale and McLaughlin, 1988) • Access to the land market and economic development (De Soto, 1990, 2003) • Access to land and security to credit (Dale & McLaughlin, 1999) • Formalizing property rights (Dale & McLaughlin, 1999) • Land taxation and land valuation (original 'pre'-land administration, major field with large literature database)
Food security	• Food security (Dekker, 2001), FAO Land Tenure Studies • Land grabbing and implications for local food security and the environment (Cotula et al., 2011) • Large scale international land transactions for food and biofuel production (Cotula et al., 2011; Zoomers, 2010)
Good governance	• Transparency (van der Molen & Tuladhar, 2007) • Dispute resolution (Zevenbergen, 2009) • Land governance (Enemark et al., 2010; Deininger et al., 2011)

Land information services	• Integrated services (Dale & McLaughlin, 1999) • Deliver services to citizens and businesses (Dale & McLaughlin, 1999) • Land information systems (Dale & McLaughlin, 1988; Tuladhar et al., 2004) • Systems approach in land registration (Zevenbergen, 2002) • Establishment Spatial Data Infrastructures (van der Molen, 2001; van der Molen, 2007) • Spatially enabled society (Rajabifard et al., 2010; Williamson et al., 2003; Williamson et al., 2011) • E-Governance (van der Molen, 2007)
Land tenure security	• Recognizing customary tenure (Zevenbergen, 2009) • Formalizing customary land rights (De Soto, 1990, 2003) • Governing the commons (Ostrom, 2008) • FAO Land Tenure Studies
Land use planning	• Decision-making about use of land and its resources, and • Management of land and its resources (Dale & McLaughlin, 1999; Enemark, 2006; Enemark et al., 2005) • Environmental control (Dale & McLaughlin, 1999) • Responding to rapid urbanization (Dale & McLaughlin, 1999; van der Molen, P., 2001); UN Habitat studies)
Social justice and equity	• Pro-poor approaches land registration (Augustinus et al., 2006; Deininger, 2003; Zevenbergen, 2011) • Access to the land market by the poor and economic development (De Soto, 1990, 2003) • Social Tenure Domain Model (Augustinus, et al., 2006; Deininger, 2003; Lemmen et al., 2009) • Innovative land administration (Deininger et al., 2010) • Secure tenure for women (GLTN, 2009), UN Habitat/GLTN publications • Millennium Development Goals (Enemark, 2010; Enemark et al., 2010) • Formalizing property rights in informal settlements (Dale & McLaughlin, 1999) • Housing provision (Agunbiade et al., 2011) • Land grabbing and its effects on poor people's livelihoods (Zoomers, 2010)
Sustainable development	• Bathurst declaration (FIG, 1999) and Land administration for sustainable development (Dale and McLaughlin, 1999; Williamson et al, 2010) • Legislative and regulative framework supporting sustainable development (Bennett et al., 2008b) • Responding to global warming and climate change (Enemark, 2010); (Mitchell et al., 2011); (van der Molen, 2010) • Preparedness and responding to natural disasters (Enemark, 2010; Mitchell & Zevenbergen, 2011)

The table is not intended to be complete, nor are the categories defined the only possible; however, it demonstrates the diversity of interests and concerns, and sometimes conflicting goals and objectives of land administration. A phenomenon already described by Dale and McLaughlin in 1999. It is suggested that it therefore remains unclear that there is a shared vision of the land administration domain's significance.

5. THE PROFESSIONAL FIELD

5.1 The professionals

The functions of land administration are traditionally organized around agencies responsible for surveying and mapping, land registration, and land valuation (Dale & McLaughlin, 1999; Zevenbergen, 2002). Each of these agencies collects data and makes them available to the public. Professionals involved include (geodetic) surveyors, engineers, lawyers and valuers, solicitors and notaries. Under the broader umbrella of the land management paradigm, including the land use and land development functions, economists, planners, and developers are also considered land administration professionals (Williamson et al, 2010).

A worldwide comparison of cadastral systems (Rajabifard et al., 2007) provides an overview of cadastral systems in thirty-four countries. Only two groups of professionals within the cadastral system (and thus land administration systems) are recognized: surveyors and lawyers (or solicitors). Other professionals such as planners and valuers are not considered in the study. This represents a limitation for this particular study; however, Rajabifard et al (2007) study represents the best data set currently available. At any rate, the ration of number of surveyors and lawyers show a large variation depending on the countries of study. Although the number of surveyors and lawyers vary according to the different cadastral systems applied in the different countries of study, in total there are as much professional land surveyors as lawyers involved in cadastral work: on average 52 fulltime equivalent surveyors per 1 million population, and 53 fulltime equivalent lawyers per 1 million population. The study shows that surveyors and lawyers on average play an equal professional role in cadastral systems, and thus land administration systems. However, the study is only concerned about surveyors, while about the lawyers no further reference is made.

In some studies reference is made of 'land administrators' (Fourie, 1998; Fourie et al., 2002; UNECE, 1996). However, a clear definition of the term is not provided. Is it one of the professionals mentioned earlier (a surveyor, a lawyer, a valuer, a planner, a public administrator)? Is it a unique and new profession? Or are we dealing with 'land professionals', a concept introduced by Enemark & Williamson (2004) in an attempt to respond to the changing nature of surveying 'from measurement to management'?.

5.2 Professional organizations

A major professional organization involved in the discussion on the development and theories in land administration is the International Federation of Surveyors (FIG). FIG can be considered the main platform where land administration has been shaped as a discipline. In numerous seminars, workshops, working weeks, and international conferences a large number are recorded and made available by the International Office of Cadastre and Land Records (OICRF), an organ of FIG.

Next to the vast amount of FIG publications, other professional journals contribute to the land administration discourse such as GIM International, GeoInformatics and Geo-Info. However, policy documents and conference papers delivering guidelines, proposed frameworks and declarations, dominate land administration literature. Peer-reviewed articles, dedicated

journals, and books on land administration are more limited.

International organizations such as EU, FAO, UNECE, UNECA, UN Habitat and the World Bank are operating in the land administration domain and have major influence on regional and global policies and programs. Their publications have a large impact on the development of the land administration professional domain.

6. THE RESEARCH COMMUNITY

To assess the research community, in line with Scholl's (2008) indicators, a bibliometric search was carried out to obtain an insight into recognized scientific publications (ISI) in land administration. The Web of Science database was selected for the search as it provides access to the most prestigious, high impact research journals in the world. This database was therefore considered most appropriate for an analysis of the global land administration research community. The Web of Science search was limited to 'land administration' in the 'topic'. This search key limits the scope of the research to the English literature. This represents a limitation to the study, however, it should be noted that the English language currently represents the dominant language in scientific and educations domains. The records are further analysed for main authors, institutions, journals and topic categories.

6.1 Leading scholars

The search on Web of Science (02.10.2011) resulted in 121 ISI publications with 'land administration' in the topic. Analysis of the records in terms of authorship is provided in (Table 4). Based on this study, in the domain of land administration, the leading scholars are: Williamson, Van der Molen, Wallace, Enemark and Rajabifard. The first author outnumbers (by far) the academic output in land administration, nearly three times more than the closest authors.

An analysis of the background of the authors revealed that most of researchers are (licensed) land surveyors. However, one of the main authors is a lawyer by background. It needs to be stressed that due to the different ways land administration is being defined and approached it is difficult to indicate leading scholars. Further analysis and research in this area is needed.

Table 4. Leading ISI authors in land administration

Authors	Record count	% of 121	University
Williamson, I.P.	14	11.6	Centre for Spatial Data Infrastructures and Land Administration, Department of Geomatics, University of Melbourne, Australia
Van der Molen, P.	5	4.1	Faculty of Geo Information Science and Earth Observation (ITC), University of Twente, Enschede, The Netherlands
Wallace, J.	5	4.1	Centre for Spatial Data Infrastructures and Land Administration, Department of Geomatics, University of Melbourne, Australia

Enemark, S.	4	3.3	Department of Development & Planning, University of Aalborg, Aalborg, Denmark
Rajabifard, A.	4	3.3	Centre for Spatial Data Infrastructures and Land Administration, Department of Geomatics, the University of Melbourne, Australia
Bennett, R.	3	2.5	Centre for Spatial Data Infrastructures and Land Administration, Department of Geomatics, University of Melbourne, Australia
Inan, I.H.	3	2.5	Faculty of Engineering, Department of Geomatic Engineering, Karadeniz Technical University, Trabzon, Turkey
Steudler, D.	3	2.5	Centre for International Cooperation, Swiss Federal Directorate of Cadastral Surveying, Federal Office of Topography, Switzerland
Van Oosterom, P.	3	2.5	Delft University of Technology, OTB Res Inst Housing Urban & Mobil Studies, Delft, The Netherlands

6.2 Institutes

The results of the same study categorized by institution are provided in Table 5. A minimum record count of '3' was imposed.

Table 5. Main institutions publishing on land administration in ISI Journals

University	Record Count	% of 121
University of Melbourne, Australia	15	12.4
University of Twente, ITC, The Netherlands	9	7.4
University of Aalborg, Denmark	5	4.1
Delft University of Technology, The Netherlands	4	3.3
Wuhan University, Wuhan, China	4	3.3
Karadeniz Technical University, Trabzon, Turkey	3	2.5
Wageningen, University, The Netherlands	3	2.5

Again, a small number of entities appear to dominate; however, the gap between the top rank and those that follow is smaller. At any rate, the number of institutions with more than three articles can be considered comparatively small when compared against more established disciplines.

6.3 Themes

As discussed earlier, land administration is dominated by cadastre and land registration: two domains of quite different disciplinary natures. However, over the years other disciplines entered and gained in importance within the domain: attending to the broader societal requirements has demanded it. These disciplines have included (land) economics, (geo-)

information science, public administration and management (Zevenbergen, 2009). Çağdaş & Stubkjær (2009) grouped the research themes according to branches of science (Table 6).

Table 6. Cagdas and Stubkjaer's thematic groupings

Scientific branch	Discipline
Natural Science	Geodesy, Physical Geography
Social and behavioral sciences	Economics, Law, Politics, Management and Sociology,
Formal sciences	Information sciences, Systems Sciences

Among these research efforts doctoral studies constitute a substantial part. Examining the themes of doctoral dissertations (published in the period 1999 – 2006) they distinguish two broad categories of themes: social and behavioral sciences aspects (11 dissertations) and information sciences aspects (5 dissertations). The analysis by Çağdaş & Stubkjær (2009) showed that, although the themes differed, all dissertations addressed: 1) rights in land, and 2) the official recording of these rights through national information systems.

A major group of the reviewed dissertations by Çağdaş & Stubkjær (2009) regards land tenure and accompanying land administration initiatives with the aim of providing economic growth by creating formal land markets. Another cluster regards the recording of property rights and land tenure information by land administration systems; and a third group regards land administration systems for sustainable development and evaluation of land administration systems. These different groups tend to express the same directions in land administration as found in paragraph 4.2.

The dissertations examined by Çağdaş & Stubkjær (2009) were further characterized by the factors which were analyzed in the research: geography; institutional factors (history, cultural framework, legal framework including formal and informal law, social relationships within society); stakeholders (land registry, cadastre and other governmental organizations, parliaments, courts, private practitioners/professional, academics, households, parcel owners, NGO's, interest groups, and donor agencies); procedures (i.e., adjudication, transfer, subdivision) and technology (i.e., surveying and mapping devices, information systems).

Analysis of the Web of Science records resulted in the following top five 'categories': environmental studies (44), remote sensing (16), planning development (14), geography (13) and geosciences multidisciplinary (13). In the category 'law' three records are found.
Summarizing, the analysis of the research themes, disciplines involved and factors examined reveals the broad scope of the land administration research area and the traditional disciplines, sub-disciplines and inter-disciplines involved.

6.4 Methods

Again, the work of Çağdaş & Stubkjær (2009) is applicable here. They analysed the

methodological aspect of ten doctoral dissertations in cadastral development, all addressing social and behavioural sciences aspects, as an empirical base to examine the research methodology applied. Their review showed that all dissertations, except one, preferred qualitative research, and all applied case study methods. A classification of the theories applied in the ten dissertations show that some draw on other scientific communities: 'property and land tenure theories', 'urban economics theory' and 'planning theory'. One researcher draws on 'land administration' theory', however this theory was not explicitly introduced. The other dissertations are not based on typical disciplinary theories, but apply theories to develop a taxonomy or classification like 'evaluation approach', 'Profit+ Resource Model' and 'system theory' (Çağdaş & Stubkjær, 2009).

The analysis by Çağdaş & Stubkjær (2009) demonstrated a notable amount of commonality among the doctoral research projects in terms of methodology. They further noted that social and behavioural science methods are applied in research that is predominantly performed at a faculty of geodetic surveyors. This dominance by one particular faculty in land administration research has also been highlighted by the Web of Science search (Table 4 and 5). Çağdaş & Stubkjær (2009) therefore state 'in an epoch favouring multi-disciplinary research, this may be considered trivial'. At any rate, it appears that the professional domain of land administration has developed faster than the scientific domain. The academic 'silos' might be more difficult to integrate than the professional land administration agencies.

According to Çağdaş & Stubkjær (2009) a coherent and universal core cadastral theory and related research methodology have not been developed so far. There is a lack of shared set of concepts and terminology, and research methodology.

6.5 Journals

The Web of Science analysis was again applied here. In terms of scientific publications, the main journals for land administration output were found to be: Land use policy (30), Survey Review (11) and Computer Environment and Urban Systems (7) (Table 7). It should be noted that there is currently no dedicated academic journal for land administration.

Table 7. Popular ISI journals for land administration output

Journal	Records	% (of 97)
Land use policy	30	31
Survey review	11	11.3
Computers environment and urban systems	7	7.2
International Development Planning Review	4	4.1

7. THE UNIVERSITY PROGRAMS

7.1 Overview of programs

The following institutions offer programs in the domain of land administration (van der Molen et al., 2006): BSc and MSc programs are offered by e.g. University of New South

Wales (School of Geomatics Engineering), the Royal University of Agriculture in Phnom Penh, the University of Technology of Malaysia, the University of Munich (Institute of Geodesy, GIS and Land Management), the University of Lund (Department Technology and Society), the Royal Institute of Technology Stockholm (KTH). Short courses and single modules are e.g. offered by the University of Florida (Department Civil and Coastal Engineering), the University of Melbourne (Centre for Spatial Data Infrastructures and Land Administration), RMIT Melbourne, the Delft University of Technology (Department Technology, Policy and Management), University College London (Department Geomatics Engineering), Olds University College Alberta Canada, Lincoln Institute of Land Policy, Cambridge US, University of Toulouse, the University of Wisconsin, Land Tenure Centre, University of Aalborg Denmark (Division of Geomatics), Swedesurvey Gävle Sweden. Since this overview was published, many other universities embarked on programs in the domain of land administration and an update of this list would be welcomed. It should further be noted that the scope of this overview is highly limited to Anglo-Saxon programs and the developed countries.

The need for academic education in land administration is particularly urgent in developing countries and countries in transition (van der Molen, 2001). In the framework of capacity building new programs and curricula for BSc and MSc programs are being developed everywhere in the developing world. In 2006 the UNU School for Land Administration Studies was established. In the framework of the United Nations University, the Faculty of Geo-information Science and Earth Observation (ITC) and the Cadastre, Land Registry and Mapping Agency (Kadaster) both in the Netherlands, joined their forces to become the provider of knowledge in land administration to complement the UN mission.

The multi-facetted nature of the land administration field requires special skills from the course and curriculum developers. The faculties engaged in academic research tend to be those offering academic education. These are, as shown in this overview, geodesy, geomatics, geo-informatics or engineering faculties. In summary, land administration academic education is heavily influenced by one academic discipline, with its own way of thinking, terminology, culture and professional norms.

7.2 Textbooks

Two major publications give an overview of the land administration domain: Land Administration by Dale and McLaughlin (1999) and Land administration for sustainable development by Williamson, Enemark, Wallace and Rajabifard (2010). Both books offer a rich source of fundamental land administration information to be used in graduate education as introductory textbooks. Not surprisingly, the names of the authors of the textbooks can be found back in the list of main scholars in land administration (see 6.1).

8. CONCLUSIONS

This paper has examined the status of land administration as an academic discipline. The lack of agreement amongst scholars about the directions of land administration was first discussed. Following this, a set of indicators for validating areas of study as academic disciplines was

described. The approach was applied to the domain of land administration. Table 8 summarizes the results.

In summary, at best, land administration represents a discipline still in formation. Alternatively, it can be considered an emerging area of interdisciplinary study, however, it must be stated that it is still primarily based in the traditional areas of land registration (land lawyers) and cadastre (geodesists/surveyors). Technical universities are responsible for research and academic education in land administration, with dominance of few universities and research groups. The above conclusions calls for a worldwide and interdisciplinary scientific community to come up with a shared vision, develop a land administration theory and propose procedures and accepted methods of inquiry.

Table 8. Summary of evaluation

Criterion	Status	Criterion	Status
A formal definition	**Yes**	Both academic and professional associations	**Yes**
Common knowledge base	**No/ Partial**	Journals and recurring conferences	**No / Partial**
Unique cluster of research problems	**No / Partial**	Researcher self-identification with the discipline	**Partial**
Unifying theories	**No**	Icons, visible/leading scholars	**Partial**
Procedures and methods of inquiry	**No**	Textbooks	**Yes**
Shared vision	**No**	Expressed allegiance via artifacts and accepted rules	**Partial**
Structural elements on university level	**Yes**	Terminology/discipline specific lingo	**Partial**
Graduate programs and students	**Yes**	Strong interaction between academic discipline and the field of practice	**Yes**
A worldwide researcher community	**No**		

However, further work could be undertaken to improve validation of the results provided here. In particular, a more robust analysis of other forms of literature (i.e. non-ISI, non-English) appears necessary. An up-to-date and global inventory of university programs in land administration is recommended. Meanwhile, more pressing work should involve developing mechanisms for academia to develop to levels commensurate to land administration practice. Those in academia must continue to develop collaboratively to overcome the areas of weakness. In particular, stronger global coverage and link with developing countries appear necessary. In doing so, the utility of land administration in assisting with the delivery of broader societal goals will be enhanced.

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