

A Framework for the Evaluation of Land Administration Systems

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SUMMARY

On the international level, there are currently no accepted frameworks and methodologies to compare and evaluate national land administration systems. Comparisons, however, are an important source for learning and for identifying strengths and weaknesses. Part of the difficulty for adopting a common comparison framework for land administration systems is that they are in constant reform and, more importantly, they have strong social and cultural links and implications. Land administration systems reflect the particular and different perceptions that societies have of their land.

This paper presents the development of a framework and methodology that allows carrying out such evaluations. This evaluation framework takes economic, social and environmental issues as well as the different social, political and administrative background of each country into consideration. It is based on evaluation principles and distinguishes five different evaluation areas, which are each associated with different stakeholders that have different responsibilities. Each evaluation area is further divided into evaluation aspects. The evaluation framework is applied to case studies illustrating how it can benefit evaluators and decision-makers.

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1. THE EVOLVING CONTEXT OF LAND ADMINISTRATION

Land administration systems, and in particular their central cadastral components are essential elements of countries' national infrastructures (UN-FIG, 1999). The United Nations Economic Commission for Europe states in their Land Administration Guidelines that "these systems are concerned with the administration of land as a natural resource to ensure its sustainable use and development and are as such concerned with the social, legal, economic and technical framework within which land managers and administrators must operate" (UNECE, 1996).

The context, in which land administration systems and the central cadastral component are operating, is increasingly evolving. Not only were traditional cadastral systems slow in responding to the changing needs of society (Dale and McLaughlin, 1988), but also the relationship of humankind to land became more dynamic over the last few decades and particularly the last decade. This evolution is reflected in the resolutions of the successive efforts of the International Federation of Surveyors (FIG): the Statement on the Cadastre (FIG, 1995), the Bogor Declaration (UN-FIG, 1996), Cadastre 2014 (Kaufmann and Steudler, 1998), and the Bathurst Declaration (UN-FIG, 1999). The Bathurst Declaration concludes that sustainable development requires a sound land administration system.

In their paper on cadastral trends, Ting and Williamson (1999) identify different phases in the humankind to land relationship depending on the different rates of development of countries. They established a cumulative model of cadastral developments: (i) land as wealth, (ii) land as commodity, (iii) land as scarce resource, and finally (iv) land as a scarce community resource. They conclude that "each of these phases in the humankind/land relationship elicited a corresponding layer of complexity in the function of cadastral systems from a simple record of ownership and fiscal tool, to a cornerstone of land markets and then increasingly detailed land-use planning"; and that "the world is at different points in the continuum. Many developing countries are only just establishing more formal cadastral records for fiscal and also land market purposes... while ...western nations are rushing to create multi-purpose cadastres that take a community approach to sustainable development issues whilst maintaining private ownership."

Cadastres are evolving into broader land administration systems addressing a diversity of issues, ultimately supporting not only land ownership and land markets, but increasingly also sustainable development.

2. REASONS FOR EVALUATING LAND ADMINISTRATION SYSTEMS

Evaluation became a field of interest in the early 1960s in the USA mainly for evaluating development aid projects (Cracknell, 2000). Evaluation is concerned with questions such as: are we doing the right thing, are we doing things right, and what lessons can we learn from the experiences.

Evaluating or measuring the performance of a process or a system is a basic prerequisite for improving productivity, efficiency, and performance: "you can't improve what you can't measure" or "if you cannot measure it, you cannot manage it" (Kaplan and Norton, 1996). This perception led in the late 1970's to the concept of benchmarking, when Xerox in 1979 decided to examine its unit costs and to compare them with those of its Japanese competitors. Xerox found that the Japanese competitors sold their products for the same amount that it cost Xerox to just produce them (Evans, 1994). Influenced by Xerox's efforts, Camp (1989) later wrote the "Benchmarking" text book which became a widely recognized reference as an industry standard for searching for best practices and for establishing benchmarking procedures.

In the land administration field, the coordination and development of reform projects and the evaluation of national land administration systems became more and more of an issue over the last decade. The UN-ECE Meeting of Officials in Land Administration (MOLA) established in 1996 an inventory of aid projects on a European level (unpublished), which revealed that in some recipient countries up to 30 projects were simultaneously being sponsored by donor organizations, all having more or less the same goals, but with little or no coordination. One of the reasons for this situation was that there was a general unwillingness in many recipient countries to recognize that for land administration projects, institutional and managerial issues were more critical than technical aspects (Onsrud, 1999). The international understanding of the situation grew over the last few years, and some initiatives were taken to better coordinate cadastral projects.

With a recent "Comparative Study of Land Administration Systems", the World Bank (2003) aims to provide a basis for a more informed assessment of land administration initiatives. The study systematically reviews the characteristics, accessibility, costs, and sustainability of different land titling and registration options based on information compiled in a number of case study countries. The need for a more comprehensive approach in land administration is illustrated by the following observation that:

'...despite the significant resources being invested by the donor community for modernizing land administration infrastructure, there is little systematic discussion of the key elements of such a system and of what constitutes effectiveness within particular socio-economic, cultural and temporal contexts.'

A comprehensive framework for comparing and evaluating land administration system may provide some support to identify such key elements and also for lesson learning. However, the aim of such a framework cannot be to imply similar policy objectives or strategic goals, but to develop a shared methodology for the comprehensive evaluation of land administration systems.

3. CURRENT EVALUATION METHODS FOR LAND ADMINISTRATION SYSTEMS

The performance of land administration systems are currently being evaluated by different international organizations, national aid agencies as well as land administration agencies themselves in order to assess the systems for planning, sponsoring, or carrying out reform projects. There is, however, no internationally accepted or standardized method for evaluation; evalua-

tion depends very much on the organization itself that carries out the evaluation, its agenda, its aims, and the commissioned consultants with their professional backgrounds and experiences.

On the international level, there have been few attempts to standardize the procedures for evaluating or comparing land administration systems. This is mainly because the land administration systems are reflecting the cultural and social context of the country in which they are operating, making them distinctly different and therefore difficult to compare with each other. In 1997, the FIG-Commission 7 attempted to collect statistical data of national cadastral systems and got feedback from some 50 countries (Steudler et al., 1997). There is a wealth of information, but as the aim was to just make facts transparent, there also was a lack of a clear framework.

Over the last few years, the UN-ECE Working Party on Land Administration (UN-ECE WPLA) tried to coordinate the evaluation of land administration system reforms in transition countries. For reforming and improving these land administration systems, the then chairman of the WPLA, Onsrud (1999) called for lenders, donors and governments "...to coordinate their efforts ..." and that "...the guiding principle for the coordinated approach must be an agreed land administration master plan, which would clarify the ultimate goals, the priorities and the sequence of projects to be implemented, the division of responsibilities between agencies and the cooperation between them." As a result, the UN-ECE WPLA (2001) started to offer assistance to national land administration authorities reviewing the current situation and performance of their land administration system and undertook evaluation missions to countries in transition. The WPLA, however, relied on the background and expertise of the participating consultants and so far did not adopt a standardized method for evaluating and assessing national systems.

Several development agencies adopted a method called "Logic Framework Analysis" (LFA) to investigate and evaluate projects and programs in the field of overseas development. According to Cracknell (2000), the LFA is used by the Canadian International Development Agency (CIDA), the German technical assistance agency (GTZ), the World Bank, and the Swedish International Development Agency (SIDA) among others.

The first "Logical Framework" was developed for the United States Agency for International Development (USAID) at the end of the 1960's. It is a way of structuring the main elements in a project, highlighting logical linkages between intended inputs, planned activities and expected results (NORAD, 1999). There are many versions of the LFA and considerable variation in terminology, but it basically comprises a simple 4x4 matrix, which breaks down a project into its component parts, namely, inputs resulting in activities, output, immediate objectives (or project purpose) and wider objectives (or project goal), together with the risks and assumptions involved, and indicators of progress towards the achievement of objectives (Cracknell, 2000).

SIDA for example bases its support for projects on national policy criteria and submitted project proposals. Before projects are approved, proposals are to be appraised in accordance with an LFA. As there are not many projects in the land administration field, SIDA has not a standardized framework for appraising land administration projects and rather relies on the professional experience of commissioned consultants, although the LFA is still being used in this context.

In a paper presenting the German approach to cooperation with UN organisations, Zimmermann (2001) points out that "an extended profile for 'Land Administrators' working in international co-operation programs is needed to implement the new land administration paradigm based on good governance, right-based development and sustainability. Advisors in this field should be selected on the basis of the new paradigm which sees them as qualified facilitators of difficult political, institutional, legal and technical processes of change brought about by state reform, macro-economic adjustment and land policy reform." He highlights that the present approaches taken for consulting and evaluating land administration systems are very different and that there is a clear challenge to address this issue.

4. DEVELOPMENT OF AN EVALUATION FRAMEWORK

An important decision that has to be taken at the beginning of any evaluation relates to how it will be carried out. For the better understanding, large projects or systems have to be broken down and divided into comprehensible subgroups. In a World Bank seminar about "Public Sector Performance – The Critical Role of Evaluation", Baird (1998) emphasized four elements that are central in how to evaluate the performance of an organization or system. They are:

- well-defined **objectives** – to know where to go to;
- clear **strategy** – to know how to get there;
- **outcomes** and monitorable **indicators** – to know if on track;
- **evaluation** of results – to gain input for improvements.

The first element, the objectives define the targets for the whole system; their evaluation might involve historical and social aspects, the cultural heritage as well as the political, legal, and economic basis. The second element, the strategies define the way forward to reach and satisfy the objectives; the evaluation of the strategies will include the set-up of the institutions and organizations, and the financing structure. The third element, the outcomes are the result of the activities arising from the objectives and strategies and the indicators will give the feedback to evaluate them. The indicators must be monitorable and relevant. The fourth element, the evaluation of the results is the actual process, which takes the outcomes and indicators into account in order to evaluate and review the objectives and strategies. This process has to be done on a regular basis and looks at the performance and reliability of the system as a whole and how the initial objectives and strategies are satisfied.

The four evaluation elements must be thought of as a cyclical process, allowing a regular assessment of the performance on the one hand and a regular review of the initial objectives and strategies on the other. The review cycle can for example be such that the strategies are reviewed annually while the objectives might be reviewed only every four years (Figure 1).

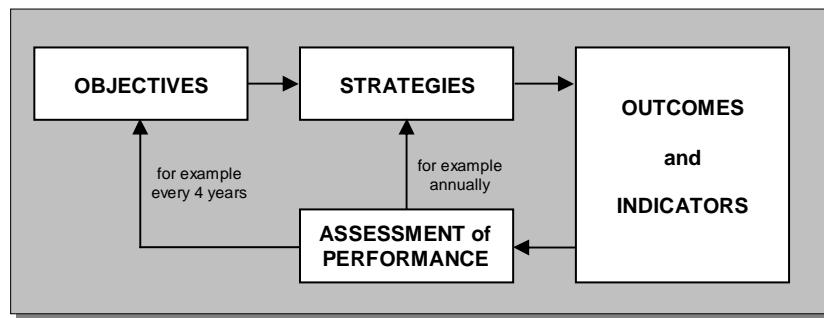


Figure 1: Basic evaluation elements and cycle of assessment (adapted from Selhofer and Steudler, 1998).

In order to fill the elements with content, they have to be brought in context with the relevant stakeholders. For that purpose, the organizational pyramid with the three organizational levels provides a valuable basis. Any organization is structured into different divisions, subdivisions and sometimes also external units, each with separate functions. Regardless of the organization, the three levels of the organizational pyramid can generally be distinguished, representing the different organizational tasks and responsibilities. The three levels are the policy level, the management level, and the operational level.

The organizational levels can be correlated with the evaluation elements mentioned above as well as with distinct groups of people carrying the responsibilities. The policy level can be related with the objectives, of which the government or the executive board is responsible. The management level includes the definition of the strategy, for which the administration or management of the organization is responsible. The operations required for the outcomes are handled in the operational level of which the operational units are responsible (Figure 2).

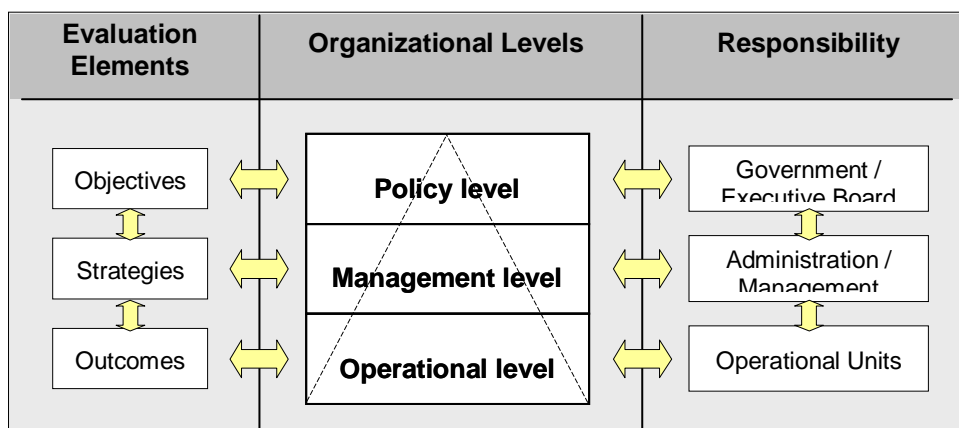


Figure 2: The relation between evaluation elements and organizational levels.

Organization management theories name further elements. Mintzberg et al. (1995) for example identify six basic parts of the organization, illustrating the elements of an organization in a very clear form. At the base of any organization can be found its operators, those who perform the basic work of producing the products and providing the services, thus forming the

operating core. All but the simplest organizations also require at least one full-time manager who occupies what can be called the *strategic apex*, where the whole system is overseen. As the organization grows, more managers are needed – not only managers of operators but also managers of managers. A *middle line* is created, which establishes a hierarchy of authority between the operating core and the strategic apex.

As the organization becomes still more complex, it generally requires another group of people. They mainly analyse, plan and control the operations of the whole organization and the work of other staff. They form what can be called the *technostructure*, which is outside the hierarchy of line authority. Most organizations also add staff units of again a different kind, to provide various internal services, from a cafeteria or mailroom to a legal counsel or public relations office. These units and the part of the organization can be called the *support staff*. Finally, every active organization has a sixth part, which may be called its *ideology* or "corporate culture". Ideology encompasses the traditions and beliefs of an organization that distinguish it from other organizations and infuse a certain life into the skeleton of its structure.

These are the six basic parts of an organization. As shown in Figure 3, the small strategic apex is connected through the middle line to the larger operating core at the base. These three parts of the organization are drawn in one uninterrupted sequence to indicate that they are typically connected through a single chain of formal authority. The technostructure and the support staff are shown off to either side to indicate that they are separate from this main line of authority, influencing the operating core only indirectly. The ideology is shown as a kind of halo that surrounds the entire system (Mintzberg et al., 1995).

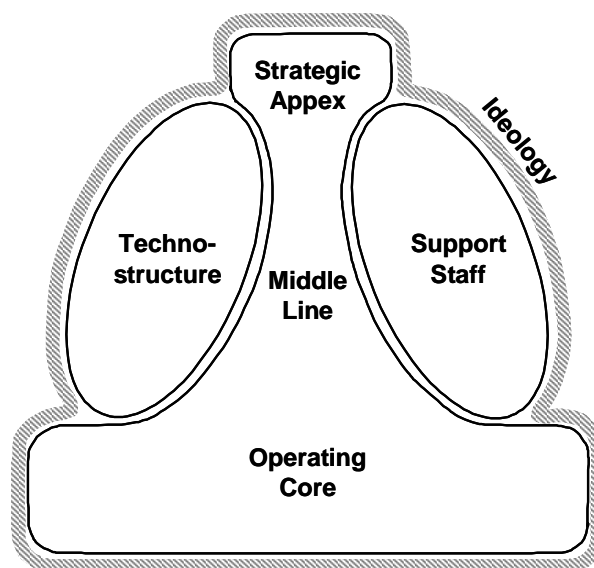


Figure 3: The six basic parts of the organization (Mintzberg et al., 1995).

The organizational levels – policy, management, and operational – provide the basis for defining the actual fields or areas of evaluation. For evaluating an administration system as a whole, however, another two areas need to be considered as well. Firstly and according to the evaluation elements discussed above, the "review process", which is looking at how the whole system performs and how objectives and strategies are satisfied. Secondly, there are

other "external factors" that have an impact across all three organizational levels. Factors such as human resources, capacity building, or technology all influence the organizational levels in one way or another and need to be addressed. Figure 4 illustrates the evaluation areas together in context.

These evaluation areas provide the basis for the evaluation framework in which all areas are evaluated separately, although with a holistic perspective and respecting the overall purpose of the system. For the evaluation, the areas are to be broken down in smaller units again, which are supported by performance indicators, measuring the performance of key variables such as quality, time, and cost in fiscal, social, cultural and environmental terms. The evaluation of those areas and indicators can then be done on the basis of predefined "good practice" criteria, which are representing a presumed "ideal" system. The criteria of this ideal system are to be based on the actual objectives and strategies of the system, on the results of previous lesson-learning and comparison projects, or ideally on both.

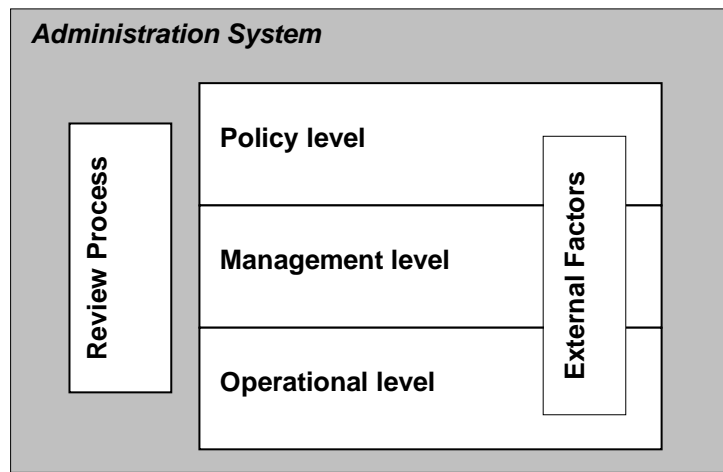


Figure 4: Evaluation areas for evaluating administration systems.

Table 2 illustrates a generalized evaluation framework where the evaluation areas are further expanded with possible aspects, indicators and good practice criteria.

Table 2: Evaluation framework with possible aspects, indicators and good practice for each area.

Evaluation Area	Possible Aspects	Possible Indicators	Good Practice
Policy Level	<ul style="list-style-type: none"> objectives and tasks of the system historic, legal, social, cultural background equity in social and economic terms viability of system (economical, social) ... 	<ul style="list-style-type: none"> list of objectives and tasks historic and legal indicators social indicators economic indicators (expenses, incomes, fees, costs) ... 	<ul style="list-style-type: none"> system is well defined by objectives and tasks system responds to needs of society system is equitable for all system is economically viable ...
Management Level	<ul style="list-style-type: none"> structural definition of system strategic targets institutional and organizational arrangements cooperation and communication between institutions involvement of private sector ... 	<ul style="list-style-type: none"> definitions and characteristics of system list of strategic targets list of institutions and their responsibilities and strategies links between institutions (legal, organizational, technical) no. of contracts with private sector ... 	<ul style="list-style-type: none"> structure of system is useful and clearly defined strategies are appropriate to reach and satisfy objectives involved institutions have each clearly defined tasks and cooperate and communicate well with each other private sector is involved ...

Operational Level	<ul style="list-style-type: none"> outcomes technical specifications implementation ... 	<ul style="list-style-type: none"> products for clients technical indicators implementation factors ... 	<ul style="list-style-type: none"> products are appropriate to respond to objectives technical specifications and implementation are appropriate to strategic needs ...
External Factors	<ul style="list-style-type: none"> Human Resources (personnel, training) capacity building professional association technical developments ... 	<ul style="list-style-type: none"> number of personnel, education continuing education (seminars, etc.) no. of universities and students is there a professional association (y/n) new technologies on the market ... 	<ul style="list-style-type: none"> appropriate no. of personnel in relation to task and total population continuing education on a regular basis appropriate no. of universities and students in relation to total population professional association takes an active role new technologies are evaluated on a continuing basis ...
Review process	<ul style="list-style-type: none"> review of objectives and strategies performance and reliability of system customer satisfaction ... 	<ul style="list-style-type: none"> review of objectives and strategies (y/n) turnover, time to deliver, no. of errors review of customer satisfaction (y/n) ... 	<ul style="list-style-type: none"> regular review process system is efficient and effective system delivers in time and with few errors appropriate, fast and reliable service to clients ...

5. APPLICATION OF EVALUATION FRAMEWORK TO LAND ADMINISTRATION SYSTEMS

The evaluation framework that has been developed in the previous section can be applied to any organization or administration system. It takes a comprehensive approach and considers issues such as the different stakeholders in the organisational pyramid, as well as the recurring and regular review of the objectives and strategies through the assessment of the performance.

The cyclical review process supported by benchmarking and feedback corresponds with other accepted concepts in land administration, e.g. the hierarchical framework for re-engineering land administration systems as presented by Williamson and Ting (2001). Global drivers of change are impacting on the whole social system and on the humankind to land relationship. Together with the existing land administration system, these factors provide the input for the development of a conceptual land administration system, which – through an implementation process – is then developed into an operational one. The initial vision and conceptual system will then continually be refined through feedback, benchmarking, and evaluation. This concept corresponds with the above developed evaluation framework.

The above developed evaluation framework to land administration also corresponds with an approach that has been presented by Kaufmann (2000) at the "1st International Seminar on Cadastral Systems, Land Administration and Sustainable Development" in Bogotá. He introduced a new perspective on cadastres and land administration and makes the analogy that the cadastre – with its traditional role of administering information on rights, restrictions and responsibilities on land – can be considered as sort of a book-keeping or "accounting system" for land issues, ultimately supporting sustainable development. Like the accounting system for an organization or a business, the cadastre has to follow certain rules and principles. For the cadastre, these principles have traditionally been to provide reliable and systematic information about individual land parcels, primarily in support of land taxes, land markets, and land-use planning, or as defined earlier for the fiscal, legal, and regulatory functions of land administration.

The analogy also takes the organizational levels from the organizational pyramid into account, whereby the policy level is responsible for the strategic goals and the management level for the resources. In the operational level, the operational tools for the "accounting system" are controlled, providing the sound basis for the whole system. Figure 4 illustrates the analogy of the organizational levels between a general business and land issues, which corresponds with the evaluation framework developed in the previous section.

Organizational Levels	Tasks	General Business	Land Issues
Policy Level	Setting of objectives:	<i>Sound economic development</i>	<i>Sustainable development</i>
Management Level	Define strategies and measures to meet them:	<i>Company management</i>	<i>Land management, resource management</i>
	Define the administrative business processes:	<i>Administrative units and accounts</i>	<i>Land administration functions and organizations</i>
Operational Level	System and rules for documenting and monitoring:	<p>→ Accounting system – accepted principles of book-keeping:</p> <ul style="list-style-type: none"> • reliable • complete • appropriate to needs • adaptable to development 	<p>→ Cadastre – accepted principles for documentation of rights, restriction and responsibilities:</p> <ul style="list-style-type: none"> • reliable • systematic, complete • appropriate to needs and laws • adaptable to development • public

Figure 4: Cadastre in relation to land management and administration (based on Kaufmann, 2000).

The aspects and possible indicators within the evaluation framework would have to be developed for the case "land administration". We find support for that in a recent paper by Williamson (2001), where he proposes a range of 'best practices' that are useful in undertaking the establishment or re-engineering of land administration systems and that can be considered as the major components of a land administration 'toolbox'. These toolbox principles provide a suitable basis for the evaluation framework as they cover the whole spectrum of land administration. The toolbox principles are:

- **Land policy principles:** state and national land policy / roles and responsibilities of the various land-related activities such as land management, land reform, land registration, cadastre and land administration / range of humankind to land relationships / role of land administration system in supporting land market, in managing urban areas, in managing natural resources / recognition of growing complexity of rights, restrictions and responsibilities in relation to land / cost recovery of government services;
- **Land tenure principles:** formal recognition of appropriate land tenure principles / recognition of indigenous and informal tenures / appropriate responses to circumstances;

- **Land administration and cadastral principles:** cadastral concept and components of a cadastre / national land information systems / visions for future / implementation of reforms / adequate protection of land rights / trade of those rights: efficient, simple, quick, secure, at low cost;
- **Institutional principles:** government, ministerial, departmental structures / decentralization and deconcentration / combination of all land administration activities into one government agency / relationships between government and private sector / professional organization;
- **Spatial data infrastructure (SDI) principles:** role of SDIs in supporting land administration / development of "infrastructure" vs. "business systems" / role of land parcel layer in SDI / hierarchy and dynamic nature of SDI;
- **Technical principles:** user-driven technical solutions / level of computerization according to country's capacity / technology's provision for overall objectives of system and reform;
- **Human resource development and capacity building principles:** sustainable long-term capacity of educated and trained personnel to operate the system in both the public and private sectors / capacity building as a mainstream component of a reform project as opposed to add-ons / capacity building is equally applicable to private sector as to public sector.

These toolbox principles provide a valuable basis for establishing the evaluation aspects for land administration and for identifying indicators for each aspect. The aspects and indicators in Table 3 point towards an operational evaluation framework and take the above-developed criteria into account.

6. CONCLUSIONS

The evaluation of land administration systems is not based on a standardized method that is internationally accepted; the evaluation methods rather depend on the background and experience of the commissioned consultants and the specific project objectives. In consequence, this paper suggests an evaluation framework for land administration systems, which takes a holistic approach looking at the whole system and which considers aspects such as the levels of the organisational pyramid, the regular review of the objectives and strategies, and other external factors having an influence on the system.

The evaluation framework has been developed by considering four evaluation elements – objectives, strategies, outcomes, review process – and by linking them with the different stakeholders within the organisational pyramid. This corresponds with other accepted concepts such as the framework for re-engineering land administration systems and the bookkeeping or accounting system analogy for land administration. The resulting elements, aspects and indicators are then facilitated by the toolbox principles for land administration providing a valuable basis for the evaluation of the whole system.

This paper contributes to the evaluation of land administration systems by considering it as a whole entity; by suggesting evaluating the three organizational levels plus the review process and the external factors; and by proposing the use of the toolbox principles for identifying the aspects and indicators within the evaluation framework. The details of the aspects and indica-

tors, however, are beyond the scope of this paper and need further investigation. The framework nevertheless provides a basis for evaluating land administration systems in a more standardized and comprehensive approach.

Table 3: Evaluation framework for land administration systems.

Area	Aspects	Possible Indicators (not detailed and not exhaustive)
Policy Level	Land policy principles	<ul style="list-style-type: none"> • Existence of a government policy for land administration (y/n) • List of statements for land administration system role • Existence of independent land board (y/n) • ...
	Land tenure principles	<ul style="list-style-type: none"> • Existence of formal recognition and legal definition of land tenure (y/n) • Security of tenure (no. and solution of disputes) • Social and economic equity (underrepresented groups) • ...
	Economic and financial factors	<ul style="list-style-type: none"> • Cost/benefit and fee structures, land tax revenue • Economic indicators (value and volume of land market) • Funding and investment structure • ...
Management Level	Cadastral and land administration principles	<ul style="list-style-type: none"> • Adequate protection of land rights • Support of land market (secure, efficient, simple, at low cost) • ...
	Institutional principles	<ul style="list-style-type: none"> • List of responsible departments and ministries • Central or decentral organization • Number of institutions and offices • Private sector involvement, no. and volume of contracts • ...
	SDI principles	<ul style="list-style-type: none"> • Standards arrangements, core data • Access network, pricing • Data definition, modelling • ...
Operational Level	Technical principles	<ul style="list-style-type: none"> • Data properties (capture method, quality and accuracy) • Data maintenance, timeliness • ...
External Factors	Human resources	<ul style="list-style-type: none"> • Number of personnel (public and private) • Professional association • ...
External Factors	Capacity building	<ul style="list-style-type: none"> • Number of universities and students • Funding structure for capacity building • On-going education (no. of workshops, seminars) • ...
	Research and development	<ul style="list-style-type: none"> • Number of research institutes in the land administration field • ...
	Technology	<ul style="list-style-type: none"> • Freedom of systems and methods (y/n) • Regular review of new technologies on market and assessment of fitness for use (y/n) • ...
Review Process	Assessment of Performance	<ul style="list-style-type: none"> • User satisfaction indicators • Degree of satisfaction of objectives and strategies • Existence of a regular review process (y/n) • ...

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BIOGRAPHICAL NOTES

Daniel Steudler graduated from the Swiss Federal Institute of Technology (ETH) in Zurich in 1983, earned the Swiss license for licensed land surveyor in 1985, and did his M.Sc.Eng. degree at the University of New Brunswick, Canada from 1989-91. Since 1991, he is working with the Swiss Federal Directorate of Cadastral Surveying with the responsibilities of supervising and consulting Swiss Cantons in organizational, financial, technical, and operational matters in cadastral surveying. Since 1994, he is involved in the activities of FIG-Commission 7 as a working group secretary until 2002. He became the official Swiss delegate to Commission 7 in 2003. Between April 2000 and February 2004, Daniel did a PhD at the University of Melbourne, Australia, under the supervision of Prof. Ian P. Williamson. The main research topic was to develop a framework and methodology for evaluating cadastral systems in the larger context of land administration.

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