Reengineering Cadastre and Land Registration Systems and Business Opportunities

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Key words: Land, Cadastre, LIS, Administration, Reengineering.

SUMMARY

The international initiatives by various agencies (such as World bank, FAO, UN, FIG, etc.) suggest that cadastre and land registration systems are currently undergoing major changes worldwide. On such changes, the emerging trends focus on easy access to land, security of land tenure, establishment and operation of efficient land markets, formalization of property rights, incorporating customary and informal settlement areas, development of land information systems (LIS), etc. These trends have encouraged many nations to adopt land information systems by reengineering their land administration systems with uses of Geo-ICT and communication infrastructure, and to support the long-term sustainable development including market economy.

While reengineering cadastre and land registration systems, the implementing agencies face many challenges in the issues of organizational, legal, financial and technical elements. These elements require tremendous efforts and cost.

This paper discusses firstly evolving trends on land administration systems in general to highlight the new requirements influenced by changing humankind to land relationships and user needs. Secondly some principles of reengineering are identified relevant to the cadastre and land registration systems where land information systems are part of Geospatial data infrastructure. Examples from Nepal and Bhutan are then summarized to assess the current situations of systems and needs for reengineering them are discussed. Lastly, cadastral domain models are proposed as a component of reengineering process.

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1. INTRODUCTION

Traditional cadastre and land registration systems are currently undergoing major changes worldwide. On such changes, the emerging trends focus on easy access to land, security of land tenure, establishment and operation of efficient land markets, formalization of property rights, incorporating customary and informal settlement areas, development of land information systems (LIS), etc. These trends have encouraged many nations to adopt land information systems by re-engineering their land administration systems, and to support the long-term sustainable development including market economy.

In this paper, we discuss firstly evolving trends in land administration systems in general to highlight the new requirements influenced by changing humankind to land relationships and user needs. Secondly we identify some principles of reengineering relevant to the cadastre and land registration systems where land information systems are part of Geospatial data infrastructure. Examples from Nepal and Bhutan are then summarized to assess the current situations of systems and needs for reengineering them are discussed. Lastly, cadastral domain models are proposed as a component of reengineering process.

2. EVOLVING TRENDS IN LAND ADMINISTRATION SYSTEMS

Many countries in the developing countries are facing, on daily basis, many challenges on the issues of land administration. The traditional systems are no longer adequate to support the sustainable development and to stimulate land market. As such these systems were narrowly designed to satisfy the needs of the society of those days. But now a day the diverse needs of land information and technological advancements have driven the necessity of changes in land administration systems, and they are making the great pressure to the organizations on the way they conduct their business.

Recognizing these facts, Bathurst declaration (UN-FIG, 1999) encouraged the national governments of the developing countries to re-engineer their land administration systems by incorporating land information infrastructure with a focus toward services and users at all levels of society. By allowing other kinds of land information to be part of land administration infrastructure, the new system would increase the data accessibility, data security and data quality. Reengineered systems would then provide improvement of existing land administration systems as such, regularization of informal settlement and management of these areas over time, improved conflict management over land, diversification of tenure types, etc.

Williamson et al (2001) proposes a framework for re-engineering land administration system, and suggests the development of a strategic planning which includes the humankind to land

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relationship as the starting point. They have covered the wide ranges of driving forces and issues for the changes, which are related to spatial data infrastructure and complexity of cadastral systems. Oosterom et al (2002) also highlights the impact of Geo-ICT on cadastral systems and discusses how the users can be satisfied with modern technological tools. Similarly, the changing relationships of humankind to the land, the changing role of government and private parties in society and technological impact to the cadastre have been very well recognized in FIG Cadastre 2014 (Kaufmann et al, 1998).

The evolving nature of man-land relationship can be mainly defined in the form of land rights, public interests and indigenous rights (Molen, 2002). The changes in such interests that are included in land administration systems can occur through the land market, planning and development, formalizing property rights, integrating indigenous rights, land reforms including land redistribution and land consolidation). That means that the existing land administration systems are to be analyzed to identify the requirements for these processes so that the appropriate systems can be realized. Since these processes run through the number of independent organizations or agencies, geospatial data infrastructure offers attractive opportunities for data sharing among these organizations and efficient access to data utilizing modern Information and communication technology.

Palmer et al (1996) indicates that there are four forms in reforming land registers that are mainly on legal, judicial, administrative and technical reforms. Additionally, integration of other property data is likely to have better cost saving through economies of scale and minimizing of duplication. Then more effective service to the public through "one-stop shopping" and potential synergies among the various property agencies can be expected. To this end, there are two important issues to tackle firstly data standards to facilitate open access and easy exchange of data (interoperability), and secondly maintenance of databases which requires continuous commitment to the acquisition of new data. However, the realization of effective and efficient land administration processes primarily depends on the coordination and cooperation of the implementing agencies.

3. PRINCIPLE OF REENGINEERING AS APPLIED TO CADASTRE AND LAND REGISTRATION SYSTEMS

The term "reengineering" is defined as: *"The fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service and speed"* (Hammer and Champy, 1993).

In this definition, the first word *"fundamental"* means that during reengineering existing systems, we must ask basic questions about organizations and how they operate: why do we do what we do? and why do we do it the way we do? Analyzing answers to these questions usually forces us to look at the tacit rules and assumptions that underlie the way we conduct their business. Often, these rules turn out to be obsolete, erroneous or inappropriate. In cadastre and land registration, it means that it is not just adjudication, surveying and registration of land parcels; we have to ask ourselves if these processes are adequately enough to serve the purposes such as handling customary rights and land rights on informal settlement.

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Second word *"Radical"* redesign means getting to the root of things: not making superficial changes or fiddling with what is already in place, but throwing away the old. Old systems may have to be redesigned completely to suit the new requirements as explained above. Few improvements in the systems may not serve our purposes. For example, in customary or informal settlement areas, land parcel units can be spatial units referring to the groups of citizens or tribes, etc. This is radically different registration perspective from those of individual owned parcels in registration of deeds or titles. In some countries such as Nepal, the registration is based on the system of simplified deed registration. This system was designed for taxation purposes. Today's requirements within the modern Nepalese society require more security on tenure and easy access to land by stimulating land market. The present system may have to be changed radically to suit the new requirements.

The third word *"dramatic"* means there has to be quantum leaps in performance. It is not about making marginal or incremental improvements. This is highly desirable to improve the quality of land administration services and products.

Lastly, but most importantly is *process* that gives most organizational managers the greatest difficulty. *A process may be defined as a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer* (Hammer et al, 1993). That means reengineering is to focus on process not function and to use information technology for restructuring what was done and how it was done. The goal of reengineering should be to create a new way of doing things where employees/workers are problem solvers and truly routine activities should be automated. Such processes must be kept simple and low cost to achieve quality and flexibility. The simplicity has enormous consequences for how processes are designed and organizations are shaped.

In reengineering a process, several characteristics can be distinguished. Firstly, it is possible that several jobs are combined into one job. This is the most basic and common feature of reengineered processes, which do not required assembly line as in traditional systems. In a traditional cadastre and land registration systems, there are many steps, which can be combined in one step. This can be easily achieved by using LIS. That means many formerly distinct feature jobs or tasks are integrated into one tasks. Therefore it is important to identify these steps that can be combined during reengineering.

Secondly in a reengineered process, employees make decision-making. In the traditional organizations like cadastre, they often have to go to the higher level of officers for decision. This takes considerable waiting time without adding any values to the processes. Such decision takes place horizontally and vertically in the hierarchy of the organizations. New systems must be able to eliminate these non-value activities by combining vertical as well as horizontal decision processes, and its benefits include fewer delays, lower overhead cost, better customer response and greater empowerment for employees.

Thirdly, the steps in the process are performed in a natural order. In reengineered processes, work is sequenced what needs to follow what. This makes a process transparent and clear to the customers.

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Fourthly, process has multiple versions. Traditional processes are intended to provide mass production for a mass market. All inputs are handled identically, so organizations could produce uniform and consistent outputs. In a world of diverse and changing markets that logic is obsolete. To meet demands of today's environment, we need multiple versions of the same process, each one tuned to the requirement of different markets, situation or inputs. But these processes must have the same economies of scale that result from mass production.

Work is performed where it makes the most sense. This is the most critical to cadastre and land registration systems. The processes are decentralized to the lowest possible units where customers are directly connected so that they do not need to travel to the head office in the capital city. In many developing countries, citizens have to travel long distance for registration, and this involves high cost. Because they cannot afford these cost and time, they do not even register their lands.

Checks and controls have to be reduced. The processes in the conventional cadastre and land registration are mostly replete with checking and control steps, which add no value but are included to ensure that people are not abusing the process. Reengineered processes use controls only to the extent that they make economic sense.

Reconciliation should be minimized. The external contacts should be reduced to avoid the chances that inconsistent data requiring reconciliation will be received.

Lastly, a case manager provides a single of contact. This mechanism proves useful when the steps are so complex or are dispersed in such a way that integrating them for a single person or even a small team is impossible. Acting as a buffer between the complex process and the customer, the case manager behaves with the customer as if he or she were responsible for performing the entire process, even though that is really not the case. This phenomenon can be seen in our traditional cadastre and land registration systems. The citizens who wish to survey and register their lands usually leave to either to notaries or land surveyors or even brokers for all kinds of arrangements.

These characteristics suggest that many of the cadastre and land registration organizations would need major changes in the way they conduct their business particularly in the developing countries.

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4. CASE STUDIES IN CADASTRE AND LAND REGISTRATION SYSTEMS

Brief explanations are given on the cadastre and land registration systems in Nepal and Bhutan in order to identify some practical situations and challenges.

4.1 Nepal

HMG Department of Survey and Department of Land Reform and Management under the Ministry of land Reform and Management are responsible for the tasks of cadastre and land regisration in Nepal. Both the departments maintained land records (cadastral maps and ownership records) at their district offices. Realizing the various problems in handling land records, the ministry has over recent decades put considerable effort into building Land Information Systems (LIS) to support the efficient management of scarce land and resources. A newly established Department of Land Information and Archives (DoLIA) has also been charged for building a nation-wide land information systems. According to the studies, the efforts toward its development have so far proved ineffective (Tuladhar et al, 2002). Some observations on the current activities are indicated below:

- Insecurity exists in the continuity and commitment of the project team,
- Inappropriateness of investment in building LIS to cover the entire country,
- Computerization without analysis of the current land administration system (specially data and processes),
- Stakeholder over-expectation in terms of LIS functions,
- Managerial capacity and frequent change of leadership,
- Inefficient and ineffective organization structure,
- Poor communication, co-ordination and participation among the various departments and stakeholders,
- A lack of rigorous strategic planning and vision towards building, operating and maintaining LIS,
- Lack of a nation-wide system architecture to fulfill the user requirements,
- Lack of standard data models and standards,
- Inappropriate processes for data collection, data checking, data storage , data maintenance, data sharing and data archiving,
- Poor quality of available data sources (both registers and the maps), and
- Local capacity-building is lacking

These observations suggest that the inffectiveness are mainly caused by a lack of appropriate approach. The approach has to take up with appropriate solutions with regards to institutional, legal, financial and technical issues, and should include a fully-fledged and structured strategic planning including analysis of existing systems and user requirements.

Since the task is huge and complex, modern techniques such as Geo-ICT infrastructure and active participation inclduing commitment on the part of all departments play a determining role in the successful implementation of LIS. The study also proposes a preliminary vision for reengineering cadastre and land registration systems as shown in the figure 1.

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External Services

NGII Network

Cadastre and land registration Services and Products at Districts

To timely supply information at affordable cost

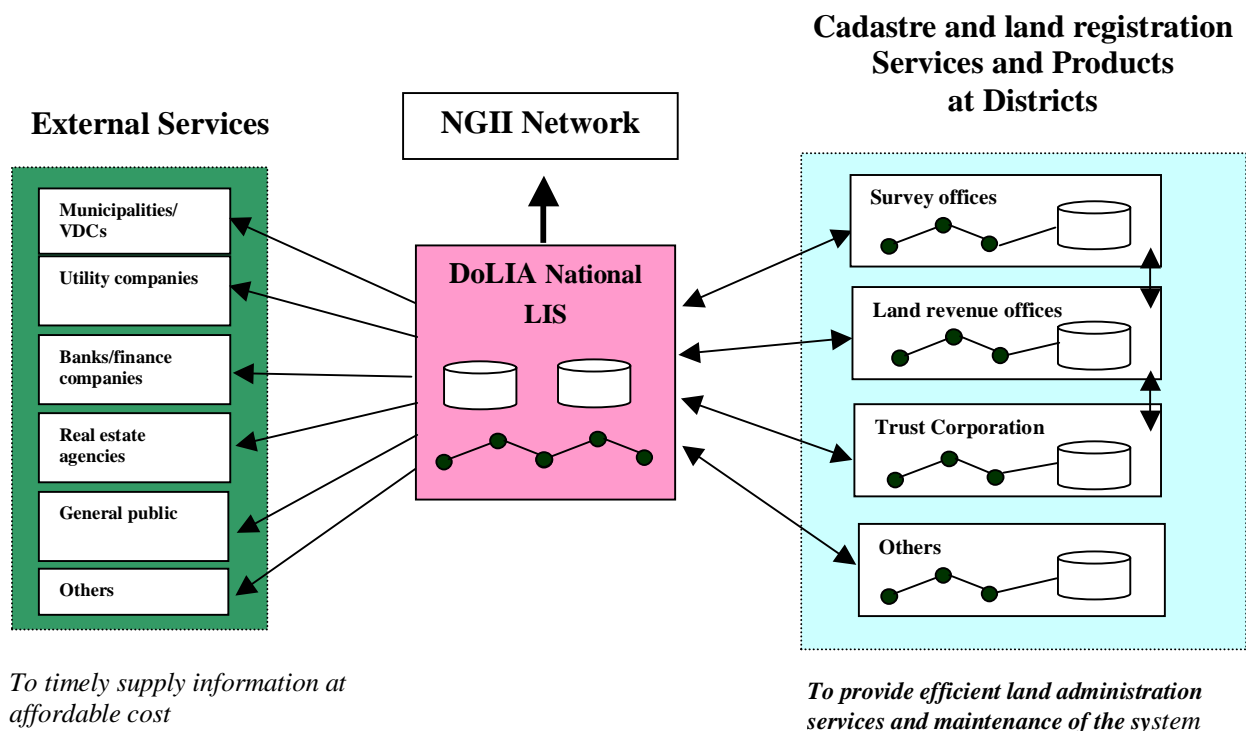*To provide efficient land administration services and maintenance of the system*

Figure 1: Proposed vision for Land information systems in Nepal

4.2 Bhutan

In Bhutan, Survey of Bhutan (SoB) under the Home Ministry is responsible for keeping and maintenance of land records (usually known as "Sathram") of the rural areas in the country. The urban land records are maintained by the respective city corporations who function under the direction of the Department of Work and Housing under the Ministry of Social Services and the respective district administration. Copies of Sathram are disseminated to all administrative units such as the districts (Dzongkhags), sub-districts (Dungkhags) and Blocks (Gewogs). All forms of land transactions except for new allocations are first handled at the sub-district or district level.

An application for transaction is received by the local court, which withholds the application for 30 days, during which it makes inquiries with the local chief (Gup) to verify the legality of ownership. If there is no objection raised within this period, an affirmative decision is made and the application is conveyed to the Home Ministry for formal approval. The Home Ministry sends the case to the land Record office in SoB Bhutan for registration. After affecting the necessary changes in the main Sathram, the relevant district, sub-district and block officials are informed of the change, whereby the local records are amended. A certificate is duly prepared and presented to the individual through the local authorities (Tshering, 1993).

In order to speed up the above processes, the project "Computerization of Land Registration system in Bhutan" was initiated in 1992 under the consultancy of the Swedesurvey, financed

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by Swedish Aid Agency and the UNDP. The database developed under this project was designed to replace manual system of handling data in Sathram.

Analyzing the current situation, the several deficiencies can be identified. The biggest challenge is that current system does not have direct contact with clients. The responsibilities are not clear. Although the districts or sub-districts execute the activities of land transaction, no land information is directly available at these offices from the SoB where cadastre and land registration systems are computerized. The communications are mostly channeled through the hierarchies of the formal administrative bodies, which induce many errors, duplication and inconsistencies in the land records (Sathram). Other government organizations and agencies have no means to obtain necessary land information. Although the system is meant for generating revenue, there are no agencies responsible for monitoring and valuing land. Thus the system is unable to recognize if it stimulates land market or if it promotes agricultural productivity in the rural areas.
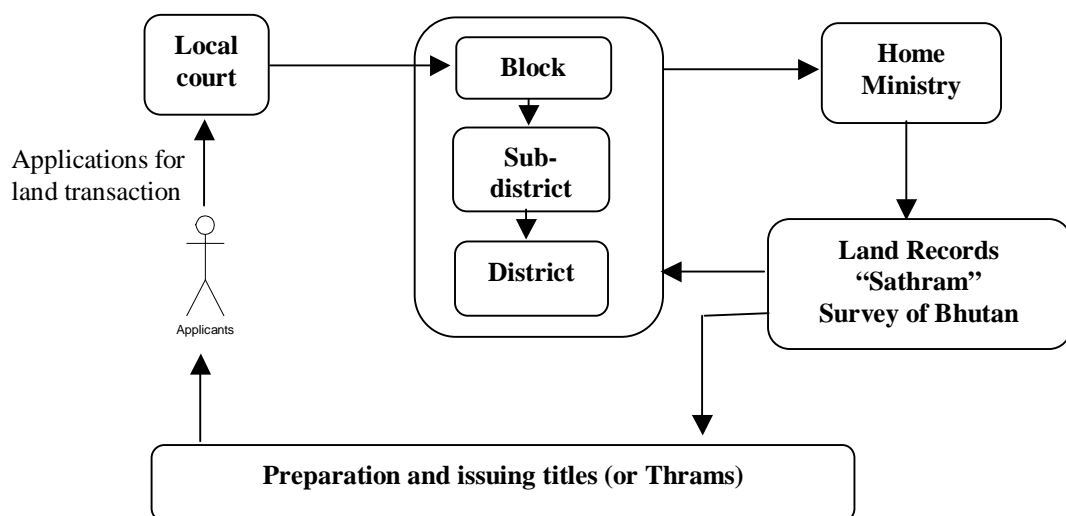

Figure 2: Current procedure for land transaction

There is no legislation with regard to mortgaging land. The studies also indicate that user requirements have never been identified, and there are no standards for data definition, quality, processes and data exchange. Lastly, local human capacity needs to be developed.

Legislative framework for any kind of Land transaction including registration is guided by land act and forest act of Bhutan (Royal govt. of Bhutan, 1991). According to land act, any persons registered in the land records are legal owners and more or less guaranteed by the state. As such there is very little or no legal provision at all for a third party to contest the ownership.

This study shows that the processes of cadastral surveying and recording at Survey of Bhutan are rather transparent. This provides good opportunities to computerize them in short periods of time. But it is not clear how local courts and other administrative officials at various levels exercise their duties to register land transaction. This may be the cause why a registration

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takes a long time even a year in some situation. It is also not known how the registration system relates to the other programme of sustainable development and market economy in the country.

5. CADASTRAL DOMAIN MODELS

In the current cadastral and land registration systems of both countries described above, it appears that there is absence of cadastral domain models for their land information systems. In case of Nepalese cadastre and land registration systems, LIS does not seem to recognize real land-related problems, and hence the results are not dissatisfactory. These may be partly due to mismanagement of information system development and the absence of cadastral domain models, which capture real problems with respect to land tenure, its allocation and registration processes, and sharing of information among the various users. To some extent, proposed vision in the figure 1 includes some of these problems but not all such as processes dealing with land pooling, readjustment, customary rights, etc.

In Bhutan, reengineering is essential to ensure availability of the cadastre and land registration systems at the place where it is needed. There appears to be big gaps between citizen and cadastral systems. Similarly, cadastral domain model will include necessary processes defined as land policy instruments.
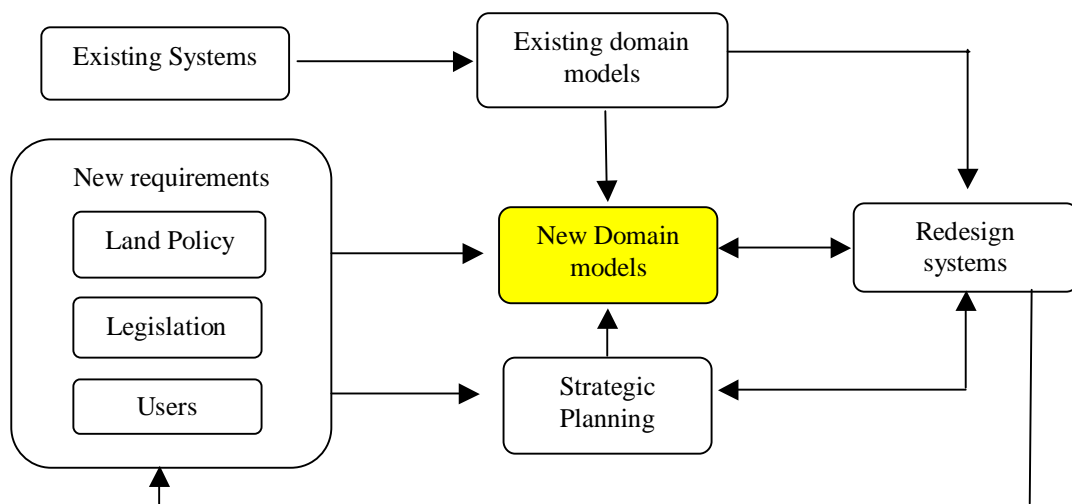

Figure 3: Approach for developing cadastral domain models

The figure 3 provides an approach for developing cadastral domain models relating with existing systems, new requirements and strategic planning for redesigning the systems using principles of reengineering.

Cadastral domain models also include data requirements for both spatial and non-spatial components. Once these requirements are known, they can be organized according to Open GIS specifications (Oosterom et al, 2002).

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6. CONCLUDING REMARKS

This paper has identified firstly evolving nature of land administration trends, which encourage the developing nations for reengineering of cadastre and land registration systems. Then it emphasizes the principles of reengineering for cadastre and land registration systems. Case studies have demonstrated that the systems are not effective and efficient as required by the objectives of land administration. If these principles are not respected in the redesign of their business processes, reengineering will hardly be successful. Lastly, it is concluded that it is appropriate to include cadastral domain models, as a component of reengineering process, capturing the essential needs of land administration aspects.

REFERENCES

Bogaerts, T. and Zevenbergern, J. (2001). *Cadastral systems – alternatives.* Computers, Environment and Urban Systems Volume25, Number 4-5, July/September 2001.

Dorje, S. (1999). *Review of the on-going land information system development in Survey of Bhutan.* IFA study, ITC, Enschede.

Hammer, M. and Champy, J. (1993). Reengineering corporation: A manifesto for business revolution. Harper Business, New York.

Kaufmann, J. and Steudler, D. (1998). *Cadastre 2014: A vision for a future cadastral system.* FIG commission 7, 1998.

Molen, P.v.d. (2002). *The dynamic aspects of land administration: an often-forgotten component in system design.* Computers, Environment and Urban systems Volume 26, Number 5, September 2002 pages 361 -381.

Osterberg T. (1998). *Cadastral systems in developing countries.* Commission 7 Cadastre and land management, FIG, XXI International congress, Brighton, UK.

Oosterom, P. & Lemmen, C. (2002). *Impact analysis of recent geo-ICT developments and cadastral systems,* XXII FIG International Congress and ACSM-ASPRS Conference and Technology Exhibition 2002, April 19-26, 2002, Washington, DC, USA.

Palmer, D. and McLaughlin, J. (1996). *Integrated Land Administration: Institutional and Technical Challenges.* A special issue of the ITC Journal for the Habitat II Conference (1996 -1).

Royal Govt. of Bhutan (1991). *Land Act.* Royal Government of Bhutan, printed at the Survey of Bhutan.

Tuladhar, A.M., BC, K. R. and Budhathoki, N. R. (2002). *Towards Strategic Planning For Building Land Information System (LIS) In Nepal.* Presented paper at Asian Remote Sensing conference (ACRS2002), Kathmandu, Nepal.

Tuladhar, A. M. (2002), April 19-26 2002). *Developing a Framework for Cadastre and Land Registration Systems in Land Administration Organizations.* Paper presented at the FIG XXII International Congress, Washington, D.C.,U.S.A, Available: http://www.oicrf.org/

Tshering, D. (1993). *Development of a strategy for re-engineering Parcel-based information system in Bhutan.* M.Sc. thesis, ITC, Enschede, The Netherlands.

UN-FIG (1999). *Bathurst declaration: Report of the workshop on land tenure and cadastral infrastructures for sustainable development.* Bathurst Australia, 22nd October 1999.

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Williamson, I. P. and Ting, L. (2001). *Land administration and cadastral trends – a framework in Re-engineering land administration*. Computers, Environment and Urban Systems Volume25, Number 4-5, July/September 2001.

BIOGRAPHICAL NOTES

Mr. **Arbind Man Tuladhar** is working as assistant professor at International Institute for Geo-Information Science and Earth Observation (ITC) in the Netherlands. He has more than 25 years of experiences in land administration and national topographical mapping. During the periods, he has gained tremendous knowledge in the use of geographic information systems, database management systems, system development methodologies and use of various CASE tools. He has also applied them within the context of Geo-spatial data infrastructure. He is a life member of Nepal Geographical Society and Indian National Cartographic Association (INCA). He has published many articles.

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