

Role of Land Administration in Sustainable Development – Country Case Studies of India and Switzerland

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Keywords: Cadastre; Land distribution; Land management; Sustainable development; land ownership.

Natural resources are many-fold, with land being the most abundant and precious resource for most societies. Less developed countries are attempting to catch up with more developed countries in terms of economic growth, which is very often linked with land development. It however is observed that this development is often intertwined with land grabbing of millions of hectares of agricultural land by richer corporations or even foreign governments. Controversial land deals could in the words of Jacques Diouf (Director-General Food and Agriculture Organisation of the United Nations, 2008) create a form of "Neo colonialism" with poorer states producing the food for the richer at the expense of their own food security. It can be argued that – with the help of political decisions – there is an upsurge of the economic pillar of sustainable development at the expense of the social pillar, i.e. the loss of social equity in land rights.

A good land administration system based on the data and information about land ownership, land valuation, and land use forms can lead to better land management. This in turn can support or trigger a better respect of the three main pillars of sustainable development. In 1999, the Bathurst Declaration identified and recognized the relevance of land administration to attain sustainable development and its potential influence to dictate the relationship between humankind to land. The declaration concluded that sustainable development needs sound land administration. In developing countries, there is the potential that land deals can be kept secret and there is a hidden uncertainty for local populations. This scenario could be blocked and the situation made more transparent with a well-defined cadastral system.

This paper tries to illustrate the innate linkage of the cadastral system as a basis for land administration to support sustainable development. Technical and institutional elements will be put forward in how they can contribute to facilitate the process of data collection and maintenance, and hence can aid political decision-making even in developing countries. A focussed approach that defines a methodology of how developing countries can learn from the developed world is put forth through a cross-country comparison of India and Switzerland.

An ecosystem consists of complex set of relationships among the living resources, habitats, residents of an area. A consummate picture reveals that nature and human being are the main components of any ecosystem. While man has the potential capability to create instability in nature's balance, Nature has the innate ability to exhibit homeostasis to attain equilibrium. However there exists a threshold at which the balance tips causing permanent changes to entire system. It is in this context of maintaining homeostatic balance of nature – the concept of

sustainable development (SD) becomes significant. Resources that are linked to nature are many fold- land is the most abundant natural resource next to water resource. Land Administration (defined by the UN/ECE as the process of determining, recording and disseminating information about ownership, value and use of land, when implementing land management policies) (UN, 1996) includes processes of land registration, cadastre, valuation and land inventory. Every country in the world pursues these activities in one form or another (UN, 2001). Land administration or proper land management practices dictates the rate at which mankind can bring sustainable development in the world.

The relationship between property rights, sustainable development and environmental management has been clearly enunciated in the 1992 World Development Report titled "Development and the Environment" (World Bank, 1992). First it establishes the relationship between environmental management and development: "The protection of the environment is an essential part of development. Without adequate environmental protection, development is undermined; without development, resources will be inadequate for needed investments, and environmental protection will fail." It is in this context that this paper attempts to show the role of land administration in bringing sustainable development from a technological perspective by comparing cadastral systems from two different regions of the world viz India and Switzerland.

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1. THE PILLARS OF SUSTAINABLE DEVELOPMENT

G.H Brundtland (1987) in – “*Our common future: The world commission on environment and development*” defines sustainable development as the development that meets the needs of the present without compromising the ability of the future generations to meet their own needs. Sustainable development (SD) today, has an expanded definition and scope. Sustainable development is the *development to reach equilibrium in between poor and rich, between current and future generations, between humankind and nature without compromising the cultural, social and biological diversity.*

To attain such equilibrium in development involves a trade-off and a close interaction between the economic, social, environmental spheres- the three pillars of sustainability. Evolving consensus believes it is absurd to think such a balance is possible to be made existent among the three pillars. A new addition to the pillars is the technology perspective (see Figure 2) as the fourth pillar to attain sustainability. Maintenance of proper land records are of utmost importance so that people know of their ownership and proprietary rights.

The land administration with the help of technology can make assignment of property rights more judiciously in a way that bridges the gap between rich and poor. Traditional approaches to land administration result in design and implementation projects that take a long time, even such that land laws are adapted in order to provide for more simple procedures (Oput, 2004). Technology is a major facilitating factor for speeding up processes, as was shown in the mass valuation for land taxation in the whole Russian Federation in 4 years, heavily supported by IT (Overchuk, 2002).

What is to be sustained	FOR HOW LONG	What is to be sustained
Nature Earth Bio diversity Ecosystems	25 Years now and in Future Forever	People Child survival Life expectancy Education Equity Equal opportunity liveability
Life support Ecosystem services Resources(Land) Environment(land)	LINKED BY Only Mostly But And Or	Economy Wealth Productive sectors Consumption Property rights Qualitative growth
Cultures Cultures Groups Places		Society Institutions Social capital States Regions

Figure 1: Three pillars of sustainability and their interaction (von Stokar and Steinemann, 2004)

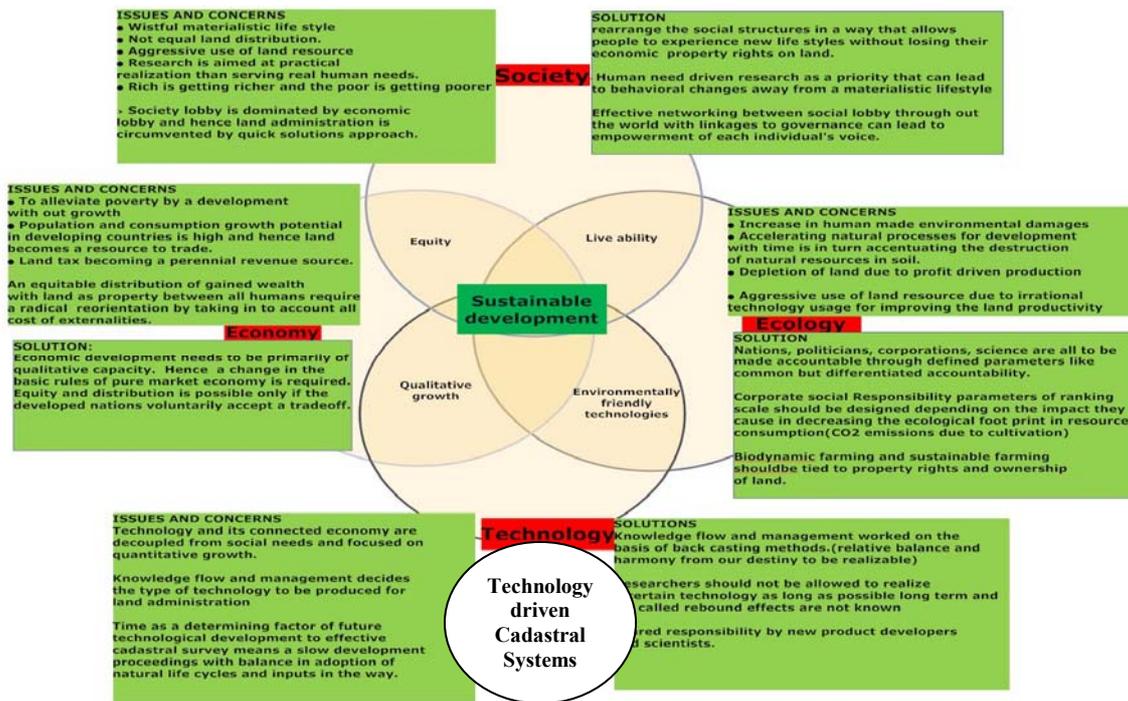


Figure 2: Excerpts of socio-philosophical perspective of sustainable development (Roger, 2008).

2. SIGNIFICANCE OF CADASTRAL SYSTEMS AND ITS LINKAGES TO PROMOTE SUSTAINABLE DEVELOPMENT

In 1999, the Bathurst declaration identified the importance of land administration to attain sustainable development. It concluded that (Figure 4) – “sustainable development needs sound **land administration**. It is the key driver influencing the relationship Humankind to Land”.

Exploitation of natural resources can be reduced if the individuals bear the full cost of environmental degradation. This is facilitated by the presence of good cadastral systems as the later facilitates perfect enforcement of property rights on natural resources and hence regulates the usage of resources by the individual. A clear legal title can help the owners either public or private to prevent over usage of land. A cadastre is thus an essential part of the legal, regulatory and institutional infrastructure which supports secure property rights in land.

Context in general

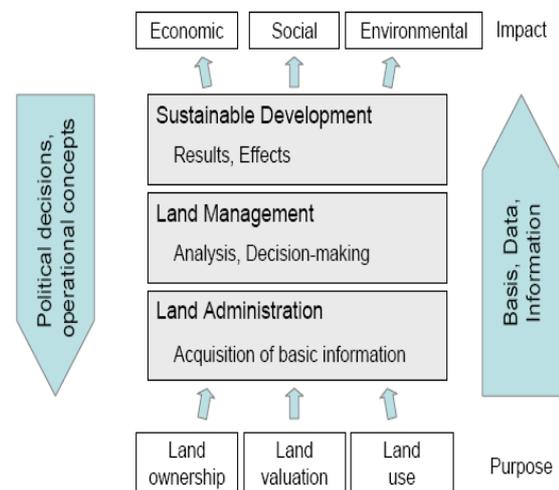


Figure 3: Cadastral systems and link to SD (Stuedler, 2008).

As shown in (Figure 3) the parameters like land ownership, land valuation, land use form the basis for land administration, land management and finally to SD. A good land administration based on the data and information on the parameters already defined could lead to good land management which triggers the results towards sustainable development addressing the three main pillars of sustainable development. A point of addition to this interdependent process is the technology pillar, which facilitates the process of data collection on all the three parameters and decision making – be it political or individual process of decision making.

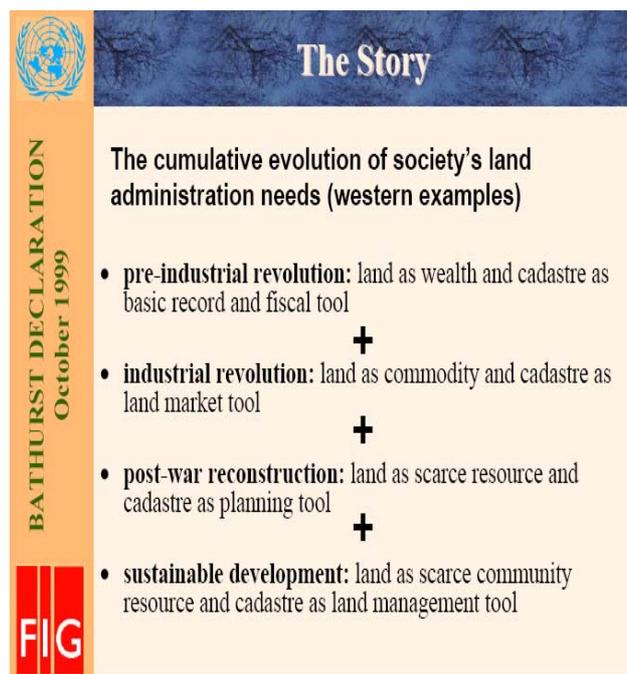


Figure 4: Bathurst declaration (Williamson, 2008)

3. COUNTRY CASE: ASIA WITH SPECIFIC FOCUS ON INDIA

India is geographically located in the south-Asia between 8° 4' and 37° 6' North latitude and 68°7' and 97°25' East longitude. The geographical extent of India is 3214 km from North to South and 2933 km from East to West with a total land area of 3,287,263 sq km. It has a land frontier of 15,200 km (9,445 mi) and a coastline of 7,517 km (4,671 mi).

The physical topography of India is highly diverse and is divided into seven physiographic regions. They are northern mountains including the Himalayas, which includes the Kuen Lun and the Karakoram ranges and the northeast mountain ranges, Indo-Gangetic plains, Thar Desert, Central Highlands and Deccan Plateau, East Coast, West Coast, Bordering seas and islands. This variation in the physical topography of land and supplemented by the cause that only 35% of groundwater resources are being utilised led to an enormous stress in the distribution of land-resources amongst this huge Population. Although India ranks seventh in the world area-wise, the country bears 16% of world population on approximately 2% of the world's land resources. This scarcity in land resource supplemented by inheritance of the western European method of allocation of land resulted in quite a large number of differences in methodology of advocating the land administration system.

4. SUSTAINABLE DEVELOPMENT FROM AN INDIAN PERSPECTIVE

The priority areas that emerging India faces today are big challenges to sustainable development and involve: Urban Issues Management, Climate Change Impacts, Energy-Environment Interfaces, Environmental Conservation, Natural Resource Management, Environmental Restoration in a globalizing world, last but not the least population. With challenges being so diversified, achieving sustainability is more than just difficult.

Sustainability as a concept in India is much older than the Brundtland report. Under the patronage of the late Prime Minister Ms. Indira Gandhi in the Stockholm conference 1972, it was for the first time identified that poverty is the greatest threat to environment. It was argued that "...poverty and a degraded environment are closely inter-related, especially where people depend for their livelihoods primarily on the natural resource base of their immediate environment. Restoring natural systems and improving natural resource management practices at the grassroots level are central to a strategy to eliminate poverty" (Sunanda, 2002). However until recent times it is acclaimed in general that sustainable development is synonymous to environmental protection. It seems to be a combination of the western oriented definitions combined with a more spiritual approach. It won't be incorrect to say that the South Asian Model for sustainability is very much philosophical and lays great stress on the individual. It is based on the notion of becoming a good human being. Once a person becomes a good human being, it can be assumed that he will not cause any harm to the environment and other people till the time he is in his senses. Sustainability in India "attempts to incorporate the sustainability dimensions of economy, environment and society in the system of values governing a human being" (Nitin, 2005).

5. CADASTRAL SYSTEMS AND THEIR ROLE IN LAND ADMINISTRATION IN INDIA

The Cadastre is a parcel-based and up-to-date land information system, consisting of:

- i. a record of rights on ownership in land; and
- ii. a graphical representation (plan or map) of the land parcels linked to other records describing the nature of the rights or interests in the respective land parcels.

Historical outline of cadastral system

India inherited many practices and conventions in the administration system from the colonial rulers. Out of the various colonial legacies that were inherited, one such legacy is land surveying methodology. British-colonial rule established the Survey of India in 1767, initiated land surveys with a sole-purpose to bring ease in the collection of land revenues from estates throughout the country. This centralised approach of land-surveying was decentralised in 1904, with states being made solely responsible to cadastral surveying. The states evolved their own legal system of surveys and the Survey of India confined itself only to the transfer of technology to aid cadastral surveying. From then the cadastre is maintained by the state government.

Institutional framework

The institutional framework associated with the cadastral surveys in India mainly involve governmental organisations both at national and state levels, technological institutions like NRSA, IITs, International Institute of Aerial Survey and Earth Sciences (ITC), The Netherlands for surveying and mapping thereby assisting the state government to build Land information systems and geographical information systems, Universities through form of training and bachelor courses on surveying to students of civil engineering and some private sector organisations to generate GIS/LIS data. The Institute of Surveyors is a major association in India having Institutional members in the field of surveying and mapping. Union Rural Development Ministry of India at the national level is the ministry responsible for National Land Records Modernization Programme (NRLMP).

Current status of Cadastral systems in India

India's cadastral maps don't follow any pre-defined scale or datum. Almost all the areas (states and union territories) within India uses same graphical representation for cadastral maps and mapping is being performed by the national body called the Survey of India in different scales depending on the basis of demand. Periodical cadastral surveys are organised by the state government while district authorities are responsible for maintenance of land records, assessment and collection of land tax.

Each district is further divided into small tahsils (under the responsibility of Tahsildars who arbitrate land disputes), and each tahsils is further divided in mandals, villages. Further on, villages are divided in agricultural lands and classified in plots. Plot is the basic unit of cadastral record in India and the registration of plot is done on the name of the owner who decides plot boundaries.

Land records comprise of cadastral maps and survey, recording of cadastral information, documents on land evaluation and planning. Economic Planning in India is done every five years and it was identified that for the first time that planning focussed on land reforms during the second five year plan. Rural development programs are closely tied to land reforms and it was advocated in many plans that a proper land record is a necessity for realisation of land reforms at the ground level. During the 7th five-year-plan it was decided that "... the land records form the base for all land reforms measures and, therefore, regular periodical updating of land records is essential in all states. This will necessarily have to include scientific survey of unmeasured land and recording of rights of tenants and share-croppers which have remained unrecorded until now". With India fast catching up towards calling itself a developed country, accurate information of the land and natural resources in the land requires spatial data infrastructure to address the needs of the nation. IT revolution in the last decade facilitated spatial data infrastructure by computerization of land records through storage of data in RDBMS GIS packages.

Union Rural Development Ministry of India on August 21, 2008 called for a system for proper upkeep of land records in the country through a program called (NLRMP). The proposal of

the Department of Land Resources, Ministry of Rural Development to merge its two existing Centrally-sponsored schemes of Computerization of Land Records (CLR) and Strengthening of Revenue Administration & Updating of Land Records (SRA&ULR) and to replace them with a modified Centrally-sponsored scheme in the shape of the National Land Records Modernization Programme (NLRMP). Under NLRMP activities like computerization of land records including digitization of maps and integration of textual and spatial data; Survey/resurvey; Computerization of registration including entry of valuation details; Setting up modern record rooms; Training and capacity building; Inter-connectivity using IT among revenue offices and among various agencies involved in land records such as Revenue Offices, Survey and Settlement Offices, Registration Offices, Panchayats, etc. will be undertaken.

The ultimate goal of the NLRMP was to replace the present system of registration of deeds and documents as provided for in the Registration Act. In the present system, the titles to property are merely presumptive and the State does not give guarantee for such titles. After implementing the programme, the country could switch to the system of 'Conclusive Titles' as followed in most advanced and some of the developing countries. The system of 'Conclusive Titles' functions on four basic principles: (i) a single agency to handle land records (including the maintenance and updating of the textual records, maps, survey and settlement operations, registration of immovable property mutations, etc.); (ii) the 'mirror principle, which states that at any given moment, the land records mirror the ground reality; (iii) the 'curtain' principle.

The curtain principle refers to the fact that the record of title was a true depiction of the ownership status, mutation is automatic following registration, there is no need for probing into past title transactions, and title is a conclusive proof of ownership; and (iv) title insurance, which refers to the fact that the title is guaranteed for its correctness and the party concerned is indemnified against any loss arising because of inaccuracy in this regard. At the moment, land records in India do not reflect any of these principles.

Three technologies had been identified in consultation with the technical agencies: Pure ground method using electronic total station (ETS) and global positioning system (GPS), Hybrid method using aerial photography and ground truthing by ETS and GPS; and High-resolution satellite imagery. Core GIS activities such as Village index base maps from satellite imagery for creating the core GIS integration of three layers of data were planned: (i) Spatial data from aerial photograph or high-resolution satellite imagery; (ii) Survey of India and Forest Survey of India maps; and (iii) Cadastral maps from revenue records. The budget provision for 2008-09 was INR 473.00 crore. It is envisaged that the entire program will be completed by the end of the 12th Plan.

6. COUNTRY CASE: EUROPE WITH SPECIFIC FOCUS ON SWITZERLAND

Switzerland is geographically located in the central part of west Europe between 45°49' & 47°48' North latitude 5°57' & 10°29' East longitude. The geographical extent of Switzerland is 220 km from North to South and 348 km from East to West with a total land area of 41'293 sq km with a land frontier of 1,881km (Stuedler, 2003).

The physical topography of Switzerland is diverse with mountain ranges (Alps in the South, Jura in the Northwest) with a central plateau of plains, rolling hills and large lakes. The total population is 7.6 million (end of 2008). The five largest urban areas are Zurich (943,400), Geneva (457,500), Basle (401,600), Berne (319,100), and Lausanne (288,100).

7. SUSTAINABLE DEVELOPMENT FROM THE SWITZERLAND PERSPECTIVE

The sustainability concept in Switzerland is in consonance with the definitions of the Brundtland report. The understanding of the concept is also based on the definitions in the Rio Declaration that rests on two pillars: “firstly, equity both between and within generations and, secondly, the equal status of social, economic and environmental goals. This means that it must be possible for the needs of all people to be met both now and in the future. At the same time, the Earth is to be conserved in such a way that life in conditions of dignity and security is possible for all people over the long term. This second pillar is also known as the three-dimensional model (Figure 4), as it classifies existing resources into social, economic and environmental dimensions” (Thomas, 2004). In addition to the three pillar model the new understanding of the concept is done through the capital stock model. The capital stock (capital stock of sustainable development is the sum of the individual capital stocks of environment, economy and social) model was developed at the World Bank as early as 1994.

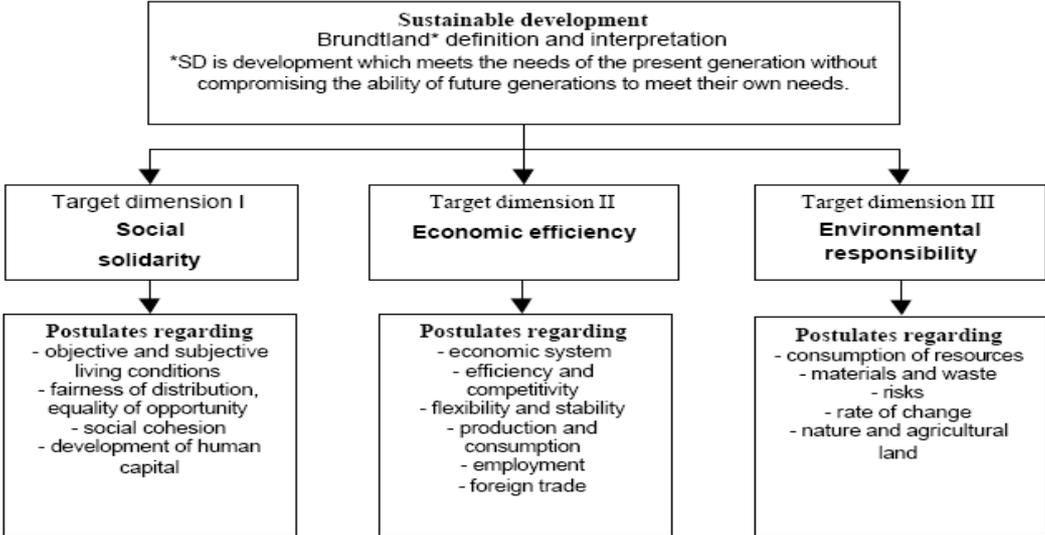


Figure 5: Implementation of "sustainable development" in MONET- Monitoring of Sustainable Development (Glauser, 2001)

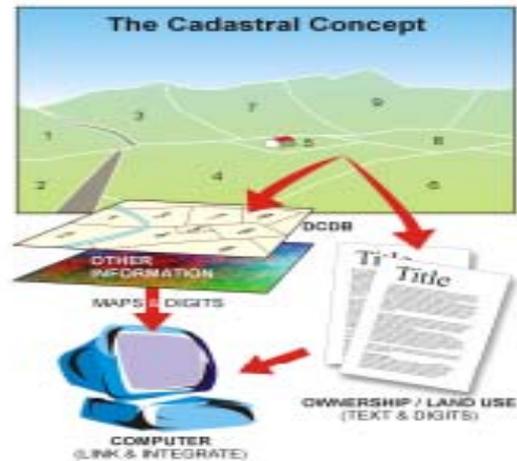
The commitment of Switzerland to sustainable development has attained legal status in 1999 when a new article exclusively focusing on sustainability was included in the Federal Constitution stating that Switzerland seeks "... a balanced relationship over time between nature and its ability to renew itself, on the one hand, and the demands placed on it by the human race, on the other". With abundant natural resource wealth, high-technological advancements (as a fourth pillar), Switzerland is well poised to bring this balanced relationship and lead the march on sustainable development.

8. CADASTRAL SYSTEMS AND THEIR ROLE IN LAND ADMINISTRATION IN SWITZERLAND

“A **cadastre** is the core or basis of a land administration system and is defined as a parcel based and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, and ownership or control of those interests, and often the value of the parcel and its improvements.”

Historical Context

Switzerland is a federal state since 1847 – with cantons and communities autonomous in their respective jurisdictions. To address revenue issues in administration and under the influence of Napoleon, the cadastral systems methodology was developed in Switzerland in the early 19th century. Although the federal constitution recognised the need of a cadastre based surveying as early as 1847 – the cadastral system attained legal status only in 1912 with the "Federal Land Registry System"-with articles like Art 942, Art 950 (appendix-I) of the Swiss civil code. "Instruction for the Monumentation and Cadastral Surveying" in 1919 provided a more detailed implementation structure to the 1912 documents. In 1993, two new ordinances – VAV and TVAV – replaced the old instruction from 1919 with the aim to renovate the cadastral surveying system and to introduce the digital data format.



Source: FIG-Statement on the Cadastre, 1995)

Figure 6: Definition of Cadastre

In the past up till 1993, the cadastral system was mainly serving legal purposes, municipal planning and management purposes and focussed mainly to provide secure land ownership rights. With the introduction of the two new ordinances in 1993, the cadastral system served land information systems in addition to the legal purpose (Stuedler, 2004).

Institutional framework

There are three administrative levels that are involved in the development of cadastral systems in Switzerland. They are the federal level, cantonal level, private survey and the community level. As shown in (Figure 6), the **Federal level** defines the Federal strategy on cadastral system, coordinates other surveying activities of the Federal administration with cadastral surveying, defines also the quality standards that needs to be followed during cadastral surveying. The **Cantonal level** is responsible to define cantonal concept, plan and manage projects,

preparing standards of implementation and verification. The **Private surveyor level** chooses the method to carry out projects, establishing and maintaining the cadastral data.

The survey approach applied in Switzerland is mostly a coordinated survey approach with complete coverage. The four methods of surveying that are mostly applied in Switzerland are the terrestrial method, photogrammetry, leveling, and Global Positioning System (GPS).

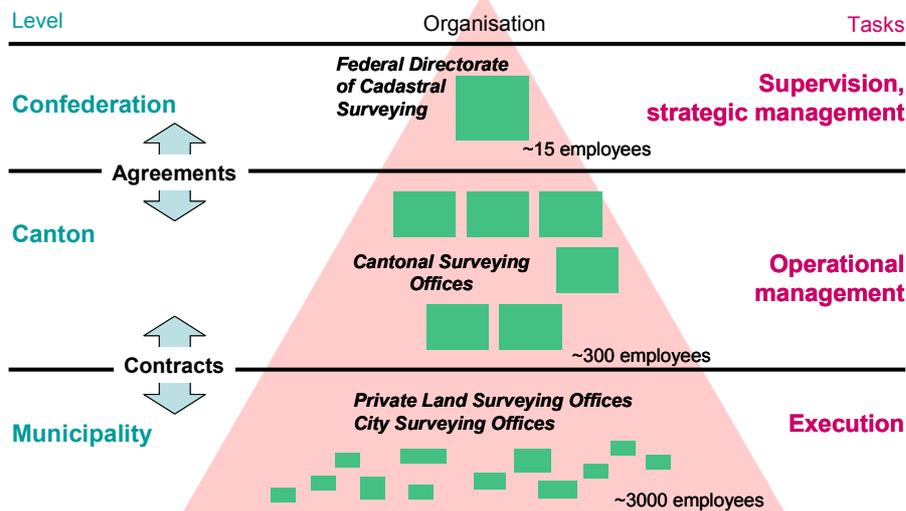


Figure 7: Organisational structure of cadastral surveying in Switzerland (Stuedler, 2008).

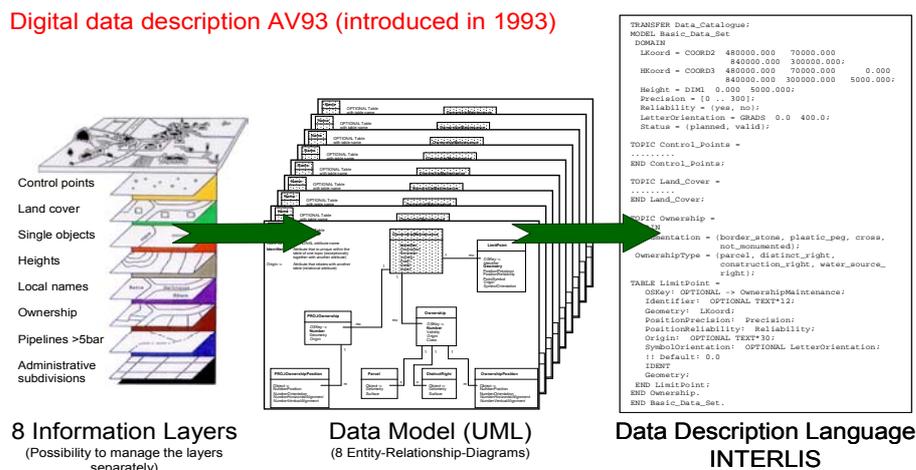


Figure 8: Core data model of Swiss cadastral surveying as an example of a technological element in the digitalisation of cadastral systems (Stuedler, 2008).

Current situation

New legal basis to cadastral surveying was provided through art. 75a, **Swiss constitution** through the acceptance of the electorate in Nov. 2003, enacted 1 Jan. 2008. The main postulates of *Art. 75a* Surveying:

- 1 **National Surveying** is in the responsibility of the Confederation.
- 2 The Confederation establishes ordinances about **cadastral surveying**.
3. The Confederation can establish ordinances about the **harmonization of official land information**.

This article indicated a growing need to document public law restrictions and responsibilities; working groups have been established to investigate their integration into the cadastral system. By 2008 it is expected to have full coverage of LIS/GIS in cadastral systems. This is made possible because of the technology used in the digital format as shown (Figure 8) above.

9. TOWARDS SUSTAINABILITY: LAND ADMINISTRATION OF INDIA AND WHAT IT CAN LEARN FROM SWITZERLAND

Land administration and policy in India unlike in Switzerland varies from state to state. An integrated system trying to separate out different but unconnected ‘boxes’ – e.g. registry and records or survey or rural-urban – is unlikely to help improve the performance of the system in India. A poor land administration system will increase the differences in development between states as inadequate information about the impact on environment due to lands and water resource usage will render the government and the people of a nation handicapped in controlling their own destiny.

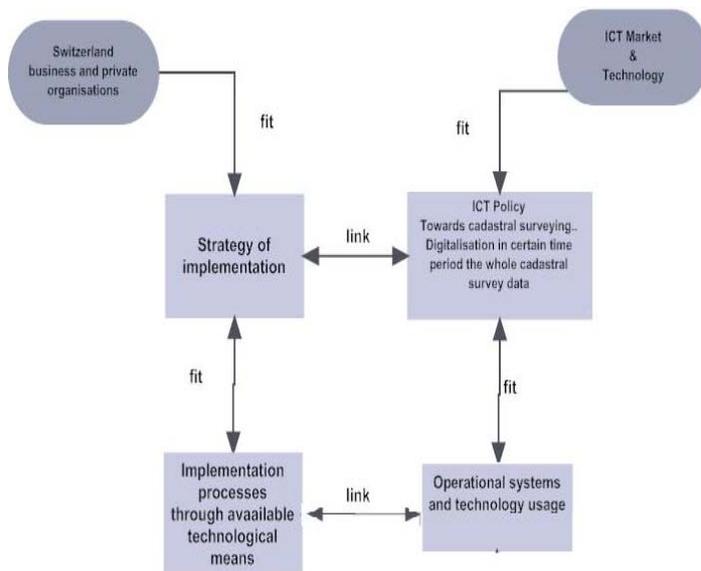


Figure 9: Strategic alignment (Henderson, 1992).

Countries like Switzerland – unlike India – enjoyed benefits of IT applications at an early stage. Many countries face renewal of their IT architecture because their existing information systems cannot cope with evolving customer demands and IT opportunities (FIG, 2003). This observation is more significant in the case of India unlike Switzerland. The efficient and effective performance of these duties is possible only with the support of information technology.

The statement of Henderson et al (1992) is of use in deciding the approach to be adopted (Figure 9) like in Switzerland to align the strategic and operational aspects organization’s objectives in relationship with the opportunities offered by ICT.

Digitalisation of cadastral survey maps is one way to achieve better land administration as it serves pro-poor land management through assigning each piece of land to an individual. Property rights to each individual could alleviate poverty as these facilitate 3D legal volumes

and their registration. To achieve this from the country case study of India to move in similar lines like Switzerland, has to be less bureaucratic, simple, transparent and less expensive. Awareness of land administrators regarding strategic management and assertiveness that low cost approaches required high technology (van der Molen, 2004) is mandatory.

Unlike as in Switzerland, poverty magnifies the problem of hunger and malnutrition in India. The problem is further compounded by the inequitable access of the poor to the food that is available. Proper land administration system with definite legal rights on the property will make the population integrated into the market economy. Henceforth there is a need to determine the type of land tenure to be defined by the land title, uniformly for the whole nation. There is a need to “evolve a scientific land valuation system that facilitates the application of modern financing and insurance practices/instruments to the agriculture, horticulture, animal husbandry and other sectors, with the ultimate objective of imparting the crucially important attributes of self-sustenance and economic viability to the national government's avowed programmes for rural development”. Ensuring the security of the livelihood of a billion people which in an agricultural economy like India is possible only if each cultivator gets his own share of land registered in a secure system and this is an imperative for sustainable development in India.

The computerisation of land records in a country like India could be accelerated if a methodology similar to Switzerland is adapted. To make land administration focussed to address the three pillars of sustainable development – it can be well concluded that Switzerland used core data model of Swiss cadastral surveying- a technological advancement, which India has to adapt initially to a clusters of 3-4 states and later on make it transcendental to the whole nation. Firstly this concept should be given constitutional status and later technology has to be used as a supplement to speed up the process of digitalisation. There is a need to develop the necessary legislative framework to support the national cadastral system.

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APPENDIX –I

-IPAT equation: The role of technology factor: $I=P*A*T$ where **I**=total environmental impact of human kind on the planet, **P**= Population, **A**= affluence, number of products or services consumed per person (i.e. the annual GNP percapita) , **T**= environmental impact per unit of product/service consumed.

-Swiss civil code (1912)

Art. 942

1 All rights on real estate's have to be registered in the **land registry**.

2 The **land registry consists of the main book with its associated maps**, the auxiliary registers (in particular the list of property owners), the deeds (records and evidences), the description of properties, and the day book.

Art. 950

1 Registration and description of the properties in the land register have to be done on the basis of a map, which as a rule, has to be the result of an official cadastral survey.

2 The Federal Council decides on which principles these maps have to be based upon.

No ownership without registration (art. 656). No registration without surveying (art. 950), No surveying without boundary definition (art. 669).

BIOGRAPHICAL NOTES

Manohar Velpuri

Manohar Velpuri graduated as a civil engineer from Indian Institutes of technology, Madras in 2005 and is pursuing Masters in department of Management, Technology and Economics, Swiss Federal Institute of Technology (ETH) in Zurich (ETH) with specialisation in: Sustainability and technology. After having involved in the design of software models like Easy plan for managing large construction projects like MRTS, Chennai in 2005, he worked for International business machines (IBM) as a software engineer in 2006 and later as a Developer in healthcare industry viz, Athena health care in 2007. Since 2005 he is closely associated in sustainability projects like IIT for Villages (Ivil) in addition to his professional experience in software modelling. Recognised from his efforts to develop the sustainability projects at Natham,(IviL, Chennai) he was invited to attend as one of the representation from India to Youth Encounter on Sustainability – delivered under the leadership of the ETH, Center for Sustainability (ETHsustainability) in collaboration with MIT Boston (USA), Technical University of Vienna (Austria), University of Tokyo (Japan), Chalmers University (Sweden) (August-September 2008). He was one of the 25 selected students from all over the world to attend the Oikos Winter school which aimed at converting ideas on sustainable economics and management into action. In 2008 he became one of the founding members of organisation careforclimate in Zurich and is in addition acting as a boardmember to non profit organisations - Aiducation International, Schweiz and EU for IA, Geneva.

Dr. Daniel Steudler

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 a 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 being involved in the publications of "Cadastre 2014" and "Benchmarking Cadastral Systems". He became the official Swiss delegate to Commission 7 in 2003. Between April 2000 and February 2004, Daniel completed a PhD at the University of Melbourne, Australia. The main research topic was to develop a framework and methodology for evaluating cadastral systems in the larger context of land administration. Since May 2004, Daniel is working with the Swiss Federal Directorate for Cadastral Surveying and is responsible for a national address data project and the development of international cooperation.

CONTACTS

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