

Spatial Data Infrastructure for Land Administration in Pakistan

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Key words: Spatial Data Infrastructure, Land Administration, Pakistan

SUMMARY

This paper identifies current needs and challenges faced by Land Administration (LA) in Pakistan. The paper discusses implications of information systems that are being developed in the country outside a bigger framework of information infrastructure such as SDI. More over, the paper explores the supporting role of Spatial Data Infrastructure (SDI) for implementing an effective, efficient and service oriented land administration system in the country. Finally, the paper suggests designing, developing and implementing information systems with in the black box of SDI.

SUMMARY

خلاصہ

اس تحقیقی مقالے میں پاکستان میں زمینی امور کے انتظام کو درپیش مشکلات اور ضروریات کی نشان دہی کی گئی ہے۔ اس تحقیقی مقالے میں ملک میں بنائے گئے اطلاعی نظامات کے مضمرات کو اطلاعی ڈھانچہ جیسے کہ (SDI) کے لحاظ سے زیر بحث لایا گیا ہے۔ مزید یہ تحقیقی مقالہ پر اثر، تیز رفتار اور خدمات سے بھرپور ملک میں موجود زمینی امور کے انتظامات کے لیے SDI کے نظام کے امدادی کردار کو تفصیل سے بیان کرتا ہے۔ آخر میں یہ تحقیقی مقالہ SDI کے تحت اطلاعی نظام کی ڈیزائننگ، بہتری اور اس کے اطلاق کے متعلق تجاویز بیان کرتا ہے۔

SPATIAL DATA INFRASTRUCTURE FOR LAND ADMINISTRATION IN PAKISTAN

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1. INTRODUCTION

The era of spaghetti information systems such as Geographic Information System (GIS) seems to be over as the system approach is being transformed into information infrastructures such as Spatial Data Infrastructure (SDI). Moreover, there is a general agreement that these systems overlap, but actually attempting to integrate these systems is complex as find Margunn Aanestad et al. (2007, p.20). Margunn Aanestad et.al (2007) underscore that the integration of information systems should not be perceived as primarily a technical issue, but rather as a complex and politically charged activity where multiple institutional influences and different, possibly competing, rationalities need to be aligned (p.21).

The term Spatial Data Infrastructure (SDI) has been defined, redefined and still is being refined due to quickly changing global as well as local needs, priorities, downing economy and rapid developments in geospatial knowledge as well as technologies. The fathers and mothers of SDI such as Masser (2005, p.17) while arguing on SDIs concluded, “The overriding objective of an SDI is to maximize the use of geographic information”. Whereas Georgiadou et al. (2006, p.247) identified that a Spatial Data Infrastructure (SDI) is a particular type of information infrastructure specifically geared to geographic information (GI). It is argued that understanding, needs and rationale for information infrastructure such as SDI development cannot be exactly the same for developed and developing countries though it may have some commonalities. De Man (2006) also supports above arguments, “SDIs and other kinds of information infrastructure alike are different at different spatial (or geographical) levels because of differentiated social contexts”. Therefore, time has come when it needs to be translated into tangible benefits according to local needs of specific regions for its smooth and successful implementation. One of such benefits is SDI for Land Administration (LA).

Land is the most valuable resource and hub of all activities of the mankind. There is no country without land. Land is an essential component of our lives because it is the source of our food, fuel and living needs. Governments should pay special attention to land (World development report 2009, p.22). But it demands to be carefully managed otherwise productivity of the resources such as crude oil, natural gas, reserves of coal, forests, water, hydropower, ores, agriculture and minerals inherited by land will decrease considerably. On the one hand developing countries like Pakistan depends more on these land owned resources and less on industry for its economy, whereas on the other hand, growing number of terrorist attacks in recent years in Pakistan has added a new dimension and value to land administration in the country. As reliable and timely supply of land related data is not only needed by security agencies but also by the rescue workers and teams to save loss of human lives. But land related data sets are possessed by many organizations such as Survey of

Pakistan, SUPARCO, Revenue (cadastre) department and Geological Survey of Pakistan. The dilemma is, these data sets are not shared among organizations due to lack of institutional, legal, and technical arrangements. Moreover, there is a dire need for the country like Pakistan to address the most significant issues like environmental degradation and natural disasters such as, earthquake, flooding and soil erosion that are a great threat to human lives as well. But to formulate effective and implementable strategies for land administration, require information that has been evaluated and synthesized persuasively. Information that is developed or accumulated from multiple sources and is objective, reliable, accessible and usable. This is one of the reasons that many countries are developing Spatial Data Infrastructure (SDI) so, that sharing of data/information could be made possible from multiple sources for effective management and administration of land and its resources.

The development of SDI is a phenomenon as well as a culture that is beyond the capabilities of one sector may it be public or private. Therefore, this paper takes a closer look at the rationale and latest challenges faced by land administration as well as the potential supporting role of SDI for its implementation in geospatial domain of Pakistan.

2. LAND ADMINISTRATION -PAKISTANI SCENARIO

It is believed that definition of land administration would help to understand the rest of this paper. Land administration is, “The process of determining, recording and disseminating information about the tenure, value, and use of land when implementing land management policies”, Land Administration Guidelines (1996).

2.1 Background

Pakistan has a land administration system inherited from the British, involving rules and regulations regarding sale, purchase and use of land resources mainly linked to the collection of land tax. The present land legislation – which is constituted mainly of the Land Revenue Act (1967) and the Registration Act (1908) – does not profess to provide for a State certificate of title to land under the aegis of a public authority. The records of rights and other documents based on the land records, by virtue of provisions in land laws, are presumed to be accurate. However, these entries only provide presumptive status of rights under land laws. Many court rulings have also maintained that entries in the land records are contestable, that the revenue records are not documents of title, and that it is permissible to challenge the entries for determining the title to land (<http://www.punjab-zameen.gov.pk/background.asp>).

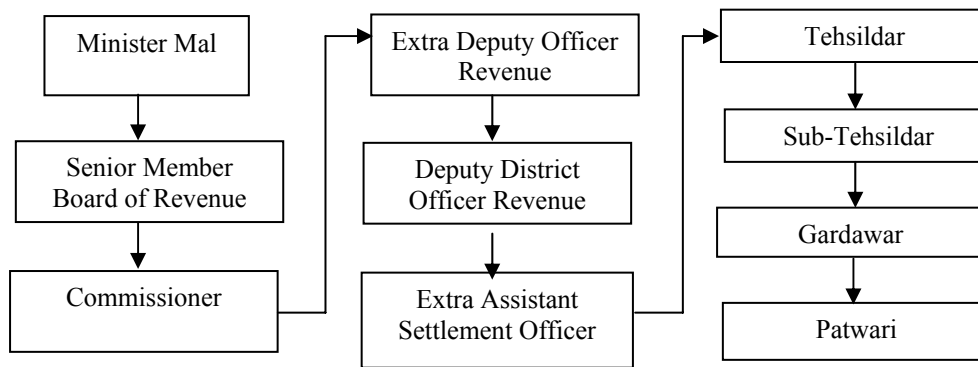


Figure 1: Snapshot of Pakistan’s Provisional Land Administration System

2.2 Rationale for Land Administration

As land is a scarce commodity, it is essential to have an effective and professional land administration system in order to keep pace with the latest rate of growth (Roger Nissim 2008, p.45). According to World Development Report published in 2008, three core assets [of a country] are land, water, and human capital (p.9). It is argued that among these three assets, land is the most important and precious one as water is inherited by land whereas human capital is also attached to land and its resources. Hence, making better use of land can substantially help to increase and enhance safety, social well-being and income of a country. But in Pakistan no agency at national level is responsible for land administration as it is treated as local government’s domain. Whereas land administration policies and legislation such as land act are made at federal level and local governments are required to implement these policies. Consequently, this top-down approach creates many ambiguities among national and local governments that results in failure of successful implementation of land related policies. More over land related data is possessed and maintained at national level by different organizations due to mandate constraints and the data is not shared and made available to fellow organizations as well as to users due to lack of comprehensive national spatial data policy. Empirical study carried out in September 2007 in Pakistan shows that five public sector organizations working under different ministries are producing and maintaining spatial data at national level. Table 1 displays spatial data producing organizations in Pakistan.

Table 1: Public sector organizations producing spatial data

Data Type	Responsible Organization	Responsible Ministry	Analogue Data	Digital Data	Use of web site for data dissemination
Topographic	Survey of Pakistan	Defence	Yes	Yes	No
Soil	Soil Survey of Pakistan	Food and Agriculture	No	Yes	No
Geological	Geological Survey of Pakistan	Petroleum and Natural Resources	Yes	Yes	No
Remote Sensing	SUPARCO	Scientific and Technological Research	No	Yes	No
Landuse	Pakistan Agricultural Research Council	Food, Agriculture and Livestock	No	Yes	No

It is important to note that all organizations displayed in Table 1 possess spatial data in digital format but none of them is making use of World Wide Web (WWW) to deliver data. The reasons behind non delivery of data via WWW are not just technical but the real issue is lack of legal and institutional arrangements towards data sharing.

A lot of benefits of land administration in literature have been promised but the most significant in the current context of Pakistan are:

2.2.1 Homeland Security

The impact of September 11, 2001 World Trade Center attacks has given a new outlook and value to land administration all over the world that was not well considered by the governments before though researchers such as Masser, Georgiadou, De Man and Williamson underscored the importance of land administration for (homeland) security and social well being of the masses. In Pakistan growing number of terrorist attacks has not only given a thought to alter the scenario of land administration in the country but has attracted politician's attention towards land management and administration also. Consequently, Government of Pakistan (GOP) announced to launch remote sensing satellite system to monitor, plan and respond to incidents that challenge homeland security in addition to other purposes as notes report of a Pakistani newspaper, "The Dawn" of August 22, 2005 (<http://www.dawn.com/2005/08/22/top3.htm>).

2.2.2 Property Taxation

Revenue generation through property taxation is a global trend as governments need revenue to develop and implement projects for social well being of its people and run government affairs. But, it is important to know “who” has “what”, “where” and “how much” as finds Henssen and Williamson (1990) for implementing an effective and efficient property taxation system. GOP also took initiative for implementing such system notes report of a Pakistani newspaper, “The Nation” of May 21, 2008 (<http://www.nation.com.pk>).

2.2.3 Disputes Resolution

Due to rapid urbanization in Pakistan not only the market value of land has increased but at the same time number of disputes related to land such as illegal possession has substantially increased as well as reported by Project Management Unit (PMU) engaged in land records management information system (LRMIS) at provincial level in Pakistan (<http://www.punjab-zameen.gov.pk/components.asp>). The similar kind of projects are being implemented in all provinces of the country to help reduction of land disputes, and resolve litigation issues to administer land properly.

2.2.4 Agriculture

Natural resources are a vital asset to any economy (Asmat 2009, p.1) Developing countries like Pakistan depend more on natural resources and less on industry for its economy. These resources contribute in GDP of the country but their contribution to GDP has declined considerably as mentioned in Pakistan’s Economic Survey report for the year 2007-08. As an example, agriculture sector contributed only 0.3 percentage points or 5.6 percent to GDP growth in 2007-08 as against 0.8 percentage points or 12 percent contribution last year. The main reasons for this decline include unplanned industrialization, urbanization, lack of modern technology, powerless local communities, deficiency of skilled personnel and none sharing or exchange of information among organizations. Simply said, there have been and still are flaws in land management and administration system as land use information is one of the fundamental component of land administration system (Figure 2).

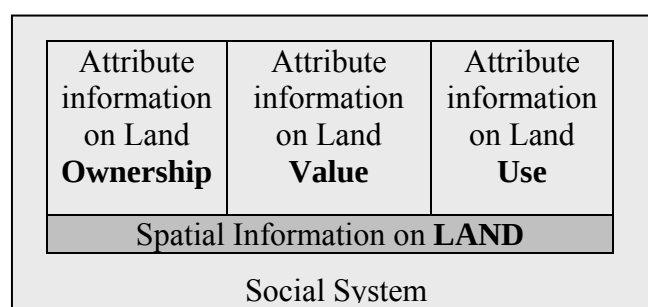


Figure 2: A Land Administration System (Williamson, 2002)

Therefore, after implementing land administration system productivity of natural resources that include agriculture, oil, coal, natural gas etc can be enhanced as envisions Federal Land Commission's website that has not been updated since April, 2004. (http://www.pakistan.gov.pk/divisions/ContentInfo.jsp?DivID=13&cPath=118_124_250&ContentID=460)

A lot of benefits of land administration in literature have been discussed but the most important includes supply of food that comes through agriculture and fuel that is included in natural resources, as well as safety and security that is subjected to homeland security override all other promised benefits.

2.3 The Challenges

Experience, literature review and empirical studies carried out in Pakistan reveal that following are the main challenges faced by land administration in Pakistan:

2.3.1 Vertical Hierarchies

A considerable number of organizations and offices are dealing with land administration activities as displayed in figure 1. Most of these agencies are administratively operating along a vertical line hence vertical hierarchies exist that is a major problem towards the development of a generally agreed upon architecture of land administration system. More complex are vertically related activities (Wearne 1993, p.50). The organization that possesses more authority can shift its responsibilities to the subordinate organizations e.g. in sub-contracting. Subordinate organizations may have to do extra hard work against no extra benefits due to less authority. More over, goals are set by the organization that possesses higher position in the hierarchy. Therefore, in this type of scenario sharing of responsibilities, roles and rewards is not justified rather it is a kind of possession approach to get control over other organizations. Resultantly, it creates problems in smooth data flow i.e. sharing/exchange and enabling a good working environment.

2.3.2 Policy Issues

Good land policies are central (World Development Report 2009, p. xxiii) to sustainable development but no comprehensive national land policy so far exists in Pakistan rather a number of confecting land reforms and acts exist in the country such as Land Reforms Regulation of Pakistan 1959, Land Revenue Act 1967 and Land Reforms 1972 etc. Reform is mainly first articulated in new national land ploicies as envisions Liz Alden Wily (2003 p.4). Hence, a comprehensive land policy to address land related issues is missing in pakistani context.

2.3.3 Corruption

In many countries, land administration is one of the most corrupt public services (World Development Report 2008, p.141). This statement holds true for Pakistan as well. A huge amount of money is paid by users of land administration services as bribery to settle land

related issues in the country. According to a survey report published in 2009 by Transparency International-Pakistan, “Highest amount has been spent on bribery on Police, followed by Land Administration, Judiciary & Tendering / Contracting” (<http://www.transparency.org.pk/>).

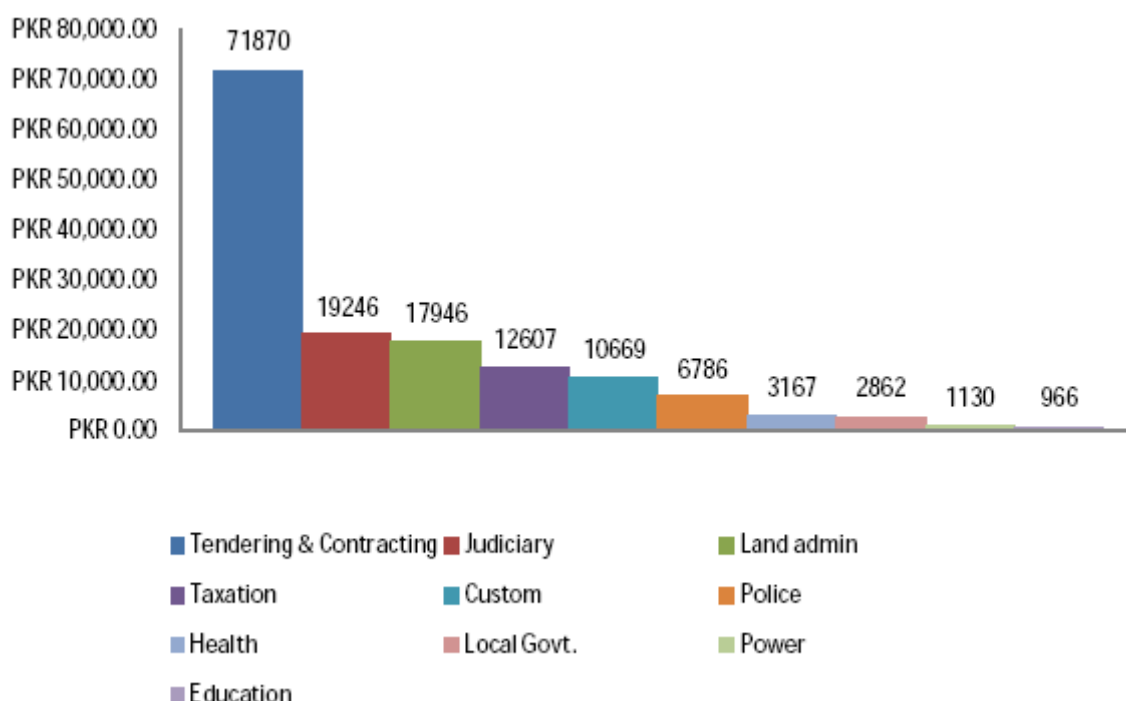


Figure 3: Ten Most Corrupt Public Sectors in Pakistan

(Source: <http://www.transparency.org.pk/>)

Similarly, in 2007, World Bank and the E-Government Directorate of Pakistan jointly worked to determine the "20 Most important Services" in Pakistan. The purpose was to identify and prioritize the most important services to the citizens (<http://go.worldbank.org/N36SGR8RA0>). According to the information available in presentation slides on the website, allotment of land needed the highest amount bribes as illustrated in figure below:

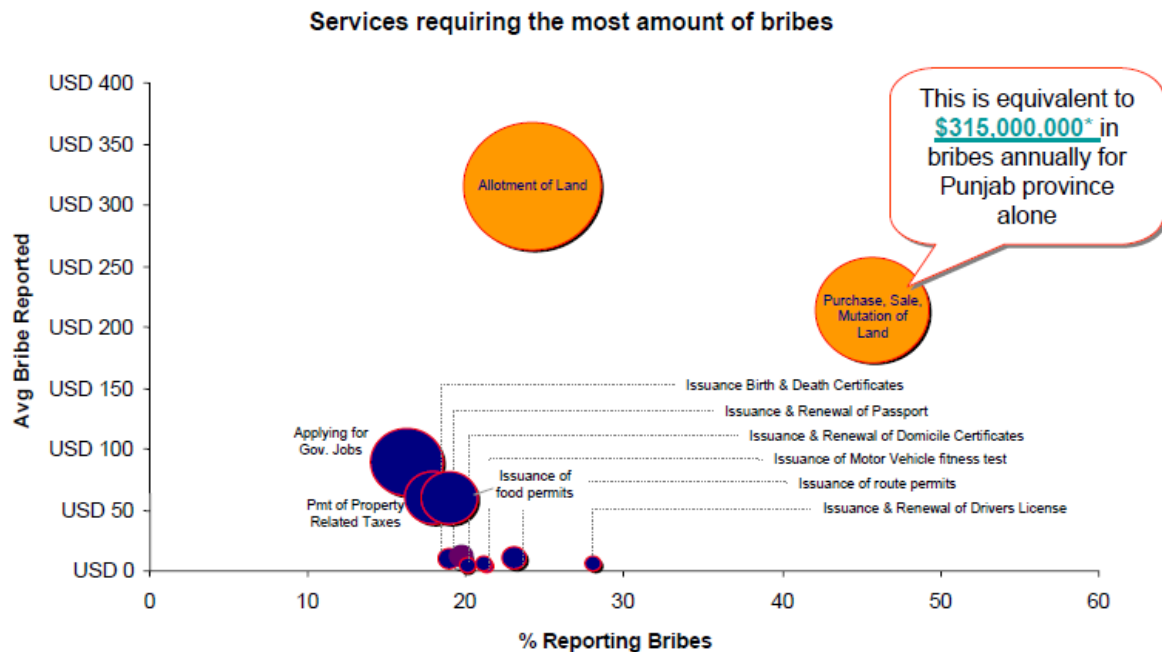


Figure 4: Services requiring the most amount of bribes in Pakistan

(Source: <http://go.worldbank.org/N36SGR8RA0>)

Therefore bureaucracy involved in provision of land related services is reluctant to implement a transparent land administration system in Pakistan.

2.3.4 Federal vs Local Governments

As policies pertaining to land are mostly crafted at national level in the country, there is no single organization to help implementing these policies at local level. Therefore, it gives birth to a gap between federal and local government functionalities. Consequently, the dream of a land administration system seen by the federal government has not come true.

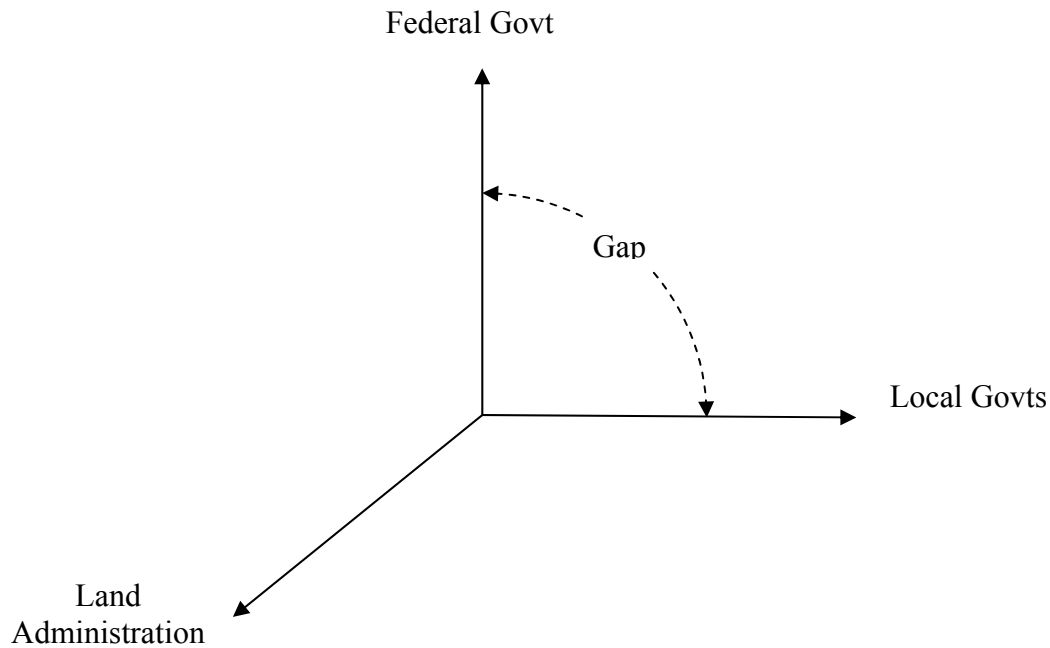


Figure 5: Current Scenario of Land Administration in Pakistan

It can be interpreted from this figure that no uniformity and standardization exists between approaches of federal and local governments in Pakistan with respect to land administration. Resultantly, current land administration efforts are driving the system to an unknown direction. Masser (2005, p.130) also finds the complexity of geographic information creation when lot of agencies are involved, and integrated efforts are missing.

The discussion made up till now reveals that in Pakistan different organizations are dealing with land matters how ever, there is dire need to build institutions that are deficient at the moment because organizations are players of game whereas institutions are rules of game as argues North (1990).

3. ROLE OF SPATIAL DATA INFRASTRUCTURE IN LAND ADMINISTRATION

As a concept, Spatial Data Infrastructures (SDI) are an initiative intended to create an environment that enables a wide variety of users, who require access to and retrieval of consistent data sets, of a certain area covered by the SDI, in an easy and secure way (Rajabifard *et al.* 1999, 2000a, 2000b). According to Masser (2005, p.17), “The overriding objective of an SDI is to maximize the use of geographic information” whereas Georgiadou *et al.* (2006, p.247) identified that a Spatial Data Infrastructure (SDI) is a particular type of information infrastructure specifically geared to geographic information (GI). It reveals, the term Spatial Data Infrastructure (SDI) has been defined, redefined and still is being refined due to rapidly varying global as well as local needs, priorities and swift developments in geospatial knowledge as well as technologies. Bas Kok, President GSDI Association also

finds “The world is experiencing rapid technological, economic, environmental and social changes”, (GSDI Newsletter June 2009). Though the president claims, “Spatial data infrastructures are being successfully developed around the world” but he has not envisioned instrument to measure success of SDI development. This paper argues, SDIs need to be translated into tangible benefits according to local needs of specific regions for its smooth and successful implementation, one of such benefits includes SDI for Land Administration in the context of the emergent revolutionary steps to be taken in Pakistan.

To explore supporting role of SDI in land administration, components of SDI as well as of land administration system are discussed first.

Although the establishment of a land administration system is enough of a challenge as it is, the task of keeping the system up to date with developments in society is even more challenging, Molen(2002).

3.1 Components of SDI

SDI Africa: An Implementation Guide Chapter 2 describes five elements of SDI, which can be summarised as:

- Geospatial Data
- Standards
- Metadata
- Data policies and legislation
- Partnerships and leadership

In 2006, Satish Puri, Sundeep Sahay and Yola Georgiadou identified seven SDI components with rainbow metaphor arguing socio-technical and Information Infrastructure (II) related paradigms. The rainbow colours add up one by one and combining all produce white colour, the components form the overall structure of SDI development which is, no doubt, quite practical and a real approach in the context of SDI development. According to them, following are the components of SDI development:

Carriage: This component can be compared with telecommunication infrastructure and related policies to facilitate access and share information.

Devices: Speaks of development of ICT devices based on local needs for sharing resources.

Software: The focus of this component is to give boom to locally developed open source software instead of costly commercial software.

Content: It underscores the need of local participation instead of top-down approach.

- Provision:* Underpin the need of more user friendly environment of government organizations. It emphasizes the importance of NGOs, because they have local knowledge.
- Literacy:* Highlight the need of capacity building and role of capacity building institutions
- Governance:* Central idea of this component is bottom-up approach as most of SDIs are victims of central/ federal governments/ and NMOs.

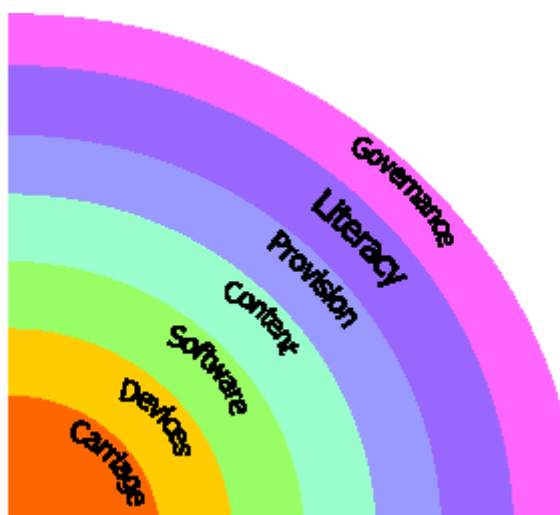


Figure 6: The Rainbow Metaphor for II (Clement and Shade, 1998)

In April 2006, GSDI newsletter envisioned its readers about the following eight components: Geographic data, metadata, framework, services, clearinghouse, standards, partnerships, education and capacity building. Former GSDI president, Mukund Rao argues in an article published in the journal “Coordinates” of August 2007 edition about six components of SDI including partnerships. It reveals from the literature cited above that no universally defined SDI components are in place. Therefore, five components identified in SDI Africa: An Implementation Guide Chapter 2 will be considered in current Pakistani scenario.

3.2 Components of Land Administration System

Like SDI components, there are no generally agreed upon components of a land administration system. Ian Williamson, Stig Enemark, Jude Wallace and Abbas Rajabifard (2008, p.1) envision the following four components:

- the **land management paradigm**, with its four core administration functions of land tenure, land use, land valuation and land development,
- **common processes** found in every system,

- a **toolbox approach**, offering tools and implementation options, and
- a **role** for land administration in supporting sustainable development.

Where as Peter Dale and John McLaughlin (1999, p.10) underscore functions of a land administration system instead of its components. According to Peter Dale and John McLaughlin, “Land administration functions may be divided into four components: juridical, regulatory, fiscal, and information management. These functions of land administration are traditionally organized around three sets of agencies responsible for surveying and mapping, land registration, and land valuation. Each of these agencies collects data and makes them available to the public.

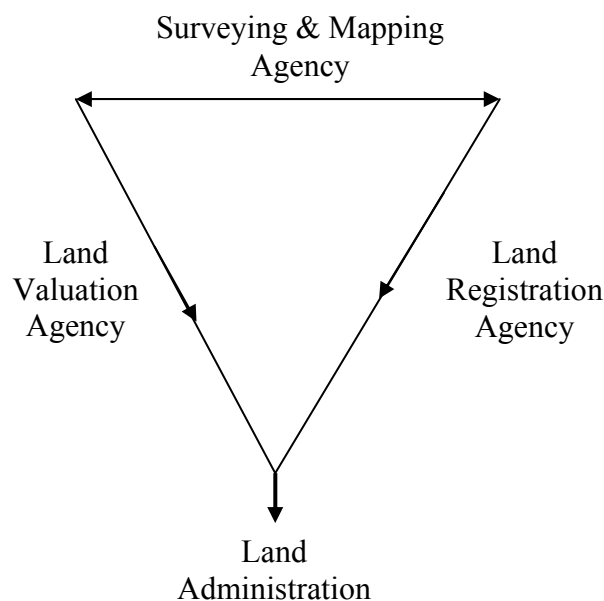


Figure 7: Agencies constituting to Land Administration System

From figure 7 it is interpreted that all three agencies i.e. surveying and mapping, land registration, and land valuation serve as three sides of a triangle. Indeed, the role of surveying and mapping agency in Pakistan such as Survey of Pakistan (SOP) is two fold. As, SOP not only provides geodetic network to help integrate all other sorts of spatial data but also to collect non spatial data such as land value and registration. Fact is, without knowing topography land value can not be estimated. For instance, a parcel located near road, telecommunication, and electricity network would have definitely more value as compared to a parcel located far away from such facilities. Similarly, land registration component requires geographic location of a parcel in order to register and verify on ground who owns the parcel. But dilemma is, SOP has not been considered as part of land administration system by the Government of Pakistan (GOP) yet. Consequently, reliable geometric and spatial component of land administration system is missing in the country. Empirical study made in 2007 reveals that SOP is rich in human and technical resources and a member of the most renowned international mapping project ‘Global Mapping’ a UN project funded and supervised by

International Steering Committee for Global mapping (ISCGM). The project being an international collaborative effort was successfully completed and launched in 2008 under supervision of Mr. Ghulam Sarwar, Director Photogrammetry and the geospatial data of the country was shared with world community such as ISCGM that is available on ISCGM website (<http://www.iscgm.org/cgi-bin/fswiki/wiki.cgi>).

In Pakistan land records management information system as e-government initiative is being implemented since 2005 to computerize land records. The dilemma is that each province has its own model. For instance, at the federal level land record project has different model than the land record model in the Punjab province as identified by World Bank in 2007. Moreover, there is also duplication in data collection as well according to the report. These can be seen as consequences of developing information systems such a land information system outside of SDI domain. As, SDI includes standardization to overcome interoperability issues from which information system development in Pakistan is suffering at the moment, therefore, there is a need to bring all the organizations engaged in computerization of land records together and to develop a standard model which is not being realized since 2005.

Table 2: Duplications and fragmentation across provinces of Pakistan

(Source: <http://go.worldbank.org/N36SGR8RA0>)

Project	Federal	Punjab	Sindh	NWFP	Balochistan
Data Centers	Yes	Yes	Yes		Yes
IT Infrastructure	Yes	Yes			Yes
Land Records	Yes	Yes	Yes		
Immovable Property	Yes	Yes			
Courts	Yes	Yes			
Police	Yes	Yes	Yes	Yes	
Taxation	Yes		Yes	Yes	
Vehicle / Drivers License	Yes	Yes		Yes	
Arms	Yes	Yes			
Public Health	Yes	Yes	Yes	Yes	
Training	Yes	Yes	Yes	Yes	

Role of SDI for Land Administration – in Brief

Importance of having SDI approach and its perceived value for Land Administration (LA) is structured in tabular form in Table 3.

Table 3: Summary of Role of SDI for LA

SDI Component	Value for Land Administration
Geospatial Data	“...land administration itself contains...spatial information” (van Oosterom et.al., 2009)
Standards	In Land Administration there are many implementations and utilizations of standards... (Szabolcs MIHÁLY et.al., 2009)
Metadata	It is recognised that for [Geo] spatial data to be used correctly and wisely, metadata that describes data quality, in addition to other attributes, should accompany it (Nebert 2000).
Policies and legislation	“...land administration systems to be improved through policy...” (Tuladhar, 2004)
Partnerships and leadership	Within the legal requirements, the land registry, cadastral and other organizations concerned with land administration should seek partnerships with the private sector to facilitate accurate, fast, inexpensive and customer friendly access to land information and its usage. United Nations Economic and social Council Report HBP/WP.7/2005/8

The discussion made so far reveals that development of information systems such as LA without considering a broader context like SDI can have negative impacts while integrating and sharing land related data with other local governments as it is happening in Pakistan. More over, it is argued that infrastructure such as SDI can accommodate and support many information systems like land administration system and land record information system etc whereas reverse of this process is not possible. Simply said, Information Infrastructure (II) contains SDI and SDI contains Land Administration System (LAS).

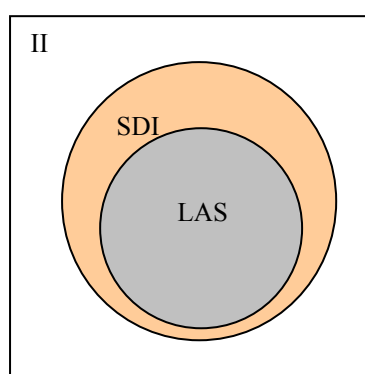


Figure 8: Relation between II, SDI and LAS

4. CONCLUSION AND RECOMMENDATIONS

Spatial knowledge is being generated continuously. The newly generated knowledge is always subjected to time and place. Therefore, knowledge that was generated hundred years ago might have appeared perfect at that moment though afterwards it might have been proven fake. Similarly, SDI is also relatively new concept and knowledge. At the moment practical experience and literature review both coincide to give rise to the thought that information systems such as land administration system (LAS) should be developed within SDI framework where SDIs should also be implemented in the context of Information Infrastructures (II).

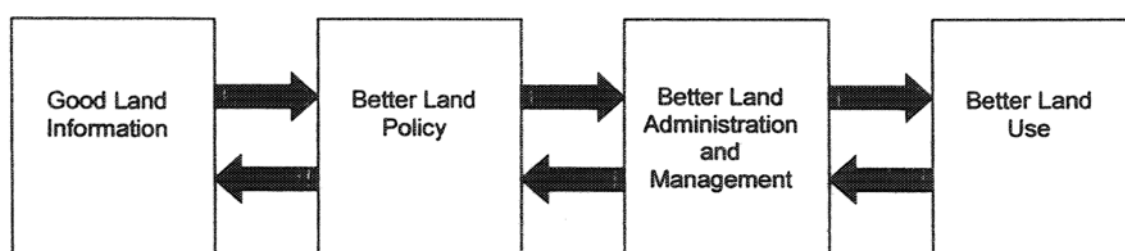


Figure 9: Relationship among Information, Policy, Administration and Use of Land
(Source: The Bathurst Declaration, 1999)

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