

# INTEGRATED LAND RECORDS MANAGEMENT TO ADMINISTER DEVELOPMENTAL ECOSYSTEM OF THE COUNTRY

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**Abstract:** In this paper the land records system and its possible interaction with various systems and environment is described. Currently the attribute information as recorded definitely helps in managing the ownership information, but it is not complete as the land parcel extent and the location is not matching the textual information. Hence effort is made to create a data repository at National level through various agencies to create the geospatial database of the cadastral system. We have described the current status of various sub system like land records attribute data, graphical data (map data) and the registration system. This paper also describes the importance of geographic boundaries of the land parcels and its interaction with various sub system like water, air and environment. How the land records management leads to control the entire ecosystems of a locality/region in terms of climate change, Urban Planning and Smart Cities, land acquisition, court cases for a better development and responsive society is also indicated.

**Index Terms:** Records of Rights, Cadastral Maps, Registration, Court Cases, Land Acquisition

## 1.0 Introduction

All countries have to deal with the management of land. They have to deal with the four functions of land tenure, land value, land use, and land development in some way or another. National capacity may be advanced and combine the activities in one conceptual framework supported by sophisticated ICT models. Different countries will also put varying emphasis on each of the four functions, depending on their cultural basis and level of economic development.

The land records of various types of land like public, private, cultivable, non-cultivable, forest, orchard, gramsabha land, banjar, awadi, padti, orchard, waterlogged, saline is recorded in various type of registers in different States. National Informatics Centre (NIC) has developed the necessary software tools to digitize the data, store the data, update and process the records based on mutations and Govt. acquisition and allocations. Presently the data is no more limited to only the attribute information. The spatial data related to cadastre is also captured and geo-referenced with respect to World geodetic system (WGS) and is readily available for public dissemination over the Bhuvan and other Base Layers by various organizations as a service like WMS/WFS. The data can be overlaid on high resolution satellite imagery for ready comparisons and temporal analysis. This enables the fast access and dissemination information during normalcy and emergencies, and has become an indispensable medium for dissemination of information among the Departments for smooth management of e-Governance applications.

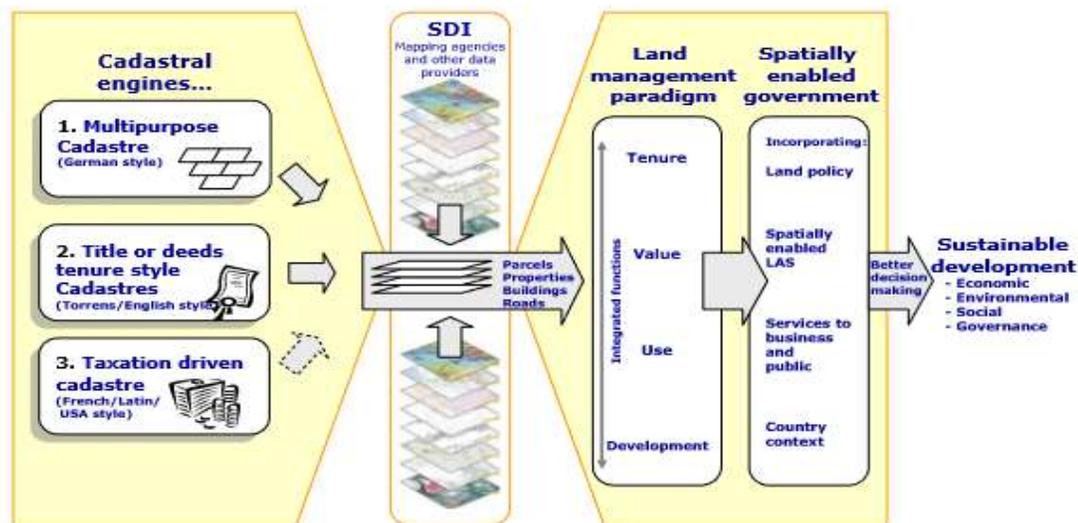


Fig.1: Significance of the Cadaster (Williamson and Wallace, 2007)

The Fig.1 demonstrates that the cadastral information layer cannot be replaced by a different spatial information layer derived from geographic information systems (GIS). The unique cadastral capacity is to identify a parcel of land both on the ground and in the system in terms that all

stakeholders can relate to, typically an address plus a systematically generated identifier (given addresses are often duplicated or are otherwise imprecise). The core cadastral information of parcels, properties and buildings, and in many cases legal roads, thus becomes the core of SDI information, feeding into utility infrastructure, hydrological, vegetation, topographical, images, and dozens of other datasets.

In this paper we are not only discussing for digitally equipping the Government with textual information but also spatially aware governance with boundary and dimensions to interact with various ecosystems (Fig 2.) like water, forest, urban, water resources structures and climate, environment and legal system. All these ecosystems can be effectively monitored, quantified, measured and administrated with the spatial aware information system like land information system.

**2.0 Land Records – Records of Rights (ROR)**

The land records computerization programme was taken up by Ministry of Rural Development in 1998-99. During the initial stages the data digitization was started in the various tehsils and then the data was merged at district level.[12], [13] Many States has collected the data to state level and hosted the data in a Data Centre through web enabled platforms with local language support.

SN.	State	Web Site
1	Department of Land Resources	<a href="http://dolr.nic.in">http://dolr.nic.in</a>
2	NLRMP Capacity building portal	<a href="http://nlrmportal.nic.in">http://nlrmportal.nic.in</a>
3	NLRMP MIS website	<a href="http://nlrmp.nic.in">http://nlrmp.nic.in</a>
4	Andhra Pradesh	<a href="http://apland.ap.nic.in/cclaweb/land.asp">http://apland.ap.nic.in/cclaweb/land.asp</a>
5	Bihar	<a href="http://lrc.bih.nic.in/">http://lrc.bih.nic.in/</a>
6	Chhattisgarh	<a href="http://cg.nic.in/cglrc">http://cg.nic.in/cglrc</a>
7	Goa	<a href="http://dslr.goa.nic.in/">http://dslr.goa.nic.in/</a>
8	Gujarat	<a href="http://anyror.gujarat.gov.in/Info712Page.aspx">http://anyror.gujarat.gov.in/Info712Page.aspx</a>
9	Haryana	<a href="http://jamabandi.nic.in/">http://jamabandi.nic.in/</a>
10	Himachal Pradesh	<a href="http://admis.hp.nic.in/himbhoomilmk/">http://admis.hp.nic.in/himbhoomilmk/</a>
11	Karnataka	<a href="http://www.bhoomi.karnataka.gov.in/landrecordsonweb">http://www.bhoomi.karnataka.gov.in/landrecordsonweb</a>
12	Madhya Pradesh	<a href="http://www.landrecords.mp.gov.in">http://www.landrecords.mp.gov.in</a>
13	Odisha	<a href="http://www.bhulekh.ori.nic.in">http://www.bhulekh.ori.nic.in</a>
14	Rajasthan	<a href="http://apnakhata.raj.nic.in">http://apnakhata.raj.nic.in</a>
15	Tamil Nadu	<a href="http://www.tn.gov.in/service/dept/26">http://www.tn.gov.in/service/dept/26</a>
16	Tripura	<a href="http://jami.tripura.gov.in">http://jami.tripura.gov.in</a>
17	Uttar Pradesh	<a href="http://bhulekh.up.nic.in">http://bhulekh.up.nic.in</a>
18	Uttarakhand	<a href="http://devbhoomi.uk.gov.in/">http://devbhoomi.uk.gov.in/</a>
19	Puducherry	<a href="http://www.pon.nic.in/nilamagal/">http://www.pon.nic.in/nilamagal/</a>

Table 1: State Websites

The Computerization of Land Records now consists of Cadastral Mapping, automation of Records of Right and computerisation of Registration. A brief diagram showing the projects in ideal condition is shown in Fig 2. The details of each system are discussed below:

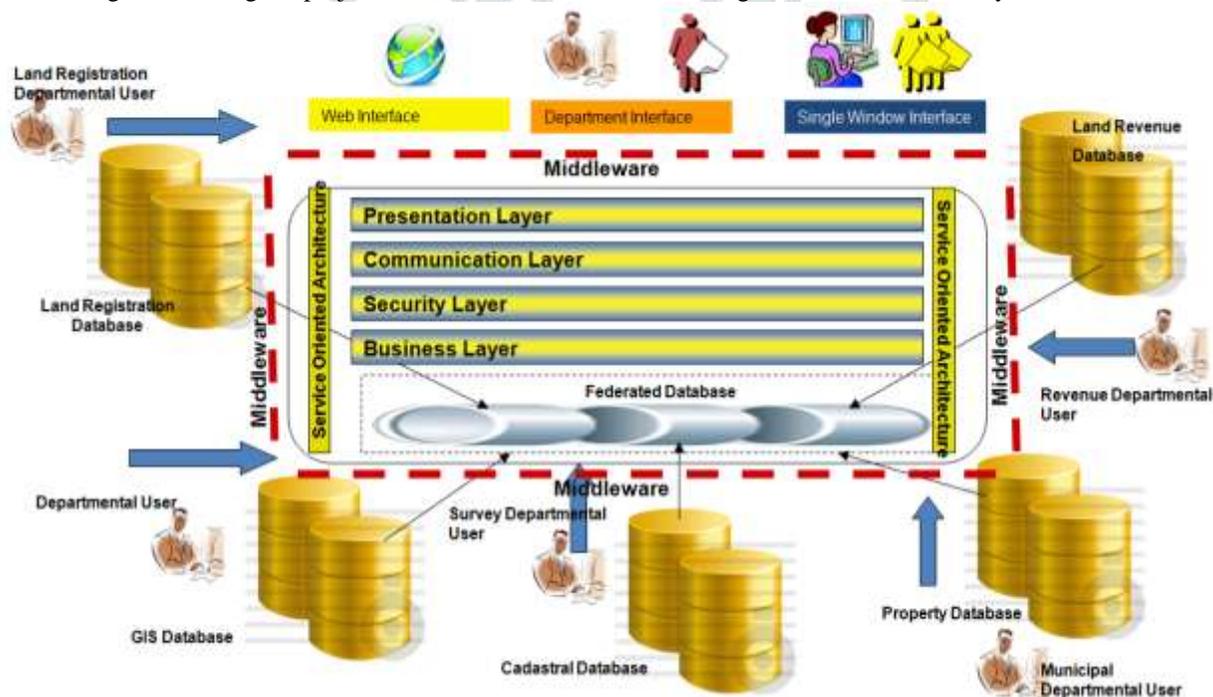


Fig 2: An ideal Computerisation System for NLRMP

### 3.0 Cadastral Map

Surveying is the art of locating the position of an object on the earth and presenting in on a paper with some scale. The modern method of Surveying Techniques utilizes modern techniques and high precision equipment's and generally covers vast stretch of the land with large scale (1:25000, 1:50000). These surveying maps are self-describing in nature and are not associated with any register for any explanations on the boundary and do have any ownership associated information.

Cadastral surveying is the definition, identification, demarcation, measuring and mapping of new or changed legal parcel boundaries. It usually includes the process of re-establishing lost boundaries and sometimes resolving disputes over boundaries or other interests in real property. Cadastral surveying is the term generally used to describe the gathering and recording of data about land parcels, even where the records do not form part of an official cadastre. Cadastral surveys are concerned with geometrical data, especially the size, shape and location of each land parcel (Dale and McLaughlin, 1999).

The cadastral maps usually have alphanumeric data containing record of rights details, crop statistics of individual plots depicting the boundaries and extent of the plots. These are maintained in form of village maps or Field Measurement Book. Numerous Survey methods were used and modified time and again. However, the records of Bombay Survey System and Madras Survey System, which evolved after various iterations, were adopted as a standard in many Southern States.

The Cadastral Maps are available in the scale of 1:4000 and mostly local referenced. The information available is the extent of the Abadi area, Marks of Lal Dora, the roads, Temples, trees and Jungle area and Common Places. The cadastral maps can be readily overlaid over the Google earth/ Bhuban for analysis and identification purposes. A sample cadastral Map is shown blow in the application s/w Bhubaksha as used in various States.

In NLRMP guidelines were indicated for geo-referencing exiting Village Maps and use of ETS GPS Survey[9] and the hybrid approach of overlaying the georeferenced Maps on Satellite Imagery.[7]

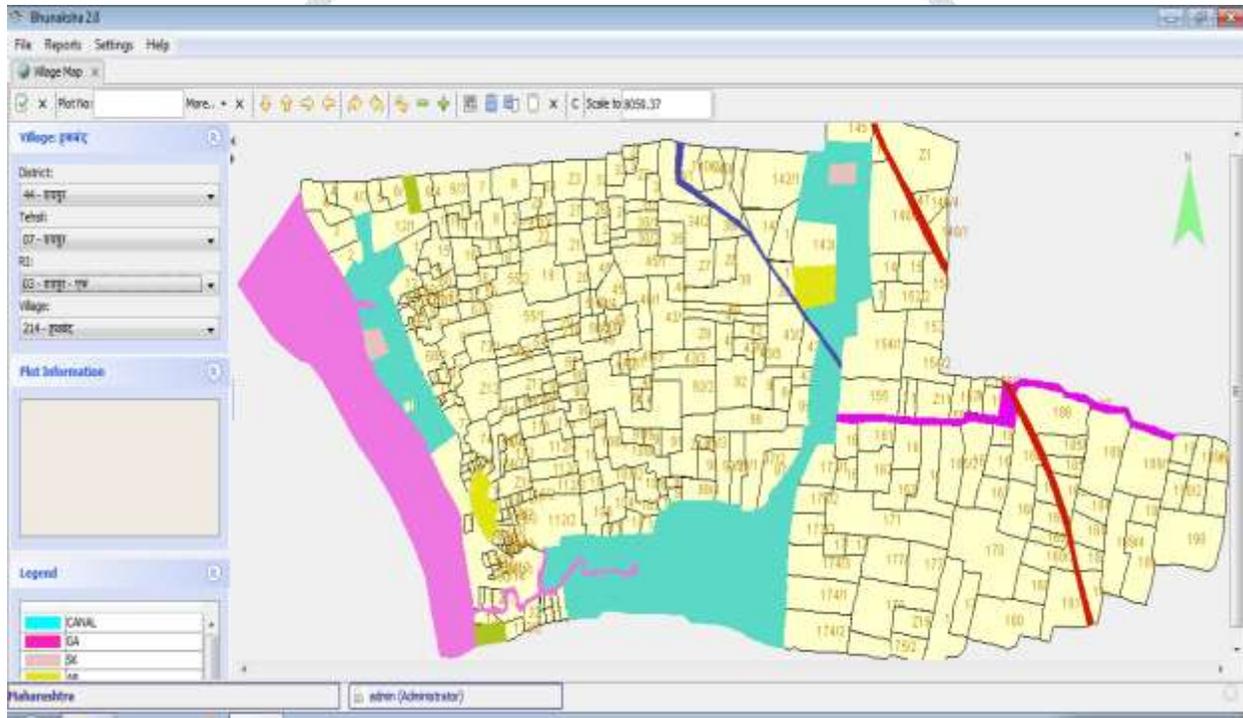


Fig 3: Cadastral Map - Land Records Computerization with integrated ROR

SL no	State	Districts	Taluks/B locks	Villages	Village Maps in the state*	Status of Digitization of Maps
1	Karnataka	27	176	30,606	30,606	All village maps
2	Tamil Nadu	30	206	17,200	17,200	Tippian scanned
3	Orissa	30	171/314	51,536	2,06,000	2 Tehsils
4	MP	48	272	55,897	1,23,468	3 Districts
5	Chattisgarh	16	98/146	19,779	39,060	All the Districts
6	HP	12	110	20,459	20,459	1 Tehsil
7	UP	70	305	99,949	99,949	2 Districts
8	Maharashtra	35	358	43,722	43,722	GAT and Village Maps
9	Andhra Pradesh & Telangana	23	1127 Mandals	27,000	37,17,726 (Telengana Area-Tippans) 6,185 (Andhra Region-Village Maps)	All Districts – Tippian/Field Measurement Book (FMBs)

10	Gujarat	25	225	18,557	18,557	All the Tehsils
11	Assam	27	155	25,163	37,520	Not done
12	Haryana	20	112	7,081	70,810	2 Districts
13	Bihar	38	535	1,28,261	1,93,229	Village Maps scanned and digitized
14	Nagaland	11	52	1,317	Nil	No Maps
15	J&K	14	69	957	30,000	1 Districts
16	Kerala	14	63	1604	14436K	New Maps being created
17	Rajasthan	32	247	42000	35000R	1 Districts
18	Goa	2	11	14783	14783 (Plain Table Sheets)	All maps scanned and digitized
19	Delhi	9	21/27	276	278	Not done
20	Jharkhand	22	212	32,615	1800 for Ranchi/Lohardaga/Dhanbad only)	3 districts
21	WB	18	341 Blocks	42042	66348	All Districts
22	Tripura	4	183	869	5088	All districts
23	Andaman & Nicobar	2	9	204	204	Not done
				Total	5,52,005	

\* There may be more than one map for a village

Table.2 Number of Village Maps for Cadastral Digitization in various States/UTs

4.0 Registration of Deeds

Deed registration is mandatory while transacting property and also an integral part for updation of land records. Presently there are around 4400 Sub-Registrar offices (SROs) responsible for property registration; collection of stamp duty, preservation of certified copies of deeds, issue of non-encumbrance certificates, etc. The process of registration is governed by the Indian Registration Act 1908 and Indian Stamp Duty Act 1899 except Jammu and Kashmir where it is governed by Jammu and Kashmir Registration Act 1977 Bikrami (1920 AD). Registration of various instruments affecting the rights and liabilities of the public over their properties, their safe preservation for eternity and granting copies thereof as and when required, are the main functions under the Registration Act. Adjudication of the instruments, supply, distribution and sale of various kinds of stamps are the main functions under the Stamp Act.

Land Records and Registration processes are integrated through automated systems where during registration, ownership data is authenticated from land records database [14], [15]. Once registration is over, systems send the details to land records system for mutation approval and recording.

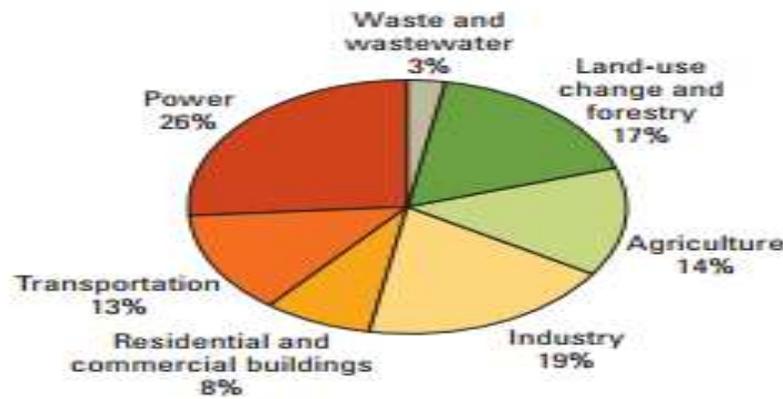
S.No	State/UT	Nos of SRO	Computerised	Technology used		Availability of Inter-net	Type of Network Connectivity			Abolish stamp paper	Availability in the Website					Payment type			Connectivity with revenue office	Security		Integration with LR	Scanning of deed	Deed searchable in web	Availability		
				Web	Client server		Swan	BB	Other		Guideline	Circle rate	Online calculator	Sample deed	Online booking	Bank	e-stamp	Online		Bar code	QR				CCD	Touch screen	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	
1	ANDAMAN & NICOBAR	5	5	1	4	5	0	4	1	0	0	0	0	1	0	5	0	0	3	1	0	1	0	0	3	4	
2	ANDHRA PRADESH	291	291	291	0	291	291	291	291	291	291	291	291	291	291	0	291	291	0	291	291	291	291	291	291	0	
3	ARUNACHAL PRADESH	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	ASSAM	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5	BIHAR	126	122	75	48	114	0	95	50	9	122	119	102	123	73	117	0	44	3	2	0	9	122	115	101	0	
6	CHANDIGARH	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	CHATTISGARH	92	2	1	1	1	0	1	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	
8	DADRA & NAGAR HAVELI	1	1	0	1	1	0	1	0	1	1	1	0	1	0	1	1	0	1	1	1	1	1	1	0	1	0
9	DAMAN & DIU	2	1	1	0	1	0	0	1	1	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	
10	GOA	12	7	0	7	12	12	0	0	0	0	0	0	0	0	0	8	0	0	7	0	0	7	0	0	0	
11	GUJARAT	287	287	287	0	287	287	0	0	0	287	287	0	287	285	287	287	0	287	0	0	287	287	0	0	0	
12	HARYANA	142	114	10	103	114	88	97	11	31	101	113	85	104	105	91	100	12	112	43	8	114	110	99	95	10	
13	HIMACHAL PRADESH	123	123	0	123	123	123	123	0	123	123	123	123	123	0	0	123	0	123	0	0	123	123	0	123	0	
14	JAMMU & KASHMIR	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
15	JHARKHAND	42	42	42	0	42	42	0	0	0	42	42	42	42	1	0	42	42	42	0	0	42	42	42	42	0	0
16	KARNATAKA	251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
17	KERALA	314	314	314	0	312	313	313	1	0	314	314	314	314	314	0	313	311	0	257	312	0	0	0	0	0	
18	LAKSHADWEEP	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
19	MADHYA PRADESH	234	234	234	0	234	234	0	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	0	
20	MAHARASHTRA	529	512	512	0	510	0	0	512	510	512	512	512	511	512	462	0	460	605	512	511	511	512	512	7	5	
21	MANIPUR	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
22	MEGHALAYA	11	1	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	
23	MIZORAM	15	0	0	14	1	0	1	0	0	2	2	0	15	0	2	0	0	0	0	0	0	15	0	0	0	
24	NAGALAND	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
25	NCT OF DELHI	21	21	0	21	21	21	0	0	21	21	21	21	21	21	0	21	0	0	0	0	0	21	21	21	0	
26	ODISHA	191	1	0	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	
27	PUDUCHERRY	10	10	10	0	10	10	0	0	10	10	10	0	0	0	0	0	0	0	0	10	0	10	0	10	0	
28	PUNJAB	173	27	0	27	26	0	27	0	27	12	22	19	6	0	3	26	0	13	2	0	14	4	0	19	0	
29	RAJASTHAN	527	512	512	6	518	279	348	23	0	526	515	515	526	111	526	420	526	376	0	0	513	513	513	8	13	
30	SIKKIM	16	13	8	5	0	0	0	1	0	0	0	0	0	0	13	0	0	8	0	0	9	10	0	0	0	
31	TAMILNADU	571	468	9	463	465	399	364	14	25	470	446	436	458	418	466	144	398	21	395	14	29	466	25	10	7	
32	TELANGANA	141	141	141	0	140	141	141	0	141	141	141	141	141	141	0	0	0	141	141	141	141	141	141	141	141	
33	TRIPURA	18	18	18	0	18	18	0	0	1	18	2	17	0	0	18	0	0	18	0	0	18	18	18	18	0	
34	UTTARAKHAND	53	45	44	1	45	42	2	0	0	45	45	45	45	45	2	29	43	0	45	0	45	7	0	4		
35	UTTAR PRADESH	354	37	0	40	33	6	24	5	6	23	27	15	15	6	7	24	1	8	1	7	8	22	13	9	0	
36	WEST BENGAL	255	255	255	0	255	166	0	250	0	255	255	254	255	2	254	253	254	180	0	253	225	255	254	0	26	
Total		9060	7605	2708	866	3562	2474	1832	1393	1432	3500	3623	3175	3513	2539	2788	1717	2618	2699	1384	1720	2629	3231	2295	4081	241	

Table.3 Status of Registration System in various States

**5.0 Climate Change**

Agriculture contributes to climate change by anthropogenic emissions of greenhouse gases (GHGs), and by the conversion of non-agricultural land (e.g., forests) into agricultural land. Agriculture, forestry and land-use change contributed around 20 to 25% to global annual emissions in 2010. The details as found in [5] are shown below in Fig 4. The geographic boundary identification with areal extent will help in identifying and quantifying the extent of pollution and administrate the owners.

Fig.4 Sector wise Global O<sub>2</sub> emission [5]



Source: IPCC 2007a, figure 2.1.

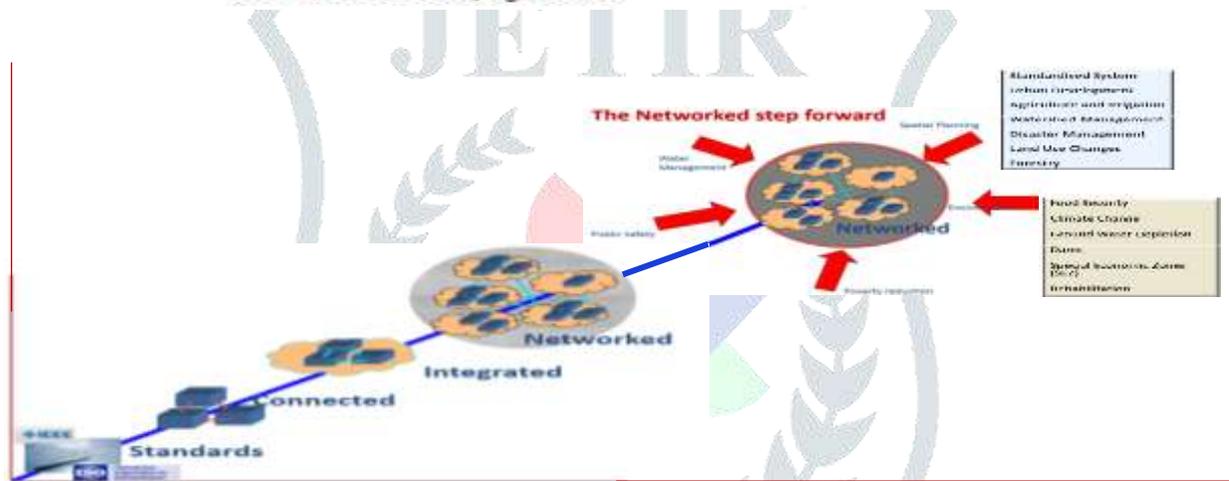


Fig.5 Evolution of land records management and its interaction with the basic ecosystem

**6.0 Urban Planning and Smart Cities**

The geospatial data of the urban area along with 2D and 3D information helps for effective planning of the Urban area. Land being the costliest asset in realty has often been at the epicentre of fights, property crimes and frauds [8][16]. In the absence of any effective land record maintenance system, one of the biggest challenges facing India has been the land ownership issue. For example, a request for land information which is 100 years old, from a family involved in a dispute, will surely make life miserable for official bookkeepers in revenue and municipal departments.

By keying in the survey number, users can access all information on the classification zone details of the site, like primary residential, mixed residential, institutional and industrial. Users can get further information on the type of constructions allowed in their respective zones[10][11]. The feature also has tools listing pockets falling under the Coastal Regulatory Zone, artificial recharge area, Red Hills Catchment Area, Outer Ring Road, Green Belt, Pallikaranai Swamp Area, and Archaeological Survey of India (ASI), where there are restrictions on constructions. Each and every activities related to Smart City is dependent of on the land parcel geography, boundary and ownership information.

**7.0 Revenue Courts and Case Monitoring**

The court Case Monitoring System is a unique application developed in many states and has the capability for managing the complete online Case Management of Board of Revenue and its related courts. Cases related to Land Records, Settlement and Consolidation are taken into consideration through this application. Citizens or their representative advocate can file a case and check the status online. The application enables the Government to automate monitoring of Revenue Court processes and case activities enabling decision-making through the use of ICT.

Cases are accepted or rejected based on the scrutiny of applications and documents by the Oath Commissioner or Peskar. Registration of case is carried out at Oath Commissioner/ Peskar level and a registration number is provided to the applicant. The priority for taking up cases depends on the date of the case or in some cases, instructions from the Hon'ble High Court. Following this, the cause list is prepared and notices are sent to the petitioner/ opponent parties physically. Sue motto party, if any, may appear on the date of hearing and may file their document and written statement. This system helps in building confidence among the citizens and automates the mutation orders and hence the updation land details.

### 8.0 Land Acquisition System

Land acquisition is the process wherein agricultural and/or non-agricultural lands are acquired by government for various activities such as village/town extension, roads, culverts, reservoirs, canals, military camps, railways, industries etc. The Land Acquisition Act 1894 governs the process of acquisition of land, which is a central act. The land owned and occupied by the private citizens and non-governmental organizations are subjected to acquisition. The land acquisition system helps in finding the land owners and types of land and land cost evaluation and helps in speedy land acquisition and settlement of the disputes.

Similarly the integration of the land records with registration system with automated land boundary updation along with updation of records of Right is an important module for keeps the land records data upto-date[17][18].

### 9.0 Conclusion:

The basic land records system started with the land valuation and taxation and gradually expanded to records to depict the ownership and rights. But recent advances in geospatial technology and the initiatives from Government made the cadastral system with records of not only 2D but also 3D information. This has enhanced the suitability of the cadastral system to act as a base system to monitor and control the entire natural ecosystem. The study has analysed the usage of cadastral system by climate change, smart city and urban planning, legal system and also demonstrated how these systems are controlled by land records management system. These systems can be related with detailed process to effectively monitor the basic ecosystem of a region or a country.

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