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Historical Issues and Perspectives of Land Resource Management in India: A Review

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HISTORICAL ISSUES AND PERSPECTIVES OF LAND RESOURCE MANAGEMENT IN INDIA: A REVIEW

M S Umesh Babu and Sunil Nautiyal*

Abstract

This paper focuses on historical aspects of land resources, land evolution and management. Moreover, it describes land issues before and after the Ice age 5000 B.C. Pre-Vedic literature on origin of land, cutting of forest for land utilization, mainly for agricultural activities, has been highlighted. Besides, it describes traditional land management techniques, registration process, land transfer and colour coding methods for isolation of land and its utilization for different purposes from the early days.

Key Words: *Pre-Vedic, Land evolution, Traditional management, Land degradation*

Introduction[1]

The early evolution of land takes place in the mid-Paleozoic era, between 480 and 360 million years ago. It is an important development in history with far-reaching consequences for the evolution of terrestrial organisms and global environments (Kenrick, et al. 1997). The name *India* is derived from *Indus*, which originates from the Old Persian word *Hindu*. *Hindustan* was originally a Persian word that meant "Land of the Hindus".

Human beings started inhabiting South Asia approximately 30,000 years ago. Around 7000 BC, the first known neolithic settlements appeared on the subcontinent in Mehrgarh and other sites in western Pakistan. These gradually developed into the Indus Valley Civilization. The first urban culture in South Asia flourished during 2500–1900 BC in Pakistan and western India. Centered around cities such as Harappa, Mohenjo-daro, Dholavira, and Kalibangan, the civilization relied on varied forms of subsistence, and engaged robustly in crafts production and wide-ranging trade during the period 2000–500 BC. In terms of culture, many regions of the subcontinent transitioned from the Chalcolithic (Bronge age) to the Iron Age.

Officially, India is known as the Republic of India (Bharat Ganarajya) and is located in South Asia. It is the seventh largest country by geographical area, the second-most populous country with over 1.2 billion people, and the most populous democracy in the world. Bounded by the Indian Ocean in the south, the Arabian Sea on the south-west, and the Bay of Bengal on the south-east, it shares land borders with Pakistan to the west, China, Nepal, and Bhutan to the north-east and Burma and Bangladesh to the east. In the Indian Ocean, India is in the vicinity of Sri Lanka and the Maldives; in addition, India's Andaman and Nicobar Islands share a maritime border with Thailand and Indonesia.

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[1] This is review paper based on the literature published in the subject. Sources are cited wherever necessary. However, citation may be at the end of sentence or in some cases at the end of the paragraph.

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In early literature, there are descriptions of land in *Stala Puranas.* These *puranas* describe natural sacred places consisting of geographical features that are revered and are almost always associated with oral narratives about the location. The shared meanings and communicated oral histories of these natural-scapes draw attention to the deep connection of nature with the concept of earth or land (also called *bhumi*). These oral histories include natural elements and natural objects, especially water, rocks, and trees, which form features such as rivers, lakes, mountains and forests. These locations are not *universal* places or generic features such as sacred groves or river confluences, but are *particulars* specific to their cartographic positions.

Land comprises soils, minerals, water, biota etc. In India, 60 per cent (apart from forest) of the land is a source of livelihood through agriculture and related activities. Population growth and the consequent demand for land, water and biological resources have put tremendous pressure on land. Agenda 21 recognizes the need to allocate land for sustainable uses and promotes integrated planning and management of land resources. Here, we analyse land resources from a historical point of view in terms of conservation and management. In addition, this paper focuses on reasons for land degradation in India.

Indian geography

India's geological processes commenced 75 million years ago when the Indian subcontinent, part of the southern supercontinent Gondwana, began a north-eastward drift across the Indian Ocean. The original Indian plate survives as peninsular India, which is the oldest and geologically most stable part of India; it extends as far north as the Satpura and Vindhya ranges in central India. India lies to the north of the equator between 6° 44' and 35° 30' north latitude and 68° 7' and 97° 25' east longitude. The history of the land is given in the Table 1.

Table 1: History of Indian subcontinent

Ages	***Period***
Stone age	7000–3000 BC
Bronze age	3000–1300 BC
Iron age	1200–26 BC
Classical period	1–1279 CE
Late medieval age	1206–1596 CE
Early modern period	1526–1858 CE
Other states	1102–1947 CE
Colonial period	1505–1961 CE
Kingdoms of Sri Lanka	543 BC–1948 CE

Source: http://en.wikipedia.org/wiki/List_of_Indian_monarchs. Accessed: 10.12.2011

History of Land - Global View

About 5,000 BC: The *last Ice age ended* when the ice sheets finally retreated from Scandinavia and the glaciers in Scotland disappeared. People, animals and plants invaded the emerging land after the ice had disappeared. Around 7,500 BC: The melting of the ice sheets resulted in the flooding of the North Sea basin and the *disappearance of the land bridge connecting Britain to the continent* around 8000 years ago. During 6,000 - 2,500 BC: *Holocene Climate Optimum*. Sea level was at a slightly higher level than today coinciding with the warmest period in the past 10,000 years with temperatures about two degrees Celsius higher than today[2].

Land Establishment in India

Pythagoras, the Greek philosopher, is believed to have learned in India not only his theory of transmigration but also his theory of numbers from the Indian Sankya system. In addition, Dr. Goldstucker and Mr. Bhandarkar refer to the grammarian Panini. Agastia, a Rishi, introduced reclamation of jungles into arable land. It would thus appear that the Aryan migration into South India has to be referred to the period of the Sutras (Aiyangar, 1941).

Indian history is the story of predominant dynasties in the country. Other princes, although their conquests were less extensive, did not succeed in establishing paramount powers (Smith, 1904).

Land Information System

According to *Crain (online),* information systems function as data banks, and facilitate information manipulation, retrieving, and updating. Geographic information systems are no different and must be capable of following the evolutionary pattern. We need to record the details of land parcels with a cadastre system for better administration of land. Because land is the ultimate resource for all the wealth, inadequacy of land information, such as who owns a piece of land, may pose serious constraints on what can be accomplished.

History of Agricultural Revolution in India

During the later Middle Ages, slowly but steadily, farmers started to experiment with new agricultural methods in order to adapt to unpredictable climates and also stimulate the growth of profitable markets in growing cities.

Agricultural revolution could not have succeeded when new ships to withstand the harsher climatic conditions imported large amounts of grain form the Baltic, undermining local grain production. This imports made the Flemish and Dutch economy independent from climatic fluctuations which were causing famine[3].

Indian agriculture began by 9000 BC as a result of early cultivation of plants and domestication of crops and animals. Soon, farmers developed agriculture further and implemented innovative

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[2] http://www.eh-resources.org/timeline/timeline_prehistory.html Accessed: 08.12.201

[3] http://www.eh-resources.org/timeline/timeline_prehistory.html. Accessed: 28.12.2011

techniques. Double monsoons led to two harvests in a year. Indian produce soon reached the world markets via existing trading networks. Wheat, barley and jujube were domesticated in the Indian subcontinent in 9000 BC. Then, domestication of sheep and goat followed. This phase also saw the first domestication of the elephant. Crops like barley and wheat were cultivated with the assistance of cattle, sheep and goat, and this is evident in Mehrgarh during 8000-6000 BC.

Irrigation was developed in the Indus Valley Civilization by around 4500 BC. The size and prosperity of the Indus civilization grew as a result of this innovation, which eventually led to more planned settlements making use of drainage and sewers. Sophisticated irrigation and water storage systems were developed by the Indus Valley Civilization, including artificial reservoirs at Girnar dated to 3000 BC, and an early canal irrigation system from circa 2600 BC.

In modern times, the third five-year plan (1961-66) stressed the importance of agriculture and improving production of wheat, but the brief Sino-Indian War of 1962 exposed the weaknesses in the economy and shifted the focus to defence industry. In 1965–1966, India fought a war with Pakistan. Due to this war, there was a severe drought in 1965. The war led to inflation and priority shifted to price stabilization. The construction of dams continued and many cement and fertilizer plants were also established. Eventually, Punjab began producing an abundance of wheat.

Box 1: Initiation of Farming System

Chandragupta's brother-in law Pushyagupta, from the western provinces, saw that damming up a small stream was of great value for irrigation. He accordingly formed a lake called Sudarsana, 'the Beautiful,' between the citadel on the side of the hill and the 'inscription rock' further to the east, but failed to complete the necessary supplemental channels (Smith, 1904). These were constructed in the reign of Chandragupta's grandson Asoka under the superintendence of his representative Tushaspa, the Persian, who then became a governor. These beneficent works constructed under the patronage of the Maurya emperors endured for 400 years. But in the year 150 A. D. a storm of exceptional violence destroyed the embankment of the lake.

Occupations during Ancient India

In ancient India, some of the Aryan families had already begun to practice agriculture. The fertility of the Indian soil was a stimulus for cultivation. In the *Rig-Veda* period, agriculture became the main occupation of the people though they still kept large herds of cattle and drove them to pasture. Wheat and barley were their chief grains of diet, but they did not disdain the use of animal food, and there are frequent allusions in the hymns to the killing of cattle and to the cooking of their flesh for human consumption. They even made use of an intoxicant, indulging freely in a fermented liquor made from the juice of a plant called Soma. In one of the hymns, the process of preparing the juice is described as a sacred rite. More than this, one whole book of the Rig Veda is dedicated to it. Their constant wars with the aborigines and with each other naturally turned their attention to the improvement of weapons and the construction of shields and protective armour. This led to considerable skill in metal work, and we hear of them putting it to uses other than war, for mention is made of metal ornaments, of golden crowns, necklaces, bracelets, and anklets (De La Fosse, 1918).

Land Management

The relationship between humankind and land will always be dynamic and changes at different rates across countries and regions as a result of varying economic, social and environmental pressures. The collection of revenue that necessitated the maintenance of land records came into use, although in rudimentary form in ancient times. Attempt to reform the system was first made by Sher Shah whereby land was categorized and measured. Elaborate methods were devised for determining the average produce of each class of land and for commuting grain rates into money rates. In fact, Akbar's settlement next widely resembles the later settlement effected under British rule. Subsequently during 1822, regulations were introduced for detailed surveys and regulations. The primary interest of the British rulers was the collection of land revenue and consequently the system of land records was also organized to serve that purpose.

Records of Right, also known as khatouni, were put in place where the names and classes of tenure of all occupants of land are recorded[4]. This consisted of

1. Village map: A pictorial form showing the village and field boundaries.
2. Field books or khasra which is an index to the map, in which changes in field boundaries, their area, particulars of tenure-holders, methods of irrigation, cropped area, other uses of land etc., are shown.
3. Records of Right to know about the names and classes of land occupants under tenure system [5].

Evolution of Concepts of Land Property

Territoriality is primarily an expression of social power in the country. Its changing function facilitates us to understand the historical relationship between society and land. "Perhaps, throughout history, one of the strongest drivers for territoriality and associated expansionist claims is the desire for commercial growth." It can be argued that from a western perspective, the drive for international territoriality that characterized the colonial era has been reinterpreted in modern times as being due to the expansion of capital in the form of multi-national corporations (Ting, online). This ascendance of capital has tended to reduce land to simply another trading commodity, albeit a useful investment alternative to "money, bonds, debentures, shares, houses, paintings or antiques".

Ownership in the Crown: The Normans extended and developed the feudal system after the Conquest of England in 1066. Under the feudal system, all land was owned directly or indirectly by the king. He granted use of these lands to his subjects in return for rendering military or other services. The tenant and his heirs were bound in feudal service even if they had sub-infeudated land to another party. "The collective power vested in the institutions of royal authority or 'state' would in theory function as a medium through which those holding property could acquire wide ranging influence and achieve high status." (Ting, online). The deeds and registration systems are mentioned in Table 2.

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[4] http://www.gisdevelopment.net/application/lis/overview/lisrp0004a.htm. Accessed: 15.11.2011

[5] http://www.gisdevelopment.net/application/lis/overview/lisrp0004a.htm. Accessed: 15.11.2011

Table 2: Deeds/Title Registration

System	Deeds System	Title System
Content	Who owns what	What is owned by whom
Register	A register of owners	A register of properties
Legal effect	Registration of the transaction of the title is not guaranteed	Registration of the title guaranteed by state.
Actors	Notaries/Registrars	Lawyers/Surveyors
Role of the Cadastre	Taxation Purposes	Identification purposes
Boundaries	Sketch for the deed	German and Torrens: Fixed English: General

Source: (Enemark, 2003)

Systems of land tenure

The system of land tenure governs the traditional or legal rights to individuals or groups to have land. Systems of land tenure are not immutable. On the contrary, they are subjected to a continual process of change. Changes in natural conditions, economic factors, technological innovations, and size of the population influence political power structures and can bring about changes in land tenure system. Nevertheless, land tenure systems are institutionally established and are difficult to alter. Political power structures, cooperative ties and class, cultural and ethnic interests and motives all work towards maintaining the established forms. Agriculture cultivation and use of land form a kind of production based on the process of growth of animals and plants. In its original form, man creates food and other articles of consumption by using his labour to cultivate a piece of land.

Land Tenure system during Ancient India

Ancient records illustrate that land has been under cultivation in India for more than 5,000 years. In the beginning, tribes exercised control (especially delimitation and defence) over the areas they had taken possession. The initial form of land rights came from such conquests. The tribes allotted land to individual families for their utilization, who practised shifting cultivation.

In the case of villages which held land rights jointly, the village community claimed the right to all land within the village boundaries and allotted it to individual families for utilization. Soon, however, it became obligatory to deliver a share of the grain yield - in other words - a tax. It was necessary to establish an official hierarchy to collect the taxes.

In order to appreciate the evolution of Revenue Administration during the British period, it is pertinent to know the different land revenue systems introduced by the British in India such as 1. Zamindari system, 2. Ryotwari system and 3. Mahalvari system.

1. Zamindari sytem

Cornwallis, who was appointed Governor General in 1786, was especially directed to devise a satisfactory solution of the land revenue system which would ensure the company's interest as well as that of the cultivators. Commenting on the company's revenue policy, Cornwallis remarked in 1789 that "one-third of the company's territory in Hindustan is now jungle, inhabited only by wild beasts". Cornwallis held prolonged discussions on three vital questions.

1. With whom was the settlement to be made - the Zamindars or the actual tillers of the soil?
2. What should be the State's share in the produce of land?
3. Should the settlement be permanent?

Under Zamindari or permanent settlement system introduced in 1793, feudal lords (Zamindars, Jagirdars etc.,) were declared as proprietors of land on the condition of fixed revenue payments to the East India Company. Among the biggest zamindars was Darbhanga Raj, also known as Raj Darbhanga or the Royal Family of Darbhanga. They ruled over territories that are now part of Mithila and Darbhanga district in Bihar. The estate of Darbhanga Raj was estimated to cover an area of 2,410 square miles (6,200 km^2), incorporating 4,495 villages within 18 circles in Bihar and Bengal and employing over 7,500 officers to manage the estate. It was the best managed estate at the time of abolition of Zamindari[6] system.

2. Ryotwari system

The other major system was the Ryotwari system introduced in Madras Province in 1802 and in Bombay in 1817-18. In this case, individual cultivators, i.e. ryots, were recognized as proprietors of their land with the rights to sublet, mortgage and transfer their lands by gift or sale. Their tenure of land was secure so long as revenue payments were paid directly to the Collectors. This system prevailed over most of South India including present day Maharashtra, Karnataka, Tamil Nadu, Kerala, Andhra Pradesh and most of Madhya Pradesh and Assam. The princely states of Jaipur and Jodhpur in Rajasthan also fell under the Ryotwari system. Pockets of Zamindari-type tenure existed within these Ryotwari areas, which were administered by local rajas or nawabs. Ryotwari systems accounted for around 38% of the total cultivated area (Rao, online, p.16)

3. Mahalwari system

This system was introduced between 1820 and 1840 in Punjab (including both present-day Punjab in Pakistan and India, and the State of Haryana), parts of what are now Madhya Pradesh and Orissa and the princely states of Oudh and Agra in Uttar Pradesh. This tenure system was much less extensive and accounted for some 5% of the cultivated area. Under this system, the village lands were held jointly by the village communities, the members of which were jointly and severally responsible for the payment of land revenue. Land revenue was fixed for the whole village and the village headman (Lumbardar)

6 http://en.wikipedia.org/wiki/Raj_Darbhanga. Accessed: 10.12.2011

collected it for which he received 'panchatra' i.e. 5 per cent as commission. (Rao, online, p.17). The western land administration system is represented in Table 3 and Figure 1.

Box 2: Zamindari system and its drawbacks[7]

The introduction of Zamindari system by the British ruined the peasants through the exorbitant charges imposed on them by the new class of landlords. Craftsmen were destroyed by the influx of British manufactured goods. The religion and the caste system, which formed the firm foundation of traditional Indian society, were endangered by the British administration. Indian soldiers as well as people in administration could not rise in hierarchy as senior jobs were reserved for Europeans. Thus, there was all-round discontent and disgust against British rule, which burst out in a revolt by the 'sepoys' at Meerut whose religious sentiments were offended when they were given new cartridges greased with cow and pig fat, whose covering had to be stripped out by biting before using them in rifles. Hindu and Muslim soldiers who refused to use such cartridges were arrested which resulted in a revolt by their fellow soldiers on May 9, 1857.

Advancement in Land Administration

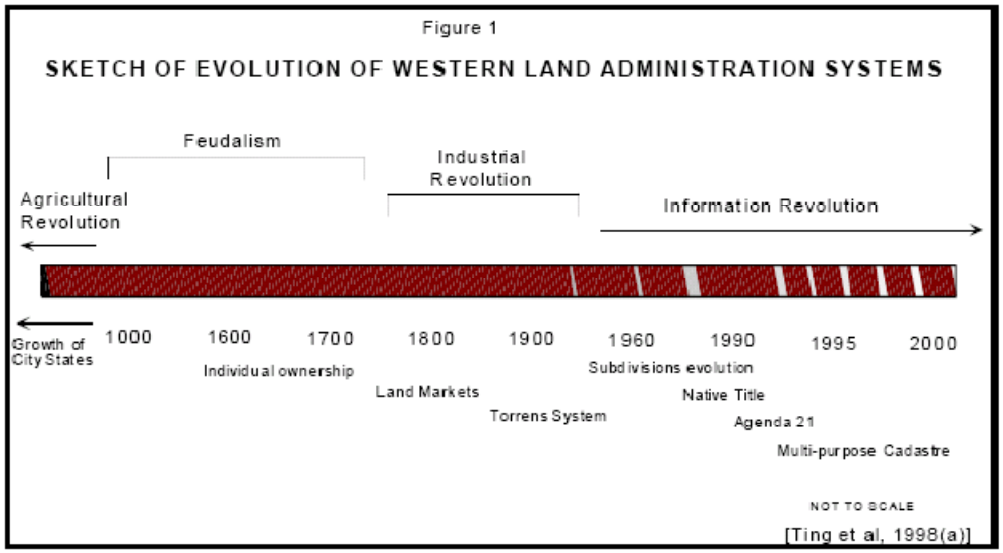
Table 3: Evolution of Western Land Administration Systems

Variables	Feudalism - 1800	Industrial revolution 1800-1950	Post-war reconstruction 1950-1980	Information revolution 1980-
Human kind to land evolution	Land as Wealth	Land as a commodity	Land as a scarce resource	Land as a community scarce resource
Evolution of cadastral applications	Fiscal cadastre. Land valuation and taxation paradigm	Legal cadastre. Land market paradigm.	Managerial Cadastre. Land management paradigm.	Multi-Purpose cadastre. Sustainable development paradigm.

Source: (Enemark, 2003)

[7] http://india.gov.in/knowindia/culture_heritage.php?id=4. Accessed: 08.01.2012

Figure 1: Evolution of Land Administration



Source: (Ting, online)

Land Revenue Administration (Tax Collection) in Colonial Period

Land revenue in India during British times was primarily based upon money collection by tax farmers, who in turn would receive this money from the local land owners or Zamindars. In such intermediary process, the poor and helpless farmers remained absolutely exploited, with the maximum moolah going to British tax farmers and Zamindars denominated by the British. The British land revenue system in India shattered and devastated the native agrarians, with practically nothing left for them to call their own[8].

The Revenue Department is the oldest arm of governments, existing from time immemorial in the country. The process of revenue administration was started by Sher Shah Suri (1540-45). From very early times, land administration and revenue administration centered on collection of taxes/land revenue, which was the main source of revenue to rulers. The history of land administration dates back to the olden days of kings and kingdoms. Right from the time of Manu, land revenue has been a major source of income to the sovereign. During the Mauryan and Gupta periods, the revenue was collected by paid officials, and resembled the present day revenue administration system. During post-Mauryan and Gupta periods, the State revenue was collected by the donees of Brahmadeya, Devadana, and Agrahara Lands. The revenue administration was systematized scientifically during British rule by introducing “permanent settlement” by Cornwallis in 1793 and Ryotwari system by Sir Thomas Munro in 1802. The British inherited the institutional form of agrarian system from the Mughals. The British Revenue Department was a pivotal department in administration. (Rao, online, p3 &4).

8 http://www.indianetzone.com/40/british_land_revenue_system_india.htm. Accessed: 05.01.2012

Mughal Empire's land administration

The Mughal Empire began in 1526. At the height of its power in the late 17th and early 18th centuries, it controlled most of the Indian subcontinent extending from Bengal in the east to Balochistan in the west, Kashmir in the north to the Kaveri basin in the south. Its population at that time has been estimated at 110 to 150 million over a territory of more than 3.2 million square kilometres (1.2 million square miles).

A major Mughal contribution to the Indian subcontinent was the unique architecture. Also, Mughal influence can be seen in cultural contributions such as:

- Centralized, imperialistic government which brought together many smaller kingdoms.
- Persian art and culture amalgamated with Indian art and culture.
- New trade routes to Arab and Turkic lands.
- The development of Mughlai cuisine
- Mughal architecture found its way into local Indian architecture, most conspicuously in the palaces built by Rajputs and Sikh rulers.
- Landscape gardening

Although the land the Mughals once ruled has separated into what are now India, Pakistan, Bangladesh, and Afghanistan, their influence can still be seen widely today. Tombs of the emperors are spread throughout India, Afghanistan and Pakistan. There are 16 million descendants spread throughout the subcontinent and possibly the world[9].

The Mughal Empire in India lasted from 1526 to 1858. The Mughal rule saw the country being united as one single unit and being administered by one single powerful ruler. During the Mughal period, art and architecture flourished and many beautiful monuments were constructed. The great rulers of Mughal Empire are Akbar, Auranqzeb, Babar, Humayun, Jahangir and Shah Jahan[10] .

According to Baindur (2009), the concept of nature in the Indian worldview is constructed to a great extent from mythological and cultural narratives as well as rituals.

The ancient kingdoms of the south, although rich and populous, were inhabited by Dravidian people not inferior in culture to the Aryans in the north. They were ordinarily so secluded from the rest of the civilized world, including Northern India, that their affairs remained hidden from the eyes of other nations. As they had no native annalists, their history before the year 1000 CE has almost wholly perished.

The long series of Chinese Buddhist pilgrims, who continued for several centuries to visit to India, which they regarded as their Holy Land, begins with Fa-hsien. He started on his travels in 399 A. D., and returned to China fifteen years later. Figure 2 shows the status of land utilization during the ancient period.

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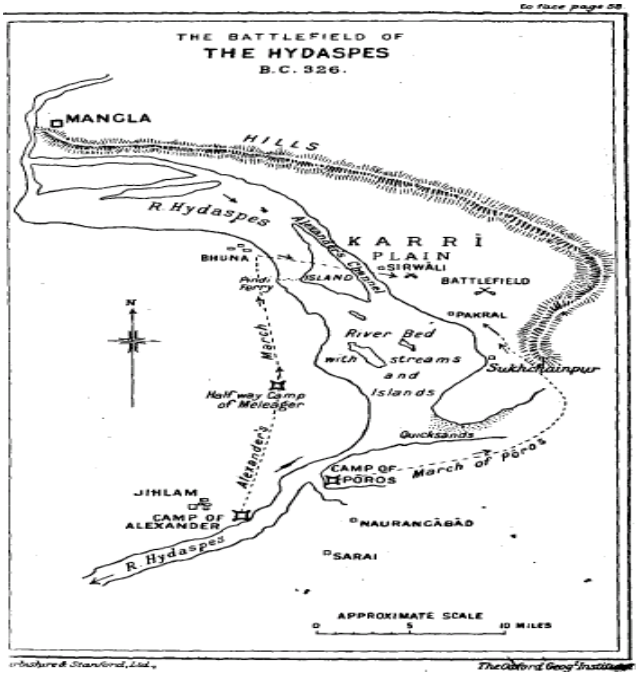
[9] http://en.wikipedia.org/wiki/Mughal_Dynasty. Accessed: 08.01.2012

[10] http://www.iloveindia.com/history/medieval-india/mughal empire/index.html. Accessed: 06.01.2012

Figure 2: Land Status and its Utilization during the 326 B.C.



Source: (Smith, 1904)

Ashokan Empire in land management

Asoka was one of the most powerful kings of the Indian subcontinent. A ruler of the Mauryan Empire, Ashoka reigned over the country from 273 BC to 232 BC. The reign of Emperor Asoka covered most of India, South Asia and beyond, stretching from present day Afghanistan and parts of Persia in the west, to Bengal and Assam in the east, and Mysore in the south. However, the Battle of Kalinga changed King Asoka completely. The power hungry emperor became a Buddhist follower and started preaching the principles of Buddhism throughout the world.

Ashoka's Policy

As Buddhist Emperor, Asoka built thousands of Stupas and Viharas for Buddhist followers. One of his stupas, the Great Sanchi Stupa, has been declared a World Heritage Site by UNESCO. The Ashoka Pillar at Sarnath has a four-lion capital, which was later adopted as the national emblem of the modern Indian republic. Throughout his life, Asoka the Great followed the policy of nonviolence or ahimsa. Even the slaughter or mutilation of animals was abolished in his kingdom. He promoted the concept of vegetarianism. The caste system ceased to exist in his eyes and he treated all his subjects as equals. At the same time, each and every person was given the right to freedom, tolerance, and equality[11].

Ashoka was a very intellectual statesman. He ruled over Magadha wisely and competently. The people of Kalinga were patriots and loved freedom. Ashoka worked hard especially for the spread of

11 http://www.culturalindia.net/indian-history/ancient-india/ashoka.html. Accessed: 15.01.2012

education in his land. During the period, Nalanda was famous for education and the University of Magadha. It is said that the university of Magadha was established by Ashoka. During his time, trade with foreign countries was carried on by sea routes. He encouraged agriculture, trade and industry[12].

Colour Coding for Land Uses

According to Jeer, (1997) land-use maps are the most common way of presenting land-based data. They show land use by rendering them in different colours. They effectively illustrate land-use concepts by graphically displaying land-uses, roads, public infrastructure, and community facilities. Planning agencies have been using one colour scheme since the 1950s that has become a de facto standard. This standard is also being frequently recommended to planners across the country. The following are traditional colouring schemes. Maps generally use a different colour for each of the major land-use categories. For example, it is common to render:

- Yellow for residential uses such as single-family and town houses.
- Browns for multi-family and high-rise residential purposes
- Reds for retail and commercial uses
- Purples for industrial uses
- Blues for institutional and public facilities
- Greens for recreational uses
- Grays for industrial utilities

The above primary and secondary colours generally serve as basic land-use maps that do not have complex land-use categories. When they do, it is common to find additional colours in shades closer to secondary and tertiary colors. Beyond this traditional colour scheme, systems vary widely on how many colours to show on a map and which colours denote what land use. Because some colors are close to others and easily discernible, elaborate coding schemes also specify the appropriate Prisma colour number (Prisma Color is the manufacturer of popular colour pencils and is its trade name). On black and white maps, colours replace monochrome patterns of varying crosshatched lines.

[12] http://www.yousigma.com/biographies/ashoka.html. Accessed: 15.01.2012

Land Registration-Comparing Land Registration systems

Box 3: Parameters for comparison

- Property Definition
  - Where and how it is defined.
  - Legal/Economic/physical concept.
- Property Determination
  - General / Fixed Boundaries.
  - Determination process.
- Property formation
  - Process, Institutions and actors – who does what
  - Role of the surveyors.
- Property Transfer
  - Process, Institutions and actors – who does what
  - Legal consequences.

Source: (Enemark, 2003)

Land Degradation - India

The World Bank (2006) says that at present, land use practices in many developing countries are resulting in land, water, and forest degradation, with significant repercussions for the countries' agriculture sectors, natural resource bases, and eco environmental balances. Land degradation can be defined as the loss of land productivity through one or more processes, such as reduced soil biological diversity and activity, loss of soil structure, soil removal due to wind and water erosion, acidification, salinization, water logging, soil nutrient mining, and pollution.

Ministry of Agriculture (2000a) estimated that about 174 million hectares of land (53%) suffers from different type and varying degrees of degradation. About 800 hectares of arable land are lost annually due to ingress of ravines. And also, it is estimated that more than 5000 million tonnes of topsoil are eroded every year (MoA, 2000a). All this has a direct bearing on food production and the livelihood of the people. The extent of human-induced soil degradation is mentioned in Table 4**.**

Table 4: Extent of soil degradation (human-induced) under different degradation types[13]

Degradation type	Area affected (m ha)	
	Total	Percent
Water erosion	148.9	45.3
Wind erosion	13.5	4.1
Chemical deterioration	13.8	4.2
Physical deterioration	11.6	3.5
Land not fit for agriculture	18.2	5.5
Soils with little/no degradation problem	90.5	27.5
Stable terrain (under natural condition)	32.2	9.8
Total geographical area	328.7	100.0

[13] http://envfor.nic.in/divisions/ic/wssd/doc2/ch13.pdf accessed: 27.12.2011

Land degradation is also strongly associated with macroeconomic forces such as building of roads. Often paid for by logging companies or through international aid, new roads open up forest areas, first for wood extraction and then for the expansion of agriculture. New migrants colonize roadsides and use roads to deliver their produce to markets. By linking forested areas to the broader economy, roads lower costs and increase the returns of conversion, but heightening the sensitivity of these areas to changes in macroeconomic conditions.

Habitat loss and its impact

Habitat loss poses the greatest threat to our species. The world's forests, swamps, plains, lakes, and other habitats continue to disappear as they are harvested for human consumption and cleared to make way for agriculture, housing, roads, pipelines and the other hallmarks of industrial development. Without a strong plan to create terrestrial and marine protected areas, important ecological habitats will continue to be lost[14].

Sacred groves are outlines of resource conservation

The existence of sacred groves in India most likely dates back to an ancient pre-agrarian hunter-gathering era, and their presence has been documented since the early 1800s. Believing trees to be the abode of gods and ancestral spirits, many communities set aside sanctified areas of forest and established rules and customs to ensure their protection. These rules varied from grove to grove but often prohibited the felling of trees, the collection of any material from the forest floor, and the killing of animals. Presiding deities were believed to administer punishment, often death, to individuals who violated the rules, and sometimes to the entire community in the form of disease or crop failure. As a result of these protective restrictions, maintained over countless years, sacred groves are now important reservoirs of biodiversity[15].

Regional Issues/Conflicts in Land Management

The word 'conflict' carries negative connotations (Warner, 2000). Different types of conflicts can be categorized in terms of whether they occur at the micro–micro or micro–macro levels, i.e. among community groups or between community groups and outside government, among private or civil society organizations (Warner, 2000).

[14] http://wwf.panda.org/about_our_earth/species/problems/habitat_loss_degradation/ accessed :23.12.2011

[15] http://www.sacredland.org/sacred-groves-of-india/. accessed :23.12.2011

Box 4: Types of conflicts arising in NRM

Intra micro–micro conflicts:

- Disputes over land and resource ownership, e.g. between private and communal land owners;
- Disputes over land boundaries between individuals or groups;
- Latent family and relationship disputes;
- Disputes due to natural resource projects being captured by elites and/or those who happen to own resources of a higher quality;
  Breaking of CPR constitutional or operational rules, such as protection agreements for grazing areas, fish net sizes, forests, or misappropriation of funds, etc.;
- Disputes over unfair distribution of work and profits.

Inter micro–micro conflicts:

- Conflict between land-owners and resource users;
- Conflict between indigenous CPR groups, and more recent settlers;
- Disputes generated by jealousy related to growing wealth disparities;
- Lack of co-operation between different community groups;
- Disputes over renewal arrangements for leased land;
- Internal land ownership disputes ignited by the speculative activities of commercial companies;
- Resentment built up due to lack of representation in village committees.

Micro–macro conflicts:

- Contradictory natural resource needs and values, e.g. between wildlife habitat protection and local livelihood security;
- Cultural conflicts between community groups and outsiders;
- Disputes over project management between community groups and outside project-sponsors;
- Disputes caused by political influence (national, provincial or local);
- Disputes arising from differences between the aspirations of community groups and expectations of NGOs or commercial companies;
- Off-site environmental impacts affecting unintended third-parties.

Source: (Warner, 2000)

Conflicts arising from poor enforcement of natural resource management regulations include:

- Private companies avoiding compliance and sanctions by threatening to withdraw their investment or by manipulating courts
- A general lack of understanding of environmental laws and regulations by industries and government agencies and the general population
- Non-compliance arising from unrealistic requirements for pollution control technology and poor implementation of environmental impact mitigation plans.
- Failure of the courts to enforce regulations because of prolonged legal processes, with the outcome often unsupported by one or more parties.
- Perverse incentive structures promoted by conventional cost-benefit analysis.

The conflict management plan describes the overall strategy for managing the conflict, combined with the proposed process of consensus-building and an initial set of conflict mitigation or prevention options. The components of a conflict management plan will vary with each situation.

Government Instigation on Land Conservation/Management

The Constitution of India enables the Central Government and the states to enact laws for the preservation and conservation of natural resources. Article 39(b) and (c) of the Directive Principles of State Policy lays down that it is the duty of the state and the Centre to develop natural resources for common good. There is a constitutional provision for the involvement and participation of the people at the local level for participatory planning and decision-making. The Eleventh Schedule (Article 243-G) of the Constitution lists matters pertaining to land improvement, implementation of land reforms, land consolidation, soil conservation, and watershed development and management under the authority and responsibility of Panchayats (rural local bodies). The Twelfth Schedule (243-W) lists urban planning and regulation of land-use under the authority and responsibility of municipalities (urban local bodies). The following table presents the important policies formulated, programmes implemented and the institutional framework adopted in India for the best possible use of land as well as sustainable and integrated management of land resources (Land 13, online).

The first five-year plan (1951-1956) addressed mainly the agrarian sector, including investments in dams and irrigation. The agricultural sector was hit hard by the partition of India and needed urgent attention. The total planned budget of ₹ 2356 crore was allocated to seven broad areas: irrigation and energy (27.2 per cent), agriculture and community development (17.4 per cent), transport and communications (24 per cent), industry (8.4 per cent), social services (16.64 per cent), land rehabilitation (4.1 per cent), and other sectors and services (2.5 per cent). Many irrigation projects were initiated during this period, including the Bhakra Dam and Hirakud Dam. Table 5 explains the features and initiatives of different programmes related to land resource management.

Table 5: Policies, Acts, Programmes by Govt. on Land Resources[16]

Year	Initiatives	Features
1950s	National Land Reforms Policy	• Abolition of intermediary tenures • Tenancy reforms • Ceiling on agricultural holdings and redistribution of surplus land • Updating and maintenance of land records • Consolidation of land holdings • Distribution of government wasteland
1972-73	Drought-prone Areas Programme (DPAP)	• Minimize adverse effects of droughts on the productivity of land, water and human resources • Promote overall economic development and improve the socio-economic condition of poor and disadvantaged sections inhabiting the programme areas • Capacity building and empowerment of village community, ensuring participation of Panchayati Raj Institutions and NGOs in programme implementation at grassroots level and transfer of funds as well as decision-making power to the local people • Since 1995-96, a watershed development based approach has been adopted

[16] Land 13. http://envfor.nic.in/divisions/ic/wssd/doc2/ch13.pdf. Accessed:27.12.2011

1977-78	Desert Development Programme (DDP)	• Mitigate adverse effects of desertification and adverse climatic conditions on crops, and human and livestock population • Restoration of ecological balance by harnessing, conserving and developing natural resources, i.e. land, water, and vegetative cover, and raise land productivity • Capacity building and empowerment of village community, and ensuring participation of Panchayati Raj Institutions and NGOs
1985	National Land Use and Conservation Board	• Formulate a national policy and perspective plan for conservation, management and development of land resources of the country • Review of the progress of implementation of ongoing schemes and programmes connected with conservation and development of land resources and soils • Take measures to restrict the conversion of good agricultural land to non– agricultural uses • Co-ordinate the work of State Land Use Boards
1985	National Wastelands Development Board (NWDB)	• Formulate perspective plan and programmes for the management and development of wastelands in the country • Identify the wastelands in the country • Review the progress of implementation of programmes and schemes for the development of wasteland • Create a reliable data base and documentation centre on related aspects of wasteland development
1988	National Land Use Policy	• To install an efficient and effective administrative structure for prescribing and regulating land by all concerned and revitalize the land-use boards in this respect • Prevent further deterioration of land resources • Restore the productivity of degraded lands • Allocate land for different uses based upon land capability, land productivity, and national production goals • Complete the inventory of land resources based on prescribed land-use
1989-90	Integrated Wastelands Development Project (IWDP)	• Adopt soil and moisture conservation measures such as terracing, bunding, trenching, vegetative barriers, etc. • Encourage natural regeneration • Enhance people's participation in wasteland development programmes at all stages resulting in equitable sharing of benefits • Employment generation, poverty alleviation, community empowerment and development of human and other economic resources of the village • Training, extension and creation of awareness among the participants
1992	Constitution (Seventy Third Amendment) Act, 1992	• Gives land related subject to the Panchayat Raj Institutions (local self governments) at the village, block and district levels to ensure participatory planning, decision making, and monitoring of programmes by the local self governments
1992	Constitution (Seventy Fourth Amendment) Act, 1992	• Regulation of land use and urban planning were brought under the functional domain of urban self-governing bodies
1999	Department of Land Resources	• Coordination of land administration in India • Formulation of integrated land resources management policies • Implementation of land-based development programmes

The 73rd and 74th Amendment Acts (1992) of the Constitution brought the land use, conservation, management and related issues under the purview of local bodies in both rural and urban areas. The initiatives taken by other ministries also had a bearing on the prevention of degradation of lands. Among them, some are mentioned below:

- Improved policy framework for natural resource management
- Improved data on land resource degradation and its management
- Draft grazing and livestock management policy, 1994
- Draft national policy for common property resource lands (CPRLs) (under formulation)

Future Considerations for Land Resources Conservation

The efforts of different ministries/departments/organizations should be integrated to harmonize the delineation, codification and classification of land. Detailed soil data (physical, biological, chemical and microbial) based on effective soil testing are pre-requisites for all lands under both rain-fed and irrigated agriculture to address the issues related to soil health *vis a vis* agriculture production. Such soil data will be vital for setting up Village Resource Centres for the benefit of the farming community. Necessary financial and human resources should thus be assigned for the purpose. Central and State Land Use Boards should be reorganized and empowered to lead this work. Further, we must implement the unimplemented agenda of land reforms with particular reference to tenancy laws, land leasing, distribution of surplus and waste land, and providing adequate access to common property and wasteland resources. Following the conferment of land rights to women under the Hindu Succession Amendment Act (2005), the provision of appropriate support services to women farmers has become important. Moreover, as far as possible, agricultural land should not be diverted to non-agricultural use (GoI, Planning Commission, 2007).

Strategies for Sustainable Land Management

- Tenth Five-Year Plan assigns high priorities to area specific programmes such as watersheds, river valleys, arid areas, wastelands.
- Public policies on land use and the impact of subsequent land use on natural resources.
- Coordinate the activities of all line departments and adopt an integrated approach.
- Expansion and intensification of irrigated agriculture.
- Address weaknesses in land use policies as well as options that are available to deal with natural resource management and conservation issues.
- Establish the horizontal linkages between various agencies that are involved in land resource management.
- Involve the stakeholders from the planning stage onwards and address socio-economic and poverty issues in land development programmes.
- The government should take the lead role in capacity building at the grass root level by planning, implementing and monitoring integrated land resources management programmes.
- Intensification of high-quality rain-fed lands.

- Land should be accounted for even when land quality deteriorates or the ecosystems functions change.
- Intensification of densely populated marginal lands.
- Increasing women's access to productive land by regularizing leasing and share cropping of uncultivated agricultural land, encouraging collective efforts in bringing wastelands under cultivation and providing policy incentives to women in low-input subsistence agriculture will have immediate benefits for women's empowerment and household food security.
- Expansion of farming into sparsely populated marginal lands.
- Urban and peri urban farming with accelerated urbanization.
- Natural resource managers and local planning officials need to understand the role in protecting natural resources. In particular, natural resource managers need to better understand and influence public policies related to natural resources.

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HISTORICAL ISSUES AND PERSPECTIVES OF LAND RESOURCE MANAGEMENT IN INDIA: A REVIEW

M S Umesh Babu and Sunil Nautiyal*

Abstract

This paper focuses on historical aspects of land resources, land evolution and management. Moreover, it describes land issues before and after the Ice age 5000 B.C. Pre-Vedic literature on origin of land, cutting of forest for land utilization, mainly for agricultural activities, has been highlighted. Besides, it describes traditional land management techniques, registration process, land transfer and colour coding methods for isolation of land and its utilization for different purposes from the early days.

Key Words: *Pre-Vedic, Land evolution, Traditional management, Land degradation*

Introduction[1]

The early evolution of land takes place in the mid-Paleozoic era, between 480 and 360 million years ago. It is an important development in history with far-reaching consequences for the evolution of terrestrial organisms and global environments (Kenrick, et al. 1997). The name *India* is derived from *Indus*, which originates from the Old Persian word *Hindu*. *Hindustan* was originally a Persian word that meant "Land of the Hindus".

Human beings started inhabiting South Asia approximately 30,000 years ago. Around 7000 BC, the first known neolithic settlements appeared on the subcontinent in Mehrgarh and other sites in western Pakistan. These gradually developed into the Indus Valley Civilization. The first urban culture in South Asia flourished during 2500–1900 BC in Pakistan and western India. Centered around cities such as Harappa, Mohenjo-daro, Dholavira, and Kalibangan, the civilization relied on varied forms of subsistence, and engaged robustly in crafts production and wide-ranging trade during the period 2000–500 BC. In terms of culture, many regions of the subcontinent transitioned from the Chalcolithic (Bronge age) to the Iron Age.

Officially, India is known as the Republic of India (Bharat Ganarajya) and is located in South Asia. It is the seventh largest country by geographical area, the second-most populous country with over 1.2 billion people, and the most populous democracy in the world. Bounded by the Indian Ocean in the south, the Arabian Sea on the south-west, and the Bay of Bengal on the south-east, it shares land borders with Pakistan to the west, China, Nepal, and Bhutan to the north-east and Burma and Bangladesh to the east. In the Indian Ocean, India is in the vicinity of Sri Lanka and the Maldives; in addition, India's Andaman and Nicobar Islands share a maritime border with Thailand and Indonesia.

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[1] This is review paper based on the literature published in the subject. Sources are cited wherever necessary. However, citation may be at the end of sentence or in some cases at the end of the paragraph.

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In early literature, there are descriptions of land in *Stala Puranas.* These *puranas* describe natural sacred places consisting of geographical features that are revered and are almost always associated with oral narratives about the location. The shared meanings and communicated oral histories of these natural-scapes draw attention to the deep connection of nature with the concept of earth or land (also called *bhumi*). These oral histories include natural elements and natural objects, especially water, rocks, and trees, which form features such as rivers, lakes, mountains and forests. These locations are not *universal* places or generic features such as sacred groves or river confluences, but are *particulars* specific to their cartographic positions.

Land comprises soils, minerals, water, biota etc. In India, 60 per cent (apart from forest) of the land is a source of livelihood through agriculture and related activities. Population growth and the consequent demand for land, water and biological resources have put tremendous pressure on land. Agenda 21 recognizes the need to allocate land for sustainable uses and promotes integrated planning and management of land resources. Here, we analyse land resources from a historical point of view in terms of conservation and management. In addition, this paper focuses on reasons for land degradation in India.

Indian geography

India's geological processes commenced 75 million years ago when the Indian subcontinent, part of the southern supercontinent Gondwana, began a north-eastward drift across the Indian Ocean. The original Indian plate survives as peninsular India, which is the oldest and geologically most stable part of India; it extends as far north as the Satpura and Vindhya ranges in central India. India lies to the north of the equator between 6° 44' and 35° 30' north latitude and 68° 7' and 97° 25' east longitude. The history of the land is given in the Table 1.

Table 1: History of Indian subcontinent

Ages	***Period***
Stone age	7000–3000 BC
Bronze age	3000–1300 BC
Iron age	1200–26 BC
Classical period	1–1279 CE
Late medieval age	1206–1596 CE
Early modern period	1526–1858 CE
Other states	1102–1947 CE
Colonial period	1505–1961 CE
Kingdoms of Sri Lanka	543 BC–1948 CE

Source: http://en.wikipedia.org/wiki/List_of_Indian_monarchs. Accessed: 10.12.2011

History of Land - Global View

About 5,000 BC: The *last Ice age ended* when the ice sheets finally retreated from Scandinavia and the glaciers in Scotland disappeared. People, animals and plants invaded the emerging land after the ice had disappeared. Around 7,500 BC: The melting of the ice sheets resulted in the flooding of the North Sea basin and the *disappearance of the land bridge connecting Britain to the continent* around 8000 years ago. During 6,000 - 2,500 BC: *Holocene Climate Optimum*. Sea level was at a slightly higher level than today coinciding with the warmest period in the past 10,000 years with temperatures about two degrees Celsius higher than today[2].

Land Establishment in India

Pythagoras, the Greek philosopher, is believed to have learned in India not only his theory of transmigration but also his theory of numbers from the Indian Sankya system. In addition, Dr. Goldstucker and Mr. Bhandarkar refer to the grammarian Panini. Agastia, a Rishi, introduced reclamation of jungles into arable land. It would thus appear that the Aryan migration into South India has to be referred to the period of the Sutras (Aiyangar, 1941).

Indian history is the story of predominant dynasties in the country. Other princes, although their conquests were less extensive, did not succeed in establishing paramount powers (Smith, 1904).

Land Information System

According to *Crain (online),* information systems function as data banks, and facilitate information manipulation, retrieving, and updating. Geographic information systems are no different and must be capable of following the evolutionary pattern. We need to record the details of land parcels with a cadastre system for better administration of land. Because land is the ultimate resource for all the wealth, inadequacy of land information, such as who owns a piece of land, may pose serious constraints on what can be accomplished.

History of Agricultural Revolution in India

During the later Middle Ages, slowly but steadily, farmers started to experiment with new agricultural methods in order to adapt to unpredictable climates and also stimulate the growth of profitable markets in growing cities.

Agricultural revolution could not have succeeded when new ships to withstand the harsher climatic conditions imported large amounts of grain form the Baltic, undermining local grain production. This imports made the Flemish and Dutch economy independent from climatic fluctuations which were causing famine[3].

Indian agriculture began by 9000 BC as a result of early cultivation of plants and domestication of crops and animals. Soon, farmers developed agriculture further and implemented innovative

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[2] http://www.eh-resources.org/timeline/timeline_prehistory.html Accessed: 08.12.201

[3] http://www.eh-resources.org/timeline/timeline_prehistory.html. Accessed: 28.12.2011

techniques. Double monsoons led to two harvests in a year. Indian produce soon reached the world markets via existing trading networks. Wheat, barley and jujube were domesticated in the Indian subcontinent in 9000 BC. Then, domestication of sheep and goat followed. This phase also saw the first domestication of the elephant. Crops like barley and wheat were cultivated with the assistance of cattle, sheep and goat, and this is evident in Mehrgarh during 8000-6000 BC.

Irrigation was developed in the Indus Valley Civilization by around 4500 BC. The size and prosperity of the Indus civilization grew as a result of this innovation, which eventually led to more planned settlements making use of drainage and sewers. Sophisticated irrigation and water storage systems were developed by the Indus Valley Civilization, including artificial reservoirs at Girnar dated to 3000 BC, and an early canal irrigation system from circa 2600 BC.

In modern times, the third five-year plan (1961-66) stressed the importance of agriculture and improving production of wheat, but the brief Sino-Indian War of 1962 exposed the weaknesses in the economy and shifted the focus to defence industry. In 1965–1966, India fought a war with Pakistan. Due to this war, there was a severe drought in 1965. The war led to inflation and priority shifted to price stabilization. The construction of dams continued and many cement and fertilizer plants were also established. Eventually, Punjab began producing an abundance of wheat.

Box 1: Initiation of Farming System

Chandragupta's brother-in law Pushyagupta, from the western provinces, saw that damming up a small stream was of great value for irrigation. He accordingly formed a lake called Sudarsana, 'the Beautiful,' between the citadel on the side of the hill and the 'inscription rock' further to the east, but failed to complete the necessary supplemental channels (Smith, 1904). These were constructed in the reign of Chandragupta's grandson Asoka under the superintendence of his representative Tushaspa, the Persian, who then became a governor. These beneficent works constructed under the patronage of the Maurya emperors endured for 400 years. But in the year 150 A. D. a storm of exceptional violence destroyed the embankment of the lake.

Occupations during Ancient India

In ancient India, some of the Aryan families had already begun to practice agriculture. The fertility of the Indian soil was a stimulus for cultivation. In the *Rig-Veda* period, agriculture became the main occupation of the people though they still kept large herds of cattle and drove them to pasture. Wheat and barley were their chief grains of diet, but they did not disdain the use of animal food, and there are frequent allusions in the hymns to the killing of cattle and to the cooking of their flesh for human consumption. They even made use of an intoxicant, indulging freely in a fermented liquor made from the juice of a plant called Soma. In one of the hymns, the process of preparing the juice is described as a sacred rite. More than this, one whole book of the Rig Veda is dedicated to it. Their constant wars with the aborigines and with each other naturally turned their attention to the improvement of weapons and the construction of shields and protective armour. This led to considerable skill in metal work, and we hear of them putting it to uses other than war, for mention is made of metal ornaments, of golden crowns, necklaces, bracelets, and anklets (De La Fosse, 1918).

Land Management

The relationship between humankind and land will always be dynamic and changes at different rates across countries and regions as a result of varying economic, social and environmental pressures. The collection of revenue that necessitated the maintenance of land records came into use, although in rudimentary form in ancient times. Attempt to reform the system was first made by Sher Shah whereby land was categorized and measured. Elaborate methods were devised for determining the average produce of each class of land and for commuting grain rates into money rates. In fact, Akbar's settlement next widely resembles the later settlement effected under British rule. Subsequently during 1822, regulations were introduced for detailed surveys and regulations. The primary interest of the British rulers was the collection of land revenue and consequently the system of land records was also organized to serve that purpose.

Records of Right, also known as khatouni, were put in place where the names and classes of tenure of all occupants of land are recorded[4]. This consisted of

1. Village map: A pictorial form showing the village and field boundaries.
2. Field books or khasra which is an index to the map, in which changes in field boundaries, their area, particulars of tenure-holders, methods of irrigation, cropped area, other uses of land etc., are shown.
3. Records of Right to know about the names and classes of land occupants under tenure system [5].

Evolution of Concepts of Land Property

Territoriality is primarily an expression of social power in the country. Its changing function facilitates us to understand the historical relationship between society and land. "Perhaps, throughout history, one of the strongest drivers for territoriality and associated expansionist claims is the desire for commercial growth." It can be argued that from a western perspective, the drive for international territoriality that characterized the colonial era has been reinterpreted in modern times as being due to the expansion of capital in the form of multi-national corporations (Ting, online). This ascendance of capital has tended to reduce land to simply another trading commodity, albeit a useful investment alternative to "money, bonds, debentures, shares, houses, paintings or antiques".

Ownership in the Crown: The Normans extended and developed the feudal system after the Conquest of England in 1066. Under the feudal system, all land was owned directly or indirectly by the king. He granted use of these lands to his subjects in return for rendering military or other services. The tenant and his heirs were bound in feudal service even if they had sub-infeudated land to another party. "The collective power vested in the institutions of royal authority or 'state' would in theory function as a medium through which those holding property could acquire wide ranging influence and achieve high status." (Ting, online). The deeds and registration systems are mentioned in Table 2.

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[4] http://www.gisdevelopment.net/application/lis/overview/lisrp0004a.htm. Accessed: 15.11.2011

[5] http://www.gisdevelopment.net/application/lis/overview/lisrp0004a.htm. Accessed: 15.11.2011

Table 2: Deeds/Title Registration

System	Deeds System	Title System
Content	Who owns what	What is owned by whom
Register	A register of owners	A register of properties
Legal effect	Registration of the transaction of the title is not guaranteed	Registration of the title guaranteed by state.
Actors	Notaries/Registrars	Lawyers/Surveyors
Role of the Cadastre	Taxation Purposes	Identification purposes
Boundaries	Sketch for the deed	German and Torrens: Fixed English: General

Source: (Enemark, 2003)

Systems of land tenure

The system of land tenure governs the traditional or legal rights to individuals or groups to have land. Systems of land tenure are not immutable. On the contrary, they are subjected to a continual process of change. Changes in natural conditions, economic factors, technological innovations, and size of the population influence political power structures and can bring about changes in land tenure system. Nevertheless, land tenure systems are institutionally established and are difficult to alter. Political power structures, cooperative ties and class, cultural and ethnic interests and motives all work towards maintaining the established forms. Agriculture cultivation and use of land form a kind of production based on the process of growth of animals and plants. In its original form, man creates food and other articles of consumption by using his labour to cultivate a piece of land.

Land Tenure system during Ancient India

Ancient records illustrate that land has been under cultivation in India for more than 5,000 years. In the beginning, tribes exercised control (especially delimitation and defence) over the areas they had taken possession. The initial form of land rights came from such conquests. The tribes allotted land to individual families for their utilization, who practised shifting cultivation.

In the case of villages which held land rights jointly, the village community claimed the right to all land within the village boundaries and allotted it to individual families for utilization. Soon, however, it became obligatory to deliver a share of the grain yield - in other words - a tax. It was necessary to establish an official hierarchy to collect the taxes.

In order to appreciate the evolution of Revenue Administration during the British period, it is pertinent to know the different land revenue systems introduced by the British in India such as 1. Zamindari system, 2. Ryotwari system and 3. Mahalvari system.

1. Zamindari sytem

Cornwallis, who was appointed Governor General in 1786, was especially directed to devise a satisfactory solution of the land revenue system which would ensure the company's interest as well as that of the cultivators. Commenting on the company's revenue policy, Cornwallis remarked in 1789 that "one-third of the company's territory in Hindustan is now jungle, inhabited only by wild beasts". Cornwallis held prolonged discussions on three vital questions.

1. With whom was the settlement to be made - the Zamindars or the actual tillers of the soil?
2. What should be the State's share in the produce of land?
3. Should the settlement be permanent?

Under Zamindari or permanent settlement system introduced in 1793, feudal lords (Zamindars, Jagirdars etc.,) were declared as proprietors of land on the condition of fixed revenue payments to the East India Company. Among the biggest zamindars was Darbhanga Raj, also known as Raj Darbhanga or the Royal Family of Darbhanga. They ruled over territories that are now part of Mithila and Darbhanga district in Bihar. The estate of Darbhanga Raj was estimated to cover an area of 2,410 square miles (6,200 km^2), incorporating 4,495 villages within 18 circles in Bihar and Bengal and employing over 7,500 officers to manage the estate. It was the best managed estate at the time of abolition of Zamindari[6] system.

2. Ryotwari system

The other major system was the Ryotwari system introduced in Madras Province in 1802 and in Bombay in 1817-18. In this case, individual cultivators, i.e. ryots, were recognized as proprietors of their land with the rights to sublet, mortgage and transfer their lands by gift or sale. Their tenure of land was secure so long as revenue payments were paid directly to the Collectors. This system prevailed over most of South India including present day Maharashtra, Karnataka, Tamil Nadu, Kerala, Andhra Pradesh and most of Madhya Pradesh and Assam. The princely states of Jaipur and Jodhpur in Rajasthan also fell under the Ryotwari system. Pockets of Zamindari-type tenure existed within these Ryotwari areas, which were administered by local rajas or nawabs. Ryotwari systems accounted for around 38% of the total cultivated area (Rao, online, p.16)

3. Mahalwari system

This system was introduced between 1820 and 1840 in Punjab (including both present-day Punjab in Pakistan and India, and the State of Haryana), parts of what are now Madhya Pradesh and Orissa and the princely states of Oudh and Agra in Uttar Pradesh. This tenure system was much less extensive and accounted for some 5% of the cultivated area. Under this system, the village lands were held jointly by the village communities, the members of which were jointly and severally responsible for the payment of land revenue. Land revenue was fixed for the whole village and the village headman (Lumbardar)

6 http://en.wikipedia.org/wiki/Raj_Darbhanga. Accessed: 10.12.2011

collected it for which he received 'panchatra' i.e. 5 per cent as commission. (Rao, online, p.17). The western land administration system is represented in Table 3 and Figure 1.

Box 2: Zamindari system and its drawbacks[7]

The introduction of Zamindari system by the British ruined the peasants through the exorbitant charges imposed on them by the new class of landlords. Craftsmen were destroyed by the influx of British manufactured goods. The religion and the caste system, which formed the firm foundation of traditional Indian society, were endangered by the British administration. Indian soldiers as well as people in administration could not rise in hierarchy as senior jobs were reserved for Europeans. Thus, there was all-round discontent and disgust against British rule, which burst out in a revolt by the 'sepoys' at Meerut whose religious sentiments were offended when they were given new cartridges greased with cow and pig fat, whose covering had to be stripped out by biting before using them in rifles. Hindu and Muslim soldiers who refused to use such cartridges were arrested which resulted in a revolt by their fellow soldiers on May 9, 1857.

Advancement in Land Administration

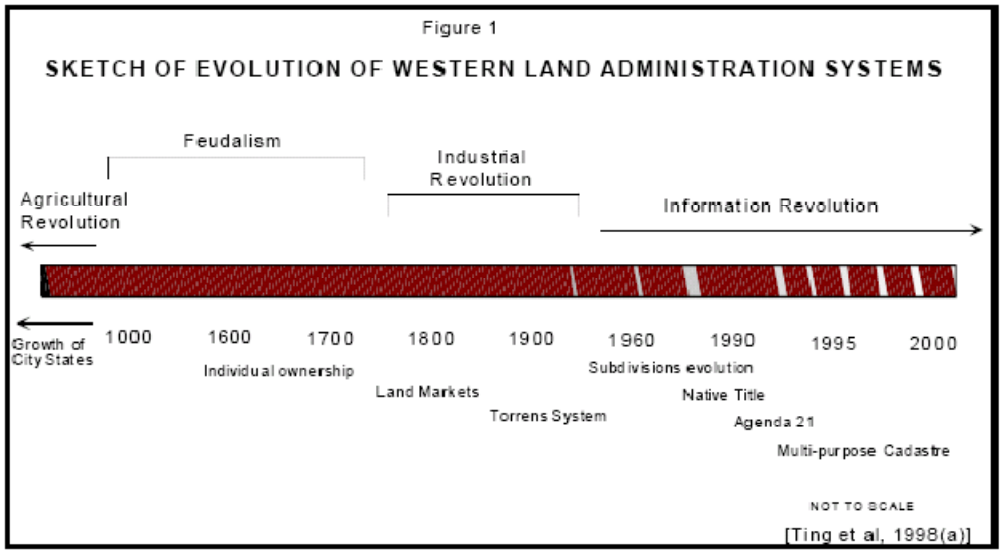
Table 3: Evolution of Western Land Administration Systems

Variables	Feudalism - 1800	Industrial revolution 1800-1950	Post-war reconstruction 1950-1980	Information revolution 1980-
Human kind to land evolution	Land as Wealth	Land as a commodity	Land as a scarce resource	Land as a community scarce resource
Evolution of cadastral applications	Fiscal cadastre. Land valuation and taxation paradigm	Legal cadastre. Land market paradigm.	Managerial Cadastre. Land management paradigm.	Multi-Purpose cadastre. Sustainable development paradigm.

Source: (Enemark, 2003)

[7] http://india.gov.in/knowindia/culture_heritage.php?id=4. Accessed: 08.01.2012

Figure 1: Evolution of Land Administration



Source: (Ting, online)

Land Revenue Administration (Tax Collection) in Colonial Period

Land revenue in India during British times was primarily based upon money collection by tax farmers, who in turn would receive this money from the local land owners or Zamindars. In such intermediary process, the poor and helpless farmers remained absolutely exploited, with the maximum moolah going to British tax farmers and Zamindars denominated by the British. The British land revenue system in India shattered and devastated the native agrarians, with practically nothing left for them to call their own[8].

The Revenue Department is the oldest arm of governments, existing from time immemorial in the country. The process of revenue administration was started by Sher Shah Suri (1540-45). From very early times, land administration and revenue administration centered on collection of taxes/land revenue, which was the main source of revenue to rulers. The history of land administration dates back to the olden days of kings and kingdoms. Right from the time of Manu, land revenue has been a major source of income to the sovereign. During the Mauryan and Gupta periods, the revenue was collected by paid officials, and resembled the present day revenue administration system. During post-Mauryan and Gupta periods, the State revenue was collected by the donees of Brahmadeya, Devadana, and Agrahara Lands. The revenue administration was systematized scientifically during British rule by introducing “permanent settlement” by Cornwallis in 1793 and Ryotwari system by Sir Thomas Munro in 1802. The British inherited the institutional form of agrarian system from the Mughals. The British Revenue Department was a pivotal department in administration. (Rao, online, p3 &4).

8 http://www.indianetzone.com/40/british_land_revenue_system_india.htm. Accessed: 05.01.2012

Mughal Empire's land administration

The Mughal Empire began in 1526. At the height of its power in the late 17th and early 18th centuries, it controlled most of the Indian subcontinent extending from Bengal in the east to Balochistan in the west, Kashmir in the north to the Kaveri basin in the south. Its population at that time has been estimated at 110 to 150 million over a territory of more than 3.2 million square kilometres (1.2 million square miles).

A major Mughal contribution to the Indian subcontinent was the unique architecture. Also, Mughal influence can be seen in cultural contributions such as:

- Centralized, imperialistic government which brought together many smaller kingdoms.
- Persian art and culture amalgamated with Indian art and culture.
- New trade routes to Arab and Turkic lands.
- The development of Mughlai cuisine
- Mughal architecture found its way into local Indian architecture, most conspicuously in the palaces built by Rajputs and Sikh rulers.
- Landscape gardening

Although the land the Mughals once ruled has separated into what are now India, Pakistan, Bangladesh, and Afghanistan, their influence can still be seen widely today. Tombs of the emperors are spread throughout India, Afghanistan and Pakistan. There are 16 million descendants spread throughout the subcontinent and possibly the world[9].

The Mughal Empire in India lasted from 1526 to 1858. The Mughal rule saw the country being united as one single unit and being administered by one single powerful ruler. During the Mughal period, art and architecture flourished and many beautiful monuments were constructed. The great rulers of Mughal Empire are Akbar, Auranqzeb, Babar, Humayun, Jahangir and Shah Jahan[10] .

According to Baindur (2009), the concept of nature in the Indian worldview is constructed to a great extent from mythological and cultural narratives as well as rituals.

The ancient kingdoms of the south, although rich and populous, were inhabited by Dravidian people not inferior in culture to the Aryans in the north. They were ordinarily so secluded from the rest of the civilized world, including Northern India, that their affairs remained hidden from the eyes of other nations. As they had no native annalists, their history before the year 1000 CE has almost wholly perished.

The long series of Chinese Buddhist pilgrims, who continued for several centuries to visit to India, which they regarded as their Holy Land, begins with Fa-hsien. He started on his travels in 399 A. D., and returned to China fifteen years later. Figure 2 shows the status of land utilization during the ancient period.

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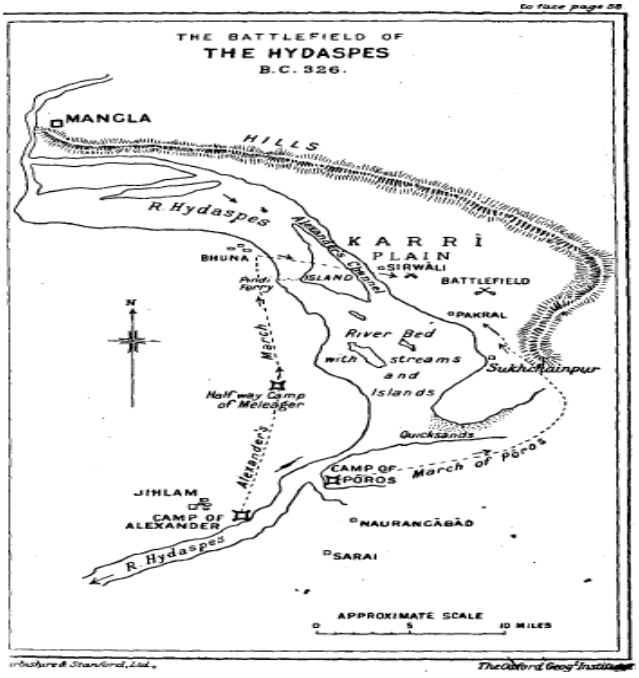
[9] http://en.wikipedia.org/wiki/Mughal_Dynasty. Accessed: 08.01.2012

[10] http://www.iloveindia.com/history/medieval-india/mughal empire/index.html. Accessed: 06.01.2012

Figure 2: Land Status and its Utilization during the 326 B.C.



Source: (Smith, 1904)

Ashokan Empire in land management

Asoka was one of the most powerful kings of the Indian subcontinent. A ruler of the Mauryan Empire, Ashoka reigned over the country from 273 BC to 232 BC. The reign of Emperor Asoka covered most of India, South Asia and beyond, stretching from present day Afghanistan and parts of Persia in the west, to Bengal and Assam in the east, and Mysore in the south. However, the Battle of Kalinga changed King Asoka completely. The power hungry emperor became a Buddhist follower and started preaching the principles of Buddhism throughout the world.

Ashoka's Policy

As Buddhist Emperor, Asoka built thousands of Stupas and Viharas for Buddhist followers. One of his stupas, the Great Sanchi Stupa, has been declared a World Heritage Site by UNESCO. The Ashoka Pillar at Sarnath has a four-lion capital, which was later adopted as the national emblem of the modern Indian republic. Throughout his life, Asoka the Great followed the policy of nonviolence or ahimsa. Even the slaughter or mutilation of animals was abolished in his kingdom. He promoted the concept of vegetarianism. The caste system ceased to exist in his eyes and he treated all his subjects as equals. At the same time, each and every person was given the right to freedom, tolerance, and equality[11].

Ashoka was a very intellectual statesman. He ruled over Magadha wisely and competently. The people of Kalinga were patriots and loved freedom. Ashoka worked hard especially for the spread of

11 http://www.culturalindia.net/indian-history/ancient-india/ashoka.html. Accessed: 15.01.2012

education in his land. During the period, Nalanda was famous for education and the University of Magadha. It is said that the university of Magadha was established by Ashoka. During his time, trade with foreign countries was carried on by sea routes. He encouraged agriculture, trade and industry[12].

Colour Coding for Land Uses

According to Jeer, (1997) land-use maps are the most common way of presenting land-based data. They show land use by rendering them in different colours. They effectively illustrate land-use concepts by graphically displaying land-uses, roads, public infrastructure, and community facilities. Planning agencies have been using one colour scheme since the 1950s that has become a de facto standard. This standard is also being frequently recommended to planners across the country. The following are traditional colouring schemes. Maps generally use a different colour for each of the major land-use categories. For example, it is common to render:

- Yellow for residential uses such as single-family and town houses.
- Browns for multi-family and high-rise residential purposes
- Reds for retail and commercial uses
- Purples for industrial uses
- Blues for institutional and public facilities
- Greens for recreational uses
- Grays for industrial utilities

The above primary and secondary colours generally serve as basic land-use maps that do not have complex land-use categories. When they do, it is common to find additional colours in shades closer to secondary and tertiary colors. Beyond this traditional colour scheme, systems vary widely on how many colours to show on a map and which colours denote what land use. Because some colors are close to others and easily discernible, elaborate coding schemes also specify the appropriate Prisma colour number (Prisma Color is the manufacturer of popular colour pencils and is its trade name). On black and white maps, colours replace monochrome patterns of varying crosshatched lines.

[12] http://www.yousigma.com/biographies/ashoka.html. Accessed: 15.01.2012

Land Registration-Comparing Land Registration systems

Box 3: Parameters for comparison

- Property Definition
  - Where and how it is defined.
  - Legal/Economic/physical concept.
- Property Determination
  - General / Fixed Boundaries.
  - Determination process.
- Property formation
  - Process, Institutions and actors – who does what
  - Role of the surveyors.
- Property Transfer
  - Process, Institutions and actors – who does what
  - Legal consequences.

Source: (Enemark, 2003)

Land Degradation - India

The World Bank (2006) says that at present, land use practices in many developing countries are resulting in land, water, and forest degradation, with significant repercussions for the countries' agriculture sectors, natural resource bases, and eco environmental balances. Land degradation can be defined as the loss of land productivity through one or more processes, such as reduced soil biological diversity and activity, loss of soil structure, soil removal due to wind and water erosion, acidification, salinization, water logging, soil nutrient mining, and pollution.

Ministry of Agriculture (2000a) estimated that about 174 million hectares of land (53%) suffers from different type and varying degrees of degradation. About 800 hectares of arable land are lost annually due to ingress of ravines. And also, it is estimated that more than 5000 million tonnes of topsoil are eroded every year (MoA, 2000a). All this has a direct bearing on food production and the livelihood of the people. The extent of human-induced soil degradation is mentioned in Table 4**.**

Table 4: Extent of soil degradation (human-induced) under different degradation types[13]

Degradation type	Area affected (m ha)	
	Total	Percent
Water erosion	148.9	45.3
Wind erosion	13.5	4.1
Chemical deterioration	13.8	4.2
Physical deterioration	11.6	3.5
Land not fit for agriculture	18.2	5.5
Soils with little/no degradation problem	90.5	27.5
Stable terrain (under natural condition)	32.2	9.8
Total geographical area	328.7	100.0

[13] http://envfor.nic.in/divisions/ic/wssd/doc2/ch13.pdf accessed: 27.12.2011

Land degradation is also strongly associated with macroeconomic forces such as building of roads. Often paid for by logging companies or through international aid, new roads open up forest areas, first for wood extraction and then for the expansion of agriculture. New migrants colonize roadsides and use roads to deliver their produce to markets. By linking forested areas to the broader economy, roads lower costs and increase the returns of conversion, but heightening the sensitivity of these areas to changes in macroeconomic conditions.

Habitat loss and its impact

Habitat loss poses the greatest threat to our species. The world's forests, swamps, plains, lakes, and other habitats continue to disappear as they are harvested for human consumption and cleared to make way for agriculture, housing, roads, pipelines and the other hallmarks of industrial development. Without a strong plan to create terrestrial and marine protected areas, important ecological habitats will continue to be lost[14].

Sacred groves are outlines of resource conservation

The existence of sacred groves in India most likely dates back to an ancient pre-agrarian hunter-gathering era, and their presence has been documented since the early 1800s. Believing trees to be the abode of gods and ancestral spirits, many communities set aside sanctified areas of forest and established rules and customs to ensure their protection. These rules varied from grove to grove but often prohibited the felling of trees, the collection of any material from the forest floor, and the killing of animals. Presiding deities were believed to administer punishment, often death, to individuals who violated the rules, and sometimes to the entire community in the form of disease or crop failure. As a result of these protective restrictions, maintained over countless years, sacred groves are now important reservoirs of biodiversity[15].

Regional Issues/Conflicts in Land Management

The word 'conflict' carries negative connotations (Warner, 2000). Different types of conflicts can be categorized in terms of whether they occur at the micro–micro or micro–macro levels, i.e. among community groups or between community groups and outside government, among private or civil society organizations (Warner, 2000).

[14] http://wwf.panda.org/about_our_earth/species/problems/habitat_loss_degradation/ accessed :23.12.2011

[15] http://www.sacredland.org/sacred-groves-of-india/. accessed :23.12.2011

Box 4: Types of conflicts arising in NRM

Intra micro–micro conflicts:

- Disputes over land and resource ownership, e.g. between private and communal land owners;
- Disputes over land boundaries between individuals or groups;
- Latent family and relationship disputes;
- Disputes due to natural resource projects being captured by elites and/or those who happen to own resources of a higher quality;
  Breaking of CPR constitutional or operational rules, such as protection agreements for grazing areas, fish net sizes, forests, or misappropriation of funds, etc.;
- Disputes over unfair distribution of work and profits.

Inter micro–micro conflicts:

- Conflict between land-owners and resource users;
- Conflict between indigenous CPR groups, and more recent settlers;
- Disputes generated by jealousy related to growing wealth disparities;
- Lack of co-operation between different community groups;
- Disputes over renewal arrangements for leased land;
- Internal land ownership disputes ignited by the speculative activities of commercial companies;
- Resentment built up due to lack of representation in village committees.

Micro–macro conflicts:

- Contradictory natural resource needs and values, e.g. between wildlife habitat protection and local livelihood security;
- Cultural conflicts between community groups and outsiders;
- Disputes over project management between community groups and outside project-sponsors;
- Disputes caused by political influence (national, provincial or local);
- Disputes arising from differences between the aspirations of community groups and expectations of NGOs or commercial companies;
- Off-site environmental impacts affecting unintended third-parties.

Source: (Warner, 2000)

Conflicts arising from poor enforcement of natural resource management regulations include:

- Private companies avoiding compliance and sanctions by threatening to withdraw their investment or by manipulating courts
- A general lack of understanding of environmental laws and regulations by industries and government agencies and the general population
- Non-compliance arising from unrealistic requirements for pollution control technology and poor implementation of environmental impact mitigation plans.
- Failure of the courts to enforce regulations because of prolonged legal processes, with the outcome often unsupported by one or more parties.
- Perverse incentive structures promoted by conventional cost-benefit analysis.

The conflict management plan describes the overall strategy for managing the conflict, combined with the proposed process of consensus-building and an initial set of conflict mitigation or prevention options. The components of a conflict management plan will vary with each situation.

Government Instigation on Land Conservation/Management

The Constitution of India enables the Central Government and the states to enact laws for the preservation and conservation of natural resources. Article 39(b) and (c) of the Directive Principles of State Policy lays down that it is the duty of the state and the Centre to develop natural resources for common good. There is a constitutional provision for the involvement and participation of the people at the local level for participatory planning and decision-making. The Eleventh Schedule (Article 243-G) of the Constitution lists matters pertaining to land improvement, implementation of land reforms, land consolidation, soil conservation, and watershed development and management under the authority and responsibility of Panchayats (rural local bodies). The Twelfth Schedule (243-W) lists urban planning and regulation of land-use under the authority and responsibility of municipalities (urban local bodies). The following table presents the important policies formulated, programmes implemented and the institutional framework adopted in India for the best possible use of land as well as sustainable and integrated management of land resources (Land 13, online).

The first five-year plan (1951-1956) addressed mainly the agrarian sector, including investments in dams and irrigation. The agricultural sector was hit hard by the partition of India and needed urgent attention. The total planned budget of ₹ 2356 crore was allocated to seven broad areas: irrigation and energy (27.2 per cent), agriculture and community development (17.4 per cent), transport and communications (24 per cent), industry (8.4 per cent), social services (16.64 per cent), land rehabilitation (4.1 per cent), and other sectors and services (2.5 per cent). Many irrigation projects were initiated during this period, including the Bhakra Dam and Hirakud Dam. Table 5 explains the features and initiatives of different programmes related to land resource management.

Table 5: Policies, Acts, Programmes by Govt. on Land Resources[16]

Year	Initiatives	Features
1950s	National Land Reforms Policy	• Abolition of intermediary tenures • Tenancy reforms • Ceiling on agricultural holdings and redistribution of surplus land • Updating and maintenance of land records • Consolidation of land holdings • Distribution of government wasteland
1972-73	Drought-prone Areas Programme (DPAP)	• Minimize adverse effects of droughts on the productivity of land, water and human resources • Promote overall economic development and improve the socio-economic condition of poor and disadvantaged sections inhabiting the programme areas • Capacity building and empowerment of village community, ensuring participation of Panchayati Raj Institutions and NGOs in programme implementation at grassroots level and transfer of funds as well as decision-making power to the local people • Since 1995-96, a watershed development based approach has been adopted

[16] Land 13. http://envfor.nic.in/divisions/ic/wssd/doc2/ch13.pdf. Accessed:27.12.2011

1977-78	Desert Development Programme (DDP)	• Mitigate adverse effects of desertification and adverse climatic conditions on crops, and human and livestock population • Restoration of ecological balance by harnessing, conserving and developing natural resources, i.e. land, water, and vegetative cover, and raise land productivity • Capacity building and empowerment of village community, and ensuring participation of Panchayati Raj Institutions and NGOs
1985	National Land Use and Conservation Board	• Formulate a national policy and perspective plan for conservation, management and development of land resources of the country • Review of the progress of implementation of ongoing schemes and programmes connected with conservation and development of land resources and soils • Take measures to restrict the conversion of good agricultural land to non– agricultural uses • Co-ordinate the work of State Land Use Boards
1985	National Wastelands Development Board (NWDB)	• Formulate perspective plan and programmes for the management and development of wastelands in the country • Identify the wastelands in the country • Review the progress of implementation of programmes and schemes for the development of wasteland • Create a reliable data base and documentation centre on related aspects of wasteland development
1988	National Land Use Policy	• To install an efficient and effective administrative structure for prescribing and regulating land by all concerned and revitalize the land-use boards in this respect • Prevent further deterioration of land resources • Restore the productivity of degraded lands • Allocate land for different uses based upon land capability, land productivity, and national production goals • Complete the inventory of land resources based on prescribed land-use
1989-90	Integrated Wastelands Development Project (IWDP)	• Adopt soil and moisture conservation measures such as terracing, bunding, trenching, vegetative barriers, etc. • Encourage natural regeneration • Enhance people's participation in wasteland development programmes at all stages resulting in equitable sharing of benefits • Employment generation, poverty alleviation, community empowerment and development of human and other economic resources of the village • Training, extension and creation of awareness among the participants
1992	Constitution (Seventy Third Amendment) Act, 1992	• Gives land related subject to the Panchayat Raj Institutions (local self governments) at the village, block and district levels to ensure participatory planning, decision making, and monitoring of programmes by the local self governments
1992	Constitution (Seventy Fourth Amendment) Act, 1992	• Regulation of land use and urban planning were brought under the functional domain of urban self-governing bodies
1999	Department of Land Resources	• Coordination of land administration in India • Formulation of integrated land resources management policies • Implementation of land-based development programmes

The 73rd and 74th Amendment Acts (1992) of the Constitution brought the land use, conservation, management and related issues under the purview of local bodies in both rural and urban areas. The initiatives taken by other ministries also had a bearing on the prevention of degradation of lands. Among them, some are mentioned below:

- Improved policy framework for natural resource management
- Improved data on land resource degradation and its management
- Draft grazing and livestock management policy, 1994
- Draft national policy for common property resource lands (CPRLs) (under formulation)

Future Considerations for Land Resources Conservation

The efforts of different ministries/departments/organizations should be integrated to harmonize the delineation, codification and classification of land. Detailed soil data (physical, biological, chemical and microbial) based on effective soil testing are pre-requisites for all lands under both rain-fed and irrigated agriculture to address the issues related to soil health *vis a vis* agriculture production. Such soil data will be vital for setting up Village Resource Centres for the benefit of the farming community. Necessary financial and human resources should thus be assigned for the purpose. Central and State Land Use Boards should be reorganized and empowered to lead this work. Further, we must implement the unimplemented agenda of land reforms with particular reference to tenancy laws, land leasing, distribution of surplus and waste land, and providing adequate access to common property and wasteland resources. Following the conferment of land rights to women under the Hindu Succession Amendment Act (2005), the provision of appropriate support services to women farmers has become important. Moreover, as far as possible, agricultural land should not be diverted to non-agricultural use (GoI, Planning Commission, 2007).

Strategies for Sustainable Land Management

- Tenth Five-Year Plan assigns high priorities to area specific programmes such as watersheds, river valleys, arid areas, wastelands.
- Public policies on land use and the impact of subsequent land use on natural resources.
- Coordinate the activities of all line departments and adopt an integrated approach.
- Expansion and intensification of irrigated agriculture.
- Address weaknesses in land use policies as well as options that are available to deal with natural resource management and conservation issues.
- Establish the horizontal linkages between various agencies that are involved in land resource management.
- Involve the stakeholders from the planning stage onwards and address socio-economic and poverty issues in land development programmes.
- The government should take the lead role in capacity building at the grass root level by planning, implementing and monitoring integrated land resources management programmes.
- Intensification of high-quality rain-fed lands.

- Land should be accounted for even when land quality deteriorates or the ecosystems functions change.
- Intensification of densely populated marginal lands.
- Increasing women's access to productive land by regularizing leasing and share cropping of uncultivated agricultural land, encouraging collective efforts in bringing wastelands under cultivation and providing policy incentives to women in low-input subsistence agriculture will have immediate benefits for women's empowerment and household food security.
- Expansion of farming into sparsely populated marginal lands.
- Urban and peri urban farming with accelerated urbanization.
- Natural resource managers and local planning officials need to understand the role in protecting natural resources. In particular, natural resource managers need to better understand and influence public policies related to natural resources.

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