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**Forest Resources  
Management and  
Conservation in Ancient  
India: A Historical Review**

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# FOREST RESOURCES MANAGEMENT AND CONSERVATION IN ANCIENT INDIA: A HISTORICAL REVIEW

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## **Abstract**

*This paper highlights the issues related to evolution, utilization and degradation of natural resources right from ancient to modern era. Several researchers, academicians, spiritual leaders and many more have conducted many studies, focusing on the historical and sustainable management of natural resources such as forests, land, water etc. The natural resource abundance such as forests and forest products were found as a basic source for living organisms during the initial period. Then, Pre-Vedic literature on natural resources justifies that forest resources were developed initially on vacant spaces during and after 8000 B.C. Later, the evolution of human being around 5000 B.C led to the utilization of the abundant natural resources.. Due to human activities natural resources started degrading slowly and steadily. In the beginning, natural resources were used for developmental activities such as agriculture, industry, urbanization etc. Subsequently they started clearing the forest tracts for agricultural purposes and many other developmental activities. Indigenous and traditional knowledge regarding resource conservation, sacred grooves protection, conservation of endangered species lost its importance in the modern India. Innovativeness and policy framework for resource utilization and management became unfriendly where as community management found successful. Therefore, resource consumption and management during the ancestral period were unique and well retained.*

**Key Words:** *Natural Resources, Evolution, Pre-Vedic age, Management, Degradation*

## **Introduction<sup>1</sup>**

Natural Resource Management (NRM) refers to the management of natural resources such as land, water, soil systems, plants and animals, with a particular focus on how the management affects the overall quality

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<sup>1</sup> This review paper is based on the ancient and contemporary literature on the subject..

of life for both the present and future generations. Further, NRM specifically focuses on the scientific and technical understanding of the existing resources and ecology and also the life-supporting capacity of such resources<sup>2</sup>.

Considering the fact that the indigenous communities are the carriers of ancestral knowledge and wisdom regarding the use and management of natural resources, their active participation in the various biodiversity programmes is essential to ensuring their sustainability and cost effectiveness? In other words, it is important that their prior consultation, participation, and consent procedures (communication with each other) are ensured with respect to such programmes so as to conform to their cultural landscape. More importantly, indigenous communities place a great importance on the processes as against products. But their value might not be the same as what conservationists and economists predict (Sobrevila, 2008).

**Conservation Principles: One of the hymns in Atharva Veda** (12.1.11), believed to have been composed at around 800 BC, somewhere amidst deep forests reads: *"O Earth! Pleasant be thy hills, snow-clad mountains and forests; O numerous coloured, firm and protected Earth! On this earth I stand, undefeated, unslain, unhurt."* Implicit here are the following principles:

- That it must be ensured that the earth remain forested;
- That humans can sustain only if the earth is protected;
- That to ensure that human beings remain 'unslain' and 'unhurt', the ecosystem integrity must be maintained;
- That albeit vaguely, it also makes a reference to ecology, economy and society concurrently<sup>3</sup>.

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<sup>2</sup> [http://en.wikipedia.org/wiki/Natural\\_resource\\_management#cite\\_note-1](http://en.wikipedia.org/wiki/Natural_resource_management#cite_note-1)  
Accessed:09.10.2011

<sup>3</sup> [http://www.infinityfoundation.com/mandala/t\\_es/t\\_es\\_pande\\_conserve.htm](http://www.infinityfoundation.com/mandala/t_es/t_es_pande_conserve.htm)  
Accessed:09.10.2011

**Utilization and Regeneration Principles:** Another hymn from Atharva Veda (12.1.35) reads: "*Whatever I dig out from you, O Earth! May that has quick regeneration again; may we not damage the vital habitat and heart*". Implicit here are the following principles:

- That human beings can use the natural resources of the earth for their sustenance;
- That resource use pattern must also help in resource regeneration;
- That in the process of harvest, no damage should be done to the earth;
- That humans are forewarned not against the use of nature for survival, but against the overuse and abuse<sup>4</sup>.

About 10,000 years ago, with the people adopting an agrarian way of life, the mankind began to establish permanent settlements wherever possible. This new type of livelihood system spread everywhere and the population began to expand faster than ever before. A sedentary agricultural life made it possible to construct villages, cities and eventually states, all of which were highly dependent on water<sup>5</sup>.

The Vedic traditions confirm that every single village came under the three main categories namely Mahavan, Tapovan and Shrivani. From third century AD, on a fresh phase of town-building began in the northern region of India with ecology and the nature of habitat changing over period, for instance, the dry lands where people lived by herding became lands of great scarcity and danger when the rains failed, a place of menace with wolves and thieves attacking people. Long before the times

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<sup>4</sup> [http://www.infinityfoundation.com/mandala/t\\_es/t\\_es\\_pande\\_conserve.htm](http://www.infinityfoundation.com/mandala/t_es/t_es_pande_conserve.htm). Accessed:09.10.2011

<sup>5</sup> [http://www.iwawaterwiki.org/xwiki/bin/view/Articles/ABRIEFHISTORYOFWATERAND\\_HEALTHFROMANCIENTCIVILIZATIONSTOMODERNTIMES#HEarlySystemsandInnovations](http://www.iwawaterwiki.org/xwiki/bin/view/Articles/ABRIEFHISTORYOFWATERAND_HEALTHFROMANCIENTCIVILIZATIONSTOMODERNTIMES#HEarlySystemsandInnovations). Accessed:19.11.2011

referred to by the Sanskrit texts, wild animals were a major source of meat across various places of the Harappan civilization. In certain parts of western India, seeds were found mostly in ancient houses. While people hunted a wide variety of wild animals, they herded only a few varieties. The use of iron tools and fire often referred to in the ancient Sanskrit texts is considered as being responsible for replacing forests with farmlands, and nature with culture. Likewise, approaches towards NRM can be explained, overtime in terms of historic, functional and futuristic<sup>6</sup> perspectives (see table 1).

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<sup>6</sup> [file:/// Forests%20in%20Ancient%20India.htm](file:///Forests%20in%20Ancient%20India.htm). Accessed:19.11.2011

**Table 1: NRM from different perspectives - historical, functional and futuristic - and their relation to traditional conservation methods**

<b>Attributes of Natural Resource Management (NRM)</b>	<b>Historical Perspective</b>	<b>Functional Perspective</b>	<b>Futuristic Perspective</b>
Traditional Ecological Knowledge (TEK) regarding NRM	Was given importance.	Along with TEK, certain new interventions have been made for conservation of natural resources. However, TEK has started vanishing from various regions .	TEK is in jeopardy, thus and needs to be given a high priority for proper documentation.
Conservation and Management of Natural Resources	The resources were used for fulfilling the basic needs and on a sustainable basis.	Resource exploitation is high and as a result, resources are depleting very fast.	Need to rethink from the perspective of growing population on the one hand, and the declining resources on the other.
Depending on Natural Resources	Was MEANT only for the sustainable utilization FO meeting the minimum requirements.	Increased for various needs without thinking of the demand for needs of the future generation .	Depends on the availability of various ecological resources
Supply of and Demand for Natural Resources	It was on a sustainable basis.	Not in an equilibrium.	Lesser chances of a sustainable ecological resource flow, if the current trend were to continue.

Exploitation of Natural Resources	Was not reported.	Most of the natural resources are being overexploited.	a high degree of scarcity of the resources.
Innovativeness in Resource conservation	Through the process of trial and error with TEK as the main basis.	Various innovations have been made, but majority of them have not got to diffused.	There is a need for a proper evaluation of all the innovations made so far and accordingly strategies have to be devised for resource utilization and conservation for future generations.
Resources - people conflicts	Not reported.	High	Conflicts will be more in future.
Role of Institutions in Resource management	Community participation	Institutions have been developed without a proper thought process with respect to most of the cases.	Has to play a major role within an integrated framework.
Policy inventions in resource utilization	Various traditional ecological methods introduced for resource utilization.	The policy has become the main tool for resource utilization.	Existing policies need to be revisited for proper implementation.

Natural resources (such as land, water bodies, biodiversity and genetic resources, biomass resources, forests, livestock and fisheries) – are the basic sources of human survival and prosperity. However, it is observed that they have been degrading since 5000 B.C and the unprecedented pace of their erosion is the root cause for the present environmental uncertainties. The over-exploitation of natural resources by an ever growing population has resulted in various problem.such as land degradation, vegetation loss, pollution and so on. Such problems need to be addressed seriously using traditional knowledge, a proven treasure for natural resource management as the main basis. One of the major concerns in this endeavour is to rehabilitate the degraded and vulnerable land and water resources characterised by soil erosion, soil acidity, salinity, alkalinity, water logging, water depletion, water pollution etc, and also to ensure a sustainable livelihood support for the rural population in the country. However, with regard to NRM and biodiversity conservation, the Epic Ramayana illustrates more on the conservation aspect rather than utilization.

Thus, this paper illustrates the existing historical and revolutionary aspects of natural resource management particularly forest resources in the Indian context.

## **A Global View of NRM and Biodiversity**

The natural green cover is a true indicator of the health of the planet. Forests are referred to as areas with a high density of trees. Forests worldwide cover about 3.9 billion hectares<sup>7</sup>. However, there's no forest cover in Antarctica and Greenland. The composition and quality of many forests have changed over the years. The forest cover has been shrinking over the years mainly due to anthropogenic pressures. The forests can be

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<sup>7</sup> <http://www.mapsofworld.com/world-natural-forest.htm>. Accessed:16.12.2011

divided into six categories globally viz., Moist Tropical, Montane Sub Tropical, Dry Tropical, Montane Temperate Forests, Sub Alpine and Alpine<sup>8</sup>.

The environmental upheavals in terms of severe climate variabilities can be traced to the period 1300 to 1400 AD. The written records from the 14th century provide detailed accounts of the severe weather patterns over the period 1314 to 1317 AD resulting in crop failures and famines. This period of failed harvests and the resultant uncertainties is known as "The Great Famine". Due to these ecological calamities, the population pattern of northern Europe underwent several changes. However, the visitation of the Black Death, in Europe in 1347 pushed the European population into a century-long demographic decline causing long term changes in the economy and society in the process. It swept quickly through the continent reaching the northern Scandinavia in countries by 1350. Although a few gregious managed to escape the Black Death; by late 1350 nearly 30 to 40% of the European population had perished<sup>9</sup>.

The dramatic decline of the European population caused by the 'Black Death' coincided with a decline in the global temperatures. The climate was already getting colder with the northern hemisphere heading towards the Little Ice Age. At about the same time, agricultural lands were taken out of production in Europe in view of a 25-40% decline in the population (depending on the region). This meant ploughing of less agin land (which releases greenhouse gasses such as Methane and carbonates) even as the forest clearance got reversed. More trees and scrubs mean that more carbon dioxide (CO<sub>2</sub>) would be taken out of the

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<sup>8</sup> <http://www.mapsofworld.com/world-natural-forest.htm>. Accessed:21.12.2011

<sup>9</sup>[http://www.eh-resources.org/timeline/timeline\\_prehistory.html](http://www.eh-resources.org/timeline/timeline_prehistory.html). Accessed:15.12.2011

atmosphere and stored in biomass, while the abandoned farmlands acted as a significant 'carbon sink' by way of absorbing carbon from the atmosphere<sup>10</sup>.

It is important to note here that germs and microbes are also a significant part of our environment. In fact, these micro organisms are regarded as the most crucial living forms on the planet. The invisible microbes in the environment have all along shaped global events in history in many ways<sup>11</sup>

## Indian View

According to Aiyangar (1941), Indo-Aryans *circa* 3000 B.C were found occupying the country as an Indian frontier during the pre Indian age. The Aryans were a nomadic agricultural tribe quite different from their Iranian *brethren* peculiar to the Indo-Aryans of the Rig-Veda. The Indian civilization evolved around the five river basins (Box 1). The Aryans were located around the Hindu Kush and Sutlej basins/regions. Although rich in soils, the flourishing communities were still primitive. Their period approximately belonged to *the half millennium 2000-1500 B.C.*

Certain scientific inquiries required for a proper understating of the Vedas and the Vedic rituals (Aiyangar, 1941) can be located in the elaboration of Vedangas namely 1) Kalpa which includes geometry so far as it is applied to the construction of sacrificial altars; 2) Siksha or phonetics; 3) Chandas or meter; 4) Viyakarana or grammar; 5) Nirukta or study of words; 6) Jyotisha or astronomy. These Vedangas find a brief treatment in the Brahmanas or Upanishads acquiring a necessary scientific cast relevant to the present age. The approximate early Hindu eras have been identified and stated in table 2.

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<sup>10</sup> [http://www.eh-resources.org/timeline/timeline\\_prehistory.html](http://www.eh-resources.org/timeline/timeline_prehistory.html). Accessed:26.12.2011

<sup>11</sup> [http://www.eh-resources.org/timeline/timeline\\_prehistory.html](http://www.eh-resources.org/timeline/timeline_prehistory.html). Accessed:05.11.2011

**Table 2: Approximate Eras of Early Hindu Period**

Rise of Magadha under the Saisunagas	600 B.C
Birth of Buddha, founder of Buddhism	557 B.C
Commencement of the reign of Bimbisara	520 B.C
Persian invasion of the Indus valley	500 B.C
Beginning of Ajatasatru's reign	490 B.C
Nirvana of Buddha	487 B.C
First Buddhist Council	477 B.C
Second Buddhist Council	380 B.C
The first of the Nandas begins to rule	370 B.C
Alexander's invasion	327 B.C
Chandragupta Mauriya	321 B.C
Bindusara	295 B.C
Asoka	267 B.C
Third Buddhist Council	244 B.C
Pushyamitra, founder of the Sunga dynasty	184 B.C
Menander's incursion	150 B.C
The Kanva dynasty founded	72 B.C
The Andhra ruler reduces Magadha	27 B.C

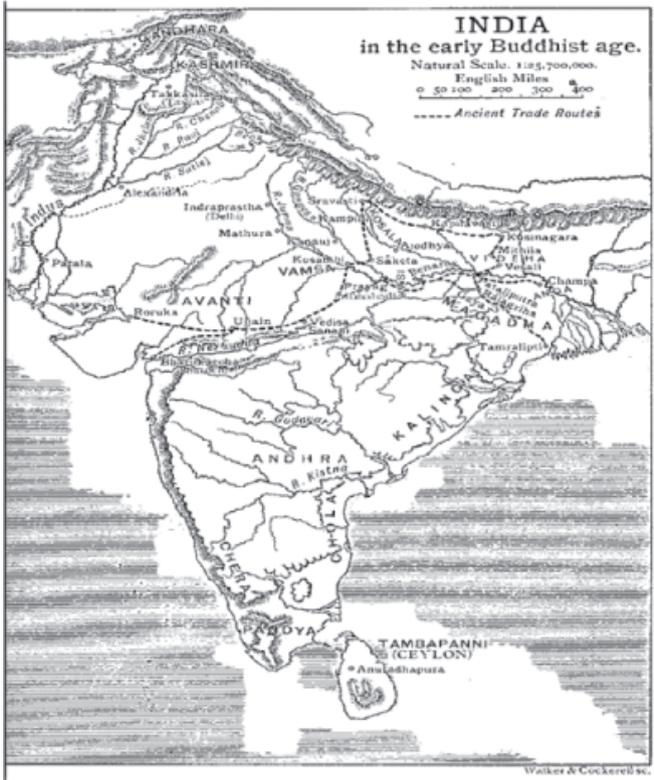
Source: (De La Fosse, 1918)



**Figure 1: Indian geographical system during the Vedic age**

Source: (De La Fosse, 1918)

Figure 1 provides a complete geographical picture of India during the Buddha's period. Moreover, Pali literature is undoubtedly the most important source of the ancient Indian geographic system. The great literature of the early Buddhist period is certainly the main source of the historical and geographical information about ancient India, followed by supplemented by Jaina and Brahmanical sources to a certain extent. For later periods, we have abundant geographical and archaeological sources and literary sources, as well as the accounts of the classical geographers and the itineraries of the Chinese pilgrims, while the geographic information contained in Pali and Sanskrit, Buddhist literature is considerably important (Bimala, 1888).



**Figure 2: Indian geographical system during the Buddhist period**  
**Source: (De La Fosse, 1918)**

Dr. Goldstucker and Bhandarkar refer the grammarian Panini to this period while bringing the history of South India into touch with that of the North. If the Ramayana could be trusted to be correct regarding its geographical details, the great forest extended up to the Pampa Saras on the north bank of the Tungabhadra near modern Hampi, though the Saras (or Tank) must have been forgotten under the name as the author of the Tamil Ramayana refers to it as Pampanadi. The advent of Agastia introduced the Reclamation of the Jungle into arable land, and was the reputed author of the first Tamil grammar (Aiyangar 1941).

According to Bimala (1888), India was bounded on the north by the stupendous Himalayan mountain ranges and on the other three sides by the mighty Beas and the ocean, constituting a distinct geographical unit (Figure 2). The vastness of the country with its infinite variety of fauna and flora, races and languages, religions and culture justly entitle it to be called a great subcontinent. The word 'India' is derived from the river Sindhu. The Chinese also knew the ancient name of India as Shin-tnh or Sindbu. It should, however, be noted that the Vedic 'Sapta Sindhavat' and the Persian 'Hi(n)du' corresponded only to a particular part lying to the north-west of India.

**Box 1: India was characterised by the river basins during the ancient period**

1. The entire Indus Valley was included as part of Northern India.
2. Western India comprised Sind and Western Rajputana with Cutch of Gujarat and a portion of the adjoining coast on the lower course of the River Narmada.
3. Mid-India or Central India comprising the whole of the Gangetic provinces from Thaneshvar to the head of the Delta and from the Himalayan Mountain to the banks of the Narmada.
4. Eastern India comprising Assam and Bengal proper including the whole of the Gangetic Delta together with Sambalpur and Ganjam in Orissa.
5. Southern India comprising the whole of the Peninsula from Nasik on the west and Ganjam on the east of Cape Comorin (Kuman) on the south including the modern districts of Berar and Telengana, and Konkan with the separate states of Hyderabad, Mysore and Travancore-Cochin or very nearly the whole of Peninsula to the south of Narmada and Mahanadi rivers (Bimala, 1888).

One remarkable feature of the religious history of South India is that it gets associated with the cult of Bhakti very early in the history and especially South India as its home (Aiyangar, 1941).

(Source: Bimala, 1888; Aiyangar, 1941)

## **Biodiversity status as described in the Epic Ramayana (300 BC-200 AD)**

In Valmiki Ramayana, two Sanskrit words viz., "Vana" and "Aranya" are used while referring to forests. The term 'Vana' is used to denote sub-forestation, a kind of cultivated forest with a clustering of desirable plants, conserved for a purpose. As the legend goes, Rama, Sita and Lakshmana had settled down in Chitrakoota forest because of its rich in biodiversity. Strangely, Lanka supported two kinds of forests, the natural woodland of its own and the cultivated forest of the Royal Majesty. The Indian forests are enigmatically known and described as the land of "glowing" also rich in medicinal plants.

The narrative style of all these forest types is supposed to evoke four predominant sentiments also, coined as the four major "rasas" (i.e. moods) such as "Santa" (Tranquil), "Madhura" (Sweetness), "raudra" (Fury) and "Bibhatsa" (Terror)<sup>12</sup>.

In addition, the Epic Ramayana describes birds, animals and the movements of tigers, and elephants. Furthermore, Valmiki mentions names of several trees in the Ramayana such as among others, (Lagerstroemia parviflora), Lodh (Symplocos racemosa), Dhawa (Anogeissus latifolia), Dhak (Butea monosperma), Ankol (Allangium salvifolium), Bhavy (Dillenia indica), Tinsa (Ougenia oogeinensis), Bel (Aegle armelos) (Dendro calamus strictus), Kasmri (Gmelina arborea), Neem (Aza dirachta indica), Sakhua (Shorea robusta), Barun (Crateva unilocularis), Mahua (Madhuca longifolia), Tilak (Wendlandia exerta) etc. These characterized the importance of biodiversity and NRM in the ancient system (For example, see Box 2).

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<sup>12</sup> [http://gattflysnest.blogspot.in/2010/05/biodiversity-in-epic-ramayana\\_19.html](http://gattflysnest.blogspot.in/2010/05/biodiversity-in-epic-ramayana_19.html). Accessed:10.11.2011

Besides, fidelity to nature and fascination for the central theme of the Indian philosophical thought along with the cosmogenic wilderness and have been addressed<sup>13</sup>.

**Box 2: The legend of Shami tree (*Prosopis Cineraria*)<sup>14</sup>**

There is a little-known legend related to Vijayadashami festival associated with Mahabharata. The Pandavas underwent a period of exile, i.e., 12 years of dwelling in the forest followed by a year of incognito exile. It is said that the particular Shami tree chosen by the Pandavas stood inside a cremation ground. The Pandavas wrapped their weapons in a white cloth and concealed the same on the same tree, making the weapons look like a dead body. Virata Parva, Chapter 5 of the Mahabharata epic mentions that on the southern bank of River Yamuna in Viratanagara, Arjuna hid his bow 'Gandiva' on a Shami tree. Meanwhile, the Kauravas had invaded that area, suspecting that the Pandavas resided there. Upon completing their exile period, the Pandavas headed straight to the battle field, and won the contest comprehensively. Even to this day, people exchange Shami leaves on Vijayadashami while wishing each other victory in their own ventures and efforts.

## **Forest Destruction in Ancient India**

According to Hunter (1883), the destruction of forests, for the high price of wood on the plains has caused many of the hills lose their forest cover resulting in the rainfall now rushing quickly down their bare slopes, with the result that no new woods can spring up. The potato crop, introduced from England, leads to the further destruction of timber.

<sup>13</sup> [http://gattflynest.blogspot.in/2010/05/biodiversity-in-epic-ramayana\\_19.html](http://gattflynest.blogspot.in/2010/05/biodiversity-in-epic-ramayana_19.html). Accessed:15.12.2011

<sup>14</sup> [http://en.wikipedia.org/wiki/Flora\\_of\\_the\\_Indian\\_epic\\_period](http://en.wikipedia.org/wiki/Flora_of_the_Indian_epic_period). Accessed:15.12.2011

The hill man clears his potato ground by burning a ring round the stems of the great trees, while laying out the side of the mountain into terraces. In a few years, the barks and leaves drop off the branches, and the forest stands bleached and ruined. Some of the trees rot on the ground, like giants fallen in a confused fight while others still remain upright with white trunks and skeleton like arms. In the rank, green potato crop marks the spot where a forest has been slain and buried. Several of the ruder hill tribes follow an even more wasteful mode of tillage. Bereft of either ploughs or cattle, they burn down the jungle, exhausting the soil by a quick succession of crops, raised by a hoe. In a year or two, the whole settlement moves off to a fresh patch of jungle while repeating the same process.

Habitat destruction is identified as the main threat to biodiversity conservation. Under diverse natural conditions, over a billion people in rural and urban areas live in harmony under a democratic system in India. Their pressing needs for food, fibre, shelter, fuel and fodder combined with a compelling need for economic development exert an enormous pressure on the natural resources. The loss and fragmentation of natural habitats affect all animal and plant species. We need to not only stop any further habitat loss immediately, but also to restore a substantial fraction of the wilderness that has been lost in the past. Various species of plants and animals are on the decline due to habitat fragmentation and overexploitation, e.g. Habitats of Great Indian Bustard in Madhya Pradesh, Gujarat and Rajasthan, and the Lion-tailed Macaque in the Western Ghats (Karthikeya, 2007).

The predominant causes of dwindling forest wealth have been identified as over-exploitation, overgrazing, illegal encroachments, unsustainable agin practices, forest fires, and environment unfriendly development projects in the forest areas. The collection of forest products, including fuel wood, timber, etc., are much beyond the regenerative capacity of our forests. (Gulati et al. Online).

The two main direct threats to biodiversity are habitat degradation and loss of biodiversity (see table 3). Pollution and invasive species are also significant threats whose effects are most clearly discerned in relation to freshwater ecosystems. The root causes of biodiversity loss are economic growth and increasing consumption, poverty, capacity constraints, lack of environmental safeguards, lack of comprehensive land-use policies and plans, undervaluation, lack of grassroots level support for conservation, and global climate change.

**Table 3: A Scenario of Forest and Mineral Resources in Indian Tableland**

Forests	Minerals
<p>The ancient Sanskrit poets speak of the southern tableland as buried under forest with <i>sdl</i>, ebony, <i>sissu</i>, teak, and other great tree species still found in abundance. The Ghats, in particular, are covered with magnificent vegetation cover. However, the cultivation of crops But tillage has now driven back the jungle to the hilly recesses with fields of wheat, and many kinds of smaller grain or millets, tobacco, cotton, sugar-cane, and pulses, spread over the open country. The black soil of Southern India is proverbial for its fertility as also the lowlands between the Ghats and the sea rival including even Lower</p>	<p>It is, moreover, on the three sided tableland, and among the hilly spurs which project from it, that the mineral wealth of India lies hidden. Coal-mining now forms a great industry, both on the north-eastern edge of the tableland in Bengal, and in the valleys of the Central Provinces. Beds of iron ore and limestone hold out bright prospect for new enterprises in the future while copper and other metal ores exist in small quantities. The diamonds of Golconda have long been famous. Gold-dust has, from very ancient times, been washed off many river beds and gold-mining is now being</p>

<p>Bengal in their fruit-bearing palms, rice harvests, and rich succession of crops. The tableland is, however, very susceptible to droughts; and the people have devised a varied system of irrigation, (depending on the region) such as wells, tanks, artificial lakes (formed by damming up the mouths of river valleys), etc. They thus store rain water during a few months of the northern and southern monsoons.</p>	<p>attempted on scientific principles in Madras and Mysore regions (Hunter, 1883).</p>
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(Source: Hunter, 1883 )

Today when the whole world is concerned with the disastrous environmental situation mainly caused by human activities, its the right time to peep into the past for lessons to make this world a better place to live.

## **Over-exploitation of Natural Resources**

Many species are at the verge of extinction. If this trend continues, by the end of the century, 50 percent of all living species will be vanished from the planet earth (Karthikeya, 2007). It is a phenomenon known as the sixth extinction. The fifth extinction took place 65 million years ago when a meteor smashed into the Earth, killing off dinosaurs and many other species, while opening the door for the rise of mammals. Currently, the sixth extinction is on the track to dwarf the fifth (Karthikeya, 2007).

The growing global concern for conservation of the world’s natural resources has resulted in the formulation of long-term perspective plans for conserving resources. Forest resources facilitate the maintenance of

the ecological balance, biodiversity, enhancement of the quality of environment by checking soil erosion, water retention and conservation, regulation of the water cycle, acting as a carbon sink which balances carbon dioxide and oxygen in the atmosphere and the greenhouse gas effects, etc. Population pressure, poverty and a weak institutional framework have often been viewed as the predominant causes of forest depletion and degradation in the developing countries. An evergrowing population and livestock and the requirements of forest products essential for development generate enormous pressures on forest resources like fuel wood, fodder, timber, lumber, paper, etc. which in turn trigger in irreversible deforestation process. The over exploitation of forest resources as compared to its incremental and regenerative capacities escalates the forest depletion and degradation process. The excessive deforestation has impacted not only the local environment but also the global environmet. It can also affect sustainable socio-economic developmental processes in the developing countries as forests have been generating a lot of employment opportunities in the primary, secondary, and tertiary sectors besides being a source of subsistence for the poorest of the poor in the agricultural economies. (Gulati et al. Online).

Population-driven pressures on croplands, pasturelands and forest lands coupled with an abject rural poverty have triggered rural out migration to urban and industrial centres for wage employment. Further, the pace of urbanization has always been faster than the pace of population growth in India. More importantly, the process of metro politization has always been more accelerated than urbanization and had further escalated since the 1980s (Gulati et al. Online).

## **Resource Conservation**

Biodiversity and ecosystems are a natural basis for the development of sustainable resource use, including forestry, farms, renewable energy,

urban land use, fisheries and other coastal & marine resources (Jeffery et al. 2007). All businesses depend upon will impact biodiversity and ecosystem and many are facing increased risks and associated with natural resource scarcity. There has been a growing awareness of the business impacts of biodiversity loss and ecosystem degradation. Conservation measures that combine land development, land conservation, and revenue generation provide a functional protection for conserving resources. Further, conservation projects are created through a process of ecologically based planning and design, whereby planners assess a site's natural resources and environmental context and use this knowledge for conserving portions of the site with high resource value while designing a development process that minimizes environmental impacts (Jeffery et al. 2007).

Although conservation oriented projects appear to have a fair potential for protecting biodiversity and ecosystem services, there have been few attempts made to evaluate their actual conservation benefits. In practice, the success of such conservation projects is typically measured in terms of the percentage of the total site area set aside as a protected land, but this indicator does not explain whether the site's conservation values are being protected functionally. Therefore, it is argued that *traditional knowledge is very crucial to contemporary natural resource management and conservation.*

## **Indigenous knowledge for resource conservation**

It has been stated that science is objective and value-free, while local knowledge is subjective and value-laden. However, all science is not necessarily value free, and so also local knowledge is not always value-laden. In numerous instances science has just rediscovered what has already been there in the local knowledge systems. The application of

scientific research and local knowledge contributes to equity, opportunity, security and empowerment of local communities, as well as the sustainability of the natural resources. Local knowledge systems have been found to contribute sustainability to diverse fields such as biodiversity conservation and maintenance of ecosystem services, tropical ecological and biocultural restoration, sustainable water management, genetic resource conservation and management of other natural resources. Recent developments in local knowledge research and interface the challenges are contemporary. In the Indian context, local knowledge can be useful to addressing the issue of biodiversity conservation<sup>15</sup>.

Along with the science of conservation, local technologies (Gandhi, 1982) and knowledge systems such as ethnoforestry have an important role to play in biodiversity conservation and sustainability. A judicious mix of local and formal knowledge systems can result in empowerment, security and opportunity for local people. Traditional societies possess a great wealth of local knowledge, transmitted from generation to generation. Further, the equity of knowledge systems also provides an opportunity for local people to participate in the management of local affairs with global implications. Scientists need not look at traditional knowledge systems uncritically, just as local people do not necessarily approach formal knowledge systems uncritically. What is important to note here is that it is the collective wisdom of humanity embodied in formal as well as local knowledge systems which is the key to pursuing our efforts towards sustainability<sup>16</sup>, while at the same time, transferring of knowledge from one generation to another generation is equally essential.

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<sup>15</sup> [http://www.infinityfoundation.com/mandala/t\\_es/t\\_es\\_pande\\_conserve.htm](http://www.infinityfoundation.com/mandala/t_es/t_es_pande_conserve.htm). Accessed:15.12.2011

<sup>16</sup> [http://www.infinityfoundation.com/mandala/t\\_es/t\\_es\\_pande\\_conserve.htm](http://www.infinityfoundation.com/mandala/t_es/t_es_pande_conserve.htm). Accessed:22.12.2011

Transferring of traditional knowledge towards resource management

Local Ecological Knowledge based on prolonged (LEK) observations and experiences has evolved over time through oral transfer down the generations. Although often termed as traditional knowledge, not much is known about its base with the exception of its transfer routes..

Even the international regime of Intellectual Property Rights protection does not take into account an integrated view of the multiple knowledge systems, i.e., whether the property Rights concept is adequate enough to deal with Traditional Knowledge systems or whether the protection/ promotion mechanisms are closer to traditional intellectual rights, substantially reducing the magnitude of the 'property' element (Dias, 2010). Traditional knowledge for resource management is of great value. Biodiversity conservation is a feasible port of entry when dealing with biodiversity in a developmental context as well as the cooperation of the local society and its economic conditions.

## **Socioeconomic and ecological implications**

The development of the local economy while managing Common Pool Resources (CPRs) has become an integral part of the sustainable development policy in many of the developing countries over the past few years (Adhikari, 2002). This initiative has emerged largely due to a strong disillusionment with the performance of the centralized management policy in terms of providing sufficient incentives to the resource users to manage the local resources on a sustainable basis. Participatory resource management is often seen as an appropriate solution to reducing rural poverty and resource degradation and also that granting community property rights over the local level natural resources would ensure an equitable and sustainable use of

environmental resources (Adhikari, 2002). More precisely, when the responsibility of allocating natural resources is delegated to local organizations, communities tend to appropriate these resources for the collective welfare of the community.

Poverty, property rights and the distributive consequences of community-based resource management are becoming a major subject of discourse with respect to the local level collective action. A long held hypothesis is that common property resource appropriators can create and sustain the local management institutions that ensure an equitable access to, and income from resource management. Further, CPR related literature claims that since poor people are heavily dependent on natural resources, they derive higher incomes from CPRs (Adhikari 2002). More importantly, there is a less attention given to the fact that a mere institutional change of resource management might not help certain sections of the community especially the poor and the marginalized people, as they are often the most vulnerable section of the community. Therefore, to preserve the existing resources, certain communities have formed sacred vegetations in their localities.

## **Sacred groves in India**

These sacred groves dedicated to local deities or ancestral spirits, are protected by local communities through social norms and taboos that incorporate spiritual and ecological values. Preserved over the course of many generations, sacred groves represent native vegetation in a natural or near-natural state rich in biodiversity and harbour many rare species of plants and animals. The forces of modernisation are depleting sacred groves and weakening the traditional institutions that protect them. Fortunately, thousands of sacred groves still remain intact with many villages continuing to observe traditional practices. Most of the sacred groves in India are associated with almost 40,000 endogamous groups within the Hindu caste system and other major religions such as Buddhism

and Islam, as well as other religious communities and traditional tribal groups. However, to date, there has been no comprehensive survey of sacred groves conducted in India, and as such, their exact number and the area covered are unknown. Kailash C. Malhotra, et.al., in a study published in 2001, found 13,720 sacred groves reported in various regions of the country. They strongly feel that the number of sacred groves in India is likely to be between 100,000 and 150,000<sup>17</sup>. Likewise, ancestors believed God’s presence in some trees and animals which can be considered as part of a conservation regime.

**Table 4: Approximate number of sacred groves in India<sup>18</sup>**

State	No. of Documented Groves
Andhra Pradesh	750
Arunachal Pradesh	58
Assam	40
Chhattisgarh	600
Gujarat	29
Haryana	248
Himachal Pradesh	5,000
Jharkhand	21
Karnataka	1,424
Kerala	2,000
Maharashtra	1,600
Manipur	365
Meghalaya	79
Orissa	322
Rajasthan	9
Sikkim	56
Tamil Nadu	448
Uttaranchal	1
West Bengal	670
Total	13,720

<sup>17</sup> <http://www.sacredland.org/sacred-groves-of-india/>. Accessed:05.01.2012

<sup>18</sup> <http://www.sacredland.org/sacred-groves-of-india/>. Accessed:05.01.2012

## Sacred Trees for Resource Conservation

According to Hindu mythology, the 14 jewels (fourteen precious objects) which emerged from the depths of the sea (they vary according to the texts) included: the horse Uchchaisravas (symbol of sovereignty), the white elephant Airavata (symbol of royalty), a throne (symbol of kingship and power), the fire (symbol of life), the Tulsi plant (probably the representation of physician Dhanvantari), a chariot, the goddess Lakshmi (the goddess of abundance) Parijata tree (divine tree), Surabhi (cow), Soma (intoxicating juice derived from sacred plants), Varuna (the sea god), precious stones, the tree of life, the divine damsels and Alakshmi, goddess of misfortune etc.

Trees being nature's major processors of solar energy which is vital for our existence, and yielding flowers, fruits, wood or medicine, are worshipped by Hindus with deep sense as a matter of gratitude. Many believe that they are conscious like humans and feel pleasure and pain. The Indian sages and seers have eulogized the significance of asvattha or peepal (*Ficus religiosa*), gular (*Ficus glomerata*), neem (*Azadirachta indica*), bel (*Aegle marmelos*), barged or banyan (*Ficus bengalensis*), Asoka (*Sereca indica*), Emile (*Phyllanthus emblica*), Arjuna (*Terminalia Arjuna*) and many other tree species had which acquired social and religious sanctity in the ancient times. Due to their ecological value and efficacious properties, trees continue to be used in the religious and social ceremonies of Hindus (for example see box 3 and table 5).

**Box 3: Month of Sravana (Rainy Season -July-August)<sup>19</sup>**

Folio from *Baramasa* (12 months of the year) set. Bundi School, 1675-1700 A.D.

Fairs and festivals are important parts of Indian life. There are many *vratas* (*observations*) and festivals related to natural forces. Teej is one of them. Teej is celebrated at the outbreak of the monsoon in the month of July-August. On this occasion, women dressed colorfully carry the image of Goddess Parvati in a procession to the outskirts of a village or town. They spend the whole day in the company of nature playing, singing, dancing and swinging. At some places, *neem*, a useful medicinal tree and Banyan tree are also worshipped.

**Table 5: Important Festivals or Vratas Related to Trees<sup>20</sup>**

Name of the Tree	Related Festival or Vrata	Time of Celebration and Rituals
Amala	Amala Ekadasi	11th day of Phalgun Sukla; bath with Amala twigs soaked in water eat it; worship it; along with Radha-Krishna.
Amra or Mango	Amra-puspa Bhaksana Vrata	1st day of Chaitra Sukla; eat mango blossoms and worship Kamadeva.
Asoka	Asoka Pratipada	1st day of Caitra Sukla; only women worship the Tree; they also observe fast seeking longevity.
Bakula	Bakula Amavasya	Bakula flowers are offered to the manes, seeking Their blessings.
Vata or Bargad	Vata Savitri Vrata	Jyestha Purnima or Amavasya day; having fasted for the three previous days, married women worship the bagged tree by

<sup>19</sup> <http://bmtrainingprog.files.wordpress.com/2010/08/14-vandana-prapanna.pdf>. accessed:17.12.2011

<sup>20</sup> <http://www.salagram.net/Sacred-trees.html> . accessed: 17.12.2011

		circumambulating, while tying the sacred protective thread around the tree (raksa Sutra), and listening to the sacred Savitri-Satyavan story; some women stay awake during the night and complete the vow by feeding a brahmin; in the western parts of India, devout women observe this vow for five consecutive years after marriage.
Bilva or Bel	Bilva Tri-ratri Vrata	On a Tuesday of Jyestha Purnima when the constellation is Jyestha; people worship the bel tree for three consecutive nights as per Hemadri's injunctions in the Skanda Purana; the vow comprises bath with water mixed with mustard seeds, partaking of sacred sattvic food (havisyanna), adorning the tree with two pieces of red cloth and placing the image of Uma-Mahesvara beneath it; Homa is performed and 1,008 Bilva leaves are offered; Brahmins are fed.
Bilva or Bel	Sravana Krsna Ekadasi	Ceremonial offering of water to the bel tree.
Bilva or Bel Bhadra	Sukla Caturthi	Offering of trifoliolate leaves of bel to Lord Ganesa
Bilva or Bel	Bilva Nimantrana	Asvina sukla sasthi; invoking the tree-goddess and worshipping the Devi.

Bilva or Bel	Bilva Saptami	Asvina sukla saptami; a twig of bel, with two fruits, is offered to Devi.
Bilva or Bel	Bilva Navami	Asvina sukla navami; bel leaves are offered to Lord Siva.
Karavira or Kaner or Oleander	Karavira Vrata	Jyestha sukla prathama tithi; (Neriumindicum) kaner roots and branches are soaked in water and adorned with red cloth; offerings of seven cereals (sapta dhanya) and fruits are made followed by fasting; Savitri, Satyabhama, and others performed this vrata when they were in trouble.
Kadali or Kela	Kadali Vrata	Vaisakha, Magha or Kartika sukla caturdasi; a banana tree is planted and nurtured till it bears fruits; for the welfare of one's family, a person should worship the tree with flowers, fruit, etc and circumambulate it.
Kadali or Kela	Yaksa-samantaka	Kadali Vrata: A golden banana tree is worshipped and offered to a brahmin on any auspicious day.
Kevada or Screw Pine (Panadanu sodoratissimus)	Kevada Teej	Bhadra sukla tritiya; As a way of soliciting unbroken married life, women offer Kevada leaves to Lord Siva.
Neem	Sitala Puja	Caitra navaratri; goddess Sitala who is said to reside in the neem tree is propitiated ritually; Pat Gosain festival in Bengal means neem tree worship; neem leaves are eaten on Vaisakha sukla saptami.

## Sacred Animals for Conservation of Resources/Culture

The Indian cultural tradition gives an equal importance to animals and trees unsurpassed by any other tradition; it also recognizes divinity in animals. Many animal species have been traditionally protected and continue to be conserved in many parts of our country (for examples, see table 6).

Animals have been traditionally considered sacred for the following reasons:

- Ø Some animals are worshipped as deities by themselves. For example, Ganesha , the elephant-headed God and Hanuman , the monkey God, Nrusimha – lion faced, Hayagriva – horse faced, Jambavan – the bear, and so on. Several non-human forms feature in Dasaavataras.
- Ø Many animals are considered as vehicles (vahanas) of deities and hence have assumed a certain degree of sanctity. For example, Garuda (Brahminy Kite), the *vahana* of Lord Vishnu and Nandi (Bull), the vehicle of Lord Shiva, and so on.
- Ø Animals have also been regarded as the abode (either temporary or permanent) of the souls of the dead. Sometimes, even as the actual soul of the dead. For example, Crow and Dog.
- Ø The sanctity of an animal may also depend on its economic value . For example, the water buffalo is venerated by Todas - a small pastoral tribe of the Nilgiris – who rely on the animal for their sustenance.
- Ø Among many of the Indian communities, (especially in the rural parts of the country), animals are sacrificed to deities with each slaughtered animal receive divine status. This practice finds a mention in the ancient literature including the great epic Ramayana as well.

## Animal diversity in Ramayana

Aquatic birds of varied types such as Rathanga (*Tadorna ferruginea*), Karandava (*Fulica atra*), Kraunca (*Ardeola grayii*), Plava (*Ardeacinerea*), Hamsa (*Cygnus olor*) etc., are described as forming part of the Chitrakuta forest. The Chitrakuta also contains song birds like Kokila (*Eudynamys scolopacea*). Another animal group that has a prominent place in the story is the arboreal pre-human such as monkeys. For example, Hanuman (*Anjaneya*) is named after Anjanagiri, a mountain on the southern side of Kailasa<sup>21</sup>.

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<sup>21</sup> [http://gattflynest.blogspot.in/2010/05/biodiversity-in-epic-ramayana\\_19.html](http://gattflynest.blogspot.in/2010/05/biodiversity-in-epic-ramayana_19.html). Accessed:10.01.2012

**Table 6: Some sacred animals and their importance in Hindustan<sup>22</sup>**

Name of the Animal	Scientific Name	Common Name	Related Festival or Vrata	Time of Celebration and Rituals
Asiatic Black Bear	<i>Ursus thibetanus</i>	Asiatic Black Bear, (Hindi)Bhalu Karadi (Tamil)	There is a temple dedicated to Jambavantha at Avani (95 kms. Off from Bangalore), Karnataka.	Jambavantha (also known as Jambavan or Jamvanta) is a bear in Hindu mythology and is believed to have lived from treta yuga to dwapara yuga . In the epic Ramayana , Jambavantha helped Rama find his wife Sita and fight her abductor, Ravana .
Asiatic Lion	<i>Panthera leo persica</i> <i>Lion</i>	Asiatic lion , Sher (Hindi), Singam (Tamil), Simhaha (Sanskrit)		Narasimha, the fourth incarnation of Lord Vishnu was half-man (Nara) and half-lion (Simha). He killed a demon named Hiranyakashipu.A black coloured lion is the vahana of Rahu, the serpent Navagraha.

<sup>22</sup> ENVIS <http://www.ecoheritage.cpreec.org/innerpageof.php?mFjyBfKPEp>. Accessed : 17.12.2011

Bengal Tiger	<i>Panthera tigris tigris</i>	Bengal tiger, Bagh (Hindi), Puli (Tamil), Vyaaghraha (Sanskrit)	The tiger is associated with Lord Ayyappan of Sabarimala, who was born of the union of Lord Shiva and Mohini (incarnation of Lord Vishnu).
Blood Pheasant	<i>Ithaginis cruentus</i>	Chillimey or Semu ( Local name in Sikkim)	The bird is sacred to the Lepchas, the aboriginal inhabitants of Sikkim. It is also the state bird of Sikkam.
Cock	<i>Gallus gallus</i>	Cock, Murga (Hindi), Seval (Tamil)	The cock is the emblem found on the Lord Murugan's battle flag (seval kodi ). It symbolises eternity of time.

## **Forest management during the British period**

India was one of the first nations in the world to have established a professional forest service under the provisions of the Forest Act 1865. Over the next hundred years, much of the country's uncultivated land was demarcated and placed under the management of the forest department. The first forest policy of 1894 had upheld the right of the state to an exclusive control over the forests (Sinha, online).

The British administration had directed its forest policy towards commercial interests and the development of agriculture, a major source of revenue for the government (Balooni, 2002). For management purposes, the British administration had divided the forests into four classes, as described in the National Forest Policy 1894. Forests of the first class were generally situated on hill slopes and were deemed essential for the protection of cultivated plains against damage caused by landslides and hill torrents. In this sense, they served a conservation role for the benefit of agriculture in the plains. The second class of forests included the vast reserves of valuable timber tree species including *Cedrus deodara*, *Shorea robusta* and *Tectona grandis*. Driven by commercial interests, the forest management measures were developed for promoting natural regeneration of these first two species, while an artificial regeneration of the third (Balooni, 2002). Moreover, the British administration was concerned with the preservation and conservation of natural resources and accordingly focused on certain innovative solutions, policies and management tools.

### **Innovativeness/policy invention towards resource conservation**

An innovative community is not one founded to produce and distribute products invented by a single individual. An innovative community has the means to stimulate, nurture and develop innovation among its people.

The lessons learned from open source development can be transferred to other existing innovative user communities of physical products as well. Farmers in the developing countries possess quite a sophisticated knowledge of agriculture and natural resource management which is recognized as being more eco-friendly and sustainable (Singh, online). Indigenous knowledge (IK) is dynamic, in terms of changing through indigenous mechanisms of creativity and innovativeness and contact with other local and international knowledge systems. Indigenous knowledge Systems (IKS) may appear simple to an outsider, but they represent mechanisms that ensure the minimal livelihoods for the local people. Because, the structure and content of traditional knowledge are intimately linked to the local bioresources and ecosystems (Downes and Laird, 1999).

Most natural-resource planners recognize genetic diversity and its underlying processes as essential components of an ecosystem and species stability, adaptability and conservation, but there is rarely an explicit provision for the conservation of genetic diversity in management planning and decision-making (Boshier, et al. Online). The conservation of genetic diversity is essential for many reasons. Given the current worldwide pervasiveness of habitat fragmentation, integrating the conservation of essential ecosystem processes with human population needs is urgent (Boshier, et al. Online). There is a need for promoting social and economic infrastructure development to realize the potential benefits of the market economy, under natural resource policies that provide a full consideration to the environment as well as local people's rights and economies. There is a need for reforming and strengthening forest governance and the forest industry sector by ensuring sustainable forest resource use and forest conservation through promoting modernization and forest conservation. Because, forest development with an industrial emphasis and a narrow-minded resource use, can further weaken the connection between local people and forests.

Every site is unique and the challenges involved in managing the same differ from country to country, and even region to region or site to site (Shioya, online). Social and ecological dynamics and the human dependence on the capacity of ecosystems in terms of generating essential services, and the vast importance of ecological feedbacks for societal development, suggest an interconnection between social and ecological systems. Social-ecological systems include societal (human) and ecological (biophysical) subsystems in terms of mutual interactions (Shioya, online). A social system includes economy, actors and institutions in mutual interactions (Kluvankova, 2009). Power, politics, knowledge, social differentiation, economic development, livelihood quality (often understood as both social and environmental), and ecological resilience have emerged as particularly salient aspects of human-environmental issues.

Often, policy maker is confronted by the various aspects, complementing and conflicting of water management to be covered by the policy. To formulate relevant strategies, policy makers need to pose a few questions first pertaining to the effectiveness, goals, monitoring, evaluation, and review of policy. Natural resource degradation is a serious economic issue (Nallathiga, 2001). A particular natural resource policy challenge is public good conservation, which refers to conservation activities undertaken on private lands, which may benefit local communities or society in general (Nallathiga, 2001). Further, a focus on the existing and future resources is required in terms of action oriented programmes.

## **The Need: Integrated Natural Resource Management Policy**

The need of the hour and a possible solution, before a threat looms large on the future generation, is to think of natural resources as one

integrated piece of asset on this planet. These resources should have a uniform use policy, be it land, water or air or even forest or minerals. Natural resource management with conservation and resource enhancement, and preservation and pollution abatement as its primary goals, should be the view and an object of a new set of policies by the government. An integrated natural resource management policy shall be the directive principle of a State policy for states to administer and the Centre to monitor and evaluate. An umbrella legislation, like the well-drafted EPA (Environmental Protection Act) 1986, would go a long way in making a thematic conservation strategy for resource utilization and regeneration possible. People need to be the centre of any such policy (Bhat, 2010).

The fundamental changes necessary for preventing the largescale destruction of the nation's (and the world's) natural resources can occur only if the people have powerful incentives to rethink and reform their behaviour towards the environment (Ruckelshaus, 1993).

The failure to view natural resources and the environment as a whole, can have far reaching adverse consequences. Ecology believes in the interrelated existence of living beings and natural resources. Environmental justice is the touching stone of resource conservation. Considering that conservation is the prerequisite for environmental justice, reorienting the legal regime towards this goal becomes significant in terms of policy and effects. "The world system is web like; to pluck one strand is to cause all to vibrate; whatever happens to one part has ramification to all the rest", (Fritsch, 1999). As Ball and Bell (1994) observe with respect to the British experience, 'The environment as a concept is a series of interdependent sectors. When individual bodies controlled separation, there has been often a reluctance to deal with a problem on a unified basis' (Ball and Bell, 1994). The interdependence

between water (jal), soil (jameen) and forest (jungle), calls for a long-term plan for developing forests, stopping the expansion of deserts, conserving soil fertility and nurturing groundwater through rain water harvesting for meeting the challenges of drought. The lack of integrated approaches and definitive standards in this sphere allows different statutory bodies to adopt different criteria and policies while applying overlapping controls with communication gaps for escaping public accountability through mutual accusations (Bhat, 2010).

Unless conservation and preservation become the main aim of institutionalized policy-making, environment in general and resources in particular tend to be on the verge of extinction. Nature, as a harmoniously unified entity, cannot tolerate a proverbial situation of 'too many cooks spoiling the broth' (Ball and Bell, 1994).

## **Conclusion**

This paper reveals the existence of natural resources and their utilization by our ancestors from ancient to modern period in addition to the interrelationship between human beings and natural biodiversity. Natural Resource Management (NRM) refers to the management of natural resources such as land, water, soil, plants and animals, with a specific focus on how management affects the overall quality of life. Indigenous people are carriers of ancestral knowledge and wisdom regarding biodiversity. Their effective participation in biodiversity conservation programs is essential for resource management to be more comprehensive and cost effective. A comprehensive NRM approach is very critical to human survival and prosperity. Forests worldwide covers around 3.9 billion hectares while there's no forest cover in Antarctica and Greenland. The existing forest resources are divided into six categories globally, namely, Moist Tropical, Montane Sub Tropical, Dry Tropical, Montane Temperate Forests, Sub Alpine and Alpine.

Under diverse natural conditions, over a billion people in rural and urban areas live in harmony under a democratic system in India. The loss and fragmentation of natural habitats invariably affect all animal and plant species. The predominant causes underlying the declining forest cover are over-exploitation, overgrazing, encroachments, unsustainable practices, forest fires, and non eco-friendly development projects in the forested areas. Forest resources help protect ecological systems and enhance the quality of environment by way of controlling soil erosion and water retention. Increased population and commercial demands on woods have dented the natural forest cover protected by our ancestors

Local knowledge was given the least attention during the colonial and modern India and therefore, the loss of natural biodiversity has doubled with conservation becoming more challenging. Along with science, local technologies and people's knowledge in respect of ethnoforestry have an important role to play in biodiversity conservation and sustainability. A balance between local and formal institutions can result in empowerment, security and opportunity for local people. Equity of knowledge also provides an opportunity for local people to participate in the management of local affairs with global implications.

Conservation development is created through a process of ecologically based planning and design, whereby planners assess natural resources in the environmental context and use their knowledge for conservation for minimizing the environmental impacts.

Participatory resource management is often seen as an appropriate approach to reducing rural poverty and resource degradation. A long held hypothesis is that common property resource appropriators can create the local management institutions that ensure an equitable access to the locally based natural resources. India was one of the first nations in the world to have established a professional forest service under the provisions of the Forest Act 1865. The first forest policy of 1894 had upheld the right of the state to an exclusive control over the forest resources.

There is a need for promoting social and economic infrastructure development for realizing the potential benefits of the market economy through natural resource policies that incorporate the environment as well as local people's rights and local economies. Farmers in the developing countries possess quite a sophisticated knowledge of agriculture and natural resource management which is recognized as being more eco-friendly and sustainable. Reforming and strengthening of the forest governance and the forest industry sector, is essential for ensuring a sustainable forest resource use and forest conservation through prompting modernization and forest conservation. Because, forest development with an industrial emphasis coupled with a reckless resource use can further weaken the interrelationship between the local people and forests.

An integrated natural resource management policy should be the directive principle of a State policy for states to administer and the Centre to monitor and evaluate. Ecology believes in the interrelated existence of living beings and natural resources.

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