ENVIRONMENTAL CONSERVATION THROUGH TRADITIONAL KNOWLEDGE SYSTEMS AND CULTURAL HERITAGE

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Abstract

The management of **natural resources** to meet people's requirements has been practised since the pre-Vedic era. Apart from technical knowledge, traditional knowledge is vital for natural resources conservation including forests, water, and agro-ecosystems with the challenges that contemporary society faces in India. The process of economic growth and development, though vital for any nation's progress, done at the cost of environmental degradation through industrialisation and urbanisation, transportation, burning of fossil fuels and deforestation has led to the emission of green house gases into the atmosphere. These gases absorb the heat of solar rays, which results in the warming of the atmosphere, seas and oceans leading to floods, droughts, severe storms, melting of ice at the poles, receding of glaciers and rise in sea water levels. These issues have brought the concerns for environmental conservation and sustainable development to the forefront. Nature has always been very vibrant, giving and resilient to a very large extent. We, as Indians, take pride in our strong cultural heritage. Religion protects and nurtures nature. The natural and social sciences have helped us by acquiring and applying knowledge about ecosystem conservation and restoration and by strengthening the policy and practice of sustainable development.

It is concluded that collective wisdom of humanity for conservation of biodiversity, embodied both in formal science as well as local systems of knowledge, therefore, is the key to pursue our progress towards sustainability.

Key words: natural resources, environmental conservation, sustainable development

Introduction

The management of natural resources to meet people's requirements has been practised since the pre-Vedic era. Farmers were ranked high in the social system and village management was in their hands. In order to manage land, water and vegetation, technical knowledge suitable to the specific conditions of a region was required.

Traditional knowledge is vital for natural resources conservation including forests, water, and agro-ecosystems with the challenges that contemporary society faces in India. Humanity faces exceptional challenge of eroding natural resources and declining ecosystems services due to a multitude of threats created by unprecedented growth and consumerism.

Nature has always been very vibrant, giving and resilient to a very large extent. We, as Indians, take pride in our strong cultural heritage. Religion protects and nurtures nature. If we take a look at Hinduism, we worship the sun, wind, land, trees, plants, and water which is the very base of human survival. Likewise, respect and conservation of wildlife garuda, lion, peacock, and snake—are part of our cultural ethos from time immemorial. Almost the entire living of God Ram and Goddess Sita was very close to nature. Further, ancient texts written in Sanskrit, Pali or other languages can provide significant details. For instance, the scripture Vishnu Samhitâ in Sanskrit language contains some direct instructions dealing with biodiversity conservation.

In fact, whole civilisations have come into existence near sources of water like Indus Valley Civilisation. In this sense, nature and culture become intertwined. Culture reflects our history, tradition and our beliefs. Revolutions in the technological and communication fields and the advent of globalisation have made an impact on our culture which have also evolved with time. However, it becomes imperative that we adapt new things without losing the basic character of our long cherished traditions and values which include environmental conservation. India is a culturally rich and diverse country where people speak many different languages, with many communities which live in their respective social structures completely depending on their environment to ensure their livelihood.

The process of economic growth and development, though vital for any nation's progress, done at the cost of environmental degradation through industrialisation and urbanisation transportation, burning of fossil fuels and deforestation has led to the emission of green house gases into the

atmosphere. These gases absorb the heat of solar rays, which results in the warming of the atmosphere, seas and oceans leading to floods, droughts, severe storms, melting of ice at the poles, receding of glaciers and rise in sea water levels. These issues have brought the concerns for environmental conservation and sustainable development to the forefront.

Sustainability and Traditional Knowledge

The natural and social sciences have helped us by acquiring and applying knowledge about ecosystem conservation and restoration and by strengthening the policy and practice of sustainable development. We need, therefore, to foster a sustainability science that draws on the collective intellectual resources of both formal sciences, and local knowledge systems of knowledge (often referred as ethnoscience) (Pandey, 2001). Indeed, people have argued that we need to install a Nobel Prize for sustainability (Snoo and Bertels, 2001). Inadequacy of economic incentives to conserve biodiversity as demonstrated recently by Kleijn et al., (2001) compels rethinking classical utilitarian approach to resource management. Second, an emerging sustainability science (Kates *et al.*, 2001) will need all stocks of knowledge and institutional innovations to navigate transition towards a sustainable planet. Third, rediscovery of traditional ecological knowledge as adaptive management (Berkes *et al.*, 2000) and need to apply human ecological (Bews, 1935; East, 1936; Muller, 1974) and adaptive strategies for natural resource management (Bates, 2000) offers prospects for scientists to address the problems that beset conservation biologists and restoration ecologists. Fourth, there is an increasing realization that we need innovative ethics and policy to conserve biodiversity and maintain ecosystem functions (Tilman, 2000) and that such ethics need not come from the god; rather, society can cultivate them. Fifth, local knowledge systems are disappearing at a rate that may not allow us even to know what value, if any, such systems had (Cox, 2000; Brodt, 2001; Pandey, 2002a).

Local knowledge helps in scenario analysis, data collection, management planning, designing of the adaptive strategies to learn and get feedback, and institutional support to put policies in to practice (Getz *et al.*, 1999). Science, on the other hand, provides new technologies, or helps in improvement to the existing ones. It also provides tools for networking, storing, visualizing, and analyzing information, as well as projecting long-term trends so that efficient solutions to complex problems can be obtained . Local knowledge systems have been found to contribute to sustainability in diverse fields such as biodiversity conservation and maintenance of ecosystems services, tropical ecological and biocultural restoration, sustainable water management, genetic resource conservation and management of other natural resources.

Environmental Conservation through Traditional Knowledge

In order to be effective, efforts on biodiversity conservation can learn from the context-specific local knowledge and institutional mechanisms such as cooperation and collective action; intergenerational transmission of knowledge, skills and strategies; concern for well-being of future generations; reliance on local resources; restraint in resource exploitation; an attitude of gratitude and respect for nature; management, conservation and sustainable use of biodiversity outside formal protected areas; and, transfer of useful species among the households, villages and larger landscape. These are some of the useful attribute of local knowledge systems (Pandey, 2002a).

Over thousands of years local people have developed a variety of vegetation management practices that continue to exist in tropical Asia (Pandey, 1998), South America (Atran *et al.*, 1999; Gomez-Pompa and Kaus, 1999), Africa (Getz *et al.*, 1999; Infield, 2001), and other parts of the world (Brosius, 1997; Berkes, 1999).

In India these systems can be classified as:

1. Forests and groves serving as cultural and social space and source of livelihood products
2. Temple forests, monastery forests, sanctified trees

3. Sacred forests, sacred groves
4. Rroyal hunting preserves, elephant forests.

The traditions are reflected through:

- Management of wood and non-wood forest products
- Traditional ethics, norms and practices for restraint use of forests, water and other natural resources
- Traditional practices on protection, production and regeneration of forests.
- Cultivation of useful trees in agroforestry systems
- Creation of traditional water harvesting systems

The above systems support biodiversity, which is although less than natural ecosystems but it helps reducing the harvest pressure. In India, local practices of vegetation management perhaps emanate from the basic ecological concepts of local communities reflected in "ecosystem-like concepts in traditional societies" (Berkes *et al.* 1998).

Farm Biodiversity

Value of traditional agroecosystems in supporting the plant and animal diversity (see for example, Kunte *et al.* 1998) is immense. Tree diversity in farms and agroecosystems is often the product of interaction of local and formal knowledge.

Traditional Ethos

In spite of the modernization, traditional ecological ethos continue to survive in many other local societies, although often in reduced forms. Investigations into the traditional resource use norms and associated cultural institutions prevailing in rural Bengal societies (Deb and Malhotra, 2001) demonstrate that a large number of elements of local biodiversity, regardless of their use value, are protected by the local cultural practices. Some of these may not have known conservation effect, yet may symbolically reflect, a collective appreciation of the intrinsic or existence value of life forms, and the love and

respect for nature. Traditional conservation ethics are still capable of protecting much of the country's decimating biodiversity, as long as the local communities have even a stake in the management of natural resources.

Formal conservation efforts in India have relied heavily on the recently declared official protected areas in various categories for biodiversity conservation. However, ancient and widespread human practice to set aside areas for the preservation of natural values in India can be seen in several examples of sacred groves, royal hunting forests, and sacred gardens (Gadgil 1982, Pandey, 1991; Gadgil *et al.*, 1993; Kanowski *et al.*, 1999; Chandrashekara and Sankar, 1998). Several of these areas became national parks and wildlife sanctuaries in India and elsewhere (Pandey, 2001). It must be noted here that much of the India's biodiversity lies outside the officially declared protected areas. Indeed, biodiversity occurs in landscape continuum (figure 1; table 1 & 2). Other areas protect ecosystem services such as the delivery of clean water or the supply of timber, or mitigate the expected adverse effects of over-clearing (Grove, 1992). Others protect recreational and scenic values and some have been planned to foster international cooperation (Hanks, 1997).

Traditional Knowledge, Water, and Biodiversity

Simple local technology and an ethic that exhorts "capture rain where it rains" have given rise to 1.5 million traditional village tanks, ponds and earthen embankments that harvest substantial rainwater in 660,000 villages in India (Pandey, 2001a), and encourage growth of vegetation in commons and agroecosystems. If India were to simply build these tanks today it would take at least US $ 125 billion

Over thousands of years societies have developed a diversity of local water harvesting and management regimes that still continue to survive, for example, in South Asia, Africa, and other parts of the world (Agarwal and Narain, 1997). Such systems are often integrated with agroforestry (Wagachchi and Wiersum, 1997) .

One of the principle tree genus growing in association with tanks and ponds in India is *Ficus* which is culturally valued throughout the country. It is a keystone genus and supports a variety of other species. Records of frugivory from over 75 countries for 260 *Ficus* species (approximately 30% of described species) suggest that in addition to a small number of reptiles and fishes, 1274 bird and mammal species in 523 genera and 92 families are known to eat figs (Shanahan *et al.* 2001).

Conservation Principles in Ancient Times

Natural Resource Management has been in the traditions of the Indian society, expressing itself variously in the management and utilization practices. This evolved through the continued historical interaction of communities and their environment, giving rise to practices and cultural landscapes such as sacred forests and groves, sacred corridors and a variety of ethnoforestry practices. This has also resulted in conservation practices that combined water, soil and trees. Nature-society interaction also brought about the socio-cultural beliefs as an institutional framework to manage the resultant practices arising out of application of traditional knowledge. The attitude of respect towards earth as mother is widespread among the Indian society.

Local knowledge has proved useful for forest restoration and protected area management in Rajasthan – one of the driest regions of India with scanty rainfall. Cultural landscapes in rural and urban areas and agroecosystems, created by the application of scientific and local knowledge, also support a variety trees, birds and other species, and provide opportunity of integration of nature and society (Taylor, 2002).

Ancient texts make explicit references as to how forests and other natural resources are to be treated. Sustainability in different forms has been an issue of development of thought since ancient times. For example, robust principles were designed in order to comprehend whether or not the intricate web of nature is sustaining itself. These principles roughly correspond with modern understanding of conservation, utilization, and regeneration.

Atharva Veda (12.1.11) hymn, 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."

1. It must be ensured that earth remains forested.
2. It must be understood that humans can sustain only if the earth is protected.
3. To ensure that humans remain 'unslain' and 'unhurt', the ecosystem integrity must be maintained.
4. Even if vaguely, it also makes reference to ecology, economy and society concurrently.

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

1. Human beings can use the resources from the earth for their sustenance,
2. Resource use pattern must also help in resource regeneration,
3. In the process of harvest no damage should be done to the earth,
4. Humans are forewarned not against the use of nature for survival, but against the overuse and abuse.

The water management and associated tree growing has been the subject of ancient text. Tanks have been the most important source of irrigation in India. Some tanks may date as far back as the *Rig Vedic* period, around 1500 BC. The *Rig Veda* refers to lotus ponds (*5.78.7*), ponds that give life to frogs (*7.103.2*) and ponds of varying depths for bathing (*10.71.7*). Reference to the tanks is also found in the *Arthashastra* of Kautilya[5] written around 300 BC (Rangarajan 1987: 231-233).

- Waterworks such as reservoirs, embankments and tanks can be privately owned and the owner shall be free to sell or mortgage them (*3.9.33*)[6].
- The ownership of the tanks shall lapse, if they had not been in use for a period of five years, excepting in case of distress (*3.9.32*).

- Anyone leasing, hiring, sharing or accepting a waterworks as a pledge, with a right to use them, shall keep them in good condition (*3.9.36*).
- Owners may give water to others in return for a share of the produce grown in the fields, parks or gardens (3.9.35).
- In the absence of owners, either charitable individuals or the people in village acting together shall maintain waterworks (*3.10.3*).
- No one will sell or mortgage, directly or indirectly, a bund or embankment built and long used as a charitable public undertaking except when it is in ruins or has been abandoned (*3.10.1,2*).

Integration of Traditional & Formal Science

The progress of science in India has built on the foundations of knowledge and wisdom that was created in ancient times on a variety of disciplines including metallurgy, mathematics, medicine, surgery and natural resource management (Rao, 1985; Gandhi, 1982; Tunon and Bruhn, 1994). Traditional skills, local techniques and rural craft provide a wide spectrum of knowledge in India, and since "knowledge cannot be fragmented" (Gandhi, 1982) we have to take the validated local knowledge into account together with science for evolving a robust sustainability science. Sharp boundaries between formal and local systems of knowledge, and natural sciences and social sciences may indeed be imaginary. Perceived confines may just be the unexplored domain that defies cognition for want of interdisciplinary explorations.

Strategies For Biodiversity Conservation

Strategies employed for conservation and management of natural resources prominently rely on nature reserves, national parks, wildlife sanctuaries and other such categories of protected areas (See for example, Inamdar *et al.*, 1999; Sarkar, 1999; Myers *et al.*, 2000; Roberts *et al.*, 2002; Briers, 2002; Wilson,2002). Protected-area-alone approach for nature conservation, however, has serious flaw as it has further exacerbated the problem of human-animal conflicts, and a majority of reserves have failed to achieve the conservation goals in marine (Tupper, 2002).

Practice to set aside areas for the preservation of natural values such has sacred groves of Asia and Africa and royal hunting forests in India are some historical examples (Kanowski *et al.*, 1999;) of nature conservation. Several of these areas became national parks and wildlife sanctuaries in India and elsewhere.

As the human and livestock population grows and natural resources decline command-and-control management of natural resources tends to become the norm. Stricter enforcement of protected areas again is gaining currency as a management proposal due to perceived failure of people-oriented approaches to safeguard biodiversity. Unfortunately, such an approach usually results in adverse consequences for natural ecosystems and human welfare in the form of collapsing resources, social and economic conflict, and loss of biological diversity (Holling and Meffe 1996).

Water Harvesting and Biodiversity Conservation

Revival of local rainwater harvesting globally could provide substantial amounts of water for nature and society. For example, a hectare of land in Jaisalmer, one of India's driest places with 100 millimeters of rainfall per year, could yield 1 million liters of water from harvesting rainwater.

There is an urgent need to policy innovations on rainwater harvesting that has been found useful by many studies (Boers and Ben-Asher, 1982). In the cities, rainwater could be harvested from building rooftops for residential use, and any surplus could be channeled through bore wells to replenish the groundwater, avoiding loss to runoff. However, if rainwater harvesting is to be used to their full potential, policy innovations must include institutional changes so that such resources are effectively managed (Ostram *et al.*, 1999;).

In Rajasthan, tanks and ponds have been a mainstay of rural communities for centuries. Strategies for tank rehabilitation must not treat tanks only as flow irrigation systems; such an approach is very likely to result in a flawed strategy. A strategy that considers tanks as multiple-use socio-ecological

entities, and which recognizes multiple stakeholder groups is more likely to enhance the social value of tanks .

Incorporating Traditional Knowledge in Practice

Regarding the cultural and institutional the following suggestions may be useful:

1. Each programme for promotion of traditional knowledge should be based on the recognition that natural resource of local communities forms the fundamental basis of respecting traditional knowledge.
2. Attention is needed for protection of intellectual property rights of traditional people.
3. Innovative projects may need to be developed which aim at enhancement of the capacity of local communities to use, express and develop their traditional knowledge on the basis of their own cultural and institutional norms.

The following consideration may be useful in this respect:

1. Encouraging the documentation of indigenous knowledge and its use in natural resource management. Such documentation should be carried out in participation with the communities that hold the knowledge.
2. Facilitating the translation of available and new documents describing Indic traditions such as ancient texts on medicinal plants, into local languages and dissemination of these documents amongst local people.
3. Facilitating the exchange of information amongst practitioners of local knowledge.
4. Developing clear and concise educational material on traditional knowledge systems to be used in communication programmes to impart information regarding the merits and threats to indigenous knowledge systems

Therefore, there is a definite need to further develop systematic insight into the nature and scope of traditional knowledge.

Village communities and other small-scale societies residing continuously over a territory create, transmit and apply comprehensive knowledge about the resources contained in the territory. In villages where women take active part in natural resource management including agriculture and forestry they develop repositories of local knowledge that is continuously applied, tested and improved over time (Harding, 1998).

By acknowledging and making use of peoples' knowledge we shall also promote the principle of equity of knowledge. Equity of knowledge between local and formal sciences results in empowerment, security and opportunity for local people. If the state and formal institutions incorporate people's knowledge into the resource management decisions, it reduces the social barriers to participation and enhances the capacity of the local people to make choices to solve the problem. Traditional societies have accumulated a wealth of local knowledge, transmitted from generation to generation. Experience has taught them how the water, trees, and other natural resources should be used and managed to last a long time.

Ultimately, it does precious little to present models, concepts, and results of studies in academic discourses if those efforts are not tested under real conservation situations . Conservation scientists must make a transition from "staid observer to participant at some level" . Gone are the times when scientists could afford to say that their work is to create knowledge, transmit it and leave application to policy makers and practitioners. Scientists shall have to collaborate with people to put forth new hypotheses that incorporate aspirations of formal and local systems of knowing and modify their methodologies accordingly.

It is concluded that ..... Collective wisdom of humanity for conservation of biodiversity, embodied both in formal science as well as local systems of knowledge, therefore, is the key to pursue our progress towards sustainability.

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