

ON DESIGNING A SYSTEM OF POSITIVE INCENTIVES TO CONSERVE  
BIODIVERSITY FOR THE ECOSYSTEM PEOPLE OF INDIA<sup>1</sup>

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INTRODUCTION

India is one of the world's top twelve megadiversity countries, with a rich tradition of as well as a vigorous modern effort at conservation of biodiversity. Yet the country's heritage of biodiversity is being rapidly eroded. This can be traced to a number of deficiencies in the current system of utilization and conservation of biological resources that have resulted in a weakening of the traditions of prudent use of biomass and conservation of biodiversity, while failing to erect in their place other effective alternatives. The traditional community based systems of sustainable use of village woodlots and pastures, coupled to protection to sacred plants, animals, forests or ponds have been adversely affected by the state take over of common property resources, in effect converting them into open access lands and waters, subject to unregulated overuse<sup>1</sup>. At

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the same time the state managed reserve forests have been dedicated to subsidized supplies of wood to urban-industrial consumers leading to overharvests, followed by clear-cutting and conversion to monocultures<sup>2</sup>. The state forest authorities, in charge of vast tracts of lands and now waters as well have been indifferent to the broader considerations of biodiversity, and have permitted unregulated harvests of myriads of so-called minor forest produce, including medicinal plants. They have also clear cut the only remaining stands of species rich climax forests surviving as sacred groves and converted them into eucalyptus plantations<sup>3</sup>.

The state sponsored conservation effort has focused on maintenance of wild life sanctuaries, national parks and biosphere reserves over 4% of the India's land mass. The management of these protected areas has paid scant attention to conservation of the total spectrum of biodiversity, focusing on a few flagship species like tiger and their mammalian prey, neglecting important elements such as aquatic habitats, or high altitude grasslands, and removing dead and fallen wood and destroying leaf litter. Managers of protected areas have also tended to treat local tribals peasants, herders and fishers as enemies resulting in serious difficulties such as burning of stretches of Kanha Tiger Reserve by displaced tribals<sup>4</sup>.

To sum up, India's current programs for conservation of biodiversity suffer from four major defects :

(1) A mistaken notion that nature conservation must involve exclusion of all human use,

especially subsistence use by tribal and rural populations, (2) A narrow focus on protected areas, largely forest tracts, to the neglect of biodiversity outside of nature reserves, in other reserve forest tracts, in lands in and around villages, in wetlands, rivers and seas, (3) An unfortunate emphasis on protection through use of arms by a bureaucracy, especially against local tribal and rural people. (4) Untenable claims of availability and application of scientific knowledge while failing to put to use detailed locality specific folk ecological knowledge.

This system obviously needs to be radically restructured to meet the present day challenges as recognized, for instance, by the Convention on Biological Diversity, to which India is now a party<sup>5</sup>. These challenges involve : (1) Conservation of the entire spectrum of biodiversity, being concerned even with apparently insignificant organisms, be they small herbs or wood rotting fungi; (2) Need to respect the traditional knowledge and conservation practices of local communities, especially women, and to share with them benefits accruing from the utilization of biodiversity. It is our purpose to discuss in this paper the lines along which such a system may be designed.

### **A NEW PARADIGM**

Such a system will have to be grounded in coupling sustainable use of biological resources with conservation of biodiversity, not in a few protected areas, but throughout the length and breadth of the country, driven by a series of positive incentives directed

especially at the people living close to the earth. The system should concern itself with the entire landscape and waterscape of the country for two reasons. Firstly, many biodiversity elements of evident value such as wild relatives of taro and yams characteristically occur in highly disturbed habitats, others such as weedy relatives of paddy occur in low input cultivation systems. It is therefore quite inadequate to concentrate conservation efforts merely on a few protected areas, primarily under forest biomes. Secondly, it is not feasible to protect a few islands rich in biodiversity in the midst of degraded landscapes. The biodiversity rich islands would be far more secure if a serious attempt is made to create a biodiversity friendly, ecologically restored matrix around them.

Of particular importance in such attempts would be the uncultivated-lands forests, grazing lands, cultivated lands under low input, rainfed cultivation which still tends to be based on a number of land races of cultivated plants, and streams, rivers, coastal tracts away from areas of intensive use<sup>6</sup>. These habitats are extensively used by the poorer segments of the Indian community, people who depend on biomass resources gathered with their own labour from their immediate vicinity to meet their requirements of food, fuel, fodder, fiber, organic manure, medicines. Such people have few options to turn to if deprived of access to these resources. In intimate contact, day in and day out, with their environment, often rooted in it for generations, they represent the ecosystem people of the world<sup>7</sup>. They have a profound knowledge of the biological resources albeit of a very limited resource catchment. Such locality specific ecological knowledge of the

ecosystem people, often based on historical experience accumulated over generations could play a most useful role in sustainable use and conservation of biological resources<sup>8</sup>. Given the limited scientific understanding of the working of complex ecosystems, and the limited information available with professional managers, the currently prescribed, overly rigid practices could be greatly improved upon by using the detailed ecological folk knowledge of local communities to evolve more flexible, adaptive management strategies fine tuned to the nuances of local ecosystems<sup>9,10</sup>.

Alienated from all control over their resource base, today the ecosystem people are often destroying it through unregulated overuse. However, of all the components of the Indian society, they have a larger, genuine stake in restoration and sustainable use of these resources, in their tremendous variety. They also retain some vestiges of cultural traditions of prudent use that could be revived<sup>11</sup>. Finally, it is these ecosystem people who are in day-to-day intimate contact with their environments and could effectively monitor the fate of its store of biodiversity.

In contrast, the people manning the state apparatus presently assigned the function of preservation of country's biodiversity, whether they belong to agriculture, forest, revenue or other departments, and their political masters belong to Dasmann's category of biosphere people<sup>7</sup>. Biosphere people have access to resources from all over India, and increasingly from other parts of the world through the market mechanisms. They have no stake in the health of any particular ecosystem, since if one locality is

degraded they always have other alternatives. As a consequence, the regulatory agencies tend to deploy their powers merely to misappropriate resources, either directly or through sanctioning others to do so. Such a regime is helped by the near total lack of accountability for politicians and the bureaucracy, despite a fairly healthy democratic system, since India's grassroots level democratic institutions still remain very weak. The current centralized approach to biodiversity conservation based on regulation by an inefficient bureaucracy in league with unscrupulous politicians and business interests is therefore unworkable. It is an approach grounded in very inflexible management plans focusing on limited localities that has often proved counterproductive<sup>12</sup>. In its place we need to design a system of positively rewarding the ecosystem people to sustainably use and maintain, indeed restore high levels of biodiversity employing flexible management practices fine tuned to the prevalent local conditions through the length and breadth of the countryside. Such rewards could be in kind in terms of greater community rights over natural resources, in cash, or in terms of recognition of the value of folk ecological knowledge and practices of ecological prudence.

#### **CUSTODIANS OF BIODIVERSITY**

The key actors in the proposed system would have to be some appropriate community level institutions to directly manage public lands and waters and to co-ordinate the management of private lands and waters within some appropriately defined territory. The size of the human community involved in such management should

not exceed a few hundred families, so as to ensure that all members of the community are in fairly regular face to face contact. The land and water area under their management should cover part or all of their resource catchment - i.e., the region from over which they regularly collect fuelwood or graze their cattle. People tend to cover a radius of 4-8 kilometers for such activities<sup>13</sup>, so that such a catchment would cover around 50 to 200 km<sup>2</sup>. Now the population densities in rural India are of the order of 200 people per km<sup>2</sup><sup>14</sup>. So such a resource catchment will support a community of 10,000 to 40,000 people or 1000 to 7000 families. This is too large a number. A manageable community would be more like 40 to 200 families. This means that the territory that can be assigned to any given community would often be only a part of their current resource catchment. Such communities would then have either to concentrate their biomass harvests on much more restricted areas, or to arrive at acceptable adjustments with neighboring communities. Such difficulties would be minimal in less densely populated forested tracts, which also tend to be richer in biodiversity.

Apart from serious difficulties thus posed by the sheer density of India's population, there are problems of the manifold divisions within the society. Indian caste society comprises thousands of communities who largely marry within bounds of the group; the Anthropological Survey of India has identified 2635 such communities<sup>15</sup>. These segments are often in highly iniquitous relationships with each other; with the ownership of means of production and political power concentrated in the hands of members of a small number of the upper caste communities. Collective decision making in such iniquitous

communities is fraught with difficulties. However, with increasing levels of literacy and with democratic processes taking root in the country, collective decision making at the level of settlements and villages is becoming more and more significant. The growing importance of Panchayat Raj (Village Self Government) as reflected in the 73rd amendment to the constitution passed in 1993 is indicative of this welcome change<sup>16</sup>.

A more difficult question is that of role of groups on the scale of castes or tribes. Most of India's villages have populations belonging to several different castes / tribes, and most individual castes / tribes have members spread over a number of villages, often taluks or districts. The tribal organization continues to be of importance, especially in the northeastern hill states which are also areas of rich biodiversity<sup>17</sup>. Caste organization may be especially relevant in groups like nomadic herders and specialist fisherfolk who have particularly intimate links with biological resources, and who tend to be rather isolated from the rest of the rural population<sup>18</sup>. Whether groups thus organized on caste or tribal lines could be fruitfully involved in a biodiversity program, or whether the focus should exclusively be on geographically delimited settlement would require further examination.

The assembly of all adults in a geographically delimited community will in any event have to be the principal focus of the reward system to encourage maintenance of as high a level of distinctive elements of biodiversity as possible within the territory assigned to the community. Apart from Gramasabha or the assembly of all adults, other community level institutions such as youth clubs or women's clubs could play an



important role in managing local biodiversity, while the local school could play a useful role in documenting it. Such community groups would have to interact with groups on other scales, for instance, individual farmers participating in in situ conservation of crop diversity on private land or panchayat raj institutions at the level of village clusters, and other institutions at taluk, district, state and national levels.

### **INSTITUTIONAL FRAMEWORK**

Working of such a system would require the support of a series of institutions to:

- (a) organize systems of management of both private and public lands and waters within the territory of the community in a manner conducive to sustainable utilization of biological resources in conjunction with maintenance of as high a level of distinctive elements of biodiversity as possible;
- (b) set priorities, assign values in terms of significance of different elements of biodiversity for conservation effort;
- (c) monitor the levels of biodiversity within the territory of the hundreds of thousands of village communities of India; and then assign an appropriate value to the sum total of this biodiversity;
- (d) decide on the share of each village community in the funds earmarked to support biodiversity conservation throughout the country in proportion to the sum total of the biodiversity maintained in the village territory;
- (e) disburse these funds, promptly and without any leakages to the village communities;

- (f) receive the funds and organize their utilization for purposes benefiting the entire community and sharing of the rest amongst members of the village community;
- (g) settle any disputes in terms of shares of various village communities and individuals;
- (h) settle disputes relating to regimes of management of land, water and biodiversity resources amongst members of different village communities.

The institutions proposed by us for this purpose do follow all the eight design principles of long enduring institutions enunciated by Ostrum<sup>19</sup>. However, they have some special features related to the fact that the intervention of the state is essential to generate additional incentives for the conservation of biodiversity.

### **EMPOWERING COMMUNITIES**

Rewards for custodianship of biodiversity and knowledge of its use may then primarily come to a geographically defined community; though they may also go to individuals, to caste or tribal groups or to clusters of village communities. The rewards could importantly be in the form of assertion of community rights over public lands and waters within their defined territory. In theory this has been accepted under the joint forest management policy and National wasteland development Board initiatives but has not been adequately translated in practice<sup>20</sup>. The ownership of these lands and waters may continue to be vested in the state, with neither the state nor the communities having the authority to dispose of public lands and waters, except through a jointly agreed upon

decision under special circumstances. Communities could then be given full authority to manage such lands and waters in a sustainable fashion, including certain levels of biomass harvests, provided that appropriate levels of biodiversity are being maintained. With the communities standing to gain in the long run they are likely to organize sustainable use patterns for these lands and waters, and to manage them in such a way as to enhance their biodiversity value. However, it is absolutely essential that they should have adequate authority to exclude outsiders, and to regulate the harvests by group members, as well as an assurance of long term returns from restrained use for such a system to operate effectively.

### **SERVICE CHARGES**

Such additional rights of access to publicly held resources would serve as a positive incentive for making prudent use of public lands and waters to meet their biomass needs. But this in itself would be inadequate to promote maintenance of high levels of distinctive elements of biodiversity within the community territory, since there may be better economic returns from monocultures, be they of high yielding crop varieties on private lands or eucalyptus on public lands. Incentives would also be necessary to compensate local communities to accept economic losses associated with maintenance of biodiversity, for instance, through crop raiding by elephants. Specific incentives which should be viewed as service charges are therefore necessary to maintain diversity, of cultivars on farm lands, of indigenous livestock breeds, of fruit trees

in homesteads, of medicinal plants, wild relatives of crop plants, or troupes of primates or crocodiles on public lands and waters. Individuals or communities participating in such efforts must therefore be paid certain rewards linked to the levels and value of biodiversity within their territory. Such rewards could be untied funds coming to the community to be devoted either to community works such as educational or health facilities, or to be shared amongst all community members. The rewards could also take the form of building community capacity for maintaining enhanced value of biodiversity within their territory, or for setting up biodiversity based enterprises, such as chemical prospecting or extraction of active ingredients. Similar rewards may also flow for making available knowledge pertinent to uses of biodiversity, for instance in pest control<sup>21</sup>.

Apart from these rewards, which may provide sustained positive incentives to custodians of biodiversity, there may be one time rewards such as fees for collecting some genetic resource from the territory, or fees for sharing some piece of knowledge relating to use of biodiversity. There may also be shorter term rewards such as royalties from commercial application of some element of biodiversity or some piece of knowledge relating to its use. It will however be very difficult to properly channelise royalties of this nature to particular individuals or communities, since this would require that every such elements of biodiversity or knowledge to be traced to a particular set of localities, communities or persons. It would then be much better to pool such royalties in a national biodiversity fund and use this for rewarding communities for the ongoing maintenance of biodiversity within their territories. It is important that these rewards are

linked to the continuing good performance of the community in conservation of biodiversity and should be based on the annual monitoring of performance and documentation of biodiversity through a transparent, open process by a neutral agency.

#### NATIONAL BIODIVERSITY FUND

This national biodiversity fund - a broader version of the Community Gene Fund as it has been termed in the context conservation of crop genetic resources - could receive funds from many sources other than royalties that cannot be assigned to a well identified set of individuals or communities. The Governments - both central and state - could deposit into it funds earmarked towards conservation efforts. The Government of India should deposit into it money it may receive in recognition of its sovereign rights over biodiversity resources that are put to commercial use through the country's prior informed consent in accordance with provisions of the Convention on Biological Diversity. The Government of India should also deposit into it funds it may receive from international sources such as Global Environmental Facility as incremental costs of its conservation effort. But the largest and the most consistent source for the National Biodiversity Fund could be a cess that the Government of India levies on the sale of all commercial products benefiting from biodiversity: seeds of protected varieties, Pharmaceuticals, cosmetics, and emerging applications of biotechnology in food processing, waste treatment, mineral leaching and so on. This would ensure that increasing volumes of funds flow into conservation efforts in step with economic growth, and in particular growth

of biodiversity based enterprises. It would also be worthwhile for the Government of India to campaign for a similar cess in industrial countries becoming a source of substantial volume of guaranteed funds to meet incremental costs of biodiversity conservation in developing countries.

M.S. Swaminathan stresses that the entire corpus of the community gene fund should go to reward farmers for their services in the development of crop genetic resources<sup>22</sup>. A similar principle should apply to the National Biodiversity Fund which should be devoted entirely to rewarding village level local communities and individuals for their contribution to ongoing maintenance of biodiversity and development of knowledge of uses of this biodiversity. None of these funds should be permitted to be diverted to support bureaucracies, for once that is accepted, Parkinson's laws would prevail and the bulk of funds would be soon consumed in unproductive expenditure, that may in the end be actually inimical to conservation of biodiversity. Of course, the administration of such a system would require help from technical and legal institutions for their effective functioning. These bodies should include representatives of people from villages / settlements involved in conservation of biodiversity along with technical and legal experts. But the Government should agree to fund these institutions through a separate budget head. This would create pressures to keep this machinery lean, demanding only minimal resource inputs. That would facilitate creation of institutions geared to deliver goods in terms of biodiversity conservation, rather than committed to their own growth.

## ASSIGNING VALUES

Such institutions would have to operate at all levels from the nation as a whole down to village communities with appropriate links. The national level institutions should also be linked to appropriate institutions at the global level. At the national level we require a consensus on the system of values to be assigned to different biodiversity elements, and methods of monitoring their status. India harbors tremendous biological diversity, with some 100,000 known species of living organisms, and another 400,000 or so remaining to be described, as well as high levels of within species genetic variation<sup>23</sup>. Evidently, we cannot deal with this entire range in the valuation and monitoring exercises and will have to deal with a sample of taxa. This sample of taxa could be so chosen as to represent different evolutionary lineages, different biogeographic affinities, different functional roles in the ecosystem, as well as occupation of different habitats. Thus one may select, for example, freshwater algae, lichens, ferns, leguminous plants, soil nematodes, ants, snails, fish and birds as the focal taxa. Additionally, we must include in the sampling scheme elements of more evident economic importance such as cultivars of crops, breeds of domesticated animals, wild relatives of crop plants and domesticated animals, and plants and animals of medicinal importance<sup>24</sup>. We should then organize a system of monitoring of levels of biodiversity of such elements in the territory of each and every village, and of valuing them on an ongoing basis to firmly link rewards to actual conservation performance.

The values could be assigned on basis of a series of principles such as the following :

- (a) Taxonomically more distinctive elements should be valued more,
- (b) Taxa with more restricted geographical ranges or narrower habitat preferences should be valued more,
- (c) Rarer taxa should be valued more,
- (d) Taxa under greater threat because of ongoing human interventions should be valued more,
- (e) Taxa with greater promise of economic utility should be valued more.

The application of such principles, and others that may be evolved should be the function of a technically competent group. This could perhaps be a specialist group established by the Central Government or the Indian National Science Academy.

#### **DOCUMENTING BIODIVERSITY**

The system of monitoring biodiversity levels that we visualize has to cover the territory of each and every village community. Obviously this has to be launched as a massive decentralized effort mobilizing the entire population. This is a great opportunity for developing a symbiotic relationship between the informal folk knowledge systems, traditional knowledge systems like Ayurveda, Siddha or Unani medicine as well as the



modern scientific knowledge<sup>25</sup>. A great deal of locality specific knowledge of biodiversity elements significant to their own life styles resides with people, many of them illiterate. This, for instance, is the case with specialist fisherfolk who know much of water bodies, ongoing changes in these water bodies and their snail, bivalve, shrimp, crab, fish fauna; or nomadic shepherds who know a great deal of large tracts of scrub savannas and grasslands and of its vegetation. This knowledge can and should be tapped to feed into the total system of biodiversity monitoring. Some pioneering attempts at documenting such knowledge have already been initiated through an organization called SRISHTI. SRISHTI has organized a series of biodiversity contests with the help of primary schools in different states and have discovered everywhere exceptional individuals, children as well as adults who know hundreds of local species. SRISHTI also runs a network called HONEYBEE for giving due credit for and sharing such knowledge of distribution of biodiversity, as also its uses, often newly discovered by some innovators<sup>26</sup>.

Another excellent model for decentralized inventorying is that of Panchayat level resource mapping pioneered by the Centre for Earth Science Studies in Trivandrum and the science popularization movement, Kerala Sastra Sahitya Parishat<sup>27</sup>. In this program scientists work with village folk in mapping land and water elements, along with perceived problems such as gully erosion, infestation by weeds or lowering of ground water table on the village map at 1 : 7000 scale. These maps, and the dialogue initiated in their preparation is then expected to feed into planning of development schemes in that village area. This program is now being made a part of the post-literacy activities as a follow up

of the National Technology Mission on Literacy in other states of the country as well by an all India network, Bharatiya Gyan Vigyan Samiti. This land, water and literacy program could easily be broadened to include mapping of biodiversity elements within the territory of each village. Just as a technical institution, Centre for Earth Science Studies and an NGO, the Kerala Sastra Sahitya Parishat catalyzed the land and water resource mapping program, a consortium of technical institutions and NGO's, along with the country's enormous network of schools and colleges could participate in the proposed program of mapping and annual monitoring of biodiversity and its knowledge. A similar idea has also been floated by the Federation for Revitalization of Local Health Traditions of preparing a community level register of medicinal plant resources and indigenous knowledge of their use<sup>28</sup>. Such a register would become a component of the land-water-biodiversity mapping program sketched above. Repeated annually these exercise could also become a central instrument of the environmental education program for the whole country.

### **ORGANIZING INFORMATION**

Such data collected all over the country, employing the 14 or so official languages, perhaps also using the many local names of organisms has to be appropriately organized as a network of distributed data bases to put it to use in fostering Indian biodiversity based enterprises as well as deciding on the proper share of the reward for its services to go to each village community. India has a vigorous enough computer science and software capabilities to meet this challenge<sup>29</sup>. Precautions would of course have to be

taken to prevent manipulation of the information, as well as use of the information without adequately compensating the individuals or village communities who have generated the knowledge or helped conserve the biodiversity resources. This should be organized as a transparent, participatory process that could play a significant role in the spread of computer literacy through the length and breadth of the country.

### **HANDLING FINANCES**

Disbursal of the share from the National Biodiversity Fund should be a public process involving the national, state, district and village level institutions. The Panchayat Raj institutions and the district level machinery for planning of natural resource use, along with the village level gramasabha would all have to work co-operatively to ensure smooth operation of this process. Local schools and colleges as well as NGO's could aid in ensuring that the system is functioning as it should.

In any such system disputes are bound to arise and could take various shapes. There could be exaggerated claims of biodiversity levels by some parties. There could be questions of compensation to a village community if it loses biodiversity in course of a project benefiting others; such as providing land for a railway line. A village community may also lose biodiversity because of discharge of pollutants by another city or an industry. An appropriate system of settlement of such disputes through impartial arbitration would have to be established, along with relevant rules and procedures.

## NURTURING CULTURAL CAPITAL

The ecosystem people of India have a rich tradition of conservation. Many of them are surviving even today albeit in an attenuated form. This is especially the case in hinterlands and tribal areas which also happen to be areas of high levels of biodiversity. Usage of a wide variety of biodiversity elements is also a part of the culture of ecosystem people, as hundreds of species of plants and animals find a place in their food, in their rituals, in their systems of medicine, on their fields and in kitchen gardens and in manifold structural uses for fabricating baskets, mats, agricultural and fishing implements and so on. This intimate relationship of elements of biodiversity with the culture of ecosystem people, now under threat from market forces should be used to full advantage in the efforts at conservation of biodiversity<sup>30</sup>.

The convention on biological diversity rightly emphasizes the need to recognize traditional knowledge, innovations and sustainable use and conservation practices of indigenous people and to equitably share with them benefits arising from any commercial application of this knowledge and these organisms. Today these practices and knowledge are often condemned as superstitious and unscientific. It is now essential that we recognize their value and encourage them in the modern day perspective. A system of rewards which need not be material should be devised for recognizing and honouring persons or communities with exceptional knowledge or achievement in this regard<sup>21</sup>.

## **DEVELOPING HUMAN RESOURCES**

This entire system would require considerable inputs into development of human resources at all levels. At the grassroots levels villagers would have to be equipped into participate in land-water-biodiversity mapping, even as technical people will have to be equipped to respect folk knowledge and put it to optimal use. Biodiversity assessment and management expertise will also have to be nurtured amongst our school and college teachers and students, and in the Universities and scientific institutions. Government officials, politicians and jurists would have to be exposed to the relevant information. Finally, full encouragement and adequate training - both of technical nature and in terms of receptivity to folk knowledge and practices would have to be provided to nurture a vigorous voluntary effort

## **LONG TERM NATIONAL INTERESTS**

The twenty first century may well turn out to be an "era of biotechnology", already a major thrust area for commercial interests in industrial countries, with large investments in R & D and production facilities. Genetic raw material for such biotechnological processes, may come from medicinal plants, from wild relatives of cultivated plants, from local cultivars and even from currently obscure elements of biodiversity like microorganisms, insects and lower plants. Traditional knowledge of ecosystem people regarding usage of various elements of biodiversity can offer valuable clues and insights

for commercial exploitation of such resources. It is in this context that the multinational pharmaceutical company MERCK has taken up biodiversity prospecting in Costa Rica with contract payment of 2 billion dollars to the government. Several companies have already patented microorganisms and biotechnological processes and are lobbying for patent or patent like protection to other life forms<sup>31</sup>.

In this scenario, India is in an advantageous position with its high levels of biodiversity, its rich store of indigenous knowledge of uses of living organisms, and its substantial scientific and technological capabilities. It therefore makes great deal of sense for the country to launch a serious effort at conservation and sustainable use of its biodiversity resources. Such an effort would succeed only if it can draw in as willing partners its masses of ecosystem people, who for millennia have served as stewards of the country's heritage of biodiversity.

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