Opinion Article

The Nilgiris Biosphere Reserve: an unrealized vision for conservation

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Abstract

The Man and Biosphere Program of UNESCO (MAB) was a pioneer in recognizing the role of local communities in the conservation of biodiversity. Biosphere reserves of MAB were designed with a core zone with maximum protection, a buffer zone with regulated activities, and a transition zone outside the reserve proper. The transition zone is where experimental management options to promote sustainable development could be developed, and could add value to the conservation network and to regional activities. The Nilgiris Biosphere Reserve (NBR), with a core zone of 1,240 km^2 and a buffer zone of 4,280 km^2, was created in 1986 without a transition zone. The absence of a transition zone separates the protected areas (PAs) from each other, and the hard boundary between the PA and surrounding areas promotes human-wildlife conflict and encourages development inimical to the mandate of the Biosphere Reserve, ultimately affecting the regional economy through progressive degradation of the environment. We examine three case studies to illustrate these concerns: the implementation of the India-based Neutrino Observatory, resistance by tourist resorts against regulations for connecting elephant corridors, and whether the goals of local tourism operators meet the conservation objectives of the NBR. Landscape ecology and econometry can help design a transition zone on a sound economic basis. A better environment management is within technical and financial reach. But is it within political reach?

Keywords: India, conservation, Nilgiris Biosphere Reserve, Man and Biosphere, sustainable development

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Introduction

Protected areas (Pas) are critical for achieving Millennium Development goals that include sustainable development [1]. The Convention on Biodiversity has set the target of protecting at least 10% of the world's ecological regions [2] to preserve biodiversity as well as to conserve the many services natural ecosystems provide. The Man and Biosphere Program of UNESCO (MAB) was a pioneer in acknowledging the role of local populations in the conservation of biodiversity within reserves. According to UNESCO [3] biosphere reserves are "places that seek to reconcile conservation of biological and cultural diversity and economic and social development through partnerships between people and nature, they are ideal to test and demonstrate innovative approaches to sustainable development from local to international scales."

Biosphere reserves attempt to promote three interconnected functions: conservation, development and logistic support to achieve these goals. The role of local populations is paramount in integrating conservation objectives within a socioeconomic setup, and conflict resolution is one of the pillars of the approach. UNESCO [3] insisted on (i) focusing on a multi-stakeholder approach with emphasis on the involvement of local communities in management, (ii) fostering dialogue for conflict resolution of natural resource use and (iii) integrating cultural and biological diversity, especially the role of traditional knowledge in ecosystem management. There are currently 610 biosphere reserves in 117 countries, including 12 trans boundary sites. The biosphere reserves are a major international collaborative effort to maintain ecosystems and their component species worldwide.

While countries can maintain flexibility at the national level regarding the definition of zones, the zoning needs to ensure a combination of conservation, sustainable use of resources, knowledge generation, and collaborative management. The zoning of each biosphere reserve should include: (i) core area(s), (ii) buffer zone(s) and (iii) a transition area. A core area is securely protected to conserve biological diversity, monitor minimally disturbed ecosystems, and undertake non-destructive research and other low-impact uses (such as education). A buffer zone usually surrounds or adjoins the core area, and is used for cooperative activities compatible with sound ecological practices, including environmental education, recreation, ecotourism, and applied and basic research. The transition area may contain a variety of agricultural activities, settlements and other uses, where local communities, management agencies, scientists, non-governmental organizations, cultural groups, economic interests and other stakeholders work together to manage and sustainably develop the area's resources. More details can be found in UNESCO 2012 [3].

The Nilgiris Biosphere Reserve (NBR) is located in the southern part of the Western Ghats – Sri Lanka biodiversity hotspot and connects the Western Ghats to the Eastern Ghats. The Eastern Ghats, an erosion escarpment, is a north-south route of passage for Indo-Chinese and Malayan elements from Assam to the extremity of the Peninsula [4]. The NBR thus forms a unique node between two biogeographic corridors that have shaped the biodiversity patterns of the subcontinent. The NBR's topographic and climatic diversity has created a large number of ecological conditions and varied ecosystems from lowland evergreen rainforest to scrub jungles, montane rainforest, high elevation grasslands and wetlands [5].

In addition to the exceptional landscape diversity, the NBR has a large number of species endemic to the Western Ghats, such as *ca* 150 angiosperms (out of 4,000 plant species in the NBR) and 150 endemic vertebrates out of 700 species (see [6] for details). The populations of emblematic species such as the Asian elephant (*Elephas maximus*) and the Bengal tiger (*Panthera tigris*), are among the largest in the world [7-8].

The NBR was established on 1 September 1986 by the Government of India [6] and recognized by UNESCO in 2000. Its size (5,520 km^2) was conducive to conserving viable populations of megafauna such as the elephant and the tiger that require adequate space, which smaller reserves such as the Mudumalai Tiger Reserve, which has an area of 321 km^2, cannot achieve in isolation.

The NBR was divided into a core zone of 1,240 km^2 and a buffer zone of 4,280 km^2. There was and still is no transition zone. The NBR only includes the constituent protected areas in the region. These constituent reserves are as poorly connected to each other as before the creation of the NBR. The NBR is nothing but enhanced nomenclature of the existing protected areas without any new management initiatives. In the present situation, it does not ensure the protection level it was supposed to offer, and without a transition zone, never provided the opportunity to test innovative methods of management. This state of affairs was known at the creation of the NBR itself.

Davidar [9] noted a lack of coordination and the exclusion of civil society: "All areas outside reserved forests are excluded… Inter-state cooperation is lukewarm…There is a severe communication gap between the different departments of the state governments with regard to development." He further commented, "the main defect of the Biosphere Reserve Scheme is that right from the start, there has been an air of secrecy about it which has done the project more harm than good. All sorts of rumors are afloat… Only an intensive and sustained campaign to educate the public about the benefits of preserving the Nilgiri environment will set fears at rest."

In this paper, we argue that the absence of a transition zone for the NBR amplifies threats to the constituent reserves, to regional connectivity, and to the regional economy in the long-term. Regional sustainable development, exploring economic avenues that would merge better with the conservation objectives of the NBR, have never been explored.

Consequences of the absence of a transition zone

The Nilgiris Biosphere Reserve is the official name for a set of reserves, with different levels of protection, managed by the Forest Departments of the States of Tamil Nadu, Kerala and Karnataka. Some reserves, such as the tiger reserves, are supposed to have regulations extending up to three kilometers outside the reserves, according the Indian Wild Life (Protection) Act. The terminology not being standardized, these areas, called "buffer zones," in this scheme play partially the role of the transition zones of the biosphere reserve. However, they are not always defined and their management is not centralized. Other reserves, such as the reserved forests, do not have buffer zones.

This organization has led to hard boundaries between most of the reserves and human-dominated spaces such as agricultural fields and settlements, and has increased habitat fragmentation by cutting off corridors important for the movement of fauna [10]. This spatial organization is the perfect recipe for augmenting human - animal conflicts, as agricultural fields growing sugarcane and rice, crops very attractive to elephants, about the protected area. These abrupt changes in land use also aggravate the conservation versus development dispute, with the local population antagonistic towards protected area management. As the individual reserves were established not on the basis of functionality for wildlife, but on the convenience of administration, connectivity among reserves within the NBR was never ensured. For more than 20 years, little has been done to improve this situation.

We examine below three examples of threats to the NBR caused by the absence of a transition zone. The first example was the proposed establishment of a mega scientific project, the second is the opposition

of the local tourism industry to Forest Department regulations to reduce habitat degradation and fragmentation, and the last is the disconnection of the tourism sector from the conservation objectives of the NBR.

High impact government projects

The India-Based Neutrino Observatory (INO), a mega scientific project was proposed to be built in the settlement of Singara, right in the geographic heart of the NBR in 2009 (Fig. 1). The rationale for implementing this project in Singara was that it was outside the protected area and not under the purview of the NBR, even though the site was located at the heart of the NBR and less than one kilometer away from the Mudumalai Tiger Reserve.

The INO was an ambitious project amounting to *ca*. 167 million US dollars for studying neutrinos, particles weakly interacting with matter. Because their weak signal can be overwhelmed by stronger radiations, the detector needed to be buried kilometers under the Earth's surface to filter out interfering cosmic rays and radioactivity. For the same reason, detectors must be huge; the INO's detector's mass was to be about 17,000 tons of iron [11]. The total duration for the construction of the observatory was projected to be 5 years, a period during which trucks would have crossed the protected areas thousands of times to transport materials to the building site. The potential contribution of INO to physics was expected to be significant and meant considerable prestige and outcomes for India in fundamental and applied sciences. The INO was naturally given high priority by the Government of India.

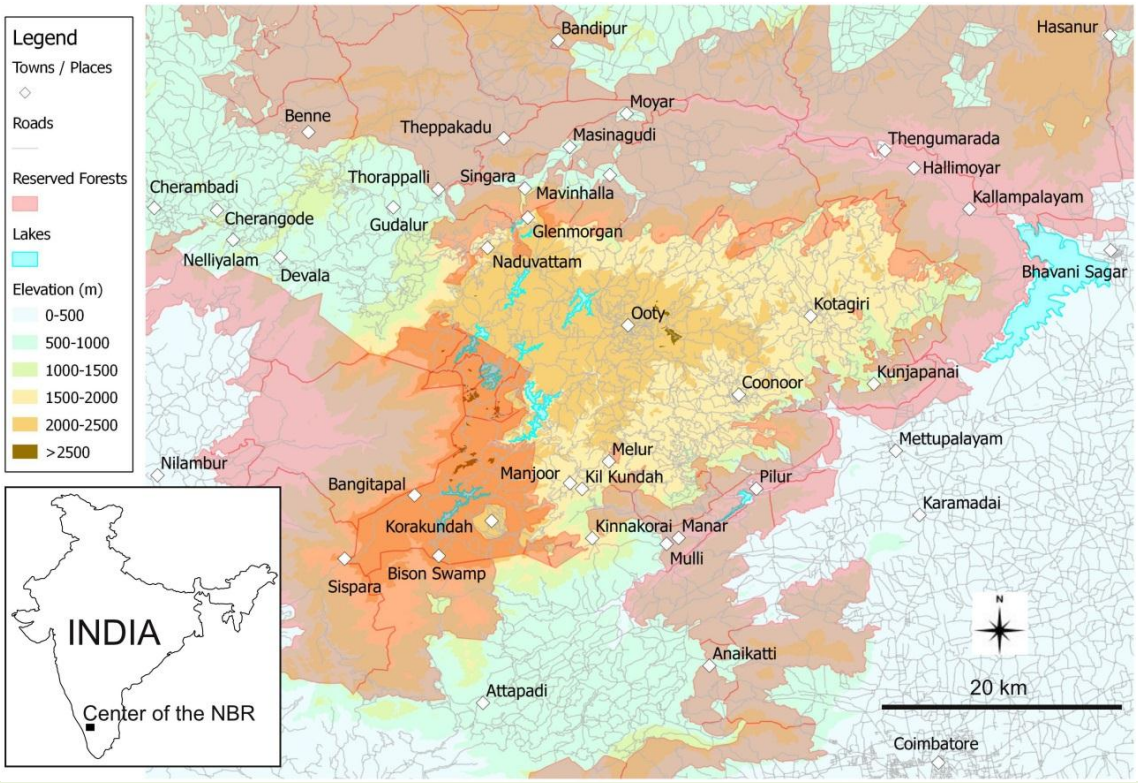

Fig. 1. The center of the Nilgiri Biosphere Reserve.

The precautionary principle should have been used to consider alternative sites. The "site was chosen after detailed survey of several sites in Western Ghats and Himalayas" [11]. The Singara site was simply deemed "ideal" [12] by the project proponents. Based on the assumption that this high priority project would ultimately find approval whatever the situation, no particular care was taken to follow best practices, either. A rapid Environmental Impact Assessment (EIA) was made [13] instead of a standard EIA despite the many threatened species in the area, followed by an Environmental Management Plan [14]. The management plan would set aside funds for elephant conservation [14] to offset the costs of environmental damage caused by the project, and this solution was claimed to be a win-win situation for scientific research and for the Asian elephant [12].The impact assessment did not address the issue of the other endangered species in the region, the environmental damage and stream pollution caused by importing thousands of workers into the site, or the vehicular disturbance caused by transporting building materials through the adjoining protected areas [15]. The EIA in this and other cases failed because of: (i) the inadequacies of the legal framework, (ii) the culture of (Government appointed) experts and their grey literature replacing knowledge, and (iii) the methodological gap for measuring sustainability with adequate expertise and technology.

In a recent article in Down-to-Earth (http://www.downtoearth.org.in/content/india-inc-s-new-bogey), Umesh Srinivasan reported that Montek Singh Ahluwalia, deputy chairperson of the Planning Commission, declared that environmental clearances for developmental projects are "arbitrary, non-scientific and non-transparent." This is because in many ways the legal framework does not follow the advances of science, which partly explains why nobody seems to know how and why decisions are made. The Manual on Norms and Standards for Environment Clearance of Large Construction Projects by the Ministry of Environment and Forests, Government of India (15th September 2006), is an example (accessed on the MoEF website in 2009). This document is replete with vague statements such as: "new construction projects should not have a negative impact on the existing biodiversity and ecosystem of the site." Ignoring that the different technical terms were not even defined, such a statement is totally impractical: any construction project will have some negative impact on the "ecosystem of the site." The problem is not to prevent negative impacts but to assess what impacts are acceptable to society. Elsewhere it states, "all existing vegetation shall be marked on a site survey plan," another totally impractical and impossible requirement. The document may mean that "trees over a certain size" should be mapped but does not say so and gives no explanation why all vegetation should be mapped. All trees (or herbs) are not equal in term of conservation values. Threatened or keystone species are of exceptional value, while common species are less important for conservation of biodiversity, but nevertheless could be important for other reasons such as size, aesthetics, soil protection, carbon sequestration, heritage, etc.

Another weakness of the legal framework is the lack of ethics associated with EIAs and EMPs. Lack of ethics can be related to the (i) accepting EIA assignments with inadequate financial support to carry out a thorough and meaningful investigations (ii) inappropriate knowledge of the subject, (iii) lack of data or models, (iv) expression of personal instead of professional opinions and of course (v) conflict of interests.

Despite the inadequacies of the INO's EIA, clearance was granted by the Ministry of Environment and Forests in April 2008. The Tamil Nadu State Forest Department however, was opposed to choice of site, because it was located less than one kilometer away from the boundary of the Mudumalai Tiger Reserve and within a major elephant corridor [10]. Since it involved moving large quantities of earth, it could be construed as precedent for the mining industry to establish mines adjacent to or within protected areas. Thus, all administrative controls ensuring the application of the precautionary principle failed for what is probably the most important conservation network in southern India.

The INO project in Singara was widely opposed by civil society and the conservation community [15].The Minister of Environment and Forests, Mr. Jairam Ramesh, was appointed in May 2009 and decided within a few months to shift the project to a less sensitive area, in Cumbum, farther south in Tamil Nadu. Without that decision by a single person, the INO would have brought a huge amount of damage to the NBR for no reason whatsoever: there were alternative sites after all, and within financial reach of the Government of India.

Elephant corridors

The rapid development of the Masinagudi area (Fig. 1) as a tourist destination has resulted in extensive urbanization that progressively disconnects wildlife habitats [9-10].To remedy this situation, the Forest Department of Tamil Nadu designated the area in between the Mudumalai Tiger Reserve and the Sigur Plateau an "elephant corridor" to regulate tourist resorts and constructions that block elephant corridors [16]. In the absence of a transition zone and in choosing the concept of "corridor" as a means to impose guidelines for regional development, the Forest Department exposed itself to a significant technicality: this region did not appear in the "Right of Passage: Elephant Corridors of India" [17] as a corridor. The tourism lobby argued that the Forest Department was arbitrary in designating a site an elephant corridor when experts had not identified it as such.

According to the authors themselves, the "Right of Passage" report [17] was supposed to provide preliminary data on elephant corridors, but is often touted as the ultimate reference list of elephant corridors in India, which is obviously a mistake. The report also contains severe methodological weaknesses. Most importantly, it did not have its own working definition of "elephant corridor." Therefore, any strip of land where elephant movement has been observed by experts was defined as a corridor. In doing so, the authors reported a list of functional corridors, i.e. corridors used by animals during the time of assessment, thereby ignoring structural corridors, which are elongated habitats or land surfaces where no animal movement was observed at the time of study, but had in the past or could in the future, function as a corridor. Also, the report failed to address the problem of scale as it applied to connectivity. Were they small corridors of local importance or large corridors linking two major elephant populations?

The Forest Department proposal issue was taken to Court, placing the Forest Department in the difficult position of "proving" that the region was an elephant corridor after failing to get a clarification from the editors of the report [17] that their work was just a preliminary compilation. On the contrary, one of the editors opposed the Forest Department's proposal based on irrelevant trifles (http://www.tehelka.com/story_main49.asp?filename=Ne3000411Corridor.asp).

In landscape ecology, a corridor is defined as a relatively narrow strip of a particular type that differs from the areas adjacent on both sides [18]. The rate of utilization of a corridor by species to disperse constitutes the connectivity. Ecological corridors are different from corridors in architecture because of their fractal nature. For example, the Eastern Ghats forms a corridor between the Western Ghats and the northern regions of India. However, the Eastern Ghats is large enough to be an eco-region, a set of particular habitats, which contains smaller corridors. Conversely, the Kallar Corridor connecting two forest patches near Mettupalayam in the Nilgiris (figure 1) is only a few hundred meters wide. A corridor's definition for the purpose of conservation biology should consequently include (i) its size/scale, (ii) its function and (iii) its contribution to connectivity. It does not take expertise to realize that the Masinagudi region is the principle, if not the only link between the northern Western Ghats and the Eastern Ghats within the NBR. Reserved forests in this region (Fig. 1) are wide and continuous, between the Nilgiris and the Deccan

Plateau. This is consequently a corridor of regional if not of national importance for the Asian elephant, and it had been missed in the Right of Passage report [17] because the scale component was not taken into consideration.

Tourism

Tourism is a major industry in the NBR, and tourist resorts have sprung up in the past 20 years in much of the private land in the Sigur plateau. We undertook a survey of the tourist operators in the NBR. At the time of the study, in July 2012, the Supreme Court banned tourism from the core zones of tiger reserves (http://www.thehindu.com/sci-tech/energy-and-environment/article3678263.ece), and we had to interrupt our survey because the operators were too distressed to respond to our questionnaire. Prior to the ban, we had interviewed 29 operators located in the Nilgiris district.

We were particularly interested in knowing whether the tourism industry had coordinated their business objectives with that of the NBR. In business operations, the vision and the mission statements (whether they were formally expressed or not) are classic management statements that help define the objectives of businesses. The vision statement outlines what the organization wants to be and the mission statement defines how the business intends to achieve its vision. Even though these businesses were located in the heart of the NBR, only five (17%) out of 29 operators mentioned an interest in nature in their vision statement. Only three operators (10%) placed nature or ecotourism (which may not be equivalent) in the heart of their mission. In strong contrast, 19 (66%) specifically mentioned the location and natural surroundings as an added value to their business. Only four (14%) businesses made an effort to protect resources and 11 (38%) operators attempted to protect wildlife. Five operations (17%) had income dedicated for conservation of biodiversity and more than half stated that they lobbied for conservation, educated tourists on conservation and were aware of environmental problems.

This survey, in spite of its limitations, tended to show that even though the exceptional natural environment of the NBR was the key factor adding value to their business, most operators did not have a business model that acknowledged this fact. Regulation of growth was not mentioned in any vision statement, and growth was essential for 21 (72%) businesses. But growth has to be controlled because there comes a point when non sustainable growth of tourism can endanger species [19]. In total, five (17%) businesses felt threatened by conservation policies: two mentioned that protected areas might be a threat to their businesses and three operators mentioned the Government policies to be threats.

Paradoxically, many businesses were making efforts towards the protection of nature. The majority understood the importance of a healthy environment, favored the conservation of species, and tolerated conservation. However, these efforts were not enough to transform their businesses into ecotourism operations. The reason, we believe, is that tourism operators have little knowledge of conservation biology and sustainability, resulting in a 'tragedy of the commons' where large noisy crowds, habitat degradation, and dumping of waste destroy the base of their economic success. Out of ignorance and desire for short-term profit, the tourism industry in this region is adamantly opposed to any regulation. A transition zone would bring guidelines, awareness, and finally, better practices.

Conclusion

The Nilgiri Biosphere Reserve exists only in name and has remained nonfunctional since its inception. The lack of a transition zone has in fact increased the problems facing the protected area network in this region, because despite the efforts made (the latest being the creation of the Sathyamangalam Tiger Reserve) reserves are managed independently. The protected area network is totally disengaged from the

rest of the economy and is perceived as "antagonistic" to development in the minds of many people. The wildlife tourism industry itself, which realizes that their incomparable environment adds value to their business, participates only marginally in the conservation vision, while destroying the base of its profit.

Due to the lack of a transition zone, there has been no platform to discuss, organize, develop and regulate the activities within the NBR. This has prevented the much awaited "experiment in sustainable development" and has put back conservation efforts. Ministries, administrations, scientists, consultants and local communities do not know how to design sustainable development plans with a strong biodiversity component. This is one of the reasons why more ambitious plans fail [20].

It is easy to understand sustainable development when it comes to waste management, energy distribution, or organic agriculture, because these activities are within the framework of classical economy, with a commodity and a market. Most people, however, are puzzled by biodiversity conservation and believe it to be a "good-guy thing" with no obvious connection to the economy. Of course, everyone knows the NBR can be a world class tourism attraction. It produces drinking water for millions of people, and has incomparable ecosystems and wildlife. The issue is not whether the NBR is economically profitable, but how to integrate the NBR within an economic vision. Within the framework of sustainable development, the NBR is a unique benefit to the country. The objective of a transition zone would be to manage both the region and the environment as well as possible, to bring as high return as possible.

No economic model can provide a simple way to derive the benefits of an entity as complex as the NBR. Only computer models can do this, taking into consideration land-use and "spatializing" the relative benefits of activities. Such econometric tools are in their infancy [21-22] and rely on elaborate computing and even more on good quality data. Studying how all local interests can be merged is an experiment with sustainable development of substantial scientific returns. On the basis of landscape ecology and econometry, a transition zone could be progressively put into place on safe economic principles. The technology exists, the expertise is available. But is there a sustainable development vision for this region?

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