Protected Areas Programme







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serving as a leading global forum for the exchange of information on issues relating to protected area establishment and management

ensuring that protected areas are placed at the forefront of contemporary environmental issues such as biodiversity conservation and ecologically sustainable development

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Cover: At up to 4 m bigb, Aloe vaotsanda is one of the largest Aloe species occurring in Madagascar. Many Aloe species can be grown in nurseries and harvested for medicinal use (see pages 17–26). Photo: Olivier Langrand.

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Editorial

DAVID SHEPPARD

The 1992 United Nations Conference on Environment and Development (UNCED) called upon countries to integrate their conservation and development activities. The term sustainable development moved squarely to the forefront of the political agenda. What is the implication for protected areas? As we move into the next century, it is clear that the pressures facing such areas are many and varied. Competition for the use of scarce land and natural resources is growing dramatically. Such pressures can combine to create a complex challenge to managers of protected areas.

These issues were addressed at another landmark conference in 1992, the IV World Parks Congress, in Caracas, Venezuela. This conference noted that protected areas will not be able to survive in their current form in many parts of the world due to pressures of encroaching land use, often related to the subsistence needs of local communities. These types of problems are illustrated in the paper by Siebert and Belsky in this issue of *PARKS*, where it is noted that the viability of many protected areas in south-east Asia is threatened by resident peoples who for generations have utilised land now designated as reserves. Conflicts between local people and protected areas in Madagascar are also noted in the article by O'Connor and Langrand.

The Caracas Congress called for prompt and effective action: the need to integrate protected areas into broader patterns of land use was identified, and more effective involvement of local people in such activities was called for. Protected areas are responding to this challenge. New and innovative models are being developed; implementation of integrated conservation and development (ICD) projects has been one approach to this issue in Madagascar. Such approaches should also build on traditional systems of resource conservation, where they exist. The positive application of the *hima* approach, a traditional system for resource conservation in Saudi Arabia, is outlined in the article by Grainger and Llewellyn.

In developing such approaches it is also important not to 'reinvent the wheel'. Biosphere reserves have attempted to combine conservation and sustainable development objectives for many years, and it is important that relevant experience, both positive and negative, is taken into account for new models and approaches. Two articles in this issue focus on Biosphere reserves. Ishwaran traces the development of the Biosphere Reserve and World Heritage concepts, and Nauber and Pokorny examine the Biosphere reserve approach in Germany.

There are many important lessons to be learnt from experiences highlighted in this issue. These include:

I important conservation values should not be compromised by sustainable development activities

■ countries should develop flexible systems of protected areas, covering areas managed for strict protection to areas managed for both conservation and development

the need for involving local communities in the implementation of such activities

the need to learn from experience and to build on this to ensure the more effective implementation of models and approaches.

It is hoped that this issue of *PARKS* will make a contribution to helping protected area professionals understand the need to integrate conservation and development.



The role of protected areas in promoting sustainable development

NATARAJAN ISHWARAN

Sustainable development has become a guiding principle for balancing the requirements of conservation and development. Protected areas have played a crucial role in maintaining natural resources, but doubts have been raised about their continued ability to do this as they become 'islands of nature' in a context of unsustainable resource use.

In this paper, UNESCO's efforts to set up instruments and programmes to facilitate the contribution of protected areas to the process of sustainable development are discussed. The difficulties of, and potential for, integrating conservation and sustainable socioeconomic development in and around protected areas is illustrated using selected examples.

SINCE THE conclusion of the United Nations Conference on Environment and Development (UNCED) in 1992, sustainable development has become a guiding principle for balancing the conservation and development efforts of governments and non-governmental organisations. Agenda 21, one of the major outcomes of UNCED, outlines a variety of strategies for consolidating the sustainability of the overall development process as well as sectoral resource-use and conservation policies and programmes. Designated protected areas have played a crucial role in salvaging natural and genetic resources during times when unsustainable socioeconomic models of development were driving resource exploitation outside those areas. Nevertheless, critiques of conventional socioeconomic development models have also raised doubts about the feasibility of conserving 'islands of nature' in an otherwise widening context of unsustainability in resource use patterns.

Sustainable development may be envisaged as a process in which the necessity for retaining the broadest possible range of future resource use options must be balanced with the inevitability of exploiting some of those options for current socioeconomic development. While the global need for this balance has been accepted in principle, its realisation in practice within localised socioeconomic and cultural contexts is confounded by scientific, technical and political uncertainties. The role of protected areas in promoting sustainable development therefore centres around their ability to generate social and economic benefits at local, national and international levels without compromising their primary goal of conserving nature and natural resources for present and future generations.

Protected area designations supported by UNESCO activities

World Heritage Sites and biosphere reserves are two protected area designations ascribed to individual sites as part of UNESCO's efforts to implement the World Heritage Convention and the Action Plan for Biosphere Reserves, respectively.

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The World Heritage Convention (i.e. Convention Concerning the Protection of the World Cultural and Natural Heritage) was adopted by UNESCO's General Conference in 1972. It is an international legal instrument that consolidates conservation of natural heritage of 'outstanding universal significance', in countries which have ratified the Convention. The criteria and conditions of integrity which natural heritage sites, including protected areas, are required to meet for qualifying for World Heritage status (UNESCO 1994) are rather stringent. Only the most internationally significant protected areas, with an adequate nationally defined legal framework and management infrastructure, are likely to meet these natural heritage criteria.

The new criterion on cultural landscapes, adopted by the World Heritage committee in 1992, has opened up the probability that some sites, where the resource use patterns of local human communities have evolved within limits set by local environmental constraints, could have outstanding universal significance; "a continuing landscape is one which retains an active social role in contemporary society closely associated with a traditional way of life, and in which the evolutionary process is still in progress" and "at the same time exhibits significant material evidence of its evolution over time" (UNESCO 1994).

The biosphere reserve, on the other hand, is a conceptual input to protected area management principles, which was derived from UNESCO's Man and the Biosphere (MAB) Programme. An area is designated as an international biosphere reserve when the authorities concerned nominate a site where they agree to commit themselves to a management regime which:

■ focuses on three essential functions, namely (1) conservation of ecosystems and genetic resources; (2) promoting research, training and environmental education (logistic function; see Batisse 1986) and (3) supporting the development of local economies and people

■ is cognisant of opportunities for harmonising the complementary and often conflicting needs of the three functions, by elaborating a zoning scheme; such a scheme should recognise (1) a core zone conserving an ecosystem and its genetic resources representing one or more biogeographic provinces of the biome specific to the region; (2) a buffer zone where, amongst others, activities that

Mount Huangshan World Heritage Site, China. Photo: Jim Thorsell.

bring social and economic benefits to local people are encouraged; and (3) a transition zone which links the biosphere reserve to regional socioeconomic development processes.

The application of the biosphere reserve concept has, in some cases, overlapped with the operations of the World Heritage Convention. Core areas of biosphere reserves may at times have the potential for meeting natural heritage criteria. The relevance of the application of the new cultural landscape criterion to protected areas will only be tested during the coming years. Variations of the biosphere



reserve model, e.g. cluster biosphere resource, will have relevance for integrating conservation and socioeconomic development within units of regional landscape.

Protected areas in sustainable development: constraints and opportunities

The international definition of national parks adopted in New Delhi, in 1969, stressed the elimination of settlements from, and prohibition of resource use in, protected areas (Miller 1982). During the same year UNESCO's Biosphere Conference, which ultimately led to the launching of the MAB Programme (1971) and the elaboration of the Biosphere Reserve Concept (1974), was convened. One major implication of the Biosphere Reserve Concept, i.e. that conservation of ecosystems and genetic resources should bring in benefits to local people and economies, was therefore quite contrary to the mainstream of thinking of protected areas managers during the late 1960s and early 1970s. It was a prelude to later events which convinced governments, particularly in developing countries, that designating protected areas need not preclude socioeconomic development options. The growing awareness of governments of less developed counties of possible linkages between conservation and socioeconomic development perhaps contributed to the sharp increases in global protected area coverage observed during the 1970s and 1980s (Reid and Miller 1989).

The most important contribution protected areas will continue to make towards sustainable development is in conserving ecosystem and genetic diversity for potential future scientific, aesthetic, social and economic benefits. Other environmental services provided by the ecosystems within protected areas, for example watershed protection, flood control etc., are equally vital for sustainable development, though their value to social and economical welfare may not be monetarised. In this connection, the natural and mixed sites included in UNESCO's World Heritage List represent the most universally significant areas for biodiversity conservation. Cooperation to ensure the effective management of those protected areas which are recognised as World Heritage sites should therefore be considered an essential ingredient of international action to promote sustainable development.

The number of visitors to Mount Huangshan has increased in recent years, raising the question of how to sustainably manage tourism. Photo: Jim Thorsell.



World Heritage sites and biosphere reserves can promote sustainable development by increasing revenues for, and promoting social welfare of, local people. These short-to-mediumterm benefits which protected areas generate are essential in awareness and educational campaigns implemented by the management in order to solicit the cooperation of local people in achieving its conservation objectives. In Nepal, the World Heritage site of Royal Chitwan National Park generates substantial revenues through tourism. A recent government decision amended the law in order to allow about 50% of

the revenue generated by protected areas to be used in local community development projects; this will explicitly demonstrate the monetary benefits that protected areas can bring to local people. According to the management authorities of Changbaishan Biosphere Reserve of the People's Republic of China, tourism-related activities generated around 3 million RMB (US\$350,000) during each of the last 2–3 years and Changbaishan has become a major attraction for visitors in the north-eastern parts of China. The economic benefits of Changbaishanbased tourism therefore extend well beyond the communities resident in the immediate vicinity of Changbaishan.

Tourism benefits generated by protected areas, however, require careful monitoring. The negative impacts of the industrial dimension of tourism on conservation tend to accumulate and exceed limits beyond which restoration of protected area values become technically, if not politically, difficult. The Mount Huangshan World Heritage site of China continues to grapple with the problem of regulating tourism development. Visitation to this site has increased in recent years, particularly due to the vibrant performance of the Chinese economy and a growing number of overseas Chinese returning as 'tourists'. A Symposium convened jointly by UNESCO, UNEP and Chinese Government in 1991 made several recommendations concerning sustainable tourism development in Mount Huangshan. Some of these recommendations are now being implemented.

The use of natural resources in and around protected areas is a reality, particularly in less developed countries. The conventional managerial attitude of the prohibition of such resource use by policing has, in the last two decades, given way to negotiation and cooperation with local people to find alternatives to their dependence on natural resources within protected areas. In fact, the new category VI of IUCN's internationally recommended protected area designations, i.e. managed resource protected area, is designed to permit sustainable use of natural resources (IUCN 1994).

Many biosphere reserves have developed management plans with explicit strategies and activities designed to minimise the dependence of local populations on core zone resources. Research scientists and extension workers who can generate and transmit information on alternative resource options and train local people to adopt such alternatives are key partners of the managers who attempt to link sustainable use of resource and conservation within and/or in the immediate vicinity of protected areas.

Zoning and a multiple-use approach to management, promoted by the Biosphere Reserve Concept since the early 1970s, now has widespread applications among several categories of protected areas (see for example Gradwohl and Greenberg 1988). Development activities in buffer and transition zones may have to provide social and welfare benefits to local people in order to solicit their support for designing strategies that would minimise their dependence on core area resources. This was a trend noted by IUCN and Sri Lankan specialists who revised the management plan for Sinharaja. Several buffer zone activities, e.g. the establishment of a mobile-eye clinic, the organisation of environmental awareness workshops and the formation of a local non-governmental organisation (NGO) under the banner "Friends of Sinharaja", appear to have set the stage for the future implementation of rural development initiatives that will minimise resource dependence of local people on core zone resources. The difficulty in designing buffer zone development activities which could have long-term benefits for the core zones of protected areas became clearly evident during an international review of the management of the Wolong Biosphere Reserve of China, carried out by UNESCO and participants from East Asian countries in March 1994. Wolong, which enjoys a special district status in the Sichuan Province of China, provides clear benefits for local people who also display a high level of environmental awareness and recognition of the specific significance of Wolong; e.g. some of the income generated through small-scale hydro-power projects in the buffer zone is used for replanting trees in denuded areas; the local people resident in core and buffer zones are provided with schools; the installation of energy-efficient stoves in homes of local people has reduced dependence on fuelwood etc. Nevertheless, the management remains concerned about potential impacts of population growth on the conservation objectives of Wolong, which is home to 10% of China's giant panda population.

Wolong Biosphere Reserve, China, contains 10% of China's giant panda population. Photo: Jim Thorsell.



Wolong's management is attempting to address this issue through a combination of tactics, including education, awareness building and the negotiated relocation of local people away from the core zone. However, the possibilities that exist for combining scientific information on giant panda ecology with the local interest in treeplanting in order to develop a coordinated programme for rehabilitating giant panda habitat remain unexplored.

Development opportunities and activities several hundreds of kilometres away from the boundaries of protected areas are frequently dependent on biological resources within them. People in the whole region around the Changbaishan Biosphere Reserve of China earn substantial revenues through deer and ginseng farming, hunting of wildlife for sale of products such as furs and skins, and forestry sector activities. The gene pools of biological resources which form the base of such economic activities are located within the Changbaishan Biosphere Reserve. The determination of the total economic value of a reserve such as Changbaishan therefore could be an interesting case study in demonstrating the role protected areas play in promoting sustainable development.

Identification of cultural landscapes throughout the world will be a major part of the operations of the World Heritage Convention in the coming years. Such landscapes are clear examples where human endeavours to exploit natural resources had been driven by traditions which consciously recognise limits set by the environment. Only one protected area, i.e. Tongariro National Park of New Zealand, has been given World Heritage status specifically with respect to the new criterion on cultural landscapes. Other potential sites such as Uluru National Park of Australia (already a natural heritage site) are currently being evaluated with regard to the applicability of the criterion on cultural landscapes.

The most innovative application which the new criterion on cultural landscapes could have, however, is in relation to traditional land-use systems, such as those in the rice-terraces of the Philippine Cordilleras. If the application of the cultural landscapes criterion is found to be relevant to the conservation of such traditionbased sustainable resource use systems then they may provide hitherto unforeseen insights into, and opportunities for, strengthening the links between protected areas and sustainable development.

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Sustainable use: lessons from a cultural tradition in Saudi Arabia

JOHN GRAINGER AND OTHMAN LLEWELLYN

Traditional systems of resource conservation, notably the practice of preserving land as *hima*, have sustained rural societies for centuries in the Arabian Peninsula and other arid regions. The hima system persists as a cultural ethic and is embodied in Islamic law. This versatile institution for regulating use of scarce resources provides a sound basis on which to elaborate conservation practices within a modern system of protected areas in Saudi Arabia and elsewhere.

THE PRACTICE of protecting areas, often for a singular purpose, has been customary in many societies. Typically such historical reserves were established by powerful individuals to serve their own interests, as hunting preserves, religious sanctuaries and suchlike, with little consideration to the welfare of the community at large, and often to their disadvantage.

In the Middle East and north African region, a distinctive conservation practice has evolved over 1,400 or more years, whereby areas have been reserved traditionally for the conservation of natural resources by local communities for their own benefit.

This region contains some of the world's most arid ecosystems to have been exploited continuously by man. Reserves, and other such institutions to regulate the use of scarce resources, were socioeconomic imperatives for sustained production in these regions of inherently low biomass potential and where all resources, water, forage and wildlife are essentially fugitive.

Permanent hima pasture in Tihama, Saudi Arabia. Photo: Paul Goriup/Pisces Nature Photos.

The Middle East and north African region is further characterised by a common faith, Islam. Islamic law (Shari'ah) offers clearly stated principles for the utilisation of common natural resources



utilisation of common natural resources (Bagader *et al.* 1991). Islamic law has sanctioned and redirected certain traditional regulatory systems, such as grazing reserves, and caused them to become more firmly entrenched in the culture and value system of many Islamic countries.

This article examines the tradition and ethics of traditional resource reserves and suggests that such versatile, cultural institutions offer sound bases for elaborating contemporary conservation initiatives through a system of protected areas. Saudi Arabia, which has recently produced a national system plan for protected areas (Child and Grainger 1990), will be used as a case study.

The hima system

In a series of papers Omar Draz (1965, 1969) described a system of range reserves, called *bima* in Arabia. *Hima* in Arabic means protected area and the hima system is now recognised as one of the oldest known forms of range and resource conservation. Himas were evidently well established in some form by the time of the Prophet Muhammad AD570 who sanctioned and established himas for the public good, but declared private himas unlawful. Early Muslim jurists explained that it had been common for rulers and powerful individuals to reserve the best rangelands for their private use, and it was this practice that the Prophet Muhammad prohibited. The himas which he established included a grazing reserve for the cavalry at al-'Aqiq near al-Madinah and a hima of twelve miles' radius around al-Madinah in which the cutting of woody vegetation was prohibited, while hunting was prohibited within four miles. The institution of hima can be seen as an early response to resource scarcity and the recognition of the close linkage between the conservation of strategic resources and sustainable development.

In Islamic law, the hima is defined as any area that is protected from unregulated exploitation by way of grazing, tree cutting, hunting, farming, or settlement, and is set aside by the governing authorities for purposes pertaining to the public good. It may be characterised by preservation or sustainable use, or any combination of the two.

At a general level the institution of hima may be defined as a set of regulations controlling the extent and intensity of utilisation of resources within a prescribed area.

Draz (1969, 1978) proposed that the hima system might provide a vehicle for range improvement in the Middle East. The tradition is well understood in Arabic culture and it is recognised that established local traditions provide opportunities for linking conservation of the resource use base with sustainable development (IUCN 1980). This is especially true in rural areas where people are generally conservative.

The hima system or variants on it was widely practised in the Arabian Peninsula. In Oman, Wilkinson (1978) describes the practice of communal range control by villagers of eastern oases and Thesiger (1959) remarks on areas called *hawtab* where hunting, cutting or grazing were proscribed. Similar social regulations governing rangeland have been recorded in Syria (locally named *mahmia* or *mar'a*) and from the Kurdish areas of Iraq and Turkey where they are referred to as *koze* (Draz 1978).

In north Africa, range reserves called *gbidal* or *zenakab* can be found in Tunisia, and Hobbs (1985) describes a tradition of "lineage reserves" among nomads in the eastern deserts of Egypt. Excellent discussions, indicating the importance of the hima and the regulations pertaining to it, can be found in nineteenth century Islamic legal texts from Hausaland (the area now known as northern Nigeria) ('Uthman ibn Fudi 1806), and range reserves called *mabram* are described in legal documents from the state of Bornu, which comprised the Lake Chad region.

Traditional hima use and their significance in Saudi Arabia

The hima is an extremely flexible institution; the only conditions for a hima to be valid in Islamic law are 1) that it be constituted by the legitimate governing authority, 2) for purposes pertaining to the public good, 3) that it avoid causing undue hardship to the local people by depriving them of resources they need in order to survive, and 4) that it in fact result in more benefits than costs to society.

Customary management of hima was highly adaptive to the particular requirements for a given area; consequently each hima tended to have its own set of regulations deriving from the special purposes for which it was established and the particular needs of the local population. Based on variations in extent of grazing control and other land use Draz (1969) recognised five commonly applied systems in the mountains of south-western Saudi Arabia whereby:

animal grazing is prohibited. Cutting of grasses is permissible during specified periods and droughts. The head of the tribe grants special privileges for a limited number of needy people to use the reserved forage. A specified number of each family are allowed to cut mature grass during the season, either for storage or for direct use.

grazing and/or cutting is permitted, but restricted to certain seasons of the year.

grazing is permitted year round, but the kind and number of animals permitted to graze (usually cattle) are specified. There is no restriction on hay cutting after grass flowers.

the reserve is kept primarily for beekeeping; grazing restrictions may be relaxed after the flowering season or may be kept in force year round.

■ the reserve aims to protect forest trees such as juniper or acacia. These himas are usually the common property of a village or a tribe. Cutting of trees is prohibited except in times of emergency or particular need. Sometimes the wood is sold to raise funds for the benefit of the village or tribe.

Later work (Eighmy and Ghanem 1982) has added detail to this typology, particularly with regard to access to the hima by tribal subsections and the type of animals permitted to pasture.



In addition and of great significance is the recent description of a tribal wildlife reserve for ibex in western Saudi Arabia (NCWCD 1988a). The site, an isolated granite massif called Jabal Ra'al, has apparently been established as a preserve for ibex by Balawi tribal decree and reportedly dates to the time of Ibrahim Pasha in about 1780.

In this reserve, hunting of ibex is prohibited and the grazing of livestock controlled, even though the surrounding plains are virtually devoid of vegetation. The protection is locally observed out of tribal loyalty and respect for the sheikh, but with no

One aim of hima systems in southwest Saudi Arabia is to protect forest trees. Photo: Paul Goriup/Pisces Nature Photos. JOHN GRAINGER AND OTHMAN LLEWELLYN

official enforcement. Traditional reserves are reported for ibex in Yemen (Sergeant 1976) and for tahr in Oman (Munton 1979).

Hima systems have obviously served a vital role in preserving biological diversity in Arabia.

Regulation of hima

Though tribally controlled himas exist in Saudi Arabia most are controlled by smaller social groups ranging from tribal sections through villages to individuals. There were also numerous himas established directly by the central government throughout Arabia for the cavalry. Private reserves are referred to as*bujrah* rather than hima. Regulation of the use of a hima is closely integrated in tribal tradition. In the traditional himas of Arabia, no permanent guards are used and with rare exceptions no walls enclose the territory, unlike hujrahs which are usually walled. The hima generally is defined by natural features, such as watersheds, or isolated hills, though occasionally stone markers are placed on hima boundaries.

Under Islamic law, the trespasser is usually fined by confiscation of all trespassing animals including riding animals, equipment and clothing. In the local traditions of al-Bahah villages in Saudi Arabia social sanctions regulated the violation of a hima which often involved the slaughtering of one or more of the trespassing animals. Today, punishment tends to be less severe, and the punishment often involves the national system of police and religious judges, and fines and warnings are most common. However, repeated violation by the same person can result in imprisonment.

Coincident with the enormous socioeconomic changes of recent decades, the hima system has become less secure as a strong local institution in Saudi Arabia. In 1965, thirty himas were known near Taif (Draz 1969), by 1981 only three of these were actively maintained.

Size and location of himas

No complete survey of Arabian himas has been undertaken so the extent and number of these protected areas is unknown. Draz (1969) estimated that there were over 3,000 hima in Saudi Arabia. In 1982, Eighmy and Ghanem estimated that the number of active himas in their 200 km long study area between Taif and al-Baha probably approached 200. A later survey of himas in a densely populated area in the western mountains region indicated that every village was associated with one or more himas, and 71 protected or partially protected reserves were found (Grainger and Ganadelly 1984). The himas varied in size from 10 to over 1,000 ha but in historical times a hima could extend over hundreds of square kilometres. The Hima ar-Rabdhah, established in around 645 to preserve grazing for horses of the cavalry, camels reserved for charity, and flocks belonging to the poor, is thought to have been at least 160 km in length.

The size of the hima seems to represent a practical compromise between the space available and the purpose of the hima. In Saudi Arabia, tradition is most developed among the sedentarised people in the south-western mountains where small himas are common in relatively well-watered areas among dense terraced agriculture systems. The largest himas are in semi-arid rangelands and probably serve as buffers against grazing stock. There have been no reports of himas in the large areas used by nomadic pastoralists in the eastern deserts (Cole 1975).

Contemporary value of himas

The use of hima has changed during the recent decades. In the Hijaz and 'Asir regions, where the concept is most strongly maintained by traditional village agriculturists, their needs have changed. With the mechanisation of terrace agriculture the need for pasture for draft animals has declined. Himas are now often used to graze sheep and goats, rather than cattle and horses.

Some himas are still regarded as an essential source of fodder, in spite of the availability of subsidised stock feeds in Saudi Arabia, and are vitally important in drought years.

Other himas remain important for the production of highly esteemed honeys, which sell for more than 130 dollars a kilogram. Still others continue to produce timber for local construction and for sale as a source of cash. In recent years, some of these honey and woodland himas have also become focal points for recreation.

Value for conservation

For biological conservation the long history of total or partial protection for himas is of great significance as they represent refuges for indigenous plants and animals which have been displaced elsewhere. Many himas are located in areas of high species diversity, or support juniper forests and other key biological habitats. Their role as geneplasm reserves will became more critical as development pressure increases. As sources of seed, traditional himas could play a vital role in the rehabilitation of the woefully degraded rangelands of Saudi Arabia.

Value to ecological research

The importance of historical himas to ecological research lies in the fact that they represent a range of areas that have been protected under some form of management regime for substantial periods. They provide an indicator of range potential under particular climatic conditions. This can be exemplified by study of the historical hima at al-Fawqah, in an area receiving an average of 350 mm rainfall (Duba and Ellis 1978). Within the hima vegetative cover stood at over 47% with an accumulated standing crop biomass of 353 g/m² Outside the hima ground cover was only 8% with a negligible standing crop of herbaceous vegetation.

Though the research opportunity offered by hima may lack some of the rigour of scientific trials, this may be more than offset by the speed of results obtained, considering that complete arid range recovery could take decades or centuries.

Value to socioeconomic research and development

It is apparent that the tradition of hima has contemporary applications for rangeland rehabilitation, stabilisation of grazing and water catchment management among others. In Syria, the hima concept has been utilised in a rangeland development project to increase range quality and animal production (Draz 1969). A similar extension of the hima system has been proposed for Saudi Arabia (Draz 1965, Duba and Ellis 1978, Grainger and Ganadelly 1984, Kingery 1971, Llewellyn 1982). However, for socioeconomic development purposes, the outstanding value of hima is that it represents a model of customary law relating to land use, which has fundamental importance for establishing a system of protected areas in Saudi Arabia and elsewhere in the Islamic world to meet modern needs.

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In this regard, it is instructive to review the underlying principles of the hima concept. The tradition sets an important cultural precedent in using designated areas of land for protecting and managing public resources over which individuals or populations enjoyed usufructural rights. The system therefore inculcates many of the socioeconomic and ecological principles essential for the sustainable use of natural resources.

In essence the system promotes the following principles:

ecological sustainability, as it allowed controlled use of resources and ensured their proper conservation

social acceptability, in that protected areas were widely recognised, respected and managed by local people

economic viability, because of the benefits and security it provided but also because allocation of benefit was equitable.

Allocating the rights to fodder and other communal resources to particular people who benefited directly from the conservation provided the necessary incentive for community discipline and investment. The hima system is thus a traditional recognition of the need to allocate access to scarce resources.

It is our contention therefore that the hima tradition embodies the fundamental ecological, ethical and socioeconomic principles whose wider recognition would serve the development of a modern system of reserves in Saudi Arabia and elsewhere in the Arab world (Abuzinada and Llewellyn 1990).

Building on tradition

Few established systems of protected areas are known that have a history comparable with that of traditional himas. As Saudi Arabia embarks on the creation of a national system of protected areas it is important that due account is taken of both past and currently evolving public attitudes towards proscribing land use rights.

Creating modern protected areas obviously requires the support and understanding of local people but their involvement in the process of establishing and managing protected areas is equally vital. The hima tradition provides an ideal base from which to evolve the necessary institutional mechanisms to encourage this public participation. can help preserve watering places, and are vitally important in drought years. Photo: Paul Goriup/Pisces Nature Photos.

Permanent himas

Firstly, the long-standing local appreciation of the need to establish areas for the conservation of primary resources is already in place in large parts of Saudi Arabia. It is not an imported concept based on foreign values, but one with a pragmatic local significance to the welfare of rural people. Alien regulations and institutions often instituted under foreign stimulation generally have no legitimacy to conservative societies, unlike those institutions embodied in traditional legal systems such as Shari'ah.



Secondly, the allocation of rights to the controlled use of resources has the sanction of Islamic law; Islamic law offers clear guiding principles to regulate the use of natural resources for the greatest common good. Certain resources like grazing, woody vegetation, wildlife and water cannot be owned in their natural state and are thus common property. In essence every member of society is entitled to benefit from a common resource to the extent of his need so long as he does not violate, obstruct or infringe the equal rights of others. The user is also accountable and must maintain the resources' value. To the extent that a common resource is not sufficiently abundant for everyone to use it freely, the direct rights of usufruct are allocated according to: 1) degree of need, 2) impact on the resource, 3) the investment in the resource by way of work or capital, 4) precedence, and 5) proximity to the resources clearly must conform with the basic requirements of Islamic law if it is to be acceptable.

The pragmatism of Islamic law relating to water is illustrative. Water, the limiting factor in arid ecosystems, cannot be wasted or its source despoiled so a descending order of priorities from drinking, washing, stock watering to irrigation, ensures that water use is optimised and the quality of the resource maintained. However, the prioritisation also favours those who have the greatest need, are less consumptive and have less impact on the resource or have prior claim to the water.

There are striking conceptual parallels between the benefits to be derived from the best possible use of the flow of water and those that can be derived from the flow of energy in natural ecosystems.

Application of the hima principle

In Saudi Arabia a plan for a representative national system of protected areas has been recently completed by the National Commission for Wildlife Conservation and Development (NCWCD) with the assistance of IUCN (Child and Grainger 1990). The system plan has sought to emphasise the socioeconomic strengths of traditional conservation practices, within a scheme for modern protected areas in which the goals are comparable with IUCN protected area categories.



The system plan has sought to extend the traditional concept of hima specifically in relation to customary law relating to land use. The hima ethic provided a valuable guide in the preparation of enabling legislation for protected area management and particularly to the categorisation of protected areas.

After analysing the traditional uses of himas together with contemporary conservation requirements for Saudi Arabia a system of five categories of reserves emerged.

A precise definition of these five categories was avoided as it is

Several large himas exist that could be gazetted as protected areas with virtually no alteration in their established management practices. Photo: Paul Goriup/Pisces Nature Photos. recognised that land use is essentially a continuum of practices, so that these protected area management categories will grade into and overlap with each other. The system simply prescribes broad management objectives for each category and so retains the flexibility of management which characterises traditional himas.

The contemporary value of the traditional hima may be best illustrated by the fact that several large and important himas have been identified that could be gazetted as protected areas with virtually no alteration in their established management practices. An example is the large tribal hima of al-Fiqrah near the city of al-Madinah, which for several centuries has been managed for terrace agriculture and honey production and where a unique variety of date palm is cultivated which reportedly produces up to 3 crops a year. Within the 540 km² hima domestic stock are excluded, to conserve honey plants, and as a result the flora is remarkably rich and diverse. The hima also constitutes an important wildlife refuge, notably for a relict population of Nubian ibex *(Capra ibex nubiana)* (NCWCD 1988b). Unfortunately, unregulated road construction and house building now threaten the hima which needs protection under national legislation.

Conclusion

The important cultural precedents inherent in the *hima* system have been briefly outlined. The revival and extension of the *hima* concept has far-reaching and exciting implications for the conservation of Saudi Arabia's renewable resources, through a process of consolidating existing traditional himas and creating new protected areas. It is recognised that the requirements of new protected areas may differ from the purposes for which himas were created in the past. Modern protected areas in general will be more extensive, will have to be located in regions where the hima tradition may be weakly developed, and will require a variety of management regimes and administrative institutions. At the same time, the obvious merits of the traditional hima suggest the need to tailor new protected areas to conform as closely as possible with local hima concept.

To this end the classification of protected areas for management purposes in Saudi Arabia has been designed to reflect the desirable flexibility that is a strong feature of the hima concept.

The principle of working through indigenous institutions to accomplish the objectives of conservation-linked development is now well understood. The hima tradition has popular appeal and has too many strong attributes to have outlived its usefulness in Saudi Arabia, and together with indigenous resource allocation systems can serve as a conceptual basis for a modern system of protected areas.

It is critical that cultural lessons from the past are not ignored. The wise conservation practices which have sustained previous generations in the Middle East and north Africa are relevant today and surely will be in the future.

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Can wildlife pay its way in Madagascar?

SHEILA O'CONNOR AND OLIVIER LANGRAND

Madagascar's biological systems provide an opportunity to test their 'profitmaking' capacity, due to their diversity, complexity and accessibility. However, many of these systems are fragile due to exploitation and degradation. Madagascan people are amongst the poorest in the world, and there are strong pressures for deforestation to provide new land for cultivation.

This paper describes current trends in integrated conservation and development practice and policy in Madagascar, discusses the potential for further such projects, and highlights the problems of trying to ensure sustainable practices. The possibilities for the management and collection of wildlife products are presented, and it is suggested that the sustainable use of native plants offers the best opportunity in the immediate future.

ADAGASCAR'S BIOLOGICAL systems provide ample opportunity to test their 'profit-making' capacity because they are very diverse in terms of species, physical and biological complexity and accessibility for exploitation. It is equally true that many of these systems are fragile because of early and current exploitation and degradation. These systems may also be more sensitive to change because they evolved in isolation from mainland challenges.

Madagascar is the fourth largest island in the world with a surface area of 587,000 km², and has been isolated for at least 120 million years. Its geographical position in the tropical/subtropical belt, its north-north-east–south-south-west orientation (blocking the trade winds), and its complex topography have given rise to a variety of weather patterns. Two major phytogeographical regions are a result of the diverse weather and complex geological features and soils: humid tropical forest and dry tropical forest (White 1983). The flora and fauna of Madagascar are equally well-known for their high level of diversity and endemism

Diversity and endemism in Madagascan vertebrates.

making Madagascar one of the nine major centres for biodiversity in the world.

Before the arrival of human settlers, about 2,000 years ago (MacPhee and Burney 1991), Madagascar was mostly covered by forest, although the central high plateau was a mosaic composed of woodlands, bushes and savannah (MacPhee *et al.* 1985). Now, 21% of the island is left under natural forest, 58% has a herbaceous cover, 14% is either cultivated or able to be cultivated, 2% is composed of river and lakes and 5% is non-cultivable land.





Eighty-five percent or more of Madagascar's 12,010,000 inhabitants (in 1990, from Hammond 1994) are rural agriculturalists/pastoralists. With a birth rate of 3.3% (Hammond 1994), Madagascar's population should double in the next twenty years. People living in Madagascar are among the poorest in the world, with a gross annual income of US\$210/year (Hammond 1994) and a growth rate of -0.3%. The economy is essentially dependent on agriculture and fishing. The need for new cultivable land is recurrent, and has led to the deforestation of much of Madagascar, leaving reservoirs of natural resources and genetic diversity. These reservoirs are protected in 39 different sites totalling 1,119,100 ha (Sayer et al. 1992), making up 1.9% of Madagascar's surface area or 8.8% of the native forest cover.

Location of protected areas and biologically important sites in Madagascar. (After Langrand 1994.)

Current trends in the management of protected areas

Integrated conservation and development projects

The current trend in conservation practice and policy in Madagascar is to link the protection of natural areas with economic development. In an effort to leap from traditional conservation-protection/preservation to modern, proactive conservation-management of natural resources, major steps have to be taken in terms of philosophy, activity and follow-up. Most integrated conservation and development (ICD) projects have three lines of approach: direct protection of an area, setting up alternatives to agricultural and pastoral practices which are destructive in terms of natural resource sustainability, and public awareness and environmental education of the importance of maintaining biological systems intact.

The principal goal of these ICD projects is the maintenance of biodiversity, and this is achieved by reducing pressure on the natural resources. Activities include:

- tree nurseries
- market gardens
- school gardens
- improved irrigation systems
- improved stoves
- employment of conservation officers, extension agents, animateurs etc.

Eventually, local people are expected to take over management of the natural resources in their area, as well as responsibility for protected areas serving as reservoirs of genetic material. Unfortunately, few of these activities actually provide enough incentive or information for local people to take responsibility for managing their natural resources (see Table 1).

Untested but potential activities in ICD projects

There are many areas in ICD projects which remain untested, but which on paper seem to provide more economic incentive for participation and greater sustainability. These include (see Table 2):

- cottage industries
- plant collection/production
- timber extraction
- animal collection/production
- hunting, fishing
- research/tourism fees.

It is naive to think that most of these profit-generating activities would be sustainable without strict controls and the cooperation of all participants to respect limits. Unfortunately, human nature has its limits too. Abuse is frequent even in developed nations, where protected area and natural resource management rules are strict and well-advertised, and the legal penalties for breaking these rules are well-known. The current exploitation rates in Madagascar indicate that

activity	run by	purpose	sustainability	economic incentive
Tree nursery.	Volunteer villagers/paid villagers.	Reduce pressure on native forests. Soil conservation. Provide wood needs to villagers.	Low. If villagers paid for work and if species grown are not usable rapidly.	Low. Must include species that could be sold if market exists (preferably native species).
Market garden.	Volunteer villagers/paid villagers.	Reduce need for more land to produce crops. To provide income. To improve diet.	High. If extension work, and no abnormal conditions. Low. If needs for fertilizer and/or pesticides.	Low. Products can be sold if markets exists.
Irrigation system.	Water user groups/ individual villagers.	Increase crop production Reduce pressure on land and watershed areas.	High. If no drastic climatic perturbations, if families remain low in number, if extension work for maintenance of canal and storage of crops works.	Medium. Sale of "extra" crops. Food self sustainablility. cultural important to have rice three times a day.
Improved stove.	Villagers.	Reduce quantity of fuel needed. Reduce pressure on forests.	High. if simple design of locally available material.	Low. In terms of money, except for people buying charcoal. High. In terms of energy expenditures.
Employment.	Project.	Assist project. Provide income. Accomplish job. Training.	Low. Need outside assistance or profit- making activities.	High. Salary short-term.

Table 1. Common activities of ICD projects.

there are inherent difficulties present in the system of controls/protection which exist already.

A closer look at economic utilisation of plants or animals will provide a test case for the possibility of managing sustainable resources around protected areas. A general premise accepted by many conservation and development organisations alike, and which directly affects ICD projects and village participation in natural resource management, is that people around protected areas know their resource base better than anyone else, and know how to use it better than outsiders (be they nationals or internationals). How does this premise fit in to the general ruling principle of integrated conservation and development projects to open up opportunities for local people to manage their own resources, redistribute

Table 2. Untested activities.

activity	run by	purpose	sustainability	economic incentive
Cottage industries.	Villagers/ cooperatives.	Provide income. Manage natural resource locally.	Medium, if people work well in groups, crafts are sold, and tourism is high.	High. Sale of goods.
Plant collection: seed, cutting or live.	Local villagers, registered village industries, registered companies.	Provide income. Reduce number of traders. Better distribution of income which benefits villagers. Manage natural resources locally.	High, if baseline data good, discipline and management procedures exist, and market remains high.	High. Direct profit from sale, low energy investment, control of natural resources.
Timber exploitation.	Companies with local employees, registered cooperatives.	Provide wood needs.	High, if managed correctly/locals paid for wood in lots and employed.	High. Profit for companies, locals and DEF if taxes paid.
Animal exploitation: live.	Registered village industries, registered companies.	Provide income. Reduction of amount of illegal traffic.	High, if baseline data is good, controls are tight, and villagers involved to manage natural resources.	High. Profit from sales.
Hunting/ fishing.	Government authority/local controls.	Manage populations. Provide food and sport.	High, if controls are in place and if baseline data is good.	Medium. Profit injected into local and national economy.
Tourism/ research.	Various organisations: university, travel agencies, etc.	To understand and advertise Madagascar's wealth in nature. Bring profit.	Medium, depending on outside interest and mechanisms in place for return of income. Investment from Government needed (infrastructure and communication).	Medium. Profit from fee paid and association with outside organisations.

wealth, improve standards of living and thus contribute to economic and social development? If local people are better able to identify potential resources, identify available markets and identify quantity and method of use, then they do not need help from outsiders or ICD projects.

In Madagascar, there are a number of problems associated with the aforementioned premise. First, most rural Malagasy are not native forest dwellers, although they have adequate knowledge of forest products to use for their own benefit (e.g. pharmacopoeia). Secondly, the contextual framework of resource utilisation is missing from most rural communities around protected areas. Little information is available to rural areas on how extensive and durable the resource base and the markets are.

The reality of protected area and natural resource management in developing countries like Madagascar is that people are chronically indigent, poorly educated, living on marginal land, with expanding families, and they have strong cultural practices which are difficult to broach or change, even though the current social, economic and ecological environment requires it to sustain life.

Collection of wildlife products

Of the proposed, but as yet mainly untested, interventions mentioned in reference to ICD projects, collection or production of wildlife products has the most potential for local economic development and management sustainability. Information on current trends in wildlife exploitation is also available to enable specific scenarios to be presented. Exploitation and trade in wildlife products is an on-going, significant activity, although there is virtually no economic return for rural people living near the resource base. Without the support and involvement of local people, sustaining exploitation of these products is highly

left:

An orchid (Gastrorchis sp.) from the eastern rainforest of Madagascar.

right:

This leaftail gecko, Uroplatus fimbriatus, is widely distributed, but locally threatened by trade collectors.

Photos: O. Langrand.





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species				country				total
	UK	France	Holland	Japan	Germany	Switzerland	USA	
Euphorbia sp.		97	21	50	324	1	4	497
E. duranii							4	4
E. ankarensis				50				50
E. francoisii					310		127	437
E. fianarantsoae					18			18
E. guillauminiana					980		100	1,080
E. caudex						1		1
E. didieroides						3		3
E. bedyotoides				50	2,765	5	158	2,978
E. isalo					4			4
E. imerine						5		5
E. bermentiana					30			30
E. lophogona					200			200
E. kondoi				25	8			33
E. moratii				50				50
E. milloti				25	251			276
E. bumbertii					240			240
E. neobumbertii					277	5	110	392
E. milii tulearensis					15	3		18
E. mainana		6			3			9
E. perrieri					119			119
E. primuleofolia					70			70
E. pachypodioides					320			320
E. pedilanboides		3			190			193
E. primulifolia	2	3		25	231	10	25	296
E. pauliani				50	153		100	303
E. quartziticola				50	350	10	19	429
E. rosulatum					15			15
E. stenoclada						2		2
E. speze					10			10
E. viguieri		50			773	8		831
E. virosa		1						1
Total	2	160	21	375	7,656	53	647	8,914

Table 3. Wild flora species exportation in 1989 (WWF, from MPAEF Ministry of Water and Forest).

unlikely. Involving local people, however, also presents difficulties in terms of handling and care of the stock, reproduction of the resources, storage and sale, amongst other constraints.

Sustainable and rational utilisation of wildlife and its products requires the cooperation, collaboration and commitment of numerous parties. These include researchers establishing the database, rural villagers participating in the activities, project managers storing, maintaining or managing the resource, and local, regional, national and international governments providing adequate controls and policies to maintain the resource in the long-term. National and international communities are involved as purchasers (creating a market), controllers (implementing legislation through organisations such as CITES), lobbyers (speaking for/against policies/practices which affect trade) and advisors (assisting in data collection and interpretation of market change).

Managing wildlife and its products

Madagascar and its wildlife products are valuable commodities because of their diversity, uniqueness and rarity. Both plants and animals are valued in national and international markets. In fact, information from the *Direction des Eaux et Forêts* and CITES on the legal export of animals and plants confirms the importance of this trade (see Tables 3 and 4).

The demand for these plants and animals continues to increase. There are eight major national operators which **Table 4.** Wild flora species exportation in 1989 (WWF, from MPAEFMinistry of Water and Forest).

species		countries		total
	France	Japan	Germany	
Alluaudia sp.	15			15
A. humberti	33			33
A. ascendens	9	4		13
A. procera		5		5
A. dumosa		2		2
Didiera sp.	170		510	680
D. madagascariensis	56	6	5	67
D. trollii	14			14
total	297	17	515	829

collect and export plants and animals, mostly to Europe. Unfortunately, most of these products are collected from the wild, and there is little incentive for rural people to become involved. The single exception in wild animal exploitation in Madagascar is the development of crocodile ranches. Eggs are collected by rural people, and then purchased by the rancher. Hence it is important for people to protect river banks and other native habitats as well as adult crocodiles so that they can directly profit from egg collection. This ranching project has met with some success, and two ranches are currently functional. It is unclear for how long wild populations will be able to sustain heavy egg collections while controls over skin quotas are still largely ignored by the government.

Plant production, on the other hand, has met with more success in nurseries in southern Madagascar and on the central high plateau. Methodologies for producing plants are more varied, including seed collection, whole plant collection, cutting, grafting and tissue culture. Rural communities could more easily adopt simple procedures for collecting or producing plants according to the availability of markets.

Constraints on the utilisation of wildlife

ICD projects should consider harnessing some of the demand for animal and plant products in their area so that rural people can directly benefit from their proximate natural environment. As pointed out earlier the economic incentives from these activities are high, and the link between sustainable management of these products and conserving biodiversity is also high. Many constraints are foreseen in making such utilisation acceptable on world, national and local levels, and to make it sustainable in terms of preserving ecosystems (see Table 5). In terms of the most stable market available for products, the least amount of energy/knowledge and resources invested, and the lowest cultural taboos, the exploitation and production of plants rather than animals is the more attractive proposition.

Conclusion

The main goal of ICD projects is to maintain the natural level of biodiversity in protected areas. To accomplish this goal it is necessary to limit the pressure that

Table 5. Fauna and flora: production versus collection.

production of fauna				
advantages	constraints			
Procedures for the control of export.	High initial investment and recurrent cost.			
Precise market quotas/controls.	Need for high-level training.			
Preservation of genetic stock.	Need for strict trade controls.			
Possibility for use in reintroduction programmes.	Need for veterinarian/health controls.			
Development of touristic interest.	Local taboos against handling certain animals.			
	Difficulties in transporting/export.			
	External controls on prices/market.			
	Cost of production greater than collection.			
	Incompatibility with CITES regulations.			
	Need for detailed data on animal populations.			
collection	of fauna			
advantages	constraints			
Rapid profit.	Need for detailed database.			
No investment needed.	Follow up studies required.			
Participation open to all.	Strict control needed.			
	Incompatibility with CITES regulations.			
	Impossibility of assuring continuity of collection.			
	Taboos associated with handling certain animal species.			
	Difficulties associated with export.			
	Skewed profit distribution to those distant from resource base.			
	Poor public image for companies associated with trade.			
production of flora				

advantages	constraints
High success even with limited genetic stock.	Incompatibility with CITES regulations.
Regularity and continuity in market of products.	Control of seed collection required.
Standardisation of products.	Internal market tied to international market.
Sustainability of system.	Disinterest in protecting natural areas if centres are successful
Preservation of genetic stock.	Need for baseline data on reproduction of plants.
Species with multiple uses and varied markets.	
Procedures and application of control/export.	

Possible use in reintroduction programmes. Both national and international market. Liaison with pharmaceutical/cosmetic industries.

Liaison with applied research.

Limited initial investment and recurrent costs. Simplicity of techniques required.

advantages

No investment needed. Instant profit. Participation open to all.

collection of flora

constraints Need for detailed database. Strict controls needed. Impossible to assure availability of plants. Internal market tied to international market. Skewed profit distribution to those distant from resource base. High possibility of traffic in bulbs or seeds. Incompatibility with CITES regulations. Public image problem for organisations associated with trade. the surrounding human populations exert on these sites. The improvement of the standard of living of these rural populations by developing profit-generating activities is one approach to conserving the high levels of biodiversity found in Madagascar's protected areas. This approach is largely untested, and remains at the experimental stage. The commercialisation of wildlife products is an economic activity which could be very valuable to communities around protected areas. However, the sustainable management of wildlife, through collection and/ or production, is limited by the following factors:

the need to have an extensive database which enables managers to decide on levels of exploitation in terms of quantity and location for different species

the necessity of having effective controls on the collection quotas so that they are not abused

• the need to invest in training rural people in identifying species, methods of collection and production, maintenance of animals in captivity and in transport and to invest in appropriate infrastructure for storing etc.

These significant constraints

preclude the development of community-based collection of animal species or of their production in a captive breeding centre. It is much more likely that the production of native plant species, which are valued as ornamentals, in village nurseries will succeed. The market for these products is high in many European countries as well as elsewhere in the world, including Madagascar itself. Such nurseries require less initial investment, less maintenance and less infrastructure than animal production, although training and base-line data are equally important factors. Plant production in nurseries can be done through seed collection or by using cuttings. These simple techniques are already wellknown by most villagers because of their expertise in agricultural and arboricultural production.

Production in nurseries can be carried out for plants other than ornamentals. For example, the production of medicinal plants (*Aloe* spp.) or species designed for use in live-fencing (*Alluaudia* spp.) would be applicable to village needs. The simplicity of producing certain plants in nurseries would be an encouragement to many communities, Allaudia procera is an endemic species distributed in the sub-arid thorn bush of the southern part of Madagascar, where it is occasionally used for live fencing. Photo: O. Langrand.



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although those that are some distance from transport and communication may have difficulty in marketing their products. In contrast to many of the larger scale economic incentive activities, plant production could rapidly be managed by villagers by themselves.

The collection and production of plants would also more easily be accepted in the cultural context of Madagascar. There are frequently taboos associated with animals, in particular reptiles and amphibians (those which are most sought after outside the country), and it is unlikely that rural communities would easily adapt to influences to capture and nurture these creatures. Can one hope to change attitudes of rural Malagasy to one of respect for the forest if the value of it is related to them in terms of animals which they fear? Plants are a straightforward vector of information about the quality of life. They are easily related to daily activities in rural communities, and their collection and production would be normal to agricultural communities. Protected areas serve as reservoirs of biodiversity, and everyone (near and far) needs natural resources. People profit from plants, and have done so for generations. Cash-incentives to motivate local people to manage wildlife products are necessary and understandable in areas where biological wealth overshadows economic stability. There are innovative, and traditional, ways to make wildlife pay its way in Madagascar, and thus conservation policy and practice whether through ICD projects or other means should begin to observe and test these to find success and sustainability.

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Establishment of biosphere reserves in Germany

JÜRGEN NAUBER AND DORIS POKORNY

Germany currently has 12 areas designated as biosphere reserves, covering 12,000 km². The history of these reserves is summarised, and the Rhoen biosphere reserve is examined in detail. This is a large reserve straddling the border of the former East and West Germany, and illustrates a variety of historical and current approaches to reserve planning and management. Methods of integrated management of the ecological and economic aspects of the reserve are discussed, and the part that the Rhoen reserve plays in the wider network of biosphere reserves is described. Progress towards an action plan for the biosphere reserve network in Germany is detailed.

THE BIOSPHERE reserve network in Germany now comprises twelve areas. All together they amount to about 12,000 km², which is equivalent to 3.3% of the land surface. They represent a wide range of landscape units in Germany from the Waddensea to the Alpine region. Half of the biosphere reserves are situated what was East Germany, the German Democratic Republic (GDR). Their history is directly linked with the unification process of East and West Germany.

For a variety of reasons the establishment of large protected areas was not possible in the former GDR. But under the Man and the Biosphere (MAB) programme two biosphere reserves were designated in 1979. Research activities, information and education services were the prime functions. Conflicts between conservation goals and land use interests were, however, not dealt with.

In contrast, the favoured nature conservation category in West Germany was the national park. Four national parks were designated (in 1969, 1978, 1985 and 1986), one of which (the Bayerischer Wald national park) was additionally given the title biosphere reserve in 1981.

Biosphere reserves both in East and West Germany were of very little public and political interest and obviously the potential of this new instrument to further The twelve biosphere reserves in Germany.



This changed under the new GDR government, which in 1990 set up a National Park Programme. Large conservation areas were designated and actual conservation issues were discussed, such as reconciling of ecological and economic interests and questions of sustainable land use. Biosphere reserves should be model regions for ecologically orientated land use in the former GDR. Due to the National Park Programme – just before



the reunification with West Germany – the two existing biosphere reserves were enlarged and four new biosphere reserves were designated along with a number of national parks and nature parks.

Whereas in the former GDR biosphere reserves have represented an official nature conservation category they have no legal status in West Germany yet. However the areas protected under GDR law were taken into account for the formulation of the unification treaty. It is under consideration to introduce biosphere reserves into the Federal Nature Protection Law which is presently being amended.

The National Park Programme had a decisive influence on the development of the biosphere reserve concept in Germany. Furthermore it facilitated the designation of two more biosphere reserves in West Germany in 1990.

Nonetheless, biosphere reserves in the eastern part of Germany are not only stronger in numbers but they also seem to have more importance and relevance in the conservation policy of the new *Länder* (states). This is possibly due to the fact that all biosphere reserves in the western part of Germany have been protected as national parks before their designation and there seems to be less urgency for action.

The Rhoen biosphere reserve however is an exception. As a joint project between three *Länder* it not only combines the east and west approach but will be an experiment for a 'trilateral cooperation' in Germany.

Plans and policies - the Rhoen biosphere reserve as an extraordinary example

The Rhoen biosphere reserve is situated in the centre of Germany and comprises an area of 1,660 km². It extends over roughly equal parts of the three *Länder*





The Rhoen biosphere reserve. Large areas of the reserve are still farmed using traditional, lowintensity methods. Photo: Doris Pokorny. Hessen, Bavaria and Thuringia; the latter of these three states belonged to the former GDR. This part was designated first as a biosphere reserve under the GDR National Park Programme. Bavaria and Hessen followed and a trilateral project started in 1991.

In history the Rhoen has always been divided and ruled by three sovereigns. This had a decisive influence on both culture and landscape. Although the three parts of the Rhoen show a lot of differences the following section emphasises the problems which they have in common.

For a better understanding of the present situation a brief review of the area's history and characteristics is necessary. The geology of the Rhoen represents the triassic formations of mainly red sandstone and shell limestone. Volcanic activities some 20 million years ago added volcanic rocks as a third geological formation. Massive erosion took place over geological times and shaped the landscape, which is characterised by rolling hills, volcanic peaks and large plateaux ranging from 600 m to 950 m above sea level. With the exception of small patches of bogs and rocky outcrops the area would have been completely covered by woodland, dominated by beech (*Fagus sylvatica*). This is why the Rhoen was called 'Buchonia' (beech tree country) when the first settlers started to cultivate the land in AD 680.

After several periods of clear cutting the Rhoen had become a cultural landscape, completely altered by man. Due to the demanding climatic conditions (5.5°C mean annual temperature and 1,000 mm mean annual precipitation), combined with soils of low yield capacity, food production was only possible at a low intensity. Application of synthetic fertiliser and pesticides to raise productivity never reached the same level as in other areas. Because of the prevailing natural conditions and the mentality of local people, who seemed

reluctant to take over the latest farming techniques, fine examples of traditional land use have been retained until today.

The unique cultural landscape of the Rhoen biosphere reserve has an open character. Hedgerows, orchards and solitary trees are characteristic features. A whole range of land use or ecosystem types is represented: natural or semi-natural bogs and woodlands, broadleaf and conifer forests, highand low-productivity meadows and pasture, arable land and settlements. About 85,000 people live in the area today, mainly in villages with no more than 1,000 inhabitants.

Since the 1970s structural changes in agriculture combined with EEC policies began to influence the Rhoen. Due to low incomes in agriculture the young generation tends to take wellpaid jobs in industries and services. woodlands, meadows, arable land and small villages – a wide variety of land use types are found in the Rhoen landscape, and the region is home to more than 85,000 people. Photo: Doris Pokorny.

Volcanic rocks,



Only few are prepared to run a farm, which in a lot of cases serves only as an additional occupation. The number of full-time farms in the Rhoen biosphere reserve is constantly decreasing.

This process has a decisive influence on the land use pattern. On the one hand production has been intensified where the soil conditions are better, which in some cases causes environmental problems such as ground water pollution and erosion. On the other hand management has been abandoned in areas which allow only extensive sheep and cattle grazing or hay production. These become fallow land or are afforested. Characteristic structures as hedgerows and orchards disappear because they are no longer used for firewood and fruit production.

Unfortunately, the ecosystems which are most affected by land use changes are the most important ones as habitats for endangered and rare species. They are essential for species richness, biodiversity and the landscape aesthetics of the biosphere reserve.

In Thuringia, which belonged to the former GDR, a similar process took place earlier and over a shorter period of time when the socialistic model of agriculture was introduced. Individual farmers were replaced by large-scale farming industry run by the state. Productivity was increased by applying fertilisers and pesticides, and by a new field structure which allowed maximum mechanisation.

In the Rhoen biosphere reserve intensive land use should ideally be reduced to a lower, sustainable level, whereas extensive forms of land use which are disappearing need to be kept. But how can the biosphere reserve influence the land use pattern in order to satisfy the economic interests of people who live on the land and reach nature conservation goals which are bound to the management of economically marginal areas?

Undoubtedly there are strong dependencies between both natural resources, the

land use pattern and the socioeconomic conditions. As far as conservation issues

Managing an ecological-economic system

The ecologicaleconomic system (from Deutsches MAB Nationalkomitee



In the course of a MAB-6 project on high montane ecosystems, carried out in the Berchtesgaden Alpes in Germany, the man-environment interrelations were approached by the following scheme (Deutsches MAB Nationalkomitee 1991). The figure shows the model of a regional man-environment system consisting of

a natural system of abiotic and biotic resources

a socioeconomic system comprising the business, political/administrative, sociodemographic and sociocultural subsystems.

Where this socioeconomic system overlays the natural system a land use



system results, as an expression of the spatial activities of man in his environment. Depending on the degree of human influence the resulting land use types range from natural and seminatural to forestry and agricultural up to technical and urban land use types.

Between the systems there exist dependencies and interrelations. The land use pattern plays the key role and is the variable factor in the system. It reflects both natural and socioeconomic conditions. It also plays the key role in conservation activities which focus on special land use or ecosystem types.

In the traditional nature conservation approach, however, nature conservation areas have often been designated without consideration of the socioeconomic consequences. This can result in local people not accepting the conservation areas, and in political actions being taken against nature conservation issues.

Therefore integrated concepts are needed to reach conservation goals. Biosphere reserves are a chance to try new strategies. If we understand a biosphere as an ecological–economic system, both natural sciences and socioeconomic sciences will be needed.

Management planning flowchart.

The planning aspect

Steps and methods towards a management plan

A management plan is the vital basis for all activities in the biosphere reserve. The zoning system corresponding to the UNESCO criteria for biosphere reserves helps to coordinate the different functions and conservation goals. Following a landscape analysis and land use evaluation, the zoning system is presently being improved for the Rhoen biosphere reserve. The relevant steps to be taken are indicated in the flow-chart.

Before starting the operation general conservation principles and guidelines in the biosphere reserve have to be clearly defined:

• which land use or ecosystem types are the most important and valuable in the biosphere reserve and why?

which land use types do not correspond to nature conservation goals and how should land use be changed? What are the limiting factors?

• which are the relevant land use activities and methods in the biosphere reserve and what is their impact on natural resources?



■ can human activities and land use methods be combined with nature conservation goals or do they need strict management?

• what are the evaluation criteria for land use types according to the above questions, and what are the relevant data?

An appropriate inventory method has to be applied which provides the relevant information as quickly as possible, with the minimum of field work, with an integration of already existing data, and preferably suitable for data management by a geographical information system.

The structure and extent of land use types can be easily identified by aerial false-colour infrared (CIR) photographs. Each land use type can be described by typical attributes, e.g. its characteristic plant or animal species. Already existing data can thus be integrated, missing data must be derived from field work.

In a further step the land use types will now be evaluated according to conservation goals. Relevant criteria may be, for example, naturalness, importance as habitat for endangered species, sensitiveness (to certain impacts) or ecological carrying capacity. The result is a differentiated evaluation of the whole biosphere reserve area. On this basis different zones can be defined.

The method described allows overall spatial information about the present conservation value of the biosphere reserve and is the basis for the identification and designation of core areas, buffer and transition zones.

It indicates where changes in land use will be necessary to reach conservation goals and helps to define management needs. A comparison of conservation goals with socioeconomic situation e.g. development trends shows actual and potential conflicts. Data processing can be done by hand or with the help of a geographical information system as it is used in the Rhoen biosphere reserve.

Translating the plan into action

For the next step more detailed studies, which are based on the zoning system, will be necessary, to assess the impact of conservation issues on socioeconomics and to find solutions which satisfy both sides. This raises the question of whether there is a short term economical (fiscal) value in nature conservation approach?

For the Rhoen example this means that the conservation of the cultural landscape may result in:

■ product related profit, e.g. through farming products; high quality beef, lamb and dairy products in combination with new marketing strategies and cooperative projects

■ landscape related profit, e.g. through promotion of low impact tourism; raising a 'landscape' visitor's tax; or through state subsidised landscape management.

During the whole of the planning process it must be ensured that the public has the possibility of participating in the project. This helps to avoid acceptance problems and will be a chance for the integration of local experience and knowledge. A biosphere reserve may be planned and administered by scientists but to make it work depends on the local people. This must not be forgotten.

The trilateral problem

In Germany, which is characterised by a strong federalism, each *Land* is fully autonomous for nature conservation policies. The federal government gives

guiding principles through framework legislation. The Rhoen biosphere reserve is a project of the three *Länder* Hessen, Thuringia and Bavaria. Although they comprise of the same natural unit the three parts of the biosphere reserve have had a different historical and political development.

Making the biosphere reserve work needs an overall management. Therefore a joint management plan is being elaborated by the three *Länder*. This is the first step for action. Furthermore organisational structures and competencies must be laid down in the very beginning in order to make the biosphere reserve work.

Since the establishment of a central administration with sovereign rights on the whole territory of the biosphere reserve is not possible, the *Länder* favour a decentralised administration with departments in each *Land*. Each *Länder* administration will have the duty of being the coordinating unit for five years in rotation. Also, the geographical information system is situated in one*Land*, which is responsible for its overall application in research and management planning.

A trilateral treaty, which is the formal basis for the biosphere reserve administration, is presently under preparation. It defines the competence, tasks and functions of the biosphere administration departments and the means of trilateral cooperation and coordination over management and research.

No model for a trilateral administration within Germany exists, so this system has a pilot function, and a long decision-making process can be foreseen. A draft structure for the future biosphere reserve administration has been worked out by the representatives of the biosphere reserve departments. Each department should comprise of sections which correspond to the various functions of the biosphere reserve: The landscape and its biodiversity can be maintained with sympathetic management from local farmers and landowners. Photo: Doris Pokorny.

Administration and finance section
 Public relations and information
 section with following tasks: running

the project visitor centre, tourism management, organising the ranger system

■ Research section (as part of a trilateral working group) with following tasks: organisation and coordination of applied ecological research, organisation and coordination of integrated ecological environmental monitoring, harmonisation of research and monitoring within the national biosphere reserve network

■ Planning and management section with following tasks: development control, management planning, translation into action, cooperation with the local 'biosphere reserve association', extension service.

The local 'biosphere reserve association' represents local communities, councils and non-



governmental organisations. It is able to receive state grants and subsidies and will be a democratic element when it comes to funding of model projects. Propositions will be made by working groups under the frame conditions of the biosphere reserve administration. Translation into action lies within the responsibility and organisation of each *Land*.

A lot of functions of the biosphere reserve overlap with those of other institutions, such as development control or nature conservation management. Therefore cooperation with the local administration bodies must be clearly defined and relevant competencies must be given to the biosphere reserve administration.

The network idea

Functions of the biosphere reserve network in Germany

Biosphere reserves have a logistic role in the mutual transfer of knowledge, experience, data and information.

In the course of the reunification process in Germany the opportunity was taken to establish a biosphere reserve network that comprises twelve biosphere reserves at present.

Representatives of each biosphere reserve form the "Permanent Working Group for Biosphere Reserves in Germany" which meets several times a year under the chair of the MAB National Committee. Tasks of the working group are: working out an Action Plan for the German biosphere reserve network concerning national, European and worldwide cooperation

Ecotourism can play an important role in conservation. To be successful, interpretation programmes for both locals and visitors are needed. Photo: Doris Pokorny.

consulting functions

harmonising research concepts

harmonising methods and approach of integrated ecological environmental monitoring

• exchanging experiences of each biosphere reserve and discussing specific problems.



How to make the network work

One of the most important tasks now is to set up the Action Plan. The intention is to ensure a harmonised development in all biosphere reserves in Germany and to pass on guidelines for conservation and management. These guidelines will also be published and will contribute to public relations work for biosphere reserves. A draft paper is currently being prepared. The biosphere reserves in Germany – except one – have all been finally designated during the last 18 months. This provides the opportunity for building up a network that ensures a concerted action.

JÜRGEN NAUBER AND DORIS POKORNY

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Rattan management for sustainable livelihoods

STEPHEN F. SIEBERT AND JILL M. BELSKY

Rattan collecting and handicraft production provide important incomes to poor people residing in and around Kerinci-Seblat National Park (KSNP) in Sumatra, Indonesia. A lack of access to irrigated rice fields, insufficient yields from degraded hillside farms and limited wage labour opportunities leave many households with few livelihood sources other than to collect rattan or cultivate farms within the park on an illegal basis. Investigations of *Calamus exilis*, an economically-important rattan in KSNP, revealed an average of 283 plants and 1,910 m of harvestable cane per hectare in rattan collecting areas inside the park. Preliminary data suggest that *C. exilis* can be repeatedly harvested at three to four year intervals. Assuming a three year harvesting cycle and 1990 market prices paid at roadside, rattan harvesting could generate approximately US\$5.00 per hectare per year on a sustained-yield basis.

Rattan collectors and artisans in Kerinci reported that they would rather earn their livelihood from rattan than cultivate forest farms, given access to legal and reliable sources of cane. Designation and management of extractive zones for rattan is recommended in KSNP. Managed harvesting of rattan represents a potential means of relieving pressures to convert forest lands, while simultaneously providing some poor households with a sustainable livelihood. However, additional income-generating sources are needed to solve forest conversion pressures in KSNP, particularly among poor households who are not engaged in rattan-based activities. Managed harvesting of wild rattan may be appropriate in other forest preserves in south-east Asia.

Vast areas of Kerinci-Seblat National Park are being converted to cinnamon and coffee farms, including the principal rattan producing region around the village of Sungai Kuning, seen here, 20 km inside the park. Photo: Stephen Siebert.

TROPICAL FORESTS in south-east Asia are rapidly disappearing under the combined pressure of timber harvesting and forest conversion by landless poor. A network of national parks and protected areas has been established in south-east Asia (Collins 1990), but the viability of many protected areas is threatened by resident peoples who for generations have collected forest



products and cultivated land now designated as reserves. Not surprisingly, conflicts between protected areas management and local economic development are intensifying. As West and Brechin (1991) have noted, simultaneously protecting biodiversity and the rights of people who live in and around protected areas is the paramount conservation challenge throughout world.

Rattans are a large group of climbing palms that comprise one of the most important forest products in south-east Asia. Rattans have been used for centuries in binding, basketry and weaving and are now a major source of cash income (DeBeer and McDermott 1989). Managed rattan harvesting is an attractive candidate in forest conservation and local development efforts because these plants have a wide range of traditional uses, are an important source of cash income, have little effect on other forest flora and fauna when harvested, and because without management wild supplies are likely to be exhausted.

This paper evaluates the potential that managed harvesting of one economicallyimportant rattan species might have for fostering economic development among resident people, while simultaneously contributing to forest conservation objectives.

Research site and methods

Site

One of the preeminent protected areas in south-east Asia is Kerinci-Seblat National Park (KSNP) in Sumatra, Indonesia. KSNP is a 1.5 million ha reserve that ranges from 100 to 3,800 m elevation and includes an extremely diverse flora and fauna. As is the case in all Indonesian national parks, farming, forest product collecting and hunting are strictly prohibited. In the centre of KSNP is a 10 by 80 km long settlement, Kabupaten Kerinci, which has been the traditional home of a distinct cultural group for many generations. Approximately 280,000 people inhabit the Kerinci enclave. The Kerinci economy is agriculturally-based with irrigated rice grown in the central valley and both annual food crops and

The Kerinci Enclave region of Kerinci-Seblat National Park. The principal rattan collecting area is located around Sungai Kuning.

perennial cash crops, particularly cinnamon (*Cinnamomum burmanii*) and coffee (*Coffea robusta*), cultivated on surrounding hillslopes that have been cleared from forests.

KSNP has been designated by IUCN (1984) as one of the most important and critically threatened protected areas in the humid tropics; thousands of hectares in the park have already been converted to cinnamon and coffee farms threatening both the integrity and longterm viability of the park. The individuals involved in forest farming inside KSNP are primarily young, resource-poor households who originate from three villages in the Kerinci enclave. These three villages are characterised by a shortage of irrigated rice land, degraded uplands and lack of alternative wage labour opportunities (Siebert 1989).

One of the principal villages involved in forest farming in KSNP is Sungai Tutung, the traditional centre of rattan basket-making in Kerinci and



more recently home to a vigorous rattan handicraft industry for the domestic Indonesian market. The rattan cottage industries in Sungai Tutung rely primarily upon one species of cane, *Calamus exilis*, all of which is illegally collected from wild populations inside KSNP.

Calamus exilis is a small clustering rattan that is capable of both sexual and vegetative reproduction (i.e. it sprouts new canes after being harvested). It ranges throughout Peninsular Malaysia and Sumatra, but is most abundant on ridges in hill and lower montane forests (Dransfield 1979).

Methods

Research on the abundance, site preferences, value and management potential of *Calamus exilis* was conducted 25 km inside KSNP in the principal rattan collection area (see map). Demographic characteristics of *C. exilis* were determined by sampling plant and cane abundance, and environmental factors in forty 0.05 ha plots selected at random intervals along transects (total of 2 ha sampled) in primary forests. The sample plots were located between 1,200 and 1,400 m elevation and were characterised by steep slopes (20%–100%), lower montane hill dipterocarp forests and Tropohumult soils.

In each plot, the following data were collected: a) the number of juvenile and mature rattans b) the number and length of canes per plant c) the predominant light regime, d) competition from understorey vegetation, and e) soil drainage characteristics. One soil sample, comprised of five subsamples, was collected between 0 and 15 cm depth in each plot. Samples were analysed for pH, available phosphorus, potassium, calcium, magnesium, exchange acidity and organic matter using standard analytical techniques by the Cornell Nutrient Analysis Laboratories in Ithaca, New York.

Rattan abundance was summarised using descriptive statistics. Site preferences were evaluated with regression analysis. The value of rattan harvesting was estimated using 1990 prices paid to collectors upon delivery of canes to local markets. Local perceptions of forest farming and interest in rattan livelihoods were assessed by informally interviewing forest farmers and rattan collectors inside KSNP and interviewing rattan artisans in Sungai Tutung.

	mean number per p	blot (std dev)	mean number per hectare
C. exilis plants			
total	14.2 (1	0.0)	283.6
seedlings	7.2 (7.4)	143.0
juvenile	3.8 (3.4)	75.0
mature	3.3 (3.3)	65.4
C. exilis canes			
total	57.1 (50).6)	1147.4
harvestable	9.6 (12	2.9)	191.0

 Table 1. The number of Calamus exilis plants and canes in lower montane forests of Kerinci-Seblat National Park (n=40).

(mean cane length 10 m)

Results and discussion

Demographic characteristics of Calamus exilis

An average of 283*C. exilis* plants with 65 mature plants and 191 harvestable canes were observed per hectare in the principal rattan collecting area of KSNP (Table 1). Cane lengths averaged approximately 10 m. Thus, the forests of KSNP produced about 1,910 m of cane per hectare.

Populations of *C. exilis* showed a strong negative relationship with light intensity and competition from understory vegetation. Sites with high light intensities were negatively correlated with the number of mature plants, number of canes and number of canes of harvestable length. Similarly, sites with dense understory vegetation were negatively correlated with the number of mature plants, total number of canes and number of canes and number of canes of harvestable length. No

significant relationships were observed between *C. exilis* populations and edaphic conditions, with the exception of soil drainage. *C. exilis* was confined to sites with moist, but well-drained, A-horizons, and was absent in poorlydrained soils.

Economics of managed rattan harvesting

The forests of KSNP contained approximately US\$15.80 worth of unprocessed *C. exilis* cane per hectare (assuming 1990 market prices of Rp4,500 per 100 canes of 3 m length). Rattan collectors reported that *C. exilis* can be harvested approximately three years after cutting and that subsequent production is comparable to initial yields. Marked plants were resurveyed in June 1992; observed resprouting and cane growth rates are reported in Siebert (in press).

Assuming plants can be harvested every three years, the value of sustainedyield *C. exilis* harvesting is about US\$5 per hectare per year. That is, each hectare of lower montane forest produces about \$5 worth of unprocessed rattan cane per year. The profitability of sustained-yield rattan harvesting is very low, on a per unit area basis, when compared with clearing forests and cultivating perennial cash crops; cinnamon and The rattan, Calamus exilis, thrives in the lowlight environment found beneath primary hill dipterocarp forests in west-central Sumatra. Photo: Stephen Siebert.



coffee cultivation earns farmers an average of about \$1,100 per hectare per year (Siebert 1991).

In contrast, the profitability of rattan collecting, on a daily wage labour basis, is very attractive in comparison to alternative wage labour opportunities (e.g. agricultural field work). Rattan collectors earn an average of US\$1.50 per day compared to US\$1.00 per day for local agricultural labour, irrespective of whether the cane is harvested on a sustainable or unsustainable basis.

The hill dipterocarp and lower montane forest types, such as seen here, are widespread in Kerinci-Seblat National Park. Photo: Stephen Siebert. The profitability of rattan to local communities could be increased by improving cane processing techniques (e.g. use of simple, inexpensive machinery to remove silica cane sheaths) and enhancing product marketing. At present, over 70 Sungai Tutung families rely on rattan handicraft or basket-making as their primary source of cash income (these benefits were not included in estimating the value of rattan), and all products are marketed either locally or in nearby



Sumatran cities. The development of market outlets in Java, Europe and North America could potentially increase economic benefits to Kerinci rattan artisans.

Implications for forest conservation and management

At present, forest conversion to perennial cash crops is widespread and uncontrolled throughout KSNP. Informal interviews with forest farmers from Sungai Tutung revealed that most would prefer to remain rattan artisans. However, because of a shortage of rattan supplies and a strong international market demand (i.e. high prices) for cinnamon and coffee, many see little or no alternative but to cultivate cash crops.

The shortage of *C. exilis* canes results, in part, from a government prohibition against collecting forest products within KSNP. The cultivation of perennial crops is also prohibited in KSNP; however, forest guards rarely patrol within the park and once cinnamon and coffee reach local markets it is impossible to determine their point of origin. In contrast, rattan is available only from within the park, and collectors can be apprehended when they attempt to transport or sell the rattan in local markets. The development of sustained-yield harvesting guidelines for rattan could provide a continuous source of income for collectors, raw materials for the local rattan industry and provide residents of Sungai Tutung with an incentive to conserve forests.

The area required to support sustained-yield *C. exilis* harvesting is difficult to estimate because no records of rattan consumption exist. Presently about 75–100 full- and part-time rattan collectors gather an average of about 200 3 m long canes per day. Collectors harvest only 2–3 days per week as cane cleaning and transport to market require additional time. In addition, rattan gathering is seasonal work for some collectors; many prefer not to gather canes during rainy months (November to April), while others engage in seasonal agricultural work as farmers and wage labourers. If one assumes that 80 collectors harvest 200 3 m canes two days per week for 30 weeks each year, a total of 2,880,000 m of *C. exilis* are harvested from KSNP on an annual basis. Based upon the abundance data cited above, this represents approximately 1,500 ha of forest harvested each year. If *C. exilis* were harvested every three years, at least 4,500 ha of forest would be required to support the Sungai Tutung rattan industry at current cane consumption levels.

The actual area required to support sustained-yield *C. exilis* harvesting may be greater than 4,500 ha due to the crude harvesting estimates employed here and because the demand for cane is increasing. Nevertheless, *C. exilis* is found throughout tens of thousands of hectares in KSNP and vast areas of the park have not been harvested at all.

Indonesian park officials and conservation NGOs should examine the feasibility of establishing extractive reserve areas for managed harvesting of *C. exilis* canes in certain zones within KSNP. One means of managing rattan harvesting would be to demarcate management units (i.e. mini-watersheds) in the principal collecting areas and open these sites to *C. exilis* harvesting once every three or four years. This approach will require park personnel to patrol inside KSNP, rather than remain in the buffer zones around the enclave, but more rigorous enforcement efforts are essential given the current practice of clearing forests for farms. Rattan collectors could be enlisted in park patrol efforts while collecting cane and perhaps provided with a supplemental income for patrolling efforts.

Conclusion

Rattan gathering and cottage industries are an important, traditional livelihood source for some households who live adjacent to KSNP. Managed rattan harvesting has the potential to foster economic development and forest conservation because it can provide local people with a viable livelihood thereby reducing pressure to convert forest to agricultural uses and because canes can be harvested on a sustainable basis with little or no effect on other forest flora and fauna. The long-term viability of KSNP and other national parks in Indonesia will be determined, in part, by the extent to which conservation benefits rural populations, particularly those who have few alternative but to clear forests for immediate food and cash income needs.

Managed rattan harvesting will not solve forest conversion pressures in KSNP. Alternative income-producing activities must be developed for the hundreds of households who currently farm inside the park, but are not engaged in rattan PARKS VOL 4 NO 3 • OCTOBER 1994

gathering or cottage industries. This will require improving agricultural productivity and reclaiming degraded lands adjacent to KSNP and developing off-farm livelihood alternatives. While managed rattan harvesting alone cannot ensure the conservation of tropical forests, it represents an important component in forest conservation strategies, and warrants greater research and development consideration.

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Legal brief The United Nations Convention to Combat Desertification

THE LIVELIHOODS of 900 million people in some 110 countries are threatened by desertification and land degradation in arid, semi-arid and dry sub-humid areas. The United Nations Environment Programme calls desertification "one of the most serious global environmental problems".

The multilateral management of our planet's natural resources is clearly a necessary element in global governance. The Convention to Combat Desertification called for at the 1992 Earth Summit builds upon Rio's sustainable development paradigm to provide a balanced legal framework for increased international cooperation.

Today, it is recognised that there is much more to desertification than the containment of moving sand-dunes. It is difficult to grasp the full impact of the loss of the agro-ecological balance in arid lands. Often there are unanticipated effects; for instance, the Almeria Symposium, organised by the Government of Spain and the INCD Secretariat in February of this year, explored the relationship between land degradation and migratory pattern linkages when the planet is likely to be home to 9 billion human beings within the next 50 years.

The international legal agreement to curb the degradation of drylands worldwide opened for signature in Paris on 14–15 October and was signed by 87 countries. The majority of countries announced their plans for putting the agreement into action and outlined concrete steps they will take immediately to tackle urgent desertification problems in Africa.

It is hoped that these interim measures will jump-start the Convention's implementation even though the accord is not expected to become legally binding for some two years. It will enter into force 90 days after it has been ratified by legislatures in 50 countries. The Convention will remain open for signature in New York until 13 October 1995.

Features of the Convention

The Desertification Convention is an innovative document which will contribute to the development of international law in many ways. It represents a major departure from the earlier approach after the 1977 UN Conference on Desertification but will require strong, focused implementation to become a reality. A number of provisions have to do not with what needs to be done but with how it should be done. The major features of the Convention are as follows:

■ It is based on a bottom-up approach to fighting desertification on the ground, at the local level of the affected people in the drylands. Experience has shown that plans developed by governments are ineffective unless they are accepted and actively supported by the populations concerned. Thus the Convention will create, for the affected countries, an obligation to provide for the effective participation of local populations in policy planning, decision-making, and implementation and review of programmes.

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• It contains precise commitments, detailed in regional implementation annexes, to the preparation by affected countries of national action programmes, fully integrated with national policies for sustainable development, as well as sub-regional and regional action programmes.

■ It adopts an integrated approach to the problem of desertification: action programmes are to address the various aspects of the problem, including the socioeconomic and the physical/biological dimensions; it is the first treaty which comprehensively applies the concept of sustainable development.

■ It gives an unprecedented role to non-governmental organisations and encourages their participation in all aspects of the preparation and implementation of action programmes.

■ It establishes a global financial mechanism to identify sources of funds and mobilise needed financing, the availability of adequate funding being a key to its success.

Implementation structure

The Conference of the Parties is a powerful new institution to guide and integrate implementation activities. During the interim period the International Negotiating Committee in effect acts for it. The core of Convention is the system of action programmes which the conference of parties will review.

The successful implementation of the Convention requires the effective coordination of all relevant actors, including donor countries, intergovernmental organisations and non-governmental organisations. In particular, it is important to ensure that a process of cooperation prevails among donor countries as opposed to the attitude of competition that has prevailed in the past, often to the detriment of recipient countries.

To address this difficulty, the regional implementation annexes introduce the concept of partnership agreements, which are the very heart of the Convention. These agreements will provide the framework for the development by affected countries of their action programmes to combat desertification, with the active participation of bilateral and multilateral donor organisations. The objective is to ensure that the actions of donor and recipient countries are complementary and coordinated.

Of course, the success of this approach depends on the participation of all actors involved in development assistance. In this regard, in the context of its role as facilitator, the INCD Secretariat is currently working to raise awareness of the Convention particularly among relevant organisations, to ensure active involvement.

All developing country parties that ratify undertake an obligation to prepare national action programmes, on which the Convention and the annexes contain detailed guidance. Affected developed country parties also undertake this, except for those which choose to opt out of this requirement if it causes constitutional problems. Those who opt out will do less detailed national desertification strategies.

Affected African countries are committed to do five sub-regional action programmes for north, west, east, central and southern Africa as well as a regional action programme. There will also be joint action programmes, including the subregional and possibly the regional level in other areas, for example central Asia and the Transcaucasus, the northern Mediterranean and the Middle East.

Conclusion

While the Convention innovates in many respects and is promising for the future, we must resist the temptation to regard its conclusion and subsequent entry into force as the ultimate objective. This achievement will not be the end of the road; it is only the starting gate. The successful implementation phase will determine whether progress is made towards the real objective: the sustainable development of countries affected by drought and desertification.

Hama Arba Diallo is presently Executive-Secretary for the Intergovernmental Negotiating Committee to Elaborate an International Convention to Combat Desertification, especially in those countries which experience serious drought and/or desertification, particularly in Africa. He has been leading the Secretariat since January 1993. INCD Secretariat, PO Box 76, 1219 Châtelaine, Geneva, Switzerland.

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The 87 signatories to the United Nations Convention to Combat Desertification, as at 15:30, 15 October 1994.

Whose Eden? Empowering local communities to manage their wildlife resources

The Overseas Development Administration of the British Government commissioned the International Institute for Environment and Development (IIED) to review community approaches to wildlife management, particularly in Africa. The conclusion to this, *Whose Eden?*, was written by a multidisciplinary team drawn from several of IIED's programmes. It presents an overview of the literature, drawn from project progress and evaluation reports, books, donor publications and reports, journal and newspaper articles, and technical papers in workshop proceedings. The report analyses the major themes on community approaches to wildlife management. This article is taken, with kind permission of IIED, from their newsletter *Perspectives*.

"When the whites first arrived in this area, they thought we were wild animals and chased us into the forest. Now that they have found out that we are people, they are chasing us out again."

Okiek hunter-gatherer, Mau Forest, Kenya, 1992.

THE CLASSIC top-down approach to wildlife management is no longer tenable if wildlife conservation is to be assured. This traditional approach has for years involved the establishment and expansion of protected areas, the introduction and enforcement of wildlife legislation, and the assumption of ownership of wildlife resources by the state.

In many respects this kind of wildlife management shares the same top-down characteristics of many other rural development initiatives, but they have been slower to integrate local people into activities than initiatives in other sectors.

Where well-supported, this classic approach has without doubt ensured the survival of populations of certain species and ecosystems and contributed to the generation of foreign exchange earnings, but in many cases it has also had a negative impact on the food security and livelihoods of local people.

Faced with a rapidly diminishing resource base, conflicts between local people and conservation authorities have escalated and law enforcement has become less practical and more costly. Human populations have continued to grow, increasing demands on remaining resources leading to environmental degradation and further conflict.

This trend has, in turn, reinforced the protectionist argument, commonly advocated by natural scientists (often expatriates), that local people do not have the knowledge, will or training to undertake sustainable wildlife management. As a result projects have been drawn up as 'blueprints' with communities viewed as homogenous undifferentiated units.

Top-down approaches to wildlife protection have also entailed high management costs for governments while the majority of benefits accrued to

external interests. It has always been assumed that the value of conserving wildlife is greater than the costs incurred and, as a result, top-down approaches have rarely been analysed vigorously to determine whether the benefits are in fact more than the costs.

The emergence of community approaches

Over the last 20 years, there has been a growing realisation of the importance of understanding the needs and perspectives of local people, of interactive communication, and of strengthening local institutional capacity. There is now an increasing awareness that local producers are knowledgeable about wildlife resources and in the past had effective management systems to control their exploitation.

This recognition has led to the emergence of participatory approaches aimed at involving people in the whole process of wildlife management. But 'participation' is interpreted and practised in many different ways from passive to active while some initiatives have advocated different participatory approaches at different stages in their implementation.

Passive participation

Passive participation is characterised by centralised decision-making and control usually dominated by foreign and national technocrats, whilst the involvement of local communities is limited to labour or the provision of information.

These initiatives have been typified by compensation schemes, incomegenerating projects, and the substitution of modern methods and environmental education programmes for indigenous farming and management practices.

Although such projects provide a wider range of benefits to local people than top-down approaches, closer examination of such schemes reveals they have rarely been subjected to full cost-benefit analyses undertaken from a community or broader perspective. Their ecological and socioeconomic viability cannot, therefore, be guaranteed.

The majority of these schemes aim to compensate local people for loss of access to natural resources by providing an alternative livelihood source. By so doing, it is assumed that the economic incentive to exploit wildlife is removed.



However, in practice, these schemes are usually carried out under the auspices of donor-funded projects which view local people as passive beneficiaries. Benefits are not always distributed equally, compensation is rarely proportionate to the amount of income foregone, and the services provided do not address sufficiently the needs of the people.

In addition, adoption of various income-generating schemes often fails owing to lack of markets. In some cases, schemes become so time-consuming and complicated that local people find it impossible to participate.

Communities have often been regarded as homogeneous entities, and insufficient attention is given to diversity in their make-up. This has led to problems of equity over access to resources and distribution of benefits. For example, the lack of success with some projects can be attributed to their 'genderblind' nature. Gender relations, resource ownership and management rights within a community are not always understood prior to the design and implementation of projects. In some cases projects fail because they segregate activities by gender and interfere with the community's relationship with a particular resource.

Rebuilding the relationship between conservation authorities and local people, after a history of policing and exclusion, has proved difficult. Some governments have been unwilling to support participation, especially if seen as a threat to central authority. In the absence of additional incentives, farmers may be unwilling to adopt 'modern' resource management techniques, since adoption of these does not guarantee a secure livelihood. Numerous cases exist where coercive methods rather than interactive dialogue have been employed, whilst project managers continually underestimate the time, human resources and commitment necessary to rebuild trusting relationships with communities.

Incentive schemes providing benefits *outside* protected areas in effect reinforce local communities' exclusion from wildlife resources, alienate them from their active management, and emphasise their powerlessness in the face of development agencies and government bodies. In these circumstances local communities have little interest in supporting conservation and management initiatives within protected areas. All too often, because donors provide infrastructure, schools, clinics, wells etc. in areas outside protected zones without consultation or participation with local communities, these initiatives are seen as grants from the government or donors, who should remain responsible for their future maintenance. Clearly, they are unsustainable.

Active participation

Over the last 10–15 years, various initiatives have progressed towards more active participation with local producers. These sought to devolve power and responsibility for resource management to the community, and local people have become involved more actively in the generation and distribution of benefits. Examples of this approach include community game guard schemes and income-generating activities based on the needs of local people. They are often centred on communal lands, rich in wildlife, around protected areas. These initiatives help communities to gain an even greater share of the benefits of wildlife management and may, for example, reduce poaching levels. However, in the absence of stable local institutions they can entail greater costs for the community.

Institutional capacity-building

Institutional capacity-building at a local level is rarely addressed and, in many areas, institutions remain undeveloped. Cases exist where local institutions are far from democratic and projects fail because the benefits are not distributed equitably. Problems also arise where a project has been initiated by high-level patronage without committed support from all government agencies concerned. If that patronage is subsequently removed, previously aggrieved parties may seek 'revenge', thus undermining the project. Some efforts continue to depend heavily on outside funding which stifles attempts to make management more self-supportive, whilst the government, in most cases, retains political and legislative control.

Difficult issues

The report argues that recognition of a community's rights to ownership of wildlife resources is fundamental for sustainable wildlife management. Whilst there have been attempts to provide an administrative and legislative framework conducive to guaranteeing such rights, this approach to wildlife management is still in its infancy. Some schemes have reintroduced consumptive and non-consumptive wildlife utilisation, which undoubtedly helps local people to appreciate the value of wildlife, increase household revenues and reduce poaching. But, experience shows that bringing together management, ownership, tenure rights and the equitable distribution of costs and benefits is complicated.

Examples exist where local governments have been unwilling to devolve real responsibility and power to local communities, and to pass on the full amounts of revenue generated. This is hardly surprising, as central grants to local governments are declining, and wildlife revenue is one way of securing funds, particularly foreign exchange. Furthermore, schemes that use participatory processes for community empowerment can still fail where societies are highly stratified and conflict arises between traditional authorities in the participatory process. Short-term commitment to the process has not helped to propagate sustainable impacts.

Failure to address the question of decentralised control also frustrates local attempts at land use planning, especially around buffer zones where land rights are a key issue. Often, there is a lack of legislation and the policy frameworks are inappropriate. In an increasing number of African countries formulation processes for legislation and policy include community input, but implementation falls short of expectation. Typically, short-term political interests, longer term dynamics of bureaucracies, and the needs of stakeholders outside government are left out of the analysis.

In the literature reviewed, community wildlife management seems to be conceived almost wholly in the context of donor-funded projects, with a surprising lack of consideration of community-led activities where planning and execution of wildlife management is driven by the community. There is historical evidence that rural communities had sophisticated systems of natural-resource management which maintained biodiversity over thousands of years. In some areas such systems still operate.

The elements of these systems include: strong linkages amongst members of communities and between communities; equitable patterns of resource access;

effective means for negotiating and controlling access to natural resources between and among groups; clearly defined territories; low-cost mechanisms for conflict resolution; support for community management institutions from wider social, political and economic structures; and the assignment of ownership for the resources concerned. However, these management systems have weakened gradually, first under colonial government and then as a result of population growth, nationalisation of resources and commercialisation of the economy. With declining government administration capacity and ability to provide effective management of natural-resource use, local management systems are currently beginning to reassert themselves in some areas.

The comparative value of wildlife resources to local people is of central importance in determining the options for community wildlife management. Where the value of wildlife is high – where, in other words, wildlife utilisation is a competitive form of land use over other production possibilities like agriculture or herding – the chances that people will opt for community wildlife management are greater. Conversely, where wildlife utilisation is not a competitive land use option, it is unlikely local producers will have an interest in wildlife management unless they are subsidised to do so.

The extent to which local communities will provide effective management systems will depend to an extent on the social and economic structure of local communities. Where differences in wealth are less marked, where there are strong bonds between community members who pool their resources in high risk environments, and where there are strong customary management institutions, then effective communal management systems are likely to either exist or come into being. This situation often characterises resource poor areas subject to high variations in rainfall year-on-year and between seasons. Where conversely there are important differences in wealth between community members, weak linkages between households, and where customary management systems are deficient, it is unlikely effective community management of wildlife will be possible. This situation is often found in resource rich areas where wildlife utilisation is not a form of competitive land use.

Nonetheless, safari-hunting, game viewing and ecotourism are growing significantly in Africa, and this is making wildlife management a competitive land use option in areas which were formerly used for agriculture and herding, and where communities have high wealth disparities between their constituent members and weak communal management systems. Donor support in such situations may yield high returns in terms of sustainable management and the creation of effective local management systems, but they will need to be very clear about the definition of 'community' and the nature of the stakeholders involved.

Conclusions

From the evidence reviewed in *Whose Eden?* the conclusion is that community wildlife management is likely to be sustainable ecologically, economically and socially only if wildlife management can be made sufficiently attractive to local people for them to adopt the practice as a long-term livelihood strategy. This is not to suggest that local communities respond only to economic determinants, but that these are one amongst a complex set of factors that determine behaviour.

Three broad principles are proposed to guide action towards achieving community-led initiatives: (1) recognition of community rights to ownership of wildlife resources; (2) building on formal and informal structures that facilitate community participation in wildlife management; and (3) operation of effective mechanisms for the sharing of benefits of wildlife resource management with communities.

The report describes practical ways in which organisations can integrate communities into on-going projects, and work with the full participation of local producers in wildlife management. It makes recommendations on ways to improve community management of wildlife resources, and there are various suggestions for applied research required to identify the range of conditions in which community wildlife management might succeed.

The report Whose Eden? An Overview of Community Approaches to Wildlife Management is available from Marilyn John, Manager, IIED Bookshop, 3 Endsleigh Street, London, WC1H 0DD, UK. Price £14.95 or US US\$22 + post and packing.

Resumenes

El papel de las áreas protegidas en la promoción de un desarrollo sostenible

NATARAJAN ISHWARAN

El concepto de desarrollo sostenible se ha convertido en un principio a seguir para balancear los requerimientos de conservación y desarrollo. Las áreas protegidas han jugado un papel crucial en el mantenimiento de los recursos naturales pero existen dudas acerca de la continua habilidad para hacerlo pues se convierten en 'islas de naturaleza' en un contexto de uso insostenible de los recursos.

En este artículo, se discuten los esfuerzos de la UNESCO para implementar instrumentos y programas para facilitar la contribución de las áreas protegidas al proceso de desarrollo sostenible. Usando ejemplos seleccionados, se ilustran las dificultades y el potencial para integrar a la conservación y al desarrollo socioeconómico dentro y fuera de las áreas protegidas.

Uso sostenible: lecciones de una tradición cultural en Arabia Saudita

JOHN GRAINGER Y OTHMAN LLEWELLYN

Los sistemas tradicionales para la conservación de los recursos, notablemente la práctica de conservación de tierras como *bima*, han sostenido a sociedades rurales por siglos en la Peninsula Arábiga y en otras regiones áridas. El sistema *bima* persiste como una ética cultural y está incorporada en la ley Islámica. Esta versátil institución para regular el uso de recursos escasos, proporciona una base sólida dentro de un sistema moderno de áreas protegidas en Arabia Saudita y en otras partes.

¿Puede la vida silvestre ser autosuficiente en Madagascar?

SHEILA O'CONNOR Y OLIVER LANGRAND

Los sistemas biológicos de Madagascar proporcionan una oportunidad para examinar su capacidad para 'sacar ganancias' debido a su diversidad, complejidad y accesibilidad. Sin embargo, muchos de estos sistemas son frágiles como resultado de explotación y degradación. La población de Madagascar se cuenta entre las más pobres del mundo y existen fuertes presiones para obtener nuevas tierras de cultivo por deforestación.

Este reporte describe tendencias actuales de prácticas y políticas de conservación y desarrollo integral en Madagascar, discute el potencial para continuar estos proyectos y subraya los problemas derivados del intento para lograr prácticas sostenibles. Se presentan las posibilidades para el manejo y colección de productos silvestres y se sugiere que el uso sostenible de plantas nativas ofrezca la mejor oportunidad en el futuro inmediato.

Establecimiento de reservas de la biosfera en Alemania

JÜRGEN NAUBER Y DORIS POKORNY

Actualmente Alemania posee 12 áreas designadas como reservas de la biosfera las cuales cubren 12,000 km². Se resume la historia de éstas reservas y se examina en detalle a la reserva de la biosfera Rhoen. Esta es una gran reserva que cubre la frontera entre las antiguas Alemania Oriental y Occidental e ilustra una variedad de enfoques históricos y actuales en la planeación y manejo de reservas. Se discuten métodos para el manejo integral de aspectos ecológicos y económicos de la reserva y se describe el papel que juega la reserva Rhoen dentro de las más amplia red de reservas de la biosfera. Se detalla el progreso hacia un plan de acción para la red de reservas de la biosfera en Alemania.

Manejo de ratán para un modo de vida sostenible

STEPHEN F. SIEBERT Y JILL M. BELSKY

La colecta de ratán y la producción de artesanías proporcionan importantes ganancias para la población pobre que reside dentro y fuera del Parque Nacional Kerinci-Seblat (PNKS) en Sumatra, Indonesia. La falta de acceso a los campos irrigados de arroz, las insuficientes cosechas resultantes de granjas en colinas degradadas y las limitadas oportunidades de trabajo asalariado, dejan a muchas familias con muy pocas fuentes de sostenimiento fuera de la colecta de ratán o el cultivo ilegal de granjas dentro de los límites del parque. Investigaciones sobre*Calamus exilis*, un ratán económicamente importante en PNKS, revelaron un promedio de 283 plantas y 1,910 metros de caña cosechable por hectárea, en las zonas donde se colecta el ratán dentro del parque. Datos preliminares sugieren que *C. exilis* puede ser cosechada repetidamente en intervalos de tres o cuatro años. Si se asume un ciclo de cosecha de tres años y se usan precios de 1990, la cosecha de ratán podrían generar aproximadamente US\$5.00 dólares por hectárea por año de una manera sostenible.

Los colectores de ratán y los artesanos en Kerinci reportaron que prefieren mantenerse del ratán que cultivar granjas forestales, si se les otorga acceso legal y confiable a las fuentes de caña. Se recomienda la designación y el manejo de zonas de extracción para ratán en PNKS. El manejo de la cosecha de ratán representa un medio potencial para aliviar la presión por transformar tierras forestales, al mismo tiempo que provee a algunas familias con un medio de vida sostenible. Sin embargo, se necesitan fuentes adicionales de ingresos para resolver las presiones por convertir a los bosques en el PNKS, particularmente entre familias pobres que no estén dedicándose a actividades basadas en el ratán. El manejo de la cosecha de ratán silvestre quede ser apropiado para otras reservas forestales en el este de Asia.

Le rôle des aires protégées dans un système de développement durable

NATARAJAN ISHWARAN

Le développement durable est devenu un principe directeur de l'équilibre entre la nécessité de conserver les ressources et le développement. Les aires protégées ont joué un rôle décisif dans le maintien des ressources naturelles, mais ce rôle, à l'avenir, est maintenant mis en doute alors qu'elles deviennent des 'ilôts de nature' dans un contexte d'utilisation non durable des ressources.

Cet article décrit les efforts de l'UNESCO pour mettre sur pied les moyens et les programmes pouvant faciliter le rôle des aires protégées dans le processus de développement durable. Les problèmes, ainsi que les possibilités d'intégrer conservation au développement socioéconomique durable, à l'intérieur et autour des aires protégées, sont illustrés de quelques exemples choisis.

Utilisation durable: les leçons d'une tradition culturelle en Arabie Saoudite

JOHN GRAINGER ET OTHMAN LLEWELLYN

Les systèmes traditionnels de conservation des ressources, en particulier la coutume de préserver les terres comme *bima*, ont permis aux communautés rurales de la Péninsule d'Arabie et autres régions arides de subsister pendant des siècles. Le système de l'*bima* demeure une éthique culturelle et fait partie de la loi islamique. Cette pratique diversifiée, qui règle l'utilisation de ressources peu abondantes, offre une base solide pour l'élaboration de stratégies de conservation dans le cadre d'un système moderne d'aires protégées en Arabie Saoudite et ailleurs.

La vie sauvage est-elle rentable à Madagascar?

SHEILA O'CONNOR ET OLIVIER LANGRAND

La diversité, complexité et accessibilité des systèmes biologiques de Madagascar permettent de pouvoir vérifier leur 'rentabilité'. Exploitation et dégradation ont cependant rendu fragiles nombreux d'entre eux. La population malgache compte parmi les plus pauvres du monde et les menaces de déforestation, afin de mettre en valeur de nouvelles terres, sont très graves.

Cet article décrit les tendances actuelles de conservation intégrée, ainsi que les modes et la politique de développement à Madagascar; il discute de l'extension possible de tels projets, et souligne les problèmes d'une politique d'utilisation durable des ressources. Les méthodes possibles de gestion et de collecte de plantes et d'animaux sauvages y sont présentées et les auteurs suggèrent que l'utilisation durable des plantes indigènes représente, dans l'immédiat, la meilleure solution.

Création de réserves de la biosphère en Allemagne

JÜRGEN NAUBER ET DORIS POKORNY

L'Allemagne possède actuellement 12 aires instituées en réserves de la biosphère et couvrant une superficie de 12,000 km². L'article présente un bref historique de ces réserves et examine plus en détail la réserve de la biosphère de Rhoen. Cette vaste réserve chevauche la frontière entre les anciennes Allemagnes de l'Est et de l'Ouest et illustre diverses approches passées et actuelles pour la planification et la gestion des réserves. Les modes de gestion intégrée des aspects écologiques et économiques de la réserve y sont discutés, ainsi que le rôle de la réserve de Rhoen dans le cadre plus général du réseau de réserves de la biosphère. Le développement d'un plan d'action pour le réseau des réserves de la biosphère en Allemagne est examiné en détail.

La gestion du rotin comme moyen de subsistance durable

STEPHEN F. SIEBERT ET JILL M. BELSKY

La collecte du rotin et son travail artisanal représentent une source importante de revenus pour les communautés pauvres vivant à l'intérieur et autour du Parc National de Kerinci-Seblat (PNKS) à Sumatra, en Indonésie. En raison de l'inaccesibilité des rizières, de la pauvre rentabilité des fermes sur les versants dégradés et du manque de travail salarié, la collecte du rotin et les cultures illicites dans le parc représentent, pour de nombreuses familles, le seul moyen de subsistance. Des études sur *Calamus exilis*, une variété de rotin d'importance économique dans le PNKS, ont dénombré une moyenne de 283 plantes et de 1,910 mètres de canne récoltable par hectare dans les zones à rotin du parc. Les données préliminaires suggèrent que *C. exilis* peut être récolté plusieurs fois, à des intervalles de 3 à 4 ans. En se basant sur un cycle de collecte triennal et le prix courant au bord de la route en 1990, la collecte du rotin pourrait rapporter environ US\$5 par hectare et par an, sur une base durable de rendement.

Ceux qui récoltent le rotin et les artisans, à Kerinci, ont déclaré qu'ils préfèreraient gagner leur vie grâce au rotin plutôt que de faire des cultures de forêt, si on leur permettait l'accès légal à des sources certaines de canne. L'institution et la gestion de zones de collecte du rotin sont recommandées dans le PNKS. Une collecte contrôlée du rotin permettrait de diminuer les pressions exercées sur les terres forestières tout en garantissant à certaines familles pauvres des moyens de subsistance durables. D'autres sources de revenus sont cependant nécessaires afin de résoudre les menaces de déforestation dans le PNKS, en particulier pour les familles qui ne vivent pas de la collecte du rotin. La collecte contrôlée du rotin sauvage serait aussi sans doute à recommander dans d'autres réserves forestières de l'Asie du sud-est.

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