

## **REAM NATIONAL PARK, CAMBODIA: balancing the local opportunity costs of wetland protection**

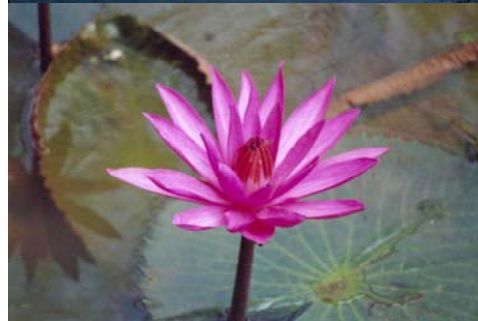
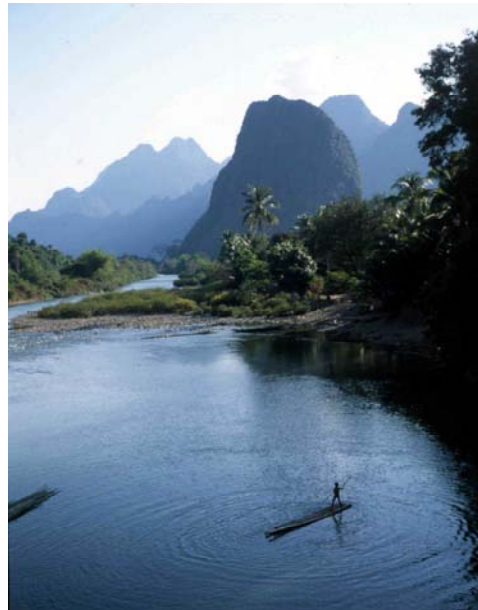
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### **Re-establishing Cambodia's Protected Area network**

After their virtual destruction during the civil war, Cambodia's protected areas are slowly starting to be rebuilt. A protected area network was re-established in 1993 when 23 national parks, wildlife sanctuaries, protected landscapes and multiple use areas were designated under Royal Decree. Since then, the Ministry of Environment has been making efforts to set in place on-the-ground conservation measures, and to develop an enabling national policy and legal framework. Management plans are being developed in five national parks, and a draft Sub-Decree for Protected Areas Management is currently under review by government.

A major challenge facing these emerging laws and management approaches is how to address the high reliance of park-adjacent and park-dwelling populations on protected area resources. To these ends, community-based conservation approaches have been piloted in several protected areas, and the concept of buffer zones has been established as a key component of national protected area planning. Neither system has however yet been institutionalised for the country as a whole, and there are as yet few experiences of their practical application.

Such considerations are especially critical to Cambodia's six coastal protected areas, where high levels of local resource exploitation have impacted severely on natural ecosystems.



**Figure 1: Ream National Park**



## **Ream National Park**

In 1995 Ream became the first National Park to be inaugurated in Cambodia after the civil war. It is located in Sihanoukville Province on the south west coast of Cambodia, and covers an area of approximately 21,000 hectares. Ream is dominated by the estuary of the Prek Toek Sap, featuring extensive areas of mangroves and associated rear mangrove forests and mudflats. Low hills rise

to the west of the river, covered with lowland and dwarf evergreen forest, and isolated hills also occur to the east of the river. The northern and eastern portions of the park contain freshwater marshes in association with mangrove and rear mangrove formations. Ream also encompasses the uninhabited islands of Koh Thmei and Koh Ses (totalling 6,000 ha), situated to the south-east. Beaches, rocky shores, seagrass beds and coral reefs are found along its islands and mainland coastal areas.

Rural poverty is widespread on the coast of Cambodia, with more than half of the population classified as poor and lacking in basic amenities such as food, water and adequate housing (ADB 1999). Most households have limited access to alternative sources of income and subsistence, and often see the existence of protected areas as a direct threat to their livelihoods.

It is clear that if Cambodia's renewed efforts at conserving protected areas are to succeed, then consideration of the economic needs of local communities will be a critical factor in management planning. This case study describes an attempt to assess the economic value of local resource use in Preah Sihanouk (Ream) National Park, a coastal protected area in Cambodia which is piloting both a management planning process and community approaches to conservation. The study aimed to demonstrate the high reliance of community livelihoods on park resources and to quantify the high local opportunity costs of switching from activities that degrade wetland biodiversity. The study underlined the importance of factoring community concerns into park management planning, as well as integrating protected area concerns into socio-economic development planning in surrounding Provinces, Districts and Communes.

Ream National Park lies close to the major towns of Kampot and Sihanoukville, and is relatively well-served by infrastructure, including Cambodia's main highway National Route No. 4. As well as providing an important set of products for local consumption, park resources are used commercially. The area in and around the park is an important fishery area used by both local communities and by commercial trawlers and push nets, and also supports some level of tourist activity. Large parts of the mangrove area has been cleared for aquaculture developments, including prawn and crab farming. As a result of prolonged human activities, parts of Ream show signs of intensive use. It is currently estimated that over one third of the Park's area has been heavily modified or transformed by farming, logging, mangrove cutting and clearance for aquaculture, charcoal burning and other resource exploitation activities (IUCN 1997).

## The National Park as a local economic resource

Almost 30,000 people or 5,500 households live in the 5 Communes that overlap or border Ream National Park, and population growth rates are estimated at nearly 3% (DNCP 1996). Four of these Communes are located on the boundary of Ream, and a total of 13 villages have land lying within the Park's boundaries. Although formerly communities were widely dispersed, settlements became increasingly concentrated along the roadside following the upgrading of National Route No. 4 during the 1960s. This concentration increased during the Khmer Rouge era, as villages grouped together as a security measure. The park-adjacent and park-dwelling populations now include a mix of more recent immigrants (most who came to the area during or after the Khmer Rouge era), and longer-term settlers. The incidence of rural poverty is extremely high, and per household cash income is estimated at less than \$1/day (ADB 1999). Few households rely on a single livelihood source: the majority of the population combine different economic activities so as to spread risk and to generate sufficient subsistence and income to survive.

With few other sources of income and employment available to them, and a shrinking natural resource base outside the park, local livelihoods depend intimately on protected area resources (DNCP 1996). Most household income is generated from farming, fishing and forest products collection, and almost all of these resources come from the National Park. Just over a quarter of households depend on farming as their main source of income, cultivating a total area of just under 3,000 hectares inside the National Park. Between a quarter and a third of the population are involved in fishing as their main form of livelihood, with almost 500 boats operating within and close by to the Park. It is estimated that up to 84% of these fishing and farming households gather firewood from the Park

(De Lopez *et al* 2001), 25% are involved in timber harvesting and 18% collect wild plants for food, medicines and handicrafts (DNCP 1996). In total, farmers gather more than 50 different wild products from the park, and use more than 200 species of plants for medicines. Nearly 30 species of marine fishes, crustaceans and shells, and 8 species of freshwater fish, are also harvested from Ream.

## Valuing the community costs and benefits of the Protected Area

Ream is one of the five National Parks in Cambodia where a draft management plan has been developed, and where community management arrangements have also been piloted. Between 1997 and 1999 the Ministry of Environment, with the support of UNDP, implemented a project to support the preparation of a zoning and management plan for Ream National Park, construct park facilities, train park staff, and develop institutional arrangements for Park management. This was followed, between 1999 and 2000, by a set of ADB-funded activities which aimed to further develop the management zones and guidelines for Ream National Park, and to demonstrate a process of community participation in marine and coastal resource management.

As part of the latest phase of the management planning process, draft guidelines have been developed for three proposed management zones of the park (GEC *et al* 2000). The bulk of the National Park is designated as a strictly protected core zone, comprising the two islands and the mainland forested, wetland and



mangrove area. Here all natural resource exploitation is prohibited. The smaller buffer zone along the coastline to the east of the park and the wetlands around the Prek Toek Sap allows for traditional community access and subsistence-level resource use according to co-management arrangements and community regulations developed by recognised groups and approved by the Ministry of Environment. Within the community development zone to the north of the park, rural development activities and settlement are permitted, including village exploitation of forest and fisheries resources.

Despite their exclusion from certain areas and natural resource exploitation activities, the participation of local communities in coastal and marine management forms a central theme in the management plan. One innovation has been the development of community fisheries regulations and organisational structures for co-management of the inshore fishing areas of Ream National Park. Today, 49 Village Fishing Groups and a Village Fisheries Committee work to regulate, conserve and manage marine resources in the Park according to the fisheries management guidelines and regulations that they have developed.

The basic aim of the valuation study was to lend support to these ongoing management planning processes in Ream – to demonstrate their validity in economic terms, as well as to identify the kinds of additional economic concerns and measures that would have to be incorporated into protected area management and into the socio-economic development plans of Sihanoukville Province. An underlying objective was to demonstrate economic assessment methods that could be replicated in other protected areas in Cambodia that might develop management plans in the future. Two principles guided the study: the need to highlight the importance of community-based approaches to park planners, at the same time as finding measurable indicators of protected area benefits that would be meaningful to local authorities and development planners.

### The economic value of key resources and ecosystems

The results of the study showed that Ream National Park constitutes an extremely

important economic resource for adjacent communities and for the Sihanoukville Provincial economy. Household and village-level surveys found that almost all local residents depend on Park resources in some way for their basic subsistence and income, to a net value of some \$1.2 million a year or an average of \$220 for every household living in and beside the National Park (Box 1, Box 2). In an area where the median family income is estimated at only \$316 a year, a third of families earn less than \$200, and where half of households can barely provide for their own subsistence (De Lopez *et al* 2001), this figure is extremely significant. The park provides land, resource and services which together contribute fisheries and agricultural sector income of more than \$0.5 million a year each, and forest resource values worth \$177,000.

#### Box 1: The value of local fisheries in Ream NP

A total of 500 boats — 300 un-motorised *touk chaev* and 200 boats with engines — fish within Ream National Park, employing 30% of the population or 1,597 households. The annual catch of 537.6 tonnes is worth a total of \$687,291 a year at market prices, or \$1,375 per boat. Taking into account the costs of boats, equipment and running costs, this translates into annual net values of \$0.515 million overall, \$1,031 per boat, or \$323 per fishing household.

	Catch (kg/year)	Local price (CR/kg)	Value (US\$/year)
Shells	72,000	5,000	92,426
Shells	60,000	3,000	46,213
Prawn	48,000	15,000	184,852
Marine fish	200,000	3,000	154,044
Crab	32,000	8,000	65,725
Shrimp	30,000	2,500	19,255
Lobster	1,600	25,000	10,270
Squid	24,000	4,000	24,647
Freshwater fish	70,000	5,000	89,859
<b>Total gross value</b>	<b>537,600</b>		<b>687,291</b>
<b>Average gross value per boat</b>	<b>1,075</b>		<b>1,375</b>
<b>Total costs</b>			<b>171,767</b>
<b>Total net value</b>			<b>515,525</b>
<b>Average net value per boat</b>			<b>1,031</b>
<b>Average net value per fishing household</b>			<b>323</b>

**Box 2: The value of other community land and resource uses in Ream NP**

A wide range of forest products are gathered within Ream, worth a total of \$190,672 at market prices. Livestock and crop production taking place in the park has a gross value of \$520,344. Taking into account the costs of harvesting these products, this translates into a net total value of \$721,897 per year.

	Gross value (US\$/year)	Net value (US\$/year)	Average value per user household (US\$/year)
Firewood	125,133	112,062	25
Construction wood	23,659	23,659	18
Medicinal plants	10,788	10,788	11
Food	17,695	17,695	18
Roofing materials	13,397	13,397	84
<b>Sub-total, forest products</b>	<b>190,672</b>	<b>177,601</b>	
Crops	316,594	316,594	119
Livestock	227,702	203,750	143
<b>Sub-total, farming</b>	<b>544,296</b>	<b>520,344</b>	
<b>Total, forest products and farming</b>	<b>734,968</b>	<b>697,945</b>	

Mangroves constitute a particularly important set of park resources, and are also one of the most endangered ecosystems in Ream and other parts of Cambodia’s coast. In order to demonstrate the broader economic benefits of ecosystem conservation, the study made a detailed analysis of the returns to alternative uses of the 1,800 hectares of mangroves in the park. A key question posed by Provincial development planners has been if it is worth conserving these mangroves, or whether they should be harvested for immediate income and financial gain, or converted for salt production and aquaculture.

The study found that much of the fishery in the Sihanoukville area depends on the habitat, nursery and breeding grounds provided by

mangroves, and a significant proportion of firewood, medicinal plants and construction materials are also sourced from them. Mangroves act as a carbon sink, prevent saltwater intrusion and coastal erosion, and buffer against storms and floods, enabling human habitation and farming in the villages which lie along the coast. By quantifying these benefits, the study showed that conserving mangrove ecosystems in the National Park, and elsewhere along the Cambodian coast, generates significant economic values – both in absolute terms, and relative to the short-term profits earned from the activities that threaten them (Box 3). Ream’s mangroves yield subsistence goods worth almost \$600,000 a year, and generate an additional \$300,000 a year through the provision of ecosystem services such as storm protection and prevention of coastal erosion in areas surrounding the park. With a overall value of almost \$1 million a year and net value of more than \$500 per hectare, this is far more than either the one-off income generated through clear-cutting (De Lopez *et al* 2001) or the returns from conversion to crab and prawn farming (Bann 1997).

**Box 3: The value of mangrove conservation in Ream NP**

In total there are approximately 1,800 ha of mangroves in Ream, with a total volume of 111,645 m3 (De Lopez *et al* 2001). The mangrove area of Ream National Park is particularly important to the local households who live around, and use, it. Much of the fishery in the area depends on the habitat, nursery and breeding grounds provided by mangrove habitats, and a significant proportion of firewood, medicinal plants and construction materials are also sourced from mangroves. Mangroves act as a carbon sink, prevent saltwater intrusion and coastal erosion, and buffer against storms and floods, enabling human habitation and farming in the villages which lie along the coast. Yet a key question is whether it worth conserving these mangroves, or should they be harvested for immediate income and financial gain, and then turned over to another land use? This is a real threat to Ream. Already part of the mangroves have been clear-cut illegally, a prawn/crab farm has been developed inside the Park over an area of nearly 50 ha, and approval has been given for a 10 ha experimental cockle farm (ADB 2000).

A simple cost-benefit analysis demonstrates the high value of mangrove conservation in terms of local socio-economic and environmental benefits. Under realistic recovery and harvesting conditions, clear-cutting the mangroves would yield a one-time income of less than \$630,000 (De Lopez et al 2001). Although prawn farms can, under the best conditions, realise a net income of almost \$4,500/ha/yr, few actually do. In Koh Kong, a similar mangrove area lying to the west of Ream National Park, half of prawn farms are making a loss — at a realistic productivity rate of 3.6 tonnes per harvest, this loss is nearly \$9,950/ha/yr — and in aggregate they show a loss of \$1,103 per ha per year (Bann 1997).

Yet even if only half of the forest, fisheries and agricultural production in surrounding villages depend on mangroves in the Park, their clearance would result in a loss of local income of around \$620,000 a year. This figure of \$344/ha/yr is a realistic one — data for similar mangrove areas in Thailand estimate local use of mangroves to be worth between \$230 (Christensen 1982) and \$1,200 (Sathirathai 1998) a year, and values in Koh Kong Province exceed \$500/ha, including charcoal (Bann 1997).

In fact many more economic losses would occur from mangrove clearance, such as the damage to houses, infrastructure, farmland, employment, markets and general local welfare that result from the loss of vital environmental functions and ecological services. In Southern Thailand, the economic benefits of mangroves in terms of coastline protection have been estimated to have a value of between \$76.5/ha/year (Sathirathai 1998) and \$165/ha/year (Christensen 1982), carbon sequestration benefits \$2.2/ha, and mangrove storm protection functions have been valued at \$32/ha in Koh Kong Province (Bann 1997). Taking into account these indirect economic benefits increases the annual economic value of conserving Ream's mangroves to \$900,000 a year. This is far more than the one-off gain (and long-term loss) of clear-cutting the mangroves and turning them over to prawn farms. The economic costs of destroying these valuable natural ecosystems, both immediate and long-term, far exceed the benefits — or, in other words, biodiversity conservation in Ream National Park is a demonstrably economically worthwhile activity to engage in.

	Net value (S\$/ha/yr)	Total Value (US\$ '000/yr)
Local use	344	619,200
Storm protection	32	57,600
Coastal erosion prevention	122	219,600
Carbon sequestration	2	3,600
<b>Total Value</b>	<b>500</b>	<b>900,000</b>

### Using economic incentives to offset the opportunity costs of protection

Some reduction in local resource utilisation activities is required by the draft zoning and management plan that has been prepared for Ream National Park. As well as the prohibition of all extractive activities in the core zone, it implies curtailing unsustainable and illegal fishing, logging, charcoal production, hunting, coral collection and agricultural encroachment in other management zones. Yet without access to the basic subsistence, income and employment that the Park provides, many of the 30,000 local people will find it difficult to survive as they lack access to other sources of livelihood. The study therefore showed that, under existing conditions, there will be a significant local opportunity cost to biodiversity protection.

Given the high levels of poverty in park-adjacent communities, and the difficulty of accessing alternative sources of income and subsistence, the local opportunity costs of resource utilisation foregone may be untenable. On the one hand valuation lends strong support to the type of community-based resource management initiatives that have been piloted for inland fisheries in Ream, and suggests that they could usefully be extended to other resources and ecosystems within the protected area. However, by themselves, such collaborative management and sustainable resource utilisation activities — although undoubtedly an essential and necessary part of park management — are likely to provide insufficient economic incentives for park conservation, because they provide no direct alternatives to unsustainable income and subsistence generating activities.



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Clearly, further measures are needed to offset the local opportunity costs of protected area conservation. Here, factoring the need to provide alternative and sustainable livelihoods to the residents of Communes that lie inside and adjacent to Ream into Provincial planning becomes critical. Existing Provincial socio-economic development plans, although laying great stress on rural poverty alleviation, take little note of the presence of the protected area and contain few activities aimed specifically at



encouraging natural resource conservation. The study underlined the importance of Ream

National Park to the long-term development of the area, as an economic asset for which conservation is well worth investing in.

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This project aims to develop, apply and demonstrate environmental economics techniques and measures for wetland, water resources and river basin management which will contribute to a more equitable, efficient and sustainable distribution of their economic benefits at the global level and in Africa, Asia and Latin America, especially for poorer and more vulnerable groups.

The views and opinions in this document are those of the authors alone, and do not necessarily reflect those of IUCN, DFID or other institutions participating in the project.

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