

Stung Sen Core Area Tonle Sap Biosphere Reserve

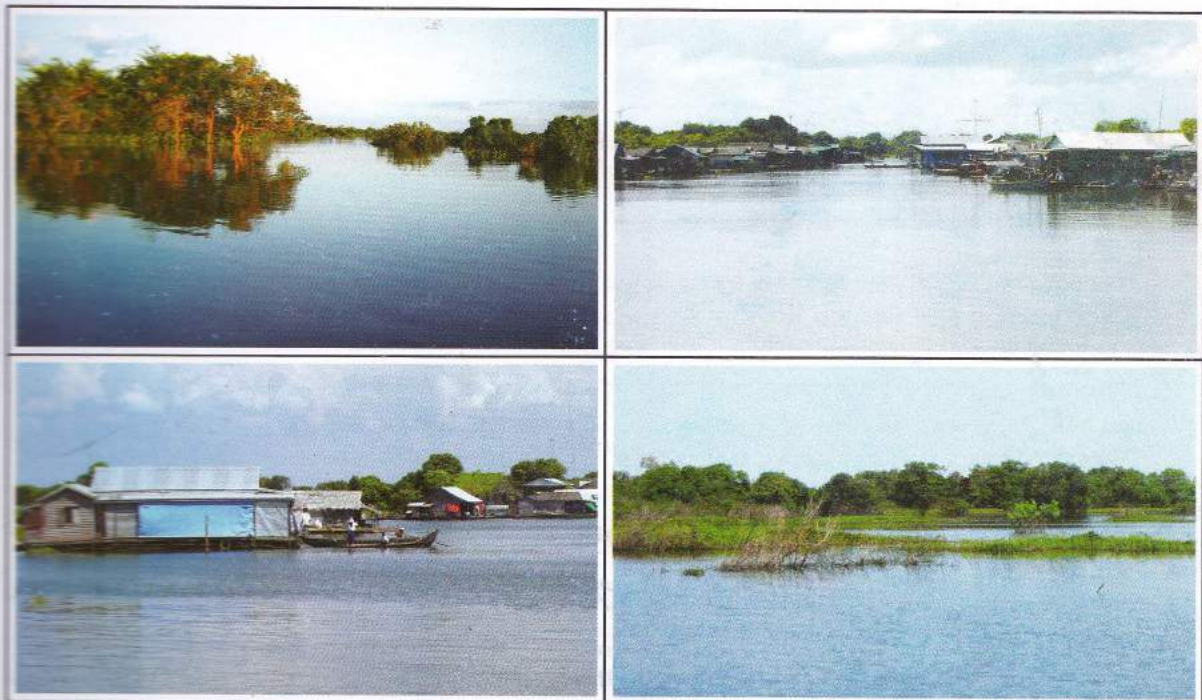
Management Plan 2008-2012





Stung Sen Core Area Tonle Sap Biosphere Reserve

Management Plan
2008-2012



PLAN PREPARED BY THE TONLE SAP CONSERVATION PROJECT
IN ASSOCIATION WITH MINISTRY OF ENVIRONMENT
AND MINISTRY OF AGRICULTURE, FORESTRY AND FISHERIES

Foreword

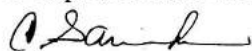
As defined by UNESCO, Biosphere Reserves are "areas of terrestrial and coastal/marine ecosystems, or a combination thereof, which are internationally recognized within the framework of UNESCO's Programme on Man and the Biosphere (Statutory Framework of the World Network of Biosphere Reserves). Reserves are nominated by national governments; each must meet a minimal set of criteria and adhere to a minimal set of conditions before being admitted to the network. Each Biosphere Reserve is intended to fulfil three complementary functions: 1) a conservation function, to preserve genetic resources, species, ecosystems and landscapes; 2) a development function, to foster sustainable economic and human development; and, 3) a logistic support function, to support demonstration projects, environmental education and training, and research and monitoring related to local, national and global issues of conservation and sustainable development.

Physically, each Biosphere Reserve comprises three elements: one or more **core areas**, which are securely protected sites for conserving biological diversity, monitoring minimally disturbed ecosystems, and undertaking non-destructive research and other low-impact uses (such as education); a clearly identified **buffer zone**, which usually surrounds or adjoins the core areas, and is used for cooperative activities compatible with sound ecological practices, including environmental education, recreation, ecotourism and applied and basic research; and a flexible **transition zone**, or area of cooperation, which may contain a variety of agricultural activities, settlements and other uses, and in which local communities, management agencies, scientists, non-governmental organizations, cultural groups, economic interests and other stakeholders work together to manage and sustainably develop the area's resources."

Cambodia's Tonle Sap Biosphere Reserve was established by Royal Decree dated 10 April 2001. It comprises the most important inland wetland in Southeast Asia. An outer Transition Zone of some 899,600 ha encircles a Buffer Zone of 541,482 ha of permanent and seasonal wetlands, including the lake itself, and managed for sustainable fisheries production and conservation of flooded forests and other wetlands. The Reserve has three Core Areas: Prek Toal (21,342 ha) in Battambang Province, and Boeung Chhmar (14,560 ha) and Stung Sen (6,355 ha) in Kampong Thom Province. The Royal Decree specifies that the Core Areas have the status of national park or wildlife sanctuary. The Ministry of Environment is responsible for the preparation of protection and conservation plans for the Core Areas, through the coordination of the Cambodia National Mekong Committee (Tonle Sap Biosphere Reserve Secretariat), and for subsequent implementation.

This plan addresses management needs in the Stung Sen Core Area for the period 2008-2012. In order to make the plan as familiar and "user-friendly" as possible to MoE officials and other stakeholders in Cambodia's protected areas system, it follows the format established in Cambodia's first protected area management plan, for Virachey National Park 2003-2007 (MoE 2003), and subsequent prescriptions and guidelines outlined in Ministry of Environment's manual "Participatory Development of Management Plans for Protected Areas in Cambodia" (MoE 2005). However, the management planning process and management plan content also have been adjusted as necessary to take into account the special circumstances and context of a Biosphere Reserve Core Area, both with regard to the international definition provided by UNESCO (above) and the functional definition of a Biosphere Reserve and constituent Core Areas in the Cambodian context. The Stung Sen Core Area Management Plan is the third in the series of management plans being prepared for the Tonle Sap Biosphere Reserve, having been preceded by management plans for the Prek Toal and Boeung Tonle Chhmar Core Areas (MoE 2007a, 2007b).

I take pleasure in entrusting the Director of Stung Sen Core Area with the authority and the responsibility to implement this management plan. *M. S.*



Mr. Chay Samith
Director, Department of Nature Conservation and Protection
Ministry of Environment

This Management Plan has been reviewed by the Department of Nature Conservation and Protection of the Ministry of Environment and approved for implementation. *M. M.*

December 2007

Senior Minister, Minister of Environment



Dr. Mok Mareth

Table of Contents

Foreword.....	2Ap
proval.....	3
Table of Contents.....	4
List of Figures.....	5
List of Tables.....	5
Acknowledgements.....	6
Acronyms, Abbreviations and Symbols.....	7
Executive Summary.....	8
Part One: Background Information on Stung Sen Core Area.....	11
A. Introduction.....	11
B. Description of Stung Sen Core Area.....	11
B1. Biophysical Description.....	11
B1.1 Location and Physical Features.....	11
B1.2 Flora.....	13
B1.3 Fauna.....	13
B2. Socio-economic Situation.....	17
B3. Conservation Values and Significance.....	18
B3.1 Biological Values.....	18
B3.2 Ecotourism Values.....	18
B3.3 Cultural Values.....	19
B3.4 Educational Values.....	19
B3.5 Economic Values.....	19
Part Two: Management Plan 2008-2012.....	20
C. Purpose and Mission Statement.....	20
C1. Purpose of Stung Sen Core Area.....	20
C2. Mission Statement for Stung Sen Core Area.....	20
D. Issues and Long-term Vision.....	20
D1. Analysis of Issues and Problems.....	20
D2. Vision Statement.....	22
E. Zones.....	23
F. Management Programmes.....	23
F1. Core Area Operations and Maintenance.....	24
F1.1 Staffing.....	24
F1.2 Infrastructure.....	25
F1.3 Equipment.....	27
F1.4 Financial Management.....	27
F1.5 Cooperation with Partners.....	28
F2. Resource Conservation and Management.....	29
F2.1 Protection and Management of Flora, Fauna and Ecological Values.....	29
F2.2 Maintenance of Cultural Values.....	33
F2.3 Fire Management.....	33
F3. Resource Inventory, Monitoring and Research.....	34
F3.1 Resource Inventory and Monitoring.....	34
F3.2 Research.....	34
F3.3 Resource Information Management System.....	35
F4. Ecotourism Development.....	36
F4.1 Needs and Priorities for Ecotourism Development.....	36

✓F5.	Community Development	36
F5.1	Involvement of Community-based Institutions.....	36
F5.2	Benefits Sharing.....	37
F5.3	Access to Livelihoods and Income Generation Support.....	38
F5.4	Community Education and Awareness Raising.....	38
F5.5	Resource Access and Utilization.....	39
F5.6	Impact of Integrated Conservation and Development Programming.....	40
F6.	Buffer Zone and Transition Zone Management	41
F6.1	Issues Related to Management of the Buffer Zone and Transition Zone.....	41
F7.	International Cooperation	42
F7.1	Issues Related to the Global System of Biosphere Reserves.....	42
G.	References Cited	43

List of Figures

Figure 1.	Location of Stung Sen Core Area.....	12
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List of Tables

Table 1.	Waterbird Species of Conservation Concern Occurring in the TSBR.....	14
Table 2.	Reptile Species of Conservation Concern Occurring in the TSBR.....	15
Table 3.	Fish Species of Conservation Concern Occurring in the TSBR.....	16
Table 4.	Core Area staff.....	24
Table 5.	Management actions related to Core Area staff.....	25
Table 6.	Management actions related to infrastructure.....	26
Table 7.	Management actions related to equipment.....	27
Table 8.	Management actions related to financial management.....	28
Table 9.	Management actions related to cooperation with partners.....	29
Table 10.	Management actions related to protection and management of flora, fauna and ecological values.....	30
Table 11.	Management actions related to maintenance of cultural values.....	33
Table 12.	Management actions related to fire management.....	33
Table 13.	Management actions related to resource inventory and monitoring.....	34
Table 14.	Management actions related to research.....	35
Table 15.	Management actions related to resource information management system.....	35
Table 16.	Management actions related to needs and priorities for ecotourism development.....	36
Table 17.	Management actions related to involvement of community-based institutions.....	37
Table 18.	Management actions related to benefits sharing.....	37
Table 19.	Management actions related to access to livelihoods and income generation support.....	38
Table 20.	Management actions related to community education and awareness raising.....	39
Table 21.	Management actions related to resource access and utilization.....	40
Table 22.	Management actions related to impact of integrated conservation and development programming.....	41
Table 23.	Management actions related to management of the Buffer Zone and Transition Zone.....	42
Table 24.	Management actions related to the global system of Biosphere Reserves.....	42

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The cover illustration was selected from entries in school drawing contests organized in primary and secondary schools immediately adjacent to the TSBR Core Areas. We thank the contest organizers and all of the entrants for their enthusiastic contributions, and congratulate the young artist whose drawing was selected for the cover illustration, Yun Sok Ra from Kampong Chamlang village.

This Plan is dedicated to the children of the communities that are reliant on the natural resources of the TSBR Core Areas and the larger Tonle Sap ecosystem. These resources and the irreplaceable biodiversity of the Tonle Sap are their legacy, and the future will soon be in their hands. We hope that this plan and its successors will assist current and future generations of Tonle Sap residents to use and conserve these resources wisely.

ADB	Asian Development Bank
B.Sc.	Bachelor of Science
BMS	Biodiversity Monitoring Subcontractor
CAMC	Core Area Management Centre
CFOs	Community Fisheries Organizations
CITES	Convention on International Trade in Endangered Species
CNMC	Cambodia National Mekong Committee
DNCP	Department of Nature Conservation and Protection
DoE	Department of Environment
e.g.	for example
et al.	and others
FA	Forestry Administration
FIA	Fisheries Administration
GEF	Global Environment Facility
GPS	Global Positioning System
ha	hectare
IBA	Important Bird Area
IFREDI	Inland Fisheries Research and Development Institute
IUCN	International Union for Conservation of Nature and Natural Resources
km	kilometer
km ²	square kilometer
m	meter
m ²	square meter
ME	Ministry of Environment
NGO	Non-Governmental Organization
N	Number
op. cit.	previously cited
ref.	reference
RGC	Royal Government of Cambodia
TSBR	Tonle Sap Biosphere Reserve
TSBRS	Tonle Sap Biosphere Reserve Secretariat
TSEMP	Tonle Sap Environmental Management Project
TSSLP	Tonle Sap Sustainable Livelihoods Project
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WCS	Wildlife Conservation Society
%	percent
~	approximately
>	greater than

Executive Summary

Introduction

The Stung Sen Core Area was created under the Royal Decree on the Establishment and Management of Tonle Sap Biosphere Reserve dated 10 April 2001. The Ministry of Environment was designated as the authority responsible for the preparation of protection and conservation plans for the Biosphere Reserve's Core Areas.

The TSBR comprises the most important inland wetland in Southeast Asia, both for biodiversity conservation and livelihoods based on harvesting of aquatic resources. The Stung Sen Core Area, comprising an area of 6,355 ha, was established to protect unique evergreen riverine forests and associated vegetation assemblages.

Mission Statement for Stung Sen Core Area

The mission of the Stung Sen Core Area is to conserve and sustainably manage the natural and cultural resources of the Core Area, in partnership with local communities and other stakeholders, for the benefit of the people from local communities and Cambodia as a nation, and, by so doing, to contribute to international efforts to reconcile the conservation of biodiversity with its sustainable use, as exemplified by the Biosphere Reserve concept.

Management Plan Purpose

This Plan is intended to be used as a guide for the management of Stung Sen Core Area during the five year period 2008-2012. Part One of the Management Plan describes the Core Area, and identifies its conservation values and significance. Part Two of the Plan describes management objectives, and identifies priority activities that need to be undertaken to achieve these objectives, including responsible parties and timing. The Plan is intended to be used as the primary resource in the preparation of annual operating plans and budgets, and also provides a basis for evaluating achievement of management objectives.

Management Programmes

The Management Plan is divided into seven Management Programmes, with the following goals and objectives:

1. Core Area Operations and Maintenance

with the **goal** of strengthening and routinely implementing Core Area operations and support services, and the **objectives** of ensuring operational effectiveness of Core Area staff; developing, operating and maintaining the infrastructure necessary for effective Core Area management; ensuring that adequate equipment is available for efficient operation and management of the Core Area; developing and implementing financial management systems that are both efficient and transparent; and improving coordination of Core Area activities with those of other government agencies, communes, communities, NGOs and other partners.

2. Resource Conservation and Management

with the **goal** of maintaining the integrity of the biological, cultural and physical features of the Stung Sen Core Area, and the **objectives** of ensuring effective and efficient protection and management of the fauna and flora, and of the biophysical elements of their habitats, within the Stung Sen Core Area; identifying and maintaining cultural values associated with the Core Area; and minimizing the occurrence of destructive fires and their related impacts within the Core Area.

3. Resource Inventory, Monitoring and Research

with the goal of providing accurate, relevant and timely information for resource management, and the objectives of carrying out baseline inventories and monitoring of Core Area ecological resources; undertaking effective, management-oriented research on these resources; and developing and maintaining a Resource Information Management System, and using this as a decision-making tool for managing Core Area resources.

4. Ecotourism Development

with the goal of developing and sustainably managing ecotourism in the Stung Sen Core Area, in partnership with local communities and other stakeholders, and without negatively affecting the ecological integrity of the Core Area or the social and cultural integrity of adjacent communities, and the objectives of establishing ecotourism that is appropriate to the ecological setting and legal status of the Core Area, and to the social setting of surrounding communities; improving dissemination of information on ecotourism experiences that are available in the Core Area, and improving the marketing of these experiences; ensuring that visitors arriving at Stung Sen are provided with the best possible orientation and information services and facilities; ensuring that products and services delivered as part of the "Stung Sen experience" adhere to the highest possible quality standards; and establishing and implementing procedures and regulations regarding the management of ecotourism and ecotourist activities.

5. Community Development

with the goal of increasing community involvement and support for biodiversity conservation, and the objectives of strengthening the operation of community institutions involved in conservation; ensuring that local communities share in the benefits of Core Area conservation and management; improving the living conditions of local communities that are impacted by Core Area management; creating understanding and awareness about biodiversity conservation among local residents; ensuring sustainable utilization of Core Area resources by local communities; and evaluating the impact and effectiveness of community awareness, conservation, livelihoods and other natural resource management programmes.

6. Buffer Zone and Transition Zone Management

with the goal of establishing and enhancing collaboration with authorities and other stakeholders in the Buffer Zone and Transition Zone adjacent to the Stung Sen Core Area, and the objectives of ensuring that prescriptions in the Stung Sen Management Plan are communicated to key stakeholders in the Buffer Zone and Transition Zone, that appropriate cooperative linkages are developed and maintained, and that impacts of land use and resource use activities adjacent to the Core Area are minimized.

7. International Cooperation

with the goal of contributing to collaboration and knowledge development within the global system of Biosphere Reserves, and the objective of ensuring that lessons learned in the development and implementation of the Stung Sen Core Area Management Plan are exchanged with others concerned with Biosphere Reserve Core Area management.

Budget

The budget summarized below combines funding from RGC (MoE, FiA) and the UNDP/GEF-funded Tonle Sap Conservation Project. Details of budgets and periodic revisions are held by the individual agencies.

Budget Summary (all figures in US\$)

Description and Cost (US\$)	2008	2009	2010	2011	2012	Subtotal
Basic Operations						
Staff salaries	9,100	9,100	9,100	9,100	9,100	45,500
Ranger equipment and supplies	800	800	800	800	800	4,000
Ranger boat operation and maintenance	2,400	2,400	2,400	2,400	2,400	12,000
Management Centre maintenance	900	900	1,500	1,500	1,500	6,300
Office supplies	300	300	300	300	300	1,500
Communications (telephone, internet)	200	200	200	200	200	1,000
Photocopying and report reproduction	400	400	400	400	400	2,000
Travel costs	2,400	2,400	2,400	2,400	2,400	12,000
Special Programmes						
Livelihoods support	22,500	22,500	6,000	6,000	0	57,000
Environmental education	3,500	500	500	500	500	67,800
Training	4,000	4,000	4,000	4,000	4,000	20,000
Boundary demarcation	5,000	5,000	0	0	0	10,000
Fisheries management	5,000	5,000	5,000	5,000	5,000	25,000
Total	56,500	53,500	32,600	32,600	26,600	201,800

A. Introduction

A basic principle of protected area management is that every protected area should have a management plan. The management plan "guides and controls the management of protected area resources, the uses of the area, and the development of facilities needed to support that management and use. It facilitates all development activities and all management activities to be implemented in an area" (MacKinnon et al. 1986).

This Management Plan is intended for use primarily by those charged with planning and implementation of the day to day management of the Stung Sen Core Area, and by other stakeholders such as resource users, resource managers, researchers, NGOs and government staff from district, provincial and national levels. The intent is to provide users of the Plan with an agreed guide to what they need to do, how and when they should do it, and what resources are required. It is intended that the Plan will also be of use to policy-makers, decision-makers and funding agencies in understanding why and how the Stung Sen Core Area is being managed.

The Plan focuses on assessments of biodiversity resources (what needs to be managed) and human use (why it needs to be managed), and on a description of administration, resource management and protection, visitor use and management, and development programmes. It provides sufficient detail on biophysical and socio-economic conditions for an understanding of key issues surrounding management of the Core Area, but purposely avoids presentation of excessive (and largely unnecessary) background information. This approach has been taken to facilitate preparation, discussion and understanding of the Plan, and to ensure that it remains focussed and easy to use. Additional background on the regional biophysical and socio-economic setting can be found in the documents listed under References Cited.

This Management Plan provides a five year framework for management, within which the scope, timing and relative emphasis on specific activities can (and should) be modified by field managers on the basis of experience, success and progress achieved as the Plan is implemented. In order to ensure success in management implementation it is important that overall levels of inputs indicated under each programme be maintained to the extent possible, but it is even more important that there is sufficient flexibility to make needed modifications and adjustments to management activities within the limits set by overall goals and objectives.

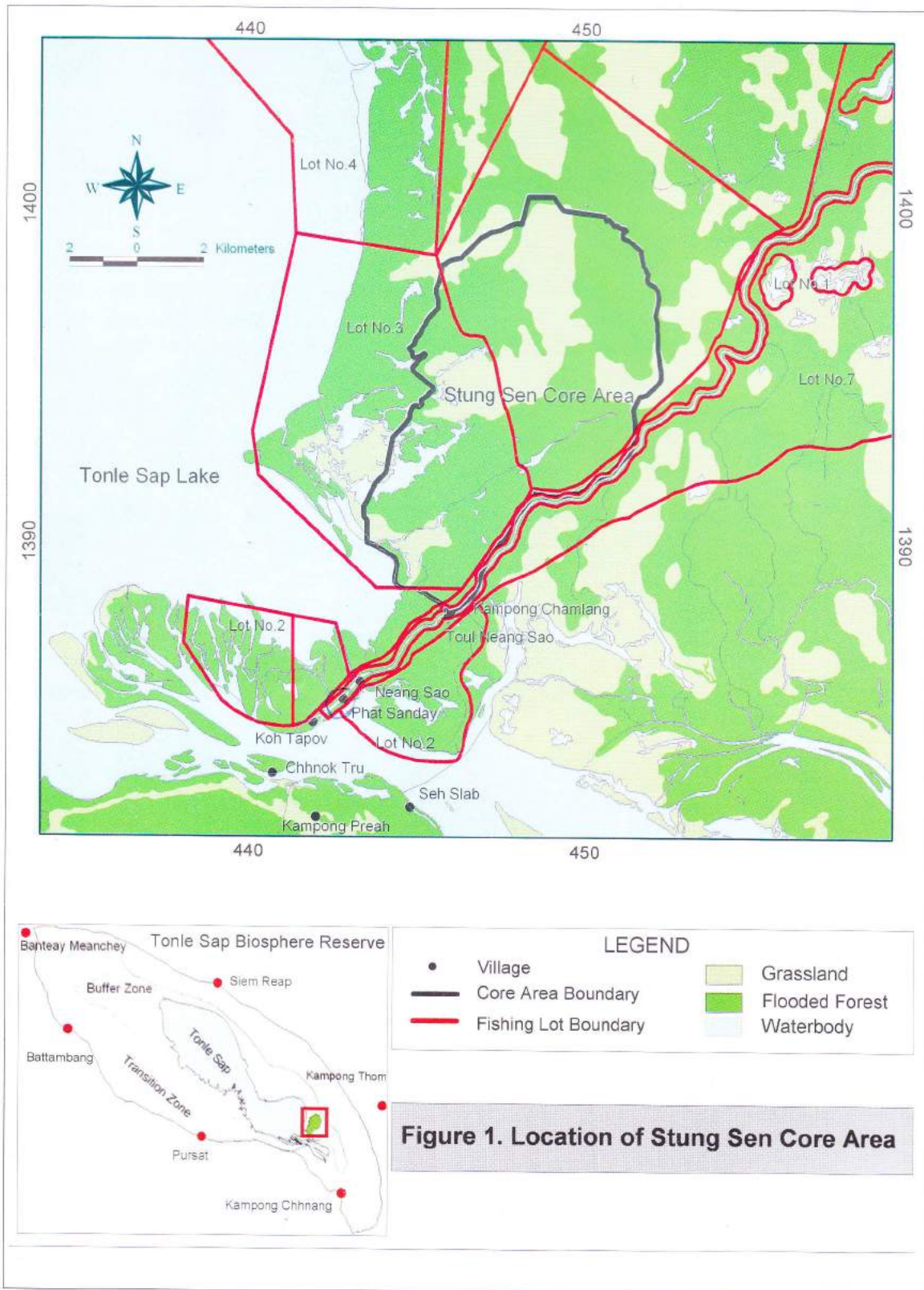
The role of the management plan is to guide the managers of a protected area towards a vision for the site in a structured way. The management plan, if properly structured and used, can be the most important document that a protected area possesses, and, together with its supporting documents, should form the basis for all management actions and decisions (MoE 2005).

B. Description of Stung Sen Core Area

B1. Biophysical Description

B1.1 Location and Physical Features

The Stung Sen Core Area is located at the southeastern end of Tonle Sap Lake, in Phat Sanday Commune, Kampong Svay District, Kampong Thom Province (Figure 1). It is located entirely within



the TSBR's Buffer Zone, extending from the dry season (low water) edge of the lake. It is the smallest of the TSBR's three Core Areas, with an extent of 6,355 ha.

Stung Sen is part of the unique Tonle Sap Lake ecosystem, the functioning of which determines the Core Area's biophysical features and biological importance. During most of the year (October to June-July) the lake drains into the Mekong through the Tonle Sap River, becoming incrementally shallower and smaller in area, to ~2500 km², and decreasing in depth to a maximum of ~1 m. However, when the Mekong floodwaters peak in mid-year, the Tonle Sap River reverses its flow and backfloods the lake, increasing its area to ~12,000 km² and maximum depths to ~10 m. The Stung Sen Core Area is largely dry during the low water season, with water remaining only in scattered pools and watercourses, and completely flooded during the high water season, only the tops of emergent trees remaining above water.

B1.2 Flora

The predominant natural vegetation cover in the Stung Sen Core Area is seasonally flooded freshwater swamp or gallery forest (also known as flooded or inundated forest), dominated by *Barringtonia acutangula* and *Diospyros cambodiana*. The evergreen forest along the Stung Sen River is believed to be the most species rich, tall forest in the TSBR, and includes a number of rare species and exceptionally large trees (McDonald *et al.* 1997).

Composition and structure of the vegetation cover varies according to depth and duration of inundation, soil composition, and human influence, primarily cutting and fire (McDonald *et al.* 1997; CNMC NEDECO 1998; Rundel 2000). Three main vegetation types can be distinguished on the basis of habitat structure and plant species composition:

- gallery forest, located primarily along the right bank of the Stung Sen River and extending to the north and west;
- short-tree shrublands, comprising dense stands of scrub and scattered emergent trees; and
- grasslands/aquatic herbaceous vegetation, covering extensive areas and subject to an annual cycle of flooding and dry season fires.

Approximately 200 vascular plant species have been documented as occurring on the Tonle Sap floodplain (review in Davidson 2006), but the number that occur within the Stung Sen Core Area, and their distribution, remains to be documented.

B1.3 Fauna

The annual cycle of flooding and drying in the Tonle Sap ecosystem limits faunal diversity to the most mobile or otherwise flood-adapted species. However, this cycle also results in very high levels of aquatic productivity which supports a unique faunal community, including one of the most productive freshwater fisheries in the world.

Although information is incomplete, the TSBR is considered to support >300 species of invertebrates, 200 species of birds, >107 species of fish, >30 species of reptiles, 20 species of mammals and ~5 species of amphibians (Goes 2005; Davidson 2006). Given its size, location and habitat structure, the Stung Sen Core Area can be expected to support many of these species.

Birds

The TSBR is a globally important site for colony-nesting waterbirds (Table 1), supporting "the largest remaining fragment of a bird megafauna that was once widespread across much of Southeast Asia" (Davidson *et al.* 2001). Currently known nesting sites are located primarily in and immediately adjacent to the Prek Toal Core area (~100 km northwest of Stung Sen).

Although not comparable to Prek Toal in terms of diversity or numbers of breeding large waterbirds, the Stung Sen Core Area is sufficiently important to have been included in the recently delineated Lower Stung Sen Important Bird Area (Seng *et al.* 2003). This IBA supports a breeding colony of darters and a significant breeding concentration of grey-headed fish eagles, as well as providing feeding habitat for spot-billed pelicans, lesser adjutants and a variety of other waterbirds.

Table 1. Waterbird Species of Conservation Concern Occurring in the TSBR ¹

Species	International Status	Significance ^{1,2}
Greater Adjutant <i>Leptoptilos dubius</i>	IUCN Endangered	TSBR supports the second largest colony in the world (>10% of global population). Additional surveys are required to document possible breeding colonies in Stung Sen
Lesser Adjutant <i>Leptoptilos javanicus</i>	IUCN Vulnerable	TSBR supports the largest colony in Southeast Asia (4% of global population). Occurs at Stung Sen, but additional surveys are required to document possible breeding colonies
Spot-billed Pelican <i>Pelecanus philippensis</i>	IUCN Vulnerable	TSBR supports the largest colony in the world (20% of global population). Occurs at Stung Sen
Milky Stork <i>Mycteria leucura</i>	IUCN Vulnerable	TSBR supports the only colony in mainland Southeast Asia
Masked Finfoot <i>Heliopais personata</i>	IUCN Vulnerable	TSBR population likely of global significance
Oriental Darter <i>Anhinga melanogaster</i>	IUCN Near-threatened	TSBR supports the largest colony in Southeast Asia (>10% of global population). An important breeding colony occurs in the Stung Sen area
Black-headed Ibis <i>Threskiornis melanocephalus</i>	IUCN Near-threatened	TSBR supports the largest colony in Southeast Asia (4-8% of global population)
Painted Stork <i>Mycteria leucocephala</i>	IUCN Near-threatened	TSBR supports the largest colony in Southeast Asia (20% of global population)
Black-necked Stork <i>Ephippiorhynchus asiaticus</i>	IUCN Near-threatened	breeds in Prek Toal
Grey-headed Fish-Eagle <i>Ichthyophaga ichthyaetus</i>	IUCN Near-threatened	TSBR population likely of global significance. Stung Sen area supports a significant breeding concentration
Little Cormorant <i>Phalacrocorax niger</i>	IUCN Least Concern (but TSBR population is internationally significant)	TSBR population ≥1% of Asian biogeographic population. Occurs in Stung Sen
Indian Cormorant <i>Phalacrocorax fuscicollis</i>	IUCN Least Concern (but TSBR population is internationally significant)	TSBR population >1% of Asian biogeographic population

Great Egret <i>Casmerodius albus</i>	IUCN Least Concern (but TSBR population is internationally significant)	TSBR population >1% of Asian biogeographic population. Occurs in Stung Sen
Asian Openbill <i>Anastomus oscitans</i>	IUCN Least Concern (but TSBR population is internationally significant)	TSBR population >1% of Asian biogeographic population
Woolly-necked Stork <i>Ciconia episcopus</i>	IUCN Least Concern (but TSBR population is regionally significant)	threatened as a breeding species in adjacent countries
Glossy Ibis <i>Plegadis falcinellus</i>	IUCN Least Concern (but TSBR population is regionally significant)	threatened as a breeding species in adjacent countries
Purple Heron <i>Ardea purpurea</i>	IUCN Least Concern (but TSBR population is regionally significant)	threatened as a breeding species in adjacent countries. Occurs in Stung Sen
Great Cormorant <i>Phalacrocorax carbo</i>	IUCN Least Concern (but TSBR population is regionally significant)	threatened as a breeding species in adjacent countries

¹significance of TSBR populations is adapted from Goes (2005) and Davidson (2006). Breeding colonies occur primarily in and adjacent to Prek Toal Core Area, although feeding and migrating birds are more widely distributed in suitable habitat elsewhere in the TSBR

²importance of Stung Sen area is based on Seng *et al.* (2003) and Pech Bunnat and van Zalinge (2006)

Mammals

The mammalian fauna of the TSBR is not particularly diverse, but includes several species that are listed as globally threatened, and that may remain in internationally significant numbers (Davidson 2006). Globally threatened mammals occurring in the TSBR are slow loris (either northern slow loris *Nycticebus bengalensis* or pygmy slow loris *N. pygmaeus*, both listed as Vulnerable), long-tailed macaque *Macaca fascicularis* (Near-threatened), Germain's silver leaf monkey *Trachypithecus villosus germaini* (Data Deficient), hairy-nosed otter *Lutra sumatrana* (Data Deficient), smooth otter *Lutrogale perspicillata* (Vulnerable), and fishing cat *Prionailurus viverrinus* (Vulnerable).

All large wild herbivores (Eld's deer *Cervus eldi*, hog deer *Axis porcinus*, wild water buffalo *Bubalus bubalis*, Asian elephant *Elephas maximus*) and Irrawaddy dolphin *Orcaella brevirostris* have now been extirpated from the TSBR.

Reptiles

The Tonle Sap is possibly the single most important wetland for reptile conservation in Southeast Asia (Goes 2005), supporting significant populations of several threatened species (Table 2). Relatively little survey work has been conducted, and many species are now difficult to observe in the field due to low population densities (Davidson 2006). Only a preliminary list of species can be derived for Stung Sen Core Area, based on limited records and known habitat affinities.

Table 2. Reptile Species of Conservation Concern Occurring in the TSBR.¹

Species	International Status	Significance
Sumese Crocodile <i>Crocodylus siamensis</i>	IUCN Critically Endangered	small numbers persist. Occurs in Stung Sen
River Terrapin <i>Batagur baska</i>	IUCN Critically Endangered	probably extinct in TSBR
Asian Giant Softshell Turtle <i>Pelochelys cantorii</i>	IUCN Endangered	reported from the Tonle Sap, but no confirmed specimens or photographs

Yellow-headed Temple Turtle <i>Hieremys annandalii</i>	IUCN Endangered	TSBR population may be the most important in Cambodia. Occurs in Stung Sen
Burmese Python <i>Python molurus</i>	IUCN Near Threatened	occurs in TSBR
Asian Box Turtle <i>Cuora amboinensis</i>	IUCN Vulnerable	now uncommon in TSBR. Occurs in Stung Sen
Black Marsh Turtle <i>Siebenrockiella crassicollis</i>	IUCN Vulnerable	rare, but TSBR population may be the most important in the region
Giant Asian Pond Turtle <i>Heosemys grandis</i>	IUCN Vulnerable	considered to be scarce
Malayan Snail-eating Turtle <i>Malayemys subtrijuga</i>	IUCN Vulnerable	reportedly the most numerous turtle around the Tonle Sap, but declining across its range. Occurs in Stung Sen
Asiatic Softshell Turtle <i>Amyda cartilaginea</i>	IUCN Vulnerable	common to rare around the Tonle Sap; populations have recently declined. Occurs in Stung Sen

¹ adapted from Seng *et al.* (2003), Davidson (2006) and Pech Bunnat and van Zallinge (2006)

Amphibians

Very little information on amphibians is available for the TSBR, and none specifically for Stung Sen Core Area, although it is noteworthy that at least two species (one frog and one toad) occur in the adjacent deepwater rice agroecosystems of Kampong Thom Province (Davidson 2006). The amphibian fauna is expected to show close affinities with that in adjacent lowlands, which includes at least 18 species (Davidson 2006, citing B. Stuart *in litt.* 2005).

Fish

Fish are the largest vertebrate group in the Tonle Sap ecosystem (Lamberts 2001), although the number of species is not precisely known. Approximately 500 fish species have been described for the Mekong River system in Cambodia; at minimum 143 of these have been recorded in the Tonle Sap Lake, the Tonle Sap River and the surrounding floodplain (Davidson 2006). Sixteen of these are known to be of international conservation concern (Table 3). The Stung Sen River mouth is believed to concentrate nutrients and supports rich feeding aggregations of fish (Davidson *et al.* 2006). The Pi Stuan Fish Sanctuary, located at the mouth of the Tonle Sap River and generally considered to be the most important of the currently designated fish sanctuaries on the lake due to its deep pools, is located immediately adjacent to the Stung Sen Core Area.

Table 3. Fish Species of Conservation Concern Occurring in the TSBR.¹

Species	International Status	Significance
Mekong Giant Catfish <i>Pangasianodon gigas</i>	IUCN Critically Endangered; CITES Appendix I	Tonle Sap Lake and Tonle Sap River (a migratory corridor for mature fish) are important habitat areas
Leaping Barb <i>Chela caeruleostigmata</i>	IUCN Critically Endangered	not recorded from Tonle Sap Lake, but possibly occurs
Jullien's Golden Carp <i>Probarbus jullieni</i>	IUCN Endangered; CITES Appendix 2	recorded from Tonle Sap Lake

Laotian Shad <i>Tomalosa thibaudeaui</i>	IUCN Endangered	populations have recently drastically declined due to factors outside of the Tonle Sap
Tricolor Sharkminnow <i>Balantiocheilos melanopterus</i>	IUCN Endangered	depicted on FiA's Endangered Fishes of Cambodia
Asian Bonytongue/Asian Arowana <i>Scleropages formosus</i>	IUCN Endangered; CITES Appendix I	occurrence in TSBR not confirmed
Thicklip Barb <i>Probarbus labeamajor</i>	IUCN Data Deficient	recorded in Tonle Sap, but little known
Giant Pangasius <i>Pangasius sanitwongsei</i>	IUCN Data Deficient	becoming increasingly rare throughout its range
Giant Barb <i>Catlocarpus siamensis</i>	not listed, but requires urgent evaluation and immediate conservation attention	numbers have declined drastically
<i>Puntioplites bulu</i>	not listed	formerly common, but has recently become very rare. Depicted on FiA's Endangered Fishes of Cambodia. Occurrence in TSBR requires confirmation
Subretoothing Thryssa <i>Lycotryssa crocodilus</i>	not listed	depicted on FiA's Endangered Fishes of Cambodia
Four-barred Tigerfish <i>Danioides quadrifasciatus</i>	not listed	occurrence in TSBR not confirmed. Depicted on FiA's Endangered Fishes of Cambodia
<i>Wallago leeri</i>	not listed	occurrence in TSBR not confirmed. Depicted on FiA's Endangered Fishes of Cambodia
<i>Albulichthys albuloides</i>	not listed	depicted on FiA's Endangered Fishes of Cambodia
Elephant-ear Gourami <i>Chromedus exodon</i>	not listed	occurrence in TSBR not confirmed. Depicted on FiA's Endangered Fishes of Cambodia
<i>Botia</i> genus	not listed	several species recorded in first half of 20th Century, but no recent records

Adapted from Davidson (2006)

Invertebrates

To date no invertebrate surveys of Stung Sen Core Area have been undertaken. However, the invertebrate fauna is likely to include primarily aquatic and semi-aquatic species, and species richness may be relatively low (as reported for Prek Toal Core Area by Constant and Grootaert 2003).

B2. Socio-economic Situation

Settlements in the vicinity of the Core Area are limited to villages along the Stung Sen River, comprising Phat Sanday (159 households), Kampong Chamlang (206 households), Neang Sao (180 households), Toul Neang Sao and Psat sub-village (total 209 households) and Koh Tapov (220 households). Neang Sao and Toul Neang Sao include some fixed (stilted) housing along the Stung Sen River, but most housing is floating and is moved seasonally along the river and lakeshore. Most of the villages are ethnic Khmer, although Koh Tapov village is predominantly Vietnamese (~70% of households). Human populations reportedly are increasing as a result of both in-migration and a relatively high birth rate.

The primary occupation of the resident population is fishing, using a variety of fishing gear. Residents are dependent on fishing for both household consumption and income (trade for rice), although the latter is problematic during the rainy season, when only small-scale gear is legally allowed, in order to protect spawning fish. Fuelwood is collected for household use and production of dried fish. Some households raise fish, crocodiles and pigs for income generation, with mixed success. A limited number of families from Koh Tapov and Toul Neang Sao villages, and seasonal villages along the Stung Sen River, engage in farming during the dry season.

Seasonal migrants use the area during both the dry season, coming primarily from Stoung District, and the wet season, when access is from the lake. Migrants use the area for fishing, hunting and honey collection, and for farming along the outer (upland) edges. Land-grabbing and pesticide run-off into the lake have been identified as problems related to dry season farming.

Market hunting of macaques has been a persistent problem in the Core Area (Hout *et al.* 2003; information from area residents 2006), although enforcement measures are currently being applied.

The western half of the Core Area is overlain by Kampong Thom Fishing Lot No. 3, which borders the permanent lake edge and limits access to subsistence resource users during the open season of October-May. The area immediately upland of Lot No. 3, comprising the eastern half of the Core Area, was released for subsistence fishing as part of the reform measures implemented in 2000. Forest fires are a problem during the dry season, and are attributable at least in part to clearance of the fishing lot boundary. Sub-leasing of the fishing lot reportedly complicates control by FiA Officers.

Community fisheries have been organized by some villages in Phat Sanday Commune but reportedly do not yet function well. A Community Protected Area (Toul Neang Sao) also has been established by the villages of Toul Neang Sao, Kampong Chamlang and Psaot.

B3. Conservation Values and Significance

B3.1 Biological Values

The predominant biological value of the Stung Sen Core Area lies in the tall, species-rich evergreen forest along the Stung Sen River, which includes a large number of rare species, exceptionally large trees (reaching 1-3 m in diameter and up to 15 m in height) and a diverse assemblage of lianas (McDonald *et al.* 1997). The area also provides protection to more widespread habitats (short-tree shrublands, aquatic and grassland communities) and their constituent plant and animal biodiversity. In addition, it is immediately adjacent to and contributes to the ecological function of critically important fish refuge areas (Stung Sen River mouth, Pi Stuon Fish Sanctuary), and areas of importance for waterbirds and Bengal floricans (Chhnuk Tru, Prey Koh and Veal Srongae).

At the ecosystem level, the Core Area represents a small but largely intact and important part of the globally unique seasonally inundated zone of the Tonle Sap Lake.

B3.2 Ecotourism Values

The Stung Sen Core Area is a potentially important ecotourism resource, although its potential remains to be fully evaluated. Assets include unique rural lifestyles, plant and animal biodiversity, and scenic values. While these are unlikely to attract large numbers of visitors, there is some potential for high-end day and overnight visits focussing on social and ecological attributes. This potential will be more fully explored during the Management Plan period.

In order for management to be effective it must consider the cultural and historic values that the Stung Sen Core Area holds for the communities that surround it. These values remain to be fully assessed, although they are certainly of immediate significance to the lifestyles of current residents in adjacent villages.

One of the aims of Biosphere Reserve management is to encourage the use of traditional knowledge in sustainable development. There is a wealth of such knowledge held by local residents, although this remains to be adequately documented.

B3.4 Educational Values

Another aim of Biosphere Reserve management is to promote environmental education and public awareness. This is important at two levels: 1) the national level, where improved and more widespread knowledge and appreciation of this unique resource will support efforts to conserve and sustainably manage the resources of the Biosphere Reserve; and 2) the local level, where the Core Area provides a unique, diverse and relatively easily accessible resource on which to focus environmental education and awareness activities. Activities at the local level will usefully be modelled after those already underway at Prek Toal, which have primarily involved delivery of environmental education and awareness programming within Prek Toal village, and structured visits to the Core Area by school children. It is anticipated that similar programming will be developed at Stung Sen, with delivery through the school system, the CAMC, and guided field trips to the Core Area.

B3.5 Economic Values

The current economic value of the Stung Sen Core Area is based largely on commercial exploitation of the fishery resource, and on resource harvesting for subsistence-level livelihoods. There is also potential for local economic diversification, including employment as Rangers, boat drivers and CAMC staff.

Part Two: Management Plan 2008-2012

C. Purpose and Mission Statement

C1. Purpose of Stung Sen Core Area

The purpose of the Stung Sen Core Area is to conserve and protect:

- representative examples of Cambodia's biodiversity, including flooded forest and associated habitat types, and constituent floral and faunal species;
- an area of exceptional natural and scenic beauty;
- endangered, vulnerable, threatened, endemic and rare species, and species otherwise of special concern or of exceptional value;
- spawning grounds and nursery habitat for an economically important assemblage of fish species;
- the unique association and mosaic of habitats that give the Core Area its distinctive character;
- the scenic, aesthetic and cultural attributes that are valued by local communities and that can support sustainable tourism development; and
- the cultural and natural ecological processes that support the Core Area's biodiversity, while safeguarding the interests of local communities.

C2. Mission Statement for Stung Sen Core Area

The mission of the Stung Sen Core Area is to conserve and sustainably manage the natural and cultural resources of the Core Area, in partnership with local communities and other stakeholders, for the benefit of the people from local communities and Cambodia as a nation, and, by so doing, to contribute to international efforts to reconcile the conservation of biodiversity with its sustainable use, as exemplified by the Biosphere Reserve concept.

D. Issues and Long-term Vision

D1. Analysis of Issues and Problems

The mission statement for Stung Sen Core Area focuses on reconciling conservation of the area's unique biodiversity resources with its sustainable use. Since the Biosphere Reserve was established in 2001, most attention has gone toward management of the Prek Toal Core Area, based on its global importance for large waterbird conservation. However, field staffing and support facilities were established at Stung Sen beginning 2005, and interaction with local communities has been initiated. Basic issues remaining unresolved, and/or requiring management attention, include but are certainly not limited to:

- **the future of commercial fishing in the area.** The western (lakeside) half of Stung Sen Core Area is overlain by a productive freshwater fishing lot (Kampong Thom Fishing Lot No. 3), producing an estimated annual harvest of 443 tonnes of fish (FiA data). Fishing is intensive and non-selective, taking all species and all size classes over an 8 month period each year.

The Royal Decree establishing the Biosphere Reserve specifically states that fishing lots within the Core Areas shall continue to function in accordance with the Fishery Law, while the fishing lot owners must be committed to long-term conservation objectives. The fishing lots are subject to review every four years and to adequate reform in order to be consistent with long-term protection and conservation objectives of the Core Areas.

- **management programming, implementation and funding.** External support has been provided since 2005 through GEF and ADB funding (through the Tonle Sap Conservation Project and the Tonle Sap Environmental Management Project). The responsible government agencies are Ministry of Environment, Department of Nature Conservation and Protection (for resource conservation and environmental protection) and Ministry of Agriculture, Forestry and Fisheries, Fisheries Administration (for fisheries management, including maintenance of flooded forest). Primary issues are: 1) securing and maintaining long-term, stable funding for routine management activities, preferably through central government; 2) agreeing on, and effectively implementing, the roles of MoE and FiA in future conservation management in the Core Area; and, 3) efficiently and effectively planning, managing, monitoring and coordinating the activities of all stakeholders in the conservation of the area's biodiversity resources.

D2. Vision Statement

Given the necessary funding and commitment by all stakeholders, in five years time the successful implementation of management measures detailed in this Management Plan will have:

1. **maintained and where necessary enhanced the biological, physical and cultural assets of the Core Area.** This will have been achieved through the effective and efficient protection of all faunal and floral diversity and physical elements of their habitats, restoration as necessary of degraded areas, control of fire and other destructive physical impacts, reform and effective management of commercial fishing operations, and protection and promotion of cultural values.
2. **strengthened Core Area management, operations and support services.** Coordination with national and provincial government agencies, commune and village level administrations, NGOs and other partners will be well-established, as will the operational capacity and effectiveness of Core Area staff. An infrastructure development and maintenance plan will have been implemented, and necessary equipment procured and maintained as required. A financial management system will be in place and the budget base for Core Area management will have been increased.
3. **increased community involvement in Core Area management, and improved support for conservation.** Community institutions will have been established and their operations strengthened, "conservation friendly" income-generating activities will be established, and unsustainable use of Core Area resources minimized. Basic living conditions of local communities will have been improved, and community members' understanding of biodiversity conservation will have been increased.
4. **provided accurate, relevant and timely information to all levels of the Core Area management team.** An information system based on routine and systematic data collection by Rangers, management-oriented research, and inventories of important Core Area ecological resources will have been established, and management decisions will routinely be based on this system. Management interventions will be routinely monitored and evaluated for effectiveness and adjusted as required.
5. **guided the development and management of ecotourism,** in partnership with local communities and other stakeholders, and without negative ecological impacts on the Core Area or negative social impacts on surrounding communities. High quality ecotourism experiences based on international best-practice standards will have been developed, and local communities will be meaningfully involved in their delivery. Ecotourism activities, products and facilities will have been diversified, and Core Area staff and community members trained in their delivery and management. Regulations and procedures guiding ecotourism activities will have been produced, routinely implemented, and periodically reviewed by Core Area management and community members for implementation effectiveness.

6. **contributed to the development and implementation of environmental education and awareness activities**, aimed primarily at local residents, resource users and school children. Information about the Core Area and surrounding TSBR will be routinely available to visitors at the CAMC, in both English and Khmer. Programming for delivery through the local school system, NGOs and community organizations will have been developed, routinely delivered on an as-required basis, and periodically reviewed for relevance and effectiveness.
7. **resulted in the establishment of cooperative linkages with organizations and initiatives aimed at improved management of the surrounding Buffer Zone.** Coordination with relevant government agencies and other organizations will be well-established. The boundary between the Core Area and Buffer Zone will be demarcated on the ground and/or on suitable maps, and its location understood by all stakeholders. Land use and livelihoods activities in the surrounding Buffer Zone will be well-documented, and initiatives underway towards both improving management of the Buffer Zone and preventing/mitigating impacts on the Core Area.

E. Zones

Biosphere Reserve Core Areas are intended to be securely protected sites for conserving biological diversity, monitoring minimally disturbed ecosystems, and undertaking non-destructive research and other low-impact uses such as education. Given the over-riding requirement for secure protection throughout, the geographic division of the Stung Sen Core Area into different use zones does not readily apply. Instead, protection of key biodiversity elements that are sensitive to human presence (primarily colonial-nesting birds and large feeding aggregations) will be based on development and application of regulations specifying permitted proximity of approach by season of year and type of transport. These regulations will be subject to public review during the development stage and will apply to all users of the area, from subsistence resource users to ecotourists. The regulations will be widely promulgated prior to and during the process of application, and may be revised (subject to appropriate public notification) on the basis of experience and public inputs. Penalties consistent with standing Government of Cambodia practice will be applied for non-conformance with these regulations.

In addition to regulating proximity of approach to key biodiversity elements, it may be necessary or desirable for area management purposes to limit certain types of transport and/or activities to specified areas. These limitations, if necessary, will be specified in more detailed plans and notifications produced during the Management Plan application period. These may include but not necessarily be limited to bans on motorized transport in specified areas and/or specified seasons.

F. Management Programmes

The Stung Sen Core Area Management Plan 2008-2012 is divided into six Management Programmes:

1. Core Area Operations and Maintenance
2. Resource Conservation and Management
3. Resource Monitoring and Research
4. Ecotourism Development
5. Community Development
6. Buffer Zone, Transition Zone and International Issues

Each Management Programme has a stated goal, and each is divided into Subprogrammes with specific objectives addressing issues identified during the planning process. Activities aimed at achieving Subprogramme objectives are listed in table form for ease of reference. Responsible parties and timing are identified for each activity as a guide to MoE managers and Core Area field staff. All activities are considered to be "high priority" for implementation, within the timeframes indicated, and within the constraints of annual budget availability. It is expected that the Subprogramme activities tables will provide the basis for both annual planning and tracking of implementation progress.

F1. Core Area Operations and Maintenance

Goal: to strengthen and routinely implement Core Area operations and support services.

F1.1 Staffing

Objective: to ensure operational effectiveness of Core Area staff.

Issues and Rationale: the success of any organization in meeting its mission is dependent on the calibre of its staff and their operational effectiveness. In order to protect the critically important ecosystem elements within the Stung Sen Core Area, well-trained and motivated staff are required.

The present field staff complement is as follows:

Table 4. Core Area staff.

Position	Location	Number	Appointed
Core Area Director	MoE staff member based in Kampong Thom, with frequent travel to Stung Sen.	1	2003
Rangers	Stung Sen. Selected from local villagers and residents of Kampong Thom.	12	from 2005

The incumbent Core Area Director is a Government of Cambodia (MoE) employee. The Rangers have employment contracts (one year, renewable) limited to the Stung Sen Core Area, and are currently funded by MoE and TSCP.

Staffing-related operational issues to be addressed during the life of the Management Plan are as follows:

- **optimal staffing levels.** Current staffing levels are based primarily on funding availability. Staffing levels will ideally be based on real needs for effective biodiversity protection.
- **staff turnover and replacement.** An effective system of recruitment needs to be in place to deal with staff attrition when it occurs.
- **staff training and equipment.** Current Ranger staff have all received basic classroom and field-based training provided through TSCP. Training will need to continue as new staff are hired and as additional training needs become apparent.
- **staff payment.** The current system of paying or supplementing staff salaries from international donor funding is unsustainable. This is not currently an urgent problem, but funding availability needs to be forecast on the basis of a one year (preferably two years or longer) horizon, in order to ensure continuity of Ranger staffing.
- **staff deployment.** At present nine Ranger staff are from villages immediately adjacent to the Core Area, and three are from Kampong Thom. Reasonably balanced representation from each of the villages in the vicinity of the Core Area needs to continue to be maintained.

Law enforcement issues, and issues related to staff mandates regarding fisheries management, are dealt with under Section F2 below.

Table 5. Management actions related to Core Area staff.

No.	Activity	Responsibility	Timing
F1.1.1	Provide uniforms and necessary personal equipment to all field staff	DNCP/Core Area Director	Year 1-5
F1.1.2	Provide appropriate, safe and reliable transport, field equipment and accommodations	DNCP/TSCP	Year 1-5
F1.1.3	Develop and periodically review job descriptions, including gender equity considerations, and ensure that all levels of staff understand their job functions in relation to others	DNCP/Core Area Director	Year 1-5
F1.1.4	Carry out annual staff performance appraisals and implement recommendations	Core Area Director	Year 1-5
F1.1.5	Update training needs assessment on an annual basis and carry out necessary training	TSCP/Core Area Director	Year 1-5
F1.1.6	Recruit Rangers and support staff primarily (preferably exclusively) from a standing roster of local residents	Core Area Director	Year 1-5
F1.1.7	Supplement permanent staff with seasonal staff members from local communities who have relevant skills and knowledge	Core Area Director	Year 1-5

F1.2 Infrastructure

Objective: to develop, operate and maintain the infrastructure necessary for effective Core Area management.

Issues and Rationale: the primary infrastructure needs for conservation management in Stung Sen Core Area are as follows:

- offices and other working space for staff; and,
- facilities suitable for community outreach and associated activities.

As the only access for most of the year is by water, there is no need for the development of roads or other ground-based facilities in the Core Area.

Infrastructure currently in place and used for conservation management in the Core Area is currently limited to a Core Area Management Centre (CAMC) located in Phat Sanday village, opened in early 2006 and providing an office/working area for staff, a large meeting room, four bedrooms, kitchen and toilet facilities, and an exterior walkway. Total area is approximately 137 m². Like other floating structures on the lake the CAMC is designed to be easily moved in response to seasonal changes in water level. Other infrastructure immediately adjacent to Stung Sen Core Area and relevant to support of Core Area operations, but maintained and operated by other government organizations, NGOs or the private sector are as follows:

- fisheries station (1);
- police posts (2: regular and water police);
- military post;
- school (1: Grades 1-9);
- medical clinics (RGC health centre and private clinic);
- restaurants;
- general shops (several);
- boat repair shops;

- generator service;
- petrol station (nearest at Chhnok Tru); and,
- pagoda (1).

Operational issues related to infrastructure, and to be addressed during the life of the Management Plan, are as follows:

- **offices and other working space for staff.** Adequate working space for staff, including necessary equipment (see below) needs to be permanently established and maintained in the CAMC.
- **community outreach facilities.** Community outreach facilities need to be permanently established in the CAMC. These will double as visitor reception and information facilities, and will centre on the office and large meeting room. Materials to be provided include reference books, identification manuals, self-learning materials, map sets, posters, flipcharts, a whiteboard and portable audio-visual equipment and programmes.
- **cleaning, maintenance and repairs.** A maintenance plan for the CAMC needs to be prepared and routinely implemented, and forecasted costs reflected in annual budget allocations. Public access areas (offices, visitor reception and information facilities, accommodation) need to be clean, orderly and maintained to the highest possible standards. Public access areas also need to conform with international safety standards.

Management Actions:

Table 6. Management actions related to infrastructure.

No.	Activity	Responsibility	Timing
F1.2.1	Develop and maintain office facilities, staff quarters, community outreach and other day use visitor facilities	DNCP/TSCP/Core Area Director	Year 1-5
F1.2.2	Provide staff quarters and basic amenities (electricity, running water) to a sufficient standard to ensure a positive effect on staff morale and efficiency	DNCP/TSCP/Core Area Director	Year 1-5
F1.2.3	Develop and implement a maintenance plan for all Core Area infrastructure, including cleaning, repair and safety protocols	Core Area Director/Senior Ranger	Year 1-5
F1.2.4	Inspect the CAMC for design and construction deficiencies and implement timely renovation and repair measures	Core Area Director	Year 1-5
F1.2.5	Ensure that all building renovations, and any new building designs and locations, are functionally and aesthetically appropriate, and in line with international standards for protected areas facilities	TSCP/Core Area Director	Year 1-5
F1.2.6	Include cost forecasts in annual budget planning and allocations	Core Area Director	Year 1-5

F1.3 Equipment

Objective: to ensure that adequate equipment is available for efficient operation and management of the Core Area.

Issues and Rationale: specialized equipment is required for the implementation of Core Area management activities, and needs to be maintained and replaced as necessary. The primary equipment needs for conservation management in Stung Sen Core Area are as follows (lists are indicative only):

- field equipment (Ranger uniforms and standard kit, spotting scopes and binoculars, compasses, GPS units, fire-fighting equipment);
- transport (paddle boats, motorboats);
- office equipment (furniture, computers and printers, generator); and,
- communications equipment (ICOMs, mobile telephones).

Basic equipment is already in place, but will need to be supplemented and replaced during the life of the Management Plan. In order to satisfy both RGC and donor requirements, careful inventory and tracking of all individual equipment items will be required.

Management Actions:

Table 7. Management actions related to equipment.

No.	Activity	Responsibility	Timing
F1.3.1	Develop and implement a rolling procurement and replacement plan for all equipment required for Core Area management	Core Area Director/TSCP	Year 1
F1.3.2	Develop and implement a maintenance plan for all equipment	Core Area Director/ Senior Ranger	Year 1-5
F1.3.3	Develop and maintain an equipment asset register with sufficient detail to track the procurement, location and maintenance history of individual equipment items	Core Area Director/ Senior Ranger	Year 1-5
F1.3.4	Train staff in proper use and maintenance of equipment	Core Area Director/ Senior Ranger	Year 1-5
F1.3.5	Include cost forecasts in annual budget planning and allocations	Core Area Director/DNCP	Year 1-5

F1.4 Financial Management

Objective: to develop and implement financial management systems that are both efficient and transparent.

Issues and Rationale: efficient and transparent financial management of conservation programming in Stung Sen Core Area will depend on how donor funding and funding released by or through MoE is managed and reported. Revenue collected from visitors is not expected to be an important funding source, but collection and expenditure of any such revenue will nevertheless need to be transparent.

It is expected that donors and other supporting agencies will continue to respond positively to requests for support only if fund management is demonstrably conscientious and based on full disclosure to all parties. Recognizing that a strong and secure financial base is required for the effective operation of any protected area, the following management actions are required.

Management Actions:

Table 8. Management actions related to financial management.

No.	Activity	Responsibility	Timing
F1.4.1	Develop and implement a financial management system that includes full disclosure to all parties	DNCP/Core Area Director	Year 1
F1.4.2	Train accounts staff and personnel responsible for budget planning in implementation of the system	DNCP/Core Area Director	Year 1
F1.4.3	Review current secured funding levels in relation to projected needs over the life of the Management Plan and beyond	DNCP/Core Area Director	Year 1
F1.4.4	Develop standards regarding collection of fees from visitors and tourism operators, and develop appropriate receipting and accounting systems for visitor revenues	DNCP/Core Area Director	Year 1
F1.4.5	Explore additional opportunities for fund-raising including donations	DNCP/Core Area Director	Year 1-5
F1.4.6	Base activities planning on secured funding, and allocate revenues to priority conservation activities	DNCP/Core Area Director	Year 1-5
F1.4.7	Provide annual reporting to all parties	Core Area Director	Year 1-5

F1.5 Cooperation with Partners

Objective: to improve coordination of Core Area activities with those of other government agencies, communes, communities, NGOs and other partners.

Issues and Rationale: only a very limited number of organizations and agencies are currently involved in activities related to natural resource management and conservation in and around Stung Sen. Nevertheless, there is a need for coordination of initiatives, particularly with regard to resource management, environmental education and ecotourism. Guidelines and effective action are needed to assist all partners to maximize collaboration and benefits. Particular attention needs to be paid to:

- **law enforcement issues.** Under the new Protected Area Law (in effect from 2008) MoE Rangers have the authority to enforce the full range of standing regulations regarding natural resources in the TSBR Core Areas. This authority includes the right to bear arms, and to arrest and charge offenders. In addition to regulating the use and protection of all resources directly under MoE's mandate, the new legislation effectively empowers Ranger staff to enforce those parts of the fisheries and forestry laws that deal with wildlife (here including fish, amphibians, turtles, crocodiles, watersnakes, and aquatic mammals and birds). However, cooperative modalities for regulation of fishing, particularly where fishing activities might result in habitat destruction or modification, remain to be established.
- **environmental education.** Environmental education is a broad subject covering all aspects of the physical and natural environment, and involving a wide cross-section of stakeholders, from school children to resource users to resource managers. The Environmental Awareness, Education and Outreach Programme being implemented with TSCP assistance in the Core Area focuses particularly on biodiversity conservation, with delivery through Commune offices, the school system and the CAMC. Appropriate cross-linkages need to be developed with other ongoing or future environmental education initiatives to improve both efficiency and effectiveness of overall environmental awareness and education delivery.
- **visitor management.** Basic visitor management services (reception, orientation and information) will be provided to visitors through the CAMC. There is currently very limited scope for provision of additional services (guiding, transportation, food and accommodation, local crafts and cultural experiences), but potential demand needs to be monitored and appropriate quality control standards developed and implemented through a cooperative approach.

Table 9. Management actions related to cooperation with partners.

No.	Activity	Responsibility	Timing
F1.5.1	Identify all stakeholders and establish routine liaison procedures, including mechanisms for effective communication and cooperation	DNCP/Core Area Director	Year 1
F1.5.2	Develop clear operational procedures for law enforcement in the Core Area, through consultation and agreement by all stakeholders	DNCP/Core Area Director	Year 1
F1.5.3	Establish, equip and provide logistic support to Conservation Teams comprising Rangers, Fisheries Officers, and Commune Police, charged with enforcement of all natural resource regulations in the Core Area	DNCP/Core Area Director	Year 1-5
F1.5.4	Review and monitor all environmental education and awareness programming being delivered in the Core Area, and identify areas of potential synergy	TSCP/Core Area Director	Year 1
F1.5.5	Develop and operationalize cooperative linkages in the delivery and periodic review of environmental education and awareness delivery	TSCP/Core Area Director	Year 1-5
F1.5.6	Review and catalogue all visitor services available in the communities adjacent to the Core Area	Core Area Director/Senior Ranger	Year 1
F1.5.7	Develop and operationalize cooperative linkages in delivery of visitor services, including development and maintenance of quality standards	DNCP/Core Area Director	Year 1-5
F1.5.8	Establish a structure/procedures for regular partner and public inputs on management plan implementation	DNCP/Core Area Director	Year 1-5

F2. Resource Conservation and Management

Goal: to maintain the integrity of the biological, cultural and physical features of the Stung Sen Core Area

F2.1 Protection and Management of Flora, Fauna and Ecological Values

Objective: to ensure effective and efficient protection and management of the fauna and flora, and of the biophysical elements of their habitats, within the Stung Sen Core Area.

Issues and Rationale: a Biosphere Reserve Core Area is intended to be a securely protected site for conserving biological diversity, monitoring minimally disturbed ecosystems, and undertaking non-destructive research and other low-impact uses. The protection and management of flora, fauna and ecological values in the TSBR needs to be consistent with the definition and function of a Biosphere Reserve as defined by UNESCO, the provisions of the Royal Decree establishing the Biosphere Reserve, and resource use and protection policies of RGC. Fisheries management is currently an area of active discussion, and adjustments will need to be made to reflect any major changes in RGC fisheries policy or management direction during the Plan period (see also Section B1).

All resource conservation and management activities currently scheduled under the Plan (below) are consistent with current RGC policies, legislation and regulations, and to the extent possible with international best practice in protected area management. These activities will need to be adjusted during implementation to reflect any changes in the national regulatory framework, again consistent with the overarching goal of effective conservation of the Core Area's biodiversity resources. The focus will be on safeguarding and managing biodiversity resources in the best possible way.

Commercial fishing activities will continue within the boundaries of the Stung Sen Core Area during the Management Plan period, pending RGC formulation and implementation of fisheries reform measures. The entire Core Area will continue to be protected as fisheries habitat (see also Section D1). Given the number of people living adjacent to the Core Area, and their reliance on the area for subsistence fishing and fuelwood collection, a controlled level of subsistence livelihoods (seasonal fishing and fuelwood harvesting only) also will need to continue to be permitted. However, subsistence fishing techniques will be limited to those that do not alter or destroy terrestrial or aquatic habitat, or result in a bycatch of birds or other species. No other commercial or subsistence harvesting of any biodiversity resources will be permitted.

Operational issues related to the protection and management of flora, fauna and ecological values are as follows:

- removal or spatial restriction of commercial fishing activities could also reduce the very effective control of access, protection of flooded forest habitat, and control of fishing methods and offtake, currently exercised by the Fishing Lot owner. This will need to be replaced, as necessary, by an armed and otherwise well-equipped, well-trained and demonstrably effective Conservation Team mandated to enforce all laws and regulations regarding natural resource use, including regulations and restrictions specific to the Stung Sen Core Area;
- the boundaries of the Core Area and permitted location of fishing activities will need to be demarcated on maps that are available to the public (e.g., at the Commune Office, the CAMC and other public buildings), marked on the ground at strategic points, and regularly patrolled by the Conservation Team; and,
- benefits of Core Area conservation will need to flow back to adjacent communities. These benefits will include but not necessarily be limited to access to subsistence fishing, controlled seasonal/subsistence level harvest of fuelwood resources, and priority access to participation in conservation and ecotourism-support services (e.g., employment as Rangers, provision of transportation and guiding services).

Management Actions:

Table 10. Management actions related to protection and management of flora, fauna and ecological values.

No.	Activity	Responsibility	Timing
	Access Management		
F2.1.1	Identify major (seasonal) water and land access points and develop an access management plan	TSCP/Core Area Director	Year 1
F2.1.2	Monitor type, location and intensity of boat, foot, motorcycle and other motorized traffic as part of routine patrolling activity	Senior Ranger/ Rangers	Year 1-5
F2.1.3	Develop policy and operational guidelines for entry of community members into the Core Area, and for resource use activities that are permitted	DNCP/TSCP/Core Area Director	Year 1
F2.1.4	Organize and deploy armed Conservation Teams to ensure a continuous and effective monitoring and regulatory presence	Core Area Director/ Senior Ranger/Rangers	Year 1-5
F2.1.5	Include access management in awareness programming and delivery	TSCP/Core Area Director	Year 1-5

Boundary Marking			
F2.1.6	Develop and implement a boundary maintenance plan, including development of public awareness of boundary location, and boundary marking at major entry points and other strategic locations	DNCP/TSCP/Core Area Director	Year 1
F2.1.7	Design boundary marking system to be 1) as tamper-proof as possible, to prevent removal or shifting of boundary markers, and 2) visible at night	TSCP/Core Area Director	Year 1
F2.1.8	Develop, install and maintain functionally and aesthetically appropriate signboards at main access points	TSCP/Core Area Director/Senior Ranger	Year 1
F2.1.9	Conduct periodic inspections to ensure that boundary delineation remains intact	Senior Ranger/Rangers	Year 1-5
Captive Animal Management			
F2.1.10	Develop and implement a rehabilitation/release protocol (including penalties for repeat offenders) and associated facilities for the humane treatment and rehabilitation of confiscated wildlife	DNCP/Core Area Director	Year 1
F2.1.11	Confiscate illegally held wildlife, and return to secure areas of natural habitat	Senior Ranger/Rangers	Year 1-5
F2.1.12	Develop and deliver appropriate staff training	DNCP/TSCP/Core Area Director	Year 1-5
F2.1.13	Include captive wildlife issues in environmental education and awareness programming	DNCP/TSCP/Core Area Director	Year 1-5
Fishing (large and medium-scale)			
F2.1.14	Cooperate with FiA regarding control of illegal fishing activities	DNCP/TSCP/Core Area Director	Year 1-5
F2.1.15	Coordinate with FiA and all relevant stakeholders regarding fisheries reform (e.g., as proposed under TSSLP, but potentially including other initiatives), advocating for the best possible balance between protection, maintenance and (where necessary) rehabilitation of flooded forest and other natural habitats, and protection and maintenance of all other elements of biodiversity, and fisheries viability	DNCP/TSCP/Core Area Director	Year 1-5
F2.1.16	Test and establish monitoring, communications and enforcement mechanisms to ensure that large and medium-scale fishing adjacent to the Core Area does not negatively impact Core Area fish populations, water, vegetation or other biodiversity resources	DNCP/Core Area Director/Senior Ranger	Year 1-5
Fishing (small-scale)			
F2.1.17	Develop and implement an equitable system, agreed by all stakeholders, and consistent with prevailing legislation, regulations and effective resource conservation, that regulates small-scale fishing within the Core Area	DNCP/FiA/Core Area Director/Senior Ranger/Rangers	Year 1-5
Fuelwood and Other NTFP Harvest			
F2.1.18	Develop and implement an equitable system, agreed by all stakeholders, and consistent with prevailing legislation, regulations and effective resource conservation, that regulates fuelwood and other NTFP harvest within the Core Area	DNCP/Core Area Director/Senior Ranger/Rangers	Year 1-5

	Habitat Management		
F2.1.19	Develop and implement appropriate habitat management prescriptions, including in surrounding Buffer Zone, specifically aimed at prevention of forest clearing and other encroachment	DNCP/TSCP/Core Area Director	Year 1
F2.1.20	Manage entire Core Area as one ecological unit	DNCP/Core Area Director	Year 1-5
F2.1.21	Ensure that habitat needs of specialist wildlife species (e.g., species dependent on standing dead trees) also are met	Core Area Director	Year 1-5
F2.1.22	Regain, protect and rehabilitate any encroached areas	Core Area Director	Year 1-5
	Hunting		
F2.1.23	Develop and apply enforcement tools and programmes	DNCP/Core Area Director/Senior Ranger	Year 1
F2.1.24	Prohibit unauthorized carrying of firearms or other weapons in or through the Core Area	Senior Ranger/Rangers	Year 1-5
F2.1.25	Prohibit hunting, collection or destruction of any type of wildlife	Core Area Director	Year 1-5
F2.1.26	Develop and deliver awareness programming, targeting both residents and seasonal migrants	TSCP/Core Area Director	Year 1-5
	Land Use		
F2.1.27	Develop and implement a monitoring and surveillance programme in coordination with the Commune Council, including the following activities not to be permitted within the Core Area at any scale: agriculture, livestock grazing, permanent or seasonal settlements, cutting of flooded forest	DNCP/Core Area Director/Senior Ranger/Rangers	Year 1-5
	Law Enforcement		
F2.1.28	Develop clear operational procedures for warnings, arrests and confiscations, and develop and deliver training specific to these measures	DNCP/Core Area Director/TSCP	Year 1
F2.1.29	Provide and maintain equipment (boats, motorcycles, communications) and ensure availability of operational costs to permit mobile law enforcement teams to efficiently reach all parts of the Core Area	TSCP/Core Area Director	Year 1-5
F2.1.30	Develop and implement a regular patrolling system and necessary support infrastructure, including seasonally or permanently manned guard posts	Core Area Director/Senior Ranger/Rangers	Year 1-5
F2.1.31	Involve local communities and Community Fisheries Organizations in reporting of illegal use of natural resources	Core Area Director/Senior Ranger/Rangers	Year 1-5
F2.1.32	Involve Commune Councils as an oversight agency with regard to law enforcement	DNCP/Core Area Director/Senior Ranger	Year 1-5
	Training		
F2.1.33	Ensure that all staff are trained in conservation area management and that refresher/specialized training is provided as required	Core Area Director/TSCP	Year 1-5

Objective: to identify and maintain cultural values associated with the Core Area.

Issues and Rationale: traditional users of natural resources often feel a strong cultural affinity with these resources, and places, times or methodologies associated with their use. This aspect of resource use has not yet been investigated in or around the Stung Sen Core Area, apart from observations on the very wide variety of family fishing techniques and gear that have been developed (Loeung *et al.* 2003). Cultural values need to be identified in consultation with local communities.

Management Actions:

Table 11. Management actions related to maintenance of cultural values.

No.	Activity	Responsibility	Timing
F2.2.1	Identify, evaluate and document cultural values associated with the Core Area	TSCP/Core Area Director	Year 1
F2.2.2	Identify opportunities for maintaining cultural values and incorporate in Core Area management programming	Core Area Director/TSCP	Year 1-5

F2.3 Fire Management

Objective: to minimize the occurrence of destructive fires and their related impacts within the Core Area.

Issues and Rationale: uncontrolled fires, many if not most set by humans (others are caused by lightning), occur regularly within the Stung Sen Core Area, and particularly around the seasonally dry periphery. Fires may be deliberately set to drive and capture wildlife (*e.g.*, turtles, primates), or to clear land for grazing/agricultural use. Casual disposal of smoking materials is widespread and is thought to be a primary cause of fire in otherwise sparsely inhabited areas. Apart from impacts on forest cover and vegetation succession, fire kills wildlife species that cannot escape.

Management Actions:

Table 12. Management actions related to fire management.

No.	Activity	Responsibility	Timing
F2.3.1	Compile and map available information on fire location and frequency in and around the Core Area	DNCP/BMS/Core Area Director	Year 1
F2.3.2	Assess past and potential future impacts of fire on biodiversity in the Core Area	DNCP/BMS/Core Area Director	Year 1
F2.3.3	Develop a fire management plan for the Core Area, including detection/early warning mechanisms; response options and response-selection and mobilization processes; and manpower, training and equipment and funding requirements	DNCP/Core Area Director	Year 1
F2.3.4	Train Core Area staff and local community members in fire response and management techniques	Core Area Director/ Senior Ranger/ TSCP/BMS	Year 1-5
F2.3.5	Contain and extinguish fires as promptly as possible	Senior Ranger/Rangers	Year 1-5

F2.3.6	Monitor vegetation regrowth and wildlife use in areas affected by fire	Senior Ranger/Rangers	Year 1-5
F2.3.7	Implement and periodically review and revise the fire management plan	Core Area Director/ Senior Ranger	Year 1-5
F2.3.8	Include fire impacts in environmental education and awareness programming	TSCP/Core Area Director	Year 1

F3. Resource Inventory, Monitoring and Research

Goal: to provide accurate, relevant and timely information for resource management.

F3.1 Resource Inventory and Monitoring

Objective: to carry out baseline inventories and monitoring of Core Area ecological resources.

Issues and Rationale: currently available information on natural resources in the Core Area is based primarily on unsystematic observational data. Additional inventory and monitoring data will be required for sound management of the area. Inventory and monitoring priorities are:

- quantitative baseline assessments and monitoring of all species groups;
- baseline assessment of habitat (vegetation) types and monitoring of area and condition; and,
- monitoring of fire distribution and impacts.

Management Actions:

Table 13. Management actions related to resource inventory and monitoring.

No.	Activity	Responsibility	Timing
F3.1.1	Review resource inventories carried out to date and determine what additional inventories are required	DNCP/BMS/Core Area Director	Year 1
F3.1.2	Design, implement and periodically review monitoring programme, and modify as necessitated by data requirements for sound scientific management of the Core Area	DNCP/BMS/Core Area Director	Year 1-5
F3.1.3	Develop a current habitat map of the Core Area, delineating flooded forest (by height class and tree density), scrubland, grassland and permanent wetlands, and regularly update on the basis of observational and remotely sensed data	TSBRS/TSCP/Core Area Director	Year 1-5
F3.1.4	Analyze and report on inventory and monitoring data on a regular basis	BMS/Core Area Director	Year 1-5
F3.1.5	Use inventory and monitoring data to guide management actions	BMS/Core Area Director	Year 1-5

F3.2 Research

Objective: to undertake effective, management-oriented research on Core Area ecological resources.

Issues and Rationale: in addition to inventory and monitoring data, the results of sound research into species biology, ecological relationships, and impacts of human behaviour and habitat change can be used to improve management decisions. While valid research needs to be encouraged and supported in the Stung Sen Core Area, there is a need to identify research priorities, competent institutions, ethical guidelines, and guidelines on ownership and dissemination of research results.

Table 14. Management actions related to research.

No.	Activity	Responsibility	Timing
F3.2.1	Develop a research policy and guidelines in coordination with FiA and other institutions	DNCP/Core Area Director	Year 1
F3.2.2	Develop list of research priorities and actively seek institutional/researcher support	DNCP/Core Area Director	Year 1
F3.2.3	Liaise with research institutions to mobilize resources	DNCP/Core Area Director	Year 1-5
F3.2.4	Encourage and support non-destructive, management-oriented research by qualified institutions-based individuals	DNCP/Core Area Director	Year 1-5
F3.2.5	Implement relevant research-based recommendations	Core Area Director	Year 1-5

F3.3 Resource Information Management System

Objective: to develop and maintain a Resource Information Management System, and to use this as an information-sharing and decision-making tool for managing Core Area resources.

Issues and Rationale: management of the Core Area and its resources will require accurate, up-to-date and easily accessible information for planning, transparent decision-making and evaluation of effectiveness of actions taken. A computer-based, user-friendly Resource Information Management System needs to be developed and maintained for the storage and utilization of a broad spectrum of information on:

- types and distribution of biodiversity resources in the Core Area (e.g., all data from resource inventory and monitoring programmes, other observations);
- location and timing of local use of these resources (e.g., from patrols, reports, resource use agreements);
- location, timing and results of management actions taken (e.g., use agreements, patrols [timing, route, personnel], warnings, arrests, fines and penalties imposed); and,
- visitor use (e.g., visitor registrations at the CAMC, visitor participation in activities, visitor comments and feedback).

Management Actions:

Table 15. Management actions related to resource information management system.

No.	Activity	Responsibility	Timing
F3.3.1	Prepare an assessment of the types of information that are/can be available and the utility of this information in managing Core Area resources	DNCP/Core Area Director	Year 1
F3.3.2	Develop a Resource Information Management System to facilitate routine access to, manipulation and use of information to facilitate effective management of the Core Area	DNCP/Core Area Director	Year 1
F3.3.3	Train staff in data input and use of the system	DNCP/Core Area Director	Year 1
F3.3.4	Input resource inventory and monitoring, resource use, visitor use and other defined data on a regular and routine basis	DNCP	Year 1-5
F3.3.5	Monitor operation and use of the system to ensure optional functionality and utility	DNCP/Core Area Director	Year 1-5

F4. Ecotourism Development

Goal: to develop and sustainably manage ecotourism in the Stung Sen Core Area, in partnership with local communities and other stakeholders, and without negatively affecting the ecological integrity of the Core Area or the social and cultural integrity of adjacent communities.

F4.1 Needs and Priorities for Ecotourism Development

Objective: to establish ecotourism that is appropriate to the ecological setting and legal status of the Core Area, and to the social setting of surrounding communities.

Issues and Rationale: given that the Core Area is intended to comprise "a securely protected site for conserving biodiversity, monitoring minimally disturbed ecosystems, and undertaking non-destructive research and other low impact uses", ecotourism activities will need to be carefully developed and implemented to ensure that negative impacts on biodiversity resources are avoided or minimized. Similarly, visitor management programming and guidelines will need to be carefully developed to ensure that benefits to local communities are maximized, and that negative social impacts are avoided.

Management Actions:

Table 16. Management actions related to needs and priorities for ecotourism development.

No.	Activity	Responsibility	Timing
F4.1.1	Develop comprehensive review of all existing ecotourism resources and activities, focussing on opportunities, strengths and weaknesses, and assessing the feasibility of development of ecotourism activities in and around the Core Area	DNCP/TSCP	Year 1
F4.1.2	Contingent on the results of F4.1.1, develop ecotourism master plan/implementation plan based on "safe" carrying capacity relative to sensitive biodiversity resources	DNCP/TSCP	Year 1
F4.1.3	Develop regulations and guidelines specifying frequency of visits to specified areas, number of visitors/group, proximity and method of approach, visitor behaviour standards <i>etc.</i>	DNCP/TSCP	Year 1
F4.1.4	Develop and implement permitting, monitoring and enforcement methodologies, including service provider quality and safety standards	DNCP/Core Area Director	Year 1-5
F4.1.5	Periodically review implementation and enforcement experience and adjust to ensure minimal impact of ecotourism on sensitive resources	DNCP/Core Area Director/ Senior Ranger	Year 1-5
F4.1.6	Ensure community involvement in ecotourism development and delivery, and gender/socio-economic equity in benefits-sharing	DNCP/Core Area Director/ Senior Ranger	Year 1-5

F5. Community Development

Goal: to increase community involvement and support for biodiversity conservation.

F5.1 Involvement of Community-based Institutions

Objective: to strengthen the operation of community institutions involved in conservation.

Issues and Rationale: implementation of the biodiversity conservation and management measures specified in this Management Plan will require the direct involvement and cooperation of the Commune Council, a Community Fisheries Organization(s) encompassing the Core Area, and other community-based organizations involved in livelihoods activities, environmental education and delivery of visitor support services. It is anticipated that the Commune Council will be directly involved in enforcement of resource use and access restrictions in the Core Area (jointly with Ranger and FiA staff), and that the CFO(s) will play a key role in management of subsistence-level fisheries (see also Section F5.5).

Management Actions:

Table 17. Management actions related to involvement of community-based institutions.

No.	Activity	Responsibility	Timing
F5.1.1	Clearly define and periodically review roles of all community partners in Core Area management implementation	DNCP/Core Area Director	Year 1
F5.1.2	Regularly disseminate information and solicit feedback on Core Area operations from all partners	DNCP/Core Area Director/Senior Ranger	Year 1-5
F5.1.3	Provide relevant training to community institution members	Core Area Director/Senior Ranger	Year 1-5
F5.1.4	Formulate and adopt a common community development strategy with all partners that is compliant with sustainable management and protection of Stung Sen Core Area	DNCP/Core Area Director	Year 1-5
F5.1.5	Support the development and functioning of a Community Protected Area organization(s)	DNCP/Core Area Director/Senior Ranger	Year 1-5

F5.2 Benefits Sharing

Objective: to ensure that local communities share in the benefits of Core Area conservation and management.

Issues and Rationale: successful conservation management of the Core Area, and successful implementation of restrictions on natural resource use, will be driven in part by how well and how profitably community members and organizations are able to participate in the benefits of ecotourism and associated activities. Also, as increased visitor levels can have negative social impacts if not carefully managed, communities adjacent to the Core Area will need to have a voice in all aspects of visitor management and related facilities development.

Management Actions:

Table 18. Management actions related to benefits sharing.

No.	Activity	Responsibility	Timing
F5.2.1	Establish mechanisms to identify opportunities for early and where feasible priority participation in development of visitor services, and in provision of other Core Area support services by community members	DNCP/Core Area Director	Year 1
F5.2.2	Establish mechanisms to identify and avoid negative impacts of increased visitor levels and related activities on local communities	DNCP/Core Area Director/Senior Ranger	Year 1

F5.2.3	Provide technical and management assistance for the development of community-based ecotourism initiatives and support services, and training for their implementation	DNCP/Core Area Director	Year 1-5
F5.2.4	Continue to hire Ranger and CAMC support staff from local communities	Core Area Director	Year 1-5

F5.3 Access to Livelihoods and Income Generation Support

Objective: to improve the living conditions of local communities that are impacted by Core Area management.

Issues and Rationale: the provisions of this Management Plan restrict use of the Core Area by local residents to subsistence-level fishing and harvest of subsistence levels of fuelwood. While this will be offset to some extent by opportunities for sharing in the benefits of ecotourism and related activities, additional support will be needed to ensure that restricted access to Core Area resources does not negatively impact local living standards. To achieve this, technical and financial support will be provided for the development of alternative sustainable livelihoods activities selected in conjunction with local residents.

Promotion and support of livelihoods activities will be based on the following priorities:

- activities that have no or easily managed environmental impacts;
- activities that can be carried out at or near the home;
- activities that benefit women, poor families or those with otherwise limited access to natural resources;
- activities that produce goods and services that will substitute for those currently obtained from the Core Area; and,
- activities that require low initial investment costs and that produce early and consistent returns.

Management Actions:

Table 19. Management actions related to access to livelihoods and income generation support.

No.	Activity	Responsibility	Timing
F5.3.1	Identify and document livelihoods activities that currently impact Core Area biodiversity resources	TSCP/Core Area Director	Year 1
F5.3.2	Consult with local resource users, including equitable representation of women and a cross-section of socio-economic groups, to select preferred alternative or replacement livelihoods for trial implementation, and provide technical and financial support	TSCP/Core Area Director	Year 1
F5.3.3	Promote environmentally friendly technologies that will potentially reduce pressures on limited natural resources used by communities	TSCP/Core Area Director	Year 1
F5.3.4	Include clean water, family planning and other health-related issues in livelihoods support and community outreach	TSCP/Core Area Director	Year 1
F5.3.5	Provide technical support for replication of successful alternative/replacement livelihoods	TSCP/DNCP/Core Area Director	Year 1-5

F5.4 Community Education and Awareness Raising

Objective: to create understanding and awareness about biodiversity conservation among local residents.

Issues and Rationale: in order for conservation action to be successful, local residents and resource users need to understand how it benefits them and their families in both the short and long-term. They also need to understand how and why resource use and access restrictions, and associated laws and regulations, are applied. This will require a broadly-based, sustained environmental education and awareness programme utilizing a variety of techniques. Delivery will be through schools, through outreach programming aimed at specific communities and resource users, and through media programming. The CAMC will be a key delivery point for residents of Stung Sen and adjacent communities, as it provides a large space that is ideal for group meetings, interaction and discussion that draws on the experience and knowledge of community members. Selected Ranger staff will be trained to assist in programme delivery, and other local human resources (school teachers, local NGO staff, community volunteers) will also be used in order to promote a sense of community ownership of the programme.

Management Actions:

Table 20. Management actions related to community education and awareness raising.

No.	Activity	Responsibility	Timing
F5.4.1	Ensure that all persons and organizations relevant to environmental education and awareness are included in Core Area management planning and implementation	TSCP/Core Area Director	Year 1
F5.4.2	Design and develop appropriate environmental education programming and materials, and deliver through local schools and outreach programming aimed at outlying (including seasonal) communities	TSCP/DNCP	Year 1-5
F5.4.3	Design and develop appropriate information/ interpretive programming and materials and deliver through Core Area Management Centre and guided tours, including a programme of free tours for community members	TSCP/DNCP	Year 1-5
F5.4.4	Develop and deliver appropriate <i>ex situ</i> awareness campaign (using newspapers, radio, television, other media)	TSCP/DNCP	Year 1-5
F5.4.5	Train staff in delivery of environmental education/ interpretive programmes, and in public and media relations	TSCP/Core Area Director	Year 1-5
F5.4.6	Involve specialist NGOs and other organizations in environmental education development and delivery, and in public and media relations	TSCP/DNCP/Core Area Director	Year 1-5
F5.4.7	Encourage and support relevant and compatible environmental education and awareness activities developed by other organizations	TSCP/DNCP/Core Area Director	Year 1-5
F5.4.8	Ensure that messaging equitably targets men, women, children and all socio-economic groups	TSCP/DNCP/Core Area Director	Year 1-5

F5.5 Resource Access and Utilization

Objective: to ensure sustainable utilization of Core Area resources by local communities.

Issues and Rationale: extractive use of Core Area resources will be limited to subsistence fishing using controlled gear, and to seasonal harvest of fuelwood for family use. These activities will be limited to *bona fide* residents of the five communities (Phat Sanday, Kampong Chamlang, Neang Sao, Toul Neang Sao (including Psaot sub-village) and Koh Tapov) adjacent to the Core Area. Levels and locations of resource harvest will be monitored and reviewed on a regular basis to ensure that impacts on biodiversity resources and the environment are minimal. Community members and organizations (*e.g.*, Community Fisheries Association) will be encouraged to participate in these reviews in order to ensure that their concerns are understood and fairly dealt with, within the over-riding priority of long-term conservation of all biodiversity resources in the Core Area.

Management Actions:

Table 21. Management actions related to resource access and utilization.

No.	Activity	Responsibility	Timing
	Subsistence Fishing		
F5.5.1	Quantify numbers, origin and socio-economic background of small-scale fishers	Core Area Director/ Commune Council	Year 1-5
F5.5.2	Strictly limit and enforce the type of fishing gear permitted, to eliminate all methods that are non-selective, that result in damage to or destruction of habitat, and/or that result in a bycatch of waterbirds or other biodiversity	DNCP/Core Area Director/ Senior Ranger/FiA	Year 1-5
F5.5.3	Develop working relationships among FiA, Core Area and Commune Council staff in order to efficiently regulate small-scale fishing	DNCP/Core Area Director	Year 1-5
F5.5.4	Include small-scale fishing issues in environmental education and awareness training and extension programming, and ensure adequate participation by women and children	Core Area Director/ TSCP	Year 1-5
F5.5.5	Involve Commune Councils as a cooperating agency with regard to small-scale fisheries management	Core Area Director/ Senior Ranger	Year 1-5
F5.5.6	At appropriate intervals, assess the feasibility of converting specified areas to Community Fisheries co-management (with the Core Area Management Authority), contingent on there being no or low (and controllable) impact on other biodiversity resources, and an adequate regulatory and enforcement structure in place	DNCP/TSCP/Core Area Director/FiA	Year 1-5
	Fuelwood and other NTFP harvest		
F5.5.7	Quantify numbers, origin and socio-economic background of harvesters	TSCP/Core Area Director	Year 1
F5.5.8	Permit resource harvest only at subsistence scale by legitimate users of the Core Area	DNCP/Core Area Director/ Senior Ranger	Year 1-5
F5.5.9	Provide replacement income sources as required, including employment as Core Area labourers	TSCP/Core Area Director	Year 1-5
F5.5.10	Provide replacement fuelwood/NTFP resources as appropriate	TSCP/Core Area Director	Year 1-5
F5.5.11	Encourage use of fuel-efficient stoves and alternative energy sources	TSCP/Core Area Director	Year 1-5
F5.5.12	Emphasize equitable representation of women in income replacement/participatory programmes	TSCP/Core Area Director	Year 1-5
F5.5.13	Improve awareness and enforcement	DNCP/TSCP/Core Area Director	Year 1-5
F5.5.14	Identify and take appropriate action against middlemen	Core Area Director/ Senior Ranger	Year 1-5

F5.6 Impact of Integrated Conservation and Development Programming

Objective: to evaluate the impact and effectiveness of community awareness, conservation, livelihoods and other natural resource management programmes.

Issues and Rationale: effective protection and conservation of the unique, globally significant biodiversity resources of the Stung Sen Core Area is a critically important issue. Impacts and effectiveness of the management programmes need to be evaluated on a regular basis, and adjusted as required to ensure that the objectives of both biodiversity conservation and community-based initiatives are being met.

Table 22. Management actions related to impact of integrated conservation and development programming.

No.	Activity	Responsibility	Timing
F5.6.1	Develop appropriate biological and socio-economic indicators and document baseline conditions	DNCP/Core Area Director	Year 1
F5.6.2	Remeasure indicators at specified intervals and make necessary management adjustments	DNCP/Core Area Director	Year 2-5
F5.6.3	Review management plan implementation at annual intervals and identify and implement any corrective actions required regarding activities implementation	DNCP/Core Area Director	Year 2-5
F5.6.4	Update the management plan at five year intervals, integrating lessons learned into the second and subsequent five year management plans	DNCP/Core Area Director	Year 5

F6. Buffer Zone and Transition Zone Management

Goal: to establish and enhance collaboration with authorities and other stakeholders in the Buffer Zone and Transition Zone adjacent to the Stung Sen Core Area.

F6.1 Issues Related to Management of the Buffer Zone and Transition Zone

Objective: to ensure that prescriptions in the Stung Sen Management Plan are communicated to key stakeholders in the Buffer Zone and Transition Zone, that appropriate cooperative linkages are developed and maintained, and that impacts of land use and resource use activities adjacent to the Core Area are minimized.

Issues and Rationale: the Stung Sen Core Area is a small part (0.4%) of the 1,483,339 ha Tonle Sap Biosphere Reserve. It is completely surrounded by the Buffer Zone, ~2 km of its perimeter comprising permanent lakefront, and the remaining 34 km seasonally flooded forest, shrubland and grassland. An essential feature of the Biosphere Reserve concept is that the Buffer Zone is intended to be used for cooperative activities compatible with sound ecological practices, including environmental education, recreation, ecotourism and applied and basic research.

Activities in the Buffer Zone are meant to be managed to be consistent with the conservation and protection plans of the Core Areas. Fishery activities and other development plans are intended to be managed based on existing laws and regulations in a coordinated and cooperative manner. The Buffer Zone is also subject to experimental research and discovery of methods for the management of flooded forest, fisheries, agriculture, housing and settlement, land use, water resources, navigation and tourism, in order to ensure their sustainability and increased production while preserving environmental quality and fisheries resources.

The concerned line ministries are responsible for the management of the Buffer Zone and Transition Zone, through the coordination of the Cambodia National Mekong Committee. The Tonle Sap Biosphere Reserve Secretariat established under the CNMC is responsible for coordinating and strengthening cooperation between ministries, agencies, local authorities and communities for the protection and sustainable management of the TSBR.

Management Actions:

Table 23. Management actions related to management of the Buffer Zone and Transition Zone.

No.	Activity	Responsibility	Timing
F6.1.1	Communicate key provisions of the Core Area Management Plan to stakeholders in the Buffer Zone and Transition Zone	DNCP/Core Area Director	Year 1
F6.1.2	Monitor land and resource uses outside of the Core Area, and communicate concerns regarding downstream impacts to the relevant agencies (through CNMC and TSBRS) for action	DNCP/FiA/TSBRS	Year 1-5

F7. International Cooperation

Goal: to contribute to collaboration and knowledge development within the global system of Biosphere Reserves.

F7.1 Issues Related to the Global System of Biosphere Reserves

Objective: to ensure that lessons learned in the development and implementation of the Stung Sen Core Area Management Plan are exchanged with other governments and agencies concerned with the management of Biosphere Reserve Core Areas.

Issues and Rationale: Biosphere Reserves are intended to be a practical means of achieving a sustainable balance between the often conflicting goals of conserving biological diversity, and promoting human development while maintaining associated cultural values. Biosphere Reserves are sites where this objective is tested, refined, demonstrated and implemented. As a member of the international Biosphere Reserve network, Cambodia has an obligation to communicate lessons learned to other members of the network, for consideration, modification and application in other areas of the world.

Management Actions:

Table 24. Management actions related to the global system of Biosphere Reserves.

No.	Activity	Responsibility	Timing
F7.1.1	On completion and review of Management Plan implementation (see Management Action 5.6.3 above) share lessons learned with other members of the Biosphere Reserve international network	TSBRS/DNCP/FiA	Year 5

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