

Regional Environmental Technical Assistance 5771
Poverty Reduction & Environmental Management in Remote Greater
Mekong Subregion Watersheds Project (Phase I)

BIODIVERSITY & PROTECTED AREAS

Regional Report

By

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CONTENTS

STRATEGIC SUBREGIONAL ANALYSIS

1	Introduction	3
2	Geography & Demography	4
3	Biodiversity	5
4	Policy and Law	15
5	Protected Area Systems	17
6	Institutional Arrangements	24
7	Participatory Management	29
8	Tourism in Protected Areas	32
9	Trade in Wild Animals and Their By-Products	34
10	Gender Issues	35
11	Threats to Biodiversity	36
12	Current Trends in Biodiversity Conservation	40

STRATEGIC RECOMMENDATIONS

1.	Introduction	44
2.	Assumptions	44
3.	The System Concept	45
4.	Policy	49
5.	Master Plans	53
6.	Management Plans	55
7.	Review of Protected Area Cover	60
8.	Private Sector and NGO Involvements	63
9.	Research	64
10.	Links with Local Communities	67
11.	Recommendations	71
12.	Public Awareness	72
13.	Regional Cooperation	75

References

STRATEGIC SUBREGIONAL ANALYSIS

1. Introduction

Methods

Regional and country reports were compiled during a six-month study. Most of the period was spent in Vientiane, Lao PDR, where desk research and interviews were used to gather local and regional information, and where the reports were written. Visits were also made to the capital cities of the other GMS countries: in this context the Yunnan Province of China is treated as a country. Two visits were made to protected areas: Xishan Nature Reserve near Kunming in Yunnan, and Hlawga Wildlife Park on the outskirts of Yangon, Myanmar

Methods of information gathering were highly dependent upon the organisations contracted to provide support in each country, and the manner in which support was given. The organisations were varied: government institutions (Myanmar and Yunnan), IUCN (Thailand and Viet Nam) and private consultancies (Cambodia and Lao PDR). In some cases, locally employed counterparts acquired information and transmitted it to the Specialist; in others, the Specialist acquired information directly from reports and interviews—access to which was facilitated by the organisation employed to provide support. Local counterparts were assigned in Cambodia, Lao PDR and Yunnan. Information was therefore variable in depth and focus.

The World Conservation Monitoring Centre (WCMC) in Cambridge, UK, provided additional data on threatened species status.

Two other related studies were carried out under this project. The first was a biodiversity and ecotourism assessment in selected areas of Yunnan, by two Junior Biodiversity/Ecotourism Specialists. Their Mission Report is annexed to the country report for Yunnan and some information contained in it has been incorporated in the country report.

The second was a study of ecotourism in the GMS, carried out by an Ecotourism Specialist as a desk research exercise in Helsinki. Some material from the latter has been added to country and regional reports.

Language differences imposed limitations on quality and quantity of information and on speed of acquisition. Where reports were unavailable in English, the Specialist was dependent upon counterparts for translations. This could be time-consuming and produced versions that may or may not have accurately represented their originals. This applied in particular to statutory laws of countries whose definitive versions are in a local language and to place and protected area names which different translators spelt differently.

Close questioning sometimes revealed discrepancies in information given by sources within a country. For example, in two countries different spokesmen gave conflicting information on international conventions to which their country had signified accession. There may have been other instances where incorrect or out-dated information was acquired—more likely in countries where, due largely to linguistic differences, the Specialist had direct access to only a relatively small number of persons and less scope for cross-checking information.

Another factor more likely to arise when the Specialist dealt directly with small numbers of persons was that information based on subjective value judgements was influenced by the focus of the individual from whom they were acquired. Each person has his or her own perceptions and fields of interest that bore upon assessments of, for example, which protected areas are the most valuable and orders of priority for threats to conservation. Given longer in each country, and access to field operations, the Specialist might have produced different sets of priorities based upon a broader range of locally expressed ideas, his own observations and past experiences and his own (equally subjective) set of values.

2. Geography & Demography

The Greater Mekong Subregion (GMS) spans 2,336,000 km² of diverse terrain between latitudes 5°35' to 29°10' north and longitudes 92°10' to 109°25' east. The distance from its extreme northerly point in northwestern Yunnan Province to the southernmost tip of Thailand is approximately 2,500 km; at its broadest the subregion measures some 2,000 km from east to west. Individual countries range in size from 181,000 km² (Cambodia) to 677,000 km² (Myanmar); see Table 1. Elevations extend from sea level along the coasts of Cambodia, Myanmar, Thailand and Viet Nam to 5,881 metres in northern Myanmar and 6,740 metres in north-western Yunnan. Lao PDR and Yunnan are landlocked.

Marked differences in climate exist across this broad sweep of diverse landscapes—from coral reefs and sun-drenched beaches in equatorial climes, through tropical, subtropical and temperate forests to alpine habitats and glaciers. Summer temperatures in southern coastal areas reach around 38° C, while, in northern areas bordering on the Himalayas, frosts occur for more than 100 days a year. Annual rainfall varies from 500 or 600 mm in south-east Yunnan and along the south-east coast of Viet Nam, to 6,000 mm on the Cardamom Mountains of Cambodia and in southern and northern Myanmar. Most of the GMS is dominated by monsoon winds that blow from the south-west during the warmer, wet season (about May to September), and from the north-east during the cooler, drier October to April period.

The estimated 1999 human population is 252 million (average density 108/km²). Annual growth rates mostly exceed 2.0 per cent. There are marked differences between countries (see Table 1).

TABLE 1: Greater Mekong Subregion country sizes, 1999 estimates for demographic data and forest cover

Country	Area (km ²)	Population (million)	Annual increase (%)	Density Persons/km ²	Forest cover (%)
Cambodia	181,000	12.0	>4	66.3	62
Lao PDR	236,000	5.4	2.8	22.9	52
Myanmar	677,000	50.5	2.1	74.6	48
Thailand	514,000	62.3	1.2	121.2	25
Viet Nam	332,000	80.0	>2	241.0	28
Yunnan	396,000	42.0	1.4	106.0	24

Sources: Various

Originally, most of the subregion was forested but, in all countries, forest cover has undergone marked reductions over the past 50 years—a trend that continues, including in Thailand, where logging has been outlawed since 1989. Extant forest cover is an estimated 877,000 km²—about 38 per cent of total land area. Estimates of forest cover by country are shown in Table 1.

Throughout the subregion, rural men and women depend upon access to forests and their plant and animal products for fuelwood, food, medicines, building materials, feed for livestock and cash-generating products. Biodiversity and its maintenance are of paramount importance to them.

3. Biodiversity

Biodiversity Indicators

Two indicators of biodiversity are used in this report: the biodiversity index and endemic bird area (EBA). They are explained below.

Biodiversity index

A measure of biodiversity, used both here and in the individual country reports, is MacKinnon's (1997) biodiversity index. MacKinnon calculated biodiversity indices for biounits and countries in the Indo-Malayan Realm. They are cited in this report under descriptions of the biounits and in the country reports. The methods used to score are described in MacKinnon (1997) but, in brief, the process took account of the total numbers of species in selected taxa, numbers of endemics and narrow range species and size of biounit or country. The resultant scores were relative and adjusted around a mean of 10 for the Realm. Biodiversity indices are unavailable for Yunnan Province or for biounits that lie wholly within Yunnan.

Biodiversity indices for biounits were based upon vertebrates only although MacKinnon (1997) claimed a close correlation between vertebrate and plant diversities. For countries, they drew upon data for mammals, birds and higher plants.

Endemic Bird Areas

The second indicator of biodiversity is the endemic bird area (EBA). Slattersfield *et al.* (1998) identified 250 EBAs globally, based upon studies of restricted-range species. An EBA contains the breeding ranges of two or more restricted-range species, the latter being land birds whose breeding ranges are smaller than 50,000 km². All or parts of six EBAs occur in the GMS (see Table 2 and map).

Bird diversity or endemism might correlate positively with diversity of other taxa—plant as well as animal—and thus be usable as a general indicator of biodiversity. This may intuitively appear plausible but the hypothesis has yet to be tested rigorously.

The occurrence of EBAs is mentioned under the brief descriptions of the biounits in the GMS that follow, and they are described in greater detail in the relevant country sections. Although they are not EBAs there are also three important sites for migratory birds in the GMS: the Mekong and Red River Deltas (Viet Nam) and Tonlé Sap Lake (Cambodia).

TABLE 2. Distribution of endemic bird areas in the countries of the Greater Mekong Subregion.

Name of EBA	CAM	LAO	MYA	THA	VIE	YUN
Annamese Lowlands		X			X	
Da Lat Plateau					X	
Eastern Himalayas			X			X
Irrawaddy Plains			X			
South Vietnamese Highlands					X	
Yunnan Mountains			X			X

Biounits of the Greater Mekong Subregion

The Indo-Malayan Realm extends from Pakistan to Papua New Guinea. It reaches into the Indo-Chinese and Sundaic Subregions and the Southwest China Unit although the Sundaic accounts for only a minute proportion of its total land area. The GMS occupies a roughly central position in this Realm, with Yunnan protruding to the north.

TABLE 3. Distribution of biounits (Udvardy 1975) and sub-units (MacKinnon & MacKinnon 1986, MacKinnon et al 1996) in the countries of the Greater Mekong Subregion.

Biounit	Sub-units	CAM	LAO	MYA	THA	VIE	YUN
Himalayas (12)	East Himalayas (12d)			X			
Central Burma (09)	South Irrawaddy (09a)			X			
	North Irrawaddy (09b)			X			X
	Burma transition (09c)			X			
Indochina (10)	Central Indochina (10a)	X	X	X	X	X	
	North Indochina (10b)		X	X	X	X	
	Indochina transition (10c)		X	X		X	X
South China (06)	South China mainland (6a)					X	
Coastal Indochina (05)	Mekong Delta (05a)	X					X
	South Annam (05b)					X	
	North Annam (05c)		X			X	
	Cardamom Mountains (05d)	X		X	X	X	
Burmese coast (04)	No sub-units			X			
Annamese Mountains (-M)	Central Annam Mountains (-Ma)	X	X			X	
	Dalat Plateau (-Mb)					X	
Peninsular Malaysia (07)	Malay Peninsula (07a)				X		
	Malay transition (07b)			X	X		
Chinese subtropical forest (01)	Guizhou Plateau (01a)						X
Sichuan-Yunnan	Yunnan Plateau (39a)						X
Highlands (39)	Hengduan Mountains (39b)						X
	Nujiang-Lancang (39f)						X

Udvardy (1975) divided the Realm into 27 biogeographic units (biounits) while MacKinnon & MacKinnon (1986) produced a finer classification of 70 sub-units. MacKinnon (1997), 'on the basis of respective levels of similarity and distinctiveness in species communities', reclassified the first two subregions into 24 biounits and 90 sub-units. Based upon a separate report on biodiversity in China (MacKinnon et al, 1996), a further two biounits (four sub-units) complete the biogeographic classification for the GMS, which comprises 10 units and 20 sub-units. These are described below and their occurrence in the GMS countries tabulated in Table 3 and illustrated on the accompanying map. The numbers in parentheses are those assigned to the biounits and sub-units described by MacKinnon et al (1996) and MacKinnon (1997).

Himalayas biounit (12)

Forested southerly slopes of the Himalayas. Within the GMS this biounit occurs only in the northern corner of Myanmar, from which it extends westwards across northern regions of the subcontinent. MacKinnon (1997) recognised four sub-units, one of which is referred to in the country report for Myanmar.

It was originally densely forested but much has been destroyed or modified by human activity.

The biodiversity index is 12.1. Levels of endemism are moderate. A small portion of one EBA (Eastern Himalayas) occurs, which is described in the country report for Myanmar.

Burmese coast biounit (04)

Coastal rainforests plus deltas and estuaries of the Irrawaddy and Salween Rivers. Within the GMS this biounit occurs only in Myanmar although it extends beyond into Bangladesh.

The original vegetation comprised lowland evergreen forest and freshwater swamp, plus some semi-evergreen forest, montane evergreen forest, mangrove forest and deciduous dipterocarp forest near the mouth of the Salween. Most of the rainforest and freshwater swamp have been cleared for agriculture, and much of the upland forest replaced by creeping bamboo.

The biodiversity index is 9.6. Endemism is low. A small portion of one EBA (Irrawaddy Plains) occurs, which is described in the country report for Myanmar.

Burmese Monsoon Zone biounit (09)

The Irrawaddy catchment, extending from the dry central zones of Myanmar to the surrounding mountains lying north, east and west. Within the GMS this unit occurs only in Myanmar and a small western area of Yunnan although it extends beyond into Bangladesh and India. MacKinnon (1997) identified three sub-units, which are referred to in the country sections for Myanmar and Yunnan.

The original vegetation comprised a wide range of types. Mixed deciduous forests with patches of dry dipterocarp forest covered most of the Irrawaddy Basin, with thorn scrub in the driest areas. Semi-evergreen forests surround the basin, grading into moister montane forest on the uplands or, to the north, with sub-tropical moist lowland forests. At higher elevations subtropical montane forests appear, while the highest peaks support sub-alpine vegetation.

Natural vegetation covers 52 per cent of the unit (MacKinnon, 1997). Much is being logged or is under cultivation. Shifting agriculture is converting moister hill forest to grassland.

The biodiversity index is 10.5. Endemism is fairly low. There is one EBA (Irrawaddy Plains), which is described in the country report for Myanmar.

Coastal Indochina biounit (05)

Coastal areas extending from the Red River Delta in northern Viet Nam to the coast of southern Myanmar. This unit occurs in Viet Nam, Cambodia, Thailand, Myanmar and marginal areas of southern Lao PDR. MacKinnon (1997) identified four sub-units, referred to in the country sections.

Most of the unit is semi-evergreen forest. True ever-wet rainforest occurs only in restricted parts of Cambodia and Viet Nam. Other vegetation types include peat forest (Mekong Delta), mangrove and freshwater swamps (Mekong and Chao Phraya Deltas), mixed deciduous forest and very small areas of forest on limestone and dry dipterocarp forest.

Human population densities are high. Most lowland forest has disappeared but some forests survive in upland areas.

The biodiversity index is 10.6. Endemism is moderately high. There are two EBAs (South Vietnamese Highlands and Da Lat Plateau) described in the country report for Viet Nam.

Annamese Mountains biounit (-M)

Two mountain blocks in Viet Nam on the Da Lat Plateau and around Ngoc Linh Mountain. The unit extends marginally into Lao PDR. MacKinnon (1997) identified two sub-units, which are referred to in the country section for Viet Nam.

Montane evergreen forest predominates; some tropical wet evergreen and semi-evergreen forest occurs at lower elevations. Patches of coniferous forest and moss forest are found on the highest peaks.

About 40 per cent of forest cover remains but disturbed by fuelwood collection.

The biodiversity index is 12.0. Endemism is moderately high. There is one EBA (Da Lat Plateau), which is described in the country report for Viet Nam.

South China biounit (06)

All land east of the Red River Delta in Viet Nam and on into China but not Yunnan Province. MacKinnon *et al* (1996) identified two sub-units referred to in the country section for Viet Nam.

Originally the unit was clothed mostly with tropical semi-evergreen rainforest, subtropical lowland moist forest and sub-montane dry evergreen forest. Smaller areas of forest occurred on limestone, mangrove forest, freshwater swamp, subtropical broadleaf forest, subtropical pine forest and montane deciduous forest.

Most lowland forest has been cleared for agriculture. That which remains is disturbed. Secondary bamboo has replaced much of the original cover on upland areas.

The biodiversity index is 9.5. Endemism is moderate.

Indochina biounit (10)

A large unit that includes plains, upland terrain and valleys of the Mekong, Chao Phraya and Salween Rivers. It extends over most of Thailand, Lao PDR, Cambodia and southern Yunnan. It extends into parts of Viet Nam and Myanmar. MacKinnon (1997) identified three sub-units in Indo-China, while MacKinnon *et al* (1996) identified another in Yunnan. These sub-units are referred to in the country sections.

The unit extends from tropical regions near sea level to temperate sub-alpine regions, resulting in a broad range of vegetation types, including dry dipterocarp forest and semi-evergreen lowland and tropical montane evergreen forests. Areas of true wet rainforest occur in the Salween Valley, and there are also pine forest, forest on limestone, dry evergreen forest, montane deciduous forest, subtropical moist lowland forest and subtropical montane forest.

The original vegetation has been cleared for agriculture in areas where human population densities are high, and in areas of lower densities where ethnic minorities practice patterns of land use that are destructive of forests. Elsewhere where densities are lower (especially Cambodia) extensive tracts of forest remain. MacKinnon (1997) estimated that about 34 per cent of the unit was still under natural vegetation.

The biodiversity index is 8.3. Endemism is moderate. The unit contains portions of two EBAs (Annamese Lowlands and Yunnan Mountains) described in the country reports for Lao PDR, Viet Nam and Yunnan.

Sichuan-Yunnan Highlands biounit (39)

This is the major biounit in Yunnan, covering most of the province north of unit 10. Within Yunnan, MacKinnon *et al* (1996) identified three sub-units, referred to in the country report for Yunnan.

Terrain varies from high mountain and mid mountain to flat plateau. *Pinus yunnanensis* and *Parmandii* forest are typical of mid mountain areas, plus areas of *Castanopsis delavayi*, *Corthacantha* and *Quercus franchettii*. *Platycarya strobilacea* and *Pyunnanensis* forest occur in karst areas, and *Cyclobalanopsis glaucoides* and *Pyunnanensis* in plateau areas in Kunming and Dali. Other species include *Lithocarpus echinotholus*, *Schima noronhae* and *Tsuga dumosa* on high mountains and in deep gorges. A more detailed account is in the Yunnan country report

No biodiversity index has been calculated. Within the context of China, species richness for Yunnan as a whole is very high—a reflection of the large size and geographical diversity of this biounit. The same is probably true of endemism, which is also high. Most of one EBA (Yunnan Mountains) occurs, which is described in the country report for Yunnan.

Chinese Subtropical Forest biounit (01)

Part of a small sub-unit of this biounit occupies the north-eastern corner of Yunnan. It comprises forests of *Lithocarpus cleistocarpus* and *Castanopsis platyacantha* growing on mid mountain terrain.

No biodiversity index has been calculated. Species richness and endemism for Yunnan as a whole are high but this biounit is small and geographically uniform. Part of one EBA (Yunnan Mountains) extends into the unit, and is described in the country report for Yunnan.

Peninsular Malaysia biounit (07)

The peninsula and offshore islands. Within the GMS, this biounit occurs only in the extreme south of Myanmar and Thailand. MacKinnon (1997) identified two sub-units, which are referred to in the two country reports.

The vegetation is predominantly rainforest rich in species, including areas of freshwater swamp, montane forest, forest on limestone, heath forest, peat swamp and mangroves. Intensive rice cultivation and extensive plantations have greatly modified the original plant cover, of which only 25 per cent remains.

The biodiversity index is 11.4. Endemism is moderately high.

Flora and fauna

The flora of the Indo-China region (excluding Yunnan) comprises at least 20,000 species, which is the estimated minimum number for Thailand alone (MacKinnon, 1997). At least 5,000 are endemic but endemism at generic level is lower. In a separate report (MacKinnon *et al*, 1996) the flora of Yunnan Province is estimated to contain 14,000 species. There is probably considerable overlap between the two but the total number for the GMS seems unlikely to be less than 25,000, and is possibly much higher.

TABLE 4. Numbers of known species of vertebrates and higher plants in the countries of the Greater Mekong Subregion.

	Mammals	Birds	Reptiles	Amphibians	FW fishes	Higher plants
Cambodia	123	545	88	28	215	
Lao PDR	200	609	66	37	244	8,286
Myanmar	300	1,000	370			7,000
Thailand	265	891	300	100		>20,000
Viet Nam	275	800	180	80		12,000 est.
Yunnan	284	729	145			14,000

Sources: MacKinnon (1997) for all except Yunnan; MacKinnon *et al* (1996) for Yunnan. The latter offers the statement that vertebrates total 1,638 but numbers are not cited for amphibians or fishes. Fish data for some countries are ambiguous as to whether marine species are included, and have therefore been omitted.

The fauna of the GMS comprises four elements: taxa shared with northern India, Himalayan Palearctic species, Chinese Palearctic species and Sundaic species. The latter have entered southern coastal areas from the Malay Peninsula. Judging from data gathered at national levels (Table 4), there are probably in excess of 1,800 terrestrial or semi-terrestrial vertebrates: 300 mammals, 1,000 birds, 400 reptiles and 100 amphibians. Numbers recorded depend both upon the numbers that occur, the nature of the country and efforts taken to survey and collect data. The more intensively an area is studied, the greater the numbers of plants and animals likely to be discovered.

Country levels of biodiversity

Biodiversity indices for the GMS countries except Yunnan are presented in Box 1, together with indices for all 18 countries of the Indo-Malayan Realm.

Within the context of the Indo-Malayan Realm, biodiversity indices for five of the GMS countries are relatively modest: all are below the mean of 10.0. MacKinnon *et al* (1996) state that Yunnan Province 'has an extremely high biological richness' although this is within the context of China where Yunnan has the richest faunal diversity of all provinces, and scores highest in endemism.

BOX 1. Biodiversity indices for countries of the Indo-Malayan Realm. Greater Mekong Subregion countries are in bold face: no index available for Yunnan
INDONESIA 26.8
PHILLIPINES 14.0
MALAYSIA 13.7
PAPUA NEW GUINEA 13.3
SINGAPORE 12.7
BRUNEI 10.7
THAILAND 9.8
INDIA 9.0
BHUTAN 8.6
Viet Nam 8.5
LAO PDR 8.3
NEPAL 7.9
CAMBODIA 7.5
SRI LANKA 7.4
MYANMAR 6.8
BANGLADESH 5.9
MALDIVES 5.2
PAKISTAN 4.0
Source: MacKinnon (1997)

Threatened species

Information on status of threatened species was taken from data sheets provided by WCMC during November and December 1998. The information is summarised in Tables 5 and 6, and elaborated in country reports. Categories of threat for fauna are 1994 IUCN Red List categories.

TABLE 5. Numbers of threatened species of wild plants and animals in the countries of the Greater Mekong Subregion. Information for Yunnan is incomplete.

	Levels of danger (IUCN)	CAM	LAO	MYA	THA	VIE	YUN
Plants		217	211	833	1,555	1,485	208
	Extinct (EX)	-	-	-	-	-	
	Extinct in the wild (EW)	-	-	-	2	-	
Vertebrate animals	Critically endangered (CR)	8	7	10	14	16	3
	Endangered (EN)	18	17	22	26	26	
	Vulnerable (VU)	31	46	71	65	62	
	Least risk (LR)	43	67	131	116	98	
	Data deficient (DD)	9	14	21	29	19	

Source: Country lists of threatened species supplied by World Conservation Monitoring Centre, November & December 1998. The two species extinct in the wild are Schomburgk's deer (*Cervus schomburgki*) and a cyprinid fish (*Epalzeorhynchus bicolor*).

TABLE 6. Occurrence of critically endangered wild vertebrates in the countries of the Greater Mekong Subregion. Information for Yunnan is incomplete.

X = occurs
X* = endemic

	CAM	LAO	MYA	THA	VIE	YUN
<i>Pipistrellus anthonyi</i> (bat)			X*			
<i>Pjeffrei</i> (bat)			X			
<i>Euroscaptor parvidens</i> (bat)					X*	
<i>Paracoleps megalotus</i> (bat)					X*	
<i>Rhinopithecus avunculus</i> (Tonkin snubbed-nosed monkey)					X	
<i>Trachypithecus delacouri</i> (White-rumped black lemur)					X	
<i>Dicerorhinus bicornis</i> (Sumatran rhinoceros)	X	X	X	X	X	
<i>Rhinoceros sondaicus</i> (Javan rhinoceros)	X	X	X	X	X	
<i>Bos sauveli</i> (Kouprey)	X	X		X	X	
<i>Typhlomys chapensis</i> (endemic mouse)					X	
<i>Rhodonessa caryophyllacea</i> (Pink-headed duck)			X			
<i>Gorsachius magnificus</i> (White-eared night-heron)					X	X
<i>Platalea minor</i> (Black-faced spoonbill)	X			X	X	X
<i>Pseudibis gigantea</i> (Giant ibis)	X	X		X		
<i>Arborophila davidi</i> (Orange-necked partridge)					X	
<i>Lophura edwardsi</i> (Edward's pheasant)					X	
<i>L imperialis</i> (Imperial pheasant)		X			X	
<i>Sterna bernsteini</i> (Chinese crested tern)				X		
<i>Pitta gurneyi</i> (Gurney's pitta)			X	X		
<i>Crocias longbianis</i> (Grey-crowned crocias)					X	
<i>Pseudochelidon sirintarae</i> (White-eyed river-martin)				X*		
<i>Crocodylus siamensis</i> (Siamese crocodile)	X	X	X	X	X	
<i>Eretmochelys imbricata</i> (Hawksbill turtle)	X		X	X	X	
<i>Geoemyda depressa</i> (Arakan forest turtle)			X			X
<i>Callagur borneoensis</i> (Painted batagur)				X		
<i>Geochelone platynota</i> (Burmese starred turtle)			X			
<i>Chitra chitra</i> (Striped narrow-headed softshell turtle)				X*		
<i>Chela caeruleostigmata</i> (fish, fam Cyprinidae)	X			X		
<i>Botia sidhimunki</i> (fish, fam Cobitidae)		X		X		

Source: Extracted from country records provided by WCMC. Some revisions made after checking with specialist in-country sources.

Levels of threat represent global status, which is not necessarily the same as status in individual countries. For example, although Asian tapir's (*Tapirus indicus*) global level of threat is only 'vulnerable', it may in Thailand may be almost or possibly extinct (MacKinnon, 1997). Checks made within countries with specialists for selected taxa suggest that some WCMC records are out of date. For example, the Vietnamese warty pig, listed by WCMC as an extinct former endemic to Viet Nam is now known to occur in Lao PDR and possibly survives still in Viet Nam; and it seems improbable that both Javan and Sumatran rhinoceroses survive in five countries as suggested by Table 6.

Global threat status has yet to be assessed for four species of ungulates due to their being only recently described. They are:

- *Pseudoryx nghetinhensis* (saola): Endemic to the Annamite Range along the borders of Lao PDR and Viet Nam.
- *Muntiacus truongsongensis* (small dark muntjac): Endemic to the Annamite Range along the borders of Lao PDR and Viet Nam.
- *Muntiacus putaoensis* (little leaf deer): Discovered in 1998. Believed to be endemic to a small locality in northern Myanmar
- *Muntiacus (Megamuntiacus) vuquangensis* (giant muntjac): Endemic to the Annamite Range along the borders of Lao PDR and Viet Nam.

4. Policy and Law

Policies

There are no specific policies for protected areas in any GMS country although intentions and guidelines are expressed in policy initiatives that have broader scope, and in legislation.

In Cambodia and Lao PDR, national Environmental Action Plans provide general guidance; and, in Lao PDR, biodiversity conservation is addressed in the Tropical Forest Action Plan. Policy objectives for protected areas in Lao PDR are also defined in forest legislation. In Myanmar, the National Forest Policy of 1995 includes provision for protected areas. In Viet Nam, the National Conservation Strategy and Biodiversity Action Plan fulfil similar functions. Provisions for biodiversity and protected areas are included in Thailand's National Forest Policy and in the far-reaching Policy and Prospective Plan for Enhancement and Conservation of National Environmental Quality 1997-2016. For Yunnan, the national Biodiversity Action Plan 1995 (prepared in response to Agenda 21) prescribes policy.

All policies pay at least lip service to the values of biodiversity and the role that protected areas play in conserving it, and some express this very forcefully; but, in general, government actions tend not to live up to their policy pronouncements—a theme that is elaborated below.

Laws

All GMS countries have laws governing biodiversity conservation and management of protected areas. Most are of recent origin or are older laws that have been up-dated. In spite of the existence of statutory laws, a widely expressed opinion in all countries was a lack of effective enforcement.

Cambodia's legislation appears to be least effective. A Law on the Environment and a ministerial decree declaring a substantial protected area system are in place but are said to be without force unless further sub-decrees are issued.

In Lao PDR, biodiversity conservation is provided for in the Forest Law of 1996, and a 1993 decree that designated the first national biodiversity conservation areas (NBCAs).

Myanmar recently up-dated its legislation, producing the Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law of 1994.

In Thailand, there are the National Park Act 1961, the Wildlife Protection and Preservation Act 1992 and the National Forest Act 1964. There is talk of overhauling legislation with the

object of producing a unified law for protected areas.

In Viet Nam, biodiversity conservation is addressed in the Law on Environmental Protection 1993, while the Law on Protection of Forests 1972 provides for protected areas. Other relevant laws, developed decades ago, need revision and consolidation: Ban on Elephant Hunting 1960; Regulations on Hunting of Forest Wildlife 1963; and Law on the Protection of Forests 1970.

In Yunnan, the Wildlife Conservation Law 1988 focuses on biodiversity conservation and provides for nature reserves, which form the greater part of the protected area system. The Provincial Forest Law of 1993 was revised in 1998.

International conventions

All GMS countries (China in the case of Yunnan) have acceded to two or more relevant international conventions: see Table 7.

TABLE 7: Adherence to international conventions relevant to biodiversity conservation by the Greater Mekong Subregion countries in February 1999.

	CAM	LAO	MYA	THA	V I E	YUN
Convention on Biological Diversity	X	X	X		X	X
Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar)		X		X		X
Convention Concerning the Protection of the World Culture and Natural Heritage		X			X	X
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	X		X	X	X	X
Convention on the Conservation of Migratory Species of Wild Animals				X		X
Convention to Combat Climate Change				X	X	
Convention to Combat Desertification		X			X	

5. Protected Area Systems

Inventories

All GMS countries have protected areas—in total 550, of which 380 are judged to have biodiversity conservation as a major function. They are listed in their respective country reports. Their distribution between countries is illustrated in Table 8. Fourteen classes of protected areas exist although many are, perforce, translations into English from other languages and may vary from one translator to another. Some classes appear not to fulfil major roles in conserving biodiversity: for example, the forest parks of Thailand and Yunnan, Thailand's non-hunting areas and the protected landscapes of Cambodia and Viet Nam. Table 8 therefore distinguishes between protected areas judged to have biodiversity as a major function (in bold face) and those that do not. The former broadly fit IUCN management categories I to IV.

TABLE 8. Areas (km²) of land in legally designated protected areas of the Greater Mekong Subregion. No proposed areas or areas of dubious validity included. Areas that perform a major biodiversity conservation function are in bold typeface.

	CAM	LAO	MYA	THA	VIE	YUN
National parks	8,713		2,328	37,113	2,547	
National marine parks			205	5,219		
Wildlife sanctuaries	20,300		9,303	30,611		
Bird sanctuaries			894			
Wildlife parks			6			
Nature reserves					13,935	19,142
National biodiversity conservation areas		29,030				
Species/habitat reserves					5,029	
Elephant ranges			1,295			
Forest parks				861		862
Protected landscapes	970				1,179	
Mountain parks			129			
Multiple use areas	4,040					
Non-hunting areas				4,118		
Totals of all protected areas	34,023	29,030	14,160	77,922	22,690	20,004
Percentage of country (all protected areas)	18.8	12.3	2.1	15.2	6.8	5.0
Totals of areas having biodiversity protection as a major function	29,013	29,030	14,031	72,943	21,511	19,142
Percentage of country in areas having biodiversity protection as a major function	16	12.3	2.1	14.2	6.5	4.8

Conservation coverage

All biounits and sub-units that occur in the GMS are represented in the combined protected areas of the six countries: see Table 9. Biodiversity representation within individual countries is almost complete: the only 'lapses' are the absence of sub-unit 5a from the protected areas of Cambodia, and 10c and 5d from Myanmar. Both sub-units are amply represented elsewhere.

Cambodia, Lao PDR and Thailand have relatively large systems, well in excess of the 10 per cent 'target'.

Thailand's system is long established although several areas have been added in recent years. Those in Cambodia and Lao PDR are of recent origin, and designed specifically with biodiversity conservation and representation in mind. In these larger systems, cover of biotic communities and their species is very good although there is a paucity of lowland dry evergreen forest. This forest type, where it occurs inland has been extensively destroyed in Southeast Asia.

Apart from limited coverage of lowland forest and inadequate provision for pheasants, Viet Nam's system offers good representation but individual areas are relatively small (see Table 10). It is difficult to see how this protected area system can be increased in size in the face of high human population density and annual increment rates leading to rising demands for land.

Myanmar and Yunnan's protected area systems are also small—their average sizes least for the subregion—but Myanmar has scope for enlargement. The National Forest Policy 1995 prescribed an ultimate target of 10 per cent cover by protected areas, and Brunner *et al* (1998) believe this to be realistic because large, well-forested and sparsely populated tracts of country exist in the north.

TABLE 9. Representation of biounits (Udvardy 1975) and sub-units (MacKinnon & MacKinnon 1986, MacKinnon et al 1996) in terrestrial protected area of the six countries of the Greater Mekong Subregion.

Number = Approximate number of protected areas or parts thereof in which sub-unit is represented
 - x - = Sub-unit present but not represented in a protected area

Biounit	Sub-units	CAM	LAO	MYA	THA	VIE	YUN
Himalayas (I2)	East Himalayas (I2d)			1			
Central Burma (09)	South Irrawaddy (09a)			10			
	North Irrawaddy (09b)			4			1
	Burma transition (09c)			2			
Indochina (10)	Central Indochina (10a)	13	15	3	68	5	
	North Indochina (10b)		5	5	2	12	
	Indochina transition (10c)		1	- x -		2	39
South China (06)	South China mainland					18	
Coastal Indochina (05)	Mekong Delta (05a)	- x -				11	
	South Annam (05b)					14	
	North Annam (05c)		2			9	
	Cardamom Mountains (05d)	9		- x -	25	1	
Burmese coast (04)	No sub-units			5			
Annamese Mountains (-M)	Central Annam Mountains (-Ma)	1	1			5	
	Dalat Plateau (-Mb)					8	
Peninsular Malaysia (07)	Malay Peninsula (07a)				5		
	Malay transition (07b)			1	20		
Chinese subtropical forest (01)	Guizhou Plateau (01a)						5
Sichuan-Yunnan	Yunnan Plateau (39a)						46
Highlands (39)	Hengduan Mountains (39b)						3
	Nujiang-Lancang (39f)						9

Table 10 provides a size analysis of those protected areas that have biodiversity conservation as a major function. The table lists the total number of biodiversity orientated protected areas in each country; the numbers in five size bands; the average sizes; the sizes of the smallest and largest areas; and the proportion (by area) of each national system contained in areas larger than 500 km² and 1,000 km². The former figure is a rule-of-thumb minimum size for maintaining viable populations of larger mammals.

TABLE 10. Size analysis of protected areas of the Greater Mekong Subregion having biodiversity conservation as a major function

		CAM	LAO	MYA	THA	VIE	YUN
Numbers of protected areas		17	20	29	124	80	111
	0-10 km ²	-	-	4	-	4	29
Numbers in each	11-100 km ²	1	-	6	12	22	49
size band	101-500 km ²	4	1	11	62	43	25
	501-1,000 km ²	1	5	4	29	9	3
	>1,000 km ²	11	14	4	21	2	5
Average size (km ²)		1,707	1,452	484	588	269	172
Smallest		50	445	0.5	38	0.5	0.1
Largest		4,025	3,710	3,812	3,674	3,103	2,807
% age area of system	500 km ²	95	98	73	73	49	67
In areas larger than	1,000 km ²	92	85	54	49	20	56

Cambodia, Lao PDR and Thailand have the highest percentage rates of cover (see Table 8) but the first two tend to have larger areas, both averaging well in excess of 1,000 km². In Cambodia, 12 out of 17 areas (71 per cent) of its protected areas are larger than 500 km², and those 12 areas contain 95 per cent of the total protected area system. The figures for Lao PDR are even higher: 19 out of 20 (95 per cent) and 98 per cent by area. The average size of Thailand's protected areas is less than half those for Cambodia and Lao PDR, only 50 out of 124 areas (40 per cent) being larger than 500 km², and 73 per cent by area.

Myanmar has the least percentage cover for the GMS (2.1 per cent), and most of its protected areas are in the 101-500 km² band (average 494 km²). Nine of its 29 protected areas (31 per cent) are larger than 500 km² but four exceed 1,000 km² (one is more than 3,000 km²) so that by area 73 per cent of the system is in the two top size bands – the same as for Thailand.

Viet Nam and Yunnan have relatively large numbers of protected areas but their average sizes are the least for the GMS. Only 11 out of 80 (14 per cent) of Viet Nam's protected areas are larger than 500 km²—49 per cent by area. In Yunnan, only eight out of 111 protected areas (7 per cent) exceed 500 km² although, because five areas are larger than 1,000 km², they include 67 per cent of the total system by area.

Areas of major biodiversity significance

Thirty-four areas were selected as having major biodiversity significance, mainly on the basis of literature search and recommendations made by members of technical departments and relevant NGOs. The areas are listed below. Reasons for their inclusion are given in the country reports. Not all are individual parks or sanctuaries: some are clusters of protected areas.

Cambodia

- Meklong Leour (a proposed Ramsar site which is not yet a protected area)
- Bokor National Park
- Verachay National Park
- Tonlé Sap Multiple Use Area
- Kulen Promtep Wildlife Sanctuary
- Lomphat Wildlife Sanctuary
- Phnom Samkos Wildlife Sanctuary
- Phnom Prich Wildlife Sanctuary

Lao PDR

- Xe Piang National Biodiversity Conservation Area
- Nakai Nam Theun National Biodiversity Conservation Area (and its proposed extension)
- Phou Dene Dinh National Biodiversity Conservation Area
- Phou Khao Khoay National Biodiversity Conservation Area
- Dong Ampham National Biodiversity Conservation Area
- Hin Namnor National Biodiversity Conservation Area
- Nam Chuan proposed national biodiversity conservation area
- Phou Hin Poun National Biodiversity Conservation Area

Myanmar

- Alaungdaw Kathapa National Park
- Chatthin Wildlife Sanctuary
- Shwesettaw Wildlife Sanctuary

- Kaserdoh (not a protected area – see country report for further information)

Thailand

- The Western Forest Complex (WFC) (seven national parks and four wildlife sanctuaries)
- Kaeng Krachan National Park
- The Khao Yai National Park-Thap Lan National Park-Pang Sida National Park complex
- The Nam Nao National Park-Phu Khieo Wildlife Sanctuary complex

Viet Nam

- Central Laotian border (four nature reserves)
- Song Tan-Dac Pring Nature Reserve
- Northern Cambodian border (one national park and three nature reserves)
- Cat Loc Species/Habitat Reserve

Yunnan

- Xishuangbanna State Nature Reserve
- Nangunhe State Nature Reserve
- Lanxang (proposed nature reserve)
- Border with Viet Nam (several small protected areas occur)
- North-eastern Zhaotong Prefecture (several small protected areas occur)
- Baimaxueshan State Nature Reserve

Protected areas in selected watersheds

A principal component of the project is the selection of priority watersheds for investment proposals in Phase II (Project Document for Phase I). Five were selected during the mid-term review workshop. They are listed below in Table 11 together with the names of protected areas that occur within them.

TABLE 11. Selected watersheds for investment proposals in Phase II, and the protected areas that occur entirely or partially within them. Protected areas also identified as having major biodiversity significance in bold typeface

<i>Watershed(s)</i>	<i>Country</i>	<i>Administrative compartment</i>	<i>Protected areas</i>
Luishaha and Nanguohe	Yunnan	Xishuangbanna Prefecture	Xishuangbanna State Nature Reserve
Nam Ou	Lao PDR	Phongsaly Province	Phou Dene Dinh National Biodiversity Conservation Area
Mae Nam Kok	Myanmar	Shan State	None
	Thailand	Chiang Rai Province	Si Lanna National Park (part) Khao Luang National Park (part)
Se San (part)	Viet Nam	Kon Tum Province	Chu Mom Ray Nature Reserve
Strung Pursat	Cambodia	Pursat Province	Tonlé Sap Multiple Use Area (part) Phnom Samkos Wildlife Sanctuary (part) Aural Wildlife Sanctuary (part)

Border protected areas

Many protected areas lie along international borders: some are contiguous with protected areas in neighbouring countries. The extent of this is illustrated in Table 12. Names of the protected areas involved are listed in each country report.

**TABLE 12. Numbers of protected areas bordering neighbouring GMS countries (those contiguous with protected areas in neighbouring countries in parentheses)
Read across rows only.**

	Cambodia	Lao	Myanmar	Thailand	Viet Nam	Yunnan	Totals
Cambodia		1 (1)		4 (1)	3 (2)		8 (4)
Lao	2 (1)			2 (1)	6 (4)		10 (6)
Myanmar		1 (0)				1 (0)	2 (0)
Thailand	4 (2)	4 (2)	11 (0)				19 (4)
Viet Nam	3 (2)	8 (4)				2 (0)	13 (6)
Yunnan		1 (0)	3 (0)				4 (0)

Thailand has more border protected areas than the other GMS countries, especially along its western side, but only four of the 19 identified (21 per cent) are contiguous with protected areas in other countries—all in Cambodia and Lao PDR. Cambodia, Lao PDR and Viet Nam have relatively large proportions of their protected areas contiguous with those of neighbouring countries (50, 60 and 46 per cent respectively), and they offer a greater range of opportunities for international collaborative management. (Lao PDR and Viet Nam have begun some initiatives.) Myanmar and Yunnan have few protected border areas, and none adjacent to ones across the frontiers.

6. Institutional Arrangements

Roles and responsibilities

Use of the term 'responsible' below should be read with circumspection: several organisations other than those listed have *their* impacts upon forested lands in and outside protected areas, without there being convincing evidence for co-ordination at ministerial levels

Biodiversity conservation and protected area management in all GMS countries are, to varying degrees, functions of technical departments in central government ministries, local government offices or a combination of the two. (In the case of Yunnan, the provincial government is the chief operational agency but subject to overall central government policy and law.) In Myanmar and Thailand, the technical forest departments exercise a large measure of direct control, whereas in Lao PDR and Viet Nam, provincial offices play leading roles. With one exception only, protected areas come under Forest Departments. The exception is Cambodia where the managing agency is the Department of Nature Conservation in the Ministry of Environment.

The private sector's contribution is negligible. Where it does occur, it is restricted to limited aspects of tourism. In Myanmar, families of staff are permitted to run small businesses that provide minor retail services for tourists. Donors and NGOs play major supporting roles in several GMS countries, accounting for the greater part of the budget in some.

In Cambodia, the Ministry of Environment, though its Department of Nature Conservation's National Parks and Wildlife Sanctuary Unit (NPWSU), in association with provincial environment offices, is ostensibly responsible for the protected area system. However, only four protected areas are under any sort of management. Total protected area management personnel comprise 20 members of NPWSU (half of them graduates) and 79 workers based in the four managed areas. The Ministry of Agriculture, Forestry and Fisheries, through its Department of Forestry and Wildlife, is responsible for biodiversity conservation in forested lands outside protected areas: it has a staff of 800.

In Lao PDR, national biodiversity conservation areas are the responsibility of the Ministry of Agriculture and Forestry. All 20 national biodiversity conservation areas are being managed, largely through provincial forest offices. The Department of Forestry, through its Centre for Protected Areas and Watershed Management (CPAWM), provides technical back up. Management personnel comprise the 55 members of CPAWM and 173 provincial and district officers: about 20 per cent are graduates. One area is staffed entirely by the Ministry of Defence. Donors and NGOs support management, surveys and research, and provide in excess of 90 per cent of operational budgets.

Myanmar's protected areas are managed directly by the Forest Department (in the Ministry of Forestry), which employs a workforce of about 14,000. Biodiversity conservation and protected area management are the responsibility of the Wildlife and Nature Conservation Division, which has a staff of 850 (about 10 per cent graduates in forestry). Several donors assist with surveys, training programmes and research.

The Royal Forest Department (RFD), another large organisation employing more than 17,000, manages Thailand's extensive protected area system. Within RFD is the Natural Resources Conservation Bureau, which includes the National Parks Division, Marine National Parks Division, Wildlife Conservation Division, Watershed Conservation Division and Forest Engineering Division. The Bureau employs about 1,300 officers and 'permanent employees' (five per cent graduates and five per cent having forestry certificates) and about 12,000 'daily paid employees', although the latter are seasonal and intermittent. NGO and donor support is chiefly directed at projects such as the Western Forest Complex Environmental Education Project, tiger conservation and an elephant reintroduction programme: there are several of them.

Provincial authorities play a major role in managing Viet Nam's protected areas. The Ministry of Agriculture and Rural Development's Forest Protection Department (FPD) headquarters directly manages the 10 national parks but, with few exceptions, provincial forest protection offices, accountable to provincial people's committees, manage most other areas. FPD's headquarters has a staff of 40 although not all work on protected area management; and there are about 7,500 employed in provincial and district forest protection offices, of which some 3,500 appear to be employed on protected area management. About three-quarters of FPD's headquarters staff are graduates (foresters, biologists, lawyers); while the provincial and district officers include 22 per cent graduates and 50 per cent technicians. Donors and NGOs support selected aspects of management, and carry out wildlife studies and surveys.

The overall managing authority for biodiversity and protected areas in Yunnan is the Provincial Forest Department. A few other institutions, including the People's Liberation Army have responsibility in certain areas. The department's Wildlife Conservation Office has a staff of 22, of whom only two deal with nature reserves. Three of the 17 prefectures have wildlife conservation offices, with up to five persons employed in each.

At the level of individual protected area there are local government personnel and local villagers, and it appears that staffing levels are relatively high although precise data were available for five areas only: Xishuangbanna National Nature Reserve (34 technicians and 32 forest police); Nabanhe Provincial Nature Reserve (6 forest police and 9 local patrollers); Weiyuanjiang Provincial Nature Reserve (20 staff); Tianchi Provincial Nature Reserve (27 staff); and Banma Snow Mountain County Nature Reserve (20 staff). Donor and NGO support exists but is slight.

Where protected areas cross internal provincial, prefecture, district or county boundaries, it might be expected that friction will occur when management is controlled at local level. Most departments questioned during the Specialist's country visits reported that ensuing conflicts are relatively minor but irksome. In Viet Nam, for example, transfer of staff from one sector of a reserve to another is complicated if the reserve straddles provincial or district boundaries.

Capacity and constraints

Numbers of management personnel vary greatly between the GMS countries but, without exception, representatives of technical departments claim to be seriously understaffed. They also claim, with apparent justification, to be under-paid, under-skilled and under-equipped.

Table 13 compares levels of staffing—size of protected area per employee—in each country. Numbers of employees are taken from data gathered when compiling country reports, which have been summarised above. Sizes of protected areas are taken from Table 8, and include all protected areas listed in the country reports, irrespective of whether or not biodiversity conservation is a major function. The differences between countries are remarkably wide—from 6.5 persons per km² in Viet Nam to almost 345 in Cambodia.

Table 13. Numbers of employees in protected area management in the countries of the Greater Mekong Subregion, and the ratio of area to employee.

	Numbers of personnel	Sizes of protected area systems (km ²)	Km ² /employee
Cambodia	99	34,023	344.7
Lao PDR	228	29,030 (27,640)	121.2
Myanmar	850	14,160	16.7
Thailand	2,600	77,922	30.0
Viet Nam	3,500	22,690	6.5
Yunnan	?(166)	19,749(3,077)	18.5

These figures were compared with similar data drawn from a study made in Africa (Bell & Clarke, 1984) although it is accepted that conditions there may not strictly be comparable with those of the GMS. The earlier study produced km²/employee ratios that ranged from 2.4 (for the former South African homeland of Bophuthatswana) to 577 (Botswana, which has a human population density of only 2.5/km²). Table 14 gives examples from five African countries that have large, reasonably well managed protected area systems, *and which have comparable human population densities* – comparable at least with those of Cambodia, Lao PDR and Myanmar (see Table 1).

TABLE 14. Size of area per employee in protected areas of six countries in eastern and southern Africa

Country	Human population density (km ²)	Sizes of protected area systems (km ²)	Km ² /employee (to nearest whole number)
Kenya	47.8	40,000	20
Malawi	81.1	11,000	46
South Africa	34.6	19,565	41
Tanzania	31.6	257,400	273
Zimbabwe	27.9	47,000	22

Source: Bell & Clarke (1984)

Table 13 shows that the GMS countries have levels of staffing not too dissimilar with those found in Africa during the early 1980s. In Myanmar, Thailand, Viet Nam and Yunnan, levels are in the same league as those of three African park systems that attract large numbers of visitors and are significant earners of foreign exchange—Kenya, South Africa and

Zimbabwe. Viet Nam's level of staffing is exceptionally high—a response perhaps to the high human population density. A recent publication, Emslie & Brooks, in prep, recommend levels of staffing for African black rhinoceros sanctuaries, which require intensive management, of, ideally, one ranger per 10 km², and not less than one per 30 km². Four GMS countries fall within this bracket.

If these African park systems can succeed in conserving biodiversity with such area to staff ratios, factors other than numbers of personnel may be more important constraints to protected area management in the GMS countries: For example, ineffectual laws, inadequate professional and technical skills; low motivation and therefore cost-efficiency (exacerbated by poor financial rewards?); insufficient equipment; unsystematic management; or political and social unrest.

Professional and technical skills

Where data were available, 10 per cent or more of most protected area management personnel in GMS countries are graduates although the extent to which their degrees are relevant in practice is unclear. As protected areas of the GMS are largely on forested lands, forestry is certainly a relevant subject and in most countries professionals are foresters.

Low motivation and cost-efficiency

Derisory salaries are paid to staff at field and headquarters levels except in Thailand and Yunnan, where governments pay more realistically though not lavishly. In Lao PDR, monthly government salaries range from about \$10 to \$20 a month—the latter for heads of departments. Myanmar salaries are somewhat lower, while those for Cambodia and Viet Nam are a trifle higher. On their own, such salaries fall far short of what is needed to support a family (some sources reckon no more than 10 per cent). Although some non-cash rewards may be added, such as housing, food supplies and (for senior personnel) cars or motorcycles, civil servants still consider themselves inadequately remunerated, and many spend sizeable proportions of their government working hours in alternative employment. This is not just a matter of poor motivation but also that of employees simply being unwilling or unable to spend time on tasks that yield such meagre rewards when other opportunities exist and can be seized concurrently. Some opportunities may run contrary to the employee's official responsibilities: can, for example, a protected area warden on \$10 a month afford to turn down a cut from an illegally killed rhinoceros (whose horn is worth \$15,000 a kilogram) which might be his merely for turning a blind eye? The resultant impacts are not unique to protected area management: they apply right across the public sector, ensuring that cost-effectiveness is diminished, and providing a fruitful ground for chicanery and corruption.

Equipment

Most technical departments report being inadequately equipped. They are short, in particular, of transport, plant, portable radios, GPS units, binoculars, camping gear, other patrolling equipment, firearms and ammunition, and rely heavily upon donors for supplies.

Management systems

Protected area management plans that define policies and identify objectives, prescribe strategies and set targets do not exist for most GMS protected areas outside of Thailand. There is also a widespread misunderstanding over what a management plan is and how it should be used. Some workers see it as little more than a construction or development programme, others as a vast compendium of information and recommendations—a sort of academic dissertation and source of reference. The subject is discussed in greater depth under strategic recommendations, where it will be argued not only that management plans are highly desirable but that they should be in the form of simple, practical management manuals, adopted at the highest level within the technical department or parent ministry, and given to wardens of protected areas with instructions to implement.

Without management plans there is no basis for systematic management of protected areas or for continuity. Management is subject to ad hoc, opportunistic judgements that may alter with changes in personnel at headquarters or field levels.

There is also clearly need for more information on biodiversity and ecological processes that can be incorporated into the planning process for protected areas, and the introduction of procedures for preparing and up-dating management plans. For example, most countries have inventories of flora and fauna (at least of vertebrates) that are incomplete and will undoubtedly be expanded through further studies and surveys. More information is required on the ecology, distribution and abundance of rare, threatened and endemic species. Other useful studies might include analyses of protected area coverage of biotic communities using GIS technology. And a pressing need exists for systematic methods of gathering, storing, managing and retrieving a broad range of management-orientated information.

7. Participatory Management

There is a tradition of hunting and gathering in the forests of the GMS, which long preceded the modern concept of protected areas, and which continues to the present day. Rural folk have collected, and continue to collect, a vast array of wild plant materials for food, medicinal purposes, building materials and various household uses; and they hunt large and small animals as sources of food, medicines and for other utilitarian or commercial purposes. There is also a long tradition of slash and burn agriculture. These practices are appropriate forms of sustainable land use while human population densities remain below critical levels—levels that vary with carrying capacity of the land, abundance and range of biodiversity and types of land use.

The existence of settlements within or close by protected areas has potential for positive and negative impacts upon management (Claridge, 1998). On the positive side:

- people who have a long history of reliance on biodiversity probably have a wealth of local ecological knowledge to contribute to planning and management;
- people dependent upon biodiversity for subsistence usually understand (and may already practise) principles of conservation management; and
- people who perceive that they benefit from sustained biodiversity have a motive for safeguarding the resources they depend upon and deterring inward migration, which, coupled with their frequent or constant presence in the managed areas, supports surveillance and law enforcement.

Negative impacts include:

- unsustainable harvesting of biodiversity, due to excessive off-take or use of unsustainable techniques;
- pollution resulting from agrochemicals or industry as a consequence of changes in land use on the part of locals, outsiders or both;
- changes in habitat brought about by factors such as fire, expansion of cultivation and housing into new areas, or development of (for example) roads and hydropower installations;
- deforestation to provide land for cultivation;
- undesirable changes to stream flow that result from deforestation; and
- exotic plants or animals that may be introduced.

In some circumstances potentially negative impacts may be avoided by resettling or inducing communities, or some individuals within them, to move voluntarily to settlements beyond protected areas. Forced resettlement has limitations, and is only advisable where:

- a protected area can effectively be policed to prevent return of resettled people or intrusion by others;
- resettlement does not have impacts, social or environmental, greater than those incurred by leaving people on site; and
- resettlement is politically and socially acceptable.

These prerequisites are rarely realised, hence the concept of participatory management, which leaves folk where they are but seeks to optimise from the potentially beneficial impacts listed above and divert adverse impacts by providing alternative resources or by giving people incentives to support management objectives. However, for the protected area manager, participation is a compromise—not an objective in its own rights. Most park and reserve wardens would prefer their areas to be devoid of other forms of land use, leaving them free to concentrate on managing the flora and fauna. Participatory management is an attempt to find a workable strategy in the face of specific constraints. It is making the best of a bad job.

Most protected areas in the GMS have settlements inside them. All have settlements in close proximity. The inhabitants of these settlements pose threats to protected area management: they harvest plant and animal resources (perhaps at unsustainable rates) and clear land for shifting or permanent cultivation. Much is said about participatory management in all GMS countries except Myanmar, and several NGOs actively promote it. The term 'buffer zone' is widely quoted but none exists in any national legislation. In some countries (Yunnan in particular) parts of protected areas are labelled 'buffer zones' so that the total sizes of the true protected area systems are less than they appear in published lists and in this report.

In Cambodia, the Departments of Nature Conservation and Forestry and Wildlife have community forest units that train staff in provincial environment and forest offices, and disseminate information. They are active and co-operate with one another.

The Laotian government claims to be committed to a participatory approach to protected area management, involving people who live in or nearby them. Responsibility for management is reportedly delegated to villages through a system of locally negotiated rules that trades continued access to selected non-wood forest products in exchange for assisting law enforcement efforts. It is unclear how or whether this works in practice.

Extant policy and forest and wildlife law in Myanmar do not provide a basis for participatory management, nor is there any office within the Forest Department charged with promoting participation although there is a public awareness programme that seeks to foster support for the department's work.

Technical departments in Thailand and Viet Nam are said (by some NGOs) to be reluctant to work with communities due to lack of sympathy for the concept of participatory management, unwillingness to co-operate across institutional boundaries and a conviction that forest management is best left to professional foresters. However, Thailand's RFD is engaged in participatory management in several areas (see country report for two examples) and takes account of local aspirations in the management planning process. Although perhaps less than enthusiastic, neither technical department can be called obstructive, and officially approved NGO programmes actively promote participation in both countries.

What might be classed as rudimentary participatory management in Yunnan is the employment of local people to police protected areas against illegal activities, and to watch for forest fires in the vicinity of their villages. This practice has benefits and disadvantages. The continued existence of a protected area ensures employment for at least a few men or women; but can a local villager be expected to play an effective police role when transgressors are likely to be members of his or her own community?

No initiatives were found in the GMS that offer rural inhabitants tangible cash or other benefits from managing wildlife, similar to those in operation in eastern and southern Africa.

A common source of tension between protected area management and nearby rural communities in Africa is caused by animals harboured by the protected areas that damage crops and harm livestock in and around nearby settlements, and gives the parks or reserves a bad name. Under the current study, this problem was reported only from Yunnan. In southerly areas of the latter, macaques, black bears, Indian muntjac, wild boar, sambar and rats are common vertebrate pests that adversely affect crop production and storage. Elephant is a problem animal in some localities, while wild cat and leopard sometimes threaten livestock. Although not reported elsewhere, a similar range of problem animals may well have similar impacts in the other five GMS countries.

8. Tourism in Protected Areas

The protected areas of GMS countries do not offer the kind of wildlife spectacle found in eastern and southern Africa, and are never likely to: They have neither the huge herds of large mammals nor the open savannah woodland habitats in which wild animals are easily seen. But they do offer some magnificent scenic amenities, a wealth of botanical diversity and opportunities to experience wilderness or near-wilderness. At the same time, all GMS countries have a rich diversity of cultural sites and traditions that can and do attract domestic and foreign tourists.

Three countries (China, Myanmar and Viet Nam) require visitors to obtain visas in advance, which is somewhat counterproductive to tourism; and Myanmar demands that a minimum of \$300 per person be exchanged for foreign currency units on entry. Cambodia and Lao PDR offer visas on arrival to all visitors (\$20 and \$30 respectively), while Thailand requires no visa for citizens of some countries, and issues them on arrival to most others for Baht300 (about \$8).

Hard statistics on visitors to national parks and other protected areas of the GMS were often elusive. Central technical departments responsible for protected areas were generally unable to provide numbers of visitors, claiming that these were held at provincial or district offices. The following account summarises what information was available.

Cambodia's overall tourist inflow exceeds 100,000 a year but numbers of visitors to protected areas appear not to be recorded. Current Ministry of Tourism policy is to diversify the industry by promoting opportunities for ecotourism although there is little infrastructure to support this.

According to National Tourism Authority statistics, about half a million international arrivals entered Lao PDR during 1998, and the target for 1999 is 700,000. In an attempt to stimulate tourism, the cost of visa on arrival was reduced from \$50 to \$30. However, Lao's protected areas (the NBCAs) are largely unvisited by tourists, foreign or domestic, except for Phou Khao Khoay (a day's trip from Vientiane) and Dong Hua Sao (from Pakse). Possibilities for developing ecotourism in other areas are being considered, and proposals for relevant legislation are reported to be under development.

Statistics were unavailable in Myanmar although uncorroborated verbal reports were given to the Specialist on annual numbers of visitor to the most heavily visited protected areas: Popa Mountain Park, 150,000, and Hlawga Wildlife Park, 104,000. Most visitors are domestic.

Thailand's tourism industry is well developed and diverse. During 1995, nearly 14 million tourists visited the national parks and marine national parks—87 per cent domestic and 13 per cent foreign. By 1997 the number was approaching 20 million. Current Tourism Authority of Thailand policy is to emphasise quality, minimise environmental damage and use ecotourism to promote awareness of conservation values: an ambitious programme.

Viet Nam's national parks are managed with an emphasis on tourism but other categories of protected areas are regarded as having conservation as their major function. If tourism potential is perceived in other protected areas, they are likely to be reclassified as national parks or brought under centralised control. Visitor statistics were not available. The most visited area is Cuc Phuong National Park: estimates of annual visitors ranged from 30,000 to 70,000, mostly domestic.

In Yunnan, forest parks are managed chiefly for domestic tourism or recreation. Nature reserves are mostly open to the public but many lie in remote areas and are neither well known nor publicised. However, the two most visited areas are nature reserves:

- Xishan, near Kunming, 500,000 visitors a year.
- Xishuangbanna, 200,000 to 300,000 a year

9. Trade in Wild Animals and Their By-Products

There is heavy demand for a broad range of wild animals and their by-products to satisfy traditional culinary and medicinal needs. The demand exists throughout the GMS but nowhere so great as in China and northern Viet Nam. Satisfying this demands erodes biodiversity and intensifies threats upon already endangered species such as tiger, of which the skin and bones of a single specimen sell for at least \$1,500—an irresistible temptation to one whose annual salary may be less than a quarter this amount.

China receives massive consignments (Anon. 1998b), including species covered by CITES. Major trade routes run from Lao PDR and Cambodia into Viet Nam, from within Viet Nam itself, and then via Hanoi to China's Yunnan and Guangxi Provinces. Thailand receives illegal consignments of a wide range of forest products (timber and non-timber) from Cambodia, Lao PDR and Myanmar, and Myanmar exports to China. All countries except Lao PDR are signatories to CITES.

Reptiles and small mammals make up the bulk of the trade into Yunnan and other provinces of China. Birds are exported in lesser numbers. Larger mammals include macaques, gibbons and langurs, which are less commonly traded but fetch higher prices. The rarest species such as tiger, leopard and elephant are traded in the form of by-products.

Although the end uses are chiefly medicinal and culinary, some are used in handicrafts (e.g., tiger claw pendants) or as trophies (e.g., elephant tusks or tiger skins). Some primates and most birds are traded live as pets.

Some plants have also been affected by high demand. A major illegal market for *maidam* (*Aqualaria* sp) in the Middle East and Japan, where it sells for up to \$2,000 a kilogram, has all but eliminated the plant from Lao PDR.

Attempts to control cross-border wildlife trade have had little apparent effect. A 1995 meeting between China's Ministry of Forestry and Viet Nam's Ministry of Agriculture and Rural Development resolved to enhance co-operation in adopting active and effective approaches to prevent and crackdown on illegal wildlife trading along the border. Viet Nam's Forest Protection Department issued an invitation for a meeting in March 1998 but there are no records of its being convened.

10. Gender Issues

Throughout the GMS, gender ratios in technical departments are heavily biased towards men, who make up between 70 and 95 per cent of the workforce: see Table 15. There were no firm data upon which to detect trends although anecdotal accounts suggest that the proportion of women employees has increased during the past decade.

There are no obvious reasons for branding this pattern desirable or undesirable: it is simply a fact. The pattern is worldwide but less pronounced in western countries. The present trend will probably continue and gender differentials gradually diminish.

TABLE 15. Gender ratios in GMS technical departments responsible for protected areas and biodiversity management.

	Male (%)	Female (%)	Sources of information
CAM	95	5	Unsubstantiated oral estimates from the Department of Nature Conservation in the Ministry of Environment
LAO	90	10	Documentary evidence (<i>Summary of conservation management staff</i>) provided by CPAWM
MYA	76	24	Unsubstantiated oral estimates from the Wildlife and Nature Conservation Division of the Forest Department
THA	92	8	Documentary evidence (<i>Gender proportion of RFD</i> , undated) provided by the Royal Forest Department.
VIE	90	10	Documentary evidence (internal staff list) from the Forest Protection Department.
YUN	70	30	Unsubstantiated oral estimates from the Wildlife Conservation Office of the Yunnan Provincial Forest Department.

Where limited community participation is being practised, men are reported to be the chief activists and decision-makers. Traditionally men and women gather different forest products: men cut timber and hunt; women collect firewood, medicinal plants and water. Biodiversity conservation is commonly perceived as being analogous to wildlife conservation, which in turn is associated with hunting, a male prerogative.

11. Threats to Biodiversity

The array of threats to biodiversity and protected areas are broadly similar across the GMS, with countries differing only in prioritisation. The threats can be grouped under seven main, closely inter-linked headings: deforestation; unsustainable harvesting; inadequate management resources; inadequate protected area systems; public apathy and unawareness; social unrest; and human population pressures.

Deforestation

Deforestation is the chief intrusive cause of declining biological diversity. Loss of wetlands and destruction of coastal habitats are also major contributors but the current study is focused upon remote watersheds, which are upland, forested areas.

The two most important direct causes of deforestation are logging and land clearance for shifting or permanent cultivation. The extent of logging varies greatly across the GMS. In Yunnan, it was banned in 1998, the national government having taken a stand after decades of unsustainable use and catastrophic floods caused by extensive past deforestation. It is too early to judge the success of this decision. In Thailand, the 1989 ban on logging is still flouted, and in Viet Nam, illegal removal of trees for commercial sale continues. Lao's Forest Law of 1996 provided a basis for confronting uncontrolled logging, which until then had been a pressing problem. Today, *illegal* logging is not a major problem although legally issued concessions, which are not necessarily based upon sustainable levels, may be.

Cambodia's problems are the most severe. Logging on a massive scale occurs in and outside protected areas, being most pronounced in the Northeast. Corruption and intimidation are rife. Timber is exported illegally through unchecked border crossings into Thailand and Viet Nam (and to a limited extent Lao PDR for onward consignment to Thailand) in spite of signed agreements between the four countries.

Land clearance for cultivation is widespread in and outside protected areas except in Myanmar. The problem continues unabated as human populations increase, exacerbated in some areas by inward migration of land-hungry folk from outside. In Thailand, refugees from neighbouring countries have added to the problem. Also in Thailand, government policies that encourage food production for export exacerbate the trend, and the recent economic recession has led to increased urban unemployment and a shift back to the land.

Other potential causes of deforestation include proposed developments such as hydropower projects and new highways, which inundate or remove forest cover, open up more remote watersheds to exploitation and place further pressures on rural inhabitants to bring further land into production.

Unsustainable harvesting

Unsustainable harvesting of non-timber forest products, plant and animal, erodes biodiversity in and outside protected areas. Fuelwood, building materials, medicinal and edible plants and wild game meat are crucial to the survival of remote forest dwellers. Other resources are sold for cash (which rural folk also need), a practice kept alive by the insatiable demand (chiefly in China and Viet Nam) for wildlife products that have traditional culinary and medicinal uses. As rural people go about gathering resources or clearing land they may cause fires that further erode biodiversity. The problem intensifies as human populations continue growing and land available to them declines.

Inadequate resources for management

All GMS countries have policies that recognise and extol the values of biodiversity, and they sign up readily to international conventions. There are also laws and large (some very large) protected area systems. But policies, laws and decrees that create (on paper) national parks and nature reserves cost little to produce and win easy applause in international forums. They are not necessarily indicative of commitment. Too often lacking are the will and determination to follow policies through logically and enforce laws, which requires considerable expenditure and the introduction of co-ordinating mechanisms to ensure that all government activities impacting upon biodiversity are harmonised.

Thus, a commonly occurring feature is that technical departments charged with conserving biodiversity or managing protected areas are inadequately financed, ill-equipped, understaffed and deficient in appropriate skills and experience. In at least four of the countries, meagre staff salaries create conditions that do not encourage cost-effectiveness.

Inadequate protected area systems

Some protected area systems and many individual areas are too small to be effective—islands of declining indigenous biodiversity in a rising sea of human activity. The ability of islands and protected areas to retain species is positively correlated with size of area, and larger species require larger tracts of land. Some protected areas may be big enough on paper, but have ill-defined boundaries or none at all and are simply non-existent on the ground. They are wide open to encroachment and misuse.

Paradoxically, while some protected areas are too small, some systems may be so large as to be counterproductive. It must seriously be questioned, for example, whether protected area systems as extensive as those in Cambodia and Lao PDR can be brought under effective management in the foreseeable future or, indeed, ever. An absence of management is hardly likely, under current circumstances, to result in a few years' benign neglect until management resources have been marshalled and are ready to be sprung into action. More likely, as human populations continue to increase and pressure for land intensifies, protected areas will continue to lose forest cover, biodiversity will become less diverse and rarer species will disappear. Sooner or later, impassioned pleas for more land will, in the interests of political expediency, lead to parts of the system being judged expendable and discarded, so setting a precedent for further excisions. In the long term, smaller protected area systems, for which governments have expressed firm commitments, which can be brought under immediate effective control and have longer life expectancies, may be more cost-effective.

With few exceptions outside of Thailand, those protected areas under active management (many are not) are under-funded and ill equipped. In most there is no systematic approach to management. Simple management plans that state objectives, identify strategies and set targets are largely absent. Even if management plans existed it seems unlikely that more than a few could be implemented, due to inadequate resources.

With the exception of Thailand and a small minority elsewhere, scant revenue is earned from protected areas. There is little infrastructure to support or expand existing low-levels of tourism, and security may be poor to calamitous. Budgets depend upon annual subventions from central governments and, in some countries there is heavy reliance upon donor support. This is not necessarily undesirable so long as support is maintained and is coupled with capacity building. In Cambodia, doubt is being expressed as to whether donor support will continue, USAID having withdrawn in 1997.

Public and official apathy and unawareness

In most GMS country there is scant evidence of a significant 'constituency' for biodiversity conservation or protected area management. Protected areas and forests in general are used for purposes that violate biodiversity. There is little public recognition of the values of biodiversity, of the reasons for maintaining ecological processes intact or of the roles that protected areas play. Apart from being sources of essential products for those who live nearby to gather according to need, they do not fulfil any obvious public needs. In any case, the rural peasantry who rely upon those products, and are knowledgeable about them, lack forums in which to voice their views and they carry little clout. In spite of policy statements to the contrary, government actions appear not to recognise that biodiversity or protected areas fulfil any meaningful human needs, and they are accordingly given low priority—especially in national budgets.

By-and-large, rural people are unfamiliar with the concept of protected areas, and the fact that few protected areas are demarcated on the ground and many are unmanned is unhelpful. Nor is there adequate public information about biodiversity and protected areas and the laws that apply to them, which might help dispel current apathy and unawareness.

Social unrest

In Myanmar, it is reported that protected area management is complicated by political instability caused by conflicts between central government and separatist movements, which renders some remote areas virtually ungovernable.

Unexploded ordnance continues to pose threats to many forms of land use, including protected area management. Development of facilities for tourism in the worst affected areas is severely hampered, limiting capacity for revenue earning. This factor applies most forcefully in Cambodia, Lao PDR and Viet Nam, where the numbers of amputees resulting from mines or other ordnance are currently estimated as 35,000, 4,000 and 80-100,000 respectively. Current estimated accident rates are highest in Cambodia and lowest in Viet Nam.

Influxes of refugees from Cambodia and (especially) Myanmar as a result of civil unrest have presented Thailand's RFD with management headaches.

Human population pressures

Viet Nam's National Conservation Strategy highlighted human population as a major threat, and stressed the need to reduce it to zero. That was in 1985: 14 years later the target is as far as ever from being reached and there is little sign that it can be achieved within the foreseeable future. Spokesmen of technical departments, especially in Yunnan, recognise the crucial nature of this issue. The existence of large, ever-increasing populations (especially of people who depend upon the products of forests and other forms of wild lands) is the crux of the problem GMS countries face in conserving biodiversity and alleviating rural poverty. It is a problem that is unlikely to go away. As populations rise, biodiversity will inevitably continue to decline.

12. Current Trends In Biodiversity Conservation

Within the context of the Indo-Malayan Realm, the GMS is an area of moderately rich biodiversity and endemism. In the global context it is almost certainly above average. Biodiversity in the GMS has been under serious threat for at least the last fifty years, due primarily to burgeoning human populations. Traditional land uses which once were practised sustainably at lower population densities, such as shifting agriculture, have become insupportable over vast tracts of country—especially in remote watersheds. Unsustainable logging and harvesting of non-timber forest produce has compounded the problem. These activities have eroded biodiversity and overall environmental quality, and continue to do so.

Protected areas provide a means of conserving biodiversity and ecological processes on a limited scale, by preserving representative areas of selected biotic communities, and safeguarding habitat to ensure the survival of viable populations of plants and animals that are of special interest, including those that are endemic, rare and threatened. The reasons for doing this be:

- aesthetic;
- economic, local level (conserving selected plants and animals as usable resources, and by providing employment or scope for small business enterprises);
- economic, national level (stimulating trade, revenue earning);
- species and biotic community conservation;
- gene conservation (preserving options for possible future uses in, for example, agriculture or medicine);
- educational;
- recreational; and
- to provide bases for research.

Protected areas also perform watershed protective functions, conserving soil and water quality that benefit other land uses such as cultivation and fishery management down stream. This function is, however, limited by their relatively small size. It is unlikely that any protected area system in the GMS will cover more than 20 per cent of total land areas and still be manageable: most will probably be far smaller. At the national scale, watershed management requires a considerably more widespread system of good land use policies and applied practices.

MacKinnon (1997), looking back across a 10-year period (1986-96), observed that

'despite apparent success in getting large areas of natural habitat included in protected area systems, the overall situation for biodiversity conservation looks worse than it did 10 years ago. . . The large and continuously growing human populations of the region (the Indo-Malayan Realm) are still heavily dependent on the direct and indirect production of biological resources.'

He also recorded progress in formulating policies and laws that were generally sound, and, in spite of continued loss of forest, impressive growth in the protected area systems of Cambodia, Lao PDR, Myanmar, Thailand and Viet Nam. Similar increases have also been observed in Yunnan: the 1985 figure for protected area cover in Table 16 was derived by summing protected areas listed by MacKinnon et al (1996) that had been established prior to that year.

TABLE 16. Changes in protected area cover in the countries of the GMS, 1985-1999.

	<i>Changes in protected area cover (% of total country area)</i>
CAM	6.0 – 18.8
LAO	0.0 – 12.3
MYA	0.1 – 2.1
THA	11.0 – 15.2
VIE	1.0 – 6.8
YUN	2.2 – 5.0

Source: MacKinnon (1997) and MacKinnon *et al* (1996) for earlier cover: the current study for present cover.

Two years on, circumstances are much the same. Over most of the GMS, policies, laws and protected area declarations have not been followed by practical actions capable of achieving declared objectives although in Lao PDR, management has been expanded to cover all NBCAs and some proposed NBCAs. In most countries there appear to be neither the will nor the resources to do more. Most to the point, human population increases have continued unabated, bringing with them escalating demands for land on which to cultivate, and continued harvesting of non-timber forest products at rates that are probably unsustainable. Logging, legal and illegal, adds to the pressures that erode biodiversity.

Current qualitative assessments of government declarations and their implementation are summarised in Table 17. The assessments are crude, necessarily subjective and based upon the views of spokespersons (of technical departments and NGOs) in the six countries, and to a certain degree upon previously documented assessments.

Table 17. Status of policies, laws, protected areas systems and implementation in countries

of the Greater Mekong Subregion, 1999.

	Policies	Laws	Protected area coverage	Staff numbers	Enforcement/Implementation
CAM	Moderate	Poor	Good (well designed)	Inadequate	Very weak
LAO	Moderate	Moderate	Good (well designed)	Moderate	Moderate/Poor (but developing)
MYA	Moderate (but sketchy)	Moderate	Too small (but plenty of potential)	Good	Good (subject to constraints imposed by civil unrest)
THA	Good/Moderate	Good (but fragmented)	Good (very extensive)	Good	Good
VIE	Good/Moderate (but fragmented)	Moderate	Moderate (but rather small)	Good	Moderate/Poor
YUN	Moderate/Poor (but developing)	Moderate	Too small (but a few excellent areas)	Good (based on limited data)	Moderate/Poor

Information in Table 17 can be expanded and summarised as follows.

- Policies of generally good to moderate quality are in place or are being developed. They are found in general environmental or forest policies; none is specific to protected area management. The extent to which policies are made public to the people they affect is, at best, limited.
- Adequate laws are in place in all countries except Cambodia, where the necessary subsidiary legislation (sub-decrees) has yet to be promulgated. Some updating and integration of separate but related laws within countries would be beneficial.
- All GMS countries have protected area systems. Three are large and two have been designed with biodiversity coverage as a specific objective. Even in countries with small systems of small average size, there are a few large individual areas (although only one more than 1,000 km² in Viet Nam). Of the three smaller systems, Viet Nam's provides good coverage of habitats but there is little scope for expanding the system, given the high (and increasing) human population density. In contrast, Myanmar has potential for expansion. The potential for Yunnan is uncertain.
- In terms of numbers, staff levels are good to moderate except in Cambodia. Myanmar, Thailand and Viet Nam are particularly good. Yunnan is probably well staffed although information is insufficient to generalise beyond five protected areas for which data were available. Proportions of professional staff are adequate although their training may not always be relevant to protected area management. Motivation of personnel in all ranks is questionable.
- Government budgets in most countries provide for little more than staff salaries. Equipment and operational costs are poorly covered. There is heavy reliance upon donor aid.
- Implementation and law enforcement is variable: best in Myanmar and Thailand, very weak in Cambodia, where only four out of 17 protected areas are operational. In the absence of management plans there may be confusion or doubt as to what has to be implemented apart from enforcing laws. Reasons for weak implementation include poorly motivated staff, inadequate equipment, civil unrest (Cambodia and Myanmar), and apathy or unawareness on the part of public and officials.

Finally, and with no apology for being repetitive, all GMS countries have policies and laws but efforts to implement them generally fall short of objectives. In most countries, a more realistic policy might be encapsulated in a statement such as:

'Biodiversity and protected areas are very interesting subjects, and doubtless have several beneficial values, but unfortunately the citizens of this country have more important needs that have prior claim on our finite financial resources: e.g., health, education, communications, defence, etc. At present we can devote only a relatively small fraction of our budget to this subject but look forward to continued donor support.'

This would be an honest and realistic statement of policy, and one that overtly acknowledged the fact that there is little significant political constituency for biodiversity and protected areas, and that those who espouse the subject are unlikely to be the poorest in the electorate—the people who depend upon direct daily access to biodiversity resources.

STRATEGIC RECOMMENDATIONS

1. Introduction

The preceding analysis gives an overview of protected area management in the GMS countries, and the context in which it functions. Many constraints and adverse pressures from external sources are common to all countries to varying degrees, but each country also has its particular problems and its own strengths and weaknesses. Recommendations or suggestions that appear below apply to protected area management across the GMS but their relevance will vary from country to country.

2. Assumptions

This study makes two assumptions.

Assumption 1

Human population growth will continue unabated into the foreseeable future. Based upon findings of the current study, annual growth rates may be expected of at least 2.0 per cent averaged across the GMS, which would produce 313 million people by the year 2010 – an increase of 61 million over today's estimate. Extrapolations in some cases are profoundly disturbing. Viet Nam, currently an estimated 80 million will become 99 million, and its average population density 298/ km². Growth will be at its greatest in remote watersheds, in and around protected areas. Pressures on land and biodiversity will increase. Biodiversity will continue to decline. Some critically threatened species will disappear within countries or from the region.

This problem cannot be addressed by any facet of protected area management although other sectors of this report may make proposals for easing population pressures on the worst affected watersheds.

Assumption 2

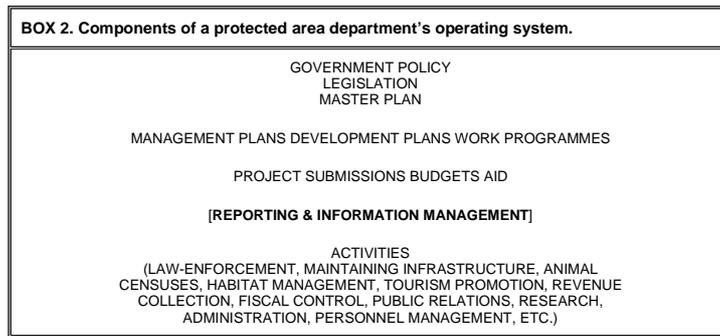
Governments will not have sufficient financial resources to implement policy. They will rate needs other than biodiversity conservation to have far higher priority. If protected area programmes are to continue, donor support will be essential. Some countries such as Cambodia and Lao PDR will depend almost entirely upon donors. The question arises: can donor aid be sustained indefinitely?

3. The System Concept

Institutional structure

A technical department may be regarded as a system whose functions are controlled by an inter-connected set of components (Clarke & Bell, 1984), which form the basis of a coherent organisational system. This applies to all types of technical departments including ones concerned with biodiversity and protected areas. The principal components of the system are shown in Box 2.

These components form a semi-hierarchical continuum, in which changes to one generally necessitate alterations to others. Interconnections lead in all directions: for example, change in policy may incur a corresponding amendment to legislation; an unexpected decrease of budget may result in modified development plans; information in law-enforcement reports may bring about changes to a management plan; or modification to a management plan may lead to altered work programmes.



Source: Adapted from Bell & Clarke (1984)

These interconnected components form a control system with objectives; plans for pursuing objectives; the means of doing so; and channels for reporting progress towards objectives and evaluating the effectiveness of different activities. They represent the components of a negative feedback control system, which embodies the concept of adaptive management. These components are briefly described below.

Policy

Policy expresses a government's reasons for valuing biodiversity and having protected areas and how it intends to manage them. Ideally policy should be widely available for information and so provide a basis for public debate.

Legislation

Legislation is the body of statutory law that controls the management and use of biodiversity and protected areas. It should be based upon policy, and support policy by adding legislative authority.

Master plan

The master plan is a document that sets out in detail the long-term (say, 20 to 25 years) objectives of a technical department and the means of pursuing them. It must be based upon policy and legislation. The master plan is, in effect, the department's operating manual, which ensures long-term consistency. The master plan addresses all of the department's activities, and provides a basis for long-range, forward planning. Without a master plan the department may be subject to *ad hoc* decisions, opportunistic judgements and inconsistent management over time.

Another important value of a master plan is to provide a basis for public scrutiny and informed debate. It also permits the department to integrate more effectively with other agencies; provide a mechanism for controlling its various activities; improve efficiency; and assist in fund-raising.

Although a long-term document, the master plan should be subject to continuous review, although amendments would be subject to approval by the head of the department or ministry.

Management plans

Management plans are akin to the master plan (to which they must conform) but at the level of individual protected areas, or of specific functions such as management of individual species, research or principles of participatory management. A management plan is the department's operating manual for a specific area or function, whose purpose is to describe the area or function; prescribe objectives and strategies for achieving them; specify targets and ensure consistent management over the declared time-span—usually of the order of five years.

Development plans

Development plans are extensions of management plans and master plan, setting out the specifics of development and resources required for achieving objectives. Development plans usually cover development over variable, specified periods. Development plans for protected areas will generally be prescribed over five-year periods to mesh with management plans.

Work programmes

Work programmes describe acts of management that units or individuals within the department must follow in implementing the prescriptions of master, management and development plans. They are drawn up annually or for shorter periods. They may include detailed scheduling for activities.

Estimates

Estimates are submissions for funding (usually made annually, sometimes over longer or shorter periods) needed to implement management plans, development plans and work programmes.

Estimates are of two sorts. Capital or development estimates to fund development work, and recurrent estimates to finance on-going management. Estimates are usually broken down into specific components such as salaries, travelling costs, labour costs, etc.

Project submissions

Project submissions are descriptions of proposed projects, with capital estimates to cover initial development costs, and recurrent estimates that may be needed in future years to maintain newly developed infrastructure or support the continuance of new activities that will arise from the proposed development.

Budgets

Budgets are statements of funds available to cover capital and recurrent costs. An overall budget may be allocated from central government to the department; and the department may allocate portions to its various sections. Budgets normally follow the breakdown pattern of estimates.

Aid

Aid is support from outside government, usually given in response to specific requests. The source may be from within or outside the country. Aid may be disbursed as grants or loans, from fund-raising programmes or through bilateral or multilateral aid programmes. It may come in the form of grants or loans to pay for specific materials or services, as technical assistance or both. Aid may be channelled through NGOs.

Reporting

Reports provide a mechanism whereby information flows between the system's components. They provide feedback by which progress and success can be assessed against prescriptions and targets set out in system, management and development plans and work programmes (Clarke & Bell, 1984).

Reports may be prepared at the end of a patrol or weekly, monthly, quarterly or annually, or at the end of a specific project or program. Occasional reports may be prepared at various levels in response to significant events. Reports are prepared at all levels for submission to supervisory levels above, and copied across and down lines of command. Reports contain data that provide feedback by which progress is assessed in relation to objectives set out in system or management plans and work programs. Correctly designed activities, standardised methods of reporting on them and systematic methods for evaluating reports are vital features of a control system operating on an adaptive management basis.

A department may have reporting protocols, in which regularly required reports (monthly, quarterly or annually) and individual reports on one-off activities conform to a standard format.

The department may publish an annual report for external consumption.

Information management

Information is gathered, recorded, stored, analysed and passed on in reports to supervisory levels where the process may be repeated. At the lowest level, field patrols record information such as encounters with law-breakers, signs of law breaking, observations on plant and animal occurrence and weather. Research assistants may gather data on phenomena such as forest condition, animal numbers and distribution, climatic change, stream flow and public perceptions of protected areas—the latter from local inhabitants and tourists. Accountants gather information on revenue collected from different activities, and record expenditure. These packets of information are passed along the line through supervisory levels in conservation, research and fiscal control, to head of department and beyond. Some reports may be passed down the supervisory chain as well as upwards. At each stage they are analysed and stored, and may be summarised or reordered for onward transmission.

Conclusions

To varying degrees, most of the features described above are found in the various technical departments of the GMS. All have policies (though none specific to protected areas) and laws, development plans and reporting systems. They make project proposals, prepare estimates, are allocated budgets, receive aid and work with donors. They prepare reports and keep records. What is less certain is the extent to which departments perceive and organise themselves as systems with components that should inter-connect smoothly in the interests of achieving cost-effectiveness, and that must have appropriate information management and reporting systems. A master plan appears to exist only in Thailand (and that not yet approved), and management plans (in the sense that this report perceives them) are at least rare.

This report continues by discussing three components of the system: policy, master plan and management plan.

4. Policy

Policy basics

As for any activity, policy is the most important factor in determining how a government will manage biodiversity and protected areas. Without a declared policy it is hard to see how the system can function coherently although, in countries that have none, legislation may partially fill the gap.

Protected areas are crucial to biodiversity conservation because they provide virtually the only means of preserving representative areas of biotic communities, and play a major part in conserving threatened, rare and endemic species. Depending upon policy they may do more than conserve biodiversity: for example, preserve sites of geomorphological, archaeological or cultural interest; protect watersheds; provide for recreation, education and research; or earn foreign exchange.

Protected areas systems, even the largest, cover relatively minor proportions of total land area, and biodiversity (including species of special concern) still exists outside them. Policy (and therefore legislation) should address this, by having a separate policy for biodiversity in general or incorporating the two in a combined biodiversity/protected areas policy. This arrangement has long existed in many countries in the form of 'wildlife' or 'nature' conservation policies. The terms of reference for this report, however, limit it to a strategic subregional analysis and recommendations for protected areas as means of conserving biodiversity and protecting watersheds.

Policy contents

A protected areas policy should address, at least, the following issues with as much brevity as is commensurate with getting across its intentions to as wide a readership as possible. (Boxes 2 and 3 below contain guidelines in the form of examples of possible wording within sections of policy.)

1. A declaration that the state's protected area policy is an integral part of overall land use policy—not something practised only on land set aside from the mainstream of human activity.
2. A declaration that policy will be, or is already, supported by legislation.
3. A declaration that protected areas will be declared in the interests of people. They exist as a consequence of conscious human decision-making, and are planned and managed for human benefit. Concepts such as 'rights' for wild animals may muddle thinking, confuse policy and bedevil management. In this respect, protected area management is no different from agriculture or industry. Both are practised according to human decisions and with the intention that the end products will benefit humans, though whether or not benefits actually accrue from any of them can never be guaranteed.
4. A description of the categories and purposes of protected areas, which may include the preservation of non-wildlife phenomena such as geomorphological features and cultural sites. (See Box 3 for elaboration.)
5. A declaration of principles (elaborated in Box 4) that management will, at least:
 - be conducted by a professional agency;
 - be adequately funded;
 - be conducted according to an adaptive management strategy, in which research and monitoring are incorporated as integral components;
 - recognise the values of public education and participation; and
 - Recognise the benefits of international co-operation.

BOX 3. Categories and purposes of protected areas: a suggested model statement
<p>THE GOVERNMENT WILL MANAGE PROTECTED AREAS (LIST CATEGORIES) ACCORDING TO THE FOLLOWING OBJECTIVES</p> <p>1. TO ENSURE CONSERVATION OF BIOLOGICAL DIVERSITY AND FUNCTIONING OF ECOLOGICAL PROCESSES BY PRESERVING:</p> <ul style="list-style-type: none"> • SELECTED EXAMPLES OF THE COUNTRY'S DIFFERENT BIOTIC COMMUNITIES; AND • POPULATIONS OF RARE, ENDEMIC AND THREATENED SPECIES OF WILD PLANTS AND ANIMALS, AND OTHER SPECIES JUDGED TO BE OF SPECIAL CONCERN. <p>2. TO PROTECT AND PRESERVE SELECTED SITES OR AREAS OF SCENIC BEAUTY OR OF SPECIAL INTEREST.</p> <p>3. TO PROTECT ENVIRONMENTAL QUALITY AGAINST EROSION, WATER WATERSHED DEGRADATION, DEFORESTATION AND DESERTIFICATION.</p> <p>4. TO PROVIDE A BASIS FOR CONSERVATION EDUCATION AND RESEARCH, INCLUDING MAINTAINING UNDISTURBED ENVIRONMENTS AS A BASELINE FOR MEASURING ENVIRONMENTAL CHANGE.</p> <p>5. TO PROVIDE A SUSTAINED BIODIVERSITY BASE FOR DEVELOPING AND DIVERSIFYING RECREATION AND TOURISM; AND FOR LONG TERM CONSUMPTIVE USE OF SELECTED NON-TIMBER FOREST PRODUCTS.</p> <p>6. TO CONTRIBUTE TO THE ECONOMIC AND ENVIRONMENTAL WELL-BEING OF THE COUNTRY.</p>

The value of directness and simplicity in cannot be over-emphasised, and policy should not enter into detail that is best addressed by a master plan and elaborated rigorously in legislation.

BOX 4. Principles underlying protected area management: a suggested model statement.
<p>THE GOVERNMENT RECOGNISES SIX IMPORTANT PRINCIPLES AS UNDERLYING ITS PROTECTED AREA POLICY.</p> <p>MANAGEMENT BY A PROFESSIONAL AGENCY</p> <p>ALL OFFICERS APPOINTED TO THE (<i>NAME OF TECHNICAL DEPARTMENT</i>) WILL HAVE ADEQUATE, RELEVANT, PROFESSIONAL TRAINING AND EXPERIENCE APPROPRIATE TO THEIR POSITIONS.</p> <p>ADEQUATE FUNDING</p> <p>THE GOVERNMENT WILL PROVIDE ADEQUATE FUNDING SO THAT THE DEPARTMENT MAY ACHIEVE ITS OBJECTIVES EFFICIENTLY.</p> <p>RESEARCH, MONITORING AND ADAPTIVE MANAGEMENT</p> <p>THE GOVERNMENT IS COMMITTED TO AN ADAPTIVE MANAGEMENT STRATEGY, IN WHICH RESEARCH AND MONITORING ARE INCORPORATED AS INTEGRAL COMPONENTS, AND IN WHICH EACH ACT OF MANAGEMENT IS DESIGNED AS A TRIAL, THE PERFORMANCE OF WHICH CAN BE ASSESSED AND IMPROVED UPON IF NECESSARY.</p> <p>PUBLIC EDUCATION</p> <p>PUBLIC UNDERSTANDING OF PROTECTED AREAS AND THE REASONS FOR MANAGING THEM WILL BE ENCOURAGED. THE GOVERNMENT INTENDS TO FOSTER PUBLIC UNDERSTANDING, AND WELCOMES PRIVATE AND VOLUNTARY ORGANISATIONS THAT ARE CONCERNED WITH ANY ASPECT OF PROTECTED AREA MANAGEMENT.</p> <p>PUBLIC PARTICIPATION</p> <p>THE GOVERNMENT WILL ENCOURAGE LOCAL PARTICIPATION IN PROTECTED AREA MANAGEMENT, WHICH MAY INCLUDE DIRECT EMPLOYMENT; TAKING PART IN MANAGEMENT PLANNING; HARVESTING NON-TIMBER FOREST PRODUCTS; REVENUE SHARING; AND DEVELOPMENT OF SMALL ASSOCIATED BUSINESS. THE OBJECTIVE IS TO ENSURE THAT MANAGEMENT IS NOT IMPOSED UPON THOSE WHO STAND TO GAIN OR LOSE BY THEM, AND TO OPTIMISE BENEFITS.</p> <p>INTERNATIONAL COOPERATION</p> <p>MANAGEMENT CANNOT BE CARRIED OUT IN ISOLATION: ECOLOGICAL, CULTURAL AND COMMERCIAL PROCESSES ARE CONTINUOUS IRRESPECTIVE OF INTERNATIONAL FRONTIERS. THE GOVERNMENT IS COMMITTED TO COOPERATION WITH OTHER GOVERNMENTS, WITH INTERNATIONAL AGENCIES AND NON-GOVERNMENT ORGANISATIONS IN MANAGING PROTECTED AREAS.</p>

Finally, policy statements typically emanate from head of state or other senior figure representing the government but these persons are rarely able to contribute more than the broadest of policy outlines. The fine detail comes from technical departments, perhaps with the help of technical assistance. Thus, policy is generated at middle management levels but is formally adopted at higher levels; and this can occur without a thorough appreciation, at higher government levels, of the implications, consequences and requirements of the policy—especially the financial ones. Contradictory action may result. The worst scenario is when a technical department (with the best possible intentions) succeeds in foisting an impracticable value system on to its government. This problem is fundamental to policies. They are only relevant if they are practicable and followed. They are no stronger than the people who use them.

Policy should, therefore, be formulated and adopted after scrutiny by every government agency that may be affected. Policy may be drafted by a small group of persons in a technical department but that should be no more than a starting point. The same applies to the process for amending policy. Furthermore, policies should be widely publicised. They should be translated into each country's major languages. The more that policy and practice are publicised and understood, the less chance there is of the two getting seriously out of phase.

It seems self-evident that departmental policy and legislation should not conflict with other government policies or laws, which presupposes a mechanism within government for ensuring compatibility. But spokesmen in some GMS countries reported that such mechanisms did not exist, so that ministries and departments fail to function harmoniously, and that serious conflicts exist over land use rights. If so, this is indicative of a more far-reaching problem whose solution lies beyond the scope of protected area departments.

5. Master Plans

A master plan provides a mechanism for regulating the activities described above, within a technical department. With or without a master plan, a department's operations are controlled by complex sets of interrelated decisions: the function of the master plan is to co-ordinate these decisions (Bell & Clarke, 1984). Most important, a master plan provides a means by which policies, intentions and decisions can be subject to public scrutiny.

A master plan is a fairly long and detailed document, having a vision that extends for, say, 20 to 25 years, and which:

- contains a coherent statement of objectives and the steps that the department plans to follow in achieving these objectives;
- represents the value system of the department, and provides a means of relating all decisions to that value system;
- contains statements about the country's environment and, in particular, its biodiversity and existing protected area system, the conservation priorities and the ways in which the department intends to influence events; and
- represents the department's claim on national and external resources, its claim to control land and other natural resources, and provides a basis for fund raising and fiscal control.

The alternative to working with a master plan is to work with uncoordinated components and be subject to personal idiosyncrasy and opportunistic decision making.

A master fulfils two other important roles. It provides bases for:

- public scrutiny and debate;
- more effective integration with other departments and organisation; and
- attracting donor support and co-ordinating fund raising.

The contents of a master plan will vary greatly between countries. This report offers a skeleton outline capable of being adapted to suit circumstances (see Box 5). It contains four components. *Constitutional Aspects* describe the circumstances in which the department operates, past and present, and how its responsibilities stem from these circumstances. The *Managerial and Developmental Aspects* describe the actual business of the department; the resources it is responsible for managing and how it goes about doing so. The *Organisation and Financial Aspects* give inventories of available resources, and describe the ways in which the department is organised to carry out its business.

BOX 5. Skeleton outline of a possible master plan format

1. CONSTITUTIONAL ASPECTS
 - THE NATIONAL ENVIRONMENT (LAND USE AND SOCIO-ECONOMIC FACTORS)
 - DEPARTMENTAL POLICY
 - DEPARTMENTAL LEGISLATION
 - DEPARTMENTAL RESPONSIBILITIES
2. MANGERIAL AND DEVELOPMENTAL ASPECTS
 - THE PROTECTED AREA SYSTEM
 - MANAGEMENT AND DEVELOPMENT PLANNING
 - LONG TERM TARGETS
 - MANAGEMENT STRATEGIES
3. ORGANISATIONAL ASPECTS
 - POSITION OF DEPARTMENT WITHIN THE CONTEXT OF THE PUBLIC SECTOR
 - ORGANISATION AND ADMINISTRATIVE STRUCTURE
 - PERSONNEL ESTABLISHMENT BY DIVISION OR UNIT
 - PHYSICAL RESOURCES AVAILABLE
 - DEPARTMENTAL ADMINISTRATION
4. FINANCIAL ASPECTS
 - FINANCIAL CONTROL
 - PROJECTIONS OF FUTURE FINANCIAL REQUIREMENTS
 - PROJECTIONS OF FUTURE REVENUE
 - FUND RAISING

6. Management Plans

This report argues that the use of management plans should be adopted by all protected area technical departments, but acknowledges that there is considerable misunderstanding over the form and purposes of management plans.

The advantages of management plans.

Management plans are the norm for protected areas in developed countries. Nevertheless, in developing countries, especially in eastern and southern Africa, many protected areas have flourished, become famous and earned more from tourism than they spent on management, yet had no management plans. There are two reasons for this.

- Merely by enforcing relevant effective laws, a Warden was following some sort of plan. Laws at least define practices that may and may not be tolerated. To that extent, comprehensive, well-drafted laws provided good managerial guidance. Wardens, often from a military background, who maintained effective law-enforcement, have traditionally been perceived as effective managers.
- The Wardens were highly motivated men who took personal interest in their areas and identified themselves with doing an efficient job.

However, when one Warden (even an efficient one) replaces another, the direction of management may alter radically if there is no management plan. Management according to personal inclination can make for haphazard swings, and often leaves protected areas at the mercy of individual decision making.

Therefore, management plans that contain realistic prescriptions and targets, and are accepted by the technical department and its parent ministry as binding upon the technical department to implement, carry several advantages over having no plans.

- They provide simple baseline data, definitive outline descriptions of protected areas and the resources available for managing them. They provide sources of reference material; and, in later years, become historical records.
- They provide a medium for identifying objectives and setting priorities.
- They prescribe mechanisms for achieving objectives.
- They provide a basis for allocating finite resources cost-effectively.
- They mandate Wardens to perform prescribed functions and achieve specified targets.
- They provide bases for monitoring implementation.
- They provide for continuity of management.
- They serve as aids to fund-raising. A potential donor shown a well-written management plan is more likely to believe a donation will be used well, for it appears that the agency knows what it wants and how it intends to set about achieving it.

Many management plans have been prepared for protected areas in developing countries (usually by expatriates), which have subsequently gathered dust. There are good reasons for this.

- Wardens responsible for management played no part in the planning process, the plans being written by planners working for the most part in isolation.
- Prescriptions for management were unrealistic in the context of the managing agency's financial and manpower resources.
- They were excessively detailed and hard to interpret by Wardens responsible for day-to-day management.
- Many prescriptions were worded as recommendations rather than instructions, which might or might not be implemented.

- They carried no authority or mandate to implement from the head of department.
- Supervisors failed to monitor implementation.

Management plans are more likely to be implemented if they:

- correspond with the value systems of the department and its Wardens who use the plans, and if those Wardens are involved in their preparation;
- are based upon realistic estimates of available resources;
- are within the technical capacity of the agency to implement;
- are written clearly and simply;
- are issued to Wardens as sets of binding instructions from the head of the agency; and
- are subsequently monitored.

Management plans must reflect policy together with numerous views and decisions taken at different levels, inside and outside government. Management planning is a corporate activity that involves numerous people, including all stakeholders. Communities who live in the vicinity will be among the stakeholders. The initiative must come from head of department although decisions will be made at various levels. The head of department, in person, must eventually approve overall objectives for each area and the completed plan, after consultation with colleagues in research and management positions.

Therefore:

- Although a Planning Specialist may be assigned to compile a management plan, the Warden should be an equal co-worker throughout the process. The Planning Specialist is a catalyst whose responsibility is to guide the planning process to its conclusion, and compile the finished plan.
- A mechanism (for example, a series of workshops) should be in place so that all stakeholders, including local people, can be involved at each stage of the planning process.
- A management plan should not contain recommendations. Recommendations form part of the process leading up to a management plan. By the time the plan is written, all recommendations should have been sifted, evaluated, judged for desirability and practicability, matched with realistic assessments of available resources, and those that are selected go into the plan as instructions to the Warden. A management plan should not prescribe what *might* be done but what the department has decided it *can and will do*.
- A management plan should be as short and as simply worded as possible, consistent with being comprehensive and comprehensible. It must never become a compendium of information or minor dissertation (a common failing). Simplicity also helps minimise the time taken to prepare plans, makes them more practical as management manuals and makes for pain free reading by potential donors.
- Brevity should be the aim, without prejudice to clarity of instructions. Most of the descriptive sections need occupy a few lines or a single paragraph. Other will probably not exceed a page. The descriptive sections must not get bogged down in detail. The physiography, flora and fauna, for example, should be given only generalised descriptions. A volume of information may be available on the flora of a protected area but the management plan is not the place for it. All that is needed after the generalised description is to cite the relevant reference.
- Objectives must be identified and prioritised. '*The identification of the management objectives is the most essential and crucial stage in the planning process.*' (Alexander, 1993). This should precede all other stages of management planning and be approved personally by head of department or even the Minister.
- Management plans should be target-orientated. They should spell out specific objectives and management and development targets in a form that allows progress to be monitored and measured.
- A management plan should be issued to a Warden under the authority of head of department or Minister. Its instructions are binding. He or she will be assessed according to success achieved in implementing them.
- Monitoring progress in management plan implementation is an essential element of management. Monitoring and evaluation allow corrective action to be taken when programmes stray off course, and identify where improvements may be made in future plans. Monitoring and evaluation also provide bases for assessing individual ability, which can be reflected in career progress, awards and other incentives.
- A mechanism should be in place to evaluate the success of management plans in general, and to assess the extent to which their objectives have been achieved. If they fall short of expectations, the fault may be a result of inadequate implementation but could also be in the design of the plans themselves. Evaluators should be asked to assess why, and to make recommendations for corrective action.

An outline layout of a protected area management plan format is in Box 6.

BOX 6. Simplified suggested layout of a protected area management plan.
A. DESCRIPTIVE SECTIONS
1 NAME AND LEGAL STATUS
2 LOCATION
3 ACCESS
4 CLIMATE
5 PHYSIOGRAPHY
6 FLORA
7 FAUNA
8 SPECIAL INTEREST SPECIES
9 SPECIAL INTEREST SITES
10 LANDSCAPE CLASSIFICATION
11 HISTORY
12 EXISTING USES
13 ECONOMIC VALUES
14 REGIONAL INFLUENCES
15 EXISTING INFRASTRUCTURE
16 EXISTING PERSONNEL
B. PRESCRIPTIVE SECTIONS
17 MANAGEMENT OBJECTIVES
18. MANAGEMENT ACTIVITIES
19. ZONING
20 MANAGEMENT AND DEVELOPMENT TARGETS
21 RESEARCH AND MONITORING

Three further suggestions are offered for preparing management plans: use of word processors, adoption of a standard format (within countries) and provision for flexibility.

Word processors

There are at least five advantages in using word processors rather than typewriters.

- Keying in the text is simpler, especially for persons who lack formal typing skills.
- Plans can be stored electronically on disc, so that amendments are easily made.

- Being stored on disc results in less shelf space being occupied.
- It becomes unnecessary to print more copies than are needed at any one time, because fresh ones can be produced to order.
- Section headings are standard for all plans, and several passages of text will be identical or similar. These need to be typed only once, when preparing the master copy.

Standard formats

There are at least three advantages if a technical department adopts a standard format to which all its management plans conform.

- The format can be set up on disc.
- The format serves as a checklist when collecting data during the management planning process.
- Members of a technical department familiar with the standard format are able to find their way around management plans for all protected areas more readily. This simplifies the task of understanding a new management plan in the case of, for example, the transfer of a Warden from one area to another.

Flexibility

Although management plans prescribe strategies and courses of actions to be followed over specified time spans allowance should be made for possible change, although any changes must be sanctioned at the same level that approves the initial adoption of management plans. Changes may be needed to correct errors, respond appropriately to unexpected cuts in government budgets or to take advantage of unforeseen windfalls.

Management plans should, therefore, be sufficiently flexible to accommodate textual amendments. Such amendments may be major revisions or involve only one section or part of a section - perhaps only a single page or paragraph. If they are bound in loose-leaf form, pages can be removed and replaced with minimum inconvenience.

7. Review of Protected Area Cover

Recent change

Protected area cover has been reviewed for all countries of the GMS except Yunnan (MacKinnon, 1997); and for Yunnan in a review of biodiversity in China by MacKinnon *et al* (1996). Overall cover has increased marginally since those reports (see Table 18). MacKinnon (1997) included proposed areas and IUCN management categories V and VI but these have been omitted from the current study.

The most striking changes have been in Myanmar and Viet Nam. The former country has potential for further increases but the latter may find it difficult to secure more land although studies are being made to find ways of achieving better cover. Thailand recorded a steady increase, which continues to the present day.

Apparent increases in Cambodia and Lao PDR and the small decrease in Yunnan are not significant, and do not represent any real increments or decline. They appear to be caused by slight differences in the way sizes of individual areas were recorded between 1997 and 1999.

TABLE 18. Apparent changes in size of biodiversity orientated protected area systems over a two- to three-year period in countries of the Greater Mekong Subregion.

	1996/97		1999		Apparent increase (% of country)
	Area (km ²)	% of country	Area (km ²)	% of country	
Cambodia	28,111	15.3	29,013	16.0	0.7
Lao PDR	28,273	12.0	29,030	12.3	0.3
Myanmar	5,421	0.8	14,031	2.1	1.3
Thailand	63,263	12.3	72,943	14.2	1.9
Viet Nam	13,425	4.0	21,511	6.5	2.5
Yunnan	19,612	4.9	18,887	4.8	(0.1)

Sources: MacKinnon (1997), MacKinnon *et al* (1996) and the current study.

Conservation aims

Merely including representative samples of all biotic communities that occur in the country is, on its own, an inadequate basis for designing protected areas for three reasons (Clarke & Bell, 1986).

1. It leaves open the choice of areas to a series of subjective decisions on the type of biographical classification to be used, and the degree of representation considered necessary.
2. It will not be insufficiently selective in including rare, endemic and threatened species.
3. It will fail to recognise scenic beauty spots and site of geomorphological, archaeological, historical and cultural interest.

The first is unavoidable. All biographical classification systems are essentially arbitrary.

- Clear-cut dividing lines between units are rare, and decisions where to draw them necessarily subjective.
- Being hierarchical, selecting the most appropriate level involves subjective decisions.
- Whatever level is chosen, some units, or small outlying pockets of major units, may be too small to map at the scale selected.
- Biogeographical units may be subject to change over time due, for example, to plant succession or cyclical changes.

Taking account of the second reason involves identifying which species are of special interest, their distributions and abundance. Extant information will probably be incomplete, so that the designers of protected areas have to make do and hope for further data on which to base amendments in the years to come.

The third is more straightforward. The features of interest are static and their locations can be mapped.

At a conceptual level, designing a protected area system from scratch involves six stages.

- Decide what the system is intended to protect. For example: representative areas of all biogeographical units, biotic or plant communities, selected species, sites of special interest, or other phenomena. These protective functions should already be defined in policy—one of the reasons for having policy.
- If inclusion of representative areas is to be a function of the protected areas, select the classification system that will be used and produce or locate a map of biogeographical units (see comments above).
- If conservation of selected species is to be a function, gather all existing data on distributions and map them. (Identify gaps in knowledge for future study.)
- If protection of geomorphological, cultural or scenic sites is to be a function, select and map them.

- Map any other information relevant to selection, including tracts of land already committed for other forms of land use or unavailable for other reasons.
- Having prepared the several layers of information, selection of the areas can begin.

This process lends itself to analysis using GIS techniques although in practice it was done before GIS was available, under IUCN projects in Jordan (Clarke, 1979) and Oman (Clarke *et al.*, 1986), and in Malawi under Commonwealth Secretariat funding (Clarke, 1983). The first two were exercises of initial design; the third evaluated coverage of an existing protected area system.

Given the short time-span, the current study used the broad biogeographical classification developed by Udvardy (1975) and elaborated by MacKinnon & MacKinnon (1986) as a means of making a broad assessment of biodiversity and its inclusion in the national protected areas systems: but at country level, classifications at higher scales would be appropriate. The country maps included in MacKinnon (1997) show considerable detail of forest and land use, and maps of land cover for all GMS countries exist in scales of between 1:500,000 and 1:1,000,000.

Much additional information will be needed on species. For example, information on distributions and ecological needs of critically endangered and endangered species is patchy, at least in technical departments' records although local people may know exactly where to find, for example, tiger or saola or little leaf deer in areas with which they are familiar.

To conduct an exercise of this sort on a subregional basis would be a major exercise although a challenging and useful one; but at national levels it would be less cumbersome and might be suitable for multilateral or bilateral support. This approach would be especially germane to Yunnan, where the chief issue to be addressed is the small size of its system. Given Yunnan's existing human population density of 106/km², and comparing this with Thailand's 121/ km² and its 15.2 per cent protected area system, 10 per cent is not an unrealistic target.

Myanmar's protected area system is also small but potential for expansion is known to exist and the required studies were made under UNDP funding during 1981 to 1984 (see country report). The priority now is to get these recommendations implemented, although this is more easily said than done: some remote areas are still affected by civil unrest and threats to security.

Work is being carried out by BirdLife International in Viet Nam, supported by the European Union—a long-standing programme that seeks to identify the most appropriate sites for adding to the existing systems. The paramount need in this country must be to increase the sizes of existing areas, or create corridors between them, rather than add new areas.

The three remaining countries appear to have no immediate pressing need to add further areas: Cambodia, Lao PDR and Thailand already have large protected areas systems, the first two recently designed with the specific aim of being representative. Lao PDR has since identified an additional nine proposed NBCAs, which would increase cover to 17 per cent. Cambodia's proposed 'protected watersheds' will probably fall in IUCN management category VI. The chief goal of both countries now must be to bring all existing areas under effective management. Thailand has increased the size of its system in recent months, and consolidation seems to be the principal need.

8. Private Sector and NGO Involvements

Private sector

Throughout the GMS, the public sector dominates protected area management. This applies even in tourism, where worldwide the private sector traditionally has strengths.

It is recommended that technical departments investigate ways of extricating themselves from managing visitor facilities such as accommodation, restaurants, shops and tour operations. Generally they lack expertise in these fields, which can tie up too much of their human and financial resources in a non cost-effective way. All the technical department needs do is to draw up terms of reference for the provision of visitor facilities, put them to tender, award contracts to selected companies or individuals and (*most crucially*) monitor subsequent implementation to ensure that contractors provide the agreed services efficiently and within conditions imposed by the contracts. The technical department must, of course, be clear as to what it wants and that this accords with policy, law and objectives specific to each protected area.

Technical departments may, however, wish to retain direct control over two aspects of tourism. The first is the provision of camp and picnic grounds, where habitat management and landscaping may be involved and the experience of the professional forester more germane. However, even this may be delegated to the private sector, provided that unambiguous terms of reference and conditions are defined and agreed to. The second is the provision of interpretation facilities, such as visitor centres and other forms of contact with the public, where the technical department may have trained expertise and wish to exercise direct control. Wherever a department allows private operators to run guided tours within protected areas, it should maintain a system of approval and inspection to ensure that guides have appropriate qualifications and are behaving in accordance with contractual agreements.

The system observed in Myanmar and Thailand, where families of departmental staff are allowed to run small businesses that provide minor retail services for tourists seems commendable because it boosts the workers' meagre incomes.

Development of infrastructure such as roads, airfields and lodges will normally be put out to contract with the private sector because technical departments rarely have the capital equipment or skills to undertake work of this sort.

NGO involvement

Donors and NGOs play major supporting roles in several GMS countries, accounting for the greater part of the budget in some. NGOs generally display greater motivation, are less constrained by bureaucracy and are favoured by aid agencies as recipients of funds and programme implementers. They conduct research, training courses and public awareness campaigns and are involved in direct management. This will probably continue. Increasing amounts of aid to developing countries are being channelled through NGOs, who operate more cost-effectively than government departments.

Cases exist where the day-to-day management of protected areas is put out to an NGO under contract. An example is Kasanka National Park in Zambia, which has been managed for several years by a charitable UK-based organisation called the Kasanka Trust. This appears to work well, and it might be worth investigating the potential for similar arrangements with selected protected areas in the GMS.

9. Research

Research to support the work of technical departments that manage protected areas and biodiversity is crucial, and those in the GMS have research units or maintain research links with external organisations such as NGOs and academic institutions.

This study argues that research should be management-orientated—that primarily it should be directed at solving management problems and that it should focus not only on ecological themes but also on management activities. Research, 'should be related to management requirements, and management should be designed to test the theories on which it is based... research and management should be regarded as parts of a continuum, not as isolated entities' (Bell, 1986).

The primary problem in developing research programmes in biodiversity management is a result of a need to define priorities on the one hand, and the difficulty in identifying themes requiring research in advance. Ecosystems are highly complex, and enormous efforts are needed if they are to be fully understood. Because resources for research are finite, the technical department has to select priorities for study. But, if the structure and functioning of an ecosystem are not fully understood it is impossible to anticipate its main controls. A rigid set of priorities may, thus, miss important factors. A research programme should, therefore, confine itself to themes that, on the basis of existing knowledge, appear related to management goals, but, at the same time, avoid suppressing research whose utility is not immediately apparent but which may lead to important insights.

To address this paradox, it is suggested that research strategies for technical departments should consist of four elements: studies of factors controlling biotic communities' structure; studies of management activities; externally based research; and maintaining contact with developments in research. The four are briefly described below.

Studies of factors controlling biotic community structure

Studies of the ecology of protected areas that include the following.

- The physical components of the environment that affect biodiversity: geology, climate, soils, hydrology and landscape structure.
- The flora: inventories, abundance, distribution, status and trends.
- The fauna: inventories, abundance, distribution, status and trends.

- Human activities that impact upon protected areas: for example, fire, hunting, fishing, harvesting non-timber forest products and cultivation.
- Ecological processes caused by the interactions of the physical components, the flora, fauna and human activities.
- Integrating data from ecological studies to produce landscape classifications for each protected area.
- Ecological monitoring of selected plants and animals and of processes such as river flow or erosion.
- Experimental studies in manipulating biotic community structure: for example, by prescribed burning, fertiliser applications, felling and clearing or animal translocation.

Studies of management activities

Studies that aim to examine and monitor the methods and procedures used by management. The object is to evaluate their effectiveness and provide feedback so that management activities can be revised for greater effectiveness. Management activities may include, for example, habitat manipulation, law enforcement and visitor control.

Externally based research

The aim is to encourage research outside the technical department's priority list in an endeavour to overcome the paradox described above. Under this component, research institutions or NGOs (foreign or local) would be encouraged to conduct research, irrespective of whether or not chosen themes appeared to be directly related to management, subject to conditions set by the department. These conditions would form the basis of a contract, and might include the following.

- Implementation of research programmes should not conflict with management objectives. For example, plants or animals could not be taken or hunted without prior authority from the department.
- Researchers would agree to adhere to the provisions of all relevant legislation and to any other instructions that may be given them by the head of department or his or her representatives.
- Research projects should be self-funded by the institutions or their donors. They would not draw upon departmental resources unless the department considered this to be desirable and cost effective.
- Researchers must submit written progress to the head of department at intervals determined by him or her.
- Researchers would be encouraged to publish their findings but, whether or not they do publish, copies of their reports including all data collected must be deposited with the department.
- The department would vet any material being submitted for publication, and reserve the right to approve or deny clearance to publish.

Maintaining contact with developments in research

The purpose of this component is to keep departmental staff up-to-date in biodiversity and protected area research. The means would include maintaining a library; subscriptions to relevant journals; participation at conferences, seminars and workshops at local, regional and international levels; and attendance at courses of further education.

10. Links With Local Communities

It has been emphasised above that, for a protected area manager, participatory management is not in itself an objective: it is a strategy to overcome specific obstacles. Ideally the manager would prefer a protected area free of human activity. He or she could then concentrate on managing its flora and fauna.

Tourists add a complication. They need roads, trails, camping grounds, hostels and restaurants, potable water, electricity—things that need maintenance and intrude upon biodiversity or, at least, divert management efforts from conserving it. But tourists are relatively easy to control (if there are not too many of them) and they bring in money that may be ploughed back into conservation.

Rural people living beside protected areas complicate the manager's life further. They have a habit of helping themselves to resources. Some may live in the protected areas, where they clear land for cultivation, graze livestock, hunt, fell trees and start fires. Biodiversity suffers. As human populations grow, demands for land and natural resources rise. The manager finds law enforcement demanding more and more of his attention.

Forging links with local communities is seen as a way of ameliorating or diverting these adverse pressures. There are six possible levels of linkage.

Level 1: Public relations

Local people are encouraged to appreciate the values of biodiversity conservation and correct the error of their ways. This is not easy if their survival depends upon behaving otherwise.

Level 2: Consultation

Local people are consulted. They are invited to contribute ideas and suggestions as to ways in which protected areas close by them are managed. Attempts are made to identify problem areas and means of addressing them to the benefit of park and people. Local people are kept informed about management and progress in development. The manager attempts to instil greater interest and understanding. He seeks to get people on side.

Level 3: Deriving benefits

Ways in which local people can derive tangible benefits from nearby protected areas are identified. The people are encouraged and shown how to set up small scale businesses to earn money from tourists: providing camp sites, food, handicrafts, vehicle maintenance services, serving as guides, etc. Some may be given employment.

Level 4: Revenue sharing

A proportion of a protected area's revenue is shared with local people. The more the area earns the greater their share. The argument is that the better managed the reserve, the greater the benefits, and the greater the support of the beneficiaries. However, an area needs to be a very high-earner or the local community very small in number if tangible benefits are to be anything other than derisory. High-earning protected areas are few and far between. Experience in Africa suggests that the greatest positive impact of this strategy is where cash goes directly to local families—less if it is used only to support community projects.

Thus far the impacts on biodiversity will be slight. Linkages of this sort may well be cost-effective in reducing hostility towards protected areas.

Level 5: Resource harvesting

Local people are allowed to harvest resources from within the protected area. This will inevitably affect biodiversity but the extent will depend upon the manager's capacity to plan, monitor and control, and to keep harvesting within sustainable or, at least, acceptable limits. This can be complicated.

First, the planning stage: It involves identifying:

- Which resources may be harvested?
- How much of each may be harvested?
- Where can harvesting take place? All over or in selected areas?
- When can harvesting be practised? All year round, certain seasons, during daytime or night?

- Who may harvest? Anyone or selected individuals?
- How may harvesting be carried out? What methods, what tools may be used?

Second, the monitoring stage.

- Parameters that are to be monitored must be selected. They may include, for example, numbers or densities of selected flora or fauna; damage to plant communities or to specific species of plant; or frequency of illegal activities of different sorts.
- For each parameter, acceptable limits to change must be defined. If subsequent monitoring reveals that a limit is being transgressed, immediate management response is mandated.
- Management must have the capacity to monitor. There must be sufficient suitably trained and adequately equipped personnel.
- Monitoring must be regular and systematic.

Third, control

- Management must have legal and *de facto* capacity to control any aspect of harvesting up to and including banning harvesting of any product? If not, biodiversity will be further threatened.

An extreme scenario for the harvesting option is, of course, zero harvesting. Setting quotas then becomes redundant, and monitoring is incorporated into law-enforcement.

Level 6: Participation in management

Local representatives sit on management boards or committees. Part of management control will now pass from the manager to other hands. His capacity to manage, to plan, monitor and control will be eroded. Decisions are more likely to be made on non-technical grounds and sustained use may be difficult to ensure. Biodiversity will be further endangered.

Level 7: Transfer of management

A protected area is handed over to a local community to manage. If subsequent management is to accord with overall government policy the local community must have at least the same levels of skills and resources as the technical department, or be supported by an advisory service provided by the department.

Discussion

In many developing countries, community participation is credited with being the key to biodiversity or wildlife conservation. This is a dubious assertion. It may well be a strategy worth testing and developing but not one that has yet been proven successful over a wide enough range of circumstances. Zimbabwe's CAMPFIRE initiative is usually trotted out in support of the claim but too enthusiastically and uncritically. Even there, evidence of proven success is elusive. Furthermore, CAMPFIRE is not concerned with protected areas—the national parks of Zimbabwe—but with the communal areas where people live outside protected areas on land marginal for agriculture.

Zimbabwe (then Rhodesia) took a profound step in the mid-1970s, when it amended legislation to transfer ownership of most wild animals to landowners. This move in effect privatised game management on private farms and ranches, and gave landowners incentives to conserve their stocks of wild animals. Many landowners did well out of it, and (contrary to the forecasts of those who opposed the legislative amendment) husbanded their stocks efficiently. These farms became privately run protected wildlife areas, used profitably for safari hunting, non-consumptive tourism and sale of stock. But they were on the highest quality agricultural lands, and owned by relatively affluent farmers who had experience in land management and good business acumen. This was not CAMPFIRE, which came later.

CAMPFIRE stands for Communal Areas Management Programme for Indigenous Resources. CAMPFIRE focuses upon utilising game animals (although the declared intention was to exploit other natural resources eventually) in the agriculturally impoverished communal lands. Where successes have been claimed under CAMPFIRE there has been a large revenue earning potential (such as from sport hunting elephant) coupled with relatively small human populations taking the entire spoils, not just a share. From the point of view of the rural community, whose individual members literally pocketed the revenue, success was highly tangible. But hard evidence is rarely presented to demonstrate a benefit in terms of stabilised or increased wild animal populations, or in reduced poaching.

In a paper on the subject, Metcalfe (1995) wrote, '*The CAMPFIRE programme cannot claim to have achieved its objectives*', although he went on to add that it was, '*establishing the framework for developing local community institutional capacity for managing wildlife resources*'. The writer, Mr S C Metcalfe, was speaking from an inside position: he worked for the Zimbabwe Trust, an NGO that is heavily committed to supporting CAMPFIRE.

In adjacent Zambia, whose community wildlife programme is called ADMADE, two review missions (Alpert & DeGeorges, 1992 and Rosenthal *et al*, 1994) drew the conclusion there were no data that could confirm or deny the success of project objectives. In this case the selected option was licensed sport hunting from which the local people would derive indirect benefits in the form of revenue spent on community projects. The problem here was a sophisticated monitoring programme that was proving unworkable within the constraints of existing departmental capacity.

A community wildlife programme in Uganda (Development Through Conservation), implemented by CARE under USAID funding from 1991 to 1996, was associated with two national parks in the south-west of the country that harbour mountain gorillas. A review mission led by Metcalfe in 1996 was impressed by the painstaking participatory approach that had gone into preparing management plans for the two parks, and for community involvement in building a stone wall to keep buffaloes off cultivation. But evidence was not available to judge whether the programme was succeeding or failing in terms of impacts on plant or animal wildlife caused by approved harvesting by local people, because the system of monitoring was insufficiently developed.

The last two cases illustrate the point that monitoring impacts of harvesting rights can be an extremely difficult process. To do so effectively may also be costly. It is often surmised that the costs of administering and policing a strictly controlled protected area will inevitably be greater than inviting community participation; but this seems not to take account of the costs of rigorous, effective monitoring that participatory management may entail.

11. Recommendations

Various schemes have been introduced in Asia and Africa that aim to establish links between local communities and protected areas, so that people's dependency upon resources within the areas is lessened, or that tangible benefits can be generated from the areas for the people, thus winning their support and co-operation. Evidence that they are successful in conserving biodiversity is hard to find, to say the least.

However, this report submits that:

1. Local communities should *always* be brought into the management planning process for *all* protected areas so that their needs and aspirations are taken into account, and their local knowledge brought to bear. This includes protected areas that may ultimately be managed and policed intensively to protect selected species or conserve biodiversity.
2. During the planning process, options for linkages between protected areas and local people should be evaluated and selected. Linkages may include revenue sharing, small business franchises, guaranteed employment, harvesting rights, etc.
3. Selected community links should then be defined in management plans, and provision included, where appropriate, for monitoring. This is as good a reason as any for having management plans.
4. Some protected areas may exist that harbour unique resources or resources of such fragility or importance, that the only effective way to manage them is through firm control by adequately equipped professionals, and with only limited local participation and no harvesting. A parallel may be drawn between this type of area and national museums. These protected areas are, in effect, outdoor museums in which interesting phenomena (be they species or ecosystems or geomorphological sites) are preserved *in situ* for posterity. Governments should take these under full state control as 'jewels in the heritage crown' that have at least national if not globally important values.

The concept of practising transparent management planning and encouraging local folk to play a part in developing protected area management plans is laudable. It is far better to have them on the side of management rather than suspicious and antagonistic toward it. But community programmes should not be hailed as a universal panacea, especially under circumstances (all too common in the GMS) of high human population densities that continue to rise. There will be circumstances where firm control and law enforcement are valuable strategies: better still is professional management backed by adequate financial and manpower resources. No matter how successful other strategies may be, it will always pay the

law-breaker to flout the law provided he can get away with it. His personal gain is greater than his share of the communal loss. And there may be circumstances where the 'fortress' approach to protecting wildlife areas is the best or even the most cost effective one; for example, in ensuring the survival of gravely threatened species that have high commercial value such as the rhinoceroses. In this context, MacKinnon (1994) wrote:

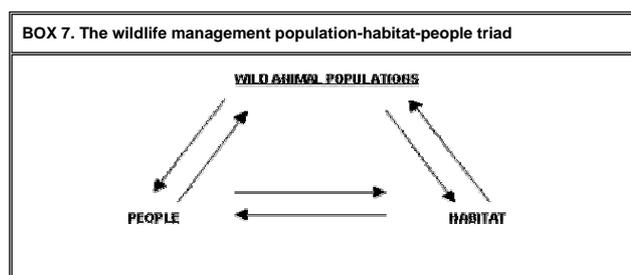
Rich and powerful individuals and organisations are far more capable of protecting their own resource bases than are rural communities. For example, there is little illegal cutting of timber or even poaching in Indonesian timber concessions compared to what happened in nature reserves.

To these examples may be added the large privately owned conservancies of Zimbabwe, whose owners (some of them very wealthy) protect and manage their wildlife efficiently and profitably.

12. Public Awareness

This report identified under its strategic subregional analysis a lack of any significant 'constituency' for biodiversity conservation or protected area management in GMS countries, which might be translated into greater positive action on the part of governments. Conservation is (rightly or wrongly) perceived to be of lesser importance than several other issues that governments must support financially. If biodiversity conservation is to be accorded higher priority, greater public awareness and understanding will be needed.

Box 7 illustrates the concept of the population-habitat-people approach to wildlife management (population in this case referring to wild animal populations).



This approach recognises that each component of the dynamic triad must be taken into account when managing wildlife (or biodiversity). The impacts made by people on natural ecosystems—beneficial and adverse, indirect and indirect—are in many cases the most important component to be manipulated, of which law-enforcement is only a sub-component. As Giles (1978) put it:

People are an integral part of the population-habitat-people triad of wildlife management. To make changes in the system as a whole, to improve its functioning, necessarily means manipulating the parts. The idea of manipulating people's attitudes and behaviour may sound like a threat to individual freedom. Yet, realistically, people are being manipulated already—by advertisements from manufacturers, by industrial public relations campaigns, by politicians and political image-makers, by religious institutions, by community custom and belief and by the educational process. Human behaviour is constantly under pressure to change. There is abundant evidence that behaviour can and does change and that changes can be controlled and guided towards objectives.

Technical biodiversity and protected area departments are aware of this, and of the need to take part in influencing human behaviour. The subject is linked, of course, with the preceding discussion on community linkages.

At national level, the need is to develop informed public opinion on biodiversity conservation and how it relates to everyday life and standards of living. The aim is to create the 'constituency' for conservation that is generally lacking—a constituency that can lead to public pressures for appropriate policies and funding to support implementation. This is part of a broader based set of issues that call for policy decisions at the highest level, and in which subjects such as energy conservation, industrial and agricultural pollution, land use planning and family planning are incorporated. Several government ministries will be involved—including education because schools' curricula may be affected. So will the public media—broadcasters and the press. Technical biodiversity departments should be geared up to participating at this level by ensuring that its policies and aims are understood and incorporated in the national picture, so that they may be in a position to influence public opinion at national and local levels. A technical department should have a unit that deals with this responsibility. Policies should be publicised, simply worded, translated into vernacular languages where necessary and widely distributed. The master plan, discussed above, provides a basis for informed public debate so that the public at large is aware of why the department exists, what its aims are and how is it plans to achieve them: in particular, how it relates to them—the people.

The unit may also involve itself with educational activities aimed at selected target groups. The latter might include:

- Students and teachers at primary, secondary and higher levels of educational
- The rural public (through the media and through local departmental offices)
- The urban public (through the media)
- Leaders and decision makers
- The educational programme might:
 - Prepare tapes or films, publications and other promotional materials
 - Give lectures or film shows to selected groups
 - Organise seminars or workshops
 - Run schools' wildlife clubs or assist them with resource materials
- Produce newsletters

At local level the technical departments should be geared as a matter of course to play a public relations and conservation education role within districts. Each district or protected area office would have its own public relations officer/community liaison officer, who would be the department's link with the local public. These links should be established for both men and women. To ensure that this is so, efforts might be made to train female public relations officers. Local offices of technical departments must also ensure that local people (and other departments) are aware of which tracts of land are protected areas; and this must be backed with clearly demarcated boundaries.

Finally, a role that a public relations unit might play is that of facilitating intradepartmental communication. The aims would be to:

- Keep officers aware of what is happening in their department
- Stimulate the exchange of ideas
- Generate a sense of belonging
- Build up esprit de corps

One means of achieving this would be through production of a regular newsletter (say, monthly or quarterly), to which officers would be encouraged to contribute. This might include:

- News on personnel matters: appointments, transfers, promotions, etc.
- Reports on conferences or workshops attended by departmental officers

- Interim or final research findings
- Information on new or planned projects
- Observations of special interest
- New ideas

13. Regional Cooperation

Ideas on co-operation between GMS countries were mixed. Some in-country contacts urged that they be developed. Others, while accepting the values of cross border contacts in principle, were pessimistic as to whether they could be practicable, taking the view that national governments would be unenthusiastic and give only token support.

Because many management problems are common to the six countries, there is evidently at least potential benefit to be gained from regular information exchange—especially in matters of research—through conferences, workshops and circulation of research reports. There may also be occasions where a common management problem is more cost-effectively researched by one institute rather than have two or more work in parallel.

In respect of professional and technical training, each country has its own institutions that educate students in forestry and the biological sciences, so there is no pressing desire or need to develop a regional training centre for biodiversity and protected area management. But information exchange and student exchanges could be fruitful and broaden management capacities of the students and their technical departments.

There is also scope for regional co-operation in two other fields, to the benefit of participating countries and biodiversity conservation. They are trade in wildlife and cross-border protected area management.

The grave loss of biodiversity due to international trade in wildlife and its by-products is described above under the strategic subregional analysis. Its control is only likely to be accomplished if the countries concerned mount a concerted exercise involving the technical departments, police forces, customs departments and, perhaps, the armed services. All six GMS countries are implicated, either as net exporters or importers of wildlife.

Lists of protected areas that lie adjacent to international frontiers, and to protected areas in neighbouring countries, appear in the country reports. They are summarised in Table 12, under the strategic subregional analysis. Four countries offer scope for trans-border co-operation in managing protected areas: the exceptions are Myanmar, which has no protected area adjacent to another GMS country, while Yunnan's few border protected areas are not contiguous with those in other countries.

The greatest scope for developing cross border protected area management programmes is in the strip of country along the borders between Cambodia, Lao PDR and Viet Nam in the Annamite Mountains; less between Thailand, Cambodia and Lao PDR. The Annamite Mountains coincide with high rates of endemism and the occurrence of many threatened species, including three large mammals new to science.

At the very least, there should be regular meetings (not less than once a year) between the staff of adjacent protected areas. Reports should be exchanged. If difference in language is a problem, it may be necessary to use a third language acceptable to both countries. Better still would be co-ordinated management, incorporated in the respective management plans. However, some country spokespersons thought this might be unacceptable to national governments, especially if proposals were made for joint law-enforcement.

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