

Cambodia's Great Lake: How to Sustain its Ecological and Economic Diversity¹ Reprint File-- by CPR

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Abstract

Cambodia's Great Lake is one of the most productive freshwater lake in the world. Located in center of the country's north-west plains, its 3,000 km² waters expand to more than 6,000 km² area inside the inundated forests, draining about 67,000 km² basin area and feeding the Mekong river's flood water through the Tonle Sap river. The inundated forest that surrounds the lake in a diverse ecosystem consisting of hundreds of plant species and wildlife. More than 280 different species of fish utilize this forest for at least 6 months for breeding, nursing and feeding during the monsoonal inundation. The six provinces that surround the lake have a population of nearly 3 million people (about 30% of the country's total population). About one third of this population live on floating villages around the lake and within the inundated forests. Fishing and foraging for wood and wildlife, combined with occasional farming form the principal basis of livelihood of the people. Due to the effects of massive over exploitation of the fisheries and destructive practices in the inundated forests, the resources and their diversities are declining, causing an imbalance in the ecological and economic system. The paper describes current management regime, and identifies the factors that have led the current regulatory management through control and enforcement to become ineffective. Likewise, factors responsible for the current lack of incentive to protect and conserve resources of the lake by its current users have been discussed. The effect of continuing destruction of watershed forests and waste disposal, such as, increasing rate of siltation has been identified as a major threat to the lake ecosystem and its diverse plant and wildlife population. The paper recommends for a more equitable fishing rights distribution and development of partnerships between government authorities and the local farming and fishing communities as an alternative management option.

Introduction

Cambodia is a relatively small and compact country. Its 181,035 km² area is located almost entirely in the catchment area of the Mekong river, which created a network of waterbodies throughout the country. The Great lake (also known as Tonle Sap Lake) is one such waterbody, recognized to be the most productive freshwater lake in the world (Bardach 1959). The lake is a major supplier of fish which constitutes more than 75% of the total protein intake by the country's nearly 10 million population (Ahmed et al, 1996). Located in the middle of the country's northwest plain, the lake occupies an area of 3,000 km² during the dry season. During the monsoon, it expands to more than 6,000 km² area.

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inside the inundated forest creating an enormous fish spawning, nursing and feeding ground of 10,000 km². Aside from fish, a wide range of wild animals and birds live on the lake and adjoining inundated forest, which are important economic and biological resource for the country. The inundated forest itself is a great ecological treasure for the country and an economic lifeline for millions of people living in and around it.

Fishing Dependent Population

The six provinces bordering the lake (Kompong Chhnang, Pursat, Battambang, Banteay Mean Chey, Siem Reap and Kompong Thom) have a total population of around 3 millions (Table 1). Most people live in the area along national roads surrounding the lake. There are as many as 170 villages in and around the inundated forest (Fig. 1) with over 1,086,000 inhabitants (Table 1). About 88% of the inhabitants rely on natural fishing and fishing related activities (Table 2).

The fishing dependent population can be divided into two groups according to their degree of dependency. (i) the fishing community whose livelihood relies exclusively on fishing and fishing related activities and (ii) the farming community that participate in fishing in between their agricultural practices in order to supplement family's food and income requirements.

Fisheries Resources - Exploitation Process and its Consequences

Commercial fishing in the lake is divided into two types fishing lots known as large-scale fishing operated by leaseholders in designated areas close to the bank of the lake and within the inundated forest, and middle-scale fishing by licensed fishers in open areas in the lake outside the fishing lots and fish reserves. Commercial fishing is open only during October-May. Besides, small-scale family fishing is allowed without requiring any license and can operate round the year. There are 52 fishing lots around the lake with size ranging from 20 to few hundred km² which are auctioned every two years to private individuals. Fishing operations in a fishing lot uses on average 20 to 40 km of bamboo fences and 40,000-80,000 poles to encircle the fish shoal each fishing season (October-May). In addition, middle-scale and small-scale fishers use a lot of bamboo fences, bamboo poles, tree branches and tree poles for fishing purposes as well as for constructing houses, fish cages and pens on the lake. The total amount of bamboo fences and other fishing materials used in the lake is estimated to be around 20,000 tons per year. Furthermore, all kind of wastes are dropped into the lake by the residents of floating houses, fishers and all those travelling across the lake.

The inundated forest is an integral part of the Great lake fisheries, recognized by the fisheries law enacted in 1945 and newly revised in 1987. There are more than 600,000 hectares of flooded forests 80 per cent of which are located around the Great Lake. Flooded forests are an important ecological link to the continued regeneration and sustenance of the freshwater capture fisheries (Ahmed et al, 1996). These areas provide a very good spawning, nursing and feeding grounds for several hundred of fish species and natural habitat for a large number of animals and water birds. The inundated forest has suffered

destruction over the last several decades, particularly during the Khmer Rouge regime (1975-1979). Nearly one third of the forests had been cleared for agricultural purposes, such as rice and mungbean cultivation. In Siem Reap province alone, more than 5,000 ha of inundated forests have reportedly been cleared between 1987-1993. In all provinces around the lake, indiscriminate human encroachment on the inundated forest is a major threat to the continued sustenance of the fish and wildlife population in the lake. The lack of cooperation between the government management and the users with multiple interests over the resources of the inundated forest is a major issue in this regard.

The Current Fisheries Management System and Its Consequences

Recognizing the importance of the commercial fisheries in the Great Lake as well as in the mainstream Mekong and its tributaries, the government enacted several laws governing the fisheries management since the mid 1940s. After the collapse of the Khmer Rouge regime, a revised fisheries law came into force in 1987. Many subsequent regulations have been enacted to regulate resource use to ensure its long-term sustainability. In addition, His Majesty the King Samdach Preah Norodom Sihanouk Varaman promulgated in late 1993 a Royal Decree No 126 declaring the Tonle Sap lake as protected areas for multiple-use under strict regulations.

The Department of Fisheries (DOF) under the Ministry of Agriculture, Forestry and Fisheries is a central agency responsible for the management of the fisheries resources. The DOF administers the leasing of fishing lots and licensing of middle-scale fishing gear, and implement the regulations through control and surveillance activities. It utilizes the Office of Fisheries in all fishing provinces for local level implementation of the leasing and licensing policies, and regulations on management and protection of the fisheries and its environments, such as the Great lake. Administratively, the provincial Office of Fisheries is under the supervision of provincial Department of Agriculture whose main focus is on improving agricultural production, an agency that is more or less in the same level as the central Department of Fisheries. This has resulted in provincial fisheries officers being supervised by two different authorities, not having the same objectives and priorities. This is a major drawback in the current institutional arrangement, which to some extent may have contributed to the ineffectiveness of the Department of Fisheries in protecting the inundated forest.

In Cambodia's socio-political context there are three sets of institutions that have roles in fisheries: (1) the Fisheries authority (central and provincial) which are the management authority by law, (2) the local authorities (provincial and district authorities), responsible for local administration; and (3) the fisher and farmer communities, having interests on the resources and its environment. There is no mechanism to draw inputs from these three groups in the management process. The fisheries authority with its limited staff and budget as well as inadequate means of transport can not successfully implement the present top-down management. Furthermore, the management relies mainly on control and surveillance through policing. This approach to manage the fisheries has alienated the traditional fishers from cooperating with the regulatory regime. Local authorities on the other hand, do very little to strengthening the enforcement capability of fisheries department or to protect the fisheries resources. The farming community continue to clear

the flooded forest to grow dry season rice and other agricultural crops. The villagers indiscriminately cut the forest for woods. The local fishers continue to over-exploit the fisheries within the areas in which they operate, and massively hunt water birds and animals for additional income. On the contrary, agencies such as police, navy, tax officers and military police tend to interfere in the management of the lake only to gain pecuniary benefits.

The lack of cooperation between the three concerned parties and interference of other agencies have rendered the top-down management by fisheries department ineffectve

As regard the fishing lot exploitation, the lease value do not reflect the true value of the fish resources harvested by the fishing lot operators. Because of capital intensive and highly organized nature of fishing operations, competition during the bidding process of fishing lots takes place only among limited few, who usually pre-arrange auctions among themselves. As a result the government loses substantial amount of potential revenue. On the other hand, despite evidence of intensive and often damaging fishing practices by operators of the fishing lots, the catch is very much under reported to avoid tax increases and competition (Ahmed et al 1996)

The leaseholders of fishing lots are generally outsiders and most of their fishing labor-force come from outside the local communities. As shown in Table 3 only few families (0.19%) have participation in fishing lots, while majority of the families (72%) are engaged in middle-scale fishing. Good fishing grounds are usually located within the fishing lots, and the benefits are taken away by the outsiders. Whereas, the vast majority of the local fishers compete among themselves for limited catch in poorer fishing grounds. Local residents can hardly make a living from the poor productivity of the fishing grounds in which they have rights for access, and hence, they continue to poach into fish reserves and over-exploit their own fishing grounds, including adjacent resources such as wildlife and birds.

Changing Ecological and Environmental Conditions

The siltation of the lake caused by the flow of the alluvial water of the Mekong has caused the bottom of the lake to rise gradually. The process of siltation has been accelerated in recent times due to deforestation in the catchments of rivers entering the lake in the northwest, and dumping of forest products (discarded fishing materials), and domestic and commercial wastes into the lake. The rate of siltation has been reported to be 20 to 40 mm per year (Csavas et al. 1994). This may change the environment and ecological conditions of the lake, affecting fish and animal life in it. Increased mortality of fish during the driest months (April-May) due to temperature increase has been reported by local fishers. Increased flooding in the surrounding plainlands has also been attributed to the decrease in the volume of flood water in the lake caused by siltation. Many people fear that the lake may eventually become two separate waterbodies during the dry season.

Conclusion and Recommendations

The Great Lake has a unique hydrological system related to the Mekong river. For centuries it has served as the receiver and regulator of the excessive monsoon flood in the Mekong basin. The productivity of fish and other aquatic animals and plants as well as the fishing and other livelihood activities in the lake have evolved around the hydrological dynamics of the Mekong river. It has also served as an important sanctuary for many species of water birds that migrate to the lake during the dry season. Management and sustenance of the diverse ecological and economic resources of the lake is an important policy issue.

The following recommendations are made to improve the ecological and economic management of the lake.

- 1 **Reducing discarded fishing materials** Indiscriminate use of bamboos and trees as materials for fishing is contributing to the depletion of forest resources and accelerating the siltation of the lake. Rent free nature of supplies from the forest encouraged only one time use of most of these materials. Longer and efficient use of these materials should be encouraged. Regulation of the exploitation of the forest, such as imposition of rent, will reduce indiscriminate use of forest materials for fishing.
- 2 **Resettlement of floating villages**. Many floating villages are located inside the flooded forests and even in the lake offshore. All kind of waste are being dropped into the lake. Resettlement by digging canals outside the flooded areas is highly recommended.
- 3 **Community-based fisheries management** Some power and responsibility should be delegated to local authorities for them to have the sense of ownership of the resources and participate actively in planning, implementing, monitoring and evaluation management of the fisheries. The three sets of institutions identified above should become actively involved to draw up a strategy that will protect the ecological and environmental resources of the lake and at the same time improve the living standard of fishing dependent communities.
- 4 **Integration of fisheries management with overall rural development in fishing dependent communities** Both the fisher and farmer communities are poorly educated. 18% are illiterate and about 50% are in the category of those who can only read and write. Access roads, schools, hospitals and other social infrastructure should be provided to the fishing dependent communities.
- 5 **Prohibition of catchment areas deforestation**. The deforestation of the catchment areas of the Great Lake, especially the land clearing activities in the flooded forest for dry season rice and mungbean cultivation have enhanced the erosion rate, reduced ecological diversity and reduced the value of the lake as a natural and economic capital. The trend in the deforestation of catchment and inundated forest should be reversed using the concept of community-based forest protection and management.

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Table 1. Number of fishing dependent communes and their population in the six provinces bordering the lake

No	Provinces	Name of		Total		Fishing commun	
		No. of commun.	No. of Populat.	No. of Families	No. of commun	No. of Populat.	No. of Families
1	Kg. Chhnang	52	244,434	47,852	38	186,271	33,048
2	Pursat	44	322,852	61,740	23	182,586	34,793
3	Battambang	66	694,854	130,720	25	254,940	46,821
4	Siem Reap	108	637,451	113,564	33	203,840	35,521
5	Kg. Thom	81	546,791	90,233	41	197,280	33,796
6	Banteay Mean Chey	62	521,533	101,130	10	61,769	11,654
		Total	413	2,967,915	545,239	170	1,086,686
		Percentage(%)	100%	100%		41.16%	36.61%

(Source: Navy et al, 1996; Department of Agriculture, Banteay Mean Chey province, 1995.)

Table 2. Occupation of head of household in 3 fishing communes around the Great lake in the Siem Reap province.

Occupation	Kampong Khleang (N=1387)		Kampong Phlouk (N=364)		Chong Khneas (N=712)		Total (N=2463)	
	No.	%	No.	%	No.	%	No.	%
Fishing	1,099	79	333	91	502	71	1,934	79
fish processing	48	3	25	7	12	2	85	3
Fish raising	38	3	145	40	68	10	251	10
Boat construction	29	2	0	0	13	2	42	2
Mungbean growing	79	6	3	<1	0	0	82	6
Petty trading	139	10	4	1	78	11	221	9
Civil servant	29	2	9	2	13	2	51	2
Hired labor	28	2	1	<1	47	7	76	3
Total a/	1,489		520		733		2,742	

a/ Total for each column is greater than N as some household heads reported more than one occupation.

Source Department of Fisheries, Siem Reap province, Cambodia.

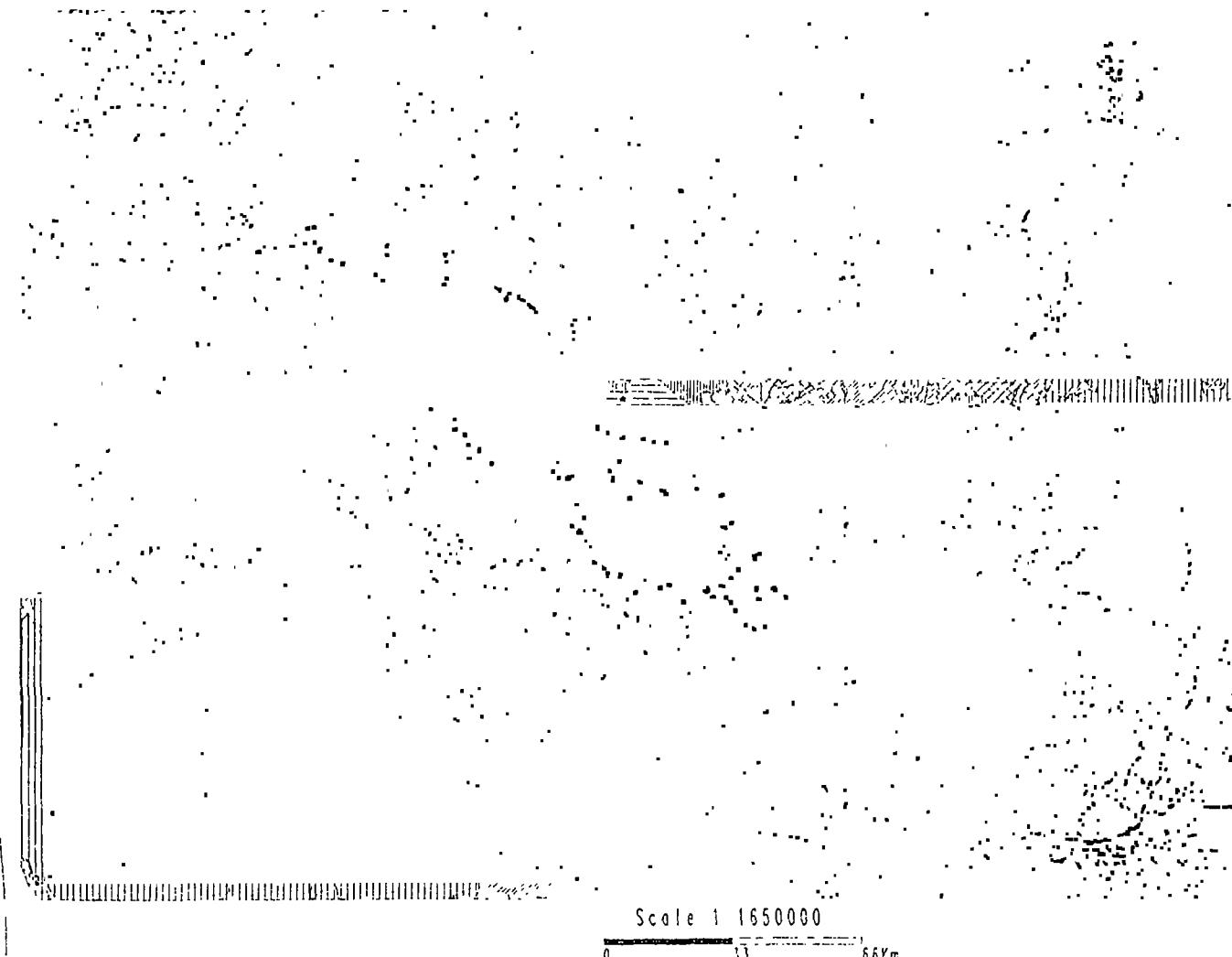
Table 3. Distribution of families engaged in large-, middle- and small-scale fishing in the Great Lake, Siem Reap province, Cambodia, 1996.

Name of Commune	Large-scale (leaseholder)		Middle-scale (license holders)		Small-scale (subsistence)		Total	
	No.	%	No.	%	No.	%	No.	%
Kg Khleang	3	0.23	1,096	82.47	230	17.31	1,329	100
Kg Phlouk	0	0.00	333	62.71	198	37.29	531	100
Chong khneas	2	0.25	500	62.03	304	37.72	806	100
Total	5	0.19	1,929	72.36	732	27.46	2,666	100

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LEGEND

- [Symbol: diagonal lines] Bare land and sandy bank
- [Symbol: diagonal lines] Deciduous forest
- [Symbol: vertical lines] Dense broad leaved forest
- [Symbol: horizontal lines] Flooded evergreen forest
- [Symbol: dots] Grass savannah
- [Symbol: diagonal lines] Grassland susceptible to flooding
- [Symbol: diagonal lines] Mosaic of evergreen or deciduous forest and secondary vegetal formation
- [Symbol: horizontal lines] Mosaic of field crops and fruit garden rural areas in the lowland
- [Symbol: diagonal lines] Mosaic of the flooded forest, swampy vegetation follow land
- [Symbol: diagonal lines] Mosaic of upland crops and secondary vegetal formation
- [Symbol: dots] Paddy field
- [Symbol: horizontal lines] Plantation (Rubber)
- [Symbol: dots] Shrub bushwoods
- [Symbol: diagonal lines] Secondary vegetal formation
- [Symbol: diagonal lines] Swampy vegetation
- [Symbol: dots] Thickets
- [Symbol: empty square] Open water
- [Symbol: diagonal lines] Paddy field with palm trees
- + Villages



Source: RECONNAISSANCE LANDUSE MAP OF CAMBODIA 1988/89

Scale of original map 1:500,000

Map 2 Floating Villages, and Land Use/ Land Cover Map of Tonle Sap