

ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY

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**COUNTRY PAPER
ON
SOME ASPECTS OF FORESTRY IN CAMBODIA**

by

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INFORMATION NOTE ON ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY

At its sixteenth session held in Yangon, Myanmar, in January 1996, the Asia-Pacific Forestry Commission, which has membership open to all governments in the Asia-Pacific region, decided to carry out an outlook study for forestry with horizon year 2010. The study is being coordinated by FAO through its regional office in Bangkok and its Headquarters in Rome, but is being implemented in close partnership with governments, many of which have nominated national focal points.

The scope of the study is to look at the main external and sectoral developments in policies, programmes and institutions that will affect the forestry sector and to assess from this the likely direction of its evolution and to present its likely situation in 2010. The study involves assessment of current status but also of trends from the past and the main forces which are shaping those trends and then builds on this to explore future prospects.

Working papers have been contributed or commissioned on a wide range of topics. They fall under the following categories: country profiles, selected in-depth country or sub-regional studies and thematic studies. Working papers are prepared by individual authors or groups of authors on their own professional responsibility; therefore, the opinions expressed in them do not necessarily reflect the views of their employers, the governments of the Asia-Pacific Forestry Commission or of the Food and Agriculture Organization. In preparing the substantive report to be presented at the next session of the Asia-Pacific Forestry Commission early in 1998, material from these working papers will be an important element but will be blended and interpreted alongside a lot of other material.

Working papers are being produced and issued as they arrive. Some effort at uniformity of presentation is being attempted but the contents are only minimally edited for style or clarity. FAO welcomes from readers any information which they feel would be useful to the study on the subject of any of the working papers or on any other subject that has importance for the Asia-Pacific forestry sector. Such material can be mailed to the contacts given below from whom further copies of these working papers, as well as more information on the Asia-Pacific Forestry Sector Study, can be obtained:

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1. INTRODUCTION

Cambodia is well endowed with forest resource-some 63 percents of the country's total area under forest cover. However, localized population concentrations, the civil war over the two decades and the recent dynamics of wood supply and demand have a strong influence and have led to spontaneous deforestation over the last 20 years - around 2 millions ha. The main causes have been the development of agriculture, shifting cultivation, fuel wood harvesting, and logging.

2. SOCIO-ECONOMIC SITUATION

Cambodia's population is mainly rural with less than 14 percent living in the urban area. The population of Cambodia was recently estimated at approximately 9.8 millions with the annual population growth in the rate of about 2.8 percent. Cambodia is dominantly rural economy, with about 85 percent are farmers. Besides the main daily activity, farming, some rural people involve themselves in several supplementary economic earnings, which is mostly under the customary use rights for those who live adjacent to forested areas, such as cutting trees, collecting fuel wood and non-wood production from the jungle (rattans, lian, resins, honey...). Between 1990-1995 the average GDP growth was about 5.9 percent, that the estimation of GDP in 1994 was 4.0 percent approximately. It is remarkable that in the last two years forestry sector contributed approximately 20 millions (12 percent) of the national income.

3. FOREST RESOURCES

The distribution of land use and land cover as estimated in 1993 from Landsat remote sensing data with visual interpretation by the Ministry of Agriculture and the Remote Sensing Mapping Unit of the Mekong Secretariat, as well as the result of estimation from the computer-based interpretation (digital processing) using Landsat TM by Japan Forest Technical Association in its project entitled "Information System Development Project for the Management of Tropical Forest" of the fiscal years 1993-1995, both indicate the significance of forests in Cambodia's overall environment, fully 60 percent and 63 percent respectively of the country is covered by forests. This is a higher percentage than any country in the sub-region and among the highest of some countries in the world. The assessment based on the above results of the Mekong Secretariat shows the most significant land cover changes in the last 20 years: the 11.2 percent reduction in total forest cover (forest land and edaphic forest combined), the 113.9 percent increase in shrubland and the 26.0 percent in agricultural land (rice fields and other crops combined).

Table 1.1 - Change in Land Cover between 1973 and 1993 (Area in Hectares)

	1973	1993	Change	Annual Change
Urban	14,700	4,500	-10,200	-3.5%
Rice fields	2,521,000	2,639,000	118,000	0.2%
Other crops	582,000	1,275,400	693,400	6.0%
Dry land forests	11,678,600	10,568,600	-1,110,000	-0.5%
Edaphic forests	1,032,500	715,600	-316,900	-1.5%
Shrublands	1,056,900	2,260,600	1,203,700	5.7%
Abandoned lands	786,300	278,700	-507,600	-3.2%
Water surface	481,500	411,100	-70,400	-0.7%
Total	18,153,500	18,153,500	0	-

Source: Land Use Mapping Statistics

The most significant result of land use practices of the last 20 years, such as commercial logging, shifting cultivation and wood harvesting for fuelwood and charcoal production, has been a net loss of some 1,110,000 hectares of dryland forest and 316,900 hectares of edaphic forest. In percentage terms the reduction in forest area over the last 20 years has been about 0.5 percent per year which is one-half the 1.0 percent per year average of countries of the sub-region during the same period. The increase in shrublands suggests that it is the primary form of land cover to succeed forests after clearance.

The most up-to-date forest resource information for Cambodia is the 1994 Land Cover Atlas prepared by the Mekong Secretariat, and Forest Register 1995 by JAFTA (Japan Forest Technical Association) (see Annex 1). Although more recent changes may have occurred and have been reported, especially along the western border with Thailand, no data are available to evaluate these reports. The total forest area of 11.3 million hectares is divided into 4.8 million hectares of evergreen forest, 4.3 million hectares of deciduous forest, 1 million hectares of mixed forest, 0.5 million hectares of secondary forest and 0.7 million hectares of edaphic forest (see table 1.2).

Changes in forest cover that have occurred over the last 20 years are shown in Table 1.2 by forest type. Some forest types, such as the edaphic, are in particular danger. These include mangrove areas along the Gulf of Siam and flooded forest around the Tonle Sap Lake which decreased at a rate of 1.53 percent per year between 1973-1993. Once again, while there have been reports that changes in land cover have affected hydrologic conditions in the Tonle Sap and its surroundings, there are no data or detailed scientific analyses which can substantiate these claims. The hydrologic role of forests, however, is well established and it is reasonable to expect that major changes in forest area should have significant impact on stream flows and aquatic life.

Table 1.2 - Area of Forest by Type and Change 1973-1993 (hectares)

	1973	1993	Change	Annual Change
Dry land forest				
Evergreen	6,876,400	4,763,300	-2,113,100	-1.5%
Coniferous	9,300	9,800	500	0.3%
Deciduous	4,792,900	4,301,200	-491,700	-0.5%
<i>(Mixed)</i>			<i>977,300</i>	<i>977,300</i>
<i>(Secondary)</i>			<i>571,000</i>	<i>571,000</i>
Subtotal	11,678,600	10,568,600	-1,110,000	-0.5%
Edaphic forest				
Flooded	937,900	370,700	-567,200	-3.0%
<i>(Flooded Secondary)</i>			<i>259,800</i>	<i>259,800</i>
Mangrove	94,600	85,100	-9,500	-0.5%
Subtotal	1,032,500	715,600	-316,900	-1.5%
Total	12,711,100	11,284,200	-1,426,900	-0.6%

Note: Changes in classification introduced in the 1993 study are indicated in italic and account for a portion of the changes suggested in the original classifications.

Source: Mekong Secretariat

Box 1 - Major Forest Types in Cambodia

Dry land forests: Include evergreen, coniferous, deciduous, mixed and secondary forests.

Evergreen forest: Multi-storey forest consisting of more than 80% of evergreen species. The main characteristic species are *Dipterocarpus dyeri*, *D. corbatus*, *D. Alatus*, *Anisoptera cochinchinensis*, *Hopea adorata*, *H.pierrei*, *Roherea vulgaris*, *Syzygium spp.*

Coniferous forest: Refers to Pines forest (mainly in Kirirom area).

Deciduous forest: Dry deciduous Dipterocarp forest. Most characteristic species are forest resistant and have thick bark, such as *Dipterocarpus intricatus*, *D. obtusifolius*, *Shorea obtusa*, *Terminalia tomentosa*, etc.

Mixed forest: Forests of deciduous and evergreen species, where deciduous species represent more than 50 percent of the stand.

Secondary forest: Refers to open forest with growth mostly after shifting cultivation.

Edaphic Forests: Include flooded, flooded secondary and mangrove forests.

Flooded forest: Refers to flooded forest around the Tonle Sap Lake.

Flooded secondary forest: Refers to flooded secondary forest with open canopy and regrowth after cultivation or cutting.

Mangrove forest: Refers to mangrove forest (on tidal saline water) and rear mangrove forest.

At the provincial level, as shown in Annex 1, forest distribution is quite varied. Forests in the west are mainly evergreen and the north-east is largely covered by deciduous forests. The southern and central parts of the country have less important forest cover and face a shortage of wood, in particular for fuelwood. Weak infrastructure does not permit raw material transport from the forest area of the north-east and the west where wood potential is high; as a result the remaining woodlands of the south are under heavy pressure to supply the local population. Available potential data provide only forest area. Detailed estimates on changes in forest volume are not available, making it impossible to provide estimates of forest degradation by province and its cause. However, because population density and transport costs are such important factors, it is likely that logging has had its major impact along the international borders of Cambodia and in the coastal province of the Koh Kong; that fuel collection has been most important along the outskirts of the forest in the central part of the country; and that shifting cultivation has been most important in the north-east provinces.

Properly managed, logging is not necessarily detrimental or degrading, but uncontrolled logging can be harmful, and aerial photographs of some areas do show a high proportion of trees removed. Most logging in Cambodia is conducted as selective cutting, rather than clear cutting because it is more profitable to exploit the best timber within reach rather than to attempt complete removal. Ground checks seem to indicate that only large timber is being transported and this concurs with the satellite image patterns which do not reveal logging as a major source of change in forest area and aerial photographs which show trails cut for logging purposes and timber extraction.

While the removal of large trees from the evergreen forest may be less damaging to the environment, removal of the same emergent trees from the open deciduous forest could seriously change the vegetative composition and rapidly degrade that type of forest, because of its very low stock volume. Furthermore, uncontrolled fires are common occurrences in the deciduous forest areas, and imagery acquired after January is often not usable, because of the fire scars.

4. ENVIRONMENTAL INITIATIVES AND PROTECTED AREAS

4.1 Protected Areas

In November 1st 1993, all edaphic forests around Tonle Sap Great Lake and some 2.8 million hectares of dryland forest were designated for the National Protected Area System (23 protected areas) by a Royal decree, which was issued by His Majesty the King Norodom SIHANOUK. The total area under some form of protection covers 3,402,200 ha or 19 percent of the country's total area and makes Cambodia one of the countries with the highest proportion of land under protection. The protected areas covers representative ecosystems including evergreen, deciduous and edaphic forests and examples of fragile and critical habitats. These areas are classified as National Parks, Wildlife Sanctuaries, Protected Landscapes and Multiple-Use Areas and are well distributed throughout the country.

4.2 *Wildlife resource*

A- Mammal of Mustelidae, Edentata, and reptiles:

- A large amount of them living around the edge of the Tonle Sap Great Lake and in the flooded forest surrounding the lake;
- An average amount living in the lake and ponds along the bank of the Mekong river and its tributaries;

B- Primates, rabbits, deers, wild pigs, and wild dogs distributing surround the Great Lake and the plain in eastern part of the Mekong river;

C- Elephants (*Elephas maximus*), Bantengs, Gaurs, Wild water buffalo, along with predator tigers, bears, and panther...distribute in the central plain adjacent to the ranges and upland of forested areas in the eastern Mekong river. Recently, it was estimated that there are about 2000 elephants and 300-600 tigers (*Panther tigris corbitti*) living through out the country.

D- Birds are living on the high mountainous areas, uplands by the edge of the Tonle Sap Greak Lake, and banks of the Mekong, Basac (joining to the Mekong river at Phnom Penh capital) rivers, and lakes and ponds along the Mekong river bank.

5. FOREST PRODUCTS AND UTILIZATION

The forests, in addition to their important role in protecting the fragile country's environment, provide variety of goods and services. The major forest products are timber, fuelwood, and a number of other non-wood products. The wood based industries set up by forest concessionaires will provide some employment to the people.

5.1 Timber and fuelwood production

During the 1981-1990 period, war activities shifted mainly to the western provinces, bringing a gradual increase in logging activities in central and western Cambodia. The average annual cut for the period was 140,000 cubic meters and about 2.4 million cubic meters of fuelwood. Most current logging activities are illegal and although since January 1995 the Royal Government has imposed a complete ban on logging, this has had little impact in the field. The 1995 production of logs is estimated at 1.5 million cubic meters, the same as prior to the introduction of the ban. Table 1.3 summarized the estimates of the level of log extraction in Cambodia over the last four decades.

For the last five years, the volume of logging increase because it was the main revenue at the disposal of the different factions and armies before the 1993 election and because it is still, actually, one of the major sources of income for many rural people. Moreover, the insecure situation favours illegal logging and transportation to foreign country in particularly Thailand by road and boat, and Malaysia/Singapore by boat. Thus actual removal are estimated to be around one and one-half times official information which is based on the legal sawmill capacity and officially recorded exports period.

Table 1.3 - Past Logging and Log Production (m³)

	Total Log Production	Exports	
		Logs	Sawnwood
1960 to 1970	(350,000m ³ /year)		
1971 to 1980	(100,000m ³ /year)		
1981	19,000		
1982	68,000		
1983	68,000		
1984	70,000		
1985	97,000	86,000	96,500
1986	127,000		
1987	167,000		
1988	200,000	12,800	283,000
1989	300,000	16,400	224,000
1990	300,000	15,700	257,400
1991	600,000	16,000	308,900
1992	900,000	16,000	104,000
1993	1,500,000	76,000	
1994	1,500,000		
1995	1,500,000		
Total 1960-1995	12,000,000		

Source: Joint World Bank, UNDP and FAO mission estimates in Cambodia 1995

Wood is the principal source of fuel of the Cambodian population and fuelwood is the largest use of wood harvested in Cambodia. Most fuelwood is collected by rural people in the accessible forest area (i.e. on the outskirts of forests, on the degraded or deciduous forests) or in woodlands. Although accurate data are not available it is reasonable to assume that half of all fuelwood is extracted from the forests (Table 1.4) (Total consumption is based on an estimated 0.6 cubic meters/person/year).

Table 1.4 - Fuelwood Extraction 1961 - Present

	Total Fuelwood	Extraction from forest (50%)
1961 to 1970	18 million m ³	9 million m ³
1971 to 1980	10 million m ³	5 million m ³
1981 to 1990	24 million m ³	12 million m ³
1990 to present	6 million m ³ per year	3 million m ³ per year

Source: Joint World Bank, UNDP and FAO mission estimates in Cambodia 1995

5.2 Non-wood forest products

At present, the most important non-wood resources that are being harvested heavily are rattan and bamboo. Rattan has been harvested in the forests throughout the country, while bamboo has been heavily extracted mostly from the forests in north-eastern part. Besides rattan and bamboo, there are other non-wood products that are being exploited: resin (esp. from the Dipterocarp species) lian, medical herbs and plants, honey. Hunting activities are also found countrywide. Large-mammal hunting (elephant, tiger) is done especially in the north-eastern part of the country. Although they are comparably not so economically beneficial as timber

harvesting, non-wood products will increasingly be harvested and lead to serious destruction of biodiversity if not well managed.

6. SERVICES

The forests provide variety of services:

- The wood based industries set up by forest concessionaires will provide some employment to the people;
- Recently the Department of Forestry and Wildlife established a zoo in degraded regrowth forest some 40 km south of Phnom Penh to open to the local and foreign tourists;
- The protected areas will become tourist resorts when the country returns to full peace and stability.

7. LAND USE PROJECTION

It is apparent from the data reviewed above that Cambodia's return to peace and stability has brought accelerating demands on the forest resource. While it is impossible to predict with certainty, it is useful to consider how an extension of recent trends in land use and demand for wood will shape the country's environment over the next decade. For illustrative purposes three scenarios were modelled to extend the latest data to 2010:

Scenario 1: the deforestation process will continue even in the protected areas because of "non-intervention"; in that case the destruction of the forest will increase to the same rate as the sub-region with a loss of 1 percent per year. The coastal and flooded ecosystems will practically disappear. In this scenario, total deforestation would be 1,900,000 hectares from 1993 to 2010, i.e. 110,000 hectares per year.

Scenario 2: the Cambodian authorities would effectively implement their new national protected areas regulations. The whole edaphic forest would be protected and also some areas of evergreen and deciduous forests. In other areas, deforestation would proceed at a rate of 1 percent per year (twice the average rate of deforestation observed in Cambodia during the last 20 years and equal to the sub-region rate). In this scenario, the total deforestation would be 1,300,000 hectares from 1993 to 2010, i.e. 77,000 hectares per year.

Scenario 3: With a very strong policy, the Cambodian authorities would be able to preserve the protected area and maintain the deforestation at the present rate of 0.5 percent per year in the non-protected areas which corresponds to the needs of agricultural development. In this scenario, the total deforestation would be 650,000 hectares from 1993 to 2010, i.e. 38,000 hectares per year.

Given the present situation, Scenario 1 appears to be the most realistic however Scenario 2 could become a real possibility, if the different authorities in charge of the forestry sector join their efforts to reinforce the operational capacities of the technical staff and if the local authorities and the population are associated for the sustainable management and conservation of the forests.

8. OUTLOOK AND CHALLENGES FOR POLICY

Cambodian forest appears to be at a cross-roads between accelerating and uncontrollable degradation and the initiation of sustainable management. Logging, mostly illegal, continues at the rate of approximately 1.5 million m³/year; harvesting takes place without regard to environmental standards. The demands on the forest resource base that result in this accelerating drain are similar in many respects to other developing countries, but have some special aspects. As in many developing countries deforestation is the most notable land use change and is both rapid and accelerating; it is due in some part to agricultural expansion and shifting cultivation. Unlike many developing countries, however, the impact on forests of policies and government investments outside of the agriculture and forestry sectors, such as infrastructure and energy policies, is limited. A few major investment projects, such as dams and highways, have or appear likely to have significant impact on the resource base. Earlier and proposed industrial harvesting, both legal and illegal, however, appears to be a much more important source of pressure on the forest than in most other countries. Consequently, the importance of Cambodian forestry sector policy is even more than in many other developing countries.

9. CONCLUSION

Forest resources have decreased by about 2 million hectares over the past two decades and will continue to decline even faster if there are not any strict measures to ensure the sustainable management. However, the remaining forest cover, about 63 percent of the total country's area, will provide prosperity, economy and genuine environment, to the nation if it is properly managed.

The proper management and development of forest resource, however, face a number of constraints. The main identified constraints are insecurity, lack of budget, poor law enforcement, poor infrastructure, lack of experienced and skilled staff, and lack of awareness on natural resources conservation among a vast majority of people.

A recent joint World Bank/UNDP/FAO mission developed some future scenarios. The projections for year 2010 are compared to 1993 forest cover in Table 1.5. It may be noted that it is assumed under all scenarios that edaphic forest would remain fully or highly protected.

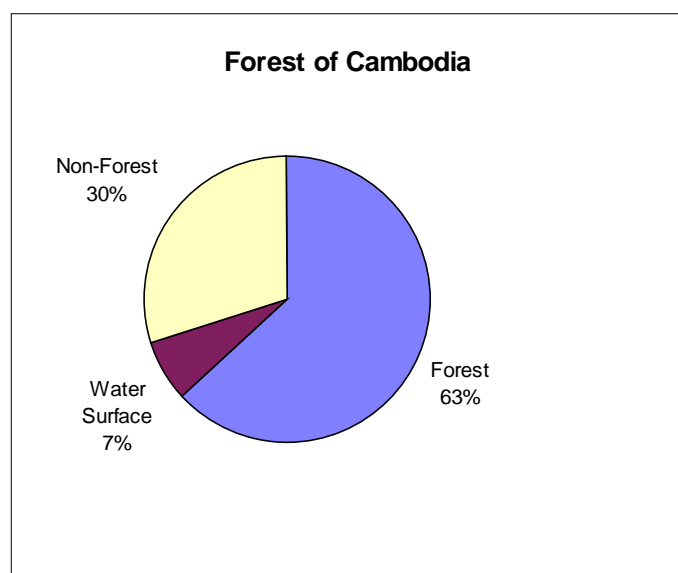
Table 1.5 - Changes in Forest types (1993-2010) “area in ha”

	1993			Scenario 1: 2010			Scenario 2: 2010			Scenario 3: 2010		
	Total Forest	Protected	Unprotected	Total Forest	Protected	Unprotected	Total Forest	Protected	Unprotected	Total Forest	Protected	Unprotected
<u>Dry land forest</u>	10,568,600	2,862,300	7,706,300	8,771,983	2,375,709	6,396,229	9,258,529	2,862,300	6,396,229	9,913,565	2,862,300	7,051,265
Evergreen	4,763,300	1,797,500	2,965,800	3,953,539	1,491,925	2,461,614	4,259,114	1,797,500	2,461,614	4,511,207	1,797,500	2,713,707
Coniferous	9,800	9,800	0	8,134	8,134	0	9,800	9,800	0	9,800	9,800	0
Deciduous	4,301,200	1,055,000	3,246,200	3,569,996	875,650	2,694,346	3,749,346	1,055,000	2,694,346	4,025,273	1,055,000	2,970,273
Mixed	977,300	0	977,300	811,159	0	811,159	811,159	0	811,159	894,230	0	894,230
Secondary	517,000	0	517,000	429,110	0	429,110	429,110	0	429,110	473,055	0	473,055
<u>Edaphic forest</u>	715,600	715,600	0	593,948	593,948	0	715,600	715,600	0	715,600	715,600	0
Flooded	370,700	370,700	0	307,681	307,681	0	370,700	370,700	0	370,700	370,700	0
Flooded secondary	259,800	259,800	0	215,634	215,634	0	259,800	259,800	0	259,800	259,800	0
Mangrove	85,100	85,100	0	70,633	70,633	0	85,100	85,100	0	85,100	85,100	0
Total forest	11,284,200	3,577,900	7,706,300	9,365,886	2,969,657	6,396,229	9,974,129	3,577,900	6,396,229	10,629,165	3,577,900	7,051,265

Source: Joint World Bank, UNDP and FAO mission estimates in Cambodia 1995.

ANNEX 1 - OVERALL AREA OF CAMBODIA

Classification	Area (ha)	Ratio(%)
Total area	18,903,100.00	100.0
of which		
Water surfaces	1,340,857.50	7.1
Rice fields	1,825,319.00	9.7
Flooded area	1,066,613.00	5.6
Towns	2,023.50	0.0
Forests and woodlands	11,961,821.00	63.3
Evergreen Forest	4,369,819.50	3.1
Mixed Forest	2,323,789.25	12.3
Deciduous Forest	3,726,676.50	19.7
Pine Forest	1,090.00	0.0
Mangrove Forest	16,497.75	0.1
Rear Mangrove Forest	17,655.00	0.1
Flooded Forest	481,224.50	2.6
Wood and Shrubland	1,025,070.50	5.4
Grass/Scattered trees	2,553,080.50	13.5
Rubber plantations	39,977.00	0.2
Orchards/other trees	108,630.25	0.6
Slash and burn	3,571.00	0.0
Others	1,198.25	0.0



Forest includes wood and shrubland.

ANNEX 2 - FOREST AREA BY PROVINCE 1993

Province	Total area hectares	Population (1994)	Total forest hectares	Percent	Forest hectares per person
Banteay Meanchey	748,100	470,000	183,600	25	0.4
Battambang	1,250,100	566,000	619,800	50	1.1
Kampot	501,900	500,000	274,800	55	0.5
Kandal	366,300	957,000	73,400	20	0.1
Koh Kong	1,296,300	36,000	1,190,000	92	33.1
Kompong Cham	935,800	1,514,000	274,300	29	0.2
Kompong Chhannng	525,800	313,000	218,000	41	0.7
Kampong Speu	6,756,000	481,000	3,667,000	54	0.8
Kampong Thom	1,307,600	536,000	743,500	57	1.4
Kratie	1,206,100	222,000	951,100	79	4.3
Mondulkiri	1,370,200	22,000	1,122,200	82	51.0
Preah Vihear	1,358,600	98,000	1,259,100	93	12.8
Prey Veng	484,700	951,000	12,000	2	0.0
Pur Sat	1,145,700	248,000	781,500	68	3.2
Ratanakiri	1,256,100	64,000	1,148,600	92	17.9
Siem Reap	1,57,600	657,000	971,400	62	1.5
Sihanoukville	142,600	75,000	110,800	78	1.5
Strung Treng	1,117,500	56,000	952,500	85	17.0
Svay Rieng	285,000	413,000	4,700	2	0.0
Takeo	343,000	751,000	24,200	7	0.0
Phnom Penh cap. (Tonle Sap Lake)	40,200 221,700	527,000 -	2,000 -	5 -	0.0 -
Total	18,153,500	9,457,000	11,284,200	62	1.2

Source: Mekong Secretariat

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List of Working Papers already released

APFSOS/WP/01	Regional Study - The South Pacific
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APFSOS/WP/03	The Implications of the GATT Uruguay Round and other Trade Arrangements for the Asia-Pacific Forest Products Trade
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APFSOS/WP/07	Country Report - Malaysia
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