United Nations Environment Programme

UNEP/GEF South China Sea Project

Global Environment Facility

NATIONAL REPORT

on

Seagrass in the South China Sea

CAMBODIA

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1. INTRODUCTION

Cambodia's shoreline is 435km long and includes the two provinces of Koh Kong and Kampot, and the two municipalities of Sihanoukville and Kep. The seaward boundary has been defined as the outer limit of the Exclusive Economic Zone (EEZ, 55,600sq. kilometres) (Nelson, 1999) but the landward boundary has not yet been defined. Cambodia's coastal and marine areas contain a diverse range of habitats and other living resources. Compared to neighbouring countries, these habitats and resources remain relatively intact, providing important nursery and feeding areas for a variety of species, especially those of significance to marine capture fisheries.

From a functional perspective, Cambodia's coastal zone is comprised of two inter-related systems, ecological and socio-economic systems. The ecological system includes the physical, chemical and biological parametres that provide natural resources, sequester pollutants and offer fundamental life-support functions (e.g. clean air and water) for humans and other living organisms. The socio-economic system is largely dependent upon the many functions and products of the ecological system.

Seagrass beds are critical habitats that support a diverse range of resident and migratory species, including some considered to be endangered and vulnerable. Since the 1972 Stockholm Conference on the Human Environment, an over-riding concern in the protection of the marine environment has been that of pollution. However, notwithstanding a number of regional action plans and conventions that have since been developed and implemented for the management of marine pollution, the quality of the marine environment has declined over the last thirty years (Miles, 1999).

The objectives of this report are to:

- Review past and ongoing research activities seagrass in Cambodia, including information relating to geographical location, physical and biological attributes, environmental state, social dependence and use, and economic valuation;
- Review past and ongoing seagrass-related programmes of concerned Ministries and NGOs, including comments regarding programme needs, priorities, and costs and benefits;
- Provide information about seagrass management, highlighting efforts in the economic valuation of seagrass goods and services carried out by concerned institutions;
- Discuss socio-economic and other influences on seagrass programme implementation in Cambodia;
- Discuss institutional requirements for the management of seagrasses within Cambodia's EEZ; and
- Provide baseline results from research and monitoring activities recently conducted in Cambodia.

2. REVIEW OF NATIONAL DATA AND INFORMATION

Very little research has been conducted on the status of fish stocks, the success of current management arrangements, and the impact of fishing on the marine environment. Most research has been funded by government and relevant organisations.

2.1 The Importance of Seagrasses to Humans and the Marine Ecosystem

The majority of seagrass studies in Cambodia have focused on ecosystem and management issues, hence, socio-economic information relevant to these resources is scarce. However, there are some reports detailing the importance of seagrass ecosystems to Cambodians. According to Tana and Chamnan (1995) one species (Khmer name *Smao Prayong*) is eaten by Dugong (*Dugong dugon*).

Cambodia's marine fisheries depend significantly on seagrass ecosystems. A large number of seagrass dependent fish and shrimp species are highly valuable in both domestic and international markets, and are subject to high levels of legal and illegal fishing effort. The collection of invertebrates by fishers using snorkel and mask is also popular in inshore seagrass areas.

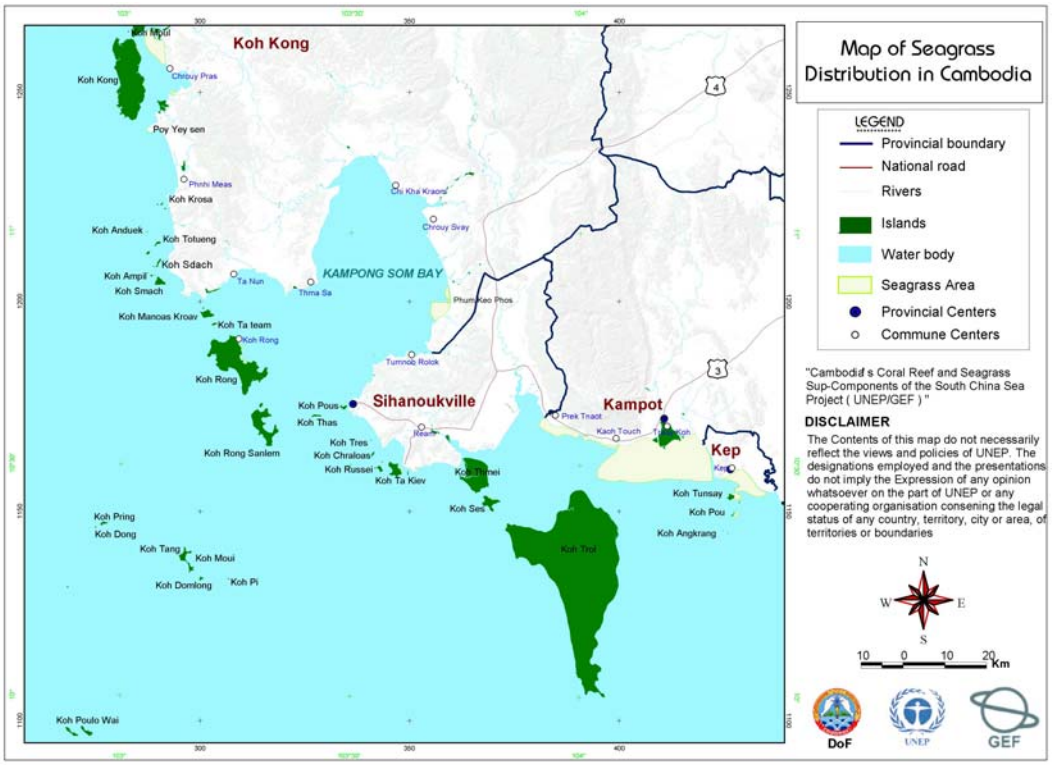
According to statistics of the Department of Fisheries, 42,000 to 45,000 tonnes of marine fish and invertebrates are harvested from Cambodia's marine waters every year. However, some observers estimate that actual landings could be 10 to 20 times higher than the reported figure. The overall representation of seagrass-dependent fish species in marine landings is unknown, but is most likely high.

2.2 Geographic Distribution of Seagrass

Seagrasses can be found in most shallow water areas of Cambodia's coastal zone. Recent surveys provide information about the location of significant areas of seagrass (Figure 1). However, the composition of seagrass species and variation in their distribution and abundance over time are largely unknown.

Extensive beds occur in waters adjacent to Kampot Province and Kep Municipality, with seagrass and/or mixed seagrass and *Caulerpa* beds found along the entire coast to the Cambodia-Viet Nam border (Ethirmannasingam, 1996 in Nelson, 1999). According to district fisheries officials, large areas of seagrass once occurred in Kampong Som Bay, although as a result of high intensity trawling and push netting, seagrass distribution and abundance has diminished significantly in this area. A limited survey conducted by Ethirmannasingam (1996) identified the presence of seagrass between mainland Cambodia and Koh Kong Island.

Seagrass habitats in Cambodia can be divided into two main types: extensive seagrass meadows along the mainland, and patches of seagrasses inter-mixed with corals around islands (Ethirmannasingam, 1996 in Nelson, 1999). Much of the muddy coast of Kampot Province supports seagrass beds, including extensive patchy beds near the river mouth at Kampot town and very large beds east of Koh Tunsay. Inshore seagrass beds are mixed stands of several species, while offshore, *Enhalus acoroides* occurs in extensive beds. Small seagrass beds have been observed in waters adjacent to Koh Rong and Koh Rong Sanlem (Wetland International Asia-Pacific and Lower Mekong Basin Program, 2001).



Source: DoF, 2004 a.

Figure 1 Map of seagrass distribution in Cambodia.

A survey conducted by Fishery Department officials in 2004 using GPS found that the total area of seagrass in Cambodia's waters is 32,492ha (DoF, 2004 b). The seagrass area at Kampot covers 25,240ha, and can be divided into three meadows. The first, extending from Prek Trapeang Ampil to Prek Kdat, has an area of 1,795ha; the second, extending from Prek Kdat to Prek Koh Torch (Kilometre 12) covers 380ha; and the third, 23,065ha, starts at Prek Koh Torch and extends to Kep Town. Seagrass beds typically occur in water depths of 3 to 4m, with salinity ranging from 25ppt to 30ppt, and most seagrass areas have been damaged by trawl and push net fishing. This damage results from the fact that, despite a ban on trawling in water less than 20m depth, this law is not enforced.

2.3 Physical/Chemical Characteristics

Information about the environmental factors influencing seagrass distribution and abundance in Cambodia is lacking. However, preliminary sea surface and air temperature, sedimentation, depth, turbidity, and visibility data have recently been gathered. Generally, visibility is low to very low in areas where most seagrass beds are situated, especially during the rainy season. The substrate is typically muddy, although some areas are characterised by a mixture of sand and mud substrate types.

2.4 Biological Aspects

2.4.1 Seagrass

Seagrass play an important role for marine animals, including dugongs and green turtles, and provide habitat for many commercially important fish and crustacean species. They also maintain water quality by absorbing nutrients and stabilising sediments (Short *et al*, 2001). A total of nine species of seagrass have been reported from Cambodia's coastal waters by the Kampot Working Group (2002) as follows:

- *Thalassia hemprichii,*
- *Halodule uninervis,*
- *Enhalus acoroides,*
- *Halophila decipiens,*
- *Cymodocea serrulata,*
- *Halodule pinifolia,*
- *Cymodocea rotundata,*
- *Syringodium isoetifolium,* and
- *Halophila ovalis*

2.4.2 Associated Marine Biota

The exact number of seagrass associated species is unknown. Many economically important species of fish and crustacean are associated with seagrass habitats and use these areas for spawning, nursing grounds, as well as feeding. The shallow water seagrass beds occur on soft sediments. In these areas, shrimp and demersal fish species, squid and cuttlefish, slipper lobster and mantis shrimps are found amongst seagrass (Ing, 2003).

2.4.3 Marine Endangered Species

Many groups of marine living resources are under threat from human activities and natural phenomena and some species of fish, reptiles, marine mammals and corals are becoming endangered. Based on a review conducted for the fisheries component of UNEP/GEF South China Sea Project, there are 12 species of marine mammals and 5 species of sea turtle in Cambodia's marine waters (Ing, 2003). According to Tana (1995) there are three species of marine mammals along the Cambodian coastline that are accidentally caught by gill nets and shrimp trawlers in the seagrass beds of Sihanoukville and Kampot Bay, i.e., Irrawady dolphin (*Orcaella brevirostris*), Spinner dolphin (*Stenella longirostris*) and dugong. Most species of marine mammals are assumed to be vulnerable, endangered or critically endangered, either locally or globally and therefore conservation of these species is a high priority of the Department of Fisheries.

2.5 Threats to Seagrass

Seagrasses are threatened by destructive fishing practices particularly demersal trawling, push netting, and other active fishing gears that damage seagrass and disturb sediments (Tana, 1995). Fisheries landings from seagrass areas have recently declined, leading to stakeholder concerns about the effects of trawling in these areas. Decline in water quality associated with agricultural use of fertilisers and pesticides, and increased erosion from unsustainable logging practices also threaten seagrass. Fertilisers can encourage the growth of algae that out-compete seagrass or epiphytic algae that reduce the ability of seagrass to photosynthesise, often leading to dieback. Erosion from poor land use can result in increased water turbidity which reduces the quantity of sunlight reaching seagrass plants, diminishing the photosynthetic capacity of the plants.

2.6 Causal Chain Analysis, Including Constraints in Addressing Threats

Cambodia's national coral reef and seagrass committee has convened numerous meetings at the national level aimed at reviewing local and national threats to seagrass. Causal chain analyses have been conducted to identify the causes of the five key threats to coral reefs and seagrasses in Cambodia. These key threats include:

- Sedimentation,
- Unsustainable fishing practices,
- Seaweed farming on seagrass beds,
- New settlements near seagrass areas, and
- Unsustainable development in coastal areas.

Owing to the comparatively short coastline of Cambodia, the causes of degradation of seagrass beds are similar in all areas. A series of flow charts have been prepared to highlight threats to seagrass at the local and national levels. The example provided in Figure 2 is based on information for Kampot Province.

These flow charts begin with the main threat at the top and then detail the root causes of these threats. In response to the causes, a series of intervention measures have been identified that are located at the base of the flow chart.

Seagrass and coral reef areas are thought to respond to key threats in a similar manner. However, trawling and push net fishing is thought to be more damaging to seagrass, whilst cyanide and dynamite fishing are more serious threats to coral reef areas.

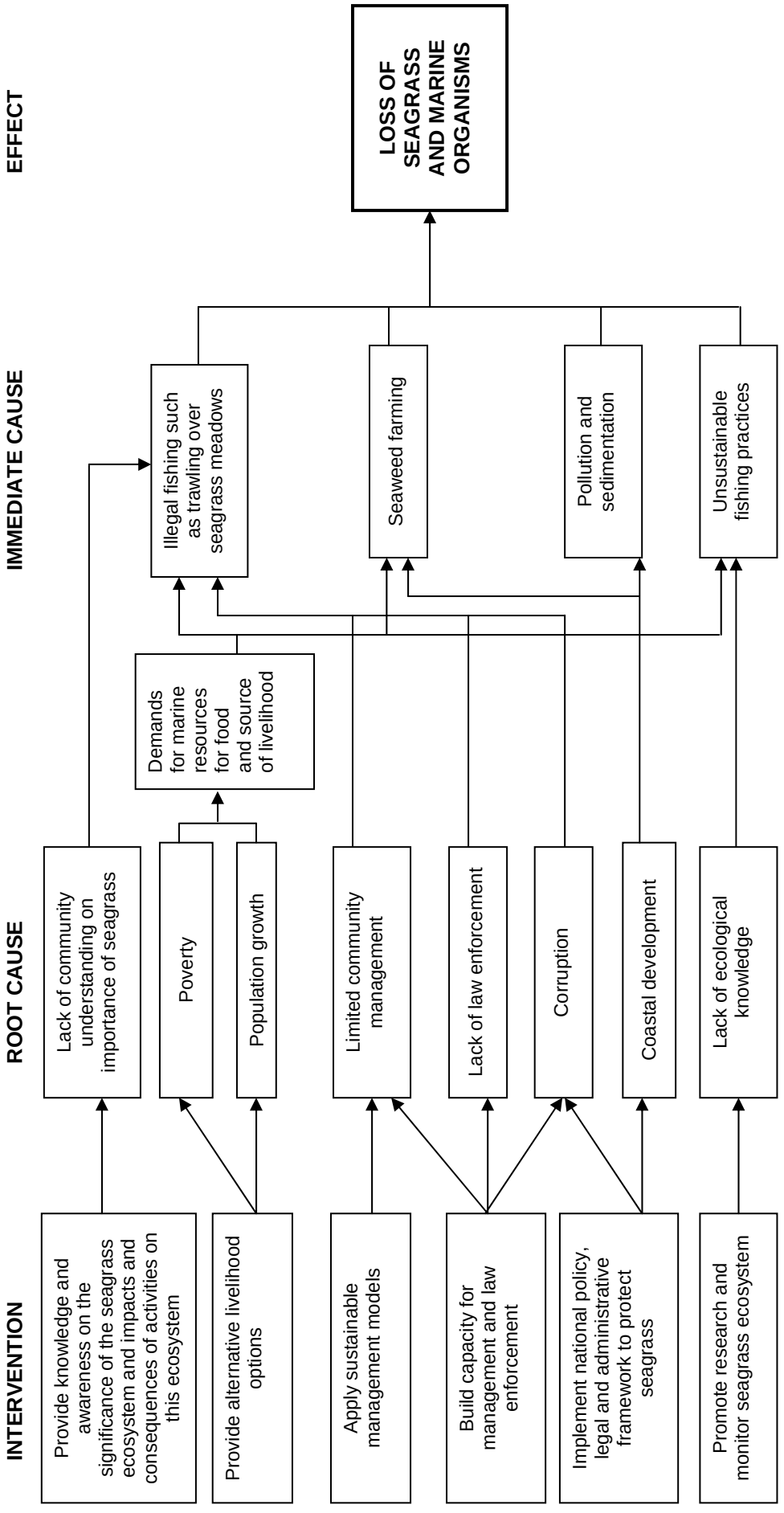


Figure 2 Causal chain analysis of threats to seagrass in Cambodia.

3. SOCIO-ECONOMIC SITUATION WITHIN COASTAL AREAS

The development of Cambodia's coastal zone continues to occur at a rapid pace, fueling concerns regarding the unsustainable use of natural resources in the coastal zone. The status of many coastal and marine resources is however, largely unknown.

This section aims to review information about the economic value of coral reefs and seagrasses in Cambodia. Issues in the management of seagrasses and coral reefs, including the socio-economic circumstances of coastal communities, problems at the operational management level, and institutional frameworks will be discussed.

3.1 Population Size and Composition

The population census conducted in March 1998 (the first census in 36 years) showed a population of 11.4 million, with approximately 85% living in rural areas.

As can be seen in Table 1, populations ranged from 28,677 in Kep to 527,904 in Kampot Province. The national average household size was found to be 5.2, which is slightly higher than the average household size of 5.0 in Kampot province, but lower than Koh Kong (5.3), Sihanoukville (5.5), and Kep (5.3). Women represent 52.1% of the population in Kampot; 48.8% in Koh Kong; 50.6% in Sihanoukville; and 51.1% in Kep (Ministry of Planning, 1999).

On a provincial basis, the proportion of female-headed households ranged from 22.5% to 26.8%. In coastal areas, 24.8% of households were headed by females; however, this is lower than the national average (Ministry of Planning, 1999).

The average population density in Cambodia is 64 persons per km^2, but the density in Koh Kong is considerably lower at 12 persons per km^2 compared with Kampot (108) and the municipalities of Sihanoukville (179) and Kep (85). Table 1 and Figure 3 highlight the population size and density of Cambodia and its coastal areas.

Table 1 Population size and density of Cambodia and its coastal areas.

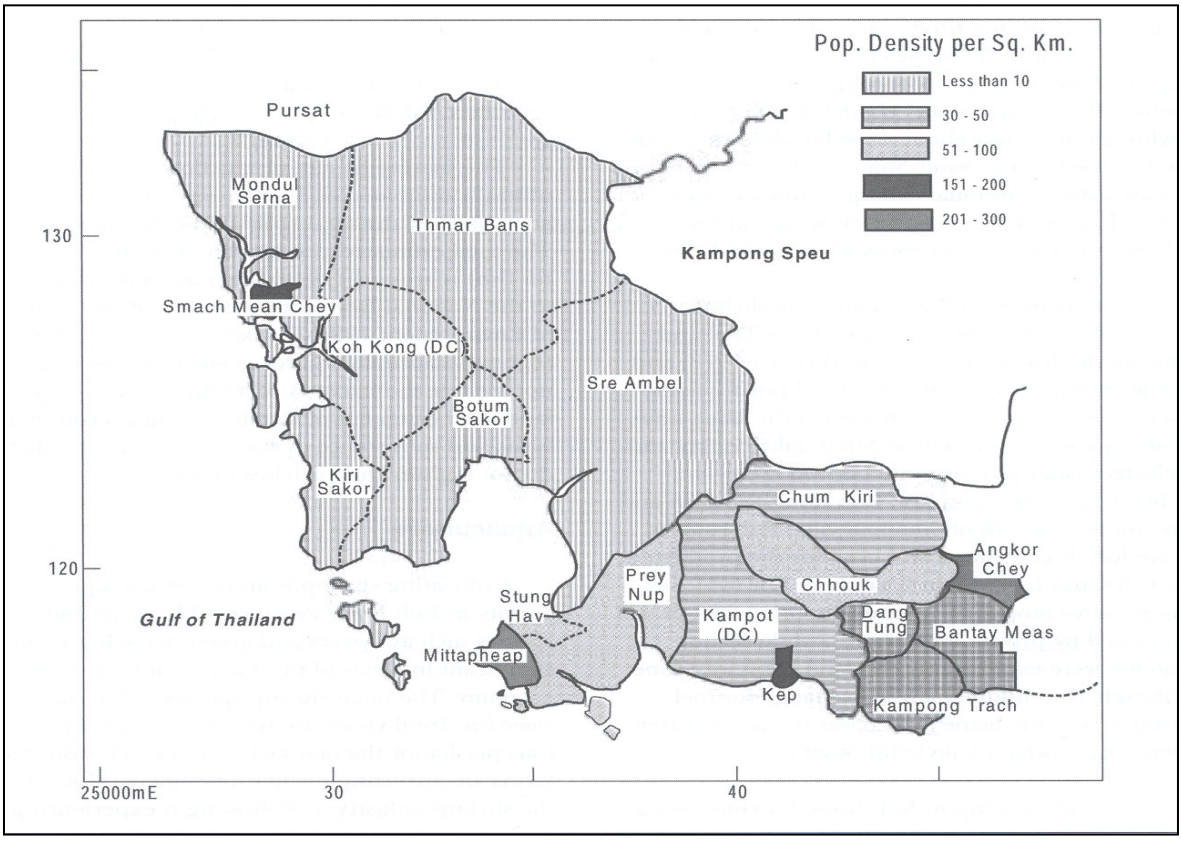
Location	Areas (Km^2)	Population	Women (% of total)	Density (/km^2)
Cambodia	181,035	11,426,223	51.8	64
Kampot	4873	527,904	52.1	108
Koh Kong	11160	131,912	48.7	12
Sihanoukville	868	155,376	50.5	179
Kep	336	28,677	51.0	85

Source: Ministry of Planning, 1999.

Cambodia's population is growing at an estimated annual rate of 2.4% (Ministry of Planning, 1999). The population is mostly comprised of people of Khmer decent (90%) and the main ethnic groups are the Cham, Vietnamese, and Chinese and others from different hill tribe groups. It is estimated that 95% of the population speak the Khmer language. The main religion in Cambodia is Theravada Buddhism, while the Cham are Muslim. There are no estimates of the distribution of ethnic groups in coastal areas. Village studies carried out by ECZM project showed that the proportion of Cham people on at least part of the coastline is relatively high.

3.2 Occupation

There is a scarcity of clear information about the occupations of Cambodia's coastal people. However, the ECZM project conducted a review of socio-economic circumstances observed in coastal areas of Cambodia. It identified that most households depended on several occupations and sources of income, but fishing was the main occupation in six villages of Sihanoukville, six villages of Kampot, five villages of Koh Kong, and three villages of Kep. This study also indicated that most villagers also farm rice for family consumption (Carl Bro International, 1999).



Source: ICLARM, 2001.

Figure 3 Population densities in the coastal zone of Cambodia (1996-1997).

3.3 Migration

There was considerable rural to urban migration in the years immediately following the 1993 elections, as villagers searched for better employment opportunities in the largely urban private sector generated by the influx of international development assistance. Village studies carried out by the ECZM project indicated that the present migration into and out of most coastal areas is limited. The migration into the coastal areas of Koh Kong province has, however, been substantial over the last 20 years. Table 2 highlights the migration by reason and by gender.

Table 2 Reasons for migration into Cambodia's coastal zone by reason and gender.

Reason for migration	Both Sex (%)	Males (%)	Females (%)
Total	100	100	100
Transfer work	11.0	15.2	3.2
To search for employment	31.0	29.6	15.6
Education	2.5	2.8	1.6
Married	11.4	12.2	9.3
Family moved	53.9	28.9	56.2
Natural calamities	2.7	2.6	3.0
Return after replacement	6.0	5.3	6.1
Other reasons	5.2	3.6	5.1

Source: Ministry of Planning, 1999.

3.4 Education

According to the 1998 census, 61.2% of Cambodia's literate population had not completed primary education. In Kampot, Koh Kong, Sihanoukville, and Kep, the percentage of the population yet to have completed education at a primary level was 65.9%, 58%, 56% and 68%, respectively. A small percentage (1.45%) of Cambodia's literate coastal population had acquired literacy without formal education and passing any grade or class. Cambodia is very much an oral society and letters are rarely used to provide news to relatives or friends. Villagers in rural areas rarely have access to newspapers, books, or any other written materials.

Recent studies show that gender disparity in education is greatest among the poor, but it is also significant among the richest 20% of the population. Boys and girls have fairly similar school enrolment rates until the age of 10; by 15 years of age, male enrolment is 50% greater than that of girls, and by 18 years of age, male enrolment rates are nearly three times as large as female enrolment rates. This means that initially, parents send both their sons and daughters to school, but take the girls out of school earlier than the boys. Household survey data suggest that more than 60% of children drop out of school because they have to help the family with household and market work. Furthermore, parents are often reluctant to send their girls to secondary school as they would be required to travel long distances or stay away from home (Ministry of Planning, 1999).

3.5 Household Income

According to a socio-economic survey conducted by the Ministry of Planning in 1999 (Ministry of Planning, 1999), the subsistence agricultural sector dominates both total employment and incomes, and there is a relatively small proportion of the population in wage employment. Nationally, earnings from self-employment were estimated at 241,990 Riels (US$63.43) per household per month, or 60% of the total monthly household income (Table 3). Income from wage employment amounted to 83,687 Riels (US$21.94) or 20% of total income, or one-third the value of earnings from self-employment. The contribution from all other sources of income, which consisted of rental income, interest received transfers, and imputed value of house rents etc., was about the same as that of wage employment.

In Phnom Penh, the main source of household income was wage employment contributing 35% of total income, a share that is marginally higher than the contribution from other income sources. In the case of Phnom Penh, income from the three main sources was nearly equal. In the rural sector, however, self-employment income contributed over 70% of household income, with wage employment contributing less than one sixth of the household income. In monetary terms, income from wage employment amounted to only 48,442 Riels (US$12.70) per household per month. The relative contributions from these three sources in the other urban areas were the same as for Cambodia as a whole, although the numerical value of household income in the urban areas is more than 160% of the value of household incomes in the rural sector (Ministry of Planning, 1999).

Table 3 Average monthly household income by main source of income by stratum in Cambodia during 1999 (Riel).

Main Sources of Income	Cambodia		Phnom Penh		Other Urban		Rural	
	Value	%	Value	%	Value	%	Value	%
Total Income	403,334	100	1,139,553	100	515,027	100	314,247	100
Self-Employment Income	241,990	60	345,340	30.3	298,509	58.0	224,352	71.4
Income from Wage Employment	83,687	20.7	397,463	34.9	109,609	21.3	48,442	15.4
Other Income	77,657	19.3	396,750	34.8	106,909	20.8	41,452	13.2

Source: Ministry of Planning, 1999.

The 1999 survey conducted by the Ministry of Planning estimated the average monthly household income of the country to be 403,334 Riels (US$105.72). There were large differences in the sectoral distribution of household incomes; the households in Phnom Penh on average received 1,139,553 Riels (US$298.70) per month, which declined to 515,027 Riels in other urban areas and to 314,247 Riels (US$82.37) per month in the rural sector. Thus, the average income of households in Phnom Penh was 262% higher than that of rural households, which depended mainly on farm incomes. The

differentials in household income were less marked among the ecological zones, rising from 319,211 Riels per month in the less developed Plateau and Mountain zone to 452,023 Riels (an increase of 41.6%) in the Plains zone that contains the capital city and several provincial towns with urban populations (Ministry of Planning, 1999).

The average *per capita* income of Cambodia was 79,355 Riels (US$20.80) per month (Ministry of Planning, 1999). Thus, the annual *per capita* income received by households amounted to US$249.60. The average *per capita* monthly income of all ecological zones, other than that of the Plains zone was lower than the national average. The differentials between the Tonle Sap zone, which had the lowest *per capita* income, and the Plains zone, which had the highest, was less than 30%. The *per capita* income of households in the Tonle Sap areas has dipped below that of the Plateau and Mountain zone as the average household size in Tonle Sap is higher than that of the Plateau and Mountain zone.

The survey also indicated that the average income per person per month in the coastal zone is US$19.50. The level is higher than that in the Tonle Sap zone (US$17.80) and mountain zone (US$18.21), but is lower than in the plain (US$23.09).

3.6 General Socio-economic Problems

Lack of rice and other food: Many informants in socio-economic studies mentioned lack of rice for several months each year as a major problem. Some also mentioned the lack of other types of food as a problem. Most households had a small plot of land where they grew rice for household consumption. However, most of the plots were small, which meant that the villagers had to purchase and/or borrow rice for part of the year. Other reasons for lack of rice and other food were bad weather and insect attacks. The two most commonly suggested solutions to this problem were for an outside organisation to provide food and seeds/seedlings for different fruit trees. The provision of more land was suggested in some villages.

Lack of water during the dry season: The main sources of water in most villages are dug wells and ponds. However, most households lack water during several months of the dry season when they either collect water from streams, springs, or ponds up to 5km from their houses or purchase water at relatively high prices. The survey conducted by CZM/DANIDA (Nelson, 1999) suggested that an outside organisation should construct more dug wells and/or ponds in villages.

Lack of schools, paths, and health facilities: Some children do not attend school because of the distance to the school and/or because they have to look after younger siblings, help with household work, farming, fishing, and other work. Many villagers identify the lack of schools and facilities, as well as an insufficient number of teachers, as a major problem and suggest the construction of a school in the village. Construction of proper paths and repair of paths is also considered a priority by many villagers for easier access to markets, schools, and other facilities. Lack of hospitals/clinics is another problem, especially for poor households who cannot afford to travel to hospitals or clinics far from their village.

Lack of capital for productive use: Many households mentioned the lack of capital to invest in fishing, farming, and other equipment as a major impediment to an improvement in their living standards. Often villagers are forced to sell their products to the traders at low prices in lieu of paying interest on loans. Other households borrow money from rich neighbours and other moneylenders at interests of up to 150% per month. Provision of long-term loans with no or low interest is seen as the solution to this problem. Villagers also suggested establishing a fishing association to be responsible for the extension of loans.

Decline in fish catch: The living standards of people are reputed to have declined over recent years. The main reasons for this are a significant reduction in availability of natural resources, especially marine fishery resources, due to the use of trawlers in shallow water, the use of modern fishing equipment like motorised push nets, a substantial increase in the number of fishers and boats, use of dynamite in rocky and coral areas, and the destruction of mangroves in order to establish salt pans or shrimp farms (Sihanoukville Coral Reef Working Group, 1999). Villagers have suggested that the use of illegal fishing equipment and methods be controlled, and that seagrasses, coral reefs, and mangrove be protected and rehabilitated to aid the resolution of this problem. Some villagers have suggested that a mangrove protection group be established.

Lack of mechanisms for participation in decision-making: The participation of villagers in decision-making is virtually non-existent. The only mechanism for villagers to express their views is through the village leader to the commune leader and district authorities. If the district does not wish to take action on their views there is no process of appeal. In some instances, this has led to rioting and destruction of private property.

Fishing conflicts: Small-scale, trawl, and motorised push net fishers are in conflict over access to inshore areas and fish resources. Trawls often destroy small-scale fishing gear and large commercial operators typically do not pay compensation to local fishers. Small-scale fishers cannot claim compensation as trawling is banned in most inshore areas and the crews of such vessels are usually under the protection of high-ranking military, police, or government officials. Push net fishing is believed to be highly destructive of habitats such as seagrass and may take large catches of juveniles when used inshore.

4. INSTITUTIONAL ARRANGEMENTS AND NATIONAL LEGISLATION

4.1 Roles and Responsibilities in Coastal Zone Management

There are a number of government bodies in Cambodia with responsibility for coastal zone management. The main ministries include the Ministry of Agriculture, Fisheries and Forestry (MAFF), the Ministry of Industry, Mines and Energy (MIME), the Ministry of Tourism (MT), the Ministry of Public Works and Transport (MPWT), the Ministry of Rural Development (MRD), the Ministry of Women's Affairs, the Ministry of Planning, and the Ministry of Environment. Additionally, there are a number of existing ministerial committees with responsibility for certain key issues. The two of significance in the coastal zone are the National Committee for Land Management, Urbanisation and Construction and the Committee on Land Tenure. Also of relevance to the coastal zone is the Cambodian Development Council, which is the body responsible for the management of foreign investments, including both private business and donor investments.

A National Steering Committee chaired by the Minister of Environment, with representatives from other institutions and ministries with a stake in the coastal zone, oversees Coastal Zone Management in Cambodia (see below).

National Steering Committee

Minister	Ministry of Environment (Chair)
Under-Secretary of State	Ministry of Agriculture, Fisheries and Forestry
Under-Secretary of State	Ministry of Tourism
Under-Secretary of State	Ministry of Industry, Mines and Energy
Governor	Kampot Province
Governor	Kep Municipality
Governor	Sihanoukville Municipality
Governor	Koh Kong Province
Representative	Cambodian Development Council
Representative	Ministry of Public Works and Transport
Representative	Ministry of Rural Development
Chief	Coastal Co-ordination Unit
Representatives	NGO and other donor projects in the Coastal Zone

Day-to-day management of coastal resource and their use is the responsibility of the Ministry of Agriculture, Forestry and Fisheries, particularly the Department of Fisheries (Nelson, 1999). There are fisheries personnel at district and provincial levels responsible for patrolling and managing commercial and medium scale fisheries. They also monitor and protect critical fisheries habitats such as mangroves, seagrasses, and coral reefs.

The mandate of the Ministry of Environment overlaps with that of the Ministry of Agriculture, Forestry and Fisheries to a certain extent. The Ministry of Environment is responsible for the management of protected areas and for overseeing environmental protection. This includes protection of coral reefs, seagrasses, and mangroves, particularly when they occur in a protected area. This overlap does not seem to be problematic for managers on the ground, but requires legal clarification.

Ministry of Industry, Mines and Energy is responsible for management of industrial operations, including licensing and regulation of salt farming, oil and gas exploration, mining, quarrying and cement production, brewing, garment and shoe manufacturing, and small-scale industries such as iron-mongery and cabinet-making.

Ministry of Public Works and Transport is responsible for management of the Port of Sihanoukville, the ferries that run between Sihanoukville, Koh Sdach, Sre Ambel and Koh Kong, development of infrastructure, sewage and waste disposal, and main roads (not rural roads that are the responsibility of the Ministry of Rural Development).

Ministry of Rural Development is primarily responsible for assistance to the rural areas of the country. The Ministry and its provincial and district offices are responsible for rural water supply (wells), roads, community development, primary health care, credit schemes, small-scale irrigation and other community-level initiatives for furthering the welfare of rural communities.

Ministry of Tourism promotes and develops tourism in Cambodia, including all aspects of planning, legislation, and policy.

The provincial governors are highly influential in provincial areas. They control the budgets of provincial sectoral departments. It is very unclear how decision-making powers are divided between provincial and national decision-makers. It may depend on the personal power of the provincial governor compared with officials at the central government level. A draft Environmental Impact Assessment (EIA) Sub-decree is currently before the National Assembly (Nelson, 1999). This law will require all coastal developments to pass an EIA administered by the Ministry of Environment.

There is currently no mechanism for coordinating the operational activities of the different ministries in the coastal zone. In the future, coastal management may be managed through the National Steering Committee or through the Coastal Co-ordinating Unit of the Ministry of Environment, which is now trying to build its capacity through improvements to its facilities and equipment.

4.2 Management Policies and Guidelines

Broad guidelines for environmental management were outlined in the First 5-Year Socio-Economic Development Plan (1996 to 2000), which states clearly that the country lacks a coherent management structure for the sustainable use of the available natural resources. The plan identified seven key environmental issues, among which degradation of the coastal zone was included. The plan also indicates that coastal zone planning and local zoning and development plans should be developed for the coastal region. Local area management plans should target specific types of anticipated activities, such as aquaculture development, oil and gas production, or tourism resort development. The Ministry of Environment in conjunction with the Ministry of Public Works and Transport and the National Committee for Land Management, Urbanisation and Construction should conduct this planning.

The medium term goals of the government with respect to coastal zone management include:

- The development of a preliminary coastal zone master plan with delineation and zoning of critical sections of the coast;
- The development of local area management plans for areas of intensified activity;
- Definition of the institutional mechanisms for implementation of the plans; and
- Provision of local infrastructure and services. Regulatory surveillance by MoE, development of local institutions for the provision and maintenance of infrastructure, and compliance with environmental criteria and surveillance.

Other national policies with respect to CZM include the fisheries policy, or more specifically, the management of the marine fisheries in the country. The main points in this policy include:

- The creation of job opportunities and improved livelihoods for local communities;
- Equity in access to and distribution of benefits within the fisheries sector;
- The encouragement of integration of fisheries management within overall rural development in fishing communities;
- The extension of institutional responsibilities of fisheries management to the communities; and
- The enhancement of protection and sustainable use of the fisheries resources of Cambodia.

Industrial sector policy is also significant to coastal areas in that it can play a key role in determining whether coastal developments are undertaken in an environmentally-friendly manner or not. The main elements of the existing industrial policy include:

- Encouragement of industrial development that ensures political, economic and social stability;
- The development of an industrial base for the country that will maximise the use of existing natural resources, attract foreign investment, and promote technology transfer and human resource development;
- Provision of support to the Ministry of Education in the development of vocational training;
- Increased effectiveness, competitiveness, and modernisation in the free market economy;
- The creation of special economic zones to facilitate new industrial foundations;
- The social and economic development of the country through industries, value-added natural resource exploitation, sustainable economic development and job opportunities;
- Development of a petroleum training institute; and
- Development of agro-manufacturing and food processing industries.

Key policy initiatives within the tourism sector include:

- Increased foreign exchange earnings;
- Increased investment in all aspects of tourism;
- Employment creation;
- Increased regional development;
- Enhancement and preservation of national heritage; and
- Development and conservation of the physical and environmental resources in the coastal areas.

Of critical importance to CZM on environmental policy:

- The implementation of all national policy and programmes relating to the environment
- The protection of the environment from all economic development
- Conservation through the creation of protected areas
- The development of laws and sub-decrees with respect to environmental management, conservation, and protection
- The strengthening of existing laws and sub-decrees with respect to environmental management, conservation, and protection
- The preparation and implementation of national and regional environmental action plans through coordinating functions
- Ensuring sustainable development.

In addition to these general policy statements about the environment, the National Environmental Action Plan (NEAP) provides clearer guidance on specific policy issues. This plan was adopted by the Council of Ministers in 1997 and is meant to provide strategic guidance on key issues. It was developed through a participatory process.

The main points of concern to the coastal sector in the NEAP include the section addressing coastal fisheries management, biodiversity, and protected areas as they relate to coastal areas, energy development, and urban waste management.

Although most ministries have policies to cover their area of responsibility, it must be noted that in most cases these policies are extremely broad, do not reflect the reality of the capacity of the ministry in question to implement them, and may not reflect the legal situation.

5. MANAGEMENT PERSPECTIVES–THE DEVELOPMENT OF A NATIONAL SEAGRASS ACTION PLAN

The goal of the National Action Plan for Coral Reef and Seagrass Management in Cambodia is to protect and manage coral reefs and seagrasses to promote the balance between utilisation and conservation and ensure that the benefits of this sustainable use contribute to the reduction of poverty and improve the quality of life for all Cambodia.

Mission:

- To maintain coral reef and seagrass diversity and production through the protection of ecosystem integrity.
- To manage human activities and utilise coral reef and seagrass resources in a way that preserves the ability of these ecosystems to sustain and improve quality of life for Cambodians.
- To ensure that the benefits coming from the sustainable use of these resources contributes to poverty reduction and food security.

Aims and Objectives:

Awareness of the important roles, functions, and economic values of coral reef and seagrass ecosystems is low among most Cambodians. As a result, these ecosystems have been poorly studied and information about their contribution to quality of life in Cambodia is scarce. This makes the task of developing policies and plans for resource management difficult.

Important aspects in the management and utilisation of coral reef and seagrass resources include: conduct scientific research and monitoring; apply national policy, legal, and administrative frameworks; enhance public awareness, communication and educational programmes; build and maintain human capacity; and apply the management system. To achieve this goal, the National Action Plan has the following objectives:

a. Implement National Policy, Legal, and Administrative Frameworks.
b. Establish management models to ensure sustainable use of coral reefs and seagrass.
c. Establish research and monitoring facilities to monitor coral reef and seagrass status to support conservation and management.
d. Build cross-sectoral capacity for sustainable coral reef and seagrass management at national and local levels.
e. Increase awareness within communities of the ecological roles and economical values of coral reef and seagrass to realise the balance between utilisation and conservation of these resources.
f. Create financial sustainability and improve economic status of coastal communities.

6. CONCLUSION AND RECOMMENDATIONS

Based on a review of existing research results it is clear that Cambodia's inshore seagrasses are threatened by increasing human pressures. This pressure comes from a variety of activities, including foraging on seagrass beds, the use of trawl or motorised push nets by commercial fishers, and a wide range of natural events and human activities within the coastal zone.

The review of income levels in coastal areas indicates that most people are poor and rely on fishing as a primary source of income and food. Due to socio-economic circumstances, including low levels of general education in most coastal areas, some fishers employ destructive fishing methods and many glean seagrass beds for a variety of food and ornamental organisms.

There is still a lack of clear policies and regulations for seagrass management in Cambodia. The responsibilities of the Department of Fisheries and Department of Environment (DoE) overlap in all coastal provinces. This has created confusion amongst departmental staff about their roles and responsibilities in the management of these ecosystems.

This review highlights a need for research into the ecology and management of seagrasses in Cambodia’s coastal zone. It is generally recommended that the following actions be carried out.

- Biological research on seagrass should be conducted throughout Cambodia’s EEZ.
- Socio-economics surveys should be used to improve understanding of the value of the goods and services provided by seagrass ecosystems.
- Capacity of Cambodian marine scientists and managers should be developed.
- Public awareness and education programmes should be implemented at the community level. More attention must be paid to the development of farmer and fisher knowledge about the role seagrass ecosystems play in the maintenance of their livelihoods and food security.
- Policies and/or sub-decrees for coral reef and seagrass conservation and management should be developed and implemented as soon as is practicable.

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