

ANALYSIS OF POLICIES TO ADDRESS CLIMATE CHANGE IMPACTS IN CAMBODIA

Final Draft

Ministry of Environment

March 2005

TABLE OF CONTENTS

I.	GENERAL INTRODUCTION	4
1.1	BACKGROUND	4
1.2	OBJECTIVES	4
II.	SECTORAL IMPACTS OF CLIMATE CHANGE	4
2.1	FLOOD AND DROUGHT	4
2.2	TYPHOONS	6
2.3	SEAWATER INTRUSION	6
2.4	MALARIA INCIDENCE	7
III.	SECTORAL ANALYSIS	7
3.1	NATIONAL DEVELOPMENT POLICY	7
3.2	PRIORITISED SECTORAL DEVELOPMENT PROGRAMMES	8
3.2.1	Agriculture, Fishery and Forestry	8
3.2.2	Water Resources and Meteorology	9
3.2.3	Coastal Zone	10
3.2.4	Human Health	11
3.3	PROGRAMMES FOR ADDRESSING CLIMATE HAZARDS	12
3.4	INTERNATIONAL FUNDING FOR SUPPORTING DEVELOPMENT IN CAMBODIA	14
3.5	INTERNATIONAL COMMITMENTS AND GLOBAL CLIMATE CHANGE POLICY	17
IV.	GAPS AND BARRIERS ANALYSIS	18
4.1	GAPS AND BARRIERS IN GOVERNMENT POLICIES	18
4.2	GAPS IN POLICIES FOR ADDRESSING CLIMATE HAZARDS	20
V.	CONCLUSION	21
	REFERENCES	23

LIST OF FIGURES

Figure 1. Total rice area affected by flood and drought. Note: solid arrows indicate El-Nino years, while dash arrows indicate La-Nina years (Source: MAFF, 1993-2000)	5
Figure 2. Flood Mitigation Projects (NCDM, 2002)	13
Figure 3. (a) Total Number of Irrigation Rehabilitation Projects in the Period of 2001-2005 and (b) the Total Project Cost by Province (MOWRAM, 2000)	14
Figure 4. Percentage of Funding from External Sources to Implement (a) National Malaria Control Program (www.theglobalfund.org), and (b) Water Resources, Meteorology and Irrigation Development (MOWRAM, 2004)	15
Figure 5. Status of Projects for Forestry, Agriculture, Fishery, Water Resources and Land Management for the Period 2000 to 2004 (Based on data compiled by WGNRM, MAFF, MOWRAM)	16
Figure 6. Project Funding Sources (Based on data compiled by WGNRM, MAFF and MOWRAM)	16

LIST OF TABLES

Table 1. Frequency of Floods and Droughts and Total Rice Area Affected	6
Table 2. Malaria Baseline and Target Indicators	11
Table 3. National Health Programmes in 2001-2005 and 2003-2007	12
Table 4. Summary of Global Commitments of the United Nations Framework Convention on Climate Change	17

I. GENERAL INTRODUCTION

1.1 Background

The increase of CO₂ emissions into the earth's atmosphere may lead to a change in global climate conditions. A study conducted by the Cambodian Ministry of Environment shows that global warming will affect the Cambodian climate (MoE, 2001). Under high emission scenarios, the mean air temperature in the next 20 years may increase by about 0.5 °C, and in the next 50 years by more than 1°C. Under low emission scenarios, the mean air temperature may increase by about 0.3°C in the next 20 years, and by about 0.7°C in the next 50 years. Global warming may increase wet season rainfall and decrease dry season rainfall. Based on studies in Stung Metoek, Russei Chrum, Stung Sala Munthun and Stung Chhay Areng, the dry season river flow may decrease up to 4 m³/s, while the wet season might increase by up to 10 m³/s (EVS, 1996). These findings would suggest that under global warming, the risk of drought and flood in Cambodia might increase.

The occurrence of drought and flood is common in Cambodia. In the Social and Economic Development Plan II (SEDP II), these climate hazards are recognised as the main contributors of poverty. Severe floods that occurred from 2000 to 2002 resulted in 438 casualties and caused damages amounting to US \$205 million (NCDM, 2002).

1.2 Objectives

The objectives of the present gaps and policies analysis are:

- To review the impacts of climate hazards and climate change in Cambodia;
- To review and assess sectoral policy gaps; and
- To identify long-term programmes for increasing sectoral adaptive capacity to changing climate conditions.

II. SECTORAL IMPACTS OF CLIMATE CHANGE

Climate hazards occurring in Cambodia include flood, drought and windstorms. In coastal areas, underground water salinisation, and seawater intrusion are common problems. The following sections provide an overview of the impacts of climate hazards in Cambodia.

2.1 Flood and Drought

Flood and drought are the two main extreme climate events and occur every year in a number of provinces. There are two types of floods in Cambodia: (1) flood resulting from an overflow of the Mekong and Tonle Sap Rivers and (2) flood resulting from extreme local rainfall. Most provinces in Cambodia, i.e. Stung Treng, Kratie, Kampong Cham, Kandal, Kampong Thom, Kampong Chhnang, Battambang, Siem Reap, Prey

Veng, Svay Rieng, and Takeo located along the Mekong and Tonle Sap tributaries are affected by the first type of flood.

The agricultural sector is the most heavily affected by flood and drought. As shown in Figure 1, rice production losses due to flood and drought have been significant. Based on historical data, flood and drought occur almost every year in rice producing provinces, such as Prey Veng, Takeo, Kampong Cham, Battambang, and Siem Reap (Table 1). These provinces account for more than 50% of national rice production.

Severe floods have resulted in a high number of casualties and destruction of infrastructures. The most severe floods, which occurred in 2000, killed some 350 people and caused US \$150 million in damages to crops and infrastructures (NCDM, 2002). The most severe drought, which subsequently occurred in 2002, affected more than 2 million people and destroyed more than 100,000 ha of paddy fields. The worst affected provinces were Prey Veng, Battambang, Kandal, Kampong Cham, Kampong Speu, Pursat and Takeo (CDRI, 2002). These facts indicate that the agricultural production centre of Cambodia is very vulnerable to extreme climate events. Efforts to increase the adaptive capacity of agriculture to climate change are therefore urgently required.

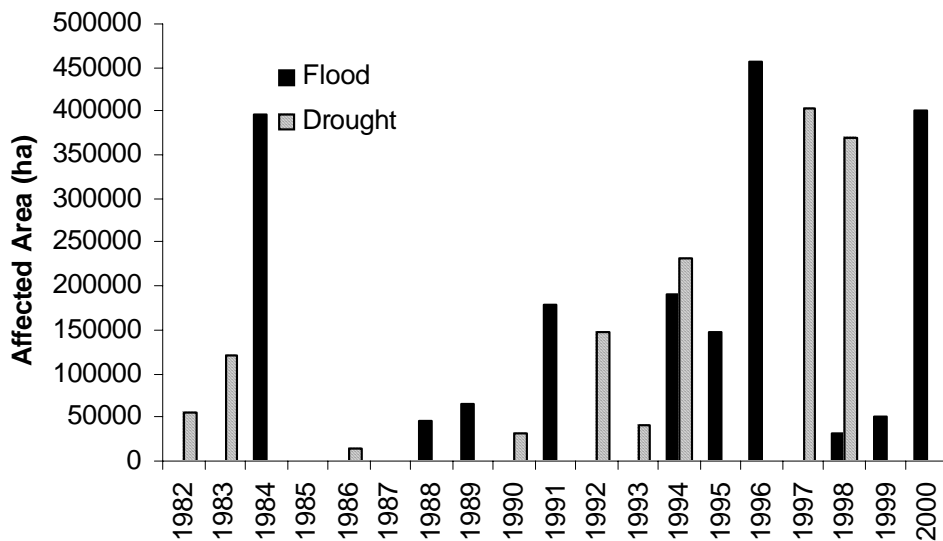


Figure 1. Total rice area affected by flood and drought. Note: solid arrows indicate El-Nino years, while dash arrows indicate La-Nina years (Source: MAFF, 1993-2000)

Table 1. Frequency of Floods and Droughts and Total Rice Area Affected

No	Province	Years of flood over a decade	Average (ha)	Years of drought over 9 years	Average (ha)
1	Prey Veng	10	42,270	9	23,275
2	Battambang	10	22,304	9	45,917
3	Takeo	9	21,223	9	5,587
4	Banteay Meanchey	9	16,675	5	17,519
5	Kampong Thom	10	15,255	9	7,996
6	Kampong Cham	8	14,773	8	9,139
7	Pursat	9	10,782	9	6,893
8	Siem Reap	9	9,581	9	7,729
9	Svay Rieng	9	9,471	9	4,442
10	Kandal	9	8,474	9	2,757
11	Kampong Speu	9	6,485	8	6,899
12	Kampong Chhnang	9	4,860	9	6,622
13	Kratie	8	4,614	8	1,113
14	Kampot	7	3,667	8	5,575
15	Stung Treng	7	2,087	5	2,667
16	Phnom Penh	8	1,534	5	495
17	Ratanak Kiri	7	1,197	5	733
18	Preah Vihear	7	1,037	6	1,512
19	Mondul Kiri	7	1,026	2	407
20	Sihanoukville	9	865	2	949
21	Oddar Meanchey	1	807	0	0
22	Koh Kong	5	190	3	810
23	Kep	1	4	0	0
24	Pailin	0	0	0	0

Source: MAFF (1993-2000).

2.2 Typhoons

Typhoons are rare in Cambodia and do not appear to be a serious threat to coastline integrity (EVS, 1996; GEC, WWF and Wetland International, 2000). Typhoons strike the Cambodian coastline every 2 to 5 years and normally occur at the end of the rainy season. In November 1997, Typhoon Linda hit the Gulf of Thailand. At the time, the wind speed in Sihanoukville reached 60 m/s. Over five days, approximately 400 mm of rainfall was recorded in coastal areas. Typhoon Linda destroyed 81 fishing boats, claiming some 100 victims and most of the paddy fields of the Sihanoukville area (MoE, 1998).

2.3 Seawater Intrusion

Underground water salinisation and seawater intrusion are common in coastal lowland areas used for agriculture, particularly during the dry season. Salinisation of groundwater occurs in Kep and Kampot Provinces (MoE, 2002a and 2002b). Similarly, most streams

in coastal areas experience seawater intrusion in the dry season (MoE, 2002a, 2002b; 2002c; and 2002d).

2.4 Malaria Incidence

Cambodia is geographically located in an area prone to vector and water-borne diseases, including malaria and dengue fever. Thus, changes in climatic conditions will have significant influence on the outbreak of these diseases. Cambodia already has the highest malaria fatality rate within Southeast Asia, with some 500 deaths per year (MoH, 2004). The percentage of malaria inpatients is the highest among communicable diseases within the country.

The Ministry of Health, especially the National Centre for Parasitology, Entomology and Malaria Control (CNM), has limited financial and human resources to fight malaria. Although malaria incidence has decreased since 1999, case fatality rate has increased from 3.2% in 1998 to 4.3% in 2002 (MoH 1999 and 2004). However, under changing climate conditions, the incidence of malaria might increase in Cambodia in the range of –1% to +16% (MoE, 2001a).

III. SECTORAL ANALYSIS

3.1 National Development Policy

In the Five Year Socio-economic Development Plans, SEDP I (1996-2000) and SEDP II (2001-2005), the focus of Cambodia's development has been on reducing poverty while developing the country's human resources. Poverty is recognized in SEDP II as interrelated with population growth, urbanisation, food security, access to land and natural resources, provision of social services, physical infrastructures, corruption and lack of participation in decision-making.

In the National Poverty Reduction Strategy 2003-2005, the strategies for achieving the primary development objectives of reducing poverty are: (i) fostering broad-based sustainable economic growth with equity, with the private sector playing the leading role; (ii) promoting social and cultural development by improving the access of the poor to education, health, water and sanitation, power, credit, markets, information and appropriate technology; (iii) promoting sustainable management and use of natural resources and the environment; and (iv) improving the governance environment through effective implementation of the Governance Action Plan (CSD, 2002).

As stated in the SEDP II, extreme climate events such as flood and drought are two events recognized as the main of poverty in Cambodia. In the SEDP II and the NPRS, adaptation to flood and drought have been explicitly addressed in the context of agricultural improvement. The NPRS acknowledges the need for (1) capable human resources and institutional structures within the National Committee for Disaster Management (NCDM) in anticipation and emergency relief, and mitigation of impacts,

(2) improved weather and hydrological forecasting, (3) prevention of watershed from degradation and (4) a long-term flood management and mitigation strategy.

Under global warming, the frequency and intensity of these two events will increase which may further impoverish Cambodia. Therefore, addressing climate change should be a priority. In this respect, the Ministry of Environment (2001) has developed the National Action Plan on Climate Change (NAPCC). The NAPCC is complementary to the Cambodian government's development objectives, as stipulated in the SEDP II and other plans of various government agencies (forestry, energy, agriculture, environment, industry, health, etc.). The NAPCC aims to integrate climate change concerns into other national plans/programmes, to develop adaptation responses to climate change impacts, to design mitigation measures which are "no regrets" in character, and to catalyse the consensus of relevant stakeholders.

3.2 Prioritised Sectoral Development Programmes

3.2.1 Agriculture, Fishery and Forestry

The long-term policies and programmes of the Ministry of Agriculture, Forestry and Fisheries (1999-2010) aim to ensure food security and production surpluses (MAFF, 1999). The main issue is to maintain and increase the growth of agriculture while achieving food security under environmental pressures (e.g. climate change), and reducing poverty and increasing life quality. MAFF has defined seven priority actions for 2004-2008. These include the development of human resources, the development of legal and institutional framework, the improvement of the productivity and the diversity of agriculture products, land use reform, fisheries reform, forestry reform and the improvement of partnerships with the private sector and international organisations.

To achieve food security, the total planted area for rice must reach 2.5 million ha with a productivity of about 2.2 tons per ha (equivalent to 5.5 million tons of rice). This means that crop yield and area cultivated must increase at a rate of 2.7% per year. Starting in 2005, cultivated areas will be expanded through a voluntary settler's programme in newly irrigated areas. Crop productivity will be increased by improving farmers' knowledge through agricultural extension, encouraging private sectors to supply agricultural inputs, promoting research activities, the use of high yielding varieties and integrated pest management. Poverty alleviation will be achieved by promoting small-scale agro-industry in rural areas, improved marketing strategies and farm mechanisation.

At present, irrigated areas amount to only 19.5% of cultivated areas. There may be a physical potential to approximately double this area (Halcrow, 1994). Irrigation (i) supplements water for wet season lowland rice (12.5%), (ii) supplements water for dry season flood recession rice (5.8%) and (iii) supplements water for dry season lowland rice (1.2%). Existing irrigation schemes supplement water either at the start or end of the rainy season or during periods of drought. Supplementary irrigation allows for the timely planting of crops and crop survival during periods of drought. Irrigated areas account for

approximately 31.4% of the total rice production of Cambodia, showing the importance of irrigation for food security.

Fish is the main source of protein for Cambodians and contributes to about 40-50% of animal protein intake in rural areas (CSD, 2002). However, destructive fishing practices commonly occur and threaten the resource base. Policies that balance sustainability of resources and local food requirements need to be implemented.

Protecting forests is crucial to the resilience of ecosystems to climate variability. Forest degradation has reduced water quality and resulted in the sedimentation of watercourses. The NPRS (2002) intends to focus on the enforcement of the Cambodian Forestry Law, including protected forests demarcation, elimination of illegal logging and enlargement of natural forest conservation areas for eco-tourism.

The National Action Plan on Climate Change (MoE, 2001b) recommends the following mitigation and adaptation measures for the agricultural sector: (i) promotion of least GHG emission agricultural practises, (ii) improvement of consumption of non-rice staple foods (crop diversification); and (iii) expansion of the best available rice planting systems for suitable land areas. For the forestry sector, the proposed initiatives are (i) mitigation of GHG emissions through forest and land management planning reform; (ii) reforestation of damaged areas or tree planting in rural and urban areas; (iii) strengthening research capacity in the areas of climate change mitigation and adaptation, and (iv) conserving forest carbon through the improvement of protected areas management and forest resource management.

3.2.2 Water Resources and Meteorology

Effective management and sustainable use of the nation's water resources are key to poverty reduction in Cambodia. In 1999, the RGC created the Ministry of Water Resources and Meteorology (MOWRAM) as the lead agency for water resources management. Cambodia is rich in water resources. However, many agricultural areas are vulnerable to floods. Flood protection infrastructures are inadequate and there is no control of human activities that may worsen the effects of floods.

The agricultural, industrial, and tourism sectors cannot be developed without water resources. Hence, there is a need to improve and strengthen national capacity for water resources management in: (i) securing water supplies; (ii) mitigating water-related disasters; and (iii) balancing hydropower production (MOWRAM, 2000).

MOWRAM's programmes may be broadly divided into five categories: (i) Management of Water Resources Information, (ii) Water Resources Management and Development, (iii) Flood and Drought Management, (iv) Water Legislation and Sustainability, (v) Human Resources Development. In mitigating the impacts of natural disasters such as floods and droughts, MOWRAM will develop a comprehensive, long-term flood management and mitigation strategy based on an assessment of the communities and assets at risk and on estimates of cost of flood damage. The strategy will include the full

range of measures (i.e. climate and weather forecasting, structural measures such as flood embankments, and non-structural measures such as flood plain zoning). MOWRAM will also assess the likely future impacts of climate variability, particularly drought. The targeted investment for flood control and drainage is about US \$680/ha for an area of 10,000 ha per year (CSD, 2002).

3.2.3 Coastal Zone

Key agencies involved in the development and management of coastal areas include the Ministries of Land Management, Urban Planning and Construction; Agriculture, Forestry, and Fishery; Industry, Mines and Energy; Tourism; Public Works and Transport; Rural Development; and Environment. To deal with cross cutting issues, the government has established a National Coastal Steering Committee (NCSC). The NCSC is responsible for setting the overall direction of coastal projects and activities related to natural resources. The committee is chaired by the Prime Minister at the national level and by governors at the provincial level. Members of the committee include line ministries at the national and provincial level respectively from Health; Public Works and Transport; Information; Water Resources and Meteorology; and security forces.

The coastal zone is important to the Cambodian economy (recreation and tourism, industry, agriculture, fishery, transport, etc.). The government's objective is to optimise the use of coastal and marine resources, and fishery so that the contribution of this sector to food security, energy production and poverty alleviation may increase. Programmes currently implemented in this sector include (i) promotion of coastal tourism, (ii) intensification of salt mining, (iii) development of aquaculture, (iv) community fishery management, (v) private sector participation in developing industries, (vi) introduction and improvement of post harvest technologies, and (vii) offshore and gas exploration

The number of tourists visiting coastal provinces increased from 111,000 in 1995 (MoE, 2001) to 405,441 in 2002 (Thailand Institute of Scientific and Technological Research, 2004). In Kampot, salt production has been increased, as mangrove areas and unproductive shrimp farms have been converted to salt pans. The production of salt sharply increased from 76,000 tonnes to 152,000 tonnes in 1996 and 1998 respectively (MoE, 2001a). Some 1,439 ha of coastal land in Kampot have been set aside for aquaculture development (Cambodia Working Group, 1999). Local people in Kep and Kampot and two foreign companies have been growing seaweeds in over 90 hectares in Kep and Kampot (MoE, 2002a; 2002b). Seaweed farming is seen as an alternative livelihood for coastal communities (Ky Ngiep, 2004).

The coastal areas of Sihanoukville and Koh Kong have been given high priority as industrial zones (CSD, 2002). In order to promote industrial development, a 900 ha industrial zone and a 260 ha export processing zone were designated in Sihanoukville in 1994 (Cambodia Working Group, 1999). The government is also considering the establishment of an industrial zone of 200 to 300 ha in Koh Kong Province (RGC, 2001). Offshore oil and gas exploration is also being considered by government, as negotiations with neighbouring countries are proceeding in overlapping marine areas (ICEM, 2003).

As discussed earlier, coastal areas are vulnerable to climate hazards. The strong westerly wind, which is predominant in the wet season and changes northerly during the cool dry season between December and January, often causes heavy damages to both crops and properties (MoE, 1998). These impacts could be intensified under changing climate conditions. Sea level rise, increased sea surface temperature and prolonged drought, would affect agriculture and local livelihoods (MoE, 2001a). Low-lying agricultural and urban coastal lands would be the most affected. A study by Ministry of Environment (2001) estimated that a sea level rise of a meter would submerge 56% of Koh Kong City and about 4,400 ha of natural habitats in the province. With the exceptions of the National Climate Change Action Plan (MoE, 2001b) and the National Biodiversity Strategy and Action Plan (MoE, 2002), no government policy or legislation makes any mention of adaptation to climate change in coastal areas. In the National Climate Change Action Plan, recommended actions are limited to research activities to assess the potential impacts and possible response to sea level rise.

3.2.4 Human Health

The high prevalence of communicable diseases such as malaria, tuberculosis, dengue fever and HIV/AIDS are threatening a majority of Cambodian people particularly the poor (CSD, 2002). Cambodia's Millennium Development Goals set the year 2015 as the deadline to reduce malaria incidence and fatalities (Table 2).

In order to prevent and control communicable diseases, the Ministry of Health (2002) has implemented a number of programmes which can be broadly categorised as (i) improving health service delivery, (ii) accelerating behavioural change, (iii) improving health service quality, (iv) developing human resources, (v) strengthening health financial management and (vi) institutional strengthening. The focus of the programmes in 2001-2005 and in 2003-2007 is given in Table 3.

Table 2. Malaria Baseline and Target Indicators

Indicators	Baseline		Target		
	Year		2005	2010	2015
Malaria fatality rate (%)	2000	0.4	0.3	0.2	0.1
Proportion of people in malaria high-risk regions using treated mosquito nets (%)	1998	24	80	95	98
Number of malaria inpatients who have received treatment at public health centres (per 1000 people)	2000	11.4	9	7	4
Proportion of public health centres able to diagnose malaria with a 95% confidence level	2002	60	70	80	95

Source: MoP, 2003

Changes in mean temperatures and rainfall patterns, as a consequence of global warming, may cause mosquito outbreaks and increase malaria cases and fatalities. MoE (2001) has defined a number of initiatives to reduce the impacts of climate change on population health: (i) promotion of curative and preventive measures for vector-borne diseases; (ii) promotion of emergency response systems for sporadic climate change disasters; (iii) promotion of literacy; and (iv) comprehensive study on vulnerability and adaptation (V&A) to climate change in Cambodia's health sector.

Table 3. National Health Programmes in 2001-2005 and 2003-2007

Programme Categories	2001 – 2005¹	2003-2007²
Health service delivery	Improve coverage and access to health services, Prevention and control of communicable diseases	Improve coverage and access to health services, Prevention and control of communicable diseases Strengthen the delivery of quality basic health service
Behavioural change	Promote public awareness of healthy lifestyles Promote higher professional ethics among healthcare providers	Improve attitudes of healthcare providers
Quality improvement		Introduce and develop a culture of quality in public health
Human resource development	Develop human resources	Increase the number of midwives through basic training and strengthen the capacity and skills of midwives
Health financing	Decentralise financial and administrative functions	Ensure regular and adequate flow of funds to the health sector especially for service delivery
Institutional development	Promote health legislation Strengthen the health information system	Organisational and management reforms of structures, systems and procedures in the Ministry of Health

Source: ¹RGC (2001), ²MoH (2002).

3.3 Programmes for Addressing Climate Hazards

A number of programs have been implemented to reduce and mitigate the impacts of floods and droughts, which are the two main climatic hazards in Cambodia. In the last five years, at least ten types of projects have been implemented to address floods. Most of these projects consisted of the construction of water culverts, and the rehabilitation of roads and bridges damaged by floods, while the construction of dams, pumping facilities,

water gates and canals has been limited (Figure 2). Some roads were constructed as part of an effort to prevent or reduce the damages of floods in agricultural areas. Planting bamboo is a traditional method used by people who live along watercourses water bodies to reduce the impact of excessive flooding, as bamboo can reduce erosion and sedimentation. Adequate funding to support traditional flood mitigation methods is still lacking.

The impacts of droughts have similarly been addressed by a number of programmes. During the period 1999-2003, major activities have been (i) improvement of irrigation systems, (ii) rehabilitation of pumping stations and water pumps, (iii) water supply and sanitation, and (iv) establishment of Farmer Water User Communities (FWUC). For the period 2001-2005, MOWRAM’s objective has been to implement a total of 290 irrigation rehabilitation projects covering 532,673 ha of wet season rice and 154,368 ha of dry season rice, at a total cost of about US \$607 million (Figure 3). Up to 2003, 315 irrigation projects had been implemented, covering 153,149 ha of paddy rice, of which 89,383 ha for wet season and 63,766 ha for dry season (MOWRAM, 2003).

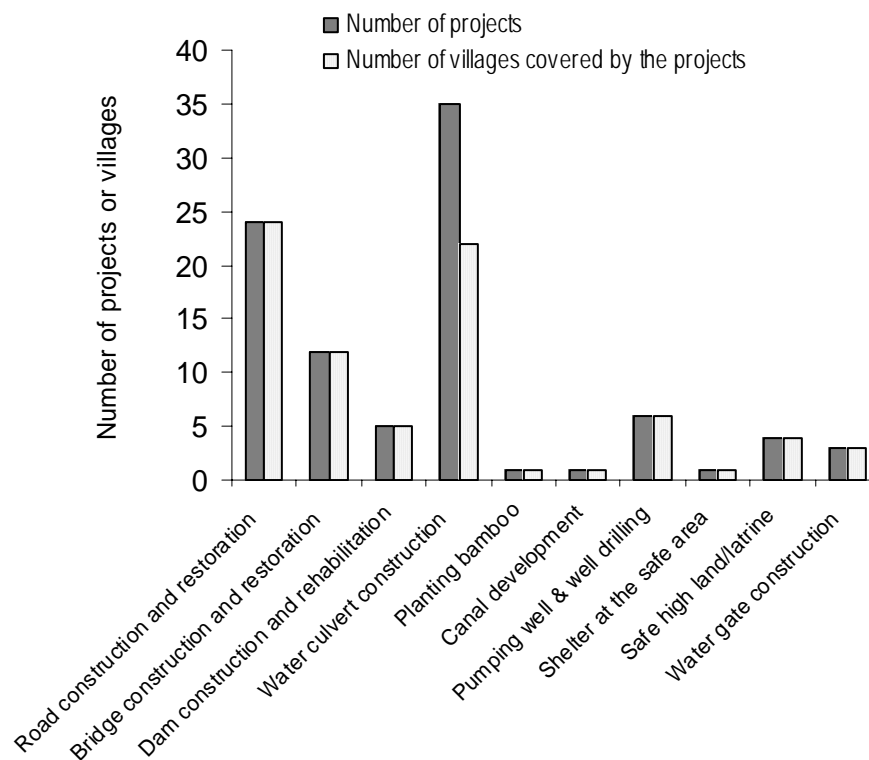


Figure 2. Flood Mitigation Projects (NCDM, 2002)

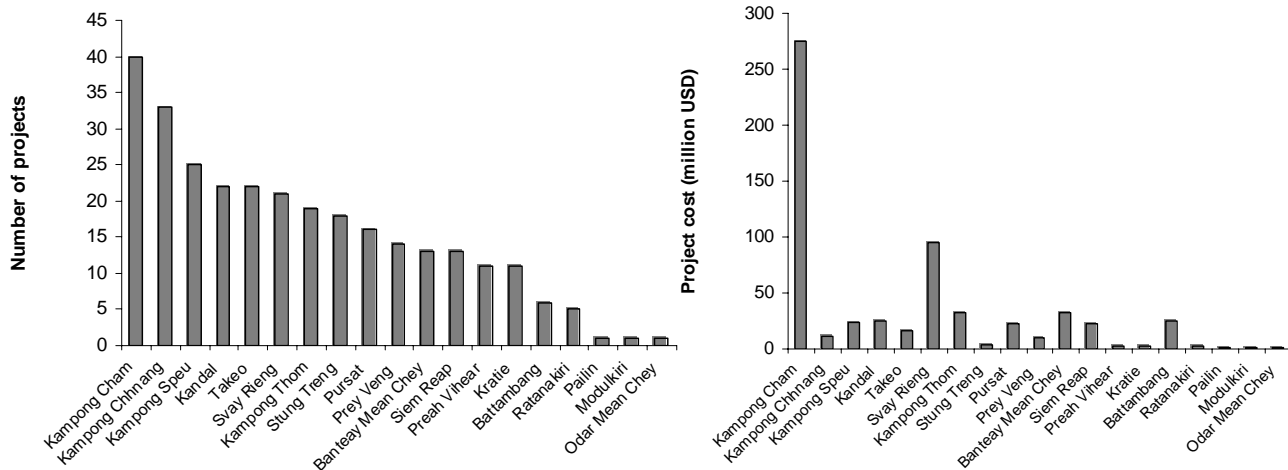


Figure 3. (a) Total Number of Irrigation Rehabilitation Projects in the Period of 2001-2005 and (b) the Total Project Cost by Province (MOWRAM, 2000)

The quantity and quality of water available to households influences hygiene and therefore public health. Household water demand continues to increase due to population and economic growth. About 69% of households use dug-wells, rivers, streams, and springs as their main sources of drinking water. About 73% of the rural population is exposed to poor water quality. Only 25 to 30% of the total population has access to safe drinking water (CNMC, 2003). Water supply and sanitation remains a challenge. Approximately US\$ 85.4 million from external investments will be needed to improve water supply for domestic uses (CNMC, 2003).

3.4 International Funding for Supporting Development in Cambodia

For the implementation of the programmes discussed above, the RGC relies to a very large extent on external sources of funding, including international aid, grants, loans etc. For example in the health sector, almost all the funding to implement the national malaria control programme has come from external sources (Figure 4a). In water resources, more than 85% of funding allocated for on-going projects, committed projects and high priority projects for the period 2004-2006 comes from external sources (Figure 4b). The majority of projects funded by international donors do not include the costs of operations and maintenance of the systems, which puts their sustainability into question (MOWRAM, 2004).

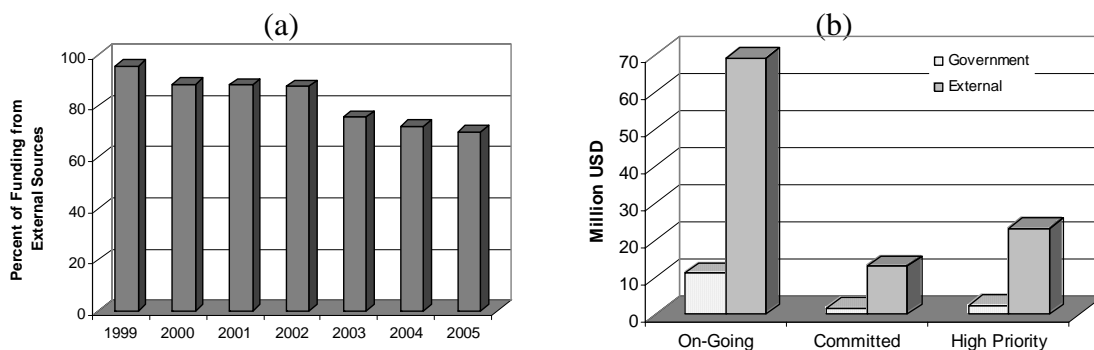


Figure 4. Percentage of Funding from External Sources to Implement (a) National Malaria Control Program (www.theglobalfund.org), and (b) Water Resources, Meteorology and Irrigation Development (MOWRAM, 2004)

In some instances, as in the case of the National Poverty Reduction Strategy 2002-2005, pipeline programmes have been identified without donor agencies commitment. This implies that if funding is not available in time, the implementation of these programmes will be delayed or cancelled, which may affect overall development strategy. A joint Government/Donor Working Group for Natural Resource Management development (WGNRM) has been established. The WGNRM is formed of technical working groups in Forestry, Fisheries, Land Management and Agriculture. The working groups provide a forum for government and donors to work together on the implementation of programmes in natural resource management and agriculture, and facilitate funding from interested parties.

The WGNRM has compiled a list of completed projects for the period 2000-2004 and on-going projects in forestry, agriculture, fishery, water resources and land management. The number of projects in the forestry sector has been the highest, followed by agriculture, fishery, water resources and land management (Figure 5). Funding for the projects has come from various agencies. The dominant international funding agencies for each sector have been quite diverse (Figure 6). For example, WWF, Danida, World Bank and Oxfam are the main donors in the forestry sector, while ADB, World Bank, ACIAR/AusAID, IFAD and the European Community dominate the agricultural sector.

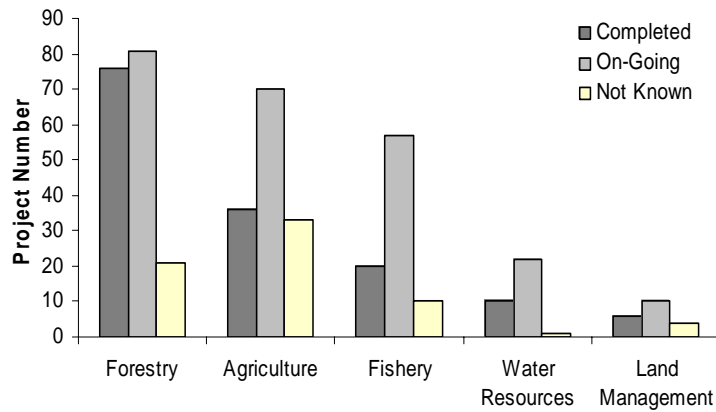


Figure 5. Status of Projects for Forestry, Agriculture, Fishery, Water Resources and Land Management for the Period 2000 to 2004 (Based on data compiled by WGNRM, MAFF, MOWRAM)

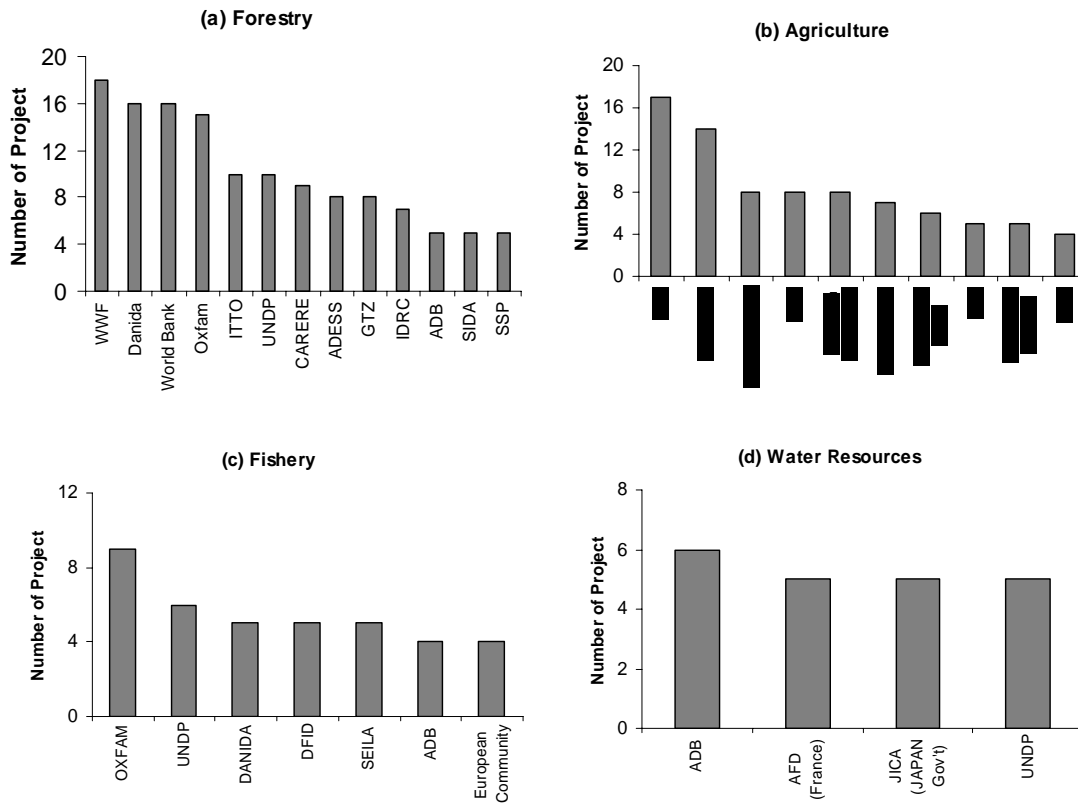


Figure 6. Project Funding Sources (Based on data compiled by WGNRM, MAFF and MOWRAM)

3.5 International Commitments and Global Climate Change Policy

The Rio conventions clearly recognise that meeting national development needs and responding to global environmental threats must go in hand. Thus poverty, environment and socio-economic development should be addressed simultaneously to achieve sustainable development. Response, adaptation, mitigation and protection strategies addressing global environmental challenges have to be consistent with national development priorities and vice versa. This requires integrating global environmental strategies into the national development agenda.

Too often, global environmental issues have been considered as a “stand alone agenda” of limited concern to national and local development priorities (OECD, 2002). In many countries for example, environmental ministries have been assigned the prime responsibility for the implementation of international conventions without the government-wide coordination needed to implement the necessary response measures in key sectors such as agriculture, energy etc.

Countries that have ratified the United Nations Framework Convention on Climate Change have commitments, as described in Article 4. These commitments are summarised in Table 4. In principle, developed countries have committed to assist developing and least developed countries in adapting to climate change and in meeting their commitments to the convention through transfer of technologies, financial support, and capacity building programmes.

Table 4. Summary of Global Commitments of the United Nations Framework Convention on Climate Change

Verse	Global commitments
Verse 1-3	Reporting greenhouse gases inventory for developing countries (non-Annex 1) is voluntary and is financially supported by developed countries (Annex 1).
Verse 4-5	Annex 1 countries should assist non-Annex 1 countries to mitigate the negative impacts of climate change and to meet their commitments to the convention in the form of financial assistance and technology transfer.
Verse 6-7	Annex 1 countries in economic transition have flexibility to meet their commitments to the convention until they are capable of increasing their capacity to cope with climate change.
Verse 8	In giving assistance, Annex 1 countries will give priority to small island countries, low-lying coastal countries, arid and semi arid countries, forested countries that vulnerable to damage, countries vulnerable to drought and desertification, countries with highly polluted cities, countries relying heavily on fossil-based energy and countries which have no coastal areas or transition countries.
Verse 9	Least developed countries will have special treatment in getting financial assistance and transfer of technologies.

Source: UNFCCC (1992)

The Global Environment Facility (GEF) was established to assist developing countries to implement the climate change and biodiversity conventions. The GEF provides grants for developing countries to undertake sustainable development activities that generate global benefits, where the cost of doing so exceeds the national benefits. Thus, the GEF financing is limited to “incremental costs”, that is, the additional costs of changing a management practice, a policy or an investment so that it may generate global benefits.

At the seventh Conference of Parties of the UNFCCC held in Marrakech in 2001, a number of new agreements related to financing were adopted:

- To assist developing countries to meet their commitments described in Article 4 of the convention, the parties agreed to provide sufficient funds in the form of: (i) Special Climate Change Fund to assist developing countries to conduct activities related to climate change in the areas of adaptation, technology transfer, energy, transport, industry, agriculture, forest management and waste management as well as activities to assist developing countries whose economies are highly dependent on income generated from fossil fuels in diversifying their economies, and (ii) Least Developed Countries Fund that support the formulation of National Adaptation Programmes for Action (NAPAs). These Plans should identify activities which, if further delayed could increase vulnerability or lead to increased costs at a later stage.
- The Kyoto Protocol established the Adaptation Fund, which consists of 2% of the proceeds of Certified Emission Reductions (CER) from Clean Development Mechanism (CDM) projects. The CDM levy could amount to about US \$50 to \$60 million per year.

The Special Climate Change Fund and Adaptation Fund may also be used to assist developing countries in the implementation of the following activities: (i) implementation of adaptation activities, (ii) development of early warning systems, (iii) capacity building in managing hazards related to climate change, and (iv) development of national and regional information networks.

IV. GAPS AND BARRIERS ANALYSIS

4.1 Gaps and Barriers in Government Policies

To reduce poverty and to achieve sustainable development under environmental pressures requires integrated policies as environmental and socio-economic aspects need to be addressed simultaneously. Good governance is critical to ensure that programmes can be implemented and contribute to sustainable development. The issues of good governance have been raised in the Consultative Group meetings during which the donor community regularly pledges funds for Cambodia's development. Continued funding by international donors requires the implementation of a number of key reforms to promote good

governance, that is, broader participation, accountability, transparency and predictability (UNDP, 2002).

The implementation of governance decentralisation and deconcentration is proceeding slowly. The traditional centralised approach still prevails in planning and decision-making and involves very limited participation. Sectoral plans consist essentially of lists of projects to be implemented, prepared with only limited consultations, in particular at the local and grassroots levels. Strategic and action plans have been developed by line ministries but the lack of clear guidance makes them vulnerable to ambiguous interpretation and confusion. Planned activities have been identified and prioritised based on available external funding rather than national budget and development needs. Targets are set without justifiable logic for their achievement. Reliance on external funding and poor coordination also frequently result in fragmented development. For example, the funding for building roads is available when the request for funding sewage and drainage system is still in the pipeline. In addition, many donor-driven projects do not take into consideration local capacity to sustain operations. Thus, projects may fail to build the capacity of human resources and local institutions to continue operations after donor funds have been exhausted.

There is a lack of appropriate mechanisms and procedures to ensure legal and public accountability. Very often the opportunities for participation are not matched by adequate mechanisms for public accountability – whereby officials, private developers, and financiers are held responsible for the consequences of their decisions (Ratner et al., 2004). This is partly due to the absence of clear definitions for individual and institutional responsibilities and weak monitoring and evaluation procedures.

Overlapping or conflicting mandates among government agencies constitute major hurdles to development and result in competition, rather than cooperation. Poor information sharing among agencies and across sectors compounds the problem. Different sectors conduct their planning and development interventions on the basis of widely differing information and understanding. In developing sectoral legislation, government agencies negotiate to protect their influence and jurisdiction rather than on the objectives of development. No reference is made to legislation proposed by other agencies.

The limited number of qualified professional civil servants and their low commitment is a barrier to the development and implementation of government policies. Higher wages offered by NGOs and international organisations are much more attractive for qualified individuals than technical positions within government. In some instances, government staff working on internationally funded projects may benefit from supplemental salaries. However, this practise is not sustainable as salary supplements end with the completion of projects.

Unavailability of clear job description for government staff except for those who engage in external funded projects is also other factors that affect their performance. There is no clear guidance for staff to perform their job effectively and in many cases staff are called

upon to undertake tasks on case-by-case basis. Staff are not normally monitored or evaluated against their performance and there is no clear reward system for improved performance. Efforts to develop human resources are often an ad-hoc process due to the varied interests and sometime limited resources within both the institutions themselves and the donor community (UNDP, 2002).

4.2 Gaps in Policies for Addressing Climate Hazards

In order for Cambodia to optimise the use of international funding for climate related issues, there is a crucial need for policy makers to increase their understanding of climate change as well as their capacity to identify eligible and appropriate programmes. National policies and regulations should take into consideration climate change aspects, and assist local communities in increasing their adaptive capacity to climate variability. In addition, there is still limited understanding of climate change issues among relevant stakeholders. Climate change information needs to be more broadly translated, disseminated and used by government agencies and other stakeholders.

The collection of weather and climate information requires a sophisticated climate observation network and highly skilled staff (Ropelewski and Lyon, 2003). At present, Cambodia's weather station network is very limited. Before the war, there were 61 rainfall stations. At present the number of operating stations has dramatically decreased to 12 for the whole country. Similarly, air temperature is only recorded in a few locations. Before 1979, there were 12 stations, while there are just 6 stations at present. There is only one station that records other climatic variables (evaporation, radiation, wind etc.). The capacity of MOWRAM staff to produce reliable and accurate weather and climate information is poor. The Department of Meteorology is only able to provide limited weather forecast. To address climate issues, the capacity to produce seasonal climate forecast should be thoroughly developed.

The dissemination of weather and climate information to rural communities and other end-users should be timely and effective. Tailored climate information must reach appropriate users in a timely fashion in order to have some practical use. This issue has not been addressed by MOWRAM's strategic plan, while this is essential to a well-functioning early warning system.

In most Asian countries, agricultural extension workers have played a significant role in accelerating the adoption of new technologies. In Cambodia, yield gaps between farmers and research agencies are substantial. In rural Cambodia, average wet season rice yields less than 2.0 t/ha, while dry season rice yields 3.3 t/ha. In contrast, theoretical yields range between 3.5 to 6.0 t/ha. This may indicate that there has been little transfer of technology and knowledge to farmers. Field trials and demonstration geared towards small holders would help improve access to agricultural knowledge. Extension workers may also play a role in disseminating climate information for agricultural applications (Boer, 2004). Planned adaptation to future climatic conditions should be based on current individual, community and institutional behaviour that, in part, have been developed as a response to current climate (Jones et al., 2004). Thus, technologies to address climate hazards such as flood and drought commonly practiced by communities should be

documented and enhanced. Communities ought to be encouraged to work together in preparing mitigation and adaptation options to climate hazards. Financial support either from national and international agencies to develop and implement community programmes must be made available. Delays in providing financial and technical support may increase rural communities vulnerability to the adverse impacts of climate hazards and climate change.

Long term strategic plan for research in the area of climate application information should also be developed. At present, concern of universities and research agencies on climate issues still limited. In NPRS 2003-2005 (CSD, 2002) it was stated that the priority of research will be given to diversification and intensification of sustainable agriculture production with few external inputs as well as cost-effective management practices. Considering the urgent need of research activities in the area of agriculture climatology, a number of countries (e.g. Indonesia) have developed a research agency with specific mandate on agriculture climatology. The presence of such agency may accelerate the production of climate application technologies.

V. CONCLUSION

Cambodia is a country vulnerable to climate variability and climate change. Flood and drought are two major climate hazards commonly experienced in Cambodia. Their impacts include the yearly destruction of infrastructures, properties, crops, livestock and losses of lives. The adaptive capacity to flood and drought is poorly developed in Cambodia.

With the support of international donors, the Royal Government of Cambodia has formulated long-term strategic sectoral plans and programmes. However, the implementation of these programmes relies almost exclusively on external funding sources.

Poor governance in all sectors and across all management levels are major barriers to achieving sustainable development. These include overlap or conflict of mandates among agencies, lack of coordination and information sharing across sectors and agencies, limited number of professional staff and low commitment of government staff.

Even though Cambodia is vulnerable to climate hazards and future climate change, current policies have not thoroughly taken into account global warming issues. The Ministry of Environment has developed a national action plan on climate change; however, this plan only focuses on mitigation aspects.

Planned adaptation to future climate should be based on current individual, community and institutional behaviour which, in part, have been developed as a response to current climate. However, common practises used by local people to adapt to existing climate hazards have not received enough attention from government and international agencies. These practises have been implemented sporadically due to the lack of financial support.

Delays in developing and enhancing local communities' capacity in responding to climate hazards may increase their vulnerability, and lead to increased costs at a later stage.

In order for Cambodia to optimise the use of global funding for climate related issues, there is a crucial need for policy makers to quickly increase their understanding of climate change as well as their capacity to identify eligible and appropriate programmes. National policies and regulations should take into consideration climate change aspects, and assist local communities in increasing their adaptive capacity to climate variability.

REFERENCES

Boer, R. 2004. *Increasing Adaptive Capacity of Farmers to Extreme Climate Events and Climate Change Through Climate Field School Program: Indonesia Experience*. Paper presented at the Fourteenth Asia-Pacific Seminar on Climate Change, Sydney, 21-24 September 2004.

Cambodia Working Group. 1999. *Management of Fisheries, Coastal Resources and Coastal Environment in Cambodia: Institutional, Legal and Policy Perspective*. PRIAP-ICLARM Working Paper Series 3. Phnom Penh: CWG.

Cambodia Development Research Institute. 2002. *The Impact of Flooding and Drought in Cambodia*. Cambodia Development Review, 4: 1.

Cambodia National Mekong Committee. 2003. *National Sector Review*. Phnom Penh: CNMC.

Council for Social Development. 2002. *National Poverty Reduction Strategy 2003-2005*. Phnom Penh: CSD.

EVS Environment Consultants. 1996. *Coastal and Marine Environmental Management for Cambodia: Final Report*. Phnom Penh: EVS.

Global Environment Consultants Ltd, Worldwide Fund for Nature and Wetlands International. 2000. *Strategic Coastal and Marine Environmental Management Plan for Cambodia: Final Report*. Phnom Penh: GEC, WWF and Wetlands International

Halcrow. 1994. *Land Resources Inventory for Agriculture Development and Agriculture Statistics in 1991/00*.

ICEM. 2003. *Cambodia National Report on Protected Areas and Development. Review of Protected Areas and Development in Lower Mekong River Region*. Indooroopilly: ICEM.

Jones, R; L.Mearns, S. Magezi and R. Boer. 2004. *Assessing Future Climate Risk*. Technical Paper for Adaptation Policy Framework. United Nations Development Program.

Ky Ngiiep. 2004. *Seaweed Farming and Community Organization in Prek Thnot and Koh Toch Communes, Kampot District, Kampot Province*. In Proceedings of the 4th Coastal Zone Management Seminar held in Sihanoukville on 3-4th April 2004. Phnom Penh: DANIDA.

Ministry of Agriculture Forestry and Fisheries. 1993. *Bulletin of Agricultural Statistics and Studies, No.1*. Phnom Penh: MAFF.

Ministry of Agriculture Forestry and Fisheries. 1993. *Bulletin of Agricultural Statistics and Studies, No 4*. Phnom Penh: MAFF.

Ministry of Agriculture Forestry and Fisheries. 1994. *Bulletin of Agricultural Statistics and Studies, No.5*. Phnom Penh: MAFF.

Ministry of Agriculture Forestry and Fisheries. 1995. *Agricultural Statistics*. Phnom Penh: MAFF.

Ministry of Agriculture Forestry and Fisheries. 1996-97. *Agricultural Statistics*. Phnom Penh: MAFF.

Ministry of Agriculture Forestry and Fisheries. 1998-99. *Agricultural Statistics*. Phnom Penh: MAFF.

Ministry of Agriculture Forestry and Fisheries. 1999. *Agriculture Development Plan: Long, Medium And Short Term, 1999-2010*. Phnom Penh: MAFF.

Ministry of Agriculture Forestry and Fisheries. 1999-2000. *Agricultural Statistics*. Phnom Penh: MAFF.

Ministry of Agriculture Forestry and Fisheries. 1994. *Bulletin Of Agricultural Statistics And Studies, No.8*. Phnom Penh: MAFF.

Ministry of Agriculture Forestry and Fisheries. 2004. *MAFF Action Plan 2004-2008*. Phnom Penh: MAFF.

Ministry of Environment. 2001. *Cambodia First National Communication*. Phnom Penh: MoE.

Ministry of Environment. 1998. *Draft Management Plan for Bokor National Park*. Phnom Penh: MoE.

Ministry of Environment. 1998. *National Environmental Action Plan 1998-2002*. Phnom Penh: MoE.

Ministry of Environment. 2001a. *Vulnerability and Adaptation Assessment to Climate Change*. Phnom Penh: MoE.

Ministry of Environment. 2001b. *Draft National Action Plan on Climate Change*. Phnom Penh: MoE.

Ministry of Environment. 2002. *Cambodia's National Biodiversity Strategy and Action Plan*. Phnom Penh: MoE.

Ministry of Environment. 2002a. *State of Environment Report of Kep Municipality*. Phnom Penh: MoE.

Ministry of Environment. 2002b. *State of Environment Report of Kampot Province*. Phnom Penh: MoE.

Ministry of Environment. 2002c. *State of Environment Report of Sihanoukville*. Phnom Penh: MoE.

Ministry of Environment. 2002d. *State of Environment Report of Koh Kong Province*. Phnom Penh: MoE.

Ministry of Health. 1999. *Health Statistic Report for 1998*. Phnom Penh: MoH.

Ministry of Health. 2002. *Health Sector Strategic Plan 2003-2007*. Phnom Penh: MoH.

Ministry of Health. 2004. *Health Statistic Report for 2002*. Phnom Penh: MoH.

Ministry of Health. 2004. *Achievements of the Ministry of Health in 2003 and Direction for 2004*. Phnom Penh: MoH.

Ministry of Planning. 2003. *Cambodia Millennium Development Goals Reports 2003*. Phnom Penh: MOP

Ministry of Water Resources and Meteorology. 2000. *Rehabilitation and Development Plan on Water Resource and Meteorology Sector for Second Five Year 2001-2005*. Phnom Penh: MOWRAM.

Ministry of Water Resources and Meteorology. 2003. *Report on Activities and Outputs of the MOWRAM 2003*. Phnom Penh: MOWRAM.

Ministry of Water Resources and Meteorology. 2004. *National Water Resources Policy for the Kingdom of Cambodia*. Phnom Penh: MOWRAM.

National Committee on Disaster Management. 2002. *Disaster Management in Cambodia*. Phnom Penh: NCDM.

National Committee on Disaster Management. 2002. *Summary of Micro Projects Completed in Phase 3*. Phnom Penh: NCDM.

Organization for Economic Co-operation and Development. 2002. *Integrating the Rio Conventions into Development Co-operation*. Paris: OECD.

Ratner, B.D., Dang Thanh Ha, Mam Kosal, Ayut Nissapa, and Somphanh Chanphengxay. 2004. *Undervalued and Overlooked: Sustaining Rural Livelihoods Through Better Governance of Wetlands*. World Fish Centre. Penang: Worldfish.

Royal Government of Cambodia. 2001. *Second Five Year Socio-economic Development Plan*. Phnom Penh: RGC.

Ropelewski, C.F and B. Lyon. 2003. "Climate Information Systems and Their Application" in Rodo X. and F.A.Comin eds. *Global Climate: Current Research and Uncertainties in the Climate System*. Berlin: Springer.

Thailand Institute of Scientific and Technological Research, 2004. *Master Plan for Tourism Development in the Coastal Zone, Kingdom of Cambodia (Draft) - An Executive Summary Report*. Phnom Penh: TISTR.

United Nations Development Program. 2002. *The Capacity Needs Assessment Report for Cambodia's National Biodiversity Strategy and Action Plan*. Phnom Penh: UNDP.