

Cambodia Country Paper for the Third Annual Mekong Flood Forum

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1 Introduction:

Flood in the Mekong River basin is a recurrent event. Low to medium flood is beneficial to living conditions in the region. Floods of higher magnitude e.g. the flood of 1966 or the most recent one in 2000 and 2001 caused devastating damage to development efforts of the region in which Cambodia associated with its physical exposure and as a downstream country had experienced heaviest losses in lives and properties. With increasing population, more foods and infrastructures are needed. This means that more and more natural lands have to be put into cultivation and use for roads, urbanization etc. more and more people are obliged to live in a flood risk area. For generation people in this region has been living with floods, however their success has been limited as evidenced by their lower standard of living as compared to the surrounding region. Natural disaster with the magnitude of the recent Tsunami in South East Asia is a clear example of how hopeless and powerless people become facing disaster of that magnitude, one can say if a warning was in place many lives would be saved. Coping or living with flood in this modern time need a constant strive for improvement in all fronts of flood management from information in the form of forecast and warning to land use and management, structural measure to awareness building and capacity strengthening. In all development planning there is always risk to be taken when people has to deal with flood. Directly affected people need to be made aware at all time and getting themselves organized to minimize damage and suffering. Within MRC and with the assistance from many donors and national efforts, Cambodia has experienced numerous constraints in its long way and difficult tasks ahead to achieve the Millennium Development Goals.

Over the past decades, Mekong floods have occurred in many different parts of the basin. The flooding has caused devastating damage to property, infrastructure and agricultural land, and loss of life that has had tragic consequences for our people and their communities. It poses a serious threat to those countries, particularly in the downstream country of the Mekong Basin like Cambodia.

Every body may aware that in 2000 alone there were more than 800 people, most of them children, including 362 people in Cambodia, died as a result of flooding. The total costs of damages exceeded US\$ 400 million, including US\$ 157 million in Cambodia. The flood in 2001 killed 300 people, including 62 people in Cambodia, and the damages were over one hundred million US dollars, including US\$ 30 million in Cambodia. Again, in 2002 Mekong floods hit the Mekong countries. In Cambodia alone, the 2002 floods killed 29 people and the total extent of damage was over US\$ 12 million.

To address the flooding in the Mekong, there is a vital and urgent need for the MRC member countries to work together to enhance effective management of the Basin's water resources. With strong and fully support from donors, the MRC Flood Management and Mitigation Programme has been starting since 2004 with the aim to find alternative ways to possibly minimize the damaging effects caused by floods.

In managing the flood we must realise that apart from the negative impact of major floods on the people's life and national economy, floods have been a rich source of biodiversity, soil fertility and other benefits.

In the last two years, we did not suffer from flood but we have been experiencing drought and severe drought and this poses new challenges for perhaps the people in the Mekong Basin to take into consideration also in managing the drought.

2 Flood and drought in Cambodia:

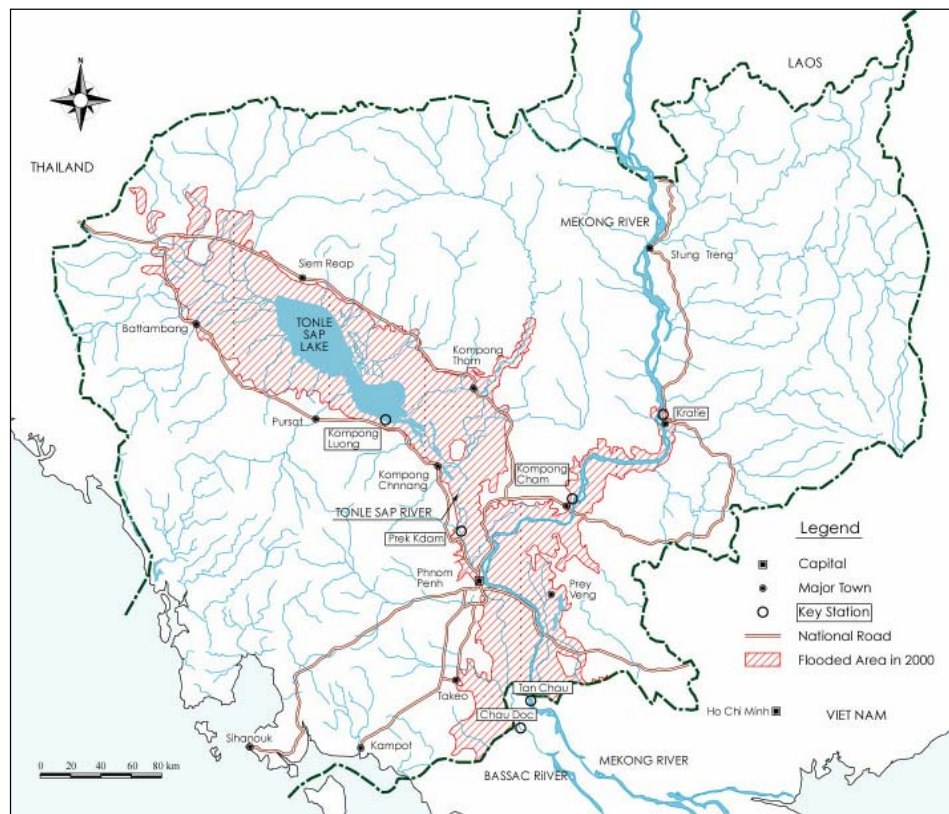
The Mekong river basin is under the influence of the monsoon regime which is characterized by great spatial and temporal variability in rainfall distribution; while part of the region is flooded another part might suffer from long dry spell or droughts. During the past two years many parts of the region have been experienced with quite severe droughts causing total crop failure in many places. Cambodia is one of the countries in the LMRB most prone to natural disasters, primarily drought and floods. The natural disasters, particularly major floods, have caused loss of lives, affected social welfare and damaged public and household's properties and livestock. As a result, obstacles and difficulties have been created for the Royal Government of Cambodia in its development efforts, especially its poverty alleviation program and in short, the disasters make the national development slow country wide to achieve the DMG.

In addition to natural flood events, flood mitigation measures upstream such as protection dikes, drainage from protected areas (irrigation scheme, cities, towns) evacuation of flood water from reservoirs etc. add more risks to flood conditions downstream. The figure 1 below shows flood prone areas in Cambodia. In

addition to the Mekong flood, many parts of the country are also subject to flash flood such the the Prek Thnot, Pursat, Sekong, Se san etc.) Development inside the country has changed the flood flow patterns and increase flood risk to adjacent areas as well.

Major natural disasters facing Cambodia are namely floods and droughts. Mekong flood added by heavy local rainfall caused devastating damages due to the weather and climate change in the country at the one hand, and to infrastructure development in the upper and the lowest parts of the Mekong River Basin at another hand. People in the country - especially the poor who are living in the low-lying areas - are the most vulnerable to the natural disasters.

For generations Cambodian people have adjusted their lives to seasonally high river flows and flooding, to take advantage of the benefits they provide to agriculture and fishing. In the wet season, however, water sometimes can be too plentiful, leading to flooding that in a bad year can cause loss of life, lost of agricultural production, and damage to property and infrastructure. Non-structural flood mitigation consists principally of flood forecasting along the mainstream Mekong River, in cooperation with the Mekong River Commission, and structural measures consists of managing flood dyke that protects Phnom



Penh City and a network of colmatage canals.

Figure 1: River network and flooded areas. MOWRAM and CNMC, June 2003

Floods

Flood water in Cambodia comes mainly from the upper and middle reaches of the Mekong mainly from the middle reach. While the river reaches its highest peak, local rainfall also intensifies (second peak in September) adding more water to the already swelling river. It was estimated that in average as much as 27% of flood water at Kampong Cham during 2002 flow trough and temporarily stored in the flood plain where major traditional structural flood management play an important role, in 2003 the estimation was only 17%. Mis-management of the flood plain will increase flood risk for Phnom Penh and its surrounding. Flood plain region is highly productive in terms of agriculture potential but deep flood water allows only a single cropping per year. Due to its large open space, roads and bridges construction and maintenance are costly and subject to frequent damages.

For Cambodia, the flooding in 2000, 2001 and 2002 devastated portions of the country, washing away bridges and villages while killing hundreds of people, mainly children. The successive last three years floods have posed a serious threat to the efforts of the Royal Government of Cambodia in its national development, especially the effort in the poverty alleviation within the country.

The annual loss of life and economy in this country varies widely, depending on the flood magnitude and duration. Losses in the 2000 flood were US\$ 157 million, and 362 people died. The flood in 2001 killed 62 people and the total estimated losses were US\$ 36 million. Again, in 2002, floods hit the Mekong countries. For Cambodia alone, it killed 29 people and the total extent of damage was over US\$ 12 million.

The flood water level of the Mekong River in 2002 was lower than that of 2001, but threatened provinces along the Mekong River such as Stung Treng, Kratie Kampong Cham, Kandal, Prey Veng, Takeo and Svay Rieng. The severe situation that resulted from the flash flood not only seriously affected the living conditions of the people and social and economic development in those provinces, but also caused difficulties to the country as a whole. Cambodia as a developing country has a very limited capacity in managing and mitigating flood. At this stage, the most appropriate approach to deal with flood in the country as well as in the whole basin is a way of living with flood.

Flood occurred in 2002 as a result of storms and heavy rainfall in upper parts of the Mekong mainly from Lao PDR and Thailand. Provinces along the Mekong River had the same level of flood as they experienced in 2001. Provinces around Tonle Sap Lake such as Banteay Meanchey, Siem Reap, Battambang and Kampong Thom received substantial rainfall and they were inundated during the late period of wet season. Also this year, some communes in Svay Rieng and Kampot province along Vietnam border were flooded.

Effects of floods along the Mekong River were similar to the 2001 flood, whereas the flood in Tonle Sap areas was like the one in 2000 as a result of inflow of rainwater from the Dang Rek mountain range after heavy rain.

Total damages caused by the flood and drought in 2002 throughout the country reported by the National Committee for Disaster Management were estimated at approximately US\$ 34 million and over 3 million people in total were affected and 29 people died, most of them were children.

In 2003 and 2004, flood has reached only limited part of the flood plain, the dry season of 2003 was the driest so that most permanent lakes in the deepest part of the flood plain were completely dried out. People living far away from the river systems faced acute water shortages for their crops and domestic use, figure 2 provides hydrographs showing mean daily water level of the Mekong at Phnom Penh for 2003, 2004 as compared to the hydrologically driest year of 1998 and the wettest year of 2000. The most recent hydrological driest year was in 1998, but it appears that the most driest year in terms of rainfall shortage (meteorological droughts) was during 2003 and 2004.

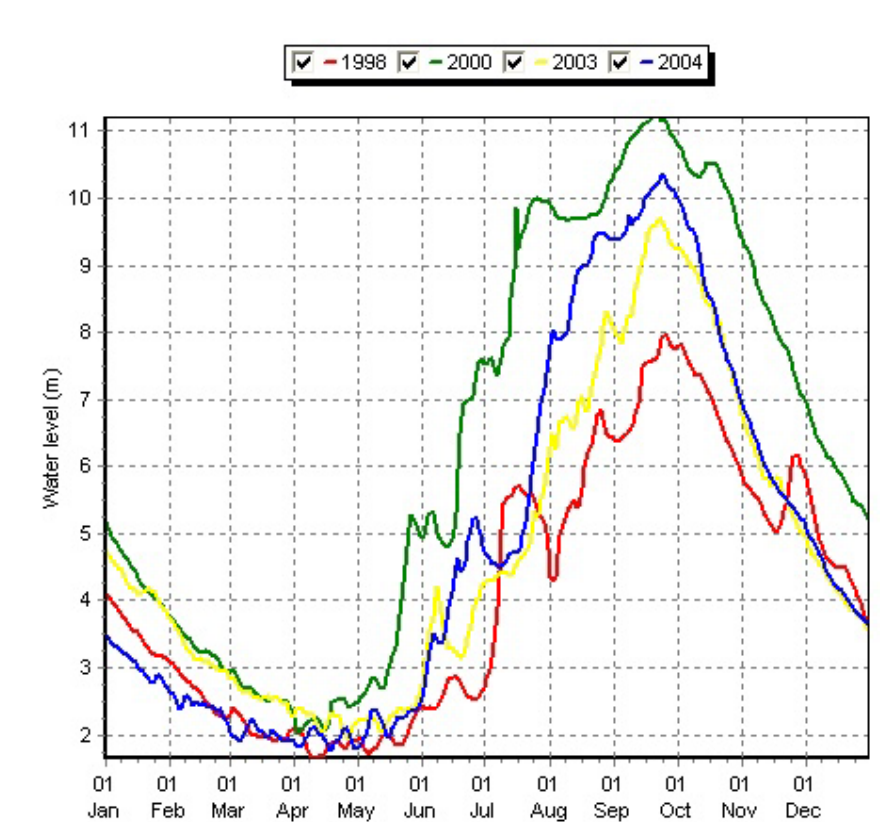


Figure 2: Mean daily water level, Mekong at Chroui Changvar, Phnom Penh

Drought

Cambodia is an agricultural country. Approximately 84% of the total population live in rural areas and 80% are farmers. About 80% of the total cultivated areas within the country depend fully on rainfall. In 2002, due to the occurrence of drought and flood at the same time, cultivation plans were not met as projected by Ministry of Agriculture, Forestry and Fisheries and

Provincial/Municipal Disaster Management Committees. Observation indicated that only 83% of cultivation plans were undertaken up to mid-November of 2002.

Rainfall distribution with time in Cambodia is characterised by a two peaks normally the first one in June and the second one in around September with a period of dry spell in between. The length and magnitude of the dry spell is quite critical for rice planting because it coincides with the transplanting period when rice field needs minimum water to allow optimum condition for land preparation. Early rain or late rain affects planting calendar subsequently put rain-fed cultivation at risk. Water conservation in small ponds mostly dug by hand provides limited supplement irrigation. During 2004, an exceptional dry year, all available water sources were running dry but still in some area farmer still could not save their crops. These hazards are quite frequent and vary also in space where as other areas experienced flooding the adjacent areas are facing droughts.

The reduction of the drought hazard requires appropriate agricultural practices and water supply facilities, such as supplementary irrigation based on upstream or off-stream storage, exploitation of groundwater or emergency pumping of water if a water resource is available.

Consecutive droughts of 2003 and 2004 were the longest in the last 21 years. It caused severe impact on rice production that poses a threat to national food insecurity. Several communes in Kampong Speu, Prey Veng, Takeo and Kandal provinces received very little rainfall so that both people and livestock faced the same difficulty of water shortage. In the absence of rain, the weather was hot, which made the soil drier. In some places it was only in the middle of November that rain started to fall during 2004. The figure 3 provides comparative monthly rainfall at a selected station. The total annual of 2004 was the lowest follows by 1998.

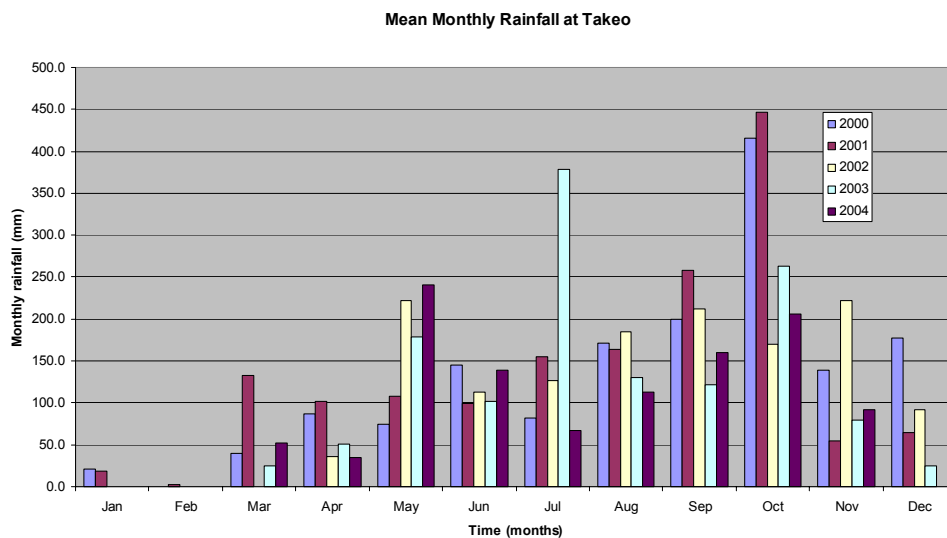


Figure 3: Monthly rainfall at Takeo from 2000 to 2004

Ten provinces were drought-stricken. The most severely affected were Kampong Speu, Prey Veng, Takeo and Banteay Meanchey. Populations affected were 442,419 families, consisting of more than 2 million people. Total damages were estimated at over US\$ 21 million, particularly on rice plantation with 62,702 hectares damaged.

Mitigation of agricultural drought using supplementary irrigation should be based on data on drought risk and surface/groundwater reliability as mentioned above. In some countries, drought forecasting is now practiced, to assist farmers to reduce the risks of making incorrect crop management decisions. There has been no analysis to determine whether drought forecasting is possible in Cambodia, or would provide a useful tool to farmers.

3 Flood management in Cambodia:

Traditionally Cambodian people live in high ground above flood level on the river banks (levees) in flood proofing houses (houses on piles) therefore flood management was less developed as compared to irrigation facilities. Only Phnom Penh is protected by dikes, many provincial capitals are not protected and subject to frequent flooding. After Kratie, the Mekong enters into its delta, in this area people manage floods by using a dense network of canals connecting the main branches of the river to the flood plain the “colmatage canals”. Colmatage canals plays an important role in flood management in Cambodia, they have three main functions, helping to reduce flood peak in the main channel, spreading sediments for soil fertility improvement, when gated conserve water for dry season cropping. Establishing a proper rule for operating those canals would help manage flood risk. Currently there is no such an operation rule for optimum benefit of those canals.

In Cambodia, the general policy for flood mitigation and protection is *to accelerate flood mitigation programme in areas where flooding and water logging have serious effects on the social and economic development of the area.*

Major institutions responsible for flood management and mitigation are namely MOWRAM and NCDM has the principal responsibility to coordinate natural hazard/disaster mitigation, while MOWRAM is implementing flood and drought mitigation. The effectiveness is growing but resources remain limited. Hydro-meteorological services in Cambodia (under MOWRAM) are still very young, ill funded with very few staffs to respond to the huge task of the country’s flood management. Flood forecasting and early warning still need more technical and financial supports as well as capacity strengthening.

Flood forecasting and early warning:

MOWRAM make use of information and MRCS forecast on the Mekong mainstream to establish its own one day forecast based on empirical regression methods.

To get flood information to the directly affected people, there are a number of pilots projects under implementation namely the Provision of Flood Early Warning to Flood-Vulnerable Communities in the Lower Mekong Basin, Phase - 1. Project financed by OFDA.

In early March 2005, the workshop on ISLAND Project was held in MOWRAM to set up the EWS into commune flood forecast by using information technology. The project has been supported by EU and Implemented by ISTED-France.

NGO's plays an important role in flood relief and rehabilitation as well as flood early warning at the village level using information from MRC and MOWRAM.

Structural flood management recently implemented in Cambodia was the ring dike protecting Phnom Penh and its surrounding areas is implemented by MOWRAM. The project is consisting of strengthening the protection dikes dredging drainage canals and construction of pumping stations

- To carry out the project initiated by MOWRAM.
- To improve canals along the east coast to accelerate draining of excess water.
- To construct and operate regulators across the canals.
- To expedite weed eradication by using proper equipment.

Emergency Response

Emergency response measures comprised of:

- Appeal for help from Prime Minister of the Royal Government of Cambodia to assist the affected people by flood and drought.
- Rice donation from their Majesties the King and Queen to the affected people through National Committee for Disaster Management and the Cambodia Red Cross. Local generous individuals have also actively contributed their resources for natural disaster victims.
- Visits to the affected areas by high-ranking officers with air distribution.
- Government stocks being used as relief for emergency response in case of flood and drought.
- Provincial, District and Commune Disaster Management Committees in place responded in a timely manner to disaster-affected people by using stocks from the central government and from the NCDM. They also used their own stocks for distribution to help alleviate people's living condition.

- NCDM coordinated with agencies concerned to mobilize the resources for the disaster responses and recovery.

One of the long-term goals of the Royal Government of Cambodia for effective and sustainable management of water--both freshwater and marine water-- in a Vision for Water in Cambodia is '*Freedom for all from the threat of loss of life and livelihood as a result of water-related hazards*'. In this connection, there is an urgent need to improve security against natural disasters, especially floods and draughts, with consequent reduced losses of property, crop, etc.

Of the 36% of Cambodia's population that is considered to be below the poverty line, 90% live in rural areas and 80% are employed in agriculture. Most of the rural poor live in an environment marked by wet-dry seasonality, which affects all aspects of their lives from income to consumption, to nutritional status, education and health.

Against this background, and the prospect of changing weathers due to climate change, plans for natural disaster prevention, preparedness, relief, mitigation and rehabilitation are important poverty reduction measures. Moreover, the further development of meteorological and hydrological networks is an essential preventive measure and will form an integral part of the Government's disaster prevention and management regime. The Government intends to put in place an effective and efficient mechanism for relief and emergency services with good coordination and cooperation at all levels. Ongoing work to develop a national natural disaster preparedness capacity are linked to the Government's efforts to minimize the vulnerabilities of the rural poor to adverse weather, in particular flooding and drought. Key aspects of national disasters preparation include (1) the elaboration of plans and mechanism for coordination, and (2) monitoring and review.

As floods are a major concern for the country, and as the capacity of the country to cope with this problem is limited, there is a need of joint effort and cooperation from all parties concerned, both in the national and regional context. At the national level, Ministry of Water Resources and Meteorology plays a very important role in flood forecasting and warning within the country. One of the policies set forth by this Ministry for the national water resources and meteorology development is *to improve weather forecasts, hydrological forecasts and ensure the timely warning of natural disasters such as typhoons, floods and drought to the population in the whole country*. As a leading Ministry in flood control and management within the country, the MOWRAM relies on three main measures to manage and mitigate the flood: (1) Hydrological forecasting; (2) Disaster prevention and preparedness activities for flood management; and (3) Action and strategy for flood control.

In the past as well as the present, during the flood season the Ministry makes the flood forecasting bulletins, and announcements are sent to the line agencies. The mass media are used to disseminate flood information within the country.

In the Article 26 of the Draft Law on Water Resources Management stipulates that *The Ministry of Water Resources and Meteorology, together with other institutions concerned, may designate any flood prone area in the Kingdom of Cambodia as a Flood Control Area.*

Cambodia is now invited to join as a member in the United Nations Disaster Assessment and Coordination Team (UNDAC).

National Water Resources Policy in Cambodia related to the Mitigation of Water-related hazards

- The measures for hazard mitigation; and
- Data collection, forecasting and warning.

4 Lessons learned:

The major natural hazards that affect Cambodia are floods and droughts. Fortunately, other hazards such as tropical cyclones, earthquake, wildfires, river erosion and landslides are not major hazards.

Floods and drought are severe constraints on socio-economic development and poverty alleviation, which, in bad years like 2000, 2001 and 2002, can cause huge economic losses, social disruption, and loss of life. Measures such as construction of secure flood embankments around Phnom Penh City, participation in the MRC's flood forecasting system for the Mekong mainstream, and establishment of the National Disaster Management Committee are significant advances. Much remains to be done, especially in rural areas where farmers are very exposed to the risk of impoverishment by natural disasters. A structural approach to flood mitigation is unaffordable, and would probably be disastrous for aquatic ecosystems and fisheries on the Mekong-Tonle Sap floodplain, but is favoured by some officials. Similarly, irrigation and drainage infrastructure can mitigate the effects of dry spells and drought only in localities that are already well-watered, and the 70-80% of the agricultural area that will continue to be rain-fed needs alternative approaches to agricultural water management. A strategic approach is needed that efficiently combines structural and non-structural means of mitigating the impacts of floods, dry spells and droughts and assists the rural community--particularly in the non-irrigable, rain-fed areas--to respond to extreme conditions without being plunged into indebtedness.

Cambodia--as the most downstream country (except for the Delta area of Vietnam)--feels very exposed to the impact of activities upstream and even downstream. This country has experienced negative impacts from hydropower development in Vietnam and many RGC officials believe that land use change, damming, river works etc in the upper Mekong are affecting the frequency and severity of floods, sedimentation, fish population etc.

Flooding from rivers and from localized rainfall is an annual phenomenon in Cambodia and people living in the country have evolved strategies to make the

most of the water and to mitigate the effects of excess. The annual floods have become an essential element in the life of the people. However, the floods are sometimes of such magnitude that loss of life and property occurs.

Much of the flooding within Cambodia is the result of rainfall and associated runoff in other countries, notably Lao PDR, Vietnam, Thailand and China, that is channelled to Cambodia through the Mekong River and other smaller international rivers.

Flood mitigation requires real-time or near-real-time information on weather and river flow, so that forecasts and warning can be issued to people at risk. Forecasts of flooding along the Mekong River and Tonle Sap are now rather accurate, because of the work of the MRC in gathering data from its member countries and assisting countries to operate forecasting models.

Natural hazards, especially floods and droughts, have severe impacts on the whole population, and mitigation is limited largely to flood forecasting along the Mekong mainstream, structural flood protection for Phnom Penh City, and after-the-fact flood/drought relief. NCDM has principal responsibility to coordinate natural hazard/disaster mitigation and MOWRAM to implement flood and drought mitigation. The effectiveness is growing but resources remain limited.

5 Recommendations:

- Practical cooperation of knowledge and experience sharing in flood preparedness and emergency response among the riparian countries and other relevant agencies to the flood should be continuous and enhanced.
- Capacity building to the field staff is strongly needed.
- The technology must be supplemented with an effective communication system to reach remote villages, which are vulnerable communities to floods and droughts.
- Weather forecasts to ensure timely warning of natural occurrences such as typhoons, floods and drought should be further improved.
- Flood forecasting and early warning is the best way to minimize the flood damage. Flood forecasting and early warning must be accurate, concise, timely and reliable.
- Drought forecasting should be considered by MRC from now on, to assist the riparian countries in order to find appropriate ways to help farmers.
- There has been no analysis to determine whether drought forecasting is possible in Cambodia, or would provide a useful tool to farmers.
- MRC should allocate some budget for emergency relief to help the people affected by floods in Cambodia and in other riparian countries when

floods occur. (Please look at the MRC mandates, in the 1995 Mekong Agreement)

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Acronyms and abbreviations

FMM:	Flood management and mitigation
MOWRAM:	Ministry of Water Resources and Meteorology (Cambodia)
MRC:	Mekong River Commission
NCDM	National Committee for Disaster Management (Cambodia)
RGC:	Royal Government of Cambodia