

# Concluding Report

## On

### “Roadmap toward Effective Flood Hazard Mapping in Cambodia”

#### PREAP SAMENG

Research and Flood Forecasting Office

Department of Hydrology and River Works (DHRW)

Ministry of Water Resources and Meteorology (MOWRAM)

Address: #576 N/R No.1, Sangkat Chak Anre Krom, Khan Mean Chey, Phnom Peng

Email : dhrw.cambodia@online.com.kh/sa\_meng@yahoo.com.au

#### 1 —Curriculum of the training courses

I hope that this training course will be good chance to gain knowledge how to producing flood hazard map and how to use it effectively.

In past the Department of Hydrology and River Works using software the flood forecasting model that produce only bulletin and this information we send it to heading, local authority and concerning agency. This training will teach to improvement of the base information (hydrological information, meteorology and topographic data, historical inundation and flood information hydraulic and river engineering run off analysis) to make a flood hazard map and how to distribution of these production to local authority to use this map for evacuation to safety during a flood disasters in city/urban area the training course are most impressive and relevant they had improve my professional knowledge work in hydrological flood forecast:

In general parts of the training were impressive, insightful and relevant the improved my professional knowledge on hydrology, hydraulic and river engineering. Technical know-how on the methods to promote public awareness on flood damage mitigation is enhanced. I consider topics on Hydrological Statistics; Flood runoff analysis and inundation analysis; Hydrologic Observation all objective is very relevant most of the topics were very familiar.

#### 2 — Role of Flood Hazard Map to Mitigate Flood Damage in Cambodia

In Cambodia almost every year is effected by flood, flooding from the rivers and from the Localize rainfall. Many people who live in inundation area are faced to the problems

Because of geographical condition, Cambodia had occoured annually Flooding from the rivers and local rainfall.it has impacted seriously for :

- National infrastructure (road, bridge,...)
- National flood control structure system ( dam, dyth, reveriore,levees break, embankment...)
- Destroyed agricultural products, life of people, animal and properties.
- Lake suitable house for people
- Lake clean water for driking when flood
- Lake foods for eating because lose opportunity for accupation
- Occurred desease for people and animal during and after flood

- Interfered with education ( especially in rural areas )

Flood mitigation requires real-time information on weather and hydrological forecasting, so that forecasts and warnings info can be issued to people at risk place, for example for merchants who may need to remove goods stored at ground to upper level. Forecasts of flooding are now become very interested for stakeholders and local authority and international communities also. In Cambodia, flooding is not restricted to the floodplains towns and rural areas (average flood and minimum flood, inundation), but the subject flash flooding and heavy flood is generally heavy not stability social and national economic losses. Many emergency situations cannot be avoided, it must be tooke care about flood management and must be ensuring the availability of financial, human and material resources. It is meant needing the help from network, coordinate individuals, agencies and organizations in order to a rapid and effective response. This is where “ Flood Hazard Mapping ” on going apply.

### 3 - Effectiveness of Countermeasures for Flood Hazard Mitigating :

Royal government of Cambodia established a mechanicism organization for disaster manngement from national till local level in vission to mitigate damages/risks by flood or drought through using measures as below :

#### **Dessemination necessary information:**

-In the flood season, Department of Hydrology and River Works/MOWRAM is main role for observing, investigating, forecasting and submitting hydro-meteorological data-information ( water level, rainfall, flow ) to the country leader, concerned ministries, municipality, local authorities and related agency by using Fax Machine, E-mail,internet, report, especially to the people by madia( television, radio, newspaper or magazine ).

-These information are very interesting from stackholders ( country leader, concerned ministries,inter-national organizations,madia networks, provincial & local authoriries and population ) because we no have Flood Hazard Maps yet. The activities of flood forecasting to rquire printing and issueing bulletin evry day to users. Therefore, the subject involved hydrological information, meteorology and topographic data, historical inundation and flood information hydraulic and river engineering run off analysis to make a flood hazard map and subject to show how to disseminate or distribution of these production to local authority for evacuation to safety place during a flood disasters in city/urban area of this training course are most impressive, relevant and improve my professional knowledge work in hydrological flood forecast.

#### **Evacuation Measures :**

- Refer to, religion traditional in cambodia, very most of temples are highland, flood can not overflow, so that, most of refuge selters are temples ( pageda ), and public school or other highland were used for safety place also.

-These safety places has handled in during flood season and evacuation was carried out emidiately when authorities known water level information at the upstream in emergency and some floodplains. Before flood season coming, the local authorities granted advice or recommendation to people for preparedness and prevention ( eg. Prepare necessary properties, investigate water level, rainfall info by tv rado or see on boad in village or go to see safety place nearest which sellected by authorities etc...).

- If any case evacuation step, provincial and local authorities, as well as local volunteer in community ( particular, Cambodian Red Cross, National Committee for Disaster Management... ) to consider first priority for elders, disabled or children victims by car, bus, motorbike but most kind of evacuation by foot, animal and bikecycle.

### **Humanity Relief**

Permanent living at safety place, some places are short term but some places long term. Thus, it is rather not difficult for short time ( less than 15 days ) but it is very difficult for long term because they are able force with decease, lack foods, lack clean water... most of they are elders, children and disabled. The solutions of these problems, national, provincial & local authorities suggested for contribution from inter-national humanity person ( CRC & NCDM are main role ) as : foods, medicine, facility or material which support for daily livelihood of those victims ect.

### **4-The “ Action Plan” of Making Flood Hazard Maps in Cambodia :**

Base on, scale of inundation in the past impacted seriously with everyday livelihood of the people. Overall natural disaster management system of Cambodia doesn't respond yet for all actual events and needs of the people in the meaning to mitigate and reduce damages/hazard/risks by flood/inundation or drought. Refer to, the above requirements and reasons demand to improve this system through consideration and establishment Flood Hazard Maps because Cambodia never consist “ Flood Hazard Map” to use in its operation of resettlement during inundation disaster to occur. Therefore, “ Action Plan” for making flood hazard maps will be chosen Tonle Toch River Basin to the point Prey Veng province to be as first priority zones for pilot case studies. It will be included indicators as below :

1- Tonle Toch River Basin to the point Prey Veng will be select for making flood Hazard Maps. Ministry of Water Resources and Meteorology and National Committee Disaster Management will be expected mainly role in the processing of this plan.

2- Tonle Toch River Basin is a tributary of Mekong river. It pass 2 provinces ( Kompong Cham & Prey Veng province ). Prey Veng province has been effected seriously by Mekong flood through this river among of 24 provincial and municipal of Cambodia because of  $\frac{3}{4}$  of the total areas of Prey Veng most of floodplain, especially 2 of 12 districts of Prey Veng was suffered seriously and longest prone inundation ( Peam Ro and Ba Phnom district ). Below information are necessary conditions & reasons will be selected : Prey Veng is covers an area 4,883 quire km and it was divided two main regions :

\*First region is Flood plain which flooded every year from the Mekong River. This region has many Streams, tributaries, lakes and Reservoirs for irrigation in dry season and supplementary crops. It is a kind of delta region that have more citronella land.

\*Second region is central-plain which cover by rain-rice fields. They have not more water resource. They have depended on the rainfall. This region has a small-scale irrigation systems and some places have used ground water for irrigating.

Prey Veng province was divided 12 districts, 116 Communes and 1,138 Villages. Totally populations are about 1,025,331persons .Among of those, female are about 541,572 persons equal 52.8 % and mans are about 483,759 persons equal 47.2 % . Totally



**Water overflowed in village in 2002**

families are 208,727 and density of people about 210 pers/km<sup>2</sup>.

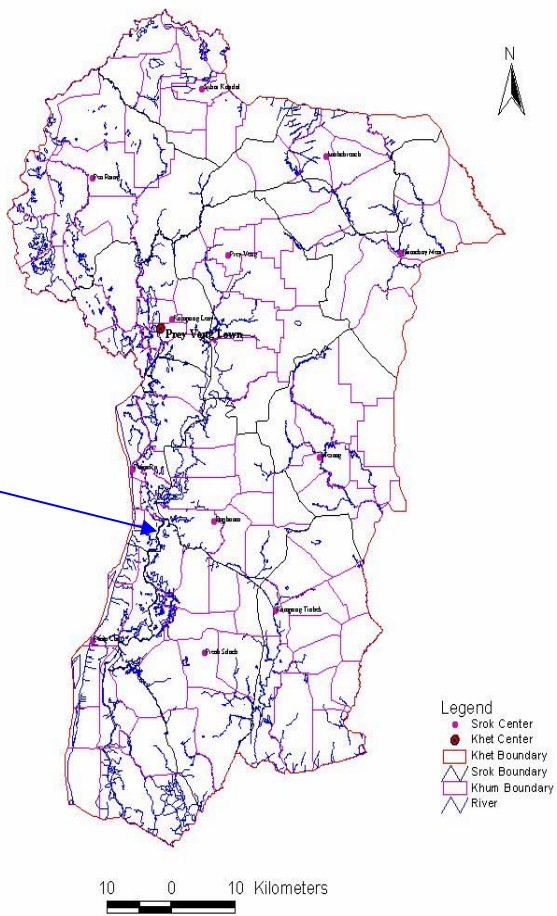
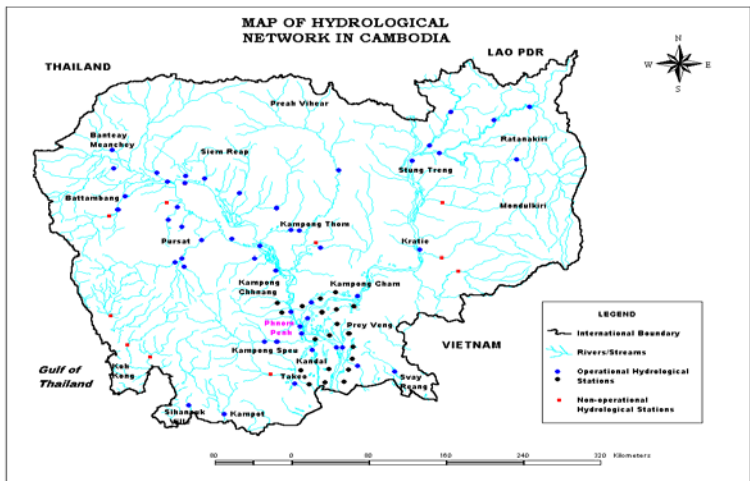
Prey Veng has 2 main rivers & 2 streams(Kompong Trabek & Stung Slot):

\*Mekong River is far about 56 Km crossing Peam Ror and Peam Chor districts.

\*Tonle Toch River is far about 193 Km crossing Sithor Kandal, Pear Raing, Kampong Laev, Peam Ror, Ba Phnom, Kampong Trabek, Preah Sdach and Peam Chor districts.

In the covers area about 488,300 ha, it was divided: land for rice field about 310,000 ha,( among those, rain rice is about 238,000 ha; dry rice is about 60,000 ha), land for crops is about 12,000 ha; forest land is about 19,461 ha; land use is about 45,518 ha and other lands about 107,286 ha.

**MAP OF PILOT CASE STUDY LOCATION**



**TONLE TUOCH RIVER BASIN**



3- Cambodia is a new developing country among regional as the same some countries in the world. The Royal Government of Cambodia same MOWRAM or NCDM are very interesting with the strategy fighting inundation. They are measuring everything to mitigate damages/risks in order to reduce poverty of people to include prevention, preparedness measures also but poverty indicator, it has interfered these procedures, didn't respond all events and requirements, especially financial and human resource area, very lake & limited in present, not suitable national and international situation. Both elements seem to be thought that, they should be able to impact the plan of Flood Hazard Mapping.

**4-Propose “Action Plan” within the next five year :**

**Project Name: Flood Hazard Mapping (FHM )** Duration: 1 January 06– 31 December 2010  
**Target Area: Tonle Touch River Basin, Prey Veng Province** Date: **28 Nov 05**

Narrative Summary	Objective Verifiable Indicator	Mean of verification
<p style="text-align: center;"><b>Overall Goal</b></p> <ul style="list-style-type: none"> <li>• To mitigate damages/hazard/risks caused by inundation</li> </ul>	<ul style="list-style-type: none"> <li>• 90% of damages/hazards will be reduced from July 2011</li> </ul>	<ul style="list-style-type: none"> <li>• The valuation report by Ministry of Planning</li> </ul>
<ul style="list-style-type: none"> <li>• Project Purpose</li> </ul> <p>FHM will be useful in flood fighting countermeasures</p>	<ul style="list-style-type: none"> <li>• 80% of the people in emergency will be safety by flood in the target group at the end of year 2011</li> </ul>	<ul style="list-style-type: none"> <li>• concerned data will be corrected by original institution.</li> </ul>
<p>Output</p> <p>1-Enhancement of Disaster Management System involve establishing and disseminating FHM.</p> <p>2-An effective Flood Hazard Map will be established.</p> <p style="padding-left: 20px;">1- To achieve most belief of the people for quality of Flood Hazard Maps.</p>	<ul style="list-style-type: none"> <li>• 2 time of training course &amp; many times of meeting will be hold</li> <li>• 75% of equipment and facilities of information involved FHM will be improved and maintenance on yearly</li> <li>• 85 % of people in target areas will belief for FHM.</li> </ul>	<ul style="list-style-type: none"> <li>• The source data is surveyed by MOWRAM &amp; NCDM</li> <li>• The source data is surveyed by MOWRAM &amp; NCDM</li> <li>• The source data is surveyed by MOWRAM &amp; NCDM</li> </ul>

## Activities

- 1.1-Review existing regulation of establishment NCDM to include FHM Plan Strategy
- 1.2-To hold workshop on “ FHM Plan”
- 1.3-Provide training courses on methodology to make FHM for concerned institutions, municipalities, local authorities and volunteer target group of local communities.
  - 2.1- Data Collection
  - 2.2-Setting of basal condition
  - 2.3-Drawing of basal maps
  - 2.4-Examination of flood Information in flood season
  - 2.5-Examination of evacuation information in inundation season
  - 2.6- Meeting to discuss with all stakeholders on above examinations and basal maps
  - 2.7- Drawing of original flood hazard maps
  - 2.8- Drawing of draft flood hazard maps
  - 2.9- publication & dissemination of draft FHM
  - 2.10-Test draft FHM in the actual events
  - 2.11-Controlling, monitoring &Evaluation
  - 2.12- Improving Flood Hazard Maps
  - 2.13- Publication & dissemination of FHM
- 3.1- Evaluation of overall project
- 3.2- Reporting
- 3.3- Final workshop to assessment project

## Input

### Personnel

- National working group
- Provincial working group
- District working group
- Commune working group
- Volunteer group of communities

### Equipment

- Hydrological tools ( some area )
- ICT tools
- Transportation (Cars/Motorbikes/Bike-cycle)
- Loud Speaker

### Stationary / Facility

- National
- Provincial
- District
- Commune
- Community areas

## **5 -Suggestions for a more meaningful training course?**

*This training course always attended by the lecturers with high knowledge and most experiences in their works for a long time. Relation the schedule of program as : kind of subject, lesson, documents, materials or times of field trip & town watching step and time of each theory lecturing are suitable and enough **but it is seemingly short for practice exercises lecturing**. If we talk about “Flood Hazard Maps” for developing countries as Lao PDR & Cambodia to be still a new topic. **Thus, we should need much time and knowledge involved operating in the office and in the field**. Accordance with, I would like suggest to add the duration ( 2-3 days more) for this step through extending duration of the course or reducing theory lecturing session.*

*Anyway, I would like request to include a few subjects of training courses concerned flood/inundation management such as “ Flood Forecasting & Management” or “Water Quality Controlling” because they are a main component for establishment and handling flood hazard map in the future.*