VIETNAM COUNTRY REPORT: 2005 RAINFALL, FLOODS AND DISASTER FORECASTING PREPAREDNESS

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Introduction

In recent years, unexpected weather occurred intermittently in the Mekong River Basin with 3 consecutive years of early and severe floods, and flash floods in the whole Basin (2000, 2001 and 2002). It caused severe flooding and big damages to many areas along the Mekong River in 4 riparian countries, Lao PDR, Thailand, Cambodia and Vietnam. The flood season of 2003 departed from the 3 previous seasons in that late rainfalls and low flows, when compared to annual average flows, caused droughts and lack of water in various areas of the Mekong River Basin. The next two years (2004-2005), although with a late rainy season and early droughts, the flood occurred within an ordinary range and without any big flood event. There was almost no heavy rainfall in the Basin and the flow fluctuated at or around the annual averages, water levels in downstream were not high and were at or about the annual averages as well. It could be evaluated that the 2004 and 2005 flood seasons were a good match and created generally favorable conditions for riparian people, especially in the Lower Mekong Basin. However, it caused some damages in the Mekong Delta where 44 people died, mostly children, with 2,723ha of area damaged by inundation.

1. OVERVIEW OF 2005 RAINFALLS AND FLOODS IN THE LOWER MEKONG DELTA

1.1. The Weather in 2005

In the dry season, the late rainy season caused droughts and lack of water in the Central Highland and Southern part, which badly affected agricultural production and living conditions of the people.

Long hot weather happened in Central Highlands and Southern part of the country in April and May. Annual temperature in the Basin and Mekong Delta was higher than the annual seasonal average, except that of south-west part of Mekong Delta.

In the rainy season of 2005, the weather was more complicated than previous years. There were 9 storms, 5 tropical depressions in the East Sea, in which 5 storms and 2 tropical depressions directly affected the Mekong River Basin (illustrated in Figure 1). The Tropical convergence was not as strong as it was in previous annual heavy storms. One month later, the South West wind was normal, when compared to the annual average.

Precipitation was not high in the Mekong River Basin in 2005. The precipitation in rainy season months was at the normal seasonal average, however in some areas in the middle of the Basin it was higher the seasonal average in some months (illustrated in the Table 1, Figure 2). Total precipitation of main rainy months in the Basin (from June to September) was from 800 to 1200 mm; the most rainfall area was in middle reaches of the Mekong River Basin and the most deficient rainfall area was in the downstream area.

Statically, in the rainy season, there were 9 heavy rainfalls which lasted 3-5 days, even up to 7 days, in which 2 heavy rainfalls of long duration happened in large areas that caused flooding in some areas in middle and downstream Mekong River areas. Due to topographic effects and weather events, rainfall was not regularly distributed in space and time.

1.2. Hydrological situation

Due to late rainfall and low precipitation, droughts were common in many areas of middle and down stream reaches. Water flows in the Mekong River and tributaries were lower than that on annual average. Salinity intrusion was deep and long lasting in the Mekong Delta.

This year, the flood in the upper part the Mekong River was nearly one month late compared to the annual average. In upstream areas, flood commenced from early June and in the downstream area from mid-June. Due to low upstream flooding and low flows, the middle part of the Basin did not influence flooding, so flows in June - July were always lower than the seasonal average. Although the flood peak was higher than that of annual average, water levels in main stations along the Mekong River were very low at the end of July and 4-6 m lower than that of annual average, even lower than that in 2003. The low water lasted for ten days (Figure 3).

At the end of July, heavy rainfalls in large upper stream areas increased the water levels along the Mekong River at an average intensity of 35-45cm/day. On some days water levels increased at 1-1.5m/day, as in Luang Prabang it increased by 161cm on August 18. (Table 2). Flood amplitude was rapid at water levels of 4–5m. In the middle of August, the upstream flood was at the annual seasonal peak, Luang Prabang: 16.02m (20 August), and Vientiane: 11.08m (21 August). This year's flood peak in Luang Prabang was higher than the flood peak of 2004 by about 0.8m (Table 3). After it reached the peak, the flow was supplemented with flood water from upstream and rainfall from middle part, thus the high water levels remained and gradually lowered until the end of October. Total flood monthly volume upstream was lower than that of annual seasonal average, particularly the annual average in August (Figure 4 – 5).

In the middle part of the Basin, upstream water volume merged with the middle stream water that made the 2005 water flow, though higher than that of the same period in 1998. It was equivalent to the 2003 water flow in the same period, which was also one of low flow years (Figure 2). Although early July in the Basin there was the early flood whose peak was 2 m higher than annual average peak, at the end of July, due to heavy rainfalls in middle part, main seasonal flood reached its average intensity at above 05-1.0m, the highest being 1.80m (in Pakse) and attained the annual flood peak in the middle of August. The flood peak in various stations were: Mukdahan: 13.10m (22 August), Pakse: 12.22m (19 August), Savanakhet: 1222m (24 August), in Stungtreng: 10.76m (20 August 8). All were 2- 4m higher than average annual peak, but 1 m lower than the 2000 peak (Table 3). Flood peaks at down stream stations occurred earlier than that of the upper stations. It was proven that the rainfall contribution into the middle part was very high and therefore the flood amplitude was high, from 5.0 – 8.0m. After reaching the highest annual flood peak, due to frequent supplementary rainfalls lasting several days, consecutive flood peaks were generated, maintaining high water flow compared to the average annual flow of the same period (Figure 6-7).

According to preliminary calculation, Mekong River flows in early flood seasons (in June and July), remaining around 10-20 % lower than that of annual average for that time of the year. In main months and end of flood season, due to contribution from the middle reaches, flow was higher than that of annual seasonal average. The highest flow was in August. Total flows in main months (from June to September) and during the whole season in the upper part of the Basin were 7 - 10% lower than that of annual average (Table 4, Figure 8). Total flood volume (from June to October) of 2005 in the down streams significantly increased in comparison to that in upstream. For example, in Pakse it was 3.2 times higher than that in Vientiane and in Kratie, it was 4.5 times higher than that in Vientiane and 1.4 time of Pakse. That proved the contribution along the middle reaches, especially in the upper parts of Vientiane - Pakse or Vientiane - Kratie, usually played important roles in the total Mekong River flood volume that flowed to the Mekong Delta. In an average that occupied 61% of flood volume at Pakse and around 73-74% of flood volume at Kratie (Table 5, Figure 9).

In downstream areas and the Mekong Delta—compared to the middle and upper reaches—the flood season started half a month late (first flood appeared in mid July) and ended at the end of November. However, due to circulation of storms, tropical low pressures**,** tropical converging and

with south-west wind, there were several heavy rainfall events in large areas from early August to early October. Total precipitation in early rainy season (from May to July), was lower than that of annual average, but at the end of the rainy season, it was higher than its annual average.

Due to the fact that water flow in early rainy season was not high, contributed water from rainfalls in the downstream part was not significant, and also due to strong regulation of water in the Great Lake, water levels in the Mekong Delta slowly increased and fluctuated with periodical tides.

In early seasonal months, water levels at stations were low remaining below the annual average from 0.2 to 0.5m in the same periods; some were even 1m lower. Early seasonal flood peaks occurred late in early July. For example, in Kratie the flood peak was 15.07m (8 July), in Phnom Penh Bassac it was 5.71m (10 July), in T©n Ch©u it was 1.89m (9 July), and in Ch©u §èc it was 1.57m (11 July). Water level gradually lowered and was below the annual average until the end of July (figure 10-11 and figure 14-15).

At the end of July and beginning of August, due to heavy rainfalls in the Centre Highlands and the Lower part of Lao PDR as well as due to upstream floods, flood water increased rapidly with the average intensity of 0.0.60-1.0 m (in Cambodia) and 0.1- 0.2m (in Vietnam). In Kratie, the highest flood intensity was 2.63m/ day (28 July). Near to the Mekong Delta, the flood intensity was reduced. The highest flood intensity thus was 0.2 - 1.0m/day, compared to the highest values of 1.24m/day in Phnom Penh port. It was 0.42m/day in Tan Chau and 0.20m/day in Chau Doc (Table 3). Flood amplitudes were rather high, about 6 - 7m in mountainous areas in Cambodia, 3 - 4m in Cambodian Delta, but only 2.0-2.5m in the Cuu Long Delta in Vietnam. However, along the contiguous areas between the middle and downstream reaches, the flood amplitude reached at 8 - 9m. It was 9.12 m in Kratie . This proved that the sub-basin water contribution in Kratie was very high (Figure 12). The highest yearly flood peak in Kratie was 21.62m (21 August) and in Kampong Cham it was 15.35m (22 August). These values are 0.3 – 0.5 m higher than in 2004. After reaching the flood peak, due to upstream converging water in conjunction with sub-basin contribution, there appeared dual floods with continuous peaks, which lasted until the end of September.

In the Delta, due to the water regulation in the Great Lake, the water levels went up and reached to its first peak in the middle of September and the second yearly peak was seen in early October (affected by strong floods). The yearly flood peak in Phnom Penh Bassac was 9.95m (1 October), in T©n Ch©u it was 4.36m (5 October) and in Ch©u §èc it was 3.90m (5 October). These values, were 0.16-0.40 m higher than the alert level No III. The duration of water levels which were over Alert level No III (4.2m) lasted 31 days in Tan Chau. It was about one month shorter than in big flood years. In the downstream areas, affected by heavy flood period, the flood peak appeared late in middle of October. The yearly flood peak in Méc Ho¸ was 2.39m (19 Oct), in Can Tho it was 1.94m (21 Oct), in Long Xuyªn it was 2.45m (18 Oct). All were higher than the peaks in 2004 and 0.2 – 0.5 m higher than the alert level No III (Figure 12-13).

At the end of the flood season, water levels rapidly went down due to early ending of the rains and due the fact that the rainfall in the Mekong River Basin was lower than average annual... From end of October to December 12, in most areas, the water flows were 10-20 % lower than annual average in the same periods, somewhere it was 30% lower. Water levels in downstream and in the Delta were thus 0.5-1m lower than annual average in the same periods. That caused salinity intrusion in the Lower Mekong Basin.

It was recognized that total water volume in the middle reaches was a little higher than the yearly average. However due to affects from topography, infrastructure changes, and flood release schemes, the water flows in the Mekong Delta in 2005 mainly were on the main stream. Flows released to fields were low, inundated areas were not large (only upper parts were inundated), and flooding levels were low that led to the low flood release. This was the reason why the in-stream water levels in channels and ditches were higher than water levels released from upstream. In the downstream parts, due to the effects of strong floods, yearly flood peaks in main channel stations

appeared around 15 days later than in the upper parts (in the middle of October) and were 10-30 cm higher than annual average (table 3).

1.3. 2005 Flood Effects

At the beginning of the season, late floods and rainfalls caused long droughts and salinity intrusion with 50 km length causing damages to agricultural production, fisheries and lives of people in the area. However, late and low floods facilitated the late harvests in many areas. In the middle of the season, the flood peak and water flows were not high in comparison to annual seasonal averages and inundated areas were not large. All that did not cause much effect to the local lives and economic development. It facilitated the harvesting of the third crop in the Mekong Delta. However, floods in 2005 caused damages in Vietnam with 44 death (mostly were children), 4,472 houses flooded and 2,723ha of rice area damaged. .

1.5. Lessons Learnt for Flood Control and Management in the Mekong Delta in 2005

- Hydro-meteorological conditions in the Basin should monitor closely;
- Proactively prepare for and control excessive rainfalls and floods;
- Utilize ultimately the water resources for economic development;
- Enhance the public awareness on floods and its measurements in the Mekong Delta.
- Resolutely apply measures to minimize effects from disasters to communities, especially people in the flooding areas.
- Develop flood control schemes to protect residential areas and important economic areas.

2. FLOOD WARNING AND FORECASTING

In order to facilitate the flood control and management actives to meet requirements from economic sectors in Viet Nam, the National Centre for Hydrometeorological Forecasting under the Ministry of Natural Resources and Environment has developed a hydrometerological forecasting system from central to local levels. The hydrometeorological forecasting system has three levels:

1. Central level, run by the National Centre for Hydrometeorological Forecasting
2. Regional levels, run by 9 Hydrometeorological Stations
3. Provincial levels run by 52 Provincial Hydrometeorological Centres.

This system is in operation during the whole year, and especially with its enhancements in the season of storms and floods.

The mandate of the National Centre for Hydormeteorological Forecasting is to collect hydrometeorological data from international station network (including the data from the MRC) and national station network. Measured data are transferred from stations to regional hydrometeorological stations via telephones or telegraph, then transferred via computers toward the National Centre for Hydrometeorological Forecasting. In the National Centre for Hydrometeorological Forecasting, data are decoded, processed, arranged into database to serve the forecasting purposes, forecasting news on two main points namely T©n Ch©u and Ch©u §èc and posted in the website/internet for hydrometeorological discipline and concerned agencies.

Southern Region Hydro Meteorological Centre collects hydrometeorological data from international station network (including data from MRC), from National Forecasting Centre and measured station network in the region. Data are processed to prepare forecasts and transmits hydrometeorological forecasting information towards provincial stations.

Regional centres for hydrometeorological forecasting in provinces located in the region collects data from regional stations and measured stations within its province. Data are processed and forecasted internally within the province.

Flood forecasting methods in Mekong River include: long term forecast (seasonal and monthly forecasts); medium term forecast (10 days) and short term forecast: 1-5 day (during the flood season). Stations in forecasting network are the main stations in the Mekong Delta, in which 2 of the most important stations in the upstream are T©n Ch©u in the Mekong River and Ch©u §èc in the Bassac River. Forecasting news includes:

- Forecasting bulletin on flood season, which is broadcasted in very early April;
- Monthly forecasting bulletin, which is broadcasted on the first day of every month;
- Medium term forecasting bulletin (10 days) is issued on 1st, 11th, 21st day of every month;
- Short term forecasting bulletin is broadcasted everyday at 10h30';
- Information on floods and emergency floods is announced as far as main stations in Mekong Delta when the flood levels reach the Alert III and over the alert III levels.

In the 2005 flood season; the National Center for Hydrometeorological Forecasting closely monitored the hydrometeorological conditions in the Mekong River. It gave timely warning and precise forecasts of water levels in two important river head -points. Forecasting results of 5 days in advance were produced with permissible error of 15 cm, in T©n Ch©u 86% precisely, over its norm of 6%, and in Ch©u §èc: 89%, over its norm of 9%. Flood peak forecasting result of 1 month in advance with permissible error of only 14cm (in T©n Ch©u) was reported. The time of occurrence was also reliable. . In the 2005 flooding season, the National Center for Hydrometeorological Forecasting issued 12 announcements on floods and emergency floods that were over Alert III levels. These announcements were practical and made in timely manners.

Southern Region Hydro-Meteorological Center and provincial forecasting centers in Cuu Long Delta have closely monitored the rainfalls, floods, forecasts and given warning announcements on flooding situations in a precise manner. Forecasting results were accurate 85-90% of the time. Additionally, they announced news on floods when they reached and exceeded Alert III levels.

Short term forecast information on hydrometeorology, storms, tropical depression and flood information is transferred to the Management Board on Flood and Storm Control at Central and Province levels. Information also is broadcasted on Vietnam Radio Cooperation, Vietnam Television Cooperation, and posted in daily newspapers and electronic newspapers. Local, regional, and provincial stations also provide daily forecasting news, flood news to the people. Flood announcements also are broadcasted on local radio and television stations. Particularly, news on storms, tropical depression, and flood announcement is directly transmitted to Party Agencies, the National Assembly, and other Government Agencies, Ministries, and response organizations.

3. RECOMMENDATIONS

- Provide more telegraphic stations on water levels and rainfalls in the Mekong River Basin, especially stations in the Mekong upper reaches;

- Ensure that information and data in the Basin are transmitted to riparian countries before 9h00;

- MRC should provide forecasting news on rainfall, floods, especially early flood forecasting judgment in early April very year so that the riparian countries could be alerted to prepare action plan on controlling such hydrologic events;

- MRC daily forecasting news should be broadcasted before 10 am so that is could be referred by riparian countries and could refer for flood forecasting and warning activities;

- Frequently exchange information on water utilization and hydrometeorological forecasting;

- MRC and riparian countries should frequently exchange and transfer new technologies on forecasting;

- MRC and riparian countries should conduct training courses for forecasters very two year.