FLOOD MANAGEMENT IN THE RED – THAI BINH RIVER BASIN – VIET NAM

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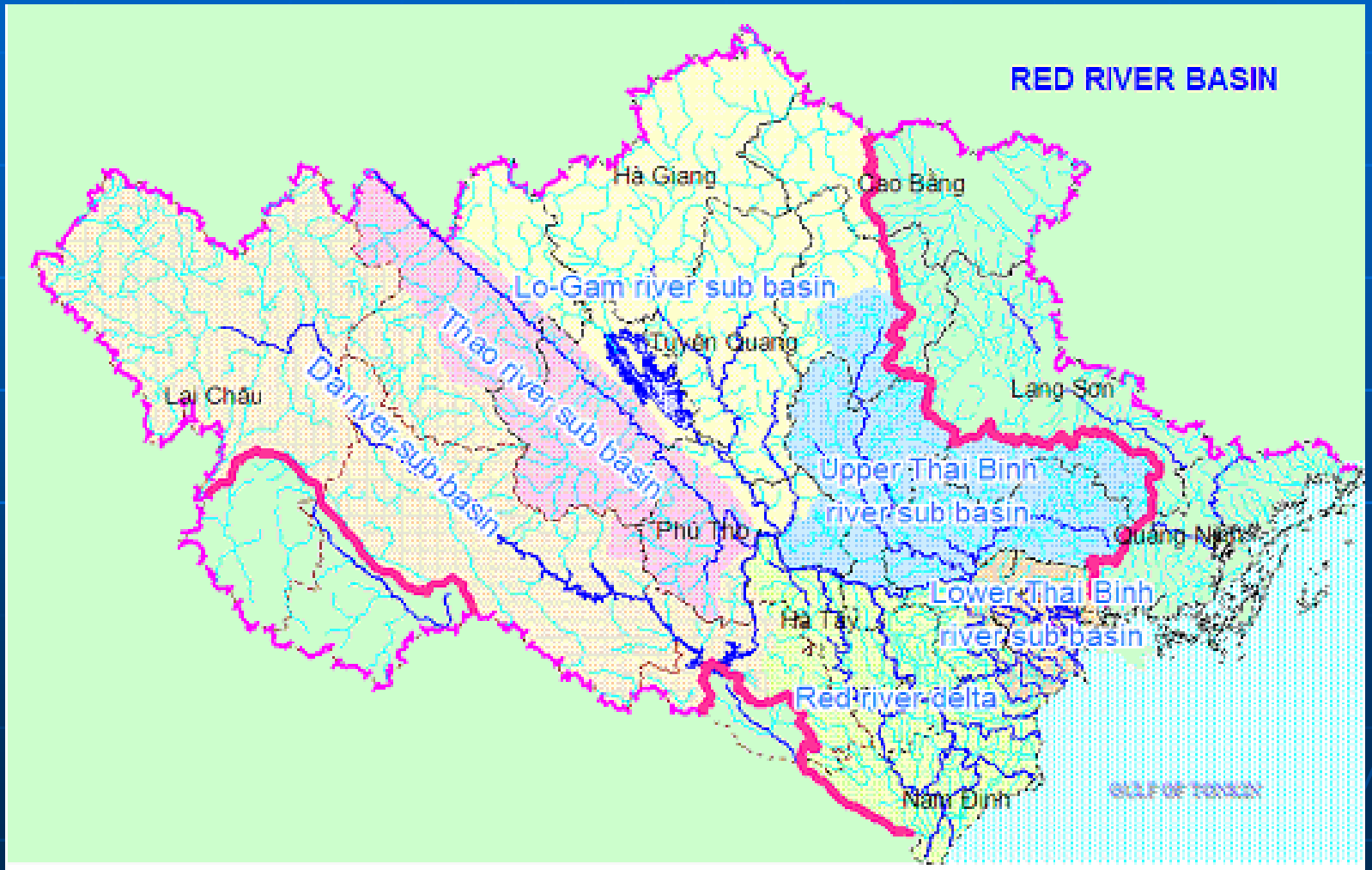
INTRODUCTION OF THE RED – THAI BINH RIVER BASIN



INTRODUCTION OF THE RED – THAI BINH RIVER BASIN

- The Red – Thai Binh river basin (RRB) is situated in the tropical monsoon region at:

  - 20° to 30°30’ in the north latitude,

  - 100° to 107°10’ in the east longitude

- The entire basin is 169,020 km^2 including the part in Vietnam’s territory of 86,720 km^2 (or 51%).
- In Viet Nam territory, the RRB covers surface lands of 26 provinces and cities including the Hanoi capital.
- The total population is 26.6 million people (in 2003).
- The agricultural lands occupy 1.95 million ha.
- Many key economic bases of the country are also established in the RRB.

INTRODUCTION OF THE RED – THAI BINH RIVER BASIN

The RRB consists of 2 parts, i.e., the upper RRB and the Red River Delta.

- The Upper RRB include:
  - sub-river basins of the Red river (Thao, Da, Lo, Gam, Chay rivers);
  - upstream Thai Binh river (Cau, Thuong, and Luc Nam rivers); and
  - upstream of Day river (Tich and Boi rivers).

- The Red river delta covers 9,840 km^2 with a dense network of tributaries and canals such as Duong, Luoc, Tra Ly, Dao Nam Dinh, Ninh Co, Kinh Thay, Kinh Mon, Van Uc rivers and others.

INTRODUCTION OF THE RED – THAI BINH RIVER BASIN

- Located at the elevation of 0.4 to 9 m above the sea level
- 58.4% of the Red river delta below +2.0 m elevation
- 72% below 3.0 m elevation, in particularly, coastal provinces have more than 80% of their surface lands below +2.0 m elevation.
- 80 to 85% of total annual rainfall concentrates in 6 months of the flood season from May to October.
- Average rainfall:
  - in the upper basin (in China territory): 1100 mm a year
  - in the Viet Nam territory part: 1900 mm a year.

FLOOD SITUATION

- Since 1960s, 7 extreme floods happened in years 1968, 1969, 1971, 1983, 1986 and 1996 when water level at Hanoi reached above 11.5 m and at Pha Lai above 6.5 m (in years 1971, 1980, 1985, 1995, and 1996).
- Floods are caused by continuously heavy rains in 8 to 10 days.
- The flood rainfalls are measured at 100 to 300 mm, or 500 to 700 mm at some places, the figures are 700 to 800 mm in the middle and upper parts of Da, Thao, Lo, Cau, Thuong and Luc Nam rivers at the rain concentration areas.

FLOOD SITUATION

- **Flood combinations in rivers:**

  According to statistics since 1902, frequencies of flood combination between the tributaries and the Red river is shown below:

  + Da river with Red river: 68%

  + Thao river with Red river: 44%, and

  + Lo river with Red river: 47%

HISTORICAL FLOODS

+ **Flood in August 1945:**
  - maximum discharges of 33,500 m^3/s at Son Tay
  - restored water level at Hanoi: 14.05 m
  - 52 sections of dike breaks resulting in inundation in 11 provinces
  - inundated areas: 312,000 ha, total damages: 14.3 millions tons of paddy
+ **Flood in August 1971:**
  - average basin rainfall: 255 mm
  - maximum discharges of 37,800 m^3/s at Son Tay
  - measured flood peak at Hanoi: 14.13 m, restored flood level: 14.85 m
  - flood was diverted into Day river and retarded to Tam Nong and Thanh Thuy areas
  - total inundation areas: 250,000 ha, 2.71 millions people affected.

FLOOD-CAUSED-DAMAGES IN RECENT YEARS

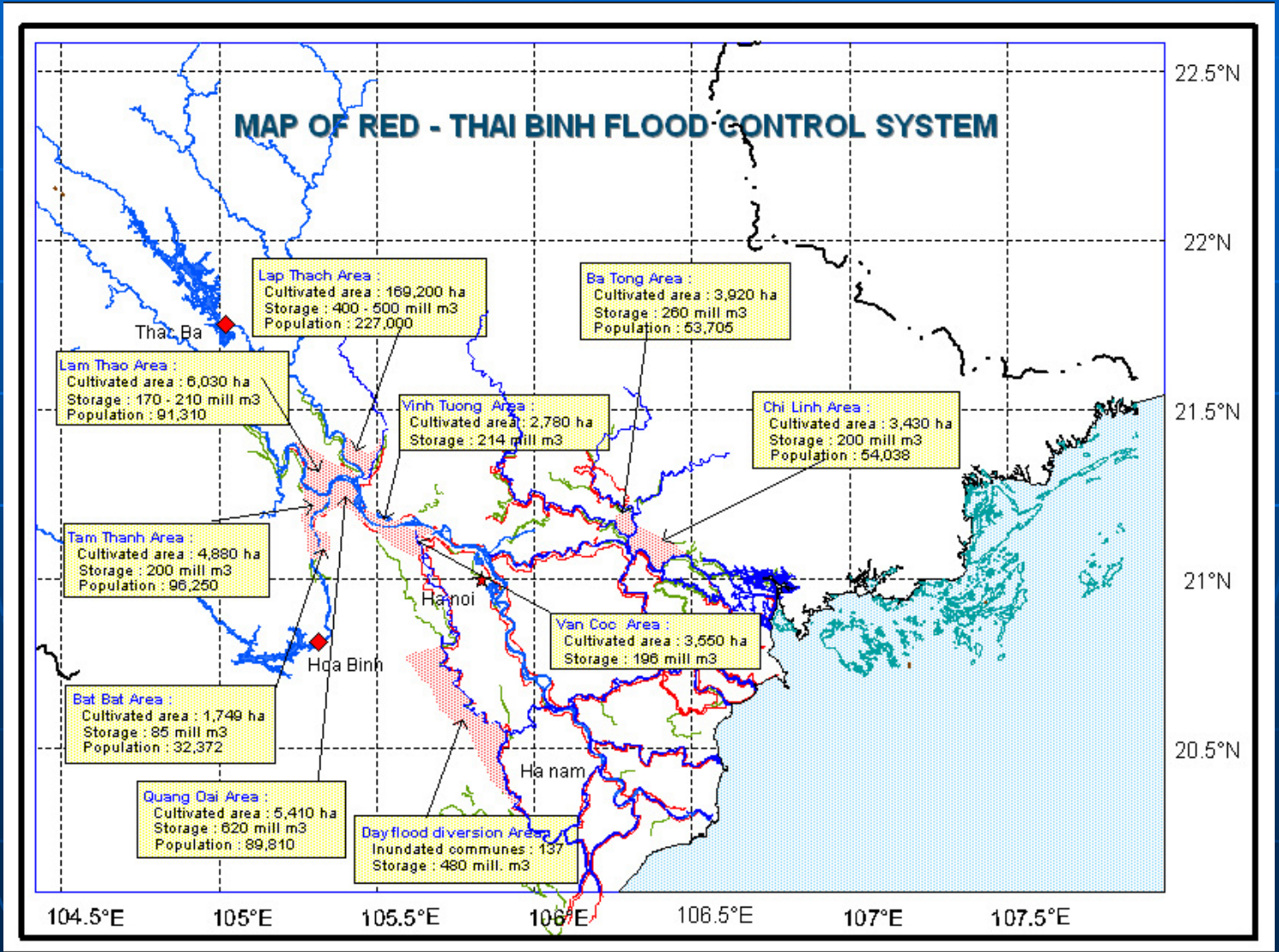
- Hundreds of flash floods causing death of thousands people, destroying hundreds hydraulic, transport works and other infrastructures occurred.
- Notably, the flash flood on July 19, 2004 at Yen Minh (Ha Giang province) causing death and missing for 45 people;
- The flood on 18 August 1996 on Da river caused serious damages with 290 people died, 503 people injured, some ten thousands of houses and public infrastructures destroyed.
- The flash flood on July 23, 1994 at Muong Lay town (Dien Bien province) with total of 17 people died and 46 injured.

FLOOD-CAUSED-DAMAGES IN RECENT YEARS

Damages caused by floods and other natural disasters from 1996 to 2005 in the RRB

Item	Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Number of people died	People	300.0	40.0	73.0	22.0	95.0	76.0	56.0	23.0	99.0	112.0	896.0
Number of people missing	People	45.0	-	6.0	-	4.0	1.0	3.0	-	2.0	5.0	66.0
Collapsed, swept houses	10^3	38.3	1.0	1.7	0.0	0.6	1.0	1.0	1.2	0.4	1.5	46.7
Inundated, destroyed houses	10^3	626.1	32.0	17.4	1.0	10.4	53.0	15.3	16.5	7.1	55.7	834.4
Inundated paddy areas	10^3 ha	380.6	69.6	12.7	6.7	16.5	26.6	8.9	170.5	260.2	256.6	1.209
Fully lost paddy areas	10^3 ha	77.5	5.1	0.9	-	1.7	7.2	1.5	39.3	82.3	2.8	218.2
Road destroyed	Km	8,653	77	10	-	784	133	2	8.889	1.231	231	20,010
Total damaged	Billion VND	3,024	99.4	111.2	6.0	84.6	793.1	220.3	-	85.0	3,260	7,684

FLOOD PREVENTION AND CONTROL MEASURES



FLOOD PREVENTION AND CONTROL MEASURES

1. Dike systems
2. Regulation reservoir system
3. Flood diversion into Day river
4. Flood retention
5. Enhanced flood drainage capacity, and
6. Development of watersheds

FLOOD PREVENTION AND CONTROL STRUCTURES

1. Dike systems

- Constitute basic structural measures in the midlands and delta to protect 38 flood-prone-areas where live about 19 million people on 1.44 million ha of natural lands.
- Total length is about 2400 km in the basin including 1580 km of the Red river, and 750 km of Thai Binh river with 600 covered revetments and 3000 sluices.
- Average height is 6 to 8 m, or 11m at some places.
- Being long built in the past, hundreds kilometers of dikes are not strong enough against floods. In case of big floods, dike incidents may happen with landslide, erosion, leakage, etc menacing safety of the systems.

FLOOD PREVENTION AND CONTROL STRUCTURES

2. Regulation reservoir system

- The two existing reservoirs:
  - Thac Ba on Chay river with 574 MCM flood storage capacity
  - Hoa Binh on Da river with 5 BCM flood storage capacity

  can ensure flood prevention for the Red river delta at the probabilities of 0.8% or the return period of 125 years.
- Under construction reservoir:
  - Tuyen Quang with 1.0 BCM flood storage capacity
  - Son La with 2.0 BCM flood storage capacity.
  - Ban Chat on Nam Mu stream
- Other studies on further reservoirs such as Lai Chau (on Da river), Bao Lao (on Gam river) for flood regulation purposes are proposed.

FLOOD PREVENTION AND CONTROL STRUCTURES

3. Flood diversion into Day river

- Day river basin is a natural sub-basin of the Red river. Day dam is an important structure to prevent Red river floods into Day river.
- In years with big floods, Day dam is open to divert Red river floods into Day river in order to mitigate flood peak for Hanoi capital. From 1937 to 1954, Day dam has been open for 5 times in years 1940, 1941, 1942, 1945 and 1947.
- After 1971, the Day flood diversion system was rehabilitated to allow a maximum flood diversion discharge of 5,000 m3/s and total diverted flood volumes of 1.1 to 1.3 BCM.

FLOOD PREVENTION AND CONTROL MEASURES

4. Flood retention

- Before there were some flood retention areas such as Tam Thanh, Luong Phu, Chi Linh, Ba Tong, etc in the midlands and lower basin aiming to reduce flood peak in the Red and Thai Binh rivers.
- However, this measure is no longer applicable due to difficulties in operation of those flood retention areas and also to poor effectiveness of this flood retention measure.

FLOOD PREVENTION AND CONTROL MEASURES

5. Enhanced flood drainage capacity

- Is one of the important measures in flood prevention and control.
- Infrastructures such as bridges and embankments have been built in flood plains.
- In estuaries, narrowing or blocking of river mouths makes decreased flood drainage capacity more serious and consequently higher flood water level in rivers.
- Dredging and deepening the channels are not yet addressed. But a comprehensive research into development rules of the estuaries and improvement of flood drainage capacity is needed

FLOOD PREVENTION AND CONTROL MEASURES

6. Development of watersheds

- This is one of the important non-structural measures to protect and reserve water resources, avoid land erosion, exhaustion and flash floods, especially in mid and upper Thai Binh river basin.
- According to 1999 statistics, the forest coverage in the basin is 32.29% (3.37 million ha of forests).
- In the 5 million ha forestation program, it is expected to increase the forest coverage to 55.55% by the year 2010.

ROLE OF RRBO AND IWARP IN FLOOD PREVENTION AND CONTROL

- ***Planning of measures*: different plans for the 6 measures with specific criteria, scope of design for dyke sites, reservoirs, retarding basins, watersheds, floodway etc to be identified.**
- ***Operation procedures of reservoirs* during flood season to be carefully elaborated as they directly relate to the flow process of the river system and electricity generation.**
- ***Regular checking and monitoring* the flood controlling: to be carried out annually by the Flood and Storm Prevention, and Control Boards at all levels with the support and cooperation of local governments.**

ROLE OF RRBO AND IWARP IN FLOOD PREVENTION AND CONTROL

- ***Inspection and evaluation of actual operation*** **of flood control structures in the system to detect problems, potential risks and critical locations for reparation and monitoring.**
- ***Checking the preparation*** **of inputs, materials, human resource and the availability of evacuation plans for people and properties in the event of floods or any big risks.**
- ***Awareness raising*** **for local people for the sake of their knowledge and participation in the flood control and natural disaster activities.**

DIFFICULTIES AND PROBLEMS IN FLOOD MANAGEMENT

- More frequent occurrence of natural disasters
- Frequent flash floods due to degraded watersheds
- Rising sea level caused by greenhouse effect explain for coastal flooding and limited flood drainage in estuaries.
- Fast and constant economic growth is putting a big pressure on population development, living quality and the society.
- Bridges and busy flood plains in the process of urbanization and cultivation have narrowed the floodway and increase flood pressure for rising water level in dyke system.

DIFFICULTIES AND PROBLEMS IN FLOOD MANAGEMENT

- Occupied retention and diversion flood areas due to urbanization hinders the retarding and diverting of flood water.
- Difficulties in mobilization of materials and resettlement for the construction of flood control structures.
- Dyke system has been built for a long time so do not meet design criteria for flood control.
- Changing main flow causes the erosion in flood plains and riverbeds menacing the stability of flood plains and dyke system.
- Coastal area and estuaries are silted up and stretched towards the sea, forming warp soil areas in the estuaries and obstruct floodways.

ACTIVITIES TO BE DONE BY THE RRBO

- Accelerating the completion of inter-reservoir operation procedures to control flood for the downstream.
- Accelerating the completion of floodway planning for the Red river. This will be a basis for the construction of dyke system, levees and flood plains to meet flood control and economic development requirements in these areas.
- Studying of training of river channel and plains, which are under frequent threat of erosion. E.g. the Red river reach from Da river junctions to Son Tay, the Da river reach after Hoa Binh hydropower plant and others in the river system.

ACTIVITIES TO BE DONE BY THE RRBO

- Studying and assessment of the sedimentation of large-scale reservoirs, plains and estuaries in the river system.
- Studying and planning to identify areas under potential risk of flash floods. This will facilitate local governments with the proper and prompt arrangements and evacuation plans for people and property before and in the event of floods.
- Accelerating the study of design criteria for sea dyke system basing on actual floods and storm faced in northern coastal delta.

Thank you very much
for your attention!