

# COUNTRY REPORT

## RED RIVER BASIN PLANNING MANAGEMENT ORGANIZATION

- Organizational structure and roles of the RRBO
- Challenges and proposed measures on IWRM in RRBO
- Structural and Non-structural countermeasures
- Background, issues, challenges, future vision and concrete action

*Prepared by Le Van Hoc & Bui Nam Sach*  
Institute of Water Resources Planning - MARD  
162A - Tran Quang Khai Str. Hanoi - Vietnam

## Issues on policy/plans at national level

### 1. Issue on policy/plans

- "Strategy for water resources development up to 2020" has completed by the Ministry of Agriculture and Rural Development (MARD) and now under the review and approval of Prime Minister. That is, "Strategy for water resources development up to 2020" has not been effective.
- Strategy for water resources up to 2020 has been approved.
- There are 18 priority project proposals (programmes) in implementing the National Strategy on Water Resources" for the period 2006-2010 with involvement of different ministries and agencies in preparing those proposals.
- Integrated river basin water resources development planning has been or being prepared for important river basins of Viet Nam. Some of those plannings have been approved.

## Problem caused by the issue

### 2. Problems caused by the issue

- There are not yet clear mechanisms to make coordinated sectoral development and management decisions across ministry lines.
- There is not any unique agency responsible for integrated water resources management.
- Ministries and sectors have their own body for water allocation and water rights regarding their sectoral water users but the tasks are not clearly defined, sometimes overlaps with other sectors are seen.
- Mandates of ministries and sectors are overlapped whilst the cooperation relation is very loose; the National Water Resources Council is just an adviser with few activities..

## (Assumed) Causes/Proposals & Processes/ Evaluations

### 3.Causes

- To have differing views and ideas among ministries about water resources management
- Unclear definition of mandates of ministries and sectors
- Sectoral management is not linked to integrated management, interests of individual sectors are always emphasized in neglecting possible affects on other sectors
- Being a developing country, there are sharp changes in water demands, in the needs of natural disaster prevention but existing water resources planning are not regularly updated.

## 4. Proposals and Processes

- There should be a unique agency responsible for integrated water resources management of the country as a whole and of river basins in particular. It's the only way to achieve equitable and sustainable water allocation and water rights among water users - Integrated river basin development planning is essential so they should be prepared and approved as basis for water allocation and management for water users.
- Investments in water infrastructure in individual sector must be harmonized and integrated with the approved overall development planning.
- Decentralization in water infrastructure investment and management must be transparent.

### 5.Evaluations

- The capacity to develop strong policy and secondary legislation under the LWR is limited. This will require better coordination between ministries, agencies and provinces as well as training in strategic approaches to integrated water resources management.
- Awareness of the LWR, secondary legislation and how these will be implemented is still at a low level. A clear program of information and awareness regarding the LWR and integrated water resources management is needed.

## Issues on policy/plans at basin level

### 1. Issue on policy and plan

- River basin planning management organizations are not yet active.
- After the 1st thematic workshop, new RBOs have been set up, i.e., the Vu Gia – Thu Bon RBO, and 2 sub-RBOs (for Day river and Cau River) under the Red - Thai Binh RBO.
- Finalization of functions, responsibilities and organization of existing RBOs are sped up.
- RBOs act as advisers in both policy and plan aspects of river basins.
- Strengthening cooperation among sectors, localities and economic sectors
- Promotion of investment and management decentralization by sector and hydraulic systems in close link with geographical territory.

## Problem caused by the issue

### 2. Problems caused by issues

- Organization of RBOs is not firm, members hold different positions concurrently
- Insufficient capability
- Limited experiences of RBOs
- Poor facilities and equipment
- Inadequate advanced technologies for operation, supervision and monitoring
- GIS is newly developed with inadequate information
- Many development plans are not yet approved
- Integrated and sectoral plannings are not linked to each other



## 3. Causes

- Lack of linkage between the NWRC and dysfunction of NWRC
- River basin planning management organizations hold the problem of lacking capacity and unclear role assignment.
- RBOs are new but not very actively operated,
- Their role as the adviser and coordinator in water allocation and interest regulation is not well implemented.
- Resolution of water disputes and conflicts in river basins.

## 4. Proposal / Processes

- These river basin planning organizations need to be strengthened and their role needs to be clarified.
- The linkage between NWRC and the river basin organizations should be strengthened
- Participation by provincial governments should be strengthened.
- Operation and drawing experiences, then better operation for each river basin.
- Training on IWARP, legislation, policy, skills, calculation and operation techniques for RBOs' staff.
- Providing facilities and advanced technologies
- Providing RBOs with certain empowerment in planning management, water allocation and interest distribution.

## 5. Evaluations

- Formation of the unique agency (or ministry) responsible for integrated water resources management of the country, of economic zones and river basins is now under the development process.
- Integrated river basin water resources development planning is being prepared, some plans have been approved for 5-year horizon and visions for 15-20 years.
- Decentralization in infrastructure investment from central to local governments is in early stage with development of investment plans in both directions top-down and bottom-up.

## 6. Remark

- Continuing establishment of new RBOs and putting them into operation RBOs because this is a right track towards integrated river basin water resources management. In immediate term, integrated water resources management is not yet fully possible then management of key aspects should be done meanwhile so that sectors, localities, water users, protected users can be aware of the importance of RBOs.
- Finalization of RBOs functions, responsibilities and organization through real-time operation. Financial supports from the central government, provinces, water users and international institutions are required.
- The NWRC manages at macro level (national) and provides advice to the Government for making decisions in resolving disputes among users, in investments in large-scale projects and in approving plans of international rivers.
- RBOs manage at micro level (river basin, sub-river basin and hydraulic systems) basing on the National Water Resources Strategy and approved river basin plannings in harmonizing water demands and interests of sectors and water users.

Issues or situations on legal framework

## Issues

- Water rights system has not been well functional though the system was provided by the new Law on Water Resources.

Problems caused by the issues

## Conflict of water users

- State management for water resources has not followed the integrated management principle yet. the fact that two institutions (two ministries) are assigned to be responsible for the same sector is scientifically improper and unconfirms with the administrative reform trends.

## (Assumed) Causes/ Proposals & Processes/ Evaluations (Legal aspect)

### Causes

- Lack of technical guideline for implementing the Law on Water Resources (secondary legislature)
- Water rights system is not applicable in Vietnam at present.
- Legal procedures in assigning responsibility are not proper even contrary to legislations
- The human resources working in water resources management are abundant, experienced and capable but scattered in different agencies without an integrated water resources management agency that covers all from water resources inventory, investigation, and assessment to feasibility study, construction and operation and maintenance for hydraulic works and water supply discharge in the whole country.
- State management for water resources has not followed the integrated management principle yet. The fact that two institutions (two ministries) are assigned to be responsible for the same sector is scientifically improper and unconfirms with the administrative reform trends.
- State management for water resources has not followed the integrated management principle yet. The fact that two institutions (two ministries) are assigned to be responsible for the same sector is scientifically improper and unconfirms with the administrative reform trends.
- Assignment of state management is not well coordinated in view of their implementation capability that cause inconsistency in implementation, conflicts in their mandates, decreasing state management efficiency and slow realization of water rights in Viet Nam.

(Assumed)  
Causes/  
Proposals &  
Processes/  
Evaluations  
(Legal  
aspect)

## Proposals and processes

- Promoting to complete the technical guideline.
- Implement a system for licensing water use (surface water and groundwater) and wastewater discharge

## Evaluation

- So far, there has not any official government report on water resources management, especially implementation of water rights in Viet Nam. The human resources working in water resources management are abundant, experienced and capable but scattered in different agencies without an integrated water resources management agency that covers all from water resources inventory, investigation, and assessment to feasibility study, construction and operation and maintenance for hydraulic works and water supply and discharge in the whole country. Water rights as noted above are realized pursuant to legislations but still need technical guidelines. Some water rights are limited. The State encourages different water exploitation and utilization activities but adequate attention on how to promote and enhance those rights has not been paid.

## Issues or situations on organization

### Issues

- Mandate overlap between the MARD and MONRE
- The coordination between ministries and agencies is still weak
- The Department of Water Resources and Hydraulic Works Management doesn't have adequate staff, finances, organizations and other requirement to carry out the necessary integrated water resources management functions at the national level.
- Water resources management belongs to many sectors and ministries. However, assignment of State management is not well coordinated in view of their Implementation capability, which causes inconsistency in implementation.
- Water allocation is inappropriate in terms of drought.
- Need for employment of more skilled staff
- Lack of institutional capacity.



Problem caused  
by the issue

## Problem

- Mandate overlapping leads ineffectiveness in implementing policy, law and others.
- Water allocation is inappropriate in terms of drought.
- Inappropriate water facility management.

(Assumed)  
Causes/Proposals  
& Processes/  
Evaluations

## Cause

- Flaw in the legislations on administrative structures.
- Legal procedures in assigning responsibility are not proper even contrary to legislations.
- The capacity of apex body (Water Resources Coordination Committee) has a room for improvement.

## Proposals & Processes

- The capacity of apex body, NWRC, should be improved. Members need awareness-raising. The Office of the NWRC should be strengthened in terms of organization, staff, inter-ministry working arrangements.
- Need to improve on NWRC and improve the situation of the Department of Water Resources and Hydraulic Works Management. 2:10
- RBOs should be assigned the role of drought management by legislatures though the role is still somewhat unclear.- The following matters should be resolved based on both international models and local experiences

(1) The degree to which they will be involved in decision-making (e.g project or budget approval)

(2) The control of RBOs by MARD

(3) Representation of multiple ministers/sectors as well as provinces

- Institutional strengthening and capacity building is needed for different staff levels on management, planning, and other issues. This is particularly true at the provincial level. One area requiring training and other technical assistance is integrated river basin planning and management. New techniques, methods and models are needed, as well as public consultation, negotiation and conflict resolution skills.
- Professional training is based on traditional approaches. New advanced concepts and techniques should be added to the curriculum. Training at the local level (provincial, district and commune) is poor. Retraining and training of trainers also need to be improved.
- Public administration reform needs to be carried forward to address both institutional issues and staff issues such as recruitment, salary and benefits, and improved staff management.
- Financial expenditure must be vital.

## Recommendation

The rap of the mandates among the multiple water-related agencies seems to be a issue, but the practical problems derived from the issue need to be clarified.

(IV)

Recommendation  
(V)

## Issues

## Issues

- There is a lack of advanced tools and resources for planning, including software, well-trained and experienced staff, guidelines, etc.
- Data and information on water resources are collected by multiple concerned agencies, which have their own database.
- A large amount of water resources data and information is still scatted in different agencies and ministries. Access to this data and information is difficult, costly and time consuming. Data is not compiled and edited in an easy accessible format. The formation of MARD and MoNRE will improve this situation, although further details on the role of the ministries will be needed. A mechanism for information exchange among agencies is being developed and should be fully implemented.

## Issues

## Issues

- There is a lack of advanced tools and resources for planning, including software, well-trained and experienced staff, guidelines, etc.
- Data and information on water resources are collected by multiple concerned agencies, which have their own database.
- A large amount of water resources data and information is still scatted in different agencies and ministries. Access to this data and information is difficult, costly and time consuming. Data is not compiled and edited in an easy accessible format. The formation of MARD and MoNRE will improve this situation, although further details on the role of the ministries will be needed. A mechanism for information exchange among agencies is being developed and should be fully implemented.

## Problem caused by the issue

## Problem caused by the issue

Planning has not been carried out in a strategic manner or at a professional level.

# Technical of Vietnam

(Assumed)  
Causes/Proposals & Processes/Evaluations  
(Technical aspect)

## Cause

Technical aspects and consultation and conflict resolution aspects of basin water resource planning are weak.

## Proposals & Processes

- To equip measuring, analyzing, computation and management facilities for water resources management.
- Financial expenditure must be vital.
- Develop river basin planning. Prioritize the formulation of river basin planning criteria, approve the river system planning.
- With the review of the NWRC, MoNRE, MARD and other ministries should develop priority policy needs in the water sector, such as:
  - water allocation and water rights, including surface and groundwater licensing and wastewater discharge licensing,
  - population migration for resettlement,
  - investment in the multi-purpose water resources projects,
  - policy on water conflict settlement and administrative procedures,
  - natural disaster mitigation
- Formulate the water resources information system and provide timely and accurate information for the water resources users. To strengthen capacity to investigate and monitor water resources. Formulate regulations on management, use and exchange the water resources information. Update periodically the water resources profile.

## Evaluations:

- Capacity building for RBOs staffs, they are improved on planning methodology, process, models, programme, new technology in order to apply on planning and management calculation.
- It is necessary to set up database on water resources, demand, environment etc. for river basins.
- Sample Water resources planning for hydraulic system one is set up in order to good management and learn from experience.

Practical troubles derived from budgetary issues

## Issues

There has been poor operation and maintenance of hydraulic works, therefore their operational efficiency is low. Also, due to low investment ratio, on-farm systems beside new headworks and main canals are incomplete. therefore, design capacity cannot be brought into play. In addition, modernization and upgrade of irrigation and drainage system are inadequate.

(Assumed)  
Causes/Prop  
osals &  
Processes/E  
valuations  
(Financial  
aspect)

## Cause

- There is a lack of long term financial strategy including state budget, international assistance, private investment and user fees. Cost compensation of the government and user fees are insufficient for the operation and maintenance of hydraulic works.
- Government subsidy plus user fees are not adequate to meet operation and maintenance requirement.
- Budget responsibilities between the central and local level may be unclear. Lack of financial capacity at local level means that some local investment can not be carried out.
- Policy is needed on the sharing of capital costs for multipurpose reservoir development. For example, where hydropower is the main sector promoting the development, other sectors which benefit from downstream flow management might make some contribution to the development or operation of the reservoir.

(Assumed)  
Causes/Prop  
osals &  
Processes/E  
valuations  
(Financial  
aspect)

## Proposals & Processes

- Develop long term financial investment strategy based on various sources of the state budget, international financial support and private contribution for the management of water resources.
- Budget responsibilities between the central and local government need to be clarified.

## Evaluations

- Hydraulics infrastructure are constructed fully made from other many budget in order to enough hydraulics works, equipment for good management.
- Existing hydraulic systems need to be improved.
- Water fees for water user need to be set up for hydraulic system other fees such as: Irrigation, domestic water, Industries, aquaculture, tourist supply, also drainage and flood control, so meet the need of fund for O & M, improvement hydraulic structure.

## Remarks

This issue was not reported in the 1st workshop, but quoted from other materials

Remarks



# Water quality of Vietnam

Issues related to water quality	<b>Issues</b> Water quality degradation have happened due to domestic, industrial and agricultural activities.	
<b>Importance</b>		
(Assumed) Causes/Proposals	Disordered discharge of waste water cannot be prevented	(1) Establishment of legislatures for discharging waste water (2) Establishment of the scheme for monitoring waste water discharge
	Each industrial plant may discharge waste water without any treatment on toxic substances.	Introduction of devices for treating waste water including toxic substances

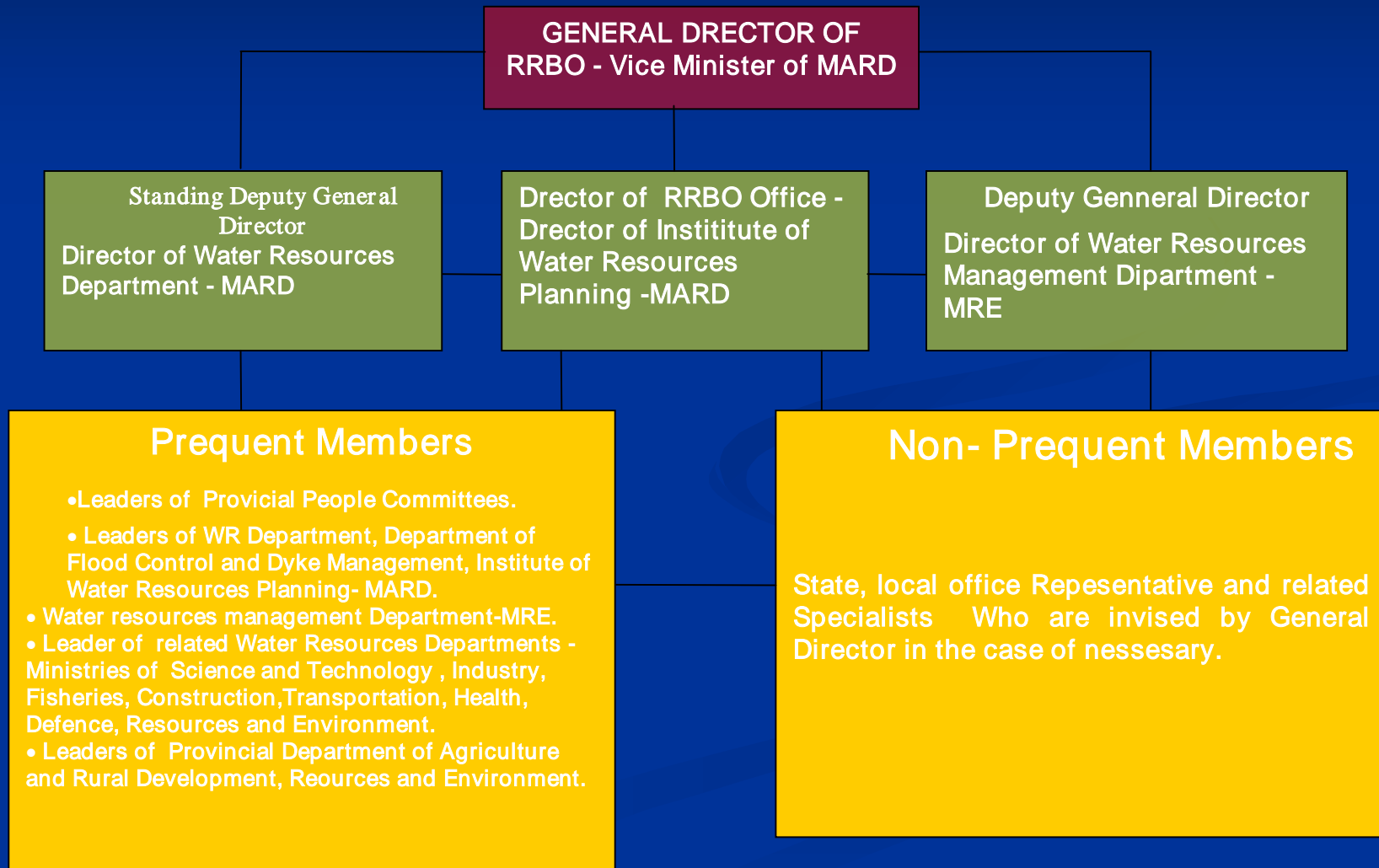
## Water quality of Vietnam

	The amount of environmental flow might be inadequate.	Reconsideration of the amount of environmental flow
	Sewage systems are not well developed	Development of sewage system
<b>Remarks</b>	Vietnam Water Resources Law stipulates the permission system for water discharge but not well functioned.	

# Others of Vietnam

<b>Issues</b>	Awareness on water resources has been limited Water quality degradation has been happened due to domestic, industrial and agricultural activities	
<b>Problem caused by the issue</b>		
<b>Importance</b>		
<b>(Assumed) Causes/ Proposals &amp; Processes/ Evaluations</b>	<b>(Cause)</b>	
	<b>(Proposals &amp; Processes)</b> Most awareness activities have been in project areas and under project funding. People's participatory activities should be built up as a public movement.	<b>(Evaluations)</b>
<b>Remarks</b>	<b>(Blank)</b>	
<b>Comments</b>		

# ORGANIZATION CHART OF THE RED RIVER BASIN ORGANIZATION (RRBO)



## Roles of RRBO

- 1. Assessment of alternatives of water resources planning projects and water resources basic investigation projects and then submit to MARD and the state authorized agencies.**
- 2. Assessment and monitoring implementation of integrated water resources planning projects, including irrigation, drainage, flood control alternatives and water resources conservation.**
- 3. Coordination with related agencies of ministries, sectors, and localities in implementation of water resources planning projects approved by MARD or Government.**
- 4. Coordination with related agencies to establish management regulation of data-base serving management, exploit, use and water resources conservancy.**
- 5. Propose to establish capacity building programs and awareness in management, protection, exploitation, and use of water resources for organizations and individuals.**
- 6. Submit to Minister of MARD and related ministries about the water use and management.**

## 2. Challenges and proposed measures on IWRM in RRBO

### 2.1 Challenges

#### Policy and Legislation

- ❖ Policy and secondary legislation under the (LWR) is not complete: Water allocation and rights, financial sustainability of hydraulic works, flood management etc.
- ❖ Flood management is a critical need:
  - Legislation, policies and institutional arrangements.
  - Major gaps: Structural and non-structural measures, information and skills to implement and maintain measures, international arrangements for flood prone international rivers.
- ❖ Require better coordination between ministries, agencies and provinces, training in integrated water resources management.
- ❖ Secondary legislation and how these will be implemented is still at a low level. Needed:
  - Clear program of information.
  - Awareness regarding the LWR.
  - Integrated water resources management.

## Institution Arrangement

- MARD has not yet clearly reflected its mandate for state management of water resources in a new organizational structure.
- The coordination between Ministries and agencies is still weak.
- RRBOs have been established for 3 years:
  - + Their role is still somewhat unclear.
  - + The control of RRBO by MARD
  - + Representation of multiple ministries/sectors, provinces are matters which should be resolved, based on both international models and local experience.
  - + RRBO will need support to raise awareness of members, train staff, provide equipment.
- Institutional strengthening and capacity building is needed for different staff levels on management, planning, and other issues, particularly at the provincial level, where lack of Technical support, Training, resources and Clear definition of responsibilities.
- The private sector is relatively weak and participation of water users in management, operation and maintenance of water infrastructure is still limited.
- The coordination of international aid and assistance for the water sector has not been done in an optimal manner, focus on allocation rather than deeper partnerships.

# Information Management

- A large amount of water resources data and information is still scattered in different agencies and ministries. Access to this data and information is difficult, costly and time consuming.
- The water resources monitoring network was established, it does not cover all rivers and groundwater adequately.
- Flood warning and preparedness does not have an adequate action plan.
- Information on the linkage between surface and groundwater needs to be improved.



## Integrated Water Resources Planning

- There is no single, official water resources development and management strategy at the national level.
  - + There are not yet clear mechanisms to make coordinated sectoral development and management decisions across ministry lines.
  - + There are no integrated river basin development and management plans.
- Planning has not been carried out in a strategic manner or at a professional level.
  - + There is a lack of advanced tools and resources for planning, including software, well trained and experienced staff, guidelines.
  - + Technical aspects and consultation and conflict resolution aspects.

## Financing

- Investment under the State budget has only reached 60-70 percent of the required level.
- Lack of financial capacity at the local level means that some local investment can not be carried out.
- Compensation rate for site clearance and its mechanism are difficult issues that result in delay of project construction schedule.
- Tendering problems and unrealistically low bid price creates low quality or delay of projects.

## Resources Regulation and Conflict Resolution

- Further secondary legislation is required to put the necessary resource regulation activities into effect.
- Considerable work will be required to prepare and test the necessary details, define institutional roles, train staff, build awareness.
- Inspection and enforcement and conflict resolution activities need to be strengthened and coordinated.

## Training and Human Resources

- The level of awareness, skills and technology for integrated water resources management and new functions for its implementation is fairly low at both the national and provincial level.
- Technical assistance is integrated river basin planning and management. New techniques, methods and models are needed, negotiation and conflict resolution skills.
- Training and technical assistance should be provided to encourage the application of integrated water resources management to areas such as flood management and mitigation.
- Public administration reform needs to be carried: Salary and benefits, and improved staff management.
- Training should address the need at both the university and post-graduate level and at the technical level.

## Education, Awareness, Consultation

- Consultation and coordination between ministries and agencies and between the central and local level needs to be improved.
- Awareness raising on water resources has been limited. People's participatory activities should be build up as a public movement

## 2.2 Proposed measures on IWRM of RRBO

The second Red River Basin Sector project is carried out by ADB, MARD and IWRP. The project aims to:

- Establish integrated water resource management.
- Upgrade or repair priority water resources infrastructure.

### *Capacity Building and training*

- Effective Capacity Building constitutes a variety of elements: Training, transfer of technology, transfer of knowledge, study tours, lectures and presentations, workshops.
- By implementation of IWRM the capacity of the RRBO and Institute of Water Resources Planning is built.
- River Basin 'planning' is only the first step in the IWRM cycle, and later in the project the management aspects will receive more attention.
- Consultants have attempted, in cooperation with MARD, IWRP and the RRBO, to assess the specific needs for Capacity Building for the RRBO, the various stakeholders and address such in the plan for phase 2.

### 3. Structural and Non-structural countermeasures

#### *Strengths*

- The Government has placed a high priority on water infrastructure construction for a very long time.
- Multi-purposes projects have been built with multi-sector and stakeholder involvement.
- Irrigation systems have been built throughout the Basin to meet the basic water demand: Strengthened and modernized irrigation system.
- Other sectors such as hydropower and urban and rural domestic and industrial water supply...

#### *Weakness*

- Poor operation and maintenance of hydraulic works.
- Operational efficiency is therefore low.
- Irrigation and drainage systems need to be modernized and upgraded. The dyke system is inadequate in some areas.
- Policy is needed on the sharing of capital costs for multipurpose reservoir development.
- Climate change has caused both severe flooding and reduced low flow, resulting in greater need for water storage and regulation.
- Hydraulic works development, management is relatively low. Major investment needs exist in the area of water supply and sanitation. Institutional development and capacity building in these areas are critical needs.

## 4. Background, issues, challenges, future vision and concrete action

### *4.1 Background*

The Red River is formed by the confluence of the Da, Thao and Lo Rivers at Viet Tri upstream of Ha Noi. The Chay and Gam Rivers are tributaries of the Lo River, all rising in China. The Day River is the first of several distributaries that form the Red River Delta. It branches downstream of Son Tay and flows south of Ha Noi. The Cau, Thuong and Luc Nam Rivers are tributaries of the Thai Binh River. They rise within Vietnam, where rainfall is lower, and discharge to the Gulf of Tonkin. The Duong and Luoc Rivers, distributaries of the Red River, discharge to the Thai Binh River.



# Red River Basin General Map



# Location of region and sub-region



## 4.1 Background

- The RRB comprised 26 provinces now. The Red River Delta (RRD) Region consists of 11 provinces and covers 17% of the basin in Vietnam. The upper basin covers about 70% of the Northern Highlands (NH) Region including 8 complete provinces and parts of 7 more. The total population of the RRB was about 25 million in 2000 of which 10 million were poor.

### *Population and Poverty in the Red River Basin*

Area	Population (million)	Poverty Incidence (%)	Poor Population
Ha Noi & Hai Phong Cities	2.0	5	0.1
Rural Delta	15.0	37	5.5
Highlands	8.0	55	4.4
Red River Basin	25.0	40	10.0

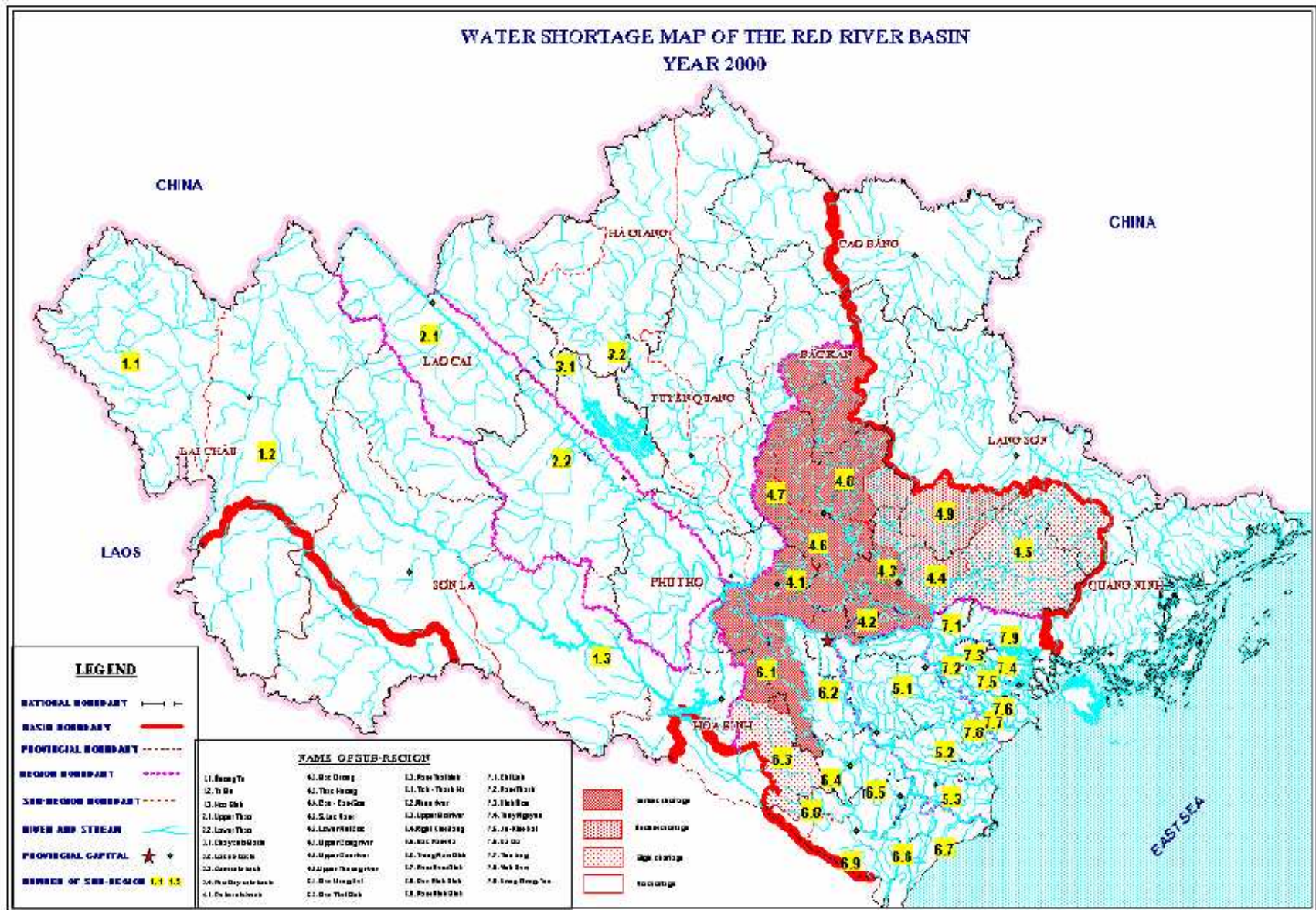
## 4.1 Background

- ❖ The RRB has a monsoon climate with pronounced wet and dry seasons. More than half the delta is less than 2 m above mean sea level. It is protected from flooding and typhoon storm surge by 3,000 km of river dykes and 1,500 km of sea dykes forming about 30 main polders. Rice is the main crop and intensive production relies on a combination of gravity and pumping for both irrigation and drainage.
- ❖ Electricity Vietnam has 2 hydropower facilities in the RRB; Hoa Binh Reservoir on the Da River (live storage 5.65 BCM) and Thac Ba Reservoir on the Chay River (2.06 BCM). The GOV is now considering several dams, and has decided already upon construction of the Son La Multi-purpose Reservoir on the Da River upstream of the existing Hoa Binh Reservoir.
- ❖ The Thai Binh Sub-basin and its tributaries, including the Cau River, are relatively short of water reflecting smaller basins and lower rainfall.
- ❖ Thus the performance of existing irrigation and drainage systems is likely to prove a priority issue. Improved agricultural production performance is likely to require a combination of system management and agricultural improvements.
- ❖ Flooding poses the greatest risk to development in the RRD a recent flood study found that Hanoi is currently protected against the 450-year flood. Thus structural dyke failure is considered the main risk rather than overtopping.
- ❖ The 6 Cau River Provinces set up a committee to manage water quality reflecting local demand for municipal and industrial pollution control.

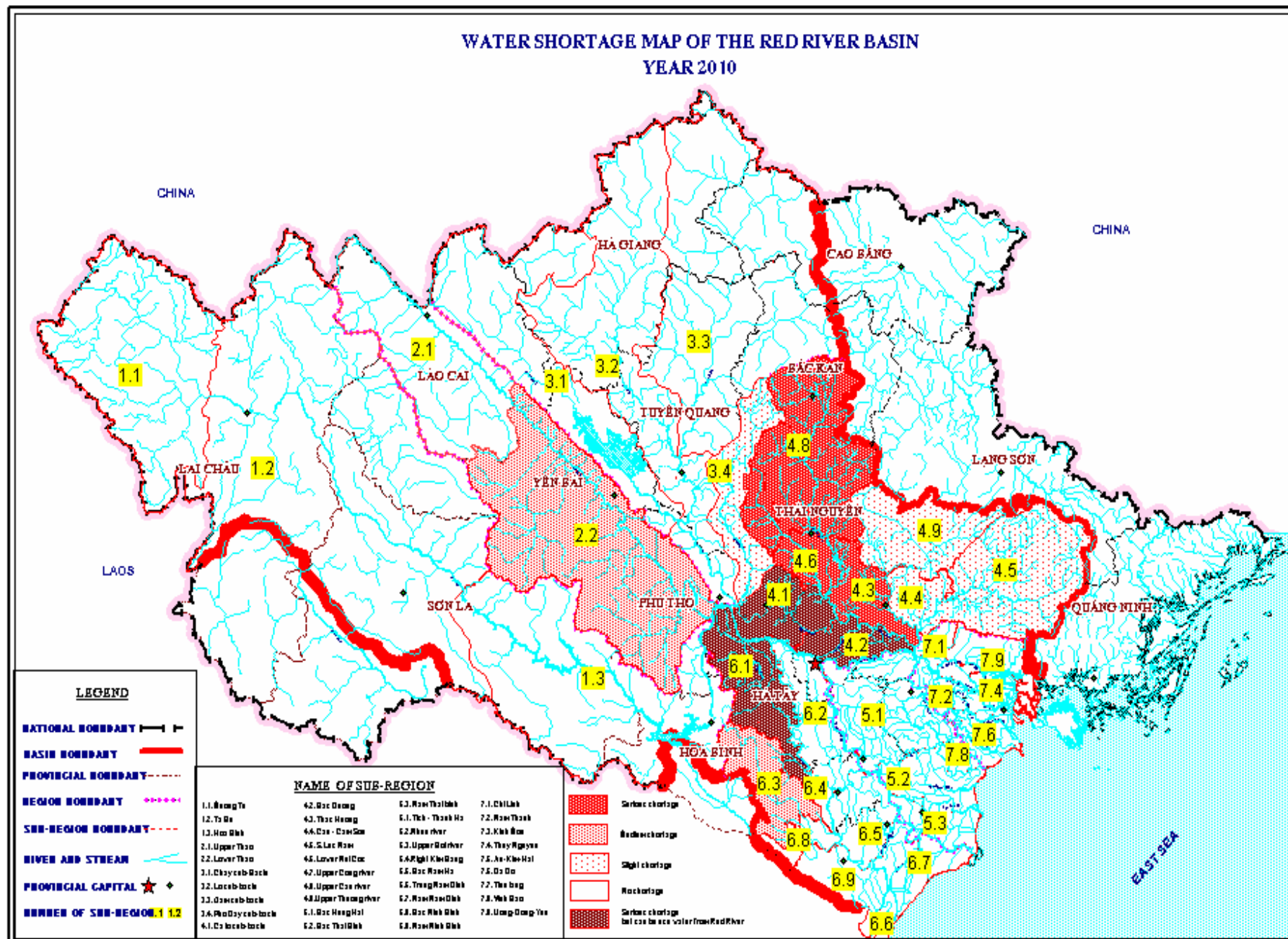
## 4.2 Issues

- ❖ Insufficient maintenance and rehabilitation of the infrastructure. Much of the infrastructure is twenty years old, has been inadequately serviced and maintained, and needs renovation. Pumps, electrical gear, and intake and sluice gates are in many instances in need of improvement. Many of the pumps are reported to have low efficiencies, although no data were available of any site measurements made of this factor.
- ❖ Inadequate infrastructure and design constraints. Most of the existing schemes were designed with an intake capacity of 0.8 l/s/ha which, at the time was considered adequate to meet peak water requirements, a higher demand is now considered necessary up to 1.2l/s/ha. Drainage sluices and pumping stations have traditionally been designed with a capacity of 3.0l/s/ha but calculations now show that a higher drainage capacity (up to 6 l/s/ha) is required in many areas.
- ❖ System operation and management problems. In the Red river Delta, many of the systems are operated as combined irrigation and drainage networks, where management of water levels is critical to controlling flooding, minimising pumping requirements and the costs. Many of the operating companies indicated that their staff lack training in water management.

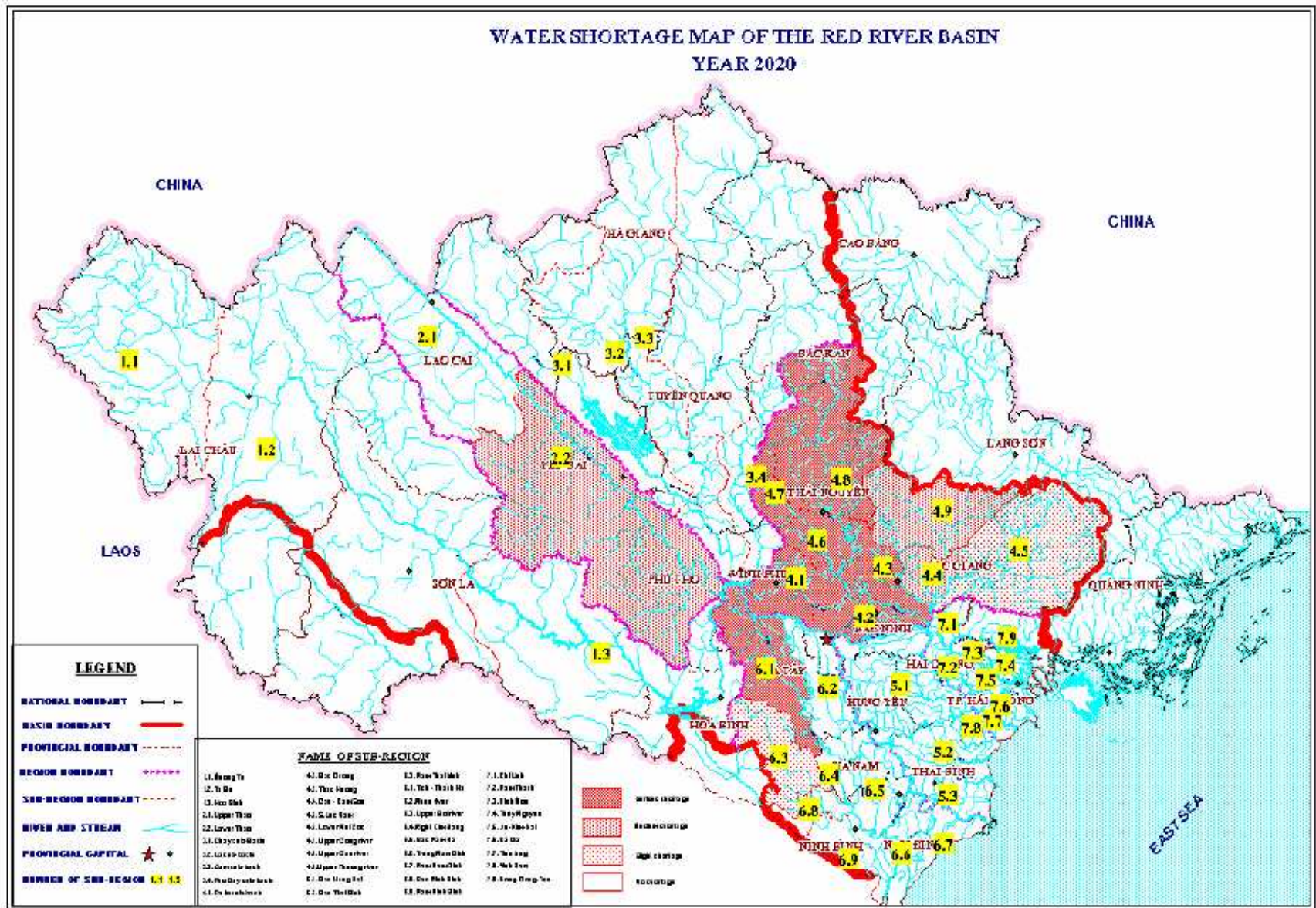
# Water shortage map of red river basin - 2000



# Water shortage map of red river basin - 2010

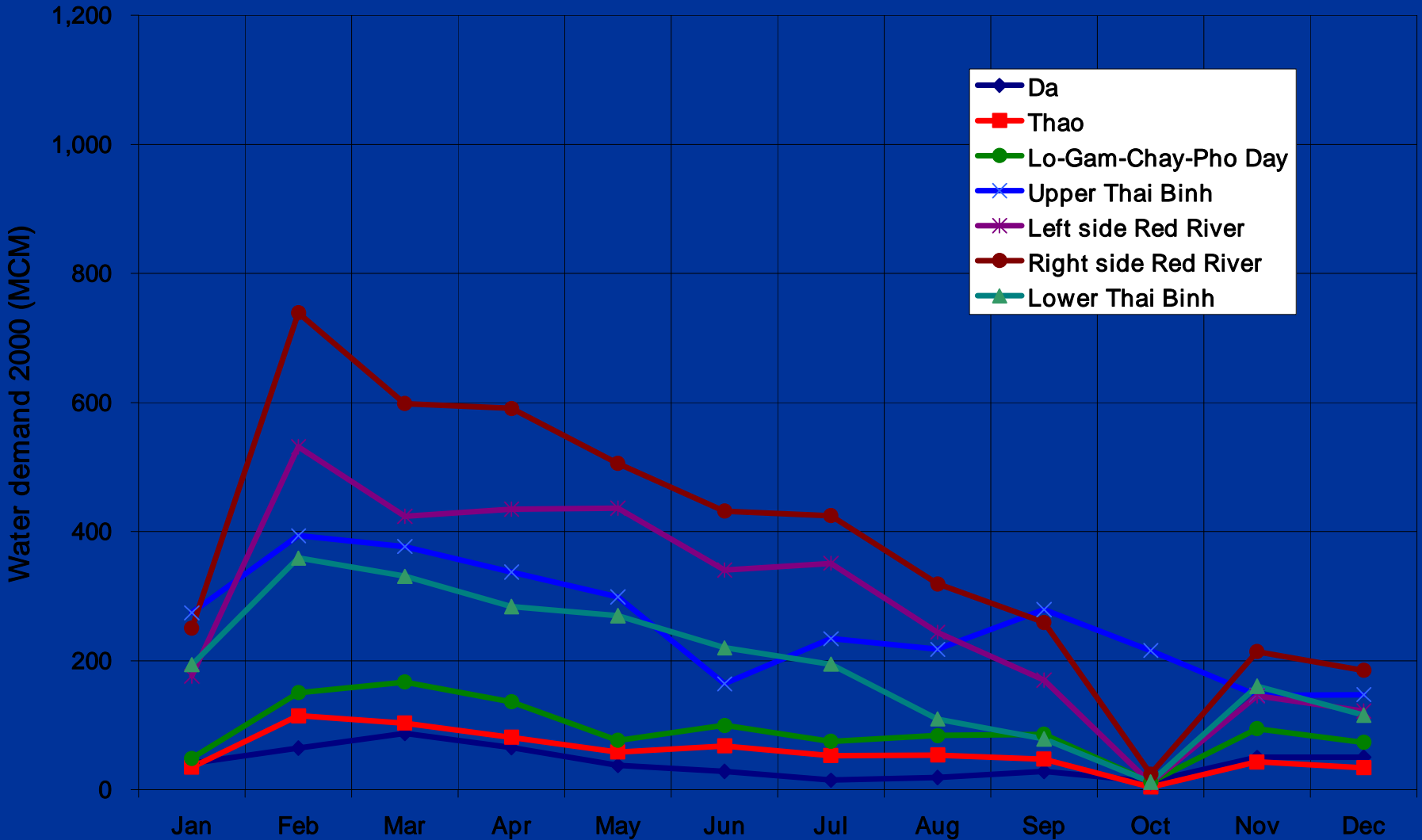


# Water shortage map of red river basin - 2020

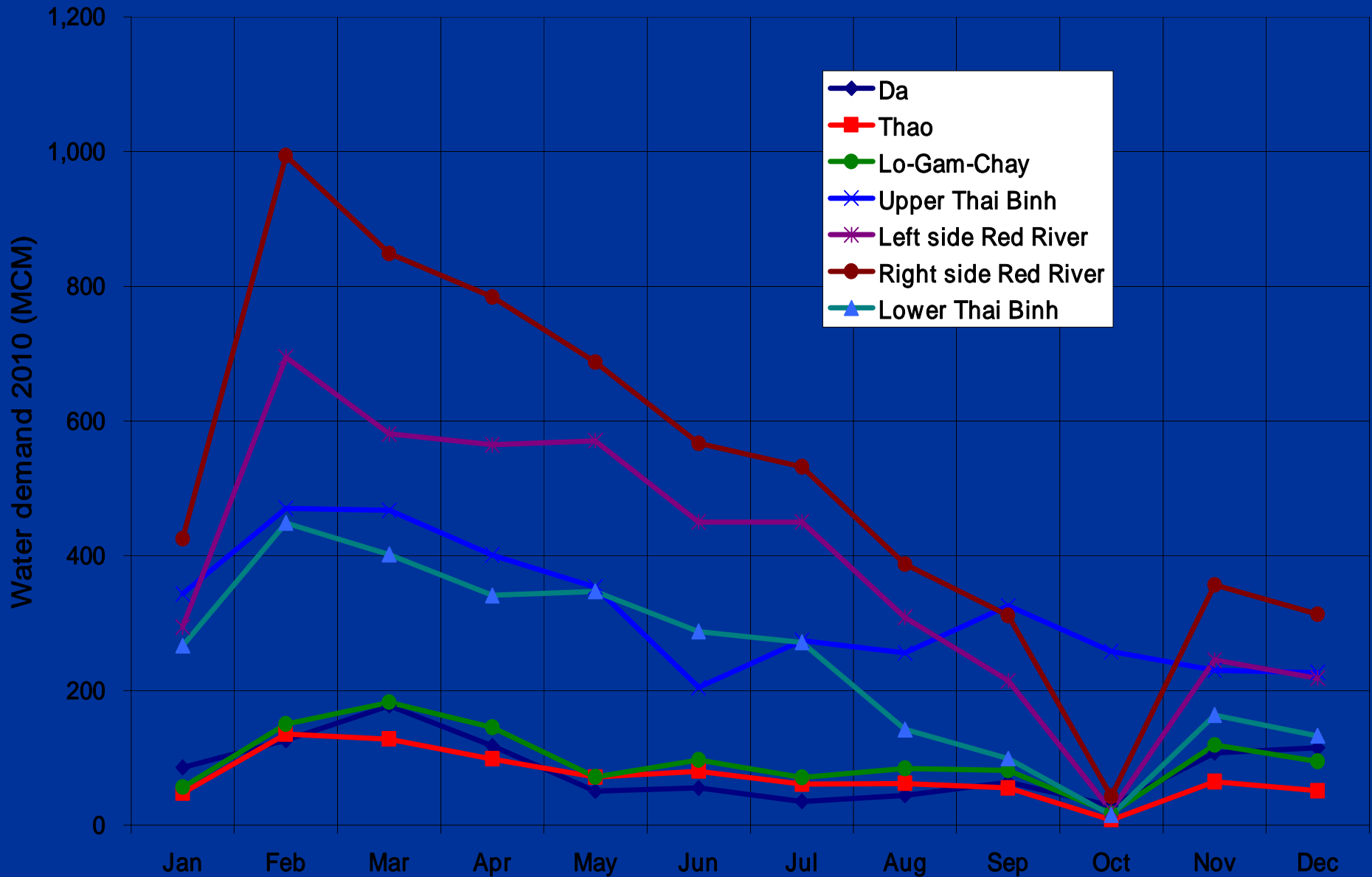




# Water demand year 2000



# Water demand year 2010



## 4.3 Challenges, future vision and concrete action

### -Irrigation, drainage and flood control structure

- Invest in upgrading, improving existing hydraulic works.
- Dredging of existing irrigation and drainage canals, lining of canals and construction of new irrigation and drainage canals.
- Invest in equipment, facilities for operation and management of irrigation and schemes.

Plant trees and develop more lakes, dams upstream.

Solve completely essential points of dykes, compartments, sluices.

To build emergency spillway, maintain flood control systems.

To reinforce the existing dyke system (investment in the critical areas).

To dredge the river channel and clear the flood way.

## Water supply and sanitation Structure

- ❖ Building many different types of water supply works for example commune drill well, tank for containing rainfall, pumping station or common filtered tank for all commune (build a tank, filter water and distribution system).
- ❖ Investment and planning in water quality and water storage. Need a master plan, especially in rural and poor area.
- ❖ Build new water supply systems and individual water supply structure for residential areas.
- ❖ Build, upgrade and complete water supply works.
- ❖ Investigate and planning surface water and underground water.

## Non-structural countermeasures

Need to have policy and regulations for managing and exploiting water resources.

Have information, education and communication activities to raise public awareness (not only for farmers, people but also staff in organizations, association, people who are in charge of collecting water fee).

Raise the management of exploitation capacity of hydraulic works, economize water in irrigation strengthen organizations, train cadres.

Forest and protect watershed (upstream forest).

To efficiently operate the flood retarding and diversion basins.

Strictly discipline on dikes law's violation.

Mechanism on management and dyke protection.

Management, exploiting and protection water supply works.

To manage the waste water poured into rivers.

To raise public awareness relating the building of sanitary facilities.

Educate and enhance public awareness.

**Thank you for attention!**



# Water demand

## Water User Sectors:

- Agriculture/Irrigation and Livestock
- Industrial water demand
- Domestic water demand
- Aquaculture (brackish and fresh)
- Environment (Environmental flows)
- Navigation/transport



## Water demand Agriculture

### 1. Irrigation water demand at headwork:

$$I_{\text{req, head}} = \alpha I_{\text{req, field}} \quad [\text{mm}]$$

where:  $I_{\text{req, head}}$  = irrigation water requirement at head works  
[mm]

$I_{\text{req, field}}$  = irrigation water requirement at field level [mm]

$\alpha$  = ratio for losses between headworks and field

### 2. Irrigation water demand at field level:

$$I_{\text{req, field}} = (ET_{\text{crop}} + I_{\text{perc}} + L_{\text{prep}}) - P_{\text{eff}} \quad [\text{mm}]$$

where:  $I_{\text{req, field}}$  = irrigation water requirement at field level [mm]

$ET_{\text{crop}}$  = crop evapotranspiration [mm]

$I_{\text{perc}}$  = percolation to groundwater [mm]

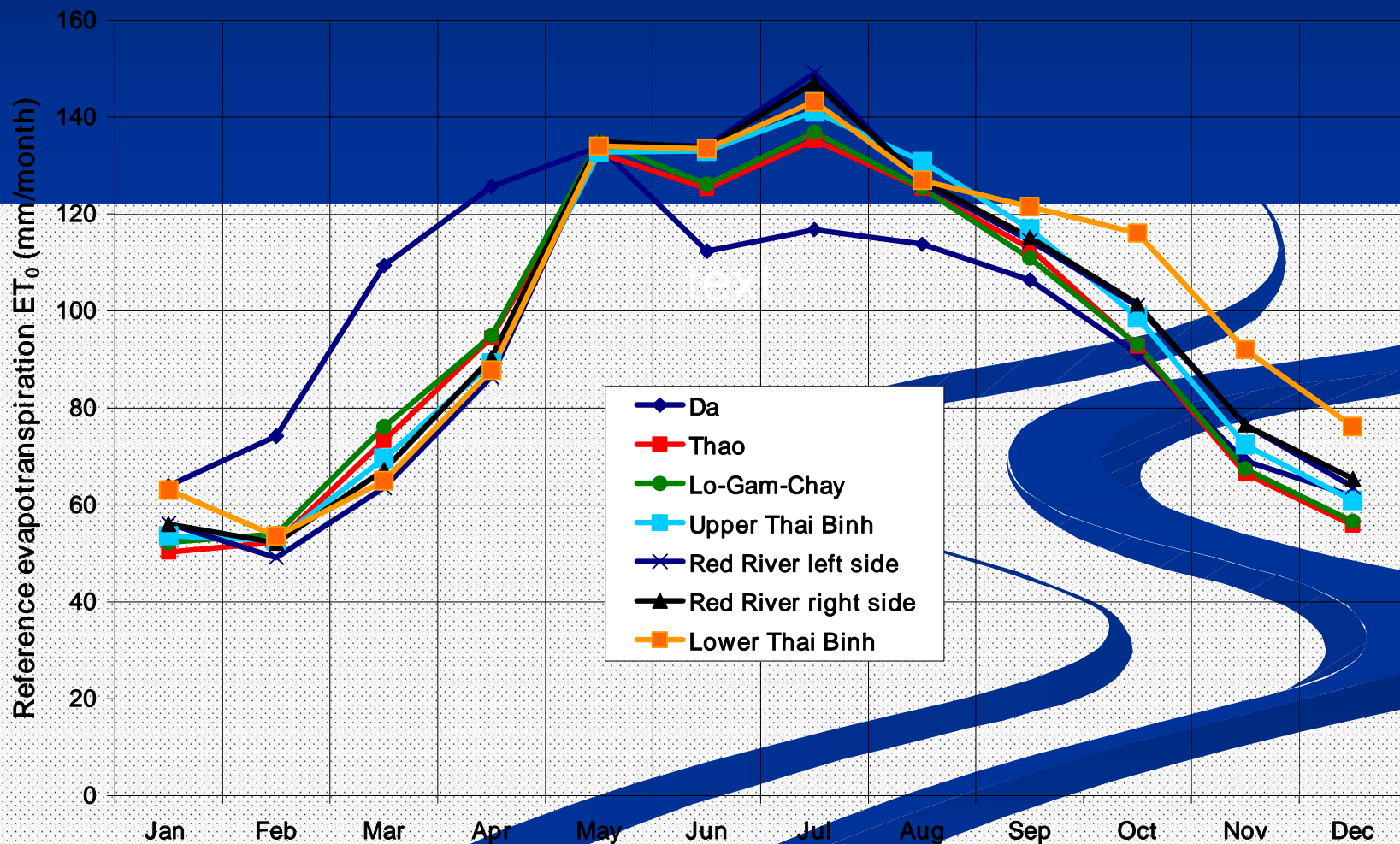
$L_{\text{prep}}$  = water required for land preparation [mm]

$P_{\text{eff}}$  = effective rainfall [mm]

# 2<sup>nd</sup> Red River Basin Sector Project, Part A: WRM

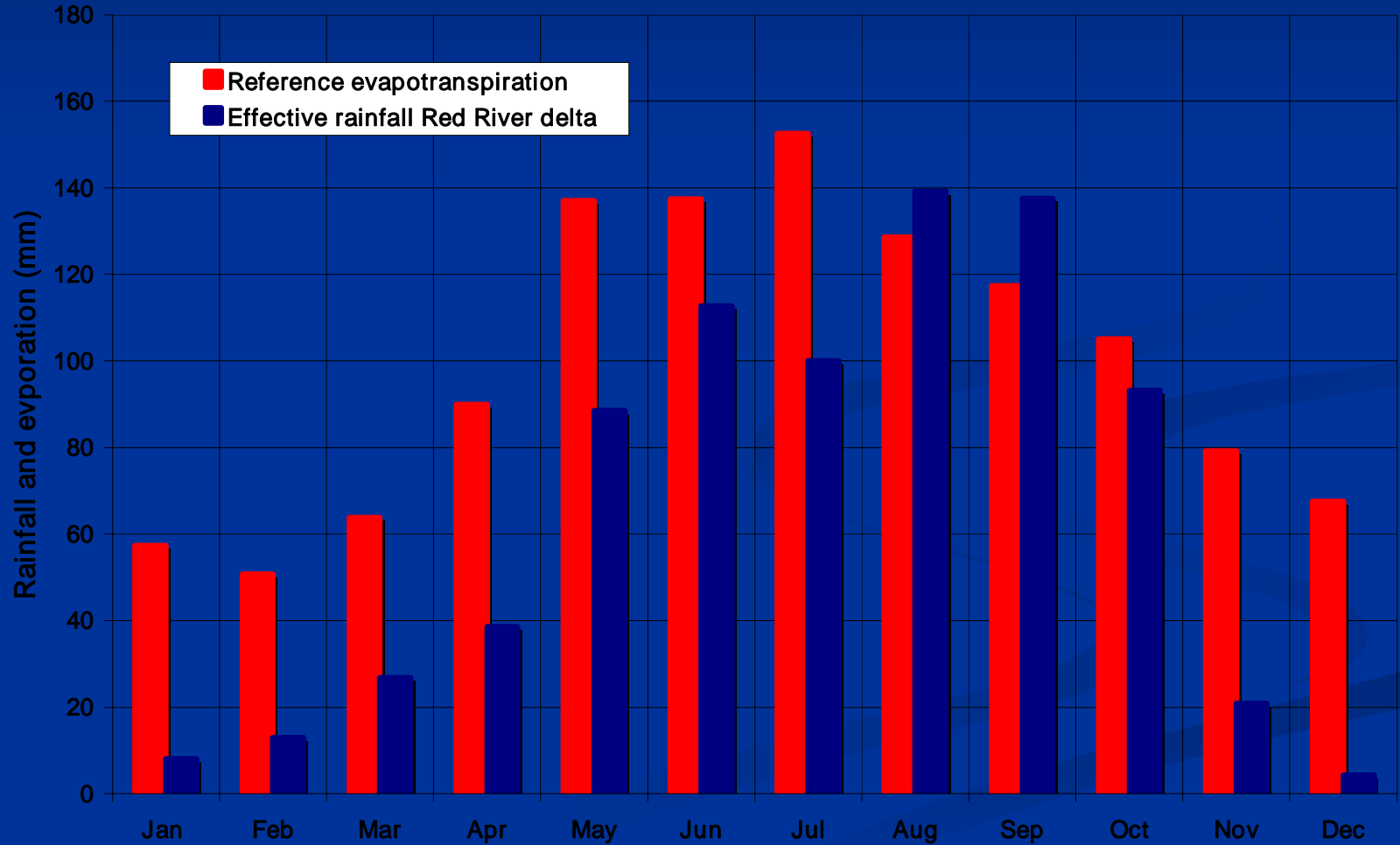
## Component A1: Capacity Building RRBO February 10, 2004

### Reference evapotranspiration



2<sup>nd</sup> Red River Basin Sector Project, Part A: WRM  
Component A1: Capacity Building RRBO February 10, 2004

# Comparison rainfall-evaporation



## Livestock water demand

livestock consumption (standard TCVN 4454-1987):

- buffalo: 80 l/head/day
- pig: 15 l/head/day
- poultry: 1 l/head/day

## Industrial water demand

- per spatial unit estimates are dependent on location of the industry:
- For industrial zones, demand depends on type of industry and product value:

Food industry:	1.0 m <sup>3</sup> /US\$ product
Light industry:	0.4 m <sup>3</sup> /US\$ product
Heavy industry:	0.2 m <sup>3</sup> /US\$ product
- For central industrial zones (Son Tay-Hoa Lac-Mieu Mon-Xuan Mai), demand is based on area: 45 – 50 m<sup>3</sup>/ha/day (5-10 mm/day), dependent on geographical condition and time of the year
- Scatter factories: water use estimated as 10% of household water demand (Guideline for industrial water use standard of the Ministry of Construction)

## Domestic water demand:

### 1) Urban water demand:

- depends on the size of the urban area, classified from large to small:
  - 1st level urban: 200 l/person/day
  - 2nd level urban: 150 l/person/day
  - 3rd level urban: 100 l/person/day
- 53% is added to accommodate for:
  - water for public and service works (10%)
  - street cleaning, gardens (8%)
  - losses and contingency (30%)
  - provision for water factory (5%)

2) Rural water demand: 40-50 l/person/day at present  
and 60-80 l/person/day in 2010.

## Domestic water demand:

used in the calculations is:

Type	year 2000	Year 2010, etc
Urban	100	120
Town	60	100
Rural	50	80

## Water demand

### Fresh water aquaculture:

$$Aq_{dem} = 4,000 - \left\{ P_{av} - (ET_0 + I_{perc}) \right\} * 10 \quad (m^3 / ha) \text{ in month 1}$$

$$Aq_{dem} = 2,000 - \left\{ P_{av} - (ET_0 + I_{perc}) \right\} * 10 \quad (m^3 / ha) \text{ in months 2 - 4}$$

where:  $Aq_{dem}$  = aquaculture water demand [m<sup>3</sup>/ha/month]  
 $P_{av}$  = average monthly rainfall [mm/month]  
 $ET_0$  = potential evaporation [mm/month]  
 $I_{perc}$  = percolation [mm/month], at a rate of 2 mm/day

crop 1: November - February

crop 2: March - June.

**Result: high demands!!**



## Water demand

### Brackish water aquaculture

$$Aq_{dem} = 5,000 - \left\{ P_{av} - (ET_0 + I_{perc}) \right\} * 10 \quad (m^3 / ha) \text{ in months 1-3}$$

$$Aq_{dem} = 2,500 - \left\{ P_{av} - (ET_0 + I_{perc}) \right\} * 10 \quad (m^3 / ha) \text{ in month 4}$$

where:  $Aq_{dem}$  = aquaculture water demand [m<sup>3</sup>/ha/month]  
 $P_{av}$  = average monthly rainfall [mm/month]  
 $ET_0$  = potential evaporation [mm/month]  
 $I_{perc}$  = percolation [mm/month], at a rate of 2 mm/day

crop 1: January – April

crop 2: May – August

**Result: high demands!!**

## Water demand Environment

- water demand for environment includes water to treat and dilute waste water from agriculture, livestock, domestic, industry and aquaculture.
- At present this water demand is not taken into consideration in VN.
- In USA and Europe this water demand amounts 1/3 of the demands of the other sectors.
  
- For the water demand assessment in this report it is assumed that:
  - in mountainous regions the water demand for environment is 10%, 15% and 20% of the total for other sectors in 2010, 2020 and 2040.
  - in the middle and delta region: the demand is 20%, 28% and 33% for the years 2010, 2020 and 2040 respectively .

## Water demand

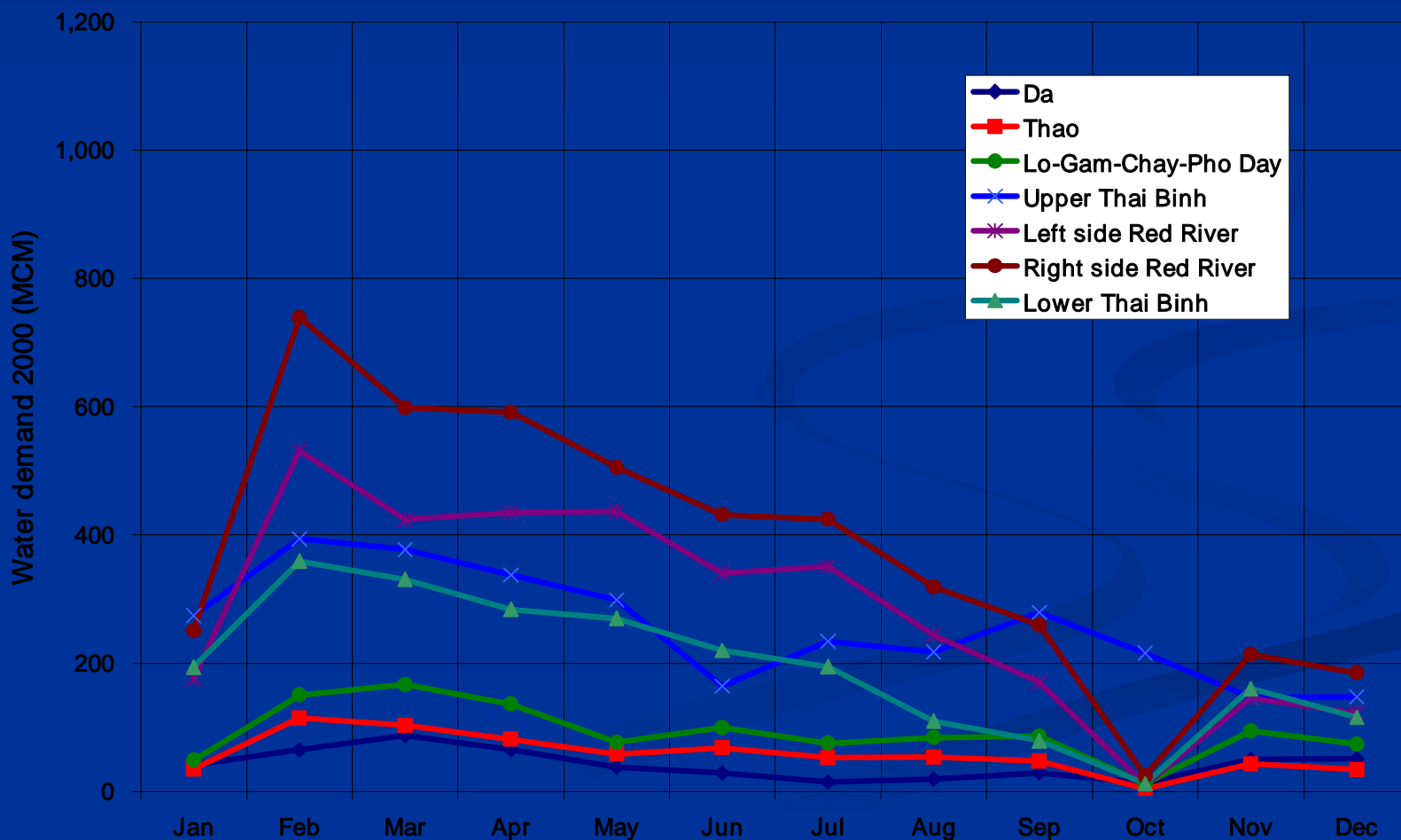
### Navigation/Transport

- width and depth requirements for the river (in 3 classes):
- class 1: rivers in the delta that connect to seaports:  
B = 50-60 m and depth = 3.6 m
- class 2: rivers connecting provinces in the delta:  
B = 50 m and depth = 2.5 m
- class 3: middle and upper part of the Red River (Da and Lo):  
B = 30 m and depth = 1.5 m.
- Viz: water demand for navigation at Son Tay is 500 to 600 m<sup>3</sup>/s. Note that this is covered by the operation procedure for Hoa Binh reservoir during the “dry” season (months September – June), where a minimum release of 550 m<sup>3</sup>/s is guaranteed.

# 2<sup>nd</sup> Red River Basin Sector Project, Part A: WRM

## Component A1: Capacity Building RRBO February 10, 2004

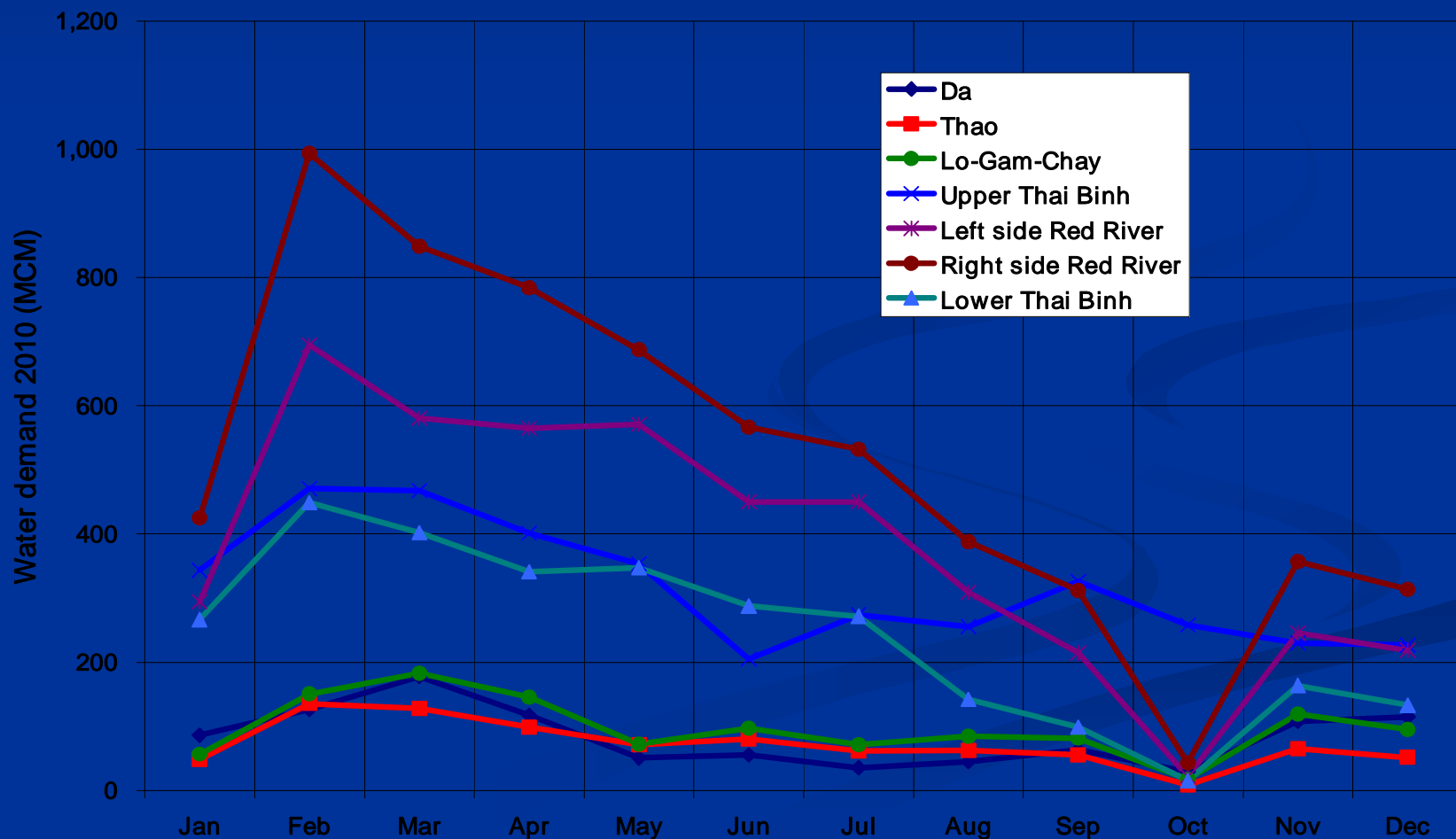
### Water demand year 2000



# 2<sup>nd</sup> Red River Basin Sector Project, Part A: WRM

## Component A1: Capacity Building RRBO February 10, 2004

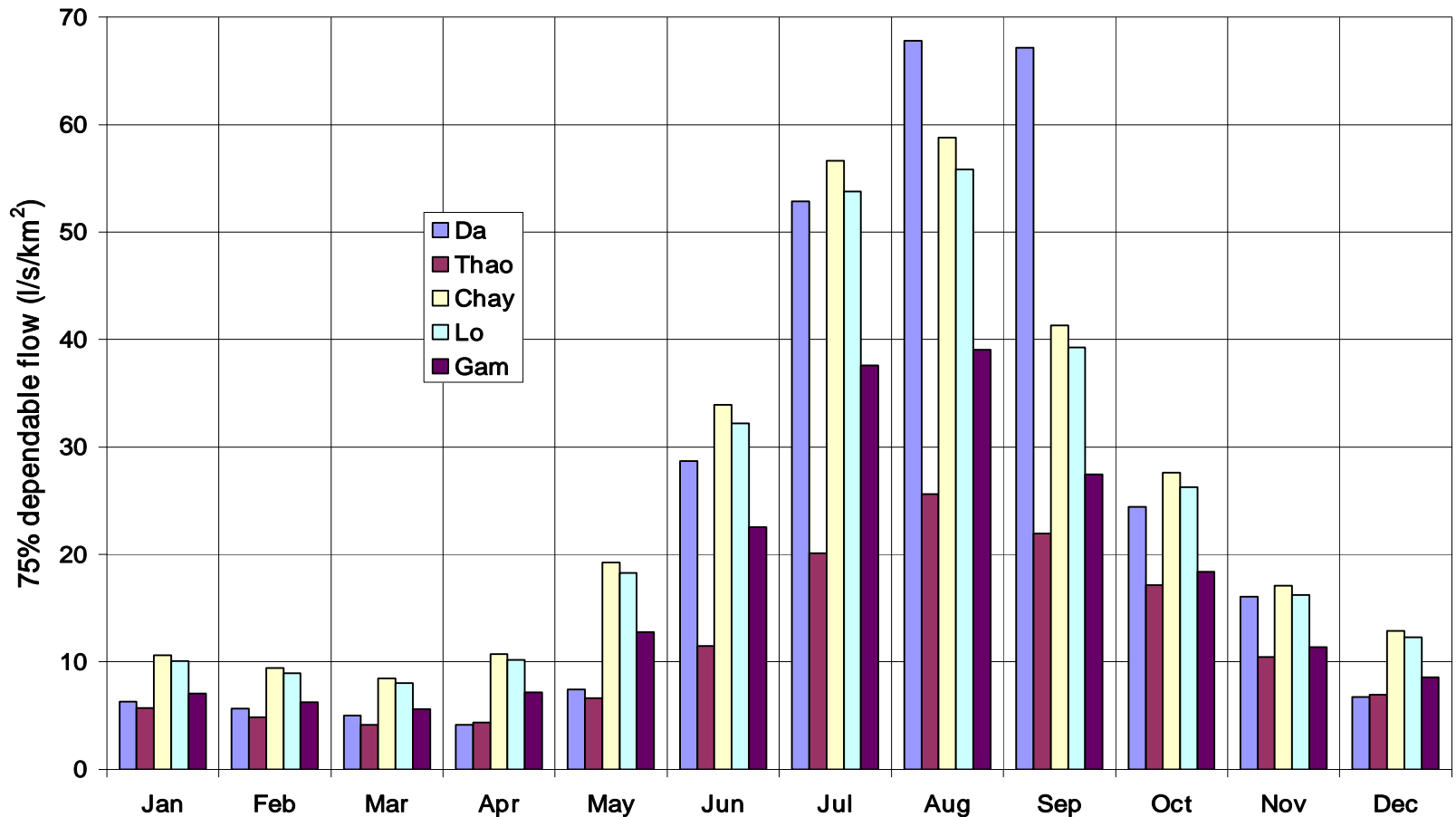
### Water demand year 2010



2<sup>nd</sup> Red River Basin Sector Project, Part A: WRM  
Component A1: Capacity Building RRBO February 10, 2004

# Water availability

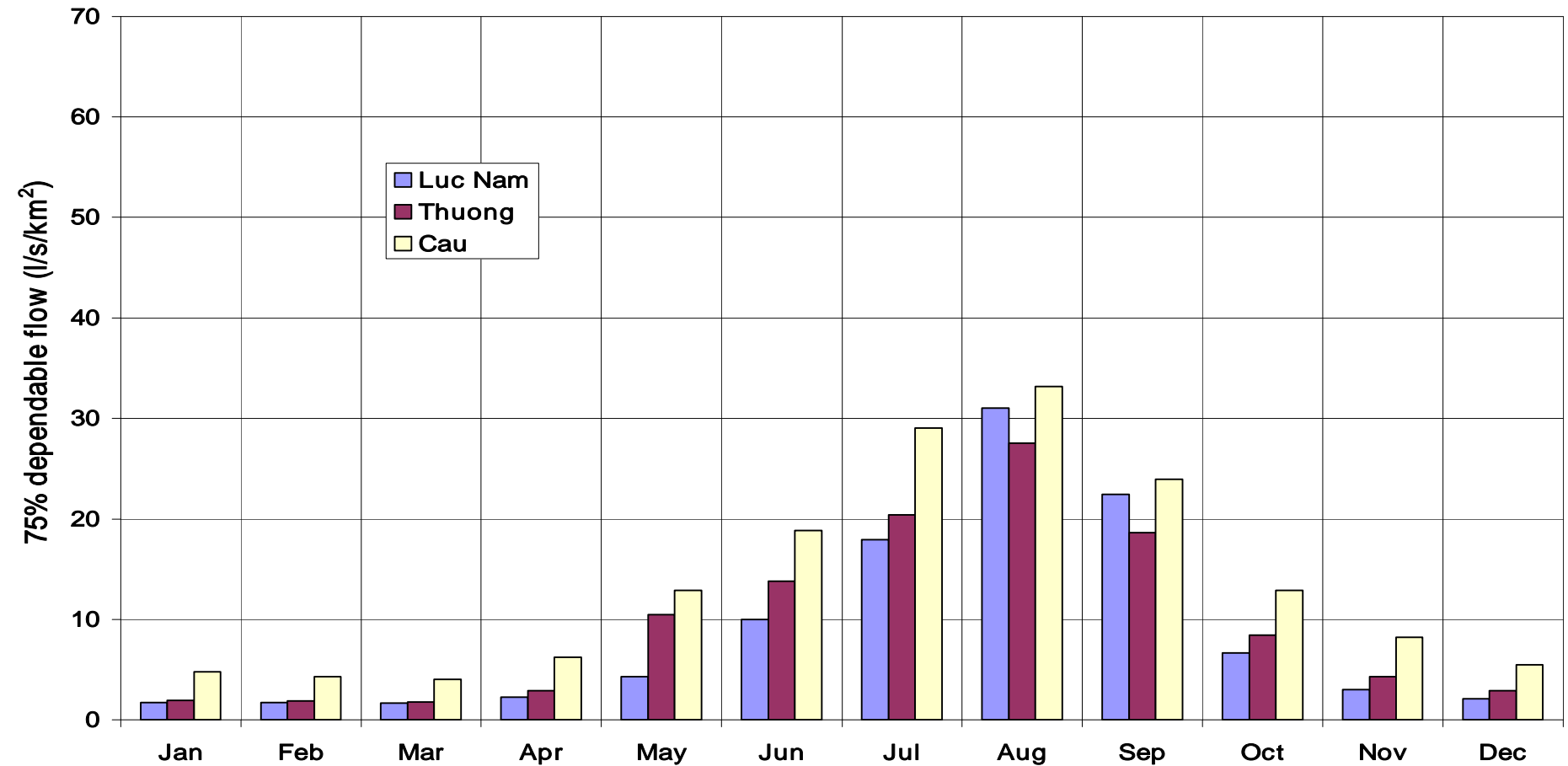
75% Dependable flow Da, Thao and Lo



2<sup>nd</sup> Red River Basin Sector Project, Part A: WRM  
Component A1: Capacity Building RRBO February 10, 2004

# Water availability

## 75% Dependable flow Upper Thai Binh

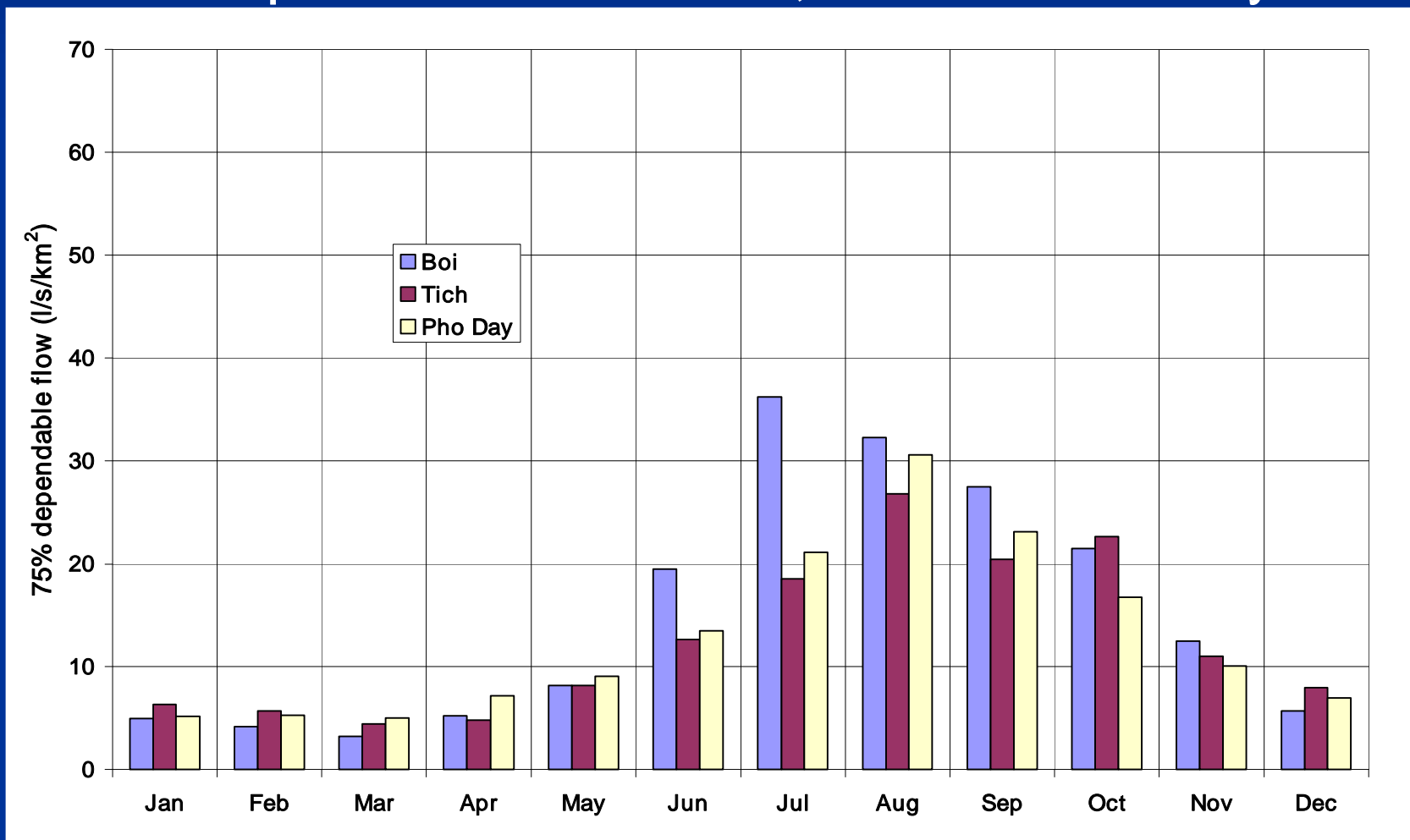


# 2<sup>nd</sup> Red River Basin Sector Project, Part A: WRM

## Component A1: Capacity Building RRBO February 10, 2004

### Water availability

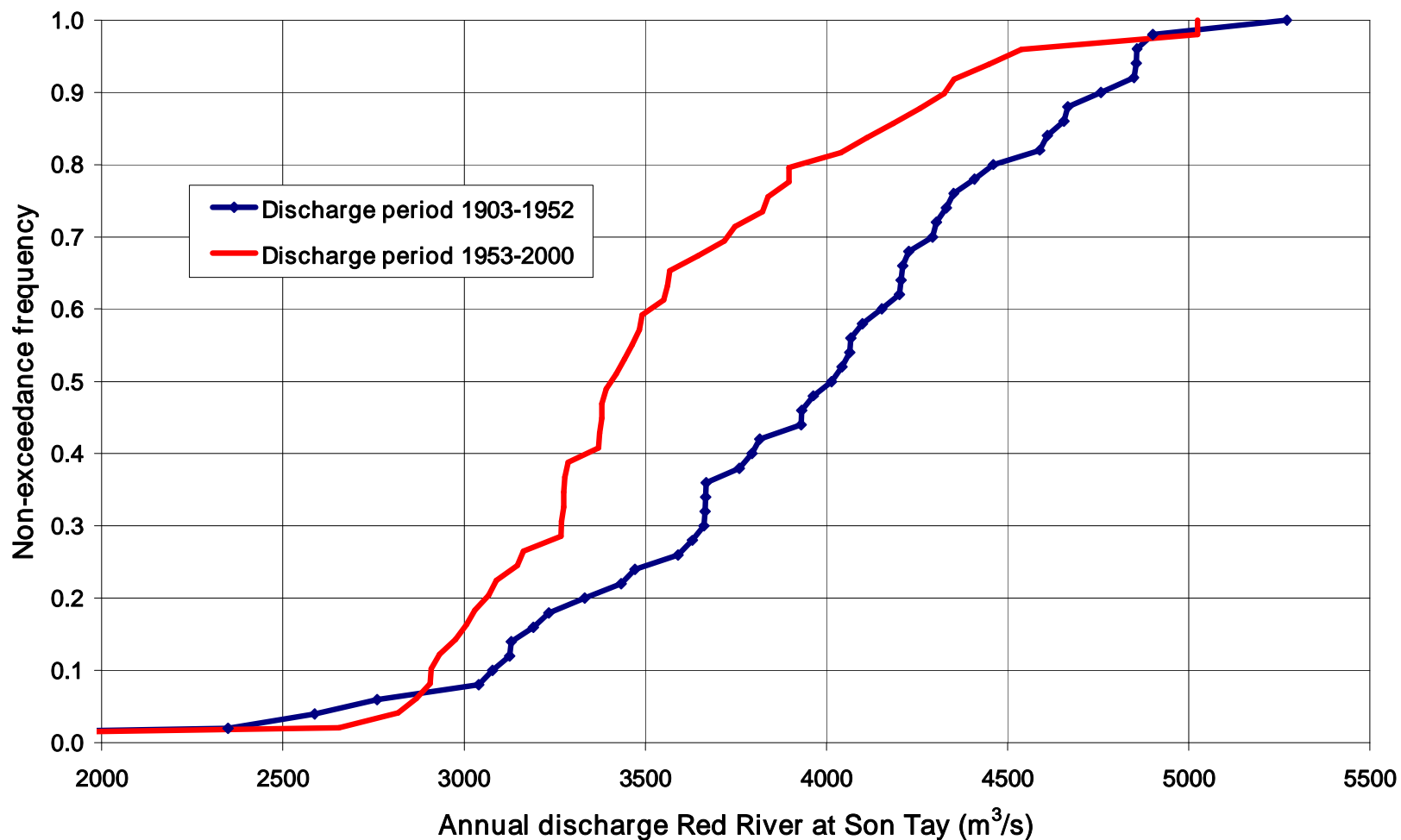
75% Dependable flow in Boi, Tich and Pho Day rivers





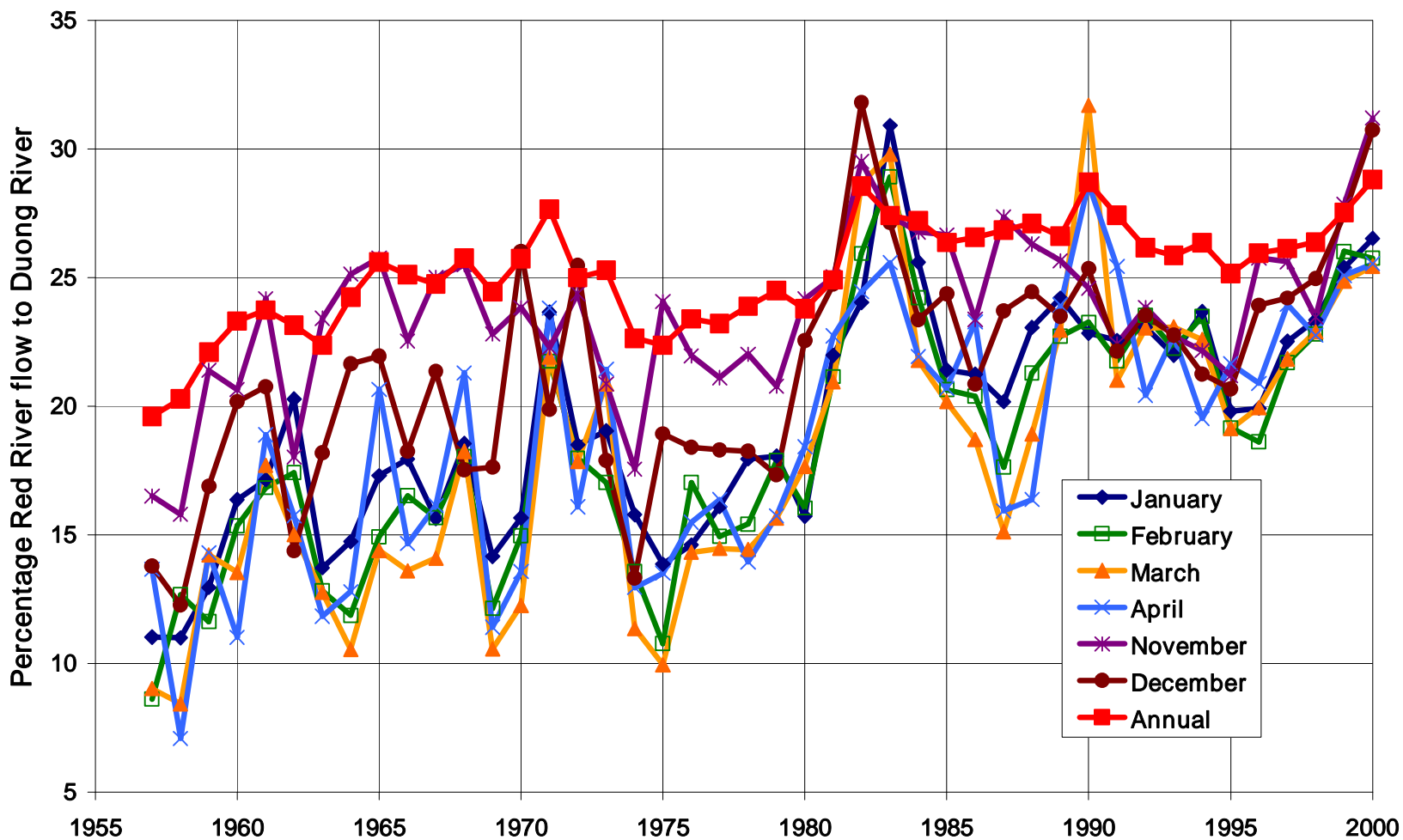
# Discharge trends

Frequency distribution annual flow Red River



# Discharge trends

% Red River flow to Duong (dry season)

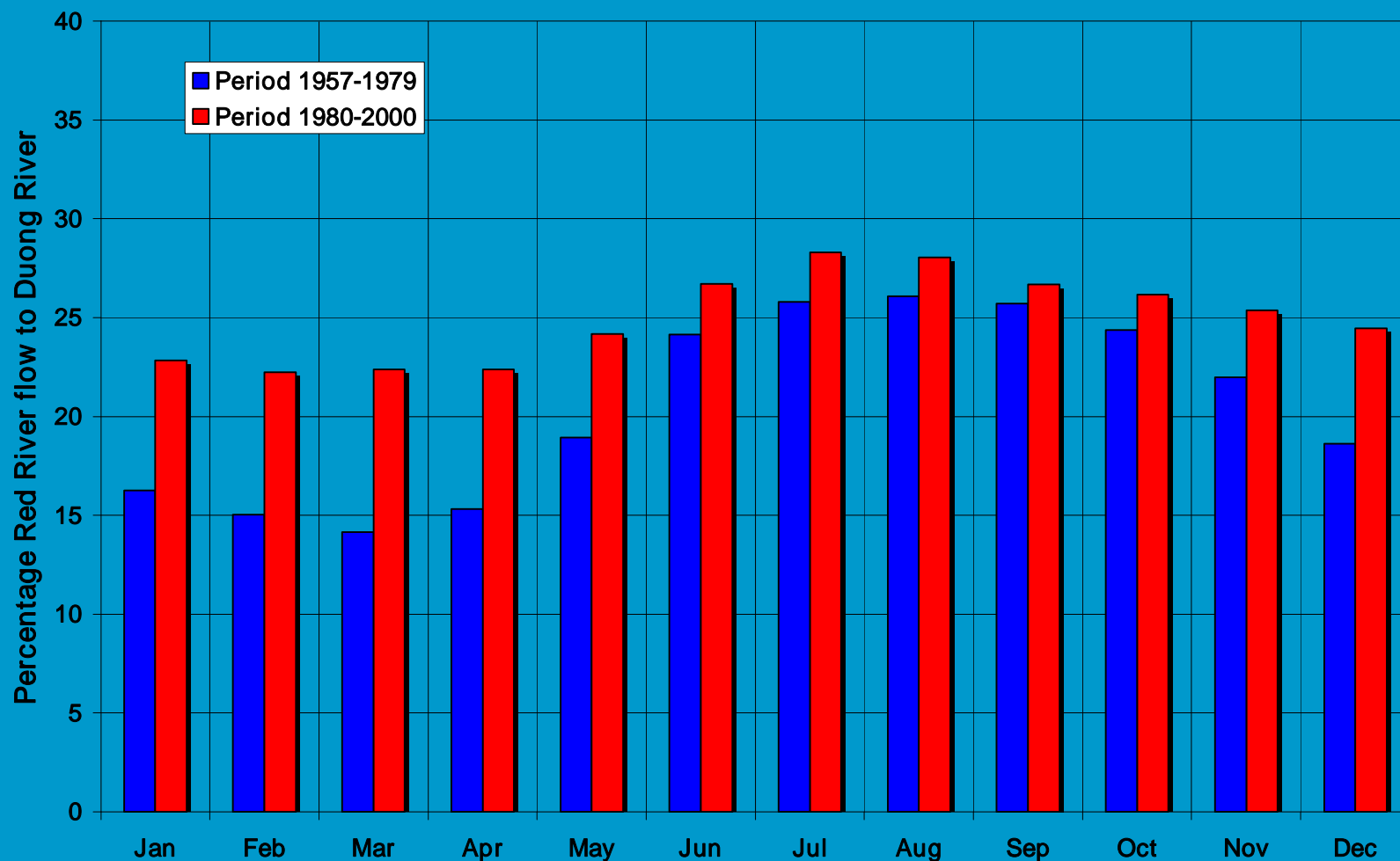


# 2<sup>nd</sup> Red River Basin Sector Project, Part A: WRM

## Component A1: Capacity Building RRBO February 10, 2004

### Discharge trends

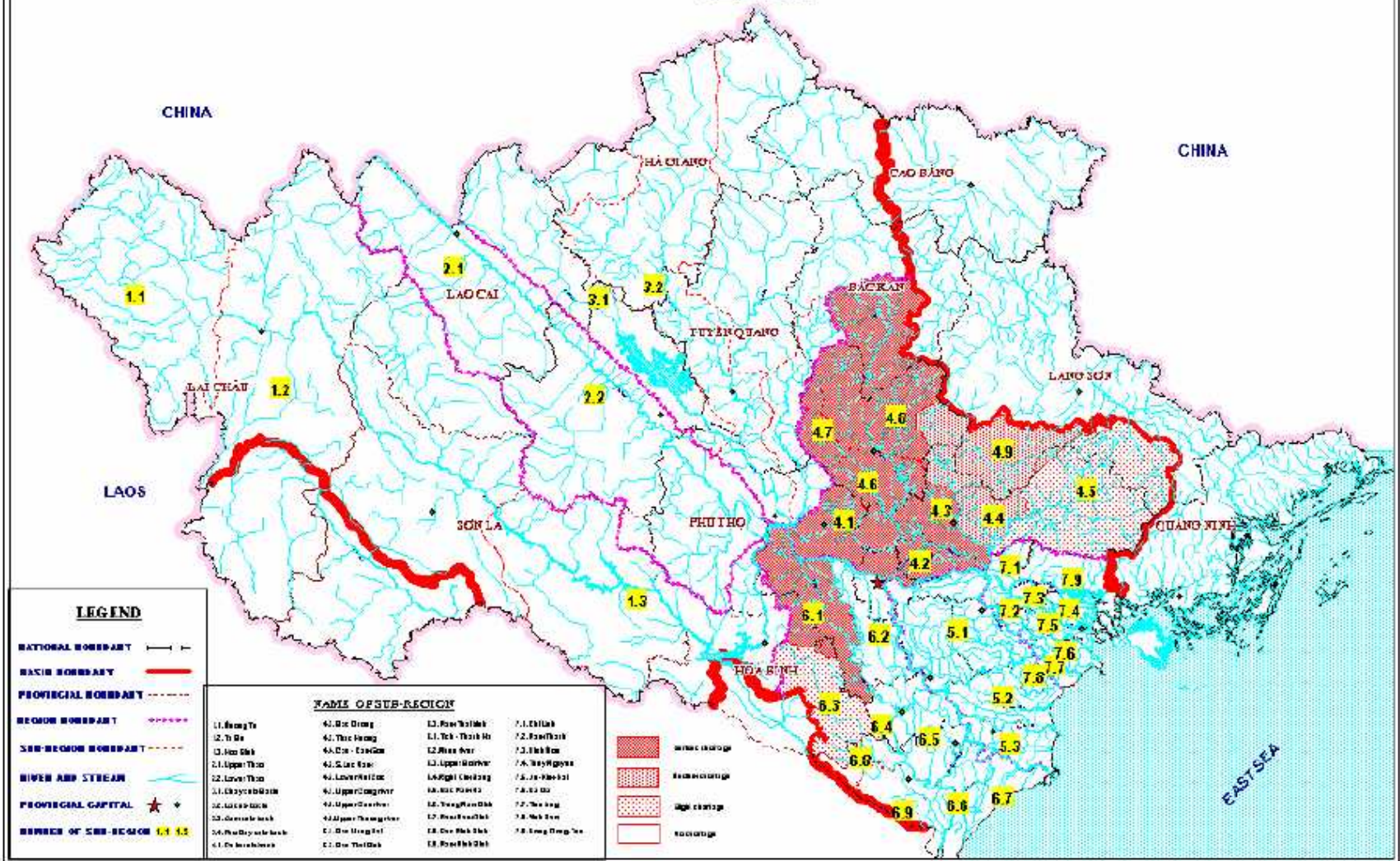
% Red River flow to Duong River prior to and after 1980



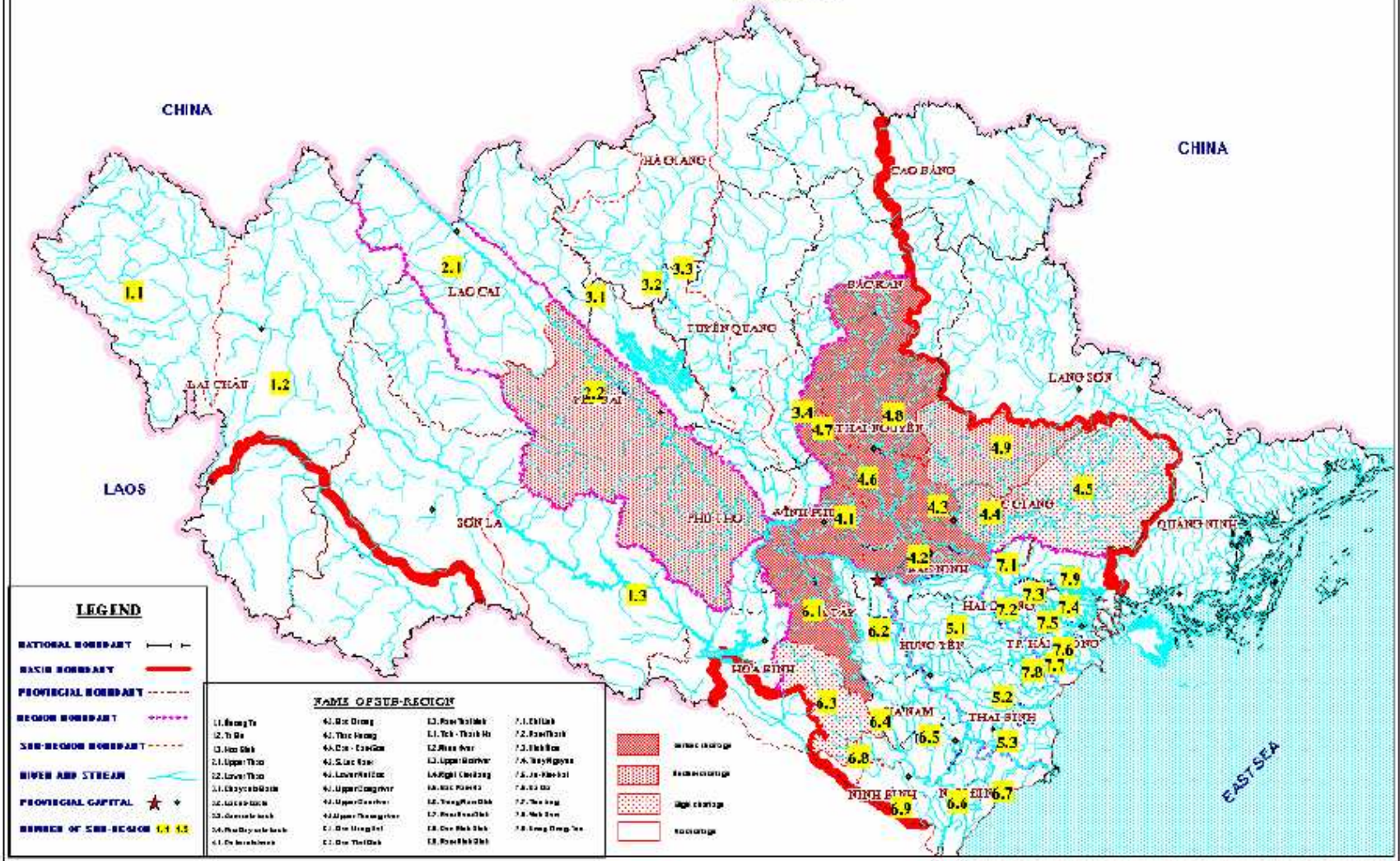
# Water availability & demand per year in BCM

Item	Red River basin	Sub-basins				
		Da	Thao	Lo-Gam Chay	Upper Thai Binh	Red River Delta
<b>Availability</b>						
Surface water		22.7	4.32	14.6	5.72	66.1
Groundwater	18.2	5.57	1.66	6.47	0.73	3.80
<b>Total</b>		28.3	6.00	21.1	<b>6.45</b>	69.9
<b>Overall demand</b>						
2000	15.5	0.50	0.70	0.93	<b>3.08</b>	10.3
2010	20.7	1.01	0.87	1.17	<b>3.81</b>	13.8
2020	25.3	1.23	1.06	1.43	<b>4.65</b>	16.9

## WATER SHORTAGE MAP OF THE RED RIVER BASIN YEAR 2000



### WATER SHORTAGE MAP OF THE RED RIVER BASIN YEAR 2020



#### LEGEND

- NATIONAL BOUNDARY ———
- Basin BOUNDARY ———
- PROVINCIAL BOUNDARY - - - - -
- REGION BOUNDARY - - - - -
- SUB-REGION BOUNDARY - - - - -
- RIVER AND STREAM ———
- PROVINCIAL CAPITAL ★
- NUMBER OF SUB-REGION 1.1 1.2

NAME OF SUB-REGION			
1.1. Song Tri	4.1. Duc Giang	13. Hoa Thinh	7.1. Chanh
1.2. To Bi	4.2. Tinh Giang	14. Tinh - Thanh Ho	7.2. Thanh Binh
1.3. Hoa Binh	4.3. Dien - Thanh	15. Hoa An	7.3. Thanh Hoa
2.1. Upper Than	4.4. Siac Khe	16. Upper Khe	7.4. Thanh Khe
2.2. Lower Than	4.5. Lower Khe	17. Upper Khe	7.5. Thanh Khe
2.3. Chay Khe	4.6. Upper Khe	18. Hoa Khe	7.6. Thanh Khe
2.4. Chay Khe	4.7. Upper Khe	19. Hoa Khe	7.7. Thanh Khe
2.5. Chay Khe	4.8. Upper Khe	20. Hoa Khe	7.8. Thanh Khe
2.6. Chay Khe	4.9. Upper Khe	21. Hoa Khe	7.9. Thanh Khe
2.7. Chay Khe	4.10. Upper Khe	22. Hoa Khe	7.10. Thanh Khe
2.8. Chay Khe	4.11. Upper Khe	23. Hoa Khe	7.11. Thanh Khe
2.9. Chay Khe	4.12. Upper Khe	24. Hoa Khe	7.12. Thanh Khe
2.10. Chay Khe	4.13. Upper Khe	25. Hoa Khe	7.13. Thanh Khe
2.11. Chay Khe	4.14. Upper Khe	26. Hoa Khe	7.14. Thanh Khe
2.12. Chay Khe	4.15. Upper Khe	27. Hoa Khe	7.15. Thanh Khe
2.13. Chay Khe	4.16. Upper Khe	28. Hoa Khe	7.16. Thanh Khe
2.14. Chay Khe	4.17. Upper Khe	29. Hoa Khe	7.17. Thanh Khe
2.15. Chay Khe	4.18. Upper Khe	30. Hoa Khe	7.18. Thanh Khe
2.16. Chay Khe	4.19. Upper Khe	31. Hoa Khe	7.19. Thanh Khe
2.17. Chay Khe	4.20. Upper Khe	32. Hoa Khe	7.20. Thanh Khe
2.18. Chay Khe	4.21. Upper Khe	33. Hoa Khe	7.21. Thanh Khe
2.19. Chay Khe	4.22. Upper Khe	34. Hoa Khe	7.22. Thanh Khe
2.20. Chay Khe	4.23. Upper Khe	35. Hoa Khe	7.23. Thanh Khe
2.21. Chay Khe	4.24. Upper Khe	36. Hoa Khe	7.24. Thanh Khe
2.22. Chay Khe	4.25. Upper Khe	37. Hoa Khe	7.25. Thanh Khe
2.23. Chay Khe	4.26. Upper Khe	38. Hoa Khe	7.26. Thanh Khe
2.24. Chay Khe	4.27. Upper Khe	39. Hoa Khe	7.27. Thanh Khe
2.25. Chay Khe	4.28. Upper Khe	40. Hoa Khe	7.28. Thanh Khe

- Water shortage
- Severe shortage
- High shortage
- Low shortage

EAST SEA

# Conclusions

1. Da basin: sufficient water is available to meet demands,
2. Lower Thao basin: surface water availability is insufficient to meet the demands all year. Supply from groundwater or storage of surface water is necessary.
3. Lo-Gam-Chay and Pho Day basin: sufficient water available to meet all demands, with the exception of the Pho Day sub-basin.
4. Upper Thai Binh basin: severe water shortage in Thuong and Cau sub-basins, and from 2010 onward also in Luc Nam sub-basin.
5. Tich and Boi basins: insufficient water to meet all demands, now and in future.

6. Overall, in the polders along Red River sufficient surface water resources are available to meet the demands. However, in view of limited intake capacity, polders along Day River encounter shortage of water, in particular Left of Kim Bang and Bac Ninh Binh.
7. Overall, in Lower Thai Binh region sufficient water is available to meet all demands, though February may become a critical month by 2040.
8. The data on flows of Da river and in particularly of Red River show that the resources have substantially diminished since the 1950's.
9. The diversion of Red River flow at Hanoi has changed in the course of time. At present substantially more flow is diverted to the Duong branch in the dry season than before 1980. This is benefiting water availability for the Lower Thai Binh.