

HYDROLOGY of LOWER MEKONG BASIN



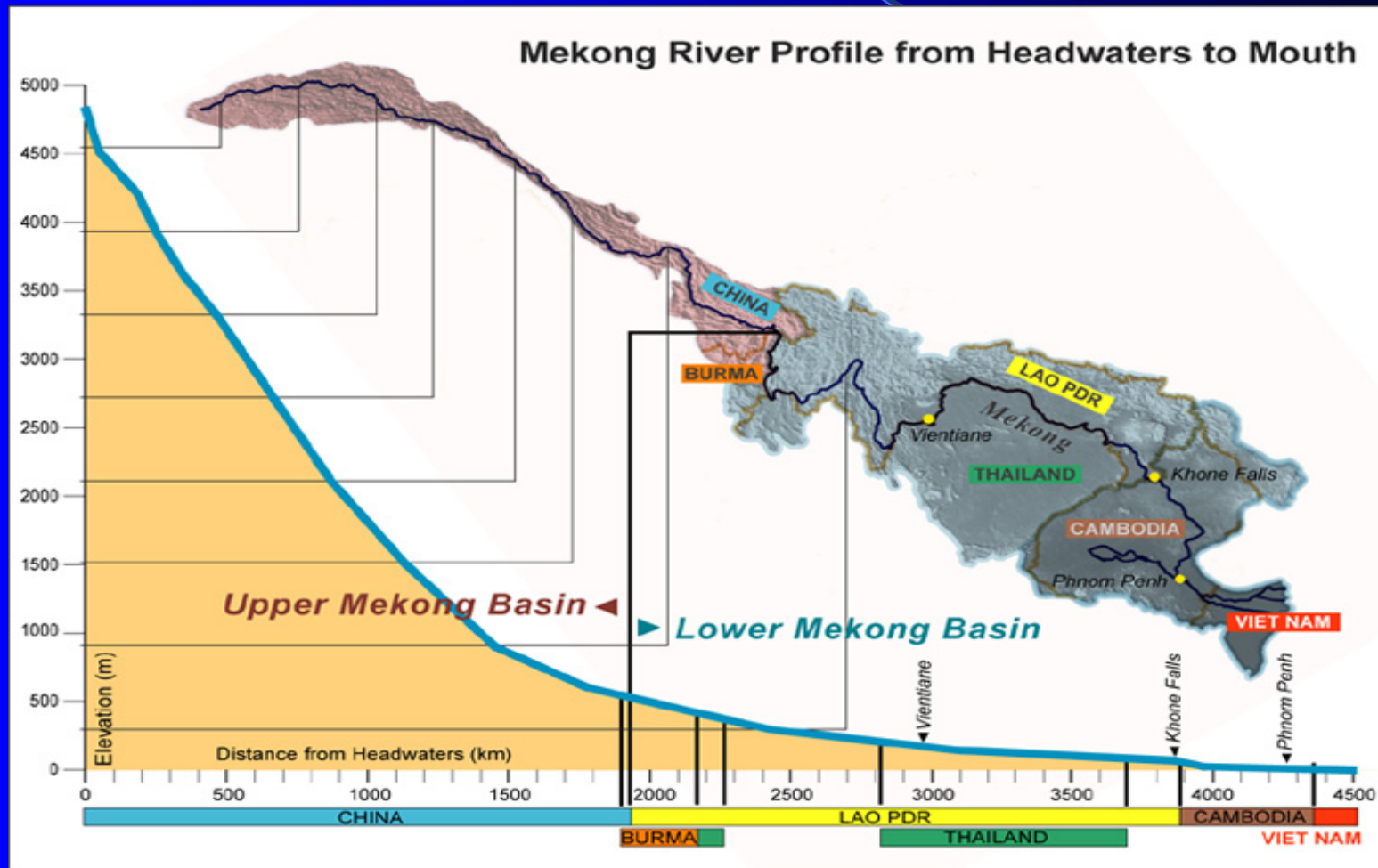
Greater Mekong Basin

Catchment area 795,000 km² in 6 Countries

China Myanmar
Lao Pdr Thailand
Cambodia Vietnam



Longitudinal river profile of the Mekong from source to delta



Climate seasons in the Mekong river basin

Cool/Cold		Hot/Dry			Wet					Cool/Cold	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NNE Monsoon		Transition			SW Monsoon					NE Monsoon	

Monthly frequency of occurrence of the 128 tropical cyclones observed in central and southern Vietnam for 38 years between 1954 and 1991 (Source: Asian Disaster Preparedness Centre, May 2000)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Occurrence Frequency (%)	0	0	2	2	2	6	0	11	20	32	20	5

Mekong Basin Mean Monthly Temperature (°C)

Site	Altitude masl	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Deqen ¹	4,000	-4	-2	2	5	10	13	13	13	11	11	6	-3
Pleiku	2,460	18	20	23	24	24	23	22	22	22	22	21	19
Dali ²	1,900	8	10	13	16	19	20	20	18	18	15	12	9
Jinhong ³	540	15	18	21	24	26	26	25	25	24	23	18	16
Chiang Rai	382	21	22	26	30	29	27	28	27	27	27	23	21
Luang Prabang	305	22	23	26	28	28	28	28	28	27	27	24	21
Vientiane	170	24	25	28	29	29	29	28	28	28	28	25	23
Khon Kaen	166	24	25	28	29	28	28	27	27	26	26	25	23
Pakse	102	26	27	30	30	29	29	28	28	28	28	26	25
Phnom Penh	10	27	28	30	31	30	29	28	28	28	28	27	26

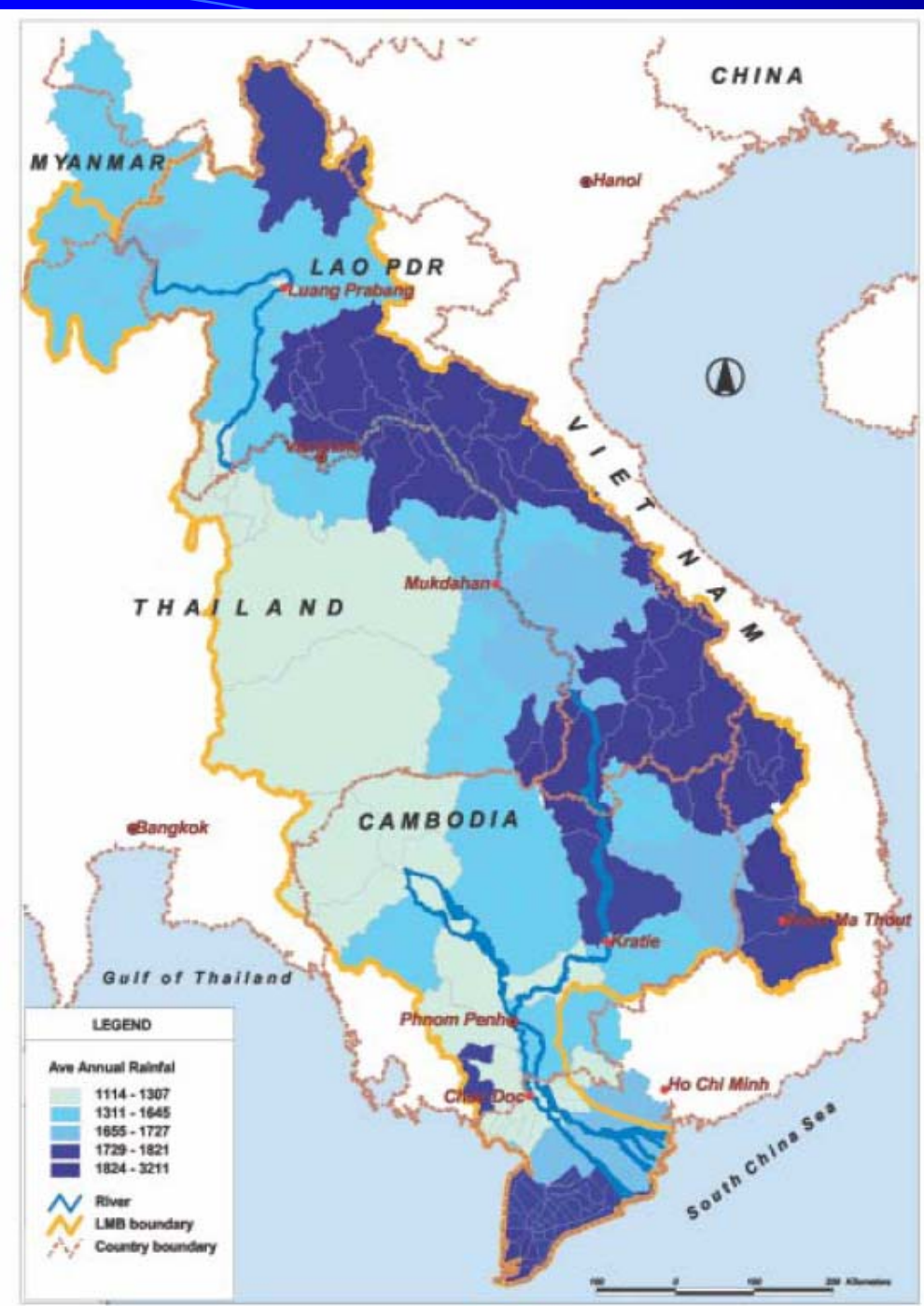
Lower Mekong Basin annual and seasonal average rainfall (mm)

Month	Northern Region	Central Region	Korat Plateau	Central Highlands	Cambodian Floodplain	Vietnam Delta
	Chiang Rai	Pakse	Khon Kaen	Pleiku	Phnom Penh	Chau Doc
Jan	13	2	5	6	8	8
Feb	10	7	15	6	3	3
Mar	20	20	35	25	15	15
Apr	85	70	60	85	65	75
May	190	220	170	225	115	165
Jun	210	380	180	350	125	110
Jul	310	390	160	360	160	140
Aug	390	500	185	460	160	170
Sep	280	320	260	360	265	160
Oct	140	100	120	220	255	250
Nov	60	20	10	75	130	160
Dec	20	3	3	20	20	40
ANNUAL	1,730	2,050	1,210	2,200	1,320	1,300

NE

SW monsoon

NE



Distribution of mean annual rainfall (mm) over the Lower Mekong Basin

Territory of the six Mekong River Basin Countries within the catchment

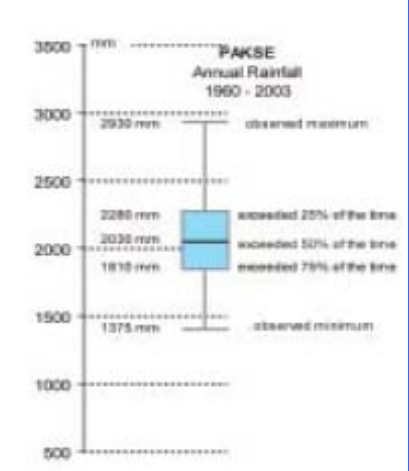
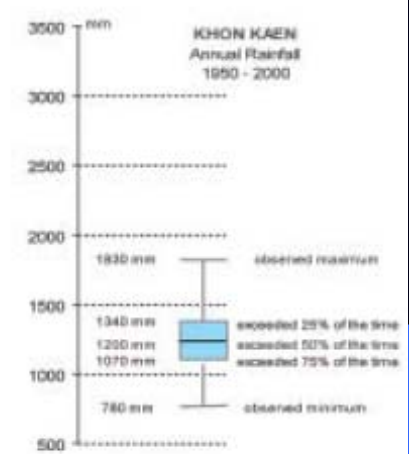
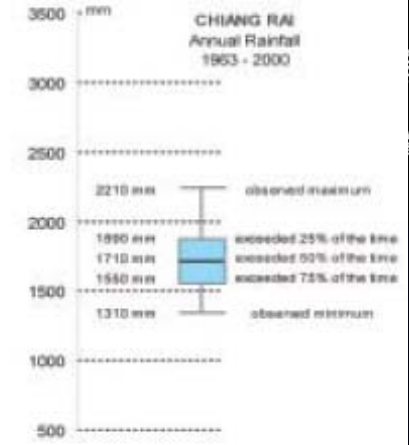
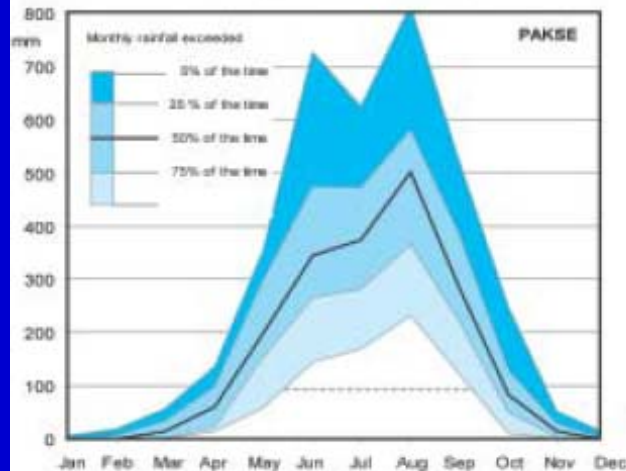
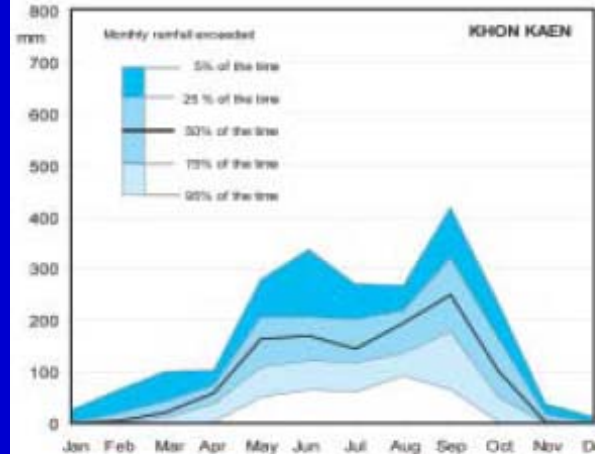
Description	China	Myanmar	Lao PDR	Thailand	Cambodia	Viet Nam	Total
Area (km ²)	165,000	24,000	202,000	184,000	155,000	65,000	795,000
Catchment as % of MRB	21	3	25	23	20	8	100
Flow as % of MRB	16	2	35	18	18	11	100

Lower Mekong Basin, distribution and range of annual and monthly rainfall at

Chiang Rai,

Khon Kaen
(Thailand),

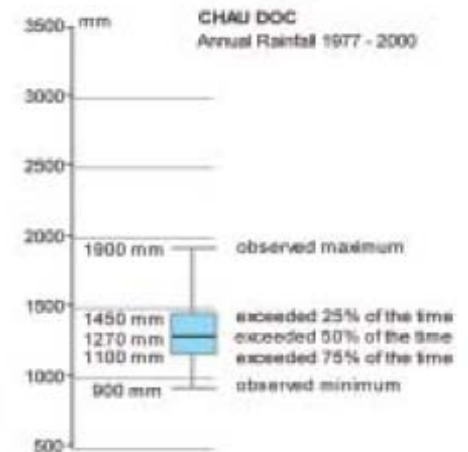
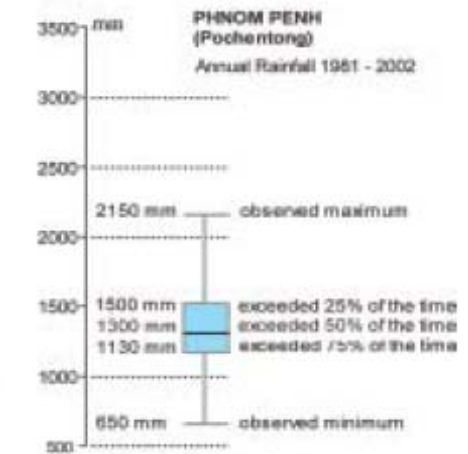
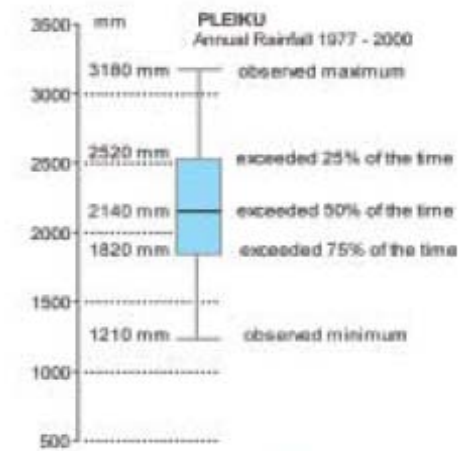
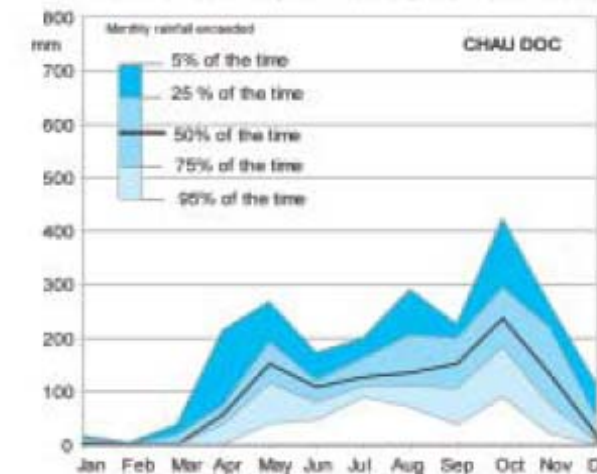
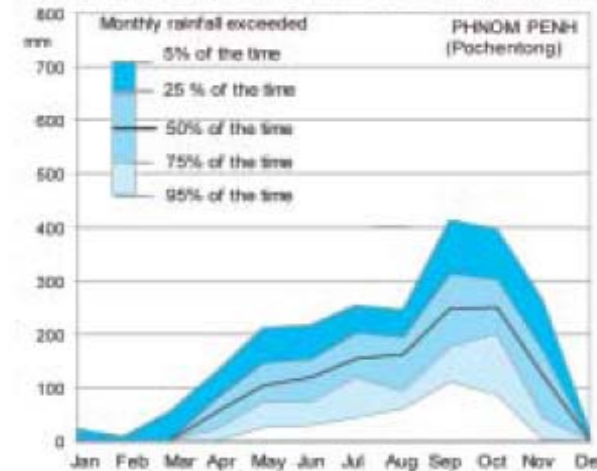
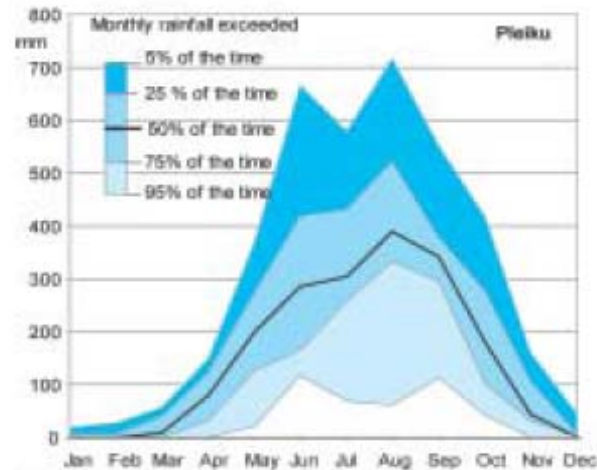
Pakse (Lao PDR)



Pleiku (Vietnam),

Phnom Penh
(Cambodia),

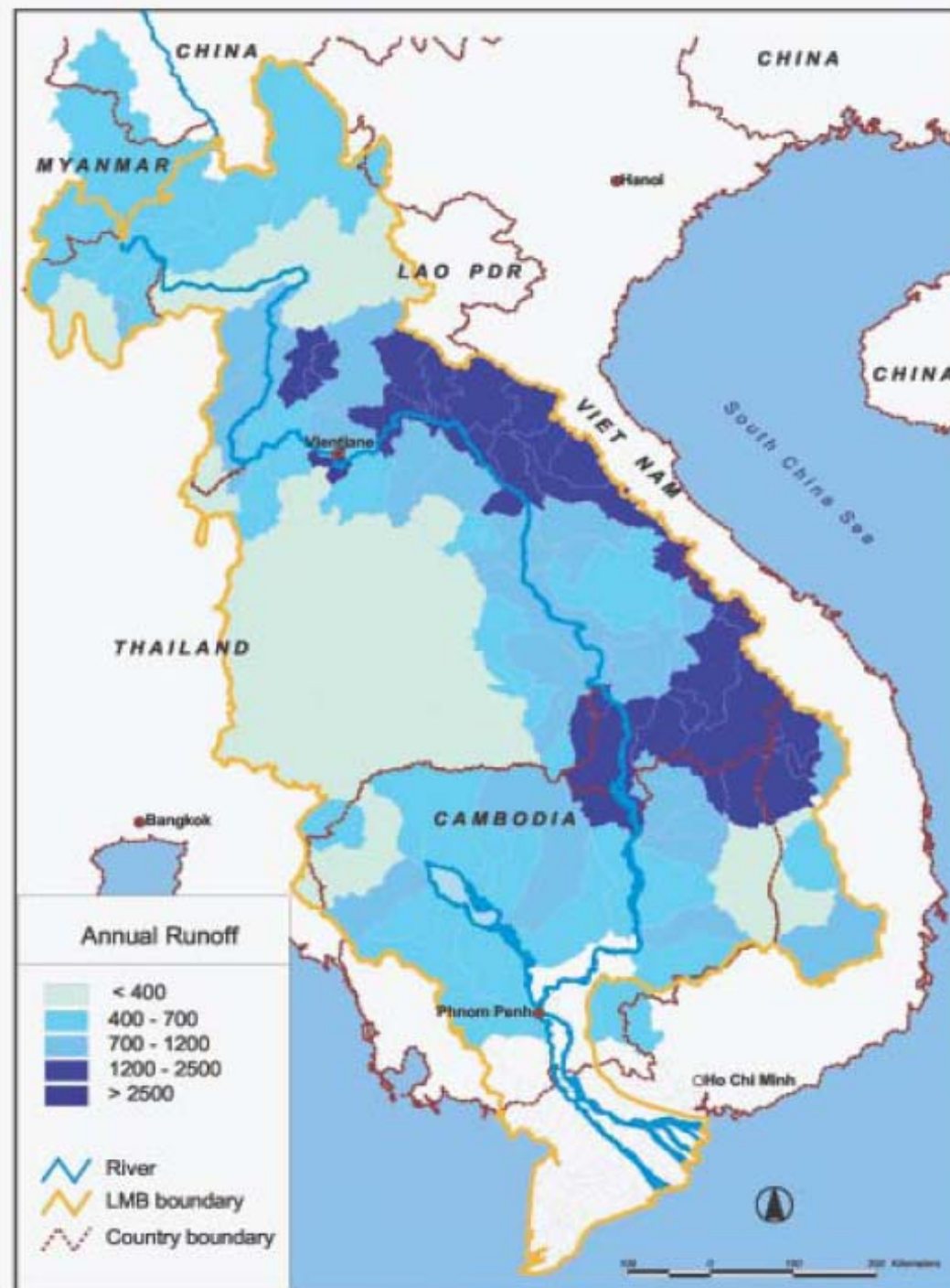
Chau Doc (Vietnam)



Lower Mekong Mainstream mean annual flow (1960-2004)

Mainstream Site	Catchment area km ²	Mean annual flow as			as % total Mekong
		discharge cumecs	volume km ³	runoff mm	
Chiang Saen	189,000	2,700	85	450	19
Luang Prabang	268,000	3,900	123	460	27
Chiang Khan	292,000	4,200	133	460	29
Vientiane	299,000	4,400	139	460	30
Nongkhai	302,000	4,500	142	470	31
Nakhon Phanom	373,000	7,100	224	600	49
Mukdahan	39,1000	7,600	240	610	52
Pakse	545,000	9,700	306	560	67
Stung Treng	635,000	13,100	413	650	90
Kratie	646,000	13,200	416	640	91
BASIN TOTAL	795,000	14,500	457	600	100

Lower Mekong Basin mean annual depth of runoff (mm)

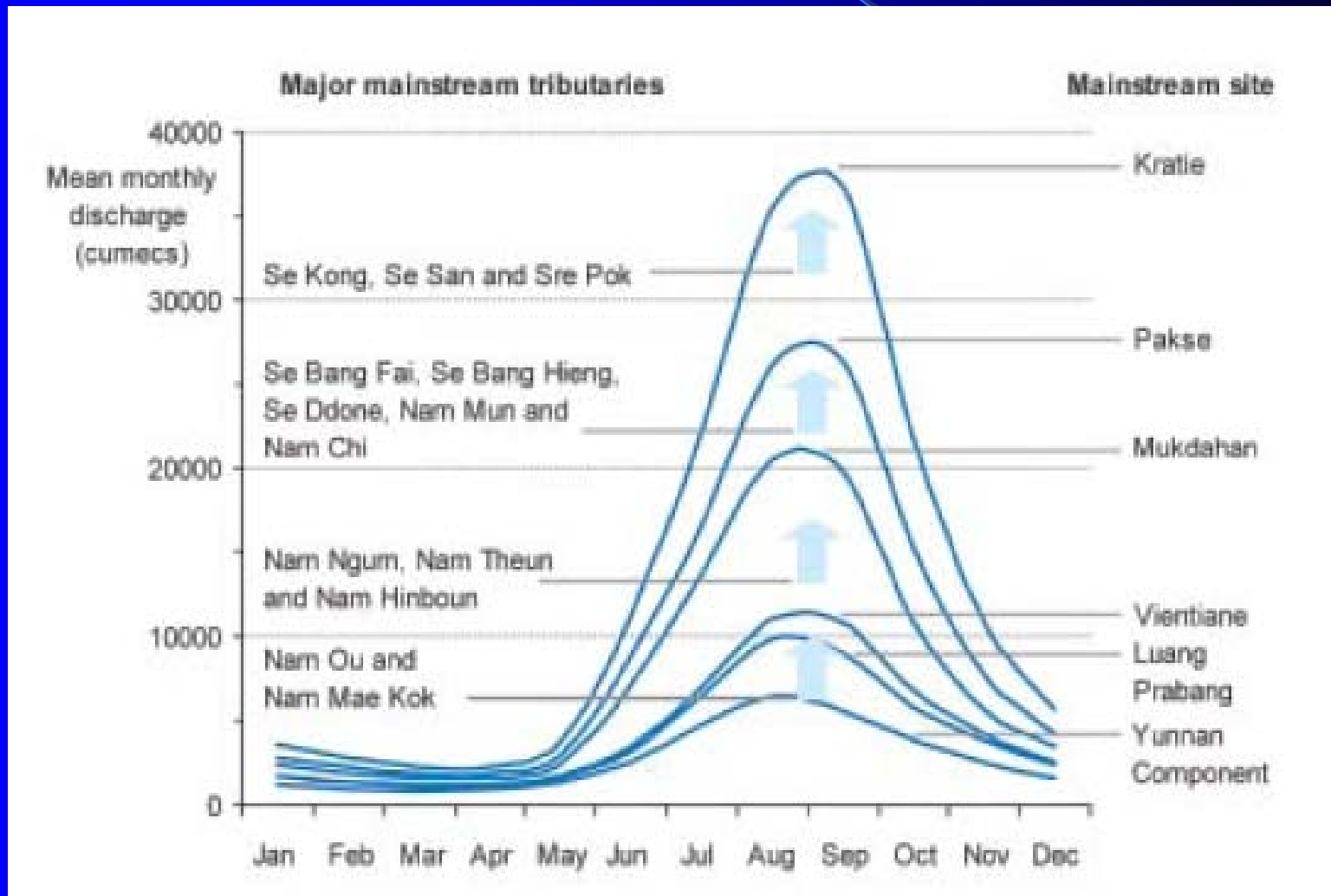


Mekong Mainstream monthly discharge 1960 to 2004 (cumecs)

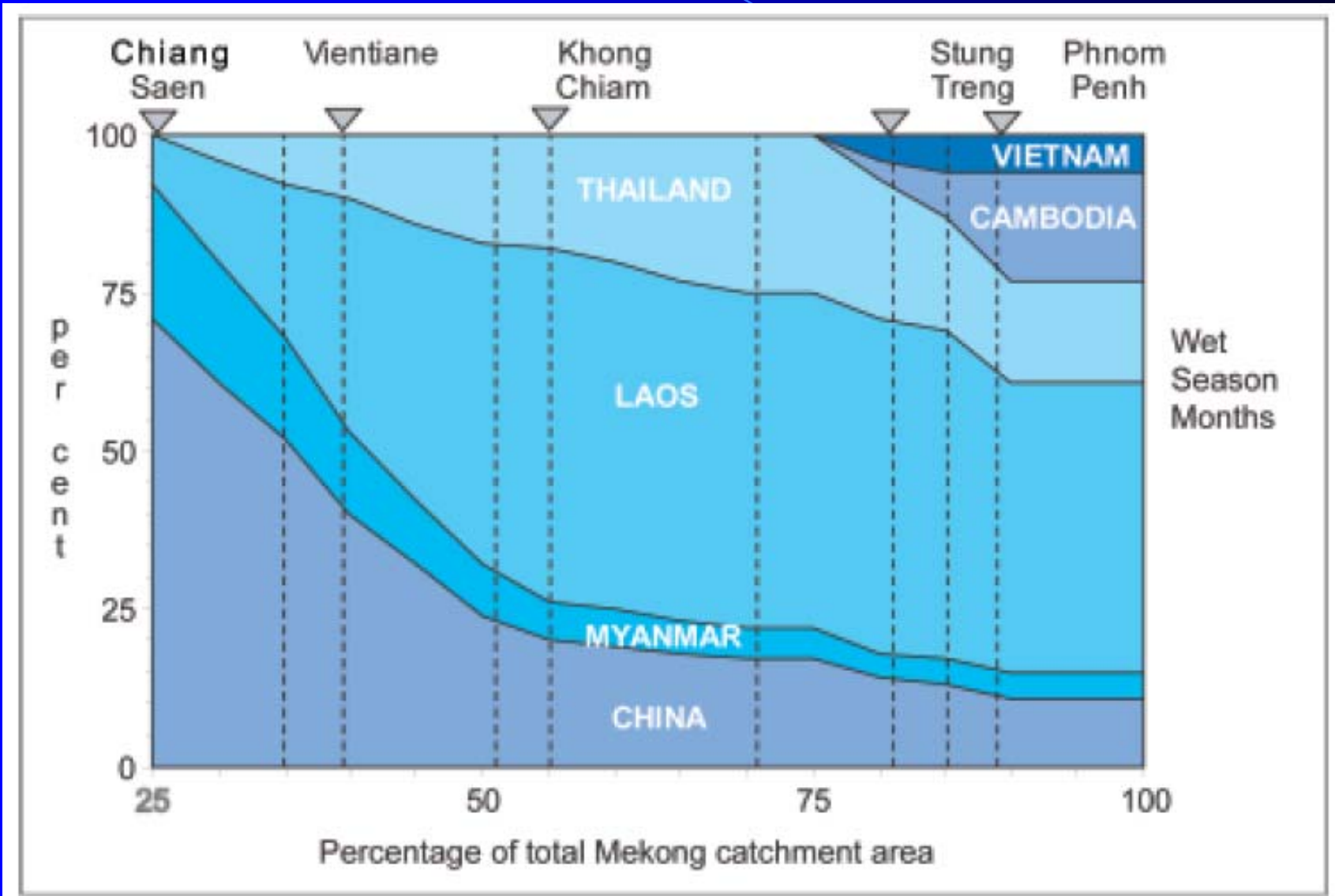


Month	Mainstream Site						
	Chiang Saen	Luang Prabang	Vientiane	Nakhon Phanom	Mukdahan	Pakse	Kratie
Jan	1,150	1,690	1,760	2,380	2,370	2,800	3,620
Feb	930	1,280	1,370	1,860	1,880	2,170	2,730
Mar	830	1,060	1,170	1,560	1,600	1,840	2,290
Apr	910	1,110	1,190	1,530	1,560	1,800	2,220
May	1,300	1,570	1,720	2,410	2,430	2,920	3,640
Jun	2,460	3,110	3,410	6,610	7,090	8,810	11,200
Jul	4,720	6,400	6,920	12,800	13,600	16,600	22,200
Aug	6,480	9,920	11,000	19,100	20,600	26,200	35,500
Sep	5,510	8,990	10,800	18,500	19,800	26,300	36,700
Oct	3,840	5,750	6,800	10,200	10,900	15,400	22,000
Nov	2,510	3,790	4,230	5,410	5,710	7,780	10,900
Dec	1,590	2,400	2,560	3,340	3,410	4,190	5,710

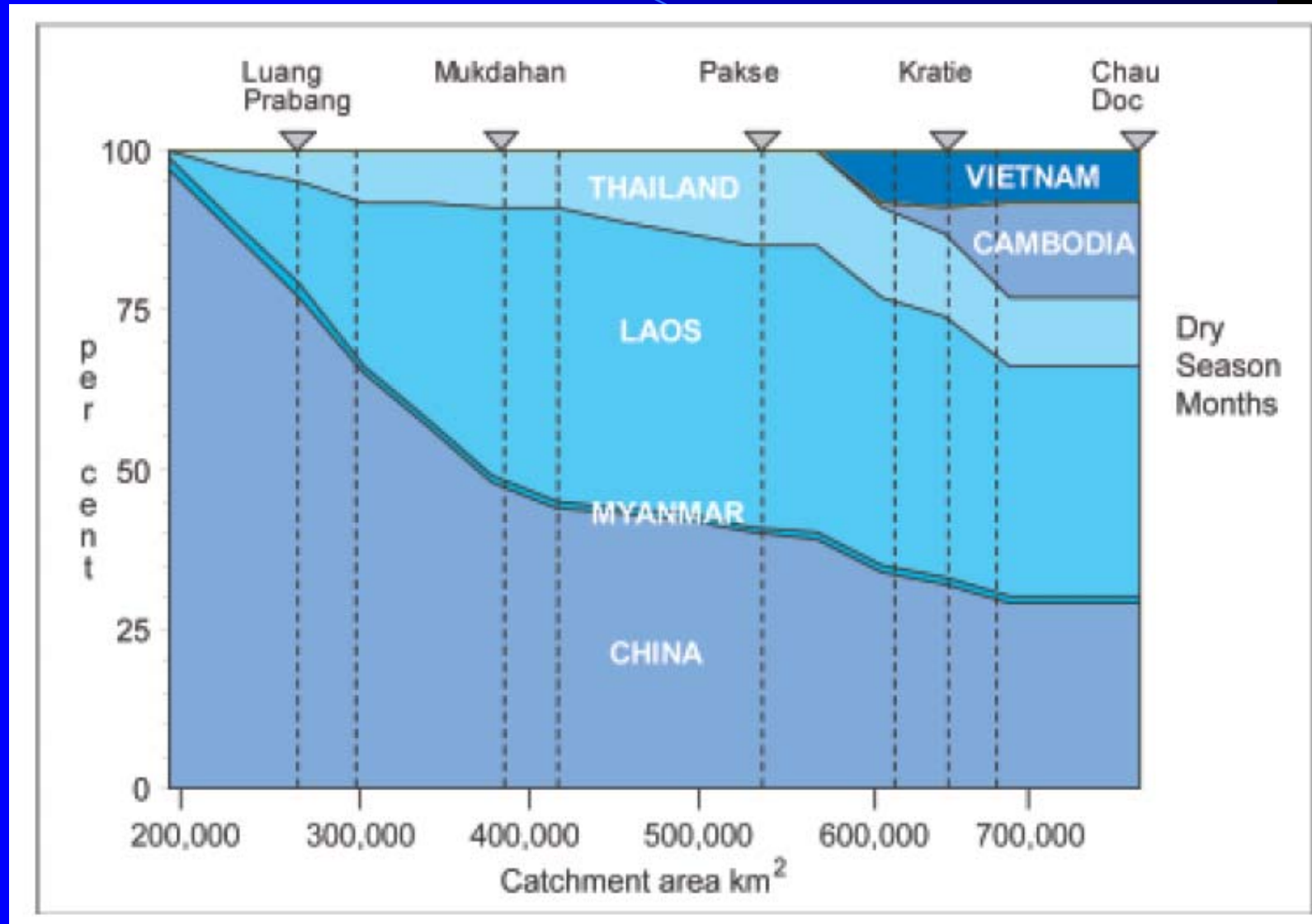
Mean monthly discharges at various site on the mainstream and the major tributary sources in each reach



Percentage of average flow during the wet (Jun to Nov) and dry (Dec to May) season months originating in each country on mainstream stations



Continued



Thank you very much

MRC Hydro-Meteorological Data

- Objectives

(1) To present the availability of Hydro-Meteorological Data

(2) MRC Procedure and Guidelines

(3) Conclusion



Station location maps

- Hydrological stations
> stations of AHNIP & HYCOS
- Rainfall stations



Hydro-meteo network

Hydrological stations, (data available in HYMOS Database)		
Country	All Station	Station (data updated)
Cambodia	73	37 (2006)
Lao PDR	89	55 (2006)
Thailand	48	42 (2003)
Viet Nam	34	28 (2006)

Rain-Gauges, (data available in HYMOS Database)		
Country	All Station	Station (data updated)
Cambodia	204	117 (2006)
Lao PDR	63	63 (2006)
Thailand	142	142 (2005)
Viet Nam	71	71 (2006)



Data type stored in database

Parameter ID	Parameter name	Unit
• HH	Mean Water Level	m
• HA	Max Water Level	m
• HI	Min Water Level	m
• QH	Discharge	m ³ /sec
• SS	Sediment Concentration	ppm
• PH	Precipitation	mm
• EH	Evaporation	mm
• AT	Air Temperature	°C
• TA	Max Air Temperature	°C
• TI	Min Air Temperature	°C
• RH	Relative Humidity	%
• WS	Wind Speed	m/sec
• WD	Wind Direction	Degree
• TB	Tipping Bucket	mm
• SD	Sunshine Duration	hrs
• SR	Solar Radiation	w/ m ²
• AP	Air Pressure	hPa
• SW	Soil Water Content	m ³ /m ³



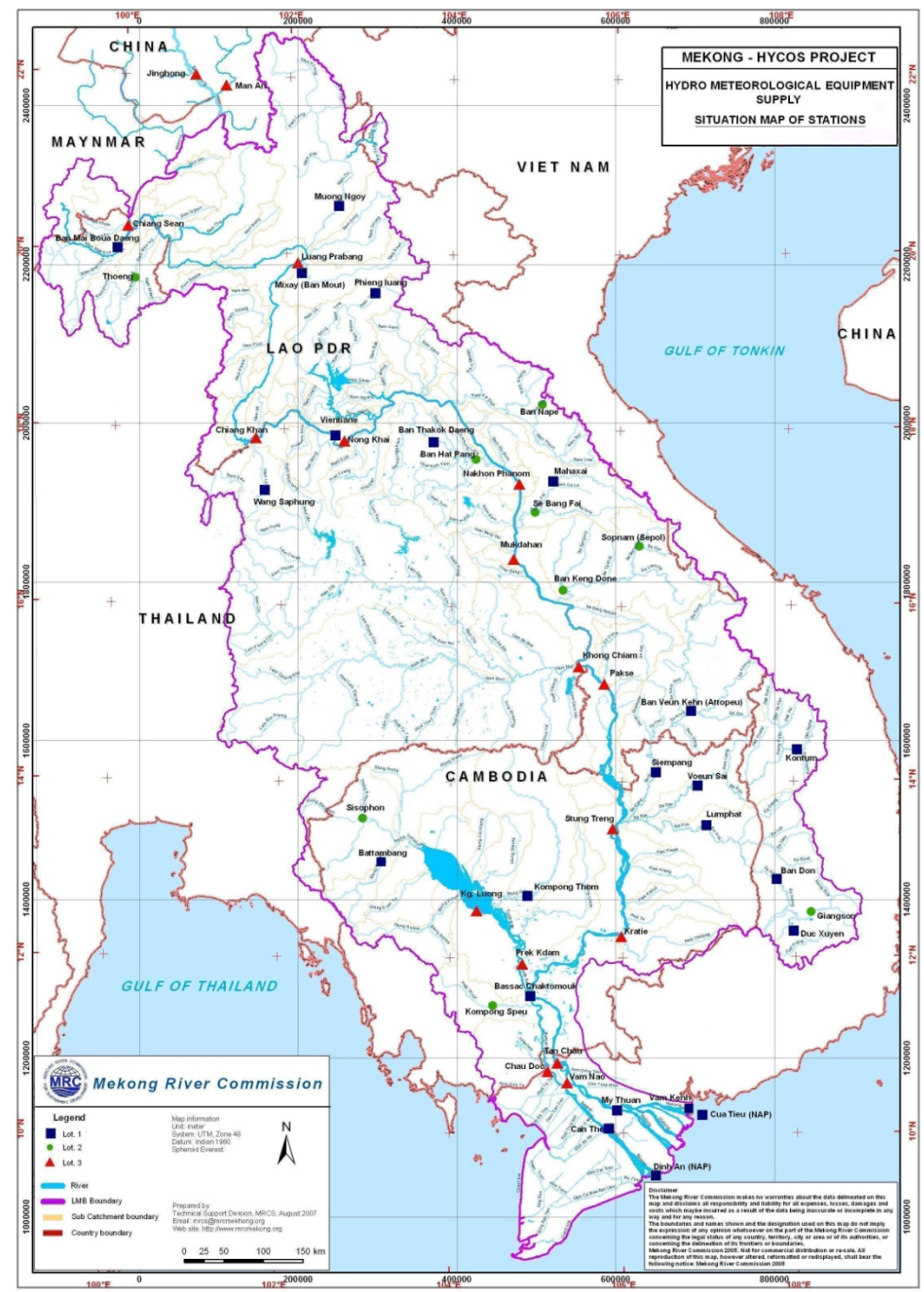
Hydrological stations



Rainfall stations



AHNIP & HYCOS STATIONS





Procedures for data and information exchange and sharing (8th March 2001)

Objectives:

- Operationalize the data and information exchange among the four MRC member countries
- Data available, upon request, basic data and information for public access as determined by NMCs concerned
- Promote understanding and cooperation among MRC member countries.



Guideline on Custodianship and Management of the MRC Information System (MRC-IS)

(1st November 2001)



- Goal- to support the activities in the framework of the Mekong Agreement
 - MRC Secretariat – Custodian of MRC-IS
 - NMCs & Line Agencies – Primary custodian of data and information.



Major Groups/ Types of Data and Information

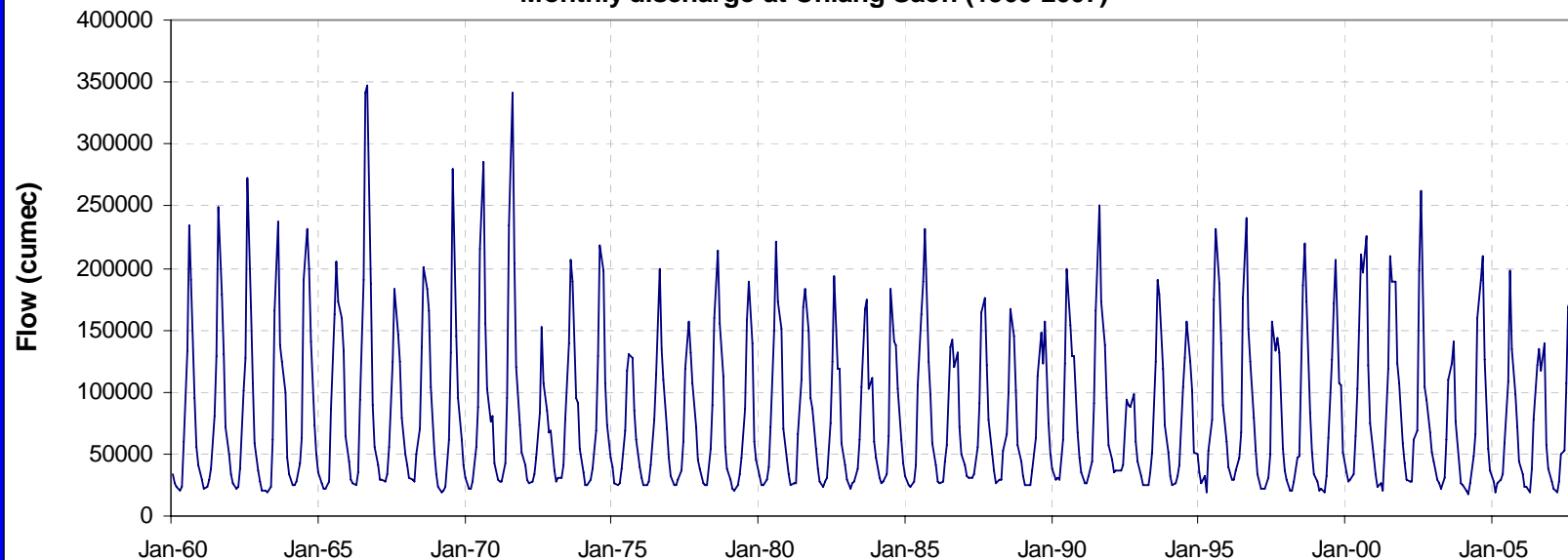
1. Water Resources
2. Topography
3. Natural Resources
4. Agriculture
5. Navigation and Transport
6. Flood Management and Mitigation
7. Infrastructure
8. Urbanization/Industrialization
9. Environment/ Ecology
10. Administration boundaries
11. Socio-economy
12. Tourism



Procedures for data and information exchange and sharing (8th March 2001)

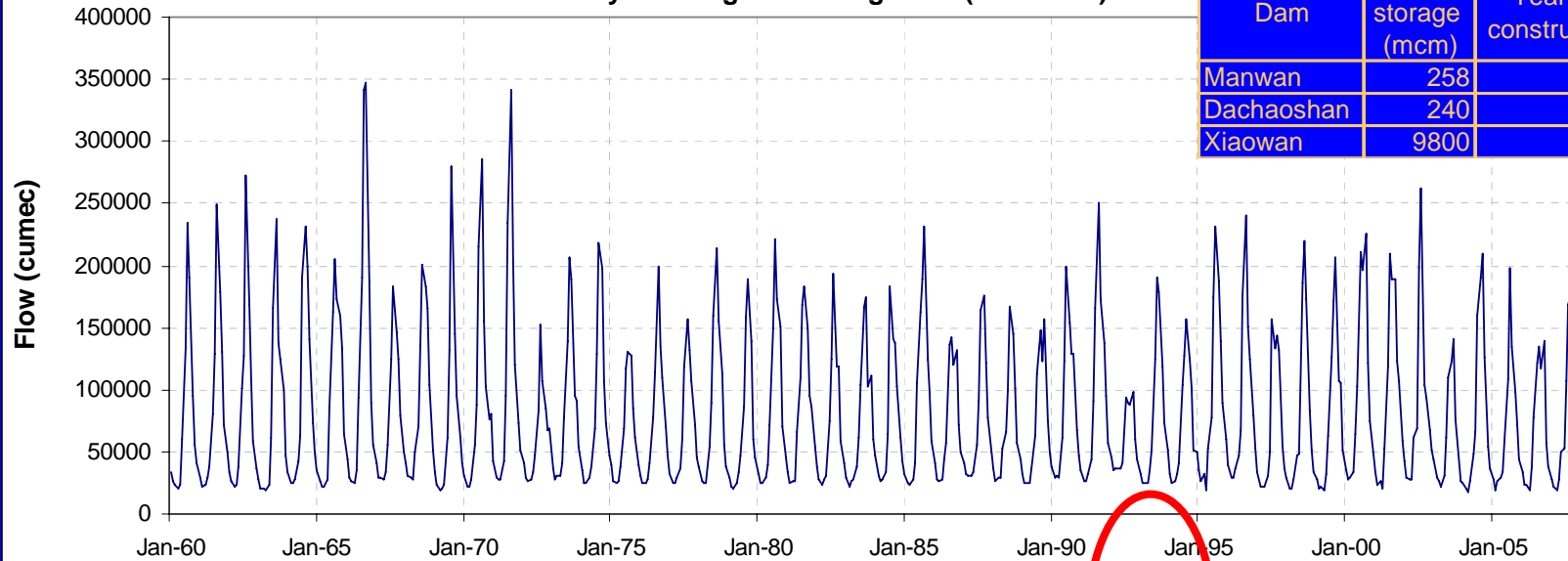
- **Internal Data and Information Users**
 - All bodies of MRC
 - National Mekong Committees
 - Line Agencies
- **Other Data and Information Users**
 - Commercial users (license required)
 - Independent users
 - Directly contracted users
 - Users associated with MRC partners
 - Research/academic & civil society users (license required)
 - Public users (made available to public through various media)

Monthly discharge at Chiang Saen (1960-2007)



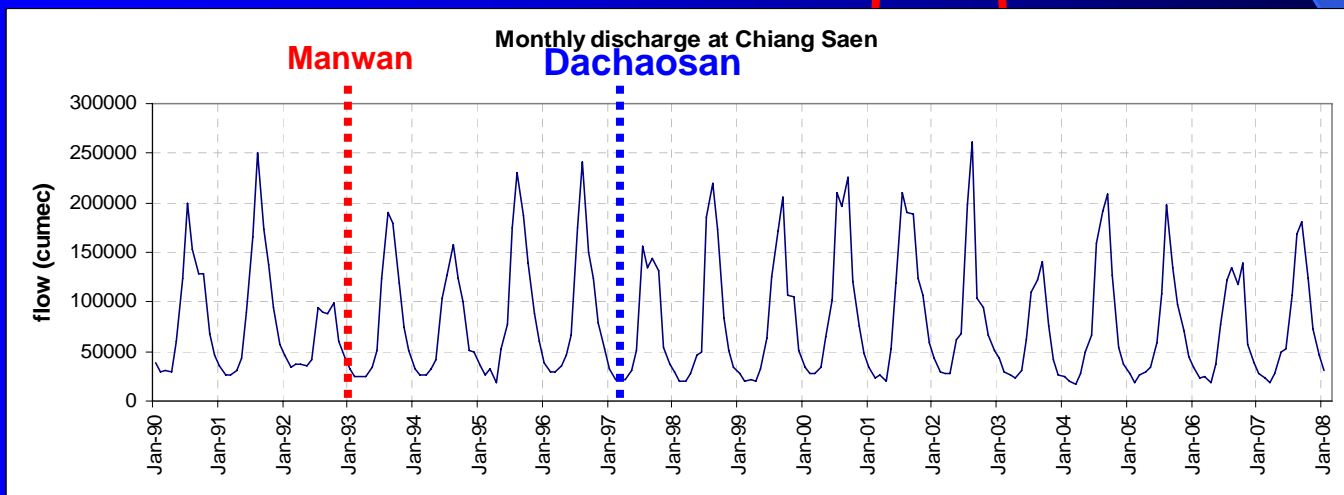
Dam	Active storage (mcm)	Year of construction	Year of commission
Manwan	258	1992	1996
Dachaoshan	240	1996	2003
Xiaowan	9800	2001	2010-2014

Monthly discharge at Chiang Saen (1960-2007)

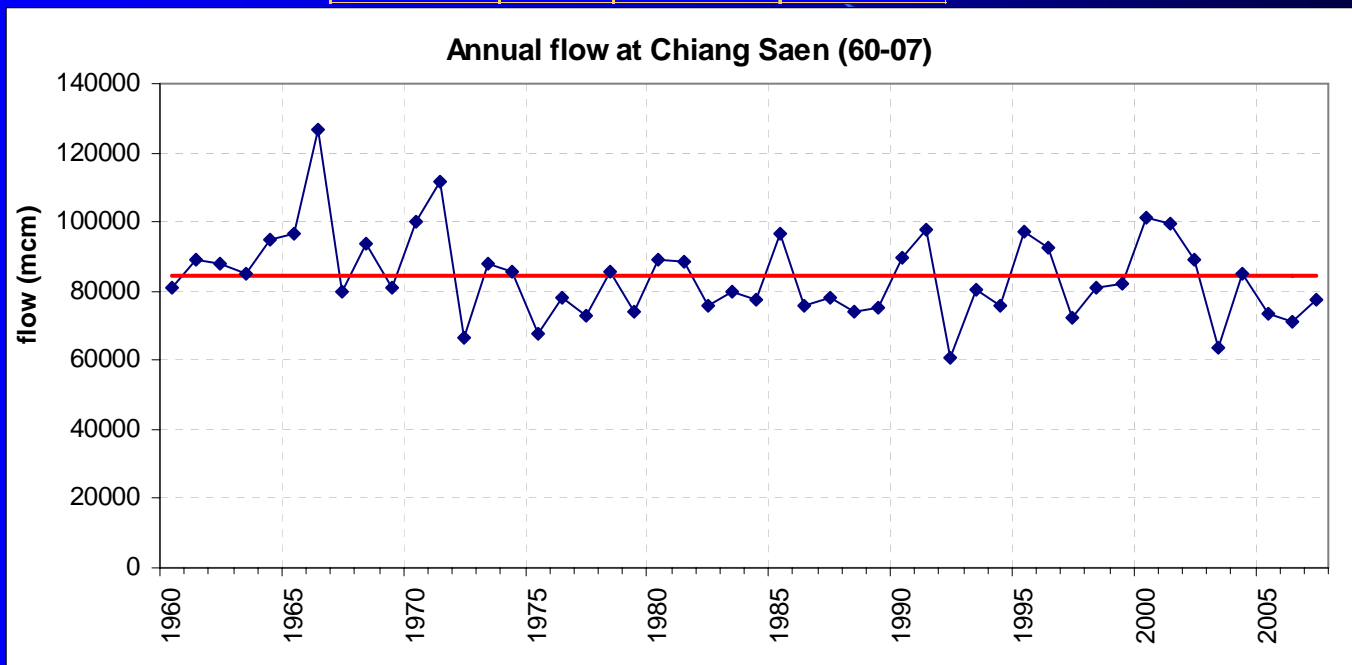


Dam	Active storage (mcm)	Year of construction	Year of commission
Manwan	258	1992	1996
Dachaoshan	240	1996	2003
Xiaowan	9800	2001	2010-2014

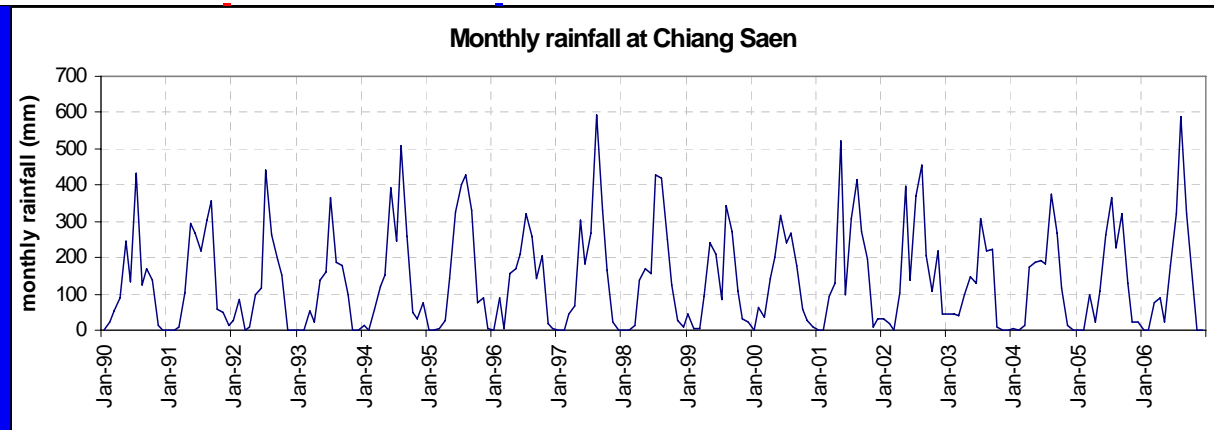
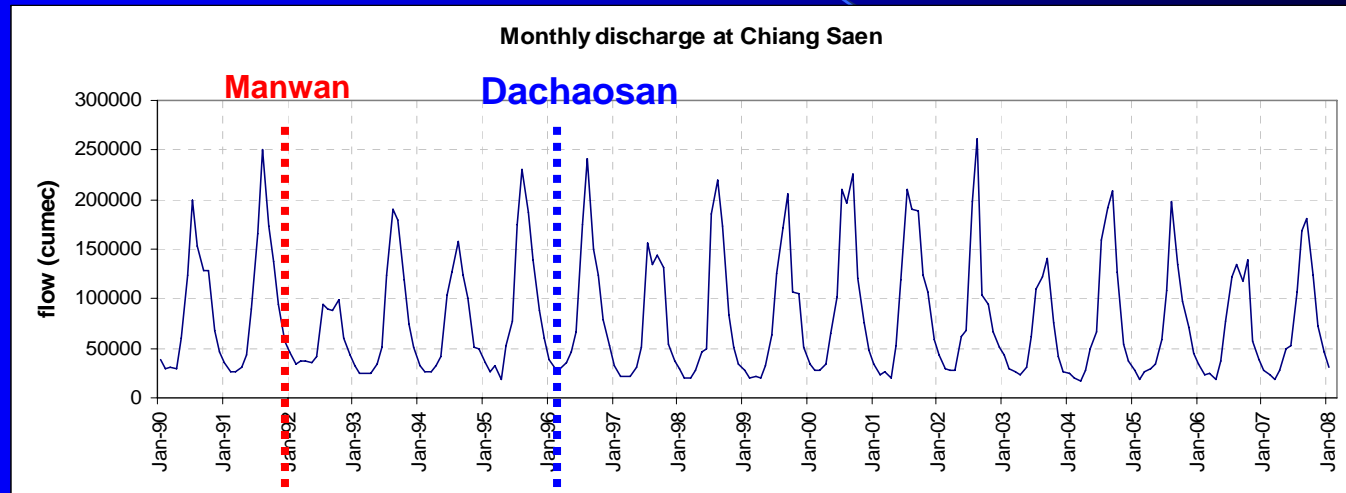
Monthly discharge at Chiang Saen



Dam	Activer storage (mcm)	Year of construction	Year of commission
Manwan	258	1992	1996
Dachaoshan	240	1996	2003
Xiaowan	9800	2001	2010-2014



Dam	Activer storage (mcm)	Year of construction	Year of commission
Manwan	258	1992	1996
Dachaoshan	240	1996	2003
Xiaowan	9800	2001	2010-2014



Conclusions

- The present MRC Hydro-Met data and information include both historical and operational .
- Present 15 MRC stations along mainstream and future 35 stations in tributaries can be very useful for the basin development plan (BDP) analyses.
- Upgrading of interval of data reading of MRC stations should be adopted to give smaller interval data (eg. hourly) for detailed flow regime analysis and etc.
- Sediment and water quality monitoring at MRC stations should be incorporated with the discharge monitoring.
- Other Hydro-Met data from country stations are also needed for the BDP analyses. We are grateful to NMCs and LAs.
- MRC-IS can be accessed through established guidelines.

Thank You for Your Kind
Attention