

# Appendix 1. Statistical Analysis of Annual Flood Risk on the Mainstream Mekong

This appendix contains the results of a statistical analysis of the distribution of annual flood risk along the Mekong mainstream. Both flood volumes and annual maximum flood peaks are considered. The flood volumes with a given annual risk of occurrence are provided both in terms of above and below normal values with an annual recurrence interval, as described in Part 2.2 and specifically in Figure 6. The flood peaks are given only as the distribution of extremes in excess of the annual mean value.

The results of an indicative statistical analysis of the annual maximum water levels at Phnom Penh Port, Prek Dam, Tan Chau and Chao Doc are also presented.

For the estimation of the quantiles of all variables, a General Extreme Value Distribution was employed, estimated using Probability Weighted Moments and using the univariate model selection criteria described in Linhart and Zucchini (1984).

## A1.1 Mekong mainstream: recurrence intervals of annual flood volumes

### *Chiang Saen (1923–2006)<sup>1</sup>*

	Recurrence Interval (years)										
	100	50	20	10	5	2	5	10	20	50	100
Annual flood volume (km <sup>3</sup> )	29.8	32.7	37.1	41.3	46.7	56.0	69.2	78.5	86.1	97.0	105.9

### *Luang Prabang (1939–2006)*

	Recurrence Interval (years)										
	100	50	20	10	5	2	5	10	20	50	100
Annual flood volume (km <sup>3</sup> )	35.2	41.1	50.1	58.2	68.1	83.1	106.4	114.7	121.6	128.7	133.4

### *Chiang Khan*

	Recurrence Interval (years)										
	100	50	20	10	5	2	5	10	20	50	100
Annual flood volume (km <sup>3</sup> )	49.6	55.6	64.4	72.2	82.0	91.2	111.1	125.2	135.1	154.6	160.0

<sup>1</sup> The 1966 flood at Chiang Saen combined a 100 year return period flood volume of 104.1 km<sup>3</sup> with a historically unprecedented flood peak discharge of 23,500 cumecs.

*Vientiane/Nong Khai (1913–2006)*

	Recurrence Interval (years)											
	100	50	20	10	5	2	5	10	20	50	100	
Annual flood volume (km <sup>3</sup> )	50.3	55.8	64.4	72.2	82.0	100.1	121.7	132.8	140.3	165.0	178.3	

*Nakhon Phanom (1923–2006)*

	Recurrence Interval (years)											
	100	50	20	10	5	2	5	10	20	50	100	
Annual flood volume (km <sup>3</sup> )	79.6	91.2	108.8	124.5	143.7	180.4	214.8	230.7	242.3	253.9	260.3	

*Mukdahan (1923–2006)*

	Recurrence Interval (years)											
	100	50	20	10	5	2	5	10	20	50	100	
Annual flood volume (km <sup>3</sup> )	91.3	103.8	122.5	139.0	158.7	193.6	226.8	241.2	251.5	260.2	269.0	

*Khong Chiam (1966–2006)*

	Recurrence Interval (years)											
	100	50	20	10	5	2	5	10	20	50	100	
Annual flood volume (km <sup>3</sup> )	96.7	109.9	130.0	148.1	170.4	212.7	254.3	274.6	289.0	304.4	313.8	

*Pakse (1923–2006)*

	Recurrence Interval (years)											
	100	50	20	10	5	2	5	10	20	50	100	
Annual flood volume (km <sup>3</sup> )	123.7	138.9	161.5	181.5	205.4	240.2	287.5	305.7	318.4	330.4	338.2	

*Stung Treng (1950–2006)*

	Recurrence Interval (years)											
	100	50	20	10	5	2	5	10	20	50	100	
Annual flood volume (km <sup>3</sup> )	168.3	184.8	210.3	233.6	262.5	320.0	377.7	407.8	431.2	454.0	468.4	

*Kratie*

	Recurrence Interval (years)										
	100	50	20	10	5	2	5	10	20	50	100
Annual flood volume (km <sup>3</sup> )	172.5	190.4	217.7	242.6	273.4	333.7	394.2	424.6	447.5	470.6	483.4

## A1.2 Mekong mainstream: recurrence intervals of annual flood peak discharge.

*Chiang Saen (1960–2006)<sup>2</sup>*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual flood peak (cumecs)	10 000	13 000	14 500	16 000	18 000	20 000

*Luang Prabang (1939–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual flood peak (cumecs)	15 000	17 500	19 500	20 500	22 000	23 500

*Chiang Khan (1976–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual flood peak (cumecs)	16 000	18 500	20 000	21 500	23 000	24 500

*Vientiane/Nong Khai (1913–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual flood peak (cumecs)	16 500	19 000	21 000	22 500	24 000	26 000

<sup>2</sup> The 1966 flood at Chiang Saen combined a 100 year return period flood volume of 104.1 km<sup>3</sup> with a historically unprecedented flood peak discharge of 23,500 cumecs. This would be regarded as an 'outlier' event, that is one outside of the main body of the historical data observed over the last 47 years.

*Nakhon Phanom (1924–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual flood peak (cumecs)	26 000	30 000	32 000	33 000	34 500	36 000

*Mukdahan (1923–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual flood peak (cumecs)	29 000	32 500	34 500	36 000	38 000	39 500

*Khong Chiam (1966–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual flood peak (cumecs)	34 000	40 000	43 000	45 000	48 000	50 000

*Pakse (1923–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual flood peak (cumecs)	37 000	42 000	45 000	49 000	53 000	56 000

*Stung Treng. (1950–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual flood peak (cumecs)	50 000	55 500	60 000	64 000	69 500	74 000

*Kratie (1924–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual flood peak (cumecs)	52 000	58 000	63 000	68 000	74 000	78 500

### A1.3 Cambodian floodplain and Mekong delta: indicative analysis of the recurrence intervals of annual maximum water level (masl)

#### *Phnom Penh (1960–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual maximum water level (masl)	8.9	9.4	9.8	10.2	10.7	11.1

#### *Prek Kdam (1960–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual maximum water level (masl)	9.1	9.6	9.9	10.0	10.2	10.4

#### *Tan Chao (1980–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual maximum water level (masl)	4.3	4.7	4.8	5.0	5.1	5.2

#### *Chao Doc (1980–2006)*

	Recurrence Interval (years)					
	2	5	10	20	50	100
Annual maximum water level (masl)	3.8	4.3	4.5	4.6	4.7	4.9