2nd Asian Water Cycle Symposium
(AWCS)

Country Report

Myanmar

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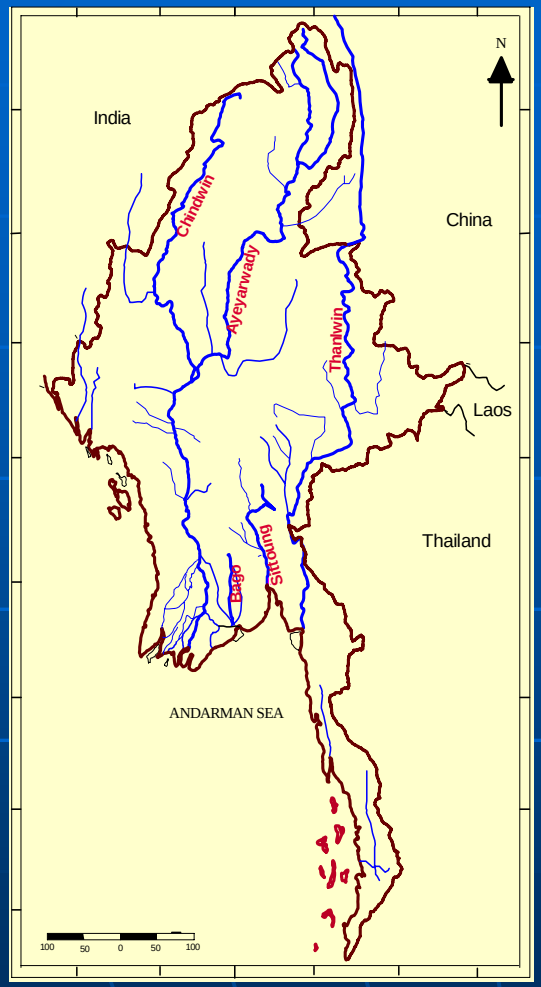
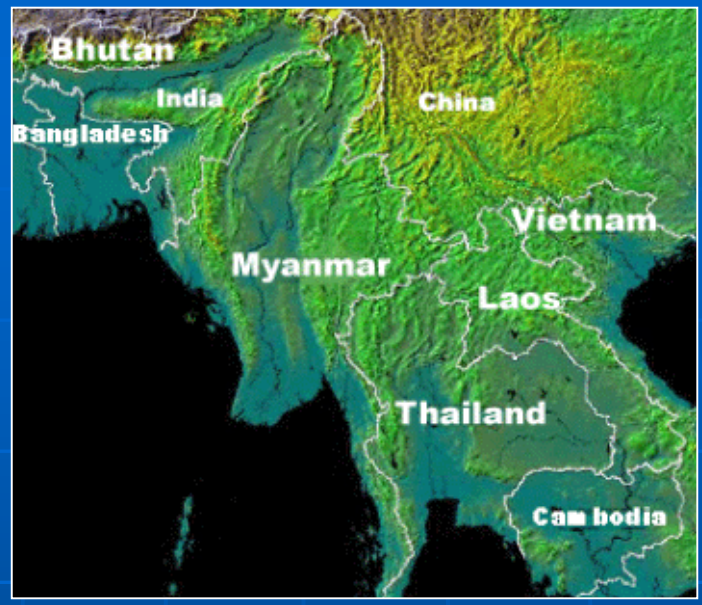
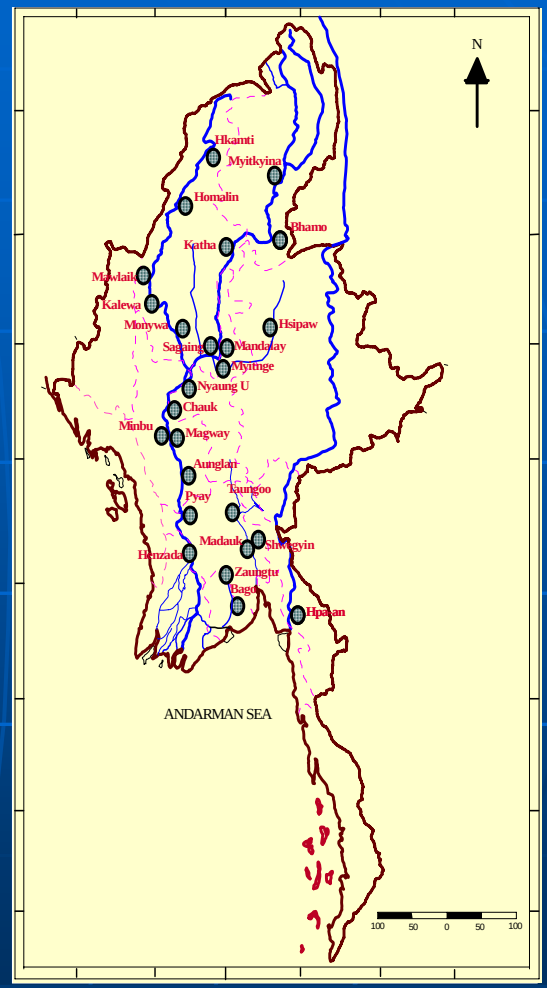






Rivers in Myanmar

River forecasting stations in Myanmar

WATERSHED MANAGEMENT ACTIVITIES

- Only about 6% of the total water resources of 870 million acre feet per annum are being utilized annually
- Numerous irrigation facilities have been implemented
- After 1988, the government put forward continuous efforts in the constructions of dams and reservoirs throughout the country by utilizing large capital investment
- Completed between 1988-1989 to 2006 numbered 193 new dams
- Establishment of 298 river pump stations and 999 of village dams were made for rural water supply and agricultural use

Natural disasters

-Meteorological

-Hydrological

-Geological

- River floods
- Flash floods
- Inundations
- Very low River water levels
- Very low ground water levels
- Heavy rain spells
- Droughts

River Basin Description

- Location : 17º 30’ to 18º 30’ (North latitude)
  96º 45’ to 97º 10’ (East Longitude)
- Catchment outlet: 17º 48’ (N. Lat) , 96º 48’(E. Long)
- Catchment Area : 1747 km^2
- MOLTS Point 1 : 17º 52’, 96º 52’
- MOLTS Pt. 1 el^n : 12 m (above mean sea level)

Available Data at Shwegyin Basin

- 42 miles long from North to South
- 19 miles wide from east to west
- only one Met. And Hydro. Station
- Rainfall, water level, water temperature, discharge, sediment discharge, evaporation, wind direction, wind speed, humidity

Monthly Distribution of Flood in Shwegyin

Station	Percentage of Flood					Frequency	Period
	June	July	Aug	Sep	Oct		
Shwegyin	3	21	74	3	0	34	1966-2005

Needs related to water resources management in the basin

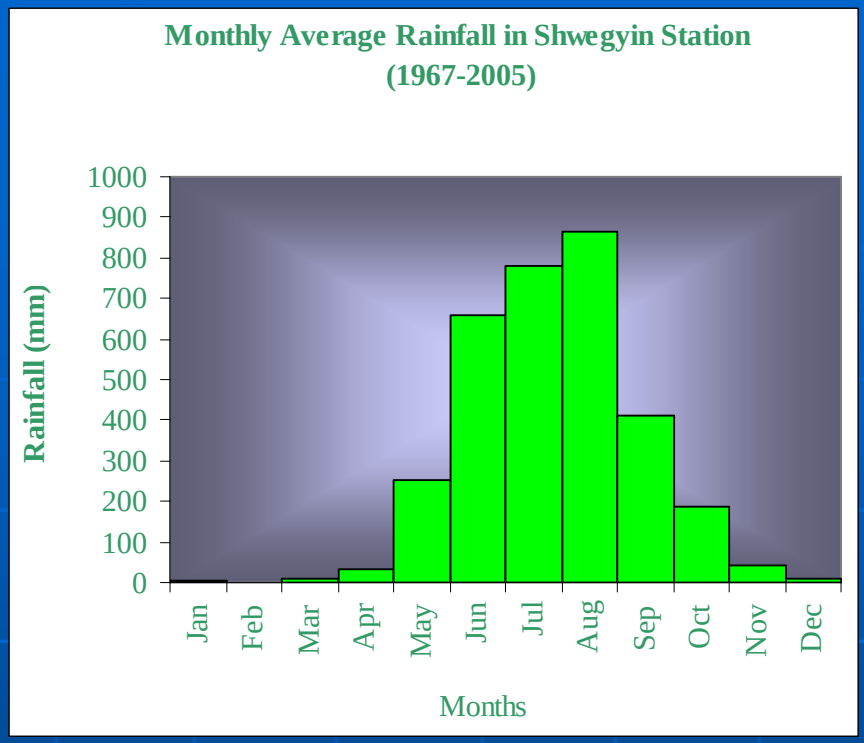
- To install two telemetering stations and one receiving station in Shwegyin river basin, in order to get early warning system
- To develop forecasting technique for flash flood
- To display the hydrological behavior of watersheds after estimation the geomorphologic parameters from digital elevation model
- To develop accurate flood inundation maps based on flows the hydrologic model using all available data including GIS data sources

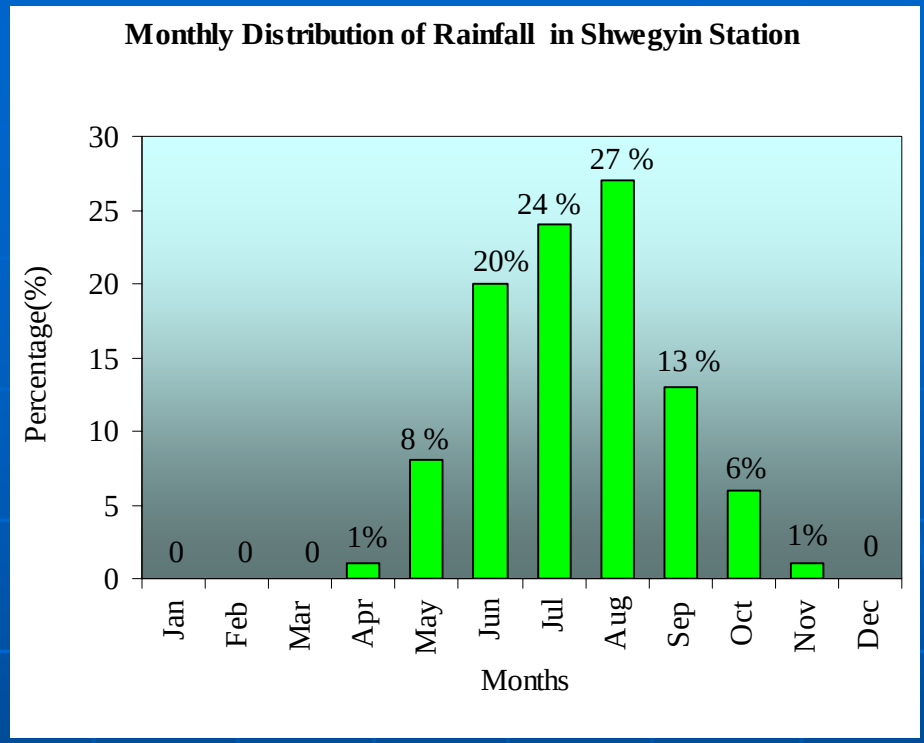
Impact of Geomorphologic Parameters on Watershed Hydrology

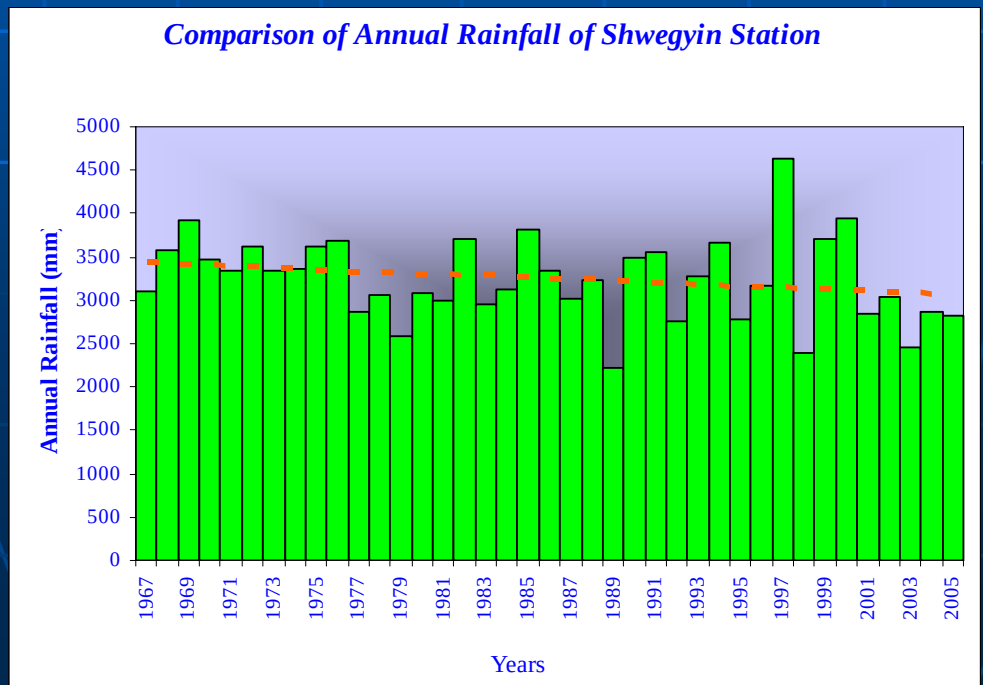
Geomorphologic Parameters	Governing Hydrological behavior
Relief ratio, relative relief, elongation ratio and average slope	Affect the time of concentration of the watershed, runoff rate and sediment loss
Stream length ratios, bifurcation ratio, drainage density and drainage factor	Governs the peak runoff rate and the sediment loss
Shape factor	Defines the basin elongation, affects the time of concentration and the peak runoff rate and translation time of runoff reaching the outlet

Severe Flood Record (Since 1966)

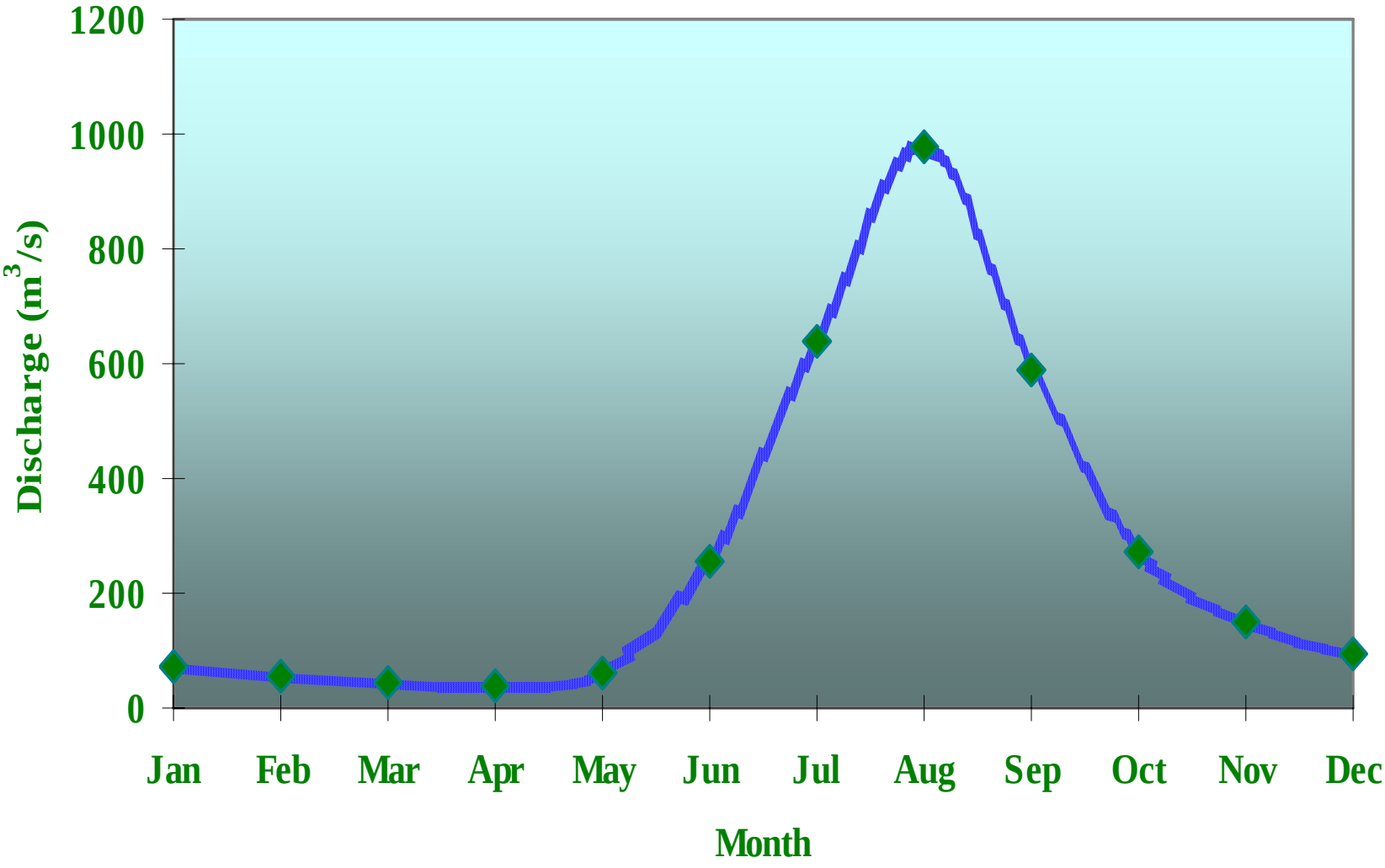
Years	Flood Peak (cm)	Flood Duration above DL	Record
1997	927	4 days 12 hours	1st Max.
1999	902	11 days 12 hours	2nd Max.
1996	827	5 days 12 hours	3rd Max.

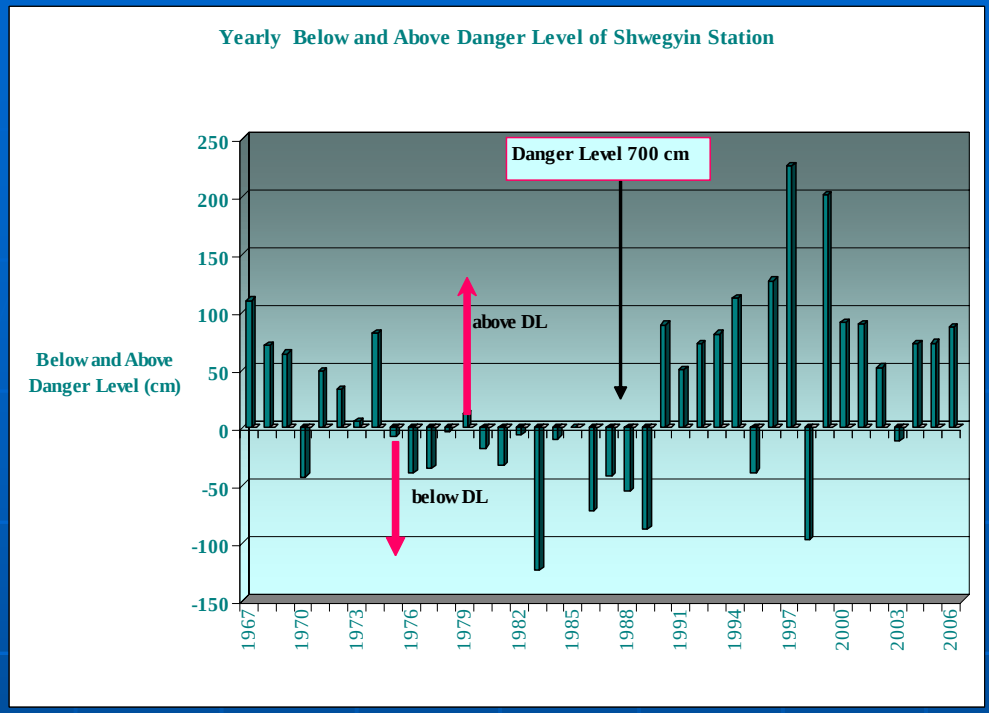

Monthly Average Rainfall in Shwegyin Station
(1967-2005)
Rainfall (mm)
1000
900
800
700
600
500
400
300
200
100
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Months

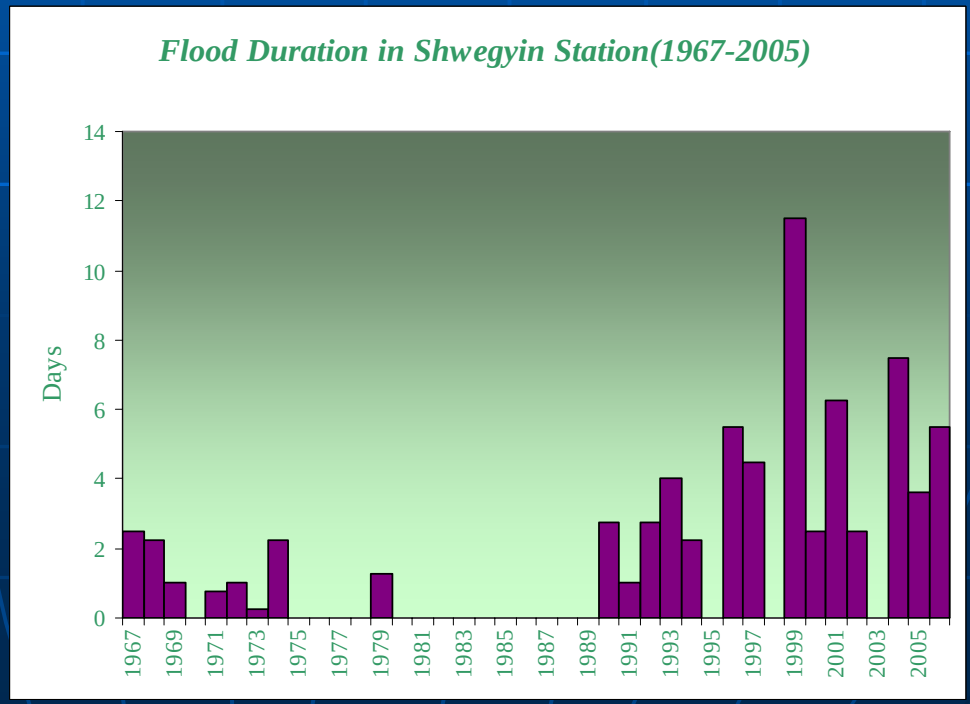

Monthly Distribution of Rainfall in Shwegyin Station
Percentage(%)
30
25
20
15
10
5
0
0
0
0
1%
8 %
20%
24 %
27 %
13 %
6%
1%
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Months

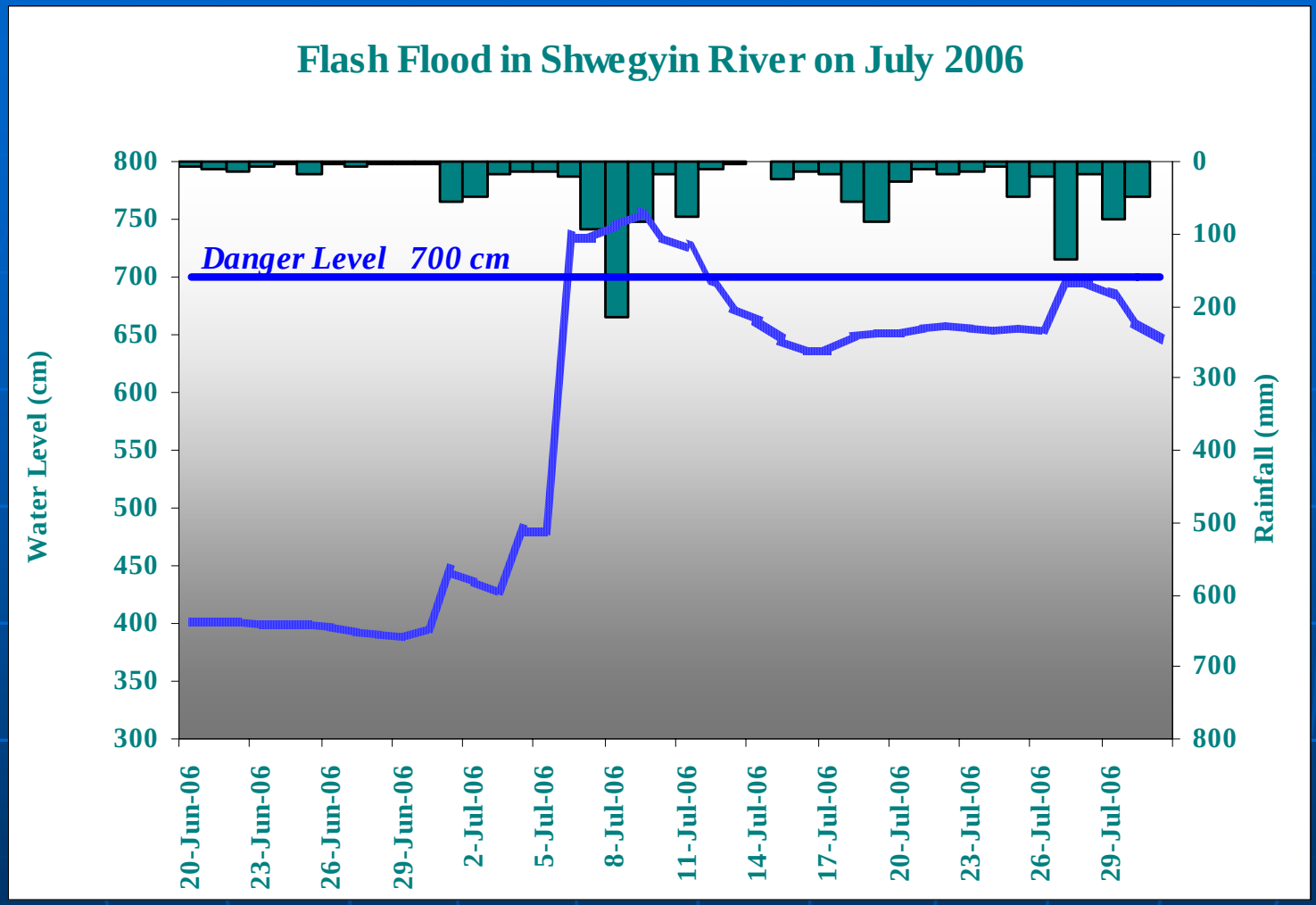

Comparison of Annual Rainfall of Shwegyin Station
Annual Rainfall (mm)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
Years

Monthly Mean Discharge of Shwegyin Station (1967-2005)



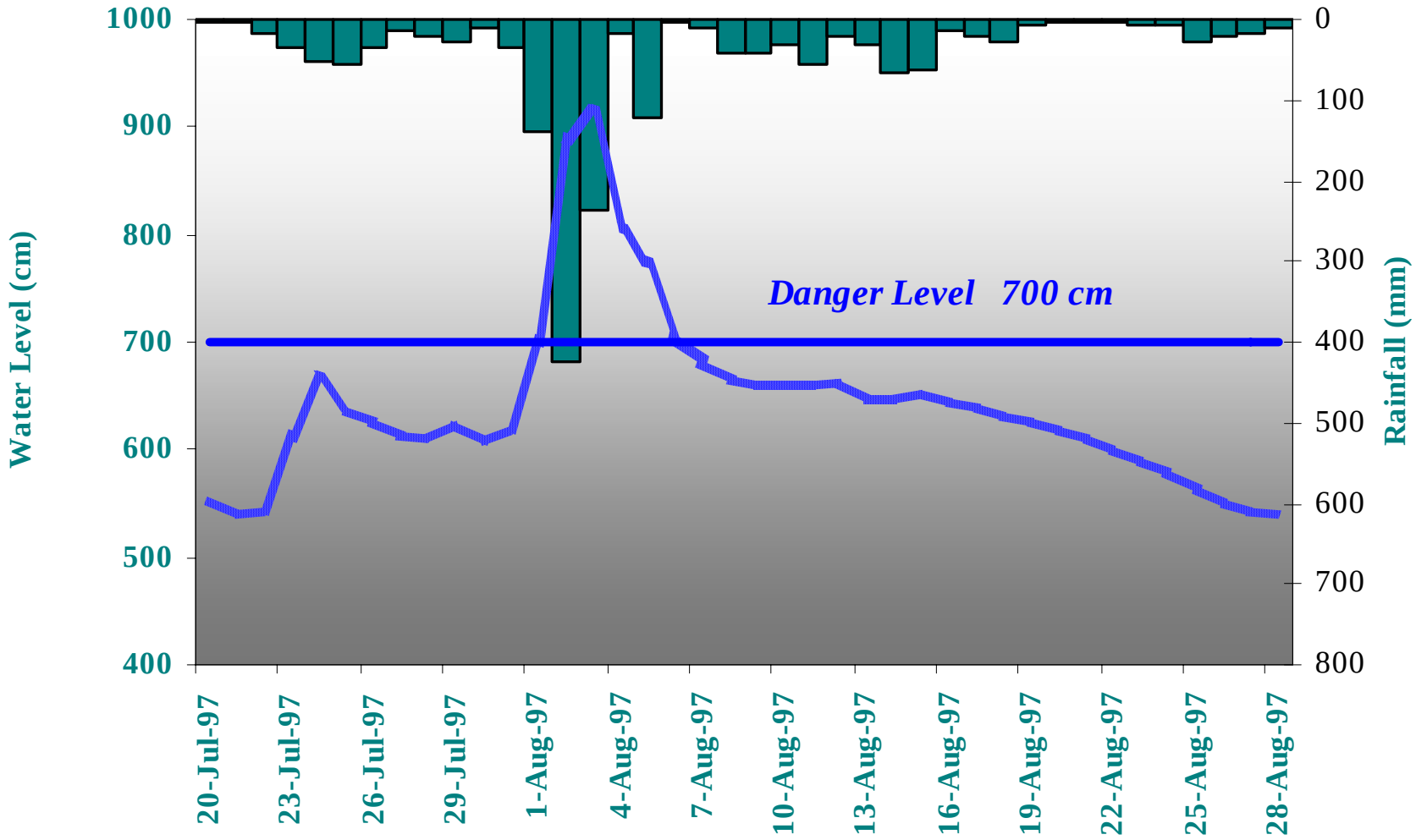

Yearly Below and Above Danger Level of Shwegyin Station
Danger Level 700 cm
above DL
below DL
Below and Above Danger Level (cm)
250
200
150
100
50
0
-50
-100
-150
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003
2006


Flood Duration in Shwegyin Station(1967-2005)
Days
14
12
10
8
6
4
2
0
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005



Water Level Change within 12 hours : 239 cm

Flash Flood in Shwegyin River on Aug 1997



Water Level Change within 24 hours : 174 cm

Damage cause by flash flood at Shwegyin in 1997

- The flood water cover 6 wards out of 8 wards in Shwegyin
- 4/5 of the areas which inundated
- 504 houses washed away
- 6336 acres of paddy field were affected

Data Analysis

For

Pre-phase Preparation

Statistical Characteristics of Original Series

Parameters	Mean	SD	Cv	Cs	Ck	R1
Annual Max. Discharge (m^3/s)	2085	717.3	0.34	1.01	4.68	0.16
Annual Max. Rainfall (mm)	151	56.0	0.37	3.16	17.43	-0.11

Outlier Test

	Computed		Observed		Remark
	Q_H	Q_L	Q_H	Q_L	
Annual Peak Flow (m3/s)	4816	809	4388	952	
Annual Max Rainfall(mm)	317	66	424	80	High Outlier

The Result of Randomness and Trend Analysis

Parameters	Turning Point Test	Kendal's Rank Correlation	Mann Kendal Test	Spear Rho Test	Auto correlation
Annual Max. Discharge	-1.43	0.21	0.21	0.53	1.18
Annual Max. Rainfall	0.91	0.54	0.58	0.60	-0.52

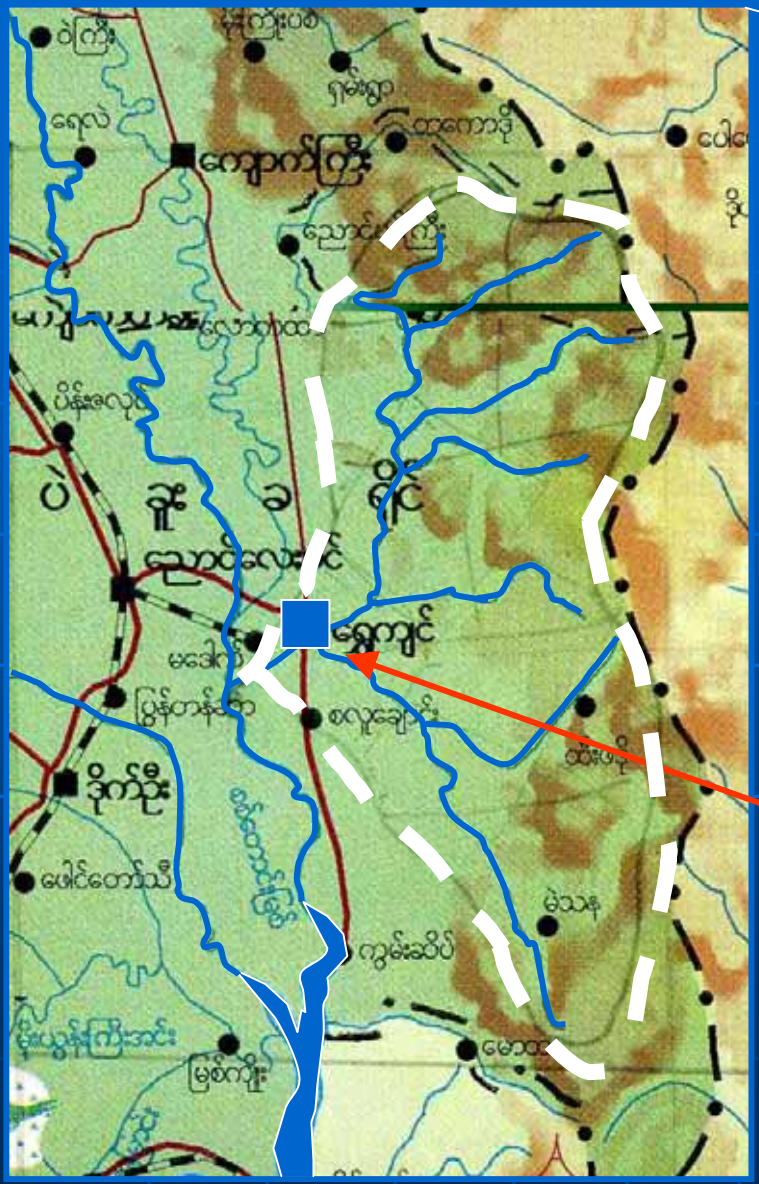
Parameters	Median Crossing Test	Run Test	WW Test	Run above and below	Ran Von Neumann	Von Neuman	Rank Difference	Hurt Coeff:
Annual Max. Discharge	***-2.27***	***-2.63***	1.22	-0.004	-1.71	-1.06	***-2.56***	0.82
Annual Max. Rainfall	0.65	0.33	-0.68	0.0004	1.33	0.63	1.22	0.59

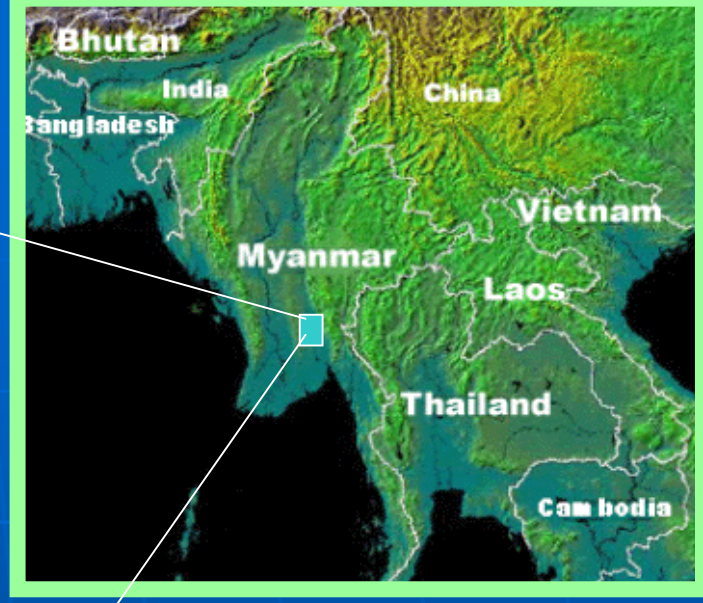
Most of tests gave the identical results

Draft Implementation Plan

- To develop forecasting technique for flash flood
- To develop the design flood and design rainfall for difference return periods and probable maximum precipitation (PMP) of one to three days
- To compare the estimated design flood by unit hydrograph approach with the flood frequency analysis
- To display the hydrological behavior of watersheds after estimation the geomorphologic parameters from digital elevation model
- To develop accurate flood inundation maps based on flows the hydrologic model using all available data including GIS data sources

Thanks for your kind attention





Shwegyin Station

North latitude : 17º 30’ to 18º 30’
East Longitude : 96º 45’ to 97º 10’