GEOSS Asia Water Cycle Initiative (AWCI) International Coordination Group (ICG)

And

3rd GEOSS Asia Pacific Symposium

Flood Study for Myanmar Rivers

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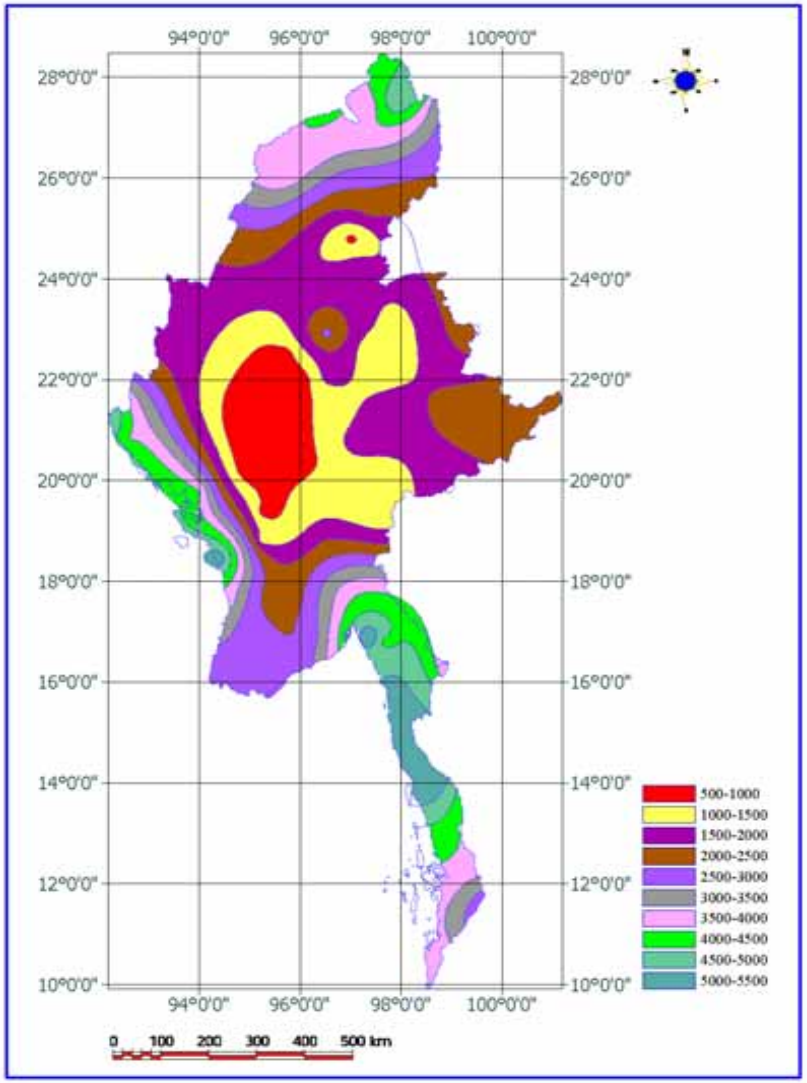
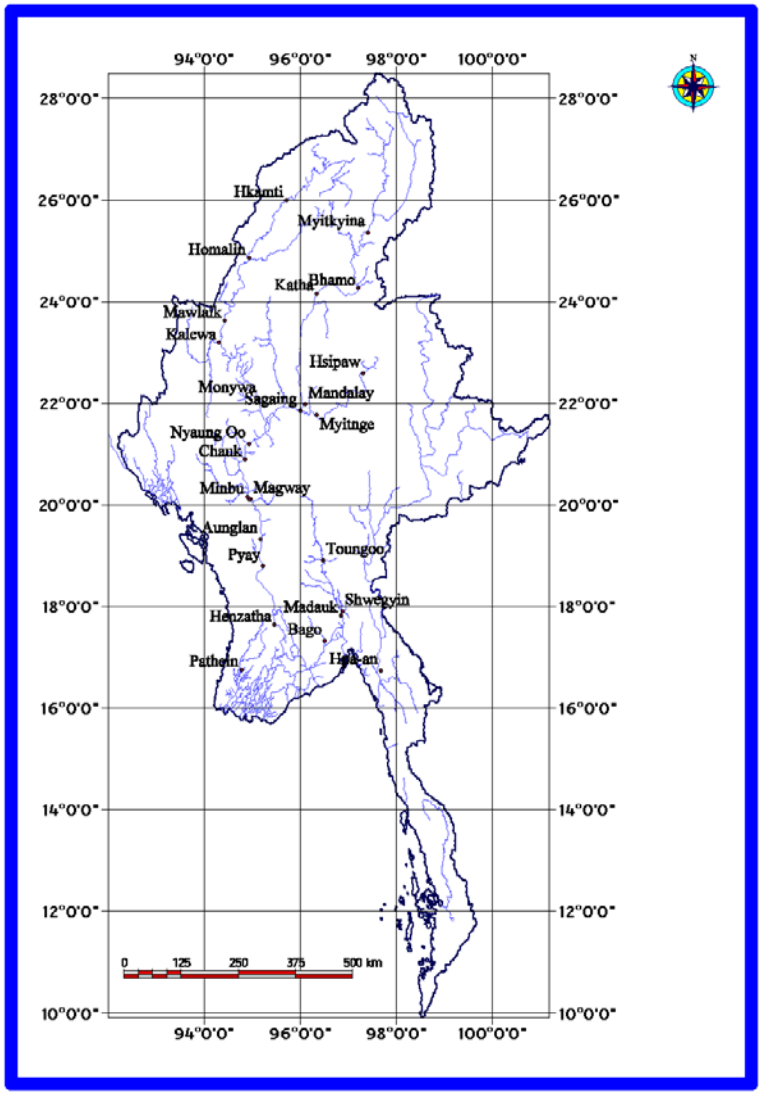
Myanmar

Normal Rainfall in Myanmar



Hydrological Forecasting Stations



PERCENTAGE OF DISASTER OUTBREAK IN MYANMAR (1998-99 to 2007-08)

Techniques used for Flood warnings

- Simple stage correlation method
- Empirical model based on single and multiple regression analysis
- Flood frequency analysis
- Conceptual models (Sacramento, SSARR, HBV and TANK) were tested for operational use

Flood Record in Myanmar (since 1966)

Stations	DangerLevel (cm)	Max. WL (cm)	Flood Duration	above DL (m)	Year
Ayeyarwady					
Myitkyina	1200	1411	4 days 12 Hrs	2.11	1979
Bhamo	1150	1338	8 days 2 Hrs	2.38	2004
Katha	1040	1154	7 days 6 Hrs	1.14	1979
Mandalay	1260	1382	16 Days	1.22	2004
Sagaing	1150	1274	17 Days 6 Hrs	1.24	2004
Nyaung Oo	2120	2263	16 Days 12 Hrs	1.43	2004
Chauk	1450	1532	12 Days 12 Hrs	0.82	1974
Minbu	1700	1982	17 Days 12 Hrs	2.82	1974
Aunglan	2550	2737	15 Days	1.87	1974
Pyay	2900	3025	13 Days	1.25	1974
Hinthada	1342	1461	13 Days 6 Hrs	1.19	1966
Chindwin					
Hkamti	1360	1771	18 Days 6 Hrs	4.11	1991
Homalin	2900	3107	18 Days 6 Hrs	2.07	1968
Mawlaik	1230	1608	15 Days 12 Hrs	3.78	1976
Kalewa	1550	1920	10 Day 12 Hrs	3.70	2002
Monywa	1000	1099	9 Days 6 Hrs	0.99	2002

Flood Record in Myanmar (since 1966)

Stations	DangerLevel (cm)	Max. WL (cm)	Flood Duration	above DL (m)	Year
Sittoung					
Toungoo	600	725	16 Days 18 Hrs	1.25	1973
Madauk	1070	1244	31 Days	1.74	1997
Dokhtawady					
Hsipaw	600	618	12 Hrs	0.18	1971
Myitnge	870	1048	8 Days 6 Hrs	1.78	2006
Shwegyin					
Shwegyin	700	927	4 Days 12 Hrs	2.27	1997
Bago					
Bago	910	950	2 Days 6 Hrs	0.4	1995
Thanlwin					
Hpaan	750	936	38 Days	1.86	2002

Occurrences of floods in major rivers

Pre-monsoon Period (May-June)

In May

- Due to Cyclonic Storm 'NARGIS' which crossed the Myanmar Deltaic area, widespread rain in whole Myanmar and locally heavyfall in Deltaic area
- also rain in Northern Myanmar due to LPA in East Central Bay during 2nd dekad of May, the water level rose up in all rivers.
- But not reach D.L

In June

- Due to LPA in BOB in 1st dekad of June, strong to vigorous monsoon in BOB in second dekad of June, widespread rain in whole Myanmar and the water levels rise again in all rivers
- But not reach D.L

River	Water level rise in May (ft)	Water level rise in June (ft)
Ayeyarwady	4 - 6	11-20
Chindwin	3 - 4 ½	14-23
Dokehtawady	1 ½ - 4	2-14
Thanlwin	4	7
Sittoung	½ - 2	4 ½ -14
Shwegyin	5	4 ½
Bago	11	6

Peak Monsoon Period (July)

- Due to Strong to vigorous Monsoon in 1st dekad of July, floods occurred in Chindwin, Ayeyarwady, Sittoung and Thanlwin river

Station	Duration	Rainfall (mm)	Water Level rise (ft)
Putao	1.7.08 –10.7.08	170	-
Hkamti	1.7.08 –7.7.08	647	26
Homalin	1.7.08 –10.7.08	204	11
Mawlaik	5.7.08 –10.7.08	254	18
Kalewa	1.7.08 –10.7.08	343	21
Monywa	1.7.08 –10.7.08	-	10

River	Stations	Flood Frequency
Chindwin	Hkamti, Homalin, Mawlaik, Kalewa & Monywa	1
Ayeyarwady	NyaungOo, Hinthada	1
Sittoung	Madauk	1
Thanlwin	Hpa-an	1

Peak Monsoon Period (August)

- Due to the tropical Cyclone “Kamuri” in the South China Sea in the first dekad and strong to vigorous monsoon in second and third dekad, widespread rain in the whole Myanmar. Floods occurred in Chindwin(Homalin, Mawlaik & Kalewa), Ayeyarwady (Hinthada) Thanlwin, Sittoung, Bago and Shwegyin river

Station	Duration	Rainfall (mm)	Water Level rise (ft)
Putao	3-8-08—20-8-08	427	-
Hkamti	11-8-08—20-8-08	706	18
Homalin	11-8-08—20-8-08	208	10
Mawlaik	11-8-08—20-8-08	264	11
Kalewa	11-8-08—20-8-08	301	10
Monywa	11-8-08—20-8-08	2	6

River	Water level rise (ft)
Ayeyarwady	2 ½ -11
Chindwin	5 ½ -19
Dokehtawady	3-4
Thanlwin	5 ½
Sittoung	4-5 ½
Shwegyin	9
Bago	6

River	Stations	Flood Frequency
Chindwin	Hmlin, Mlaik & Klwa	1,1,1
Ayeyarwady	Hinthada	2
Thanlwin	Hpa-an	1
Sittoung	Toungoo, Madauk	1,1
Thanlwin	Hpa-an	1
Shwegyin	Shwegyin	1
Bago	Bago	1

Late Monsoon Period (Sept)

- **Due to monsoon rain in first dekad of Sept in Northern Myanmar area, W/L rose in Chindwin, Ayeyarwady and Dokehtawady river.**

- **Also due to monsoon rain in first and second dekad of Sept in Central and Eastern part of Myanmar, W/L rose in Sittoung, Bago and Shwegyin river.**

- **Fourth flood at *Hinthada (Ayeyarwady) and first flood at Myitnge (Dokehtawady)***

- **Flood at Hpa-an starting from August continued up to second dekad of September**

River	Stations	Flood Frequency
Ayeyarwady	Hinthada	1
Thanlwin	Hpa-an	1(con: Aug)
Dokehtawady	Myitnge	1

River	Water level rise (ft)
Ayeyarwady	2 - 4½
Chindwin	½ -4
Dokehtawady	4-5
Sittoung	1 ½ -4
Shwegyin	3 ½
Bago	12

Issues of Flood Warnings and Bulletins in 2008

DMH ⟹ Issuing timely Flood warning and Bulletin during the Southwest Monsoon Period

River	Flood Warning	Flood Bulletin
Chindwin	14	24
Ayeyarwady	6	18
Dokehtawady	1	2
Sittoung	3	14
Shwegyin	1	4
Bago	2	2
Thanlwin	1	16
Total	28	80

Flood Occurrence and Duration in 2008

River/ Station	Danger Levels (cm)	Maximum¥W/L (cm)	Above DL (ft)	Date of Occurrence	Flood Duration	Start Date	End Date	Record
Chindwin								
Hkamti	1360	1559	6.5	6.7.08 (18;30)	4 Days 12 Hrs	5-7-08	9-7-08	7 th Max (1967-2008)
Homalin	2900	3034 2934	4.4 1.1	8-7-08 (18:30) 21-8-08 (06:30)	8 Days 6Hrs 4 Days 0Hrs	6-7-08 (06:30)	14-7-08 (12:30)	7 th Max (1968-2008)
Mawlaik	**1230**	**1519 1284**	**9.5 1.8**	**10-7-08 (18:30) 23-8-08 (06:30)**	**9 Days 12 Hrs 6 Days 1 Hrs**	**7-7-08 (18:30) 19-8-08 (06:30)**	**17-7-08 (06:30) 25-8-08 (07:30)**	**4th Max (1966-2008)**
Kalewa	**1550**	**1840 1584**	**9.5 1.1**	**10-7-08 (18:30) 23-8-08 (12:30)**	**9 Days 0 Hrs 5 Days 9 Hrs**	**7-7-08 (18:30) 19-8-08 (15:30)**	**16-7-08 (18;30) 25-8-08 (00:30)**	**4th Max (1966-2008)**
Monywa	**1000**	**1094**	**3.1**	**11-7-08 (18:30)**	**7 Days 14 Hrs**	**8-7-08 (18:30)**	**16-7-08 (08:30)**	**2nd Max (1966-2008)**
Ayeyarwady								
NyaungU	2120	2135	0.5	14-7-08 (06:30)	2 Days 12 Hrs	13-7-08 (06:30)	15-7-08 (18:30)	
Hinthada	1342	1379 1343 1370 1351	1.2 0.03 0.9 0.3	18-7-08 (12:30) 6-8-08 (18:30) 30-8-08 (18:30) 15-9-08 (06:30)	6 Days 11 Hrs 1 Days 19 Hrs 8 Days 12 Hrs 4 Days 0 Hrs	15-7-08 (10:30) 6-8-08 (11:30) 25-8-08 (06:30) 13-9-08 (06:30)	21-7-08 (21:30) 8-8-08 (06:30) 2-9-08 (18:30) 17-9-08 (06:30)	

Flood Occurrence and Duration in 2008

River/ Station	Danger Levels (cm)	Maximum W/L (cm)	Above DL (ft)	Date of Occurrence	Flood Duration	Start Date	End Date	Record
Dokehtawady								
Myitnge	870	889	0.6	11-9-08 (04:30)	3 Days 3 Hrs	9-9-08 (21:30)	13-9-08 (01:30)	
Sittoung								
Toungoo	600	606	0.2	20-8-08 (09:30)	1 Days 22 Hrs	20-8-08 (00:30)	21-8-08 (22:30)	
Madauk	1070	1097 1175	0.9 3.4	9-7-08 (18:30) 13-8-08 (18:30)	14 Days 18 Hrs 22 Days 0Hrs	6-7-08 (18:30) 8-8-08 (06:30)	21-7-08 (12:30) 30-8-08 (06:30)	12th Max (1966-2008)
Shwegyin								
Shwegyin	700	828	4.2	8-8-08 (18:30)	7 Days 1 Hrs	7-8-08 (17:30)	14-8-08 (18:30)	3rd Max (1965-2008)
Thanlwin								
Hpaan	750	751 911	0.3 5.3	30-7-08 (07:30) 12-8-08 (06:30)	- 46 Days 5 Hrs	- 1-8-08 (06:30)	- 16-9-08 (12:30)	- 6th Max (1966-2008)
Bago								
Bago	910	946	1.2	15-8-08 (10:30)	3 Days 2 Hrs	13-8-08 (22:30)	17-8-08 (24:30)	2nd Max (1966-2008)

Bago Flood View

ပဲခူးမြို့၊ ဇိုင်း/မြောက်ရပ်ကွက်၊ (၄)လမ်းတွင် ရေဝင်ရောက်နေမှု
အနက်ဆုံး (၅)ပေ၊အတိမ်ဆုံး(၃)ပေခန့် (၁၅.၈.၂၀၀၈)

ပဲခူးမြို့၊ ဇိုင်း/တောင်ရပ်ကွက်၊ ထုံးတန်းလမ်းတွင် ရေဝင်ရောက်နေမှု
အနက်ဆုံး (၁၀)ပေ၊အတိမ်ဆုံး(၄)ပေခန့် (၁၅.၈.၂၀၀၈)

ပဲခူးမြို့၊ ဇိုင်း/မြောက်ရပ်ကွက်၊ ရန်ကုန် - မန္တလေးကားလမ်းတွင် ရေကျော်နေမှု
လမ်းအလယ် (၁)ပေခန့်၊လမ်းဘေး(၂)ပေခန့် (၁၅.၈.၂၀၀၈)

ပဲခူးမြို့ မဇင်းရပ်ကွက်၊ (၁)လမ်းတွင် ရေဝင်ရောက်နေမှု
အနက်ဆုံး(၇)ပေ၊အတိမ်ဆုံး(၅)ပေခန့် (၁၅.၈.၂၀၀၈)

Temporary Relief Shelters

ပဲခူးမြို့ ကျောက်ကြီးစုရပ်ကွက်၊ အလက(၁)ယာယီကယ်ဆယ်ရေးစခန်းတွင်
ရေဘေးသင့်အိမ်ထောင်စုများ ရောက်ရှိနေပုံ

ပဲခူးမြို့ ကျွန်းသာယာရပ်ကွက်၊ အနောက်ရွှေ့သာကျောင်းယာယီကယ်ဆယ်ရေးစခန်း
တွင်ရေဘေးသင့်အိမ်ထောင်စုများ ရောက်ရှိနေပုံ

ပဲခူးမြို့ မြို့သစ်ရပ်ကွက်မှ ရေဘေးသင့်အိမ်ထောင်စုများ သာသနာ့ဝိဟာန်
ယာယီကယ်ဆယ်ရေးစခန်းတွင် ရောက်ရှိနေပုံ

ပဲခူးမြို့နယ်၊ ကလိတပ်ခလေးကျေးရွာ ကန်သာယာဘုန်းကြီးကျောင်း
ယာယီကယ်ဆယ်ရေးစခန်းတွင် ရေဘေးသင့်အိမ်ထောင်စုများ ရောက်ရှိနေပုံ

Hpaan Flood View

Monywa Flood View

Hpaan Flood View

Monywa Flood View

During the entire flood period, more than 35 000 people, comprising of Government employees, local residents, police & fire service staffs, red cross Volunteers, students, etc, watched the river water conditions and the stability
Of the river embankments day and night, for immediate response.

Along the 106 miles long embankment, the watch houses are placed at every
One furlong apart.

The watchers discovered
261 holes along the embankment of 106 miles long during the 2005 flood period in Hinthada embankment. Under this condition each hole can break the embankment, which could leave enormous inundation and disastrous consequences. In spite of that, each holes were well maintained from breaking by applying the Myanmar traditional civil technology so called “ Yay Khway”.

Taming the flood water and guarding the banks of rivers by using the local bamboos.

Heavy machines at works for strengthening the embankments
Before the flood water arrives.

Heavy machines at works for strengthening the embankments
Before the flood water arrives.

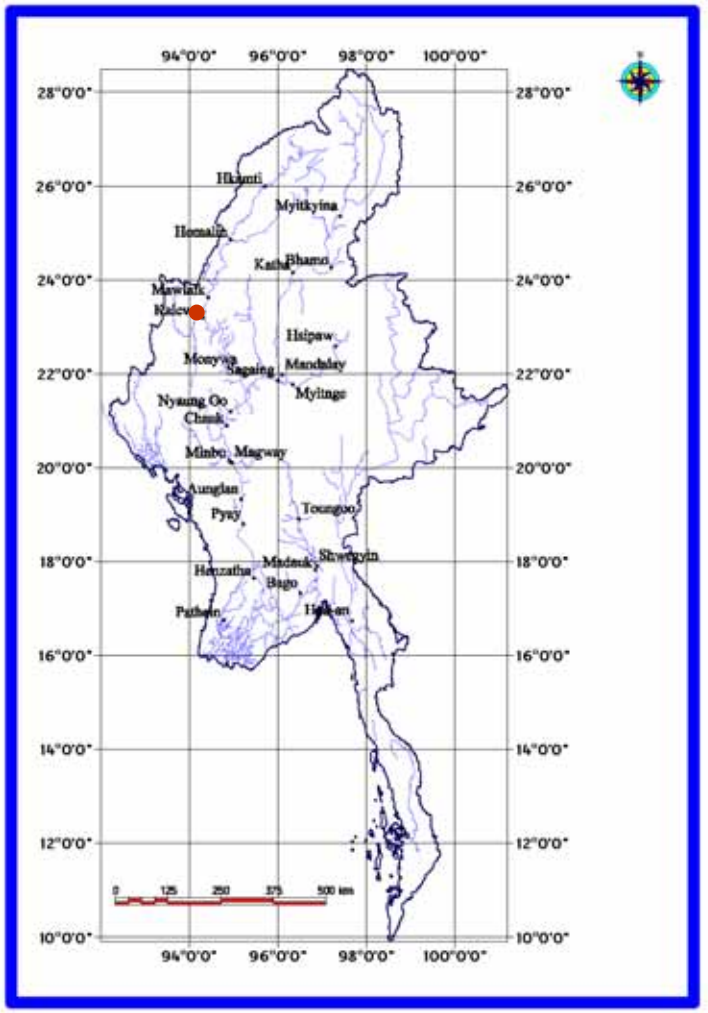
Strong Embankment after
reenforcement works
- ready to combat against flood water.

Protection from erosion by using
low coast local bamboos.

Kalewa Flood 2008 (Chindwin River)

Flood Duration 7-7-2008 to 16-7-2008 (9 days)

Flood Peak 1840 cm (9.5 ft above danger Level)

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