



The Republic of the Union of Myanmar
Ministry of Agriculture and Irrigation
Irrigation Department



Water Quality Management at River Basin in Myanmar

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River Basins in Myanmar

- There are Four Major Rivers
 1. Ayeyarwady River- 2210 Km
 2. Chindwin River - 900 Km
 3. Sittoung River - 320 Km
 4. Thanlwin River - 1224 Km
- Besides four main rivers, coastal streams in the
 1. Rakhine State
 2. Taninthayi Region



The Salient Features of the Rivers in Myanmar

Sr No	Name of Principal River Basin	Length (Km)	Catchment Area (000'sq-km)	Annual Surface Water (km ³)
1	Chindwin River	900	115.30	141.293
2	Upper Ayeyarwady River	1310	193.30	227.920
3	Lower Ayeyarwady River	690	95.60	85.800
4	Sittoung River	320	48.10	81.148
5	Rivers in Rakhine State	-	58.30	139.245
6	Rivers in Tanintharyi Division	-	40.60	130.927
7	Thanlwin River (from Myanmar boundary to its mouth)	1224	158.00	257.918
8	Mekong River (within Myanmar territory)	350	28.60	17.634
	Total		737.80	1081.885

River Basin in Myanmar

- ❖ These riverine systems in the country are the most important for the transportation and developing of water resources project.
- ❖ Due to favourable climate condition, wide spread river basin which covers 90% of the country's area.
- ❖ Most of the Water resources projects are located in the Ayeyarwady and Sittoung river basins.
- ❖ At present , Myanmar can be identified as low stress country concerning with water use.

Navigable Water Ways

River	Navigable Length (Km)
The Ayeyarwady River	1534
The Chindwin River	730
The Thanlwin and Mon State River	380
The Ayeyarwady Delta	2404
Rakhine State River	1602
Total	6650

Salient Features of Selected Tributaries of the Ayeyarwady River

Name of river	Length (km)	Elevation at source (m)	Catchment area (sq-km)	Average annual inflow (million m ³)	Remarks
Myittha	351	2000	24030	19000	Construction of a multipurpose dam with 40 MW is under going
Uyu	-	-	12410	12000	-
Samon	200	-	8700	1900	A retention dam was completed in 1992
Panlaung	300	-	3553	1500	A multipurpose dam with hydroelectric power of 56MW was completed in 1991
Zawgyi	245	-	5000	2800	-A dam with 15MW is under going -A diversion weir was constructed in 1891 and a dam with 12MW was completed in 1998.
Myitnge	528	1400	29630	24000	A dam with 790MW was completed in 2010.
Chaungmagyi	100	1700	5720	2700	A multipurpose dam with hydroelectric power of 25MW was completed in 1988 A dam with 60MW is under going.
Shweli	610	3400	29630	24000	A diversion system with 400MW was completed in 2009
Tapaing	230	3429	7213	9400	A dam with 240 MW was completed in 2010
Mu	440	533	18840	7200	2 diversion weirs were constructed in 1906 and 1997, and a dam with 30 MW was completed in 2001

Continued					
Mogaung	264	838	8433	9500	-
Malikha	367	4900	23550	57400	Construction of Myitson dam with hydroelectric power of 6000 MW is under going.
Mone *	-	-	3802	4319	In multipurpose dam with hydroelectric power of 75MW was completed in 2005 and 3 more dams with 74 MW, 42 MW and 150MW are under going
Mann*	-	-	352	243	A dam was completed in 1999.
Salin *	-	-	1028	626	A dam was completed in 2001.
Kun *	-	-	162	93	A dam was completed in 2006.
MaMya*	-	-	155	159	A dam was completed in 2007.
Nankathu *	-	-	114	117	A dam was completed in 2001
Kanyin *	-	-	334	337	A dam with 5MW is under going.
NorthNawin*	-	-	583	226	A dam was completed in 1981-1982
SouthNawin*	-	-	642	249	A dam was completed in 1995-1996.
Nayinzayar*	-	-	337	302	A dam with 4MW is under going.
Manipur*	-	-	11549	6170	A dam with 380MW is under going.
Chindwin* (Htamanthi)	-	-	43476	101682	A dam with 1200MW is under going.

*Indicates only for the dam site

Salient Features of Selected Tributaries of Sittoung River				
Sr.No	Name of River	Average annual Flow (million-acft)	Basin Area (sq-mls)	Remarks
1	Yezin	-	-	A dam was completed in 1976
2	Sinthe	1.11	1020	A dam was completed in 1999
3	Ngalaik	0.49	409	A dam was completed in 1987
4	Paunglaung	4.01	1861	A dam was completed in 2005
5	Madan*	-	35	A dam was completed in 2009
6	Swa	0.93	584	A dam was completed in 2001
7	Chaungmange*	-	103	A dam was completed in 2006
8	Kabaung	1.39	616	A dam was completed in 2008
9	Yetho	-	-	A dam was completed in 1998
10	Thaukyegat	4.13	925	-
11	Pyu	1.6	527	A dam was completed in 2009
12	Kun Chaung	2.17	600	-
13	Bawgata	-	-	-
14	Yenwe	2.74	690	A dam was completed in 2006
15	Baingda*	-	98	A dam was completed in 2002
16	Kawliya*	-	43	A dam was completed in 2003

*Indicates only for the dam site.

Water Quality Management in River Basins

Irrigation Department has to carry out

- The water quality test of water sample from Stream or Streamlet at the preliminary survey of the future irrigation projects.
- The Water Quality test of Water Sample from Hydrological net work stations.
 - Focus on mainly Agriculture purpose and drinking purpose
 - Measurement - Seasonal test
 - Physical and Chemical test
 - pH, ECw, Sediment, Salinity, Turbidity, TDS, CO_3^- , HCO_3^- , Cl^- , SO_4^- , Ca^{++} , Mg^{++} , Temp °C



Collected Information on Water Quality at The Hydrology Branch's Net-Work Stations

Sr. No	Name of Station	Date	ECw	T.D.S	T.C	pH	Turbidity	CO ₃	HCO ₃	Cl	SO ₄	Ca	Mg
1	Ngaputaw	16.10.97	1.40	0.70	28.4	6.90	92	Nil	91.5	213.0	Nil	40.0	24.0
		13.1.98	2.00	1.00	27.8	7.50	28	Nil	134.2	241.4	Nil	50.0	26.4
		13.3.98	2.15	1.07	30.1	7.10	29	Nil	158.6	245.0	Nil	56.0	33.6
2	Laputta	16.10.97	12.0	6.0	27.5	7.20	48	Nil	67.1	3585.0	99	34.0	33.6
		13.1.98	18.0	9.0	27.5	7.30	29	Nil	85.4	5325.0	120	39.2	45.6
		13.3.98	20.4	10.2	28.2	7.20	88	Nil	85.4	6590.0	155	40.2	46.8
3	Dedaye	16.10.97	0.34	0.17	29.3	6.90	120	Nil	91.5	42.60	Nil	14.0	11.0
		13.1.98	0.93	0.47	29.1	6.80	250	Nil	36.6	198.41	Nil	16.0	17.5
		13.3.98	2.46	1.23	28.9	6.80	65	Nil	36.6	1347.64	Nil	27.3	41.8
4	Mawlamyine	16.10.97	0.42	0.21	27.9	7.20	83	Nil	79.3	28.4	Nil	31.5	7.0
		13.1.98	0.50	0.25	29.3	7.00	100	Nil	91.5	30.2	Nil	32.0	7.0
		13.3.98	0.60	0.30	27.8	7.20	49	Nil	91.5	30.2	Nil	34.0	7.2
5	Shwegon	16.10.97	0.13	0.07	27.9	6.90	28	Nil	70.2	24.2	Nil	12.0	7.2
		13.1.98	0.14	0.07	29.8	7.20	81	Nil	73.2	20.0	Nil	12.4	8.4
		13.3.98	0.16	0.08	29.9	6.90	31	Nil	79.3	24.4	Nil	12.4	9.6

▪ Review and Re-evaluate the water quality of existing Dams and Reservoirs

- Focus on still suitable or not for Agriculture purpose (irrigation use) and drinking purpose

- Focus on special case, such as acid content

- Methods and Measures

- Seasonal Test

- Physical & Chemical Test

- pH, EC_w, Turbidity, Temp °C, Total Hardness, TDS, Salinity, SAR, RSC, Ca⁺⁺, Mg⁺⁺, Na⁺, K⁺, CO₃⁼, HCO₃⁻, SO₄⁼, Cl⁻



Water Quality Results at Azin Dam

No	Ions	Symbol	Unit	May/2005	June/2010
1	Calcium	Ca ⁺⁺	meq/l	0.01	0.08
2	Magnesium	Mg ⁺⁺	meq/l	0.11	0.08
3	Sodium	Na ⁺	meq/l	0.06	0.17
4	Potassium	K ⁺	meq/l	0.02	0.03
5	Carbonate	CO ₃ ⁼	meq/l	N.D	N.D
6	Bicarbonate	HCO ₃ ⁻	meq/l	0.2	0.4
7	Chloride	Cl ⁻	meq/l	0.28	0.4
8	Total Hardness	TH	ppm	-	8
9	Total Dissolved Solids	TDS	ppm	-	3.58
10	Soluble Sodium Percentage	SSP	%	30	85
11	Sodium Adsorption Ration	SAR	-	0.24	0.6
12	Residual Sodium Carbonate	RSC	meq/l	0.08	0.24
13	pH	pH	-	6.03	6.97
14	Electrical Conductivity	EC _w	µmhos/cm	6	5.6
15	Temperature	Temp	°C	27.3	29
16	Salinity	Sal	%	0	0
17	Classification	-	CS	C ₁ S ₁	C ₁ S ₁

N.D = Non Detected.

C₁S₁=Low Salinity and low sodium water(Due to classification of United State Department of Agriculture)

At present Irrigation Department is not only concentrate in providing efficient increased irrigation water but also embraces objectives pertaining to adequacy of drinking water, generation of Hydro-electricity and protection of the environment. To provide more water, and implement the water resources project, it is essential to monitor and evaluate the river quality. Irrigation Department has started to carry out the water quality of rivers at Ayeyarwady, Chindwin, Thanlwin and Sittoung since 2006.

Stations	Ayeyarwady	Chindwin	Sittoung	Thanlwin	Total
	8	3	2	2	15

- Focus on Agriculture purpose and Domestic

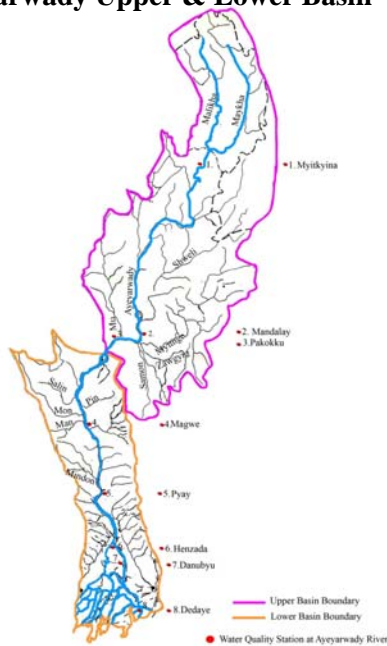
- Methods and Measures

- Seasonal Test

- Physical & Chemical Test

- pH, ECw, Turbidity, Temp °C, Total Hardness, TDS, Salinity, SAR, RSC, Ca⁺⁺, Mg⁺⁺, Na⁺, K⁺, CO₃⁼, HCO₃⁻, SO₄⁼, Cl⁻

Ayeyarwady Upper & Lower Basin



Water Quality Stations

1. Myitkyina
2. Mandalay
3. Pakokku
4. Magwe
5. Pyay
6. Henzada
7. Danabyu
8. Dedaye



Water Quality Results of Ayeyarwady River Station (March)

Station	2008			2009			2010			2011		
Township	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm
Myitkyina	7.10	121	52	7.20	125	90	7.3	97	90	7.33	134	94
Mandalay	8.20	136	48	8.30	104	80	8.21	117	94	7.89	107	108
Pakokku	6.87	150	91.5	6.90	155	100.50	-	-	-	7.25	160	144
Magwe	6.95	470	111	6.90	199	120	6.95	195	92.5	7.50	200	135
Pyay	7.50	198.8	96	7.57	200	124	7.75	165	76	7.65	205	132
Henzada	6.87	189	113.5	7.38	237	112	7.65	191	105	6.99	156	107
Danubyu	7.18	221	106	7.17	210	94	7.15	200	100	7.16	200	88
Dedaye	7.45	270	96	7.47	257	92.5	7.50	258	79	7.50	259	93

Water Quality Results of Ayeyarwady River Station (September)

Station	2008			2009			2010		
Township	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm
Myitkyina	6.95	90	58	6.99	75	48.5	6.98	100	67
Mandalay	8.01	89.5	71	7.95	125	70	8.11	100	73
Pakokku	6.95	142	102	-	-	-	7.21	150	114
Magwe	6.95	249	99.50	7.02	251	94	7.01	250	102
Pyay	6.32	133	64	7.67	126	48.50	7.49	100	56
Henzada	6.92	179	70	7.62	100	52	7.87	62	60
Danubyu	6.76	130	52	7.20	100	43	7.50	70	85
Dedaye	7.37	150	61	7.35	150	60	7.40	160	38

Chindwin River Basin


● Water Quality Stations

1. Homalin
2. Kalaywa
3. Monywa

Water Quality Results of Chindwin River Station												
Station Township	(March) 2008			(March) 2009			(March) 2010			(March) 2011		
	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm
Homalin	6.99	200	108.5	7.21	205	117.5	7.26	200	116.5	7.35	215	123
Kalaywa	7.25	117	121	7.22	102	115	7.35	100	116	7.25	129	125
Monywa	7.50	242	104	7.55	250	96	7.56	200	89.5	7.63	255	114.5

Station Township	(September) 2008			(September) 2009			(September) 2010		
	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm
Homalin	7.20	189	107	7.25	199	118.5	7.25	190	108
Kalaywa	6.87	67	63	7.31	97	67.5	6.95	75	68.5
Monywa	6.95	115	66	7.20	110	69	7.35	125	72.5


Thanlwin River Basin



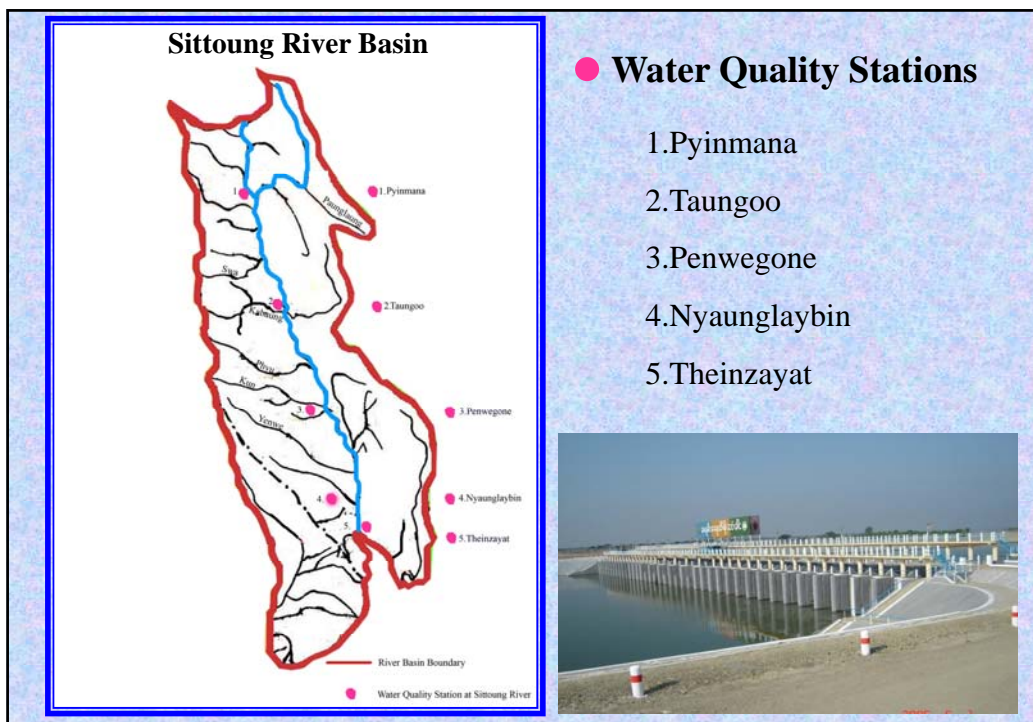
— River Basin Boundary
● Water Quality Station at Thanlwin River

● Water Quality Stations

1. Hpa-An
2. Mawlamyine



Water Quality Results of Thanlwin River Station									
Station Township	January 2008			January 2009			January 2011		
	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm
Hpa-an	7.20	275	113	7.10	297	98	7.15	305	101
Mawlamyine	7.30	12210	1578.5	7.93	12410	1574.5	8.00	12450	1596
Station Township	March 2008			March 2009			March 2011		
	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm
Hpa-an	6.92	399	161	6.99	385	97.5	7.11	396	98
Mawlamyine	7.41	13100	1629.5	7.52	13200	1651.5	7.59	13500	1607
Station Township	September 2008			September 2010					
	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm			
Hpa-an	6.98	292	115	7.02	300	119			
Mawlamyine	7.55	12000	1536	7.65	12500	1507			



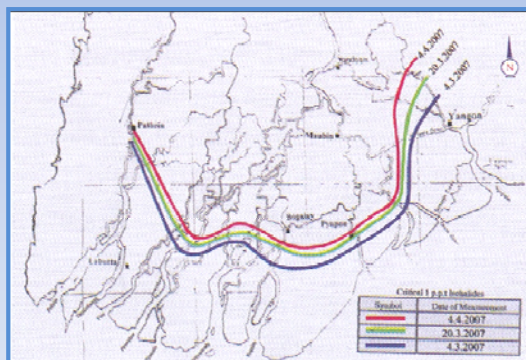
Water Quality Results of Sittoung River Station												
Station Township	(March)2008			(March)2009			(March)2010			(March)2011		
	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm
Pyinmana	-	-	-	-	-	-	7.85	273	109			
Taungoo	7.40	215	52	7.35	219	59.5	7.75	215	61.5	7.43	235	65
Penwegone	-	-	-	-	-	-	7.37	320	107.5			
Nyaunglaybin	-	-	-	-	-	-	7.59	309	101			
Theinzayat	7.21	259	101	7.40	260	118.5	7.95	295	122	7.79	277	131

Station Township	(September)2008			(September)2009			(September)2010		
	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm	pH	ECw µmhos/cm	Total Hardness ppm
Pyinmana	-	-	-	7.56	245	96.5	-	-	-
Taungoo	7.60	192	98	7.60	190	92.5	7.75	200	95
Penwegone	-	-	-	7.25	295	79	-	-	-
Nyaunglaybin	-	-	-	7.50	325	70	-	-	-
Theinzayat	7.50	243	104.5	7.59	259	102.5	7.85	250	108

- ID has also constantly carried out to monitor the extent of salt water intrusion in the deltaric area during the summer season, every year. The map shown below depicts the degree of penetration and saline fronts measured, from observation made during the summer of 2007.

- The Stations which has been under monitor of deltaric area are:-

1. Pathein River (Nga Wun)
2. Pyanmalaw River
3. Hlaing River
4. Pyapon River
5. Toe River
6. Ayeyarwady River



Water Quality Management related to Organizations

Each Water User Organization – Own purpose.

- ❑ Ministry of Health (MOH)
 - ❖ Responsible for the monitoring and controlling of drinking water quality.
 - ❖ Conducting and monitoring works for water quality, private and industrial tube wells and issue certificate of fitness in respect of new tube wells.
- ❑ Ministry of Mine
 - ❖ Controlling of contamination of river water quality causes by gold mining activities.
- ❑ YCDC
 - ❖ Control for discharging of municipal waste water.
- ❑ Ministry of Industry 1
 - ❖ Control for treated water for industrial waste water.
- ❑ Ministry of Transport
 - ❖ Monitoring for water quality at major rivers.

Water Quality Standard

- Water quality is one of the crucial criteria for the water users.
- There is no specific standard of water quality index for Myanmar.
- At present, WHO standard and USDA classification are applied as reference for drinking water and also for Agriculture use.

Conclusion

- Ministry of Forestry was renamed Ministry of Environmental Conservation and Forestry by Notification No.83/2011 in 6 September, 2011.
- Myanmar Environmental Protection law (draft) was submitted to the Government and is still needed to be approved by the Government.
- Myanmar National Water quality standard can be identified after approval of the Myanmar Environmental Protection law and set up of the Ministry of Environmental Conservation and Forestry.
- Institutional Framework- responsibility of each organization will be more clear.
- Some inherent and hampering problems still exist. It needs more international cooperation, financial supports, requirements of advanced technology and inputs of modern equipments.

Thank you
For
your attention

**Khon Ra
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