

ANNEX 1: HOT SPOTS AND METHODOLOGY FOR RATING

The Philippine Government aims to maintain the quality of its surface waters according to their best beneficial use. This is embodied in the DENR Administrative Order (DAO) No. 34, which classifies bodies of water according to the degree of protection required. Class AA and SA have the most stringent water quality for fresh surface waters and marine/coastal waters; and Class D and SD waters have the least stringent water quality for fresh surface waters and marine waters, respectively.

Hot spot areas of surface water quality were assessed by province using Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) as parameters²¹. Groundwater quality was assessed by using Total Dissolved Solids (TDS) and Coliform. Saltwater intrusion was mapped based on National Water Resources Board (NWRB) data (See Water Quality Hot Spots Map). Areas in water quantity were assessed by river basin using the potential resource to demand for 2025, and annual water availability per capita.

Other hot spot areas were identified and rated on the basis of the objective of recovering the water quality of surface waters (rivers, lakes, and bays) for beneficial use, i.e., Class A (for fresh surface waters) for drinking, and Class SB (for coastal and marine waters) for recreation.

EVALUATION FACTORS

Water quality status of fresh surface waters and coastal and marine waters is rated SATISFACTORY (S), MARGINAL (M), and UNSATISFACTORY (U) based on water quality requirements as follows:

Surface Water Class A and Coastal and Marine Water Class SB

DO (mg/l)		BOD (mg/l)	
SATISFACTORY (S)	>5	SATISFACTORY (S)	<5
MARGINAL (M)	5	MARGINAL (M)	5
UNSATISFACTORY (U)	<5	UNSATISFACTORY (U)	>5
Minimum Requirement	5	Minimum Requirement	5

Water quality status of groundwater is rated SATISFACTORY (S) and UNSATISFACTORY (U) based on wells tested that met standards as follows:

Groundwater Wells Tests			
TDS		COLIFORM	
SATISFACTORY (S)	Less than 10% of wells tested did not meet standard	SATISFACTORY (S)	No wells found positive for coliform (0%)
UNSATISFACTORY (U)	10% or more of wells tested did not meet standard	UNSATISFACTORY (U)	Wells found positive for coliform (>0%)
Standard	500 mg/l	Standard	negative

For water quantity rating for major rivers and basins, two evaluation factors were considered: (a) ratio of potential resource to demand for 2025; and (b) per capita water availability per year. A ratio of 2 or less for water resource available to demand per person is considered “stress”²². This stress is rated from 0 to 0.5 when the ratio is less than 2 or 0.5 to 1 when the ratio is more than 2.

The scorecard provides the comparative rating of the water resources quantity status in the regions as: SATISFACTORY (S), MARGINAL (M), and UNSATISFACTORY (U) based on significance of the evaluation factor’s effect on the water resources quantity.

The scoring system for rating the water quantity

1.0	Below threshold level or minimum standard
0.8	requirement not met - S
0.6	Within the threshold level or minimum standard requirement - M
0.4	Sufficiently higher than threshold level or minimum standard requirement - U
0.2	

The weighted score for water quantity

Evaluation Factor	Indicator	Weight (in percent)
Quantity	Ratio of potential to demand for 2025	50
	Per capita water availability per year	50

²¹ National standards for DO: 2-5 mg/l based on water usage and classification; BOD: 1-15 mg/l based on water usage and classification.

²² JICA-NWRB Master Plan Study on Water Resources Management of the Philippines, 1998.

**WATER QUALITY SCORECARD
FOR SURFACE WATER (RIVERS, LAKES, BAYS)**

Region	Name of River/ Lake/Bays	Location (Province)	Class	DO (mg/l) * Average (Range)	BOD (mg/l) * Average (Range)	Rating
NCR Metro Manila	Parañaque R.	Metro Manila	C	3.07 (0 - 9.50)	25.62 (7.0 - 54.0)	U
	San Juan R.	Metro Manila	C	3.0 (0 - 8.0)	34.81 (8.0 - 72.0)	U
	NMTT R. ^{1/}	Metro Manila	C	2.8 (0 - 7.5)	25.23 (7.0 - 54.0)	U
	Marikina R.	Metro Manila	C	5.03 (0 - 8.0)	12.11 (1.0 - 42.0)	U
	Pasig R. ^{2/}	Metro Manila	C	3.67 (0 - 6.5)	17.07 (2.0 - 59.0)	U
	Manila Bay	Metro Manila/ R III/ R IV	C	4.77 (3.90 - 5.48)	3.23 (2.50 - 4.18)	S
	Laguna de Bay ^{3/}	Metro Manila / Region IV	C	7.86 (6.1 - 14.0)	1.8 (0.2 - 7.0)	S
CAR Cordillera Administrative Region	ND					
I Ilocos	Laoag R.	Ilocos Norte	A	6.69 (4.03 - 7.8)	—	S
	Amburayan R.	Benguet/Ilocos Sur/ La Union	C	8.35 (6.0 - 11.0)	—	S
	Dagupan R.	Pangasinan	A/C	5.96 (2.0 - 11.82)	—	M
	Agno R. ^{2/}	Benguet/Pangasinan	A/C	6.78 (1.46 - 11.1)	—	S
II Cagayan Valley	ND					
III Central Luzon	Pampanga R. ^{1/}	Nueva Ecija/Pampanga	C	5.86 (4.85 - 7.21)	3.78 (1.0 - 15.0)	M
	Marilao R.	Bulacan	C	1.75 (0 - 5.75)	34.64 (10.0 - 147)	U
	Meycauayan R.	Bulacan	C	1.35 (0 - 5.55)	54.94 (11.0 - 170)	U
	Bocaue R.	Bulacan	C	6.19 (0.3 - 9.07)	11.13 (6.0 - 20.0)	S
	Labangan R.	Bulacan		5.33 (2.50 - 7.30)	18.48 (3.3 - 50.0)	M
	Sta. Maria R.	Bulacan		3.10 (0.10 - 5.20)	33.57	U
	Guiguinto R.	Bulacan	C	3.03 (1.50 - 3.80)	14.81	U
	San Fernando R.	Pampanga	C	2.86 (1.90 - 3.80)	29.4 (27.0 - 32.0)	U
IV Southern Tagalog	Mogpong R.	Marinduque	C	5.72 (3.45 - 7.80)	6.03 (4.73 - 8.01)	M
	Pagbilao R.	Quezón		5.28 (4.00 - 6.50)	6.26 (4.00 - 8.61)	M
	Bacoar R.	Cavite		6.10 (5.30 - 7.40)	—	S
	Taal Lake	Batangas	B	7.40 (7.0 - 8.2)	1.50 (1.0 - 2.0)	S
	Palico R.	Batangas	C	6.95 (4.8 - 8.3)	1.11 (1.0 - 1.5)	S
	Pagbilao R.	Quezón		7.75 (6.2 - 10.2)	2.1 (1.0 - 5.0)	S
	Pagbilao Bay	Quezón	-	6.65 (4.77 - 7.10)	-	S
	Boac R.	Marinduque	C	10.42 (6.24 - 17.13)	—	S
	Calancan Bay	Marinduque	-	7.14 (4.80 - 8.5)	—	S
	Cajimos Bay	Romblon	-	6.89 (6.0 - 9.0)	—	S
	Puerto Galera Bay	Mindoro Oriental	SA	7.67 (6.75 - 10.0)	—	S
	Naujan Lake	Mindoro Oriental	B	8.00 (1.0 - 9.6)	12.3	S
		Calapan R.	Mindoro Oriental		1.46 (0 - 7.0)	30.0 (2.0 - 225.0)
V Bicol	Bicol R. ^{2/}	Camarines Sur	A	5.28 (2.36 - 10.74)	—	M
VI Western Visayas	Jaro-Aganan R.	Iloilo	C	8.79 (0.90 - 14.50)	3.45 (0.6 - 15.6)	S
	Panay R. ^{2/}	Iloilo	A	7.58 (1.40 - 12.80)	4.63 (0.4 - 52.0)	S
	Jalaur R.	Iloilo	C	8.30 (0.50 - 12.90)	6.40	S
	Iloilo R.	Iloilo		5.64 (1.70 - 10.40)	6.67 (0.8 - 265.0)	M
	Panay R. ^{2/}	Iloilo	A	7.69 (1.40 - 23.20)	-	S
	Iloilo Coasts	Iloilo	—	8.34 (7.40 - 10.00)	-	S
VII Central Visayas	Guindarohan R.	Cebu	A	7.21 (6.50 - 8.30)	1.53 (0.4 - 4.0)	S
	Guadalupe R.	Cebu	C	4.32 (0.50 - 7.50)	1.90	U
	Dalaguete-Argao R.	Cebu	A/B	7.85 (6.9 - 10.10)	1.07 (0.3 - 2.6)	S
	Guinhulugan R.	Cebu	A/B	7.74 (7.10 - 8.40)	1.13 (0.6 - 2.4)	S
	Luyang R.	Cebu	A/B/C	7.17 (5.70 - 8.40)	1.1 (0.9 - 1.3)	S
	Cotcot R.	Cebu	A	6.56 (1.4 - 7.90)	3.06 (0.6 - 8.0)	U
	Bassak R.	Cebu		8.30	0.5 (0.2 - 0.8)	S
	Mananga R.	Cebu	A	5.5 (5.0 - 6.00)	7.1 (5.3 - 7.8)	M
	Balamban R.	Cebu	A/B	7.35 (6.3 - 8.70)	1.07 (0.2 - 2.53)	S
	Guinabasan R.	Cebu	A	8.05 (5.1 - 11.10)	2.13 (0.4 - 9.8)	S
	Minglanilla	Cebu	—	6.25 (2.1 - 9.70)	-	S
	Mandaue to Consolacion	Cebu	—	5.27 (0.0 - 14.00)	-	M
	Liloan to Compostela	Cebu	—	7.15 (4.1 - 14.0)	-	S
	Inabanga R.	Bohol	A/C	6.40 (5.40 - 7.40)	1.2 (0.8 - 1.6)	S
	Inabanga Beach	Bohol	-	6.93 (5.50 - 7.90)	-	S
	Ipil R.	Bohol	A	4.15 (2.80 - 5.20)	2.48 (1.2 - 4.0)	M
		Manaba R.	Bohol	B/C	7.65 (4.50 - 16.90)	—

**WATER QUALITY SCORECARD
FOR SURFACE WATER (RIVERS, LAKES, BAYS)**

Region	Name of River/ Lake/Bays	Location (Province)	Class	DO (mg/l) * Average (Range)	BOD (mg/l) * Average (Range)	Rating
	Matul-id R.	Bohol	A	5.77 (5.70 - 5.90)	1.2 (1.2 - 1.2)	S
	Canaway R.	Negros Oriental	A	7.25 (6.90 - 7.40)	1.2 (0.6 - 1.8)	S
	Cawitan R.	Negros Oriental	A	7.73 (7.50 - 7.90)	0.5 (0.2 - 1.0)	S
	La Libertad R.	Negros Oriental	A	8.55 (7.90 - 9.20)	1.25 (0.1 - 6.6)	S
	Siaton R.	Negros Oriental	A	7.67 (7.30 - 7.90)	0.57 (0.1 - 1.3)	S
	Sicopong R.	Negros Oriental	A/B	3.21 (0.25 - 7.50)	40.73 (0.4 - 100)	U
	Tanjay R.	Negros Oriental	A/B	7.05 (6.83 - 7.30)	0.85 (0.7 - 1.0)	S
VIII Eastern Visayas	Danao Lake	Leyte	-	7.20 (6.3 - 7.9)	-	S
IX Western Mindanao	Mercedes R.	Zamboanga del Sur	B/C	5.16 (1.50 - 8.30)	4.72 (0.4 - 17.0)	M
	Saaz R.	Zamboanga del Sur	A/B	4.85 (1.70 - 7.80)	—	U
	Manicahan R.	Zamboanga del Sur	-	5.92 (2.50 - 9.40)	2.76 (0.1 - 8.0)	M
	Vista del Mar	Zamboanga del Sur	-	6.77 (4.90 - 8.80)	2.03 (0.1 - 5.40)	S
	Cawacawa Beach	Zamboanga del Sur	-	5.40 (2.10 - 8.50)	-	M
X Northern Mindanao	Cagayan de Oro R. ^{2/}	Misamis Oriental	A	8.08 (5.70 - 9.90)	—	S
	Iponan R.	Misamis Oriental	A	7.51 (2.10 - 9.20)	3.59 (0.7 - 17.0)	S
XI Southern Mindanao	Silway R.	South Cotabato	-	8.22 (5.60 - 73.0)	—	S
	Malalag Bay	Davao del Sur	-	6.30 (5.70 - 7.00)	-	S
	Digos R.	Davao del Sur	B/C	7.33 (5.80 - 9.0)	1.55 (0.1 - 7.8)	S
	Hijo R.	Davao del Norte	D	7.35 (5.80 - 9.0)	0.94 (0.3 - 4.0)	S
	Sibulan R.	Davao del Sur	A/B	7.69 (6.50 - 8.60)	1.68 (0.1 - 4.0)	S
	Pujada Bay	Davao Oriental	-	6.11 (3.20 - 6.80)	-	S
	Talomo R.	Davao City	B	7.47 (6.40 - 8.30)	2.73 (0.5 - 12.2)	S
	Padada R.	Davao del Sur	D	5.85 (0.00 - 7.40)	1.84 (0.3 - 18.0)	U
	Tuganay R.	Davao del Norte	B	6.02 (0.20 - 8.00)	1.37 (0.3 - 4.7)	U
	Agusan R. ^{2/}	Agusan del Norte	C	7.01 (2.60 - 8.10)	1.01 (0.1 - 5.6)	U
	Ilang R.	Davao City	C	6.69 (4.40 - 8.40)	2.29 (0.7 - 9.0)	S
	Lasang R.	Davao City	B	7.57 (6.30 - 8.50)	1.36 (0.4 - 3.0)	S
	Lipadas R	Davao City	AA/A	7.29 (5.30 - 8.50)	1.88 (0.3 - 8.7)	S
	Davao R. ^{2/}	Davao City	A/B	7.46 (5.8 - 8.60)	1.06 (0.1 - 2.4)	S
Tagum R. ^{2/}	Davao del Norte	A	6.46 (4.80 - 7.80)	1.71 (0.3 - 36.0)	S	
XII Central Mindanao	ND					
CARAGA	Agusan R. ^{2/}	Agusan del Norte/ Agusan del Sur	A/B/C	5.94 (2.60 - 8.00)	—	M
	Magallanes R.	Agusan del Norte	A/B/C	7.75	—	S
ARMM Region in Muslim Mindanao	ND					

Sources: DENR-EMB, 2003 and LLDA data for Laguna De Bay, 1999.

- Notes: DO criteria: Class A, SB = 5mg/l
 BOD criteria: Class A, SB = 5 mg/l
 ND = No data
 R = River
 1/ NMTT - Navotas-Malabon-Tenejeros-Tullahan.
 2/ Major river as per NWRB classification.
 3/ Not yet officially classified but generally maintains Class C water.

* Monitored for at least three (3) years within the period 1996 - 2001 for annual mean DO and BOD levels.

GROUNDWATER QUALITY SCORECARD

Region	Province	TDS				Coliform			
		Wells Tested (No.)	Wells That Failed Criteria (No.) ^{1/}	Wells That Failed Criteria (%) ^{1/}	Rating ^{2/}	Wells Tested (No.)	Wells That Failed Criteria (No.) ^{3/}	Wells That Failed Criteria (%) ^{3/}	Rating ^{2/}
NCR Metro Manila	Metro Manila	49	5	10	U	ND			
CAR Cordillera Administrative Region	Benguet	ND				5	2	40	U
I Ilocos	Ilocos Norte	3	3	100	U	3	1	33	U
	Ilocos Sur	ND				3	3	100	U
	La Union	2	1	50	U	1	1	100	U
II Cagayan Valley	Pangasinan	15	1	7	S	23	1	4	U
	Isabela	20	3	15	U	9	7	78	U
	Quirino	1	0	0	S	ND			
III Central Luzon	Bataan	20	0	0	S	3	3	100	U
	Bulacan	1	1	100	U	ND			
	Nueva Ecija	14	0	0	S	7	0	0	S
	Pampanga	12	0	0	S	ND			
	Tarlac	5	2	40	U	ND			
IV Southern Tagalog	Zambales	6	1	17	U	5	5	100	U
	Batangas	15	0	0	S	ND			
	Cavite	31	1	3	S	ND			
	Laguna	69	6	9	S	6	0	0	S
	Palawan	1	0	0	S	ND			
V Bicol	Rizal	5	1	20	U	ND			
	Albay	7	2	29	U	6	4	67	U
	Camarines Norte	3	0	0	S	2	0	0	S
	Camarines Sur	5	1	20	U	5	0	0	S
	Masbate	14	11	79	U	ND			
VI Western Visayas	Sorsogon	3	0	0	S	3	0	0	S
	Iloilo	ND				2	2	100	U
	Negros Occidental	17	11	65	U	ND			
VII Central Visayas	Bohol	5	2	40	U	ND			
	Cebu	15	7	47	U	ND			
	Negros Oriental	9	1	11	U	ND			
VIII Eastern Visayas	Leyte	8	3	38	U	ND			
	Western Samar	2	2	100	U	2	2	100	U
IX Western Mindanao	Zamboanga del Norte	4	0	0	S	ND			
	Zamboanga del Sur	27	3	11	U	ND			
X Northern Mindanao	Misamis Oriental	46	12	26	U	44	44	100	U
XI Southern Mindanao	Davao del Sur	2	0	0	S	ND			
XII Central Mindanao	ND					ND			
CARAGA	ND					ND			
ARMM Autonomous Region in Muslim Mindanao	ND					ND			

Sources: NWRB-NWIN Project and compiled data from various Feasibility Studies of water districts-LWUA, 2003.

Notes: 1/ Wells tested did not meet standard for drinking water at 500 mg/l.

TDS S below 10% of wells tested did not meet standard

U 10% and above of wells tested did not meet standard

2/ Only provinces with data were included in the rating. - Coliform - S - no wells found positive for coliform (0%); U- wells tested found positive for coliform(>0%).

3/ Wells tested found positive for coliform.

ND = No Data.

**WATER QUANTITY SCORECARD FOR MAJOR RIVERS AND BASINS
AND HOT SPOTS RATING FOR WATER QUANTITY**

Major River Basin	Water Resources Region		Yearly Water Requirement (in MCM) in 2025 ^{1/}				Yearly Water Availability ^{2/}			Weighted Score	Water Rating		
			Potential	Demand	Potential Ratio	Potential Rating	[m ³ /person]	Ratio	Rating		Potential	Availability	Weighted Score
Pasig-Laguna	IV	Southern Tagalog	1,816	2,977	0.61	0.15	124	0.07	0.04	0.09	U	U	U
Cebu Island ^{3/}	VII	Central Visayas	708	932	0.76	0.19	218	0.13	0.06	0.13	U	U	U
Pampanga	III	Central Luzon	4,688	9,015	0.52	0.13	888	0.52	0.26	0.20	U	U	U
Agno	III	Central Luzon	2,275	4,063	0.56	0.14	972	0.57	0.29	0.21	U	U	U
Cagayan	II	Cagayan Valley	1,150	1,797	0.64	0.16	2,143	1.26	0.55	0.36	U	M	U
Jalaur	VI	Western Visayas	1,351	1,251	1.08	0.27	1,657	0.97	0.49	0.38	U	M	U
Bicol	V	Bicol	2,138	1,388	1.54	0.39	1,533	0.90	0.45	0.42	U	M	M
Ilog-Hilabangan	VI	Western Visayas	5,496	2,987	1.84	0.46	1,843	1.08	0.55	0.50	M	M	M
Agus	XII	Southern Mindanao	1,449	665	2.18	0.57	5,070	2.98	0.62	0.60	M	S	S
Davao	XI	Southeastern Mindanao	1,476	297	4.97	0.66	2,368	1.39	0.56	0.61	S	M	S
Tagoloan	X	Northern Mindanao	2,200	473	4.65	0.65	3,646	2.14	0.59	0.62	S	M	S
Tagum-Libuganon	XI	Southeastern Mindanao	2,504	412	6.08	0.69	3,449	2.03	0.58	0.64	S	M	S
Mindanao	XII	Southern Mindanao	24,854	6,923	3.59	0.61	7,027	4.13	0.67	0.64	S	S	S
Buayan Malungon	XI	Southeastern Mindanao	3,672	701	5.24	0.66	5,656	3.33	0.64	0.65	S	S	S
Abra	I	Ilocos	2,479	378	6.55	0.70	4,954	2.91	0.62	0.66	S	S	S
Panay	VI	Western Visayas	4,340	609	7.13	0.72	6,782	3.99	0.67	0.69	S	S	S
Cagayan de Oro	X	Northern Mindanao	4,326	355	12.18	0.88	9,321	5.48	0.73	0.80	S	S	S
Abulog	II	Cagayan Valley	1,827	237	7.72	0.74	19,228	11.31	0.97	0.86	S	S	S
Agusan	X	Northern Mindanao	15,984	1,037	15.41	0.98	13,732	8.08	0.84	0.91	S	S	S

Sources: NWRB-NWIN Project and compiled data from various Feasibility Studies of Water Districts-LWUA, 2003.

Notes:

- 1/ At 80% dependability of surface water availability using low flow and adopting low economic growth scenario (JICA/NWRB Master Plan Study on Water Resources Mngt. of the Philippines, 1998). Ratio of 2 or less is an indication of a shortfall that would create water shortage problem.
- 2/ Amount of annual renewable water resources per capita (Ibid). Areas where per capita water supply drops below 1,700 m³/year are experiencing water stress (World Resources Institute, 2000).
- 3/ Cebu Island is included due to its significant economic role, second to Metro Manila.

U - Unsatisfactory

M - Marginal

S - Satisfactory