



**KEMENTERIAN SUMBER ASLI
DAN KELESTARIAN ALAM
JABATAN ALAM SEKITAR**

STANDARD KUALITI AIR KEBANGSAAN & INDEKS KUALITI AIR

PENGENALAN

Program pengawasan kualiti air sungai di Malaysia bermula pada tahun 1978 selepas pengisytiharan Akta Kualiti Alam Sekeliling, 1974. Menjelang tahun 1985, satu standard interim telah disediakan untuk membolehkan pengkelasan sungai berdasarkan keperluan kualiti air bagi mengekalkan kegunaan bermanfaat air sungai. Standard interim tersebut kemudian diangkat sebagai *National Water Quality Standard/ Standard Kualiti Air Kebangsaan (NWQS)* pada tahun 2005.

NWQS merupakan standard ambien yang membolehkan pengklasifikasian kualiti air sungai dilakukan mengikut lima kelas dan mengambilkira kegunaan air seperti pemeliharaan keadaan semulajadi, sumber bekalan air, perikanan, rekreasi, dan pengairan.

Indeks Kualiti Air (IKA) digunakan untuk memberi maklumat kualiti air yang ringkas bagi menilai status secara umum badan air dengan merujuk kepada standard untuk pelbagai kegunaan di bawah NWQS. IKA dikira berdasarkan enam parameter utama yang mencerminkan tahap pencemaran dan kesesuaian air sungai untuk pelbagai kegunaan.

Jabatan Alam Sekitar (JAS) menjalankan program pengawasan kualiti air sungai di seluruh Malaysia dan melaporkan status kualiti air sungai secara tahunan melalui Laporan Kualiti Alam Sekeliling (EQR).

NWQS dan IKA digunakan sebagai panduan kepada semua pihak berkepentingan yang berkaitan mengenai pemeliharaan, pemuliharaan dan pengurusan sumber air sungai. Ini merangkumi agensi kerajaan, badan bukan kerajaan, organisasi berasaskan komuniti, sektor swasta dan masyarakat umum.



National Water Quality Standards for Malaysia

PARAMETER	UNIT	CLASS				
		I	IIA/IIIB	III#	IV	V
Al	mg/l	NATURAL LEVEL OR ABSENT	-	(0.06)	0.5	LEVEL ABOVE IV
As	mg/l		0.05	0.4 (0.05)	0.1	
Ba	mg/l		1	-	-	
Cd	mg/l		0.01	0.01* (0.001)	0.01	
Cr (VI)	mg/l		0.05	1.4 (0.05)	0.1	
Cr (III)	mg/l		-	2.5	-	
Cu	mg/l		0.02	-	0.2	
Hardness	mg/l		250	-	-	
Ca	mg/l		-	-	-	
Mg	mg/l		-	-	-	
Na	mg/l		-	-	3 SAR	
K	mg/l		-	-	-	
Fe	mg/l		0.3	1	1 (Leaf) 5 (Others)	
Pb	mg/l		0.05	0.02* (0.01)	5	
Mn	mg/l		0.1	0.1	0.2	
Hg	mg/l		0.001	0.004 (0.0001)	0.002	
Ni	mg/l		0.05	0.9*	0.2	
Se	mg/l		0.01	0.25 (0.04)	0.02	
Ag	mg/l		0.05	0.0002	-	
Sn	mg/l		-	0.004	-	
U	mg/l		-	-	-	
Zn	mg/l		5	0.4*	2	
B	mg/l		1	(3.4)	0.8	
Cl	mg/l		200	-	80	
Cl ₂	mg/l		-	(0.02)	-	
CN	mg/l		0.02	0.06 (0.02)	-	
F	mg/l		1.5	10	1	
NO ₂	mg/l		0.4	0.4 (0.03)	-	
NO ₃	mg/l		7	-	5	
P	mg/l		0.2	0.1	-	
Silica	mg/l		50	-	-	
SO ₄	mg/l		250	-	-	
S	mg/l		0.05	(0.001)	-	
CO ₂	mg/l		-	-	-	
Gross- α	Bq/l		0.1	-	-	
Gross- β	Bq/l		1	-	-	
Ra-226	Bq/l		< 0.1	-	-	
Sr-90	Bq/l		< 1	-	-	
CCE	µg/l		500	-	-	-
MBAS/BAS	µg/l		500	5000 (200)	-	-
O & G (Mineral)	µg/l		40; N	N	-	-
O & G (Emulsified Edible)	µg/l		7000; N	N	-	-
PCB	µg/l		0.1	6 (0.05)	-	-
Phenol	µg/l		10	-	-	-
Aldrin/Dieldrin	µg/l		0.02	0.2 (0.01)	-	-
BHC	µg/l		2	9 (0.1)	-	-
Chlordane	µg/l		0.08	2 (0.02)	-	-
t-DDT	µg/l		0.1	(1)	-	-
Endosulfan	µg/l		10	-	-	-
Heptachlor/Epoxide	µg/l		0.05	0.9 (0.06)	-	-
Lindane	µg/l		2	3 (0.4)	-	-
2,4-D	µg/l		70	450	-	-
2,4,5-T	µg/l		10	160	-	-
2,4,5-TP	µg/l		4	850	-	-
Paraquat	µg/l		10	1800	-	-

Notes:

* = At hardness 50 mg/l CaCO

= Maximum (unbracketed) and 24-hour average (bracketed) concentrations

N = Free from visible film sheen, discolouration and deposits

NATIONAL WATER QUALITY STANDARDS FOR MALAYSIA

PARAMETER	UNIT	CLASS					
		I	IIA	IIB	III	IV	V
Ammoniacal Nitrogen	mg/l	0.1	0.3	0.3	0.9	2.7	> 2.7
Biochemical Oxygen Demand	mg/l	1	3	3	6	12	> 12
Chemical Oxygen Demand	mg/l	10	25	25	50	100	> 100
Dissolved Oxygen	mg/l	7	5 – 7	5 – 7	3 – 5	< 3	< 1
pH	-	6.5 – 8.5	6 – 9	6 – 9	5 – 9	5 – 9	-
Colour	TCU	15	150	150	-	-	-
Electrical Conductivity*	µS/cm	1000	1000	-	-	6000	-
Floatables	-	N	N	N	-	-	-
Odour	-	N	N	N	-	-	-
Salinity	%	0.5	1	-	-	2	-
Taste	-	N	N	N	-	-	-
Total Dissolved Solid	mg/l	500	1000	-	-	4000	-
Total Suspended Solid	mg/l	25	50	50	150	300	300
Temperature	°C	-	Normal + 2 °C	-	Normal + 2 °C	-	-
Turbidity	NTU	5	50	50	-	-	-
Faecal Coliform**	count/100 ml	10	100	400	5000 (20000) ^a	5000 (20000) ^a	-
Total Coliform	count/100 ml	100	5000	5000	50000	50000	> 50000

Notes:

N : No visible floatable materials or debris, no objectional odour or no objectional taste

* : Related parameters, only one recommended for use

** : Geometric mean

a : Maximum not to be exceeded

ANNEX
II

WATER CLASSES AND USES

CLASS	USES
Class I	Conservation of natural environment. Water Supply I – Practically no treatment necessary. Fishery I – Very sensitive aquatic species.
Class IIA	Water Supply II – Conventional treatment required. Fishery II – Sensitive aquatic species.
Class IIB	Recreational use with body contact.
Class III	Water Supply III – Extensive treatment required. Fishery III – Common of economic value and tolerant species; livestock drinking.
Class IV	Irrigation
Class V	None of the above.

DOE WATER QUALITY CLASSIFICATION BASED ON WATER QUALITY INDEX

SUB INDEX & WATER QUALITY INDEX	INDEX RANGE		
	CLEAN	SLIGHTLY POLLUTED	POLLUTED
Biochemical Oxygen Demand (BOD)	91 – 100	80 – 90	0 – 79
Ammoniacal Nitrogen (NH ₃ - N)	92 – 100	71 – 91	0 – 70
Suspended Solids (SS)	76 – 100	70 – 75	0 – 69
Water Quality Index (WQI)	81 – 100	60 – 80	0 – 59

DOE WATER QUALITY INDEX CLASSIFICATION

PARAMETER	UNIT	CLASS				
		I	II	III	IV	V
Ammoniacal Nitrogen	mg/l	< 0.1	0.1 – 0.3	0.3 – 0.9	0.9 – 2.7	> 2.7
Biochemical Oxygen Demand	mg/l	< 1	1 – 3	3 – 6	6 – 12	> 12
Chemical Oxygen Demand	mg/l	< 10	10 – 25	25 – 50	50 – 100	> 100
Dissolved Oxygen	mg/l	> 7	5 – 7	3 – 5	1 – 3	< 1
pH	-	> 7	6 – 7	5 – 6	< 5	> 5
Total Suspended Solid	mg/l	< 25	25 – 50	50 – 150	150 – 300	> 300
Water Quality Index (WQI)		> 92.7	76.5 – 92.7	51.9 – 76.5	31.0 – 51.9	< 31.0

WQI FORMULA AND CALCULATION

Formula

WQI = (0.22 * SIDO) + (0.19 * SIBOD) + (0.16 * SICOD) + (0.15 * SIAN) + (0.16 * SISS) + (0.12 * SlpH)

where;

SIDO = Subindex DO (% saturation)
SIBOD = Subindex BOD
SICOD = Subindex COD
SIAN = Subindex NH₃-N
SISS = Subindex SS
SlpH = Subindex pH
0 ≤ WQI ≤ 100

Best Fit Equations for the Estimation of Various Subindex Values

Subindex for DO (in % saturation)

SIDO = 0 for x ≤ 8
SIDO = 100 for x ≥ 92
SIDO = -0.395 + 0.030x² - 0.00020x³ for 8 < x < 92

Subindex for BOD

SIBOD = 100.4 - 4.23x for x ≤ 5
SIBOD = 108*exp(- 0.055x) - 0.1x for x > 5

Subindex for COD

$$\text{SICOD} = -1.33x + 99.1 \quad \text{for } x \leq 20$$

$$\text{SICOD} = 103 \cdot \exp(-0.0157x) - 0.04x \quad \text{for } x > 20$$

Subindex for NH_3 -N

$$\text{SIAN} = 100.5 - 105x \quad \text{for } x \leq 0.3$$

$$\text{SIAN} = 94 \cdot \exp(-0.573x) - 5 \cdot |x - 2| \quad \text{for } 0.3 < x < 4$$

$$\text{SIAN} = 0 \quad \text{for } x \geq 4$$

Subindex for SS

$$\text{SISS} = 97.5 \cdot \exp(-0.00676x) + 0.05x \quad \text{for } x \leq 100$$

$$\text{SISS} = 71 \cdot \exp(-0.0016x) - 0.015x \quad \text{for } 100 < x < 1000$$

$$\text{SISS} = 0 \quad \text{for } x \geq 1000$$

Subindex for pH

$$\text{SpH} = 17.2 - 17.2x + 5.02x^2 \quad \text{for } x < 5.5$$

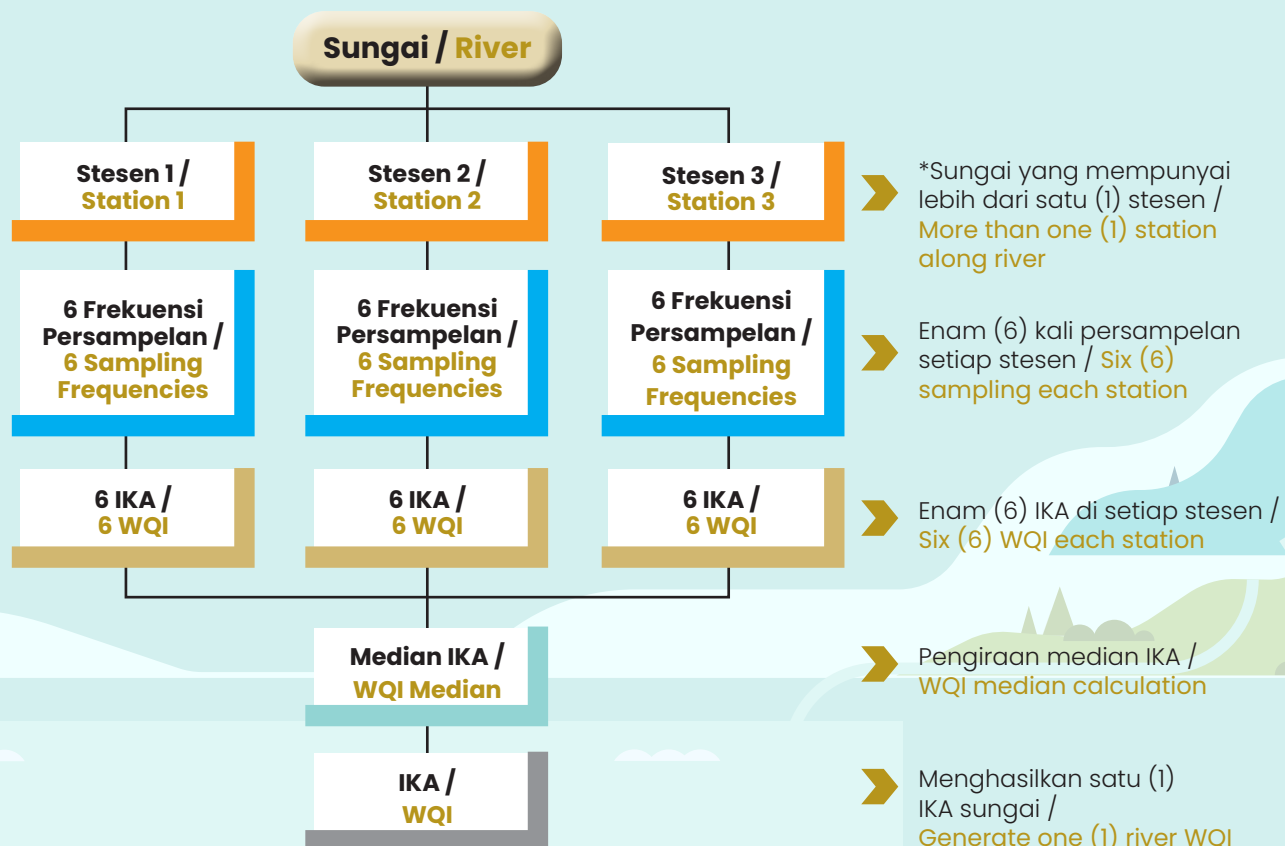
$$\text{SpH} = -242 + 95.5x - 6.67x^2 \quad \text{for } 5.5 \leq x < 7$$

$$\text{SpH} = -181 + 82.4x - 6.05x^2 \quad \text{for } 7 \leq x < 8.75$$

$$\text{SpH} = 536 - 77.0x + 2.76x^2 \quad \text{or } x \geq 8.75$$

Note:

*means multiply with

PENENTUAN INDEKS KUALITI AIR MENGIKUT SUNGAI /
DETERMINATION OF WATER QUALITY INDEX BY RIVER


* Bilangan stesen adalah berbeza mengikut sungai yang dipantau. Bagi contoh ini, pengiraan median adalah ke atas 18 data IKA /

* The number of stations varies according to the river monitored. For this example, the median calculation is on 18 WQI data

PENENTUAN INDEKS KUALITI AIR MENGIKUT STESEN / DETERMINATION OF WATER QUALITY INDEX BY STATION



PENGEKELASAN SUNGAI BERDASARKAN INDEKS KUALITI AIR (IKA) / RIVER CLASSIFICATION BASED ON WATER QUALITY INDEX (WQI)

