



**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	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

Nota:

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.

STANDARD KUALITI AIR KEBANGSAAN (NWQS) DI MALAYSIA

PARAMETER	UNIT	KELAS				
		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		1	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	mg/l		500	-	-	-
MBAS/BAS	mg/l		500	5000 (200)	-	-
O & G (Mineral)	mg/l		40; N	N	-	-
O & G (Emulsified Edible)	mg/l		7000; N	N	-	-
PCB	mg/l		0.1	6 (0.05)	-	-
Phenol	mg/l		10	-	-	-
Aldrin/Dieldrin	mg/l		0.02	0.2 (0.01)	-	-
BHC	mg/l		2	9 (0.1)	-	-
Chlordane	mg/l		0.08	2 (0.02)	-	-
t-DDT	mg/l		0.1	(1)	-	-
Endosulfan	mg/l		10	-	-	-
Heptachlor/Epoxide	mg/l		0.05	0.9 (0.06)	-	-
Lindane	mg/l		2	3 (0.4)	-	-
2,4-D	mg/l		70	450	-	-
2,4,5-T	mg/l		10	160	-	-
2,4,5-TP	mg/l		4	850	-	-
Paraquat	mg/l		10	1800	-	-

Nota:

* = At hardness 50 mg/l CaCO

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

N = Free form visible film sheen, discolouration and deposits

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.

INDEKS KUALITI AIR (IKA) / WATER QUALITY INDEX (WQI)

Indeks Kualiti Air (IKA) digunakan untuk mengukur tahap pencemaran dan kesesuaian jenis guna air seperti yang digariskan di dalam Standard Kualiti Air Negara (NWQS). IKA adalah julat indeks daripada 0 hingga 100 di mana julat ini dibahagikan kepada tiga (3) kategori iaitu bersih, sederhana tercemar dan tercemar.

Indeks Kualiti Air merangkumi enam parameter kualiti air yang lazimnya berkaitan dengan status kualiti air sungai di Malaysia iaitu:



DOE WATER QUALITY CATEGORIZATION 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	-	> 7.0	6.0 – 7.0	5.0 – 6.0	< 5.0	> 5.0
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

$$0 \leq WQI \leq 100$$

Best Fit Equations for the Estimation of Various Subindex Values

Subindex for DO (in % saturation)

$$\begin{aligned} SIDO &= 0 & \text{for } x \leq 8 \\ SIDO &= 100 & \text{for } x \geq 92 \\ SIDO &= -0.395 + 0.030x^2 - 0.00020x^3 & \text{for } 8 < x < 92 \end{aligned}$$

Subindex for BOD

$$\begin{aligned} SIBOD &= 100.4 - 4.23x & \text{for } x \leq 5 \\ SIBOD &= 108 * \exp(-0.055x) - 0.1x & \text{for } x > 5 \end{aligned}$$

Subindex for COD

$$\begin{aligned} SICOD &= -1.33x + 99.1 & \text{for } x \leq 20 \\ SICOD &= 103 * \exp(-0.0157x) - 0.04x & \text{for } x > 20 \end{aligned}$$

Subindex for NH₃ -N

$$\begin{aligned} SIAN &= 100.5 - 105x & \text{for } x \leq 0.3 \\ SIAN &= 94 * \exp(-0.573x) - 5 * |x - 2| & \text{for } 0.3 < x < 4 \\ SIAN &= 0 & \text{for } x \geq 4 \end{aligned}$$

Subindex for SS

$$\begin{aligned} SISS &= 97.5 * \exp(-0.00676x) + 0.05x & \text{for } x \leq 100 \\ SISS &= 71 * \exp(-0.0016x) - 0.015x & \text{for } 100 < x < 1000 \\ SISS &= 0 & \text{for } x \geq 1000 \end{aligned}$$

Subindex for pH

$$\begin{aligned} SlpH &= 17.2 - 17.2x + 5.02x^2 & \text{for } x < 5.5 \\ SlpH &= -242 + 95.5x - 6.67x^2 & \text{for } 5.5 \leq x < 7 \\ SlpH &= -181 + 82.4x - 6.05x^2 & \text{for } 7 \leq x < 8.75 \\ SlpH &= 536 - 77.0x + 2.76x^2 & \text{for } x \geq 8.75 \end{aligned}$$

Note:

*means multiply with