

Kualiti Air Marin dan Pulau-Pulau

*Marine and Island
Marine Water Quality*



BAB 4 Chapter 4



PENGAWASAN KUALITI AIR MARIN

Jabatan Alam Sekitar (JAS) menjalankan pengawasan kualiti air marin bermula pada tahun 1978 di Semenanjung Malaysia dan 1985 bagi Sabah dan Sarawak dengan tujuan untuk mengenalpasti status kualiti air marin dan menentukan tahap pencemaran daripada punca-punca di daratan dan juga di laut. Punca-punca pencemaran ini boleh menimbulkan ancaman kepada sumber kehidupan marin dan mengganggu kestabilan serta kepelbagaian ekosistem marin.

Pada tahun 2018, sebanyak 188 stesen pantai, 85 stesen kuala dan 95 stesen pulau telah dipantau. Sebanyak 1128 sampel di kawasan pantai, 510 di kuala dan 570 di pulau telah diambil untuk dianalisis dan hasilnya dilaporkan berdasarkan Indeks Kualiti Air Marin (IKAM).

IKAM digunakan sebagai satu kaedah untuk menentukan kategori dan status kualiti air marin. Indeks ini dibangunkan berdasarkan 7 parameter utama iaitu Oksigen Terlarut (DO), Nitrat (NO_3), Fosfat (PO_4), Ammonia Tidak Terion (NH_3), *Faecal Coliform*, Minyak dan Gris (O&G) dan Jumlah Pepejal Terampai (TSS).

IKAM yang berskala 0 hingga 100 akan menentukan kategori kualiti air marin daripada Terbaik hingga Tercemar (**Jadual 4.1**).

MARINE WATER QUALITY MONITORING

Department of Environment (DOE) has been monitoring the marine water quality since 1978 in Peninsular Malaysia and 1985 in Sabah and Sarawak with the main objective to establish the marine water quality status and to determine the degree of pollution from both the land-based as well as the sea based sources. These sources may pose threats to the marine resources which would upset the stability and diversity of the marine ecosystem.

In year 2018, a total of 188 coastal, 85 estuary and 95 island stations were monitored. As many as 1128 samples from coastal, 510 samples from estuary and 570 samples from island monitoring stations were collected for analyses and reported based on the Marine Water Quality Index (MWQI).

The MWQI was used to reflect the marine water quality status and its category. The index was developed based on seven (7) main parameters which are Dissolved Oxygen (DO), Nitrate (NO_3), Phosphate (PO_4), Unionized Ammonia (NH_3), *Faecal Coliform*, Oil and Grease (O&G) and Total Suspended Solids (TSS).

The resulting MWQI with a scale between 0 to 100 will determine the category of the marine water quality, ranging from *Excellent* to *Poor* (**Table 4.1**).

Jadual 4.1: Klasifikasi Indeks Kualiti Air Marin
Table 4.1 : Marine Water Quality Index Classification

KATEGORI/CATEGORY	NILAI INDEKS/INDEX VALUE
Terbaik/Excellent	90 – 100
Baik/Good	80 - <90
Sederhana/Moderate	50 - <80
Tercemar/Poor	0 - <50

Jadual 4.2 : Standard dan Kriteria Kualiti Air Marin Malaysia
Table 4.2 : Malaysia Marine Water Quality Criteria and Standards

PARAMETER/ PARAMETER	KELAS 1/ CLASS 1	KELAS 2/ CLASS 2	KELAS 3/ CLASS 3	KELAS E/ CLASS E
KEGUNAAN/ USES	Pemeliharaan, Kawasan Dilindungi, Taman Laut/ Preservation, Marine Protected Areas, Marine Parks	Kehidupan Laut, Perikanan, Terumbu Karang, Rekreasi dan Marikultur/ Marine Life, Fisheries, Coral Reefs, Recreational and Mariculture	Pelabuhan, Lapangan Minyak dan Gas/ Ports, Oil & Gas Fields	Paya Bakau & Muara Sungai/ Mangroves Estuarine & River- mouth Water
Suhu (°C)/ Temperature (°C)	≤ 2°C peningkatan terhadap ambien maksimum ≤ 2°C increase over maximum ambient	≤ 2°C peningkatan terhadap ambien maksimum ≤ 2°C increase over maximum ambient	≤ 2°C peningkatan terhadap ambien maksimum ≤ 2°C increase over maximum ambient	≤ 2°C peningkatan terhadap ambien maksimum ≤ 2°C increase over maximum ambient
Oksigen Terlarut (mg/L)/ Dissolved Oxygen (mg/L)	>80% tepu >80% saturation	5	3	4
Jumlah Pepejal Terampai* (mg/L)/ Total suspended solid (mg/L)	25 mg/L atau ≤ 10% peningkatan dalam purata bermusim, yang mana lebih rendah/ 25 mg/L or ≤ 10% increase in seasonal average, whichever is lower	50mg/L (25 mg/L) atau ≤ 10% peningkatan dalam purata bermusim, yang mana lebih rendah/ 50mg/L (25 mg/L) or ≤ 10% increase in seasonal average, whichever is lower	100 mg/L atau ≤ 10% peningkatan dalam purata bermusim, yang mana lebih rendah/ 100 mg/L or ≤ 10% increase in seasonal average, whichever is lower	100 mg/L atau ≤ 30 % peningkatan dalam purata bermusim, yang mana lebih rendah/ 100 mg/L or ≤ 30 % increase in seasonal average, whichever is lower
Minyak dan Geris (mg/L)/ Oil and grease (mg/L)	0.01	0.14	5	0.14
Raksa* (µg/L)/ Mercury* (µg/L)	0.04	0.16 (0.04)	50	0.5
Kadmium* (µg/L)/ Cadmium* (µg/L)	0.5	2 (3)	10	2
Kromium (VI) (µg/L)/ Chromium (VI) (µg/L)	5	10	48	10
Kuprum (µg/L)/ Copper (µg/L)	1.3	2.9	10	2.9

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PARAMETER/ PARAMETER	KELAS 1/ CLASS 1	KELAS 2/ CLASS 2	KELAS 3/ CLASS 3	KELAS E/ CLASS E
KEGUNAAN/ USES	Pemeliharaan, Kawasan Dilindungi, Taman Laut/ Preservation, Marine Protected Areas, Marine Parks	Kehidupan Laut, Perikanan, Terumbu Karang, Rekreasi dan Marikultur/ Marine Life, Fisheries, Coral Reefs, Recreational and Mariculture	Pelabuhan, Lapangan Minyak dan Gas/ Ports, Oil & Gas Fields	Paya Bakau & Muara Sungai/ Mangroves Estuarine & River- mouth Water
Arsenik (III)* (µg/L)/ Arsenic (III)* (µg/L)	3	20 (3)	50	20 (3)
Plumbum (µg/L)/ Lead (µg/L)	4.4	8.5	50	8.5
Zink (µg/L)/ Zinc (µg/L)	15	50	100	50
Sianida (µg/L)/ Cyanide (µg/L)	2	7	20	7
Ammonia (tidak terion) (µg/L)/ Ammonia (unionized) (µg/L)	35	70	320	70
Nitrit (NO ₂) (µg/L)/ Nitrite (NO ₂) (µg/L)	10	55	1,000	55
Nitrat (NO ₃) (µg/L)/ Nitrate (NO ₃) (µg/L)	10	60	1,000	60
Fosfat (µg/L)/ Phosphate (µg/L)	5	75	670	75
Fenol (µg/L)/ Phenol (µg/L)	1	10	100	10
Tributyltin (TBT) (µg/L)	0.001	0.01	0.05	0.01
Faecal coliform	70 faecal coliform count/100mL	100 faecal coliform count/100mL & (70 faecal coliform count/100mL)	200 faecal coliform count/100mL	100 faecal coliform count/100mL & (70 faecal coliform count/100mL)
Polycyclic Aromatic Hydrocarbon (PAHs) (µg/L)	100	200	1000	1000

Nota: * Nilai SKKAM dalam kurungan digunakan untuk kawasan air marin yang menjadi sumber makanan laut

Note: * MWQCS in parentheses are for coastal and marine water areas where seafood for human consumption is applicable

STATUS KUALITI AIR MARIN PANTAI

Pada tahun 2018, sebanyak 188 stesen pantai telah dipantau dan dianalisis serta dilaporkan dalam Indeks Kualiti Air Marin. Hasil pengawasan menunjukkan 124 stesen (65.96%) dikategorikan sebagai Terbaik, 37 stesen (19.68%) sebagai Baik, 27 stesen (14.36%) sebagai Sederhana dan tiada stesen sebagai Tercemar (**Jadual 4.3**).

COASTAL WATER QUALITY STATUS

In year 2018, a total of 188 coastal stations was monitored, analysed and reported in term of the Marine Water Quality Index. The monitoring results indicated that 124 stations (65.96%) as Excellent, 37 stations (19.68%) as Good, 27 stations (14.36%) as Moderate and no station categorized as Poor (**Table 4.3**).

Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai

Table 4.3 : Marine Water Quality Status for Coastal

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Kedah	Pantai/Coastal	Pantai Merdeka	5603905	MMKC001	65	68	76	79	91	Terbaik/ Excellent
		Langkawi Island Resort	6399914	MMKC002	80	71	66	90	94	Terbaik/ Excellent
		Pantai Kok	6397922	MMKC003	82	72	66	83	94	Terbaik/ Excellent
		Pantai Kuah	6398925	MMKC004	80	71	71	91	94	Terbaik/ Excellent
		Pantai Pasir Tengkorak	6499701	MMKC005	82	85	68	93	94	Terbaik/ Excellent
		Pantai Teluk Burau	6396923	MMKC006	88	70	64	85	94	Terbaik/ Excellent
		Pantai Teluk Nibong	6497915	MMKC007	79	74	63	91	84	Baik/Good
		Pantai Tengah	6297903	MMKC008	70	68	60	87	94	Terbaik/ Excellent
		Pantai Beras Basah*	NA	MMKC009	-	-	-	93	94	Terbaik/ Excellent
Pulau Pinang	Pantai/Coastal	Gertak Sanggul	5201919	MMPC001	55	53	53	71	81	Baik/Good
		Kawasan Perindustrian Bayan Lepas 1	5303932	MMPC002	55	-	-	67	59	Sederhana/ Moderate
		Kawasan Perindustrian Bayan Lepas 2**	5303933	NA	54	-	-	-	-	Stesen tutup/Close station
		Kawasan Perindustrian Bayan Lepas 3**	5302939	NA	54	53	50	-	-	Stesen tutup/Close station
		Pantai Bersih	5403906	MMPC003	61	52	76	50	66	Sederhana/ Moderate
		Pantai Miami	5502901	MMPC004	65	69	61	68	93	Terbaik/ Excellent
		Pantai Pasir Panjang	5201938	MMPC005	66	70	63	86	93	Terbaik/ Excellent
		Batu Ferringgi (Casuarina)	5402904	MMPC006	69	66	79	67	67	Sederhana/ Moderate
		Luar Pantai Teluk Bahang	5402930	MMPC007	66	65	88	85	93	Terbaik/ Excellent

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					2014	2015	2016	2017	2018	
Pulau Pinang	Pantai/Coastal	Persiaran Gurney	5403902	MMPC008	66	48	83	63	66	Sederhana/ Moderate
		Rumah Pam Baru Perai	5304927	MMPC009	55	52	66	59	64	Sederhana/ Moderate
		Rumah Pam Lama Perai	5303926	MMPC010	59	55	61	64	65	Sederhana/ Moderate
		Selat PP Selatan (Jelutong)	5303911	MMPC011	51	49	60	49	59	Sederhana/ Moderate
		Tanjung Bungah	5402937	MMPC012	67	61	83	84	67	Sederhana/ Moderate
		Teluk Tempoyak	5202923	MMPC013	61	52	51	61	75	Sederhana/ Moderate
		Batu Maung	5202901	MMPC014	57	52	46	59	62	Sederhana/ Moderate
		Pantai Sungai Batu Ferringhi 3*	NA	MMPC015	-	-	-	62	93	Terbaik/ Excellent
		Pantai Sungai Batu Ferringhi 2*	NA	MMPC016	-	-	-	61	93	Terbaik/ Excellent
		Pantai Sungai Batu Ferringhi 1*	NA	MMPC017	-	-	-	51	85	Baik/Good
Perak	Pantai/Coastal	Pantai Pasir Bogak	4205908	MMAC001	80	55	58	91	92	Terbaik/ Excellent
		Pantai Teluk Dalam	4205928	MMAC002	70	54	75	91	93	Terbaik/ Excellent
		Pantai Teluk Batik	4205932	MMAC003	71	73	51	89	92	Terbaik/ Excellent
		Pantai Tanjung Batu	4406927	MMAC004	84	69	53	92	94	Terbaik/ Excellent
		Pantai Teluk Rubiah*	NA	MMAC005	-	-	-	93	92	Terbaik/ Excellent
		Pantai Damai Laut*	NA	MMAC006	-	-	-	91	92	Terbaik/ Excellent
		Pantai Teluk Senangin*	NA	MMAC007	-	-	-	92	93	Terbaik/ Excellent
		Pantai Pasir Panjang	4205924	MMAC008	85	51	52	93	93	Terbaik/ Excellent
Selangor	Pantai/Coastal	Pantai Bagan Lalang	2616927	MMBC001	85	89	90	92	88	Baik/Good
		Pantai Morib	2712902	MMBC002	87	70	62	89	87	Baik/Good
		Selat Pulau Babi	3012929	MMBC003	93	87	75	72	90	Terbaik/ Excellent
		Selat Klang Utara	3013908	MMBC004	94	68	78	64	62	Sederhana/ Moderate
		Pantai Remis*	NA	MMBC005	-	-	-	67	90	Terbaik/ Excellent
		Pantai Klanang*	NA	MMBC006	-	-	-	91	82	Baik/Good
Negeri Sembilan	Pantai/Coastal	Bagan Pinang	2518915	MMNC001	92	87	97	68	91	Terbaik/ Excellent
		Telok Siting	2419908	MMNC002	88	90	97	87	88	Baik/Good
		Port Dickson Bandar	2517907	MMNC003	70	84	97	68	68	Sederhana/ Moderate
		Port Dickson Batu 4	2518937	MMNC004	93	91	97	67	90	Terbaik/ Excellent

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					2014	2015	2016	2017	2018	
Negeri Sembilan	Pantai/Coastal	Port Dickson Batu 5	2418906	MMNC005	67	88	97	79	68	Sederhana/ Moderate
		Port Dickson Batu 6	2418916	MMNC006	81	88	97	68	92	Terbaik/ Excellent
		Port Dickson Batu 7	2418905	MMNC007	90	86	97	67	88	Baik/Good
		Port Dickson Batu 8	2418912	MMNC008	93	77	97	75	87	Baik/Good
		Port Dickson Batu 10	2418914	MMNC009	90	93	97	68	89	Baik/Good
		Port Dickson Janakusa TNB	2517909	MMNC010	91	79	97	68	68	Sederhana/ Moderate
		Telok Pelanduk	2419917	MMNC011	91	93	97	81	90	Terbaik/ Excellent
		Pantai Cermin	2416918	MMNC012	88	89	97	68	92	Terbaik/ Excellent
		Pantai Teluk Kemang*	NA	MMNC013	-	-	-	68	67	Sederhana/ Moderate
		Pantai Seri Purnama*	NA	MMNC014	-	-	-	85	93	Terbaik/ Excellent
Melaka	Pantai/Coastal	Pantai Rombang	2221916	MMMC001	55	58	68	85	85	Baik/Good
		Pantai Kundur	2221908	MMMC002	55	55	57	84	82	Baik/Good
		Pantai Tanjung Bidara	2320909	MMMC003	52	53	57	82	93	Terbaik/ Excellent
		Teluk Gong	2320902	MMMC004	51	55	57	88	93	Terbaik/ Excellent
		Pulau Melaka Point A1	2121915	MMMC005	-	78	72	64	67	Sederhana/ Moderate
		Pulau Melaka Point A2	2121915	MMMC006	-	-	-	72	81	Baik/Good
		Pulau Melaka Point B1	2121916	MMMC007	-	84	63	63	62	Sederhana/ Moderate
		Pulau Melaka Point B2	2121916	MMMC008	-	-	-	66	58	Sederhana/ Moderate
		Pantai Klebang*	NA	MMMC009	-	-	-	67	81	Baik/Good
Johor	Pantai/Coastal	Tanjung Bin	1336975	MMJC001	90	90	84	92	92	Terbaik/ Excellent
		Pelabuhan Tanjung Pelepas	1438943	MMJC002	85	89	85	90	92	Terbaik/ Excellent
		Hadapan Jabatan Laut	1438918	MMJC003	87	62	84	80	88	Baik/Good
		Pantai Stulang Laut	1437951	MMJC004	61	58	76	61	63	Sederhana/ Moderate
		Jeti Teluk Jawa	1438918	MMJC005	84	64	53	62	62	Sederhana/ Moderate
		Pelabuhan Pasir Gudang	1428939	MMJC006	64	75	75	64	65	Sederhana/ Moderate
		Hadapan HSAJB	1437920	MMJC007	55	64	44	59	59	Sederhana/ Moderate
		Pantai Lido	1437921	MMJC008	63	59	66	55	52	Sederhana/ Moderate

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NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Johor	Pantai/Coastal	Pantai Teluk Mahkota	1841911	MMJC009	85	85	89	92	94	Terbaik/ Excellent
		Pantai Tanjung Leman	2140694	MMJC010	87	88	88	94	93	Terbaik/ Excellent
		Pantai Sri Pantai	2339960	MMJC011	87	87	88	94	94	Terbaik/ Excellent
		Tanjung Merak	1441968	MMJC012	61	73	89	93	73	Sederhana/ Moderate
		Tanjung Pengelih	1441967	MMJC013	85	88	88	93	93	Terbaik/ Excellent
		Pantai Tanjong Stapa	1341961	MMJC014	57	88	89	93	93	Terbaik/ Excellent
		Pantai Teluk Gorek	2538958	MMJC015	79	89	88	93	94	Terbaik/ Excellent
		Pantai Air Papan	2538959	MMJC016	86	89	89	93	94	Terbaik/ Excellent
		Jeti Kukup	1334925	MMJC017	64	62	87	88	89	Baik/Good
		Pasir Gogok	1441966	MMJC018	79	89	90	94	93	Terbaik/ Excellent
		Tanjung Buai	1340973	MMJC019	89	88	80	92	92	Terbaik/ Excellent
		Pantai Desaru	1542914	MMJC020	71	65	89	94	94	Terbaik/ Excellent
		Tanjung Sepang	1443969	MMJC021	83	64	87	94	93	Terbaik/ Excellent
		Tanjung Penyusup	1444920	MMJC022	77	62	86	92	93	Terbaik/ Excellent
		Pantai Sungai Lurus	1730962	MMJC023	86	64	89	90	91	Terbaik/ Excellent
		Punggur	1531974	MMJC024	52	87	88	84	87	Baik/Good
		Pantai Penyabung*	NA	MMJC025	-	-	-	93	93	Terbaik/ Excellent
		Tanjung Resang*	NA	MMJC026	-	-	-	94	94	Terbaik/ Excellent
		Tanjung Balau*	NA	MMJC027	-	-	-	93	93	Terbaik/ Excellent
		Batu Layar*	NA	MMJC028	-	-	-	93	94	Terbaik/ Excellent
		Tanjung Sengat*	NA	MMJC029	-	-	-	92	91	Terbaik/ Excellent
Pahang	Pantai/Coastal	Pantai Cherating (Club Med A)	4133903 (A)	MMCC001	91	85	60	92	94	Terbaik/ Excellent
		Pantai Cherating (Club Med B)	4133903 (B)	MMCC002	94	85	61	93	94	Terbaik/ Excellent
		Pantai Cherating (Legend A)	4133942 (A)	MMCC003	67	87	81	92	94	Terbaik/ Excellent
		Pantai Cherating (Legend B)	4133942 (B)	MMCC004	92	87	61	89	94	Terbaik/ Excellent
		Pantai Muhibbah Balok A	3933901 (A)	MMCC005	87	77	58	68	89	Baik/Good

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NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Pahang	Pantai/Coastal	Pantai Muhibbah Balok B	3933901 (B)	MMCC006	86	75	59	65	83	Baik/Good
		Pantai Batu Hitam A	3833915 (A)	MMCC007	93	85	62	68	87	Baik/Good
		Pantai Batu Hitam B	3833915 (B)	MMCC008	91	87	56	81	91	Terbaik/Excellent
		Pantai Berserah A	3933941 (A)	MMCC009	93	90	65	80	90	Terbaik/Excellent
		Pantai Berserah B	3933941 (B)	MMCC010	71	78	63	67	90	Terbaik/Excellent
		Pantai Teluk Cempedak A	3833910 (A)	MMCC011	93	78	59	67	88	Baik/Good
		Pantai Teluk Cempedak B	3833910 (B)	MMCC012	94	67	59	88	91	Terbaik/Excellent
		Pantai Teluk Gelora A	3833909 (A)	MMCC013	71	62	64	67	77	Sederhana/Moderate
		Pantai Teluk Gelora B	3833909 (B)	MMCC014	78	64	59	66	76	Sederhana/Moderate
		Pantai Sepat A	3737915	MMCC015	93	62	88	91	93	Terbaik/Excellent
		Pantai Sepat B	3633916	MMCC016	94	85	80	91	93	Terbaik/Excellent
		Pantai Legenda A	3534943 (A)	MMCC017	94	82	85	93	94	Terbaik/Excellent
		Pantai Legenda B	3534943 (B)	MMCC018	94	64	79	94	94	Terbaik/Excellent
		Pantai Kuala Api-Api	3235917	MMCC019	93	66	79	90	93	Terbaik/Excellent
		Pantai Tanjung Batu	3334915	MMCC020	93	83	79	90	94	Terbaik/Excellent
		Pantai Chendor*	NA	MMCC021	-	-	-	86	94	Terbaik/Excellent
		Pantai Lanjut*	NA	MMCC022	-	-	-	93	92	Terbaik/Excellent
Terengganu	Pantai/Coastal	Pantai Batu Buruk	5331935	MMTC001	66	58	78	94	93	Terbaik/Excellent
		Pantai Bukit Keluang	5825903	MMTC002	69	52	64	94	94	Terbaik/Excellent
		Pantai Chendering	5231934	MMTC003	69	53	61	89	94	Terbaik/Excellent
		Pantai Rantau Abang	4833917	MMTC004	70	60	61	90	94	Terbaik/Excellent
		KIPC Utara	4634954	MMTC005	62	62	74	91	94	Terbaik/Excellent
		KIPC Tengah	4534955	MMTC006	63	73	77	89	94	Terbaik/Excellent
		KIPC Selatan	4534956	MMTC007	66	75	74	89	94	Terbaik/Excellent
		Pantai Rhu 10*	NA	MMTC008	-	-	-	94	94	Terbaik/Excellent
		Pantai Tok Jembal*	NA	MMTC009	-	-	-	94	94	Terbaik/Excellent
		Pantai Kelului*	NA	MMTC010	-	-	-	94	94	Terbaik/Excellent
		Pantai Teluk Ketapang*	NA	MMTC011	-	-	-	94	94	Terbaik/Excellent

Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai
Table 4.3 : Marine Water Quality Status for Coastal

NEGERI/ STATE	KLASIFIKASI STESAN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESAN LAMA/OLD STATION NUMBER	NOMBOR STESAN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Terengganu	Pantai/Coastal	Pantai Kuala Abang*	NA	MMTC012	-	-	-	94	94	Terbaik/ Excellent
		Pantai Teluk Kalong*	NA	MMTC013	-	-	-	94	94	Terbaik/ Excellent
		Pantai Sura*	NA	MMTC014	-	-	-	94	94	Terbaik/ Excellent
		Pantai Tanjung Bidara*	NA	MMTC015	-	-	-	94	94	Terbaik/ Excellent
		Pantai Kemasik*	NA	MMTC016	-	-	-	93	88	Baik/Good
Kelantan	Pantai/Coastal	Pantai Seri Tujoh	6221910	MMDC001	71	63	66	88	93	Terbaik/ Excellent
		Pantai Cahaya Bulan	6122903	MMDC002	74	61	78	87	93	Terbaik/ Excellent
		Pantai Sabak	6123909	MMDC003	72	61	66	81	93	Terbaik/ Excellent
		Pantai Irama Bachok	6024908	MMDC004	69	62	66	86	93	Terbaik/ Excellent
		Pantai Bisikan Bayu	5825905	MMDC005	67	64	66	89	94	Terbaik/ Excellent
		Pantai Melawi*	NA	MMDC006	-	-	-	93	94	Terbaik/ Excellent
Sarawak	Pantai/Coastal	Pantai Sematan	1898902	MMQC001	91	76	74	88	90	Terbaik/ Excellent
		Pantai Pandan	1824918	MMQC002	94	87	75	87	91	Terbaik/ Excellent
		Pantai Pasir Putih	1604910	MMQC003	67	67	88	80	87	Baik/Good
		Pantai Bako	1704906	MMQC004	94	88	74	88	89	Baik/Good
		Pantai Damai	1702904	MMQC005	91	76	89	86	91	Terbaik/ Excellent
		Pantai Tanjung Kembang	1810923	MMQC006	73	87	85	69	85	Baik/Good
		Pantai Harmoni Mukah	2920921	MMQC007	53	54	85	72	86	Baik/Good
		Pantai Tanjung Batu	3132602	MMQC008	70	67	82	84	89	Baik/Good
		Pantai Likau	3230915	MMQC009	63	89	79	85	89	Baik/Good
		Pantai Emas	3331903	MMQC010	63	88	90	87	90	Terbaik/ Excellent
		Pantai Piasau	4539918	MMQC011	88	82	68	86	89	Baik/Good
		Pantai Brighton	4449917	MMQC012	91	94	68	81	88	Baik/Good
		Pantai Esplaned	4339920	MMQC013	89	97	68	86	82	Baik/Good
		Pantai Beraya	4238921	MMQC014	89	97	68	87	88	Baik/Good
		Pantai Bungai	4137922	MMQC015	91	82	94	88	87	Baik/Good
		Pantai Belawai	2212913	MMQC016	65	83	73	84	88	Baik/Good
		Pantai Mukah*	NA	MMQC017	-	-	-	84	88	Baik/Good

Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai
Table 4.3 : Marine Water Quality Status for Coastal

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Sarawak	Pantai/Coastal	Tanjung Kidurong*	NA	MMQC018	-	-	-	85	90	Terbaik/ Excellent
		Pasir Pandak*	NA	MMQC019	-	-	-	86	90	Terbaik/ Excellent
		Rambungan*	NA	MMQC020	-	-	-	89	90	Terbaik/ Excellent
		Sri Tanjung Lawas*	NA	MMQC021	-	-	-	92	86	Baik/Good
		Pantai Luak*	NA	MMQC022	-	-	-	88	78	Sederhana/ Moderate
		Pasir Panjang*	NA	MMQC023	-	-	-	87	88	Baik/Good
Sabah	Pantai/Coastal	Pantai Teluk Brunei 1	5053901	MMSC001	80	82	66	70	92	Terbaik/ Excellent
		Pantai Teluk Brunei 2	5053902	MMSC002	79	83	59	65	93	Terbaik/ Excellent
		Pantai Teluk Brunei 3	5053903	MMSC003	73	85	67	65	92	Terbaik/ Excellent
		Pantai Teluk Brunei 4	5053904	MMSC004	75	86	66	69	93	Terbaik/ Excellent
		Pantai Teluk Brunei 5	5053905	MMSC005	71	85	65	69	93	Terbaik/ Excellent
		Pantai Teluk Brunei 6	5053906	MMSC006	80	83	67	70	93	Terbaik/ Excellent
		Borneo Golf Seawater	5355901	MMSC007	80	79	68	68	92	Terbaik/ Excellent
		Pantai Manis Papar	5555901	MMSC008	81	83	66	69	91	Terbaik/ Excellent
		Pantai Melinsung	5565902	MMSC009	77	83	67	73	93	Terbaik/ Excellent
		Pantai Tanjung Aru (Roll Skating)	5656902	MMSC010	70	67	63	86	93	Terbaik/ Excellent
		Pantai Tanjung Aru (No. 3)	5656903	MMSC011	67	66	67	82	93	Terbaik/ Excellent
		Pantai Lok Kawi	5656904	MMSC012	59	69	62	85	93	Terbaik/ Excellent
		Pantai Dalit Tuaran	6161901	MMSC013	85	70	64	74	93	Terbaik/ Excellent
		Mangrove Paradise	6161902	MMSC014	86	67	68	86	93	Terbaik/ Excellent
		Pantai Sabandar	6161903	MMSC015	83	68	67	71	93	Terbaik/ Excellent
		Pantai Bak-Bak Kudat	6665901	MMSC016	85	65	63	70	93	Terbaik/ Excellent
		Pasir Putih Sandakan	5580901	MMSC017	83	84	67	66	92	Terbaik/ Excellent
		Pantai TLDM	5580902	MMSC018	81	87	69	69	92	Terbaik/ Excellent
		Pantai Batu Sapi	5580903	MMSC019	83	84	67	51	93	Terbaik/ Excellent
		Pantai Ulu Tungku	5085901	MMSC020	83	84	68	69	92	Terbaik/ Excellent
		Pantai Sarina Kunak	4481901	MMSC021	83	82	69	68	93	Terbaik/ Excellent
		Pantai Kg. Lamak	4581902	MMSC022	-	82	67	49	91	Terbaik/ Excellent

Jadual 4.3 : Status Kualiti Air Marin Kawasan Pantai
Table 4.3 : Marine Water Quality Status for Coastal

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Sabah	Pantai/Coastal	Pantai Tinagat	4473901	MMSC023	83	82	69	70	93	Terbaik/ Excellent
		Pantai Tanjung Aru (Rest Lido)	5656901	MMSC024	82	68	68	86	93	Terbaik/ Excellent
Labuan	Pantai/Coastal	Pulau Papan	5151905	MMLC001	51	76	75	73	92	Terbaik/ Excellent
		Kiamsam	5151906	MMLC002	67	77	76	73	93	Terbaik/ Excellent
		Sungai Pagar	5151907	MMLC003	79	77	78	71	92	Terbaik/ Excellent
		Layang-Layangan	5251902	MMLC004	79	76	77	73	92	Terbaik/ Excellent
		Tanjung Aru	5251903	MMLC005	75	78	72	73	91	Terbaik/ Excellent

Nota/Note:

* (Stesen baru/New station)

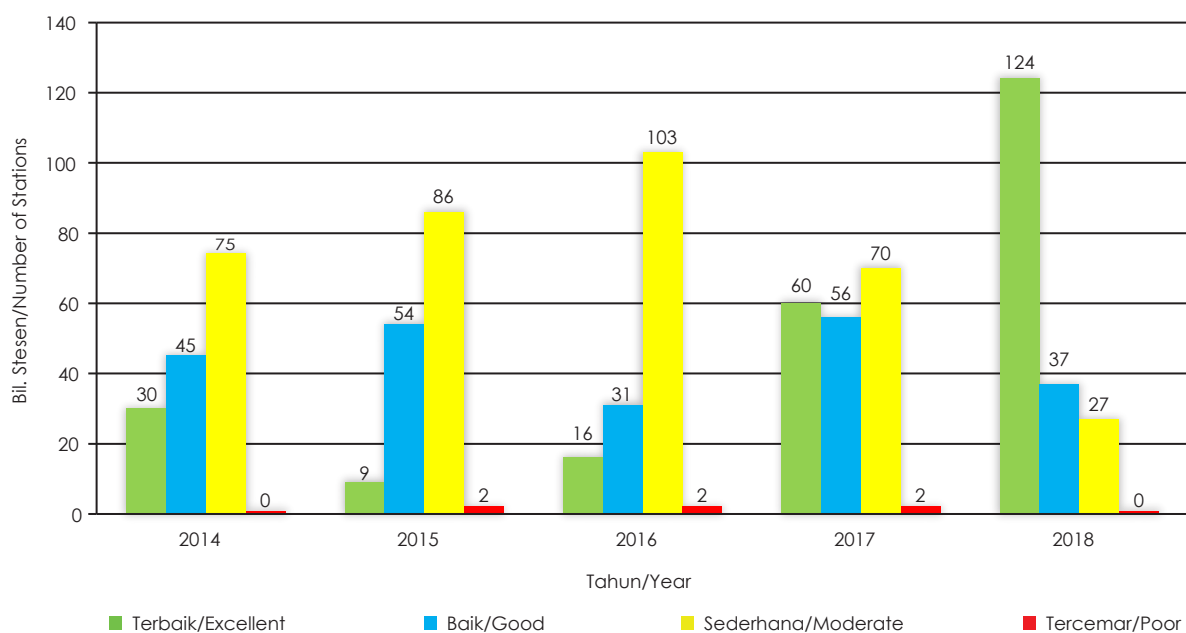
** (Stesen tutup/Close station)

- (Tiada data/No data)

NA (Tidak berkenaan/Not available)

Tren Indeks Kualiti Air Marin (IKAM) mulai tahun 2014 hingga 2018 adalah seperti ditunjukkan dalam **Rajah 4.1**. Bilangan stesen Terbaik menunjukkan peningkatan daripada 60 kepada 124 stesen (52%).

The Marine Water Quality Index (MWQI) trend for 2014 to 2018 is as shown in **Figure 4.1**. The number of stations recorded Excellent category increased from 60 to 124 stations (52%).



Rajah 4.1 : Tren Status Kualiti Air Marin Kawasan Pantai di Malaysia, 2014-2018
Figure 4.1 : The Trend of Marine Water Status for Coastal Area in Malaysia, 2014-2018

STATUS KUALITI AIR KUALA

Pada tahun 2018, sebanyak 85 stesen Kuala telah dipantau dan dianalisis serta dilaporkan sebagai Indeks Kualiti Air Marin. Hasil program pengawasan yang telah dijalankan menunjukkan 18 stesen (21.18%) dikategorikan sebagai Terbaik, 21 stesen (24.71%) sebagai Baik, 41 stesen (48.24%) sebagai Sederhana dan 5 stesen (5.88%) sebagai Tercemar (**Jadual 4.4**).

ESTUARY WATER QUALITY STATUS

In year 2018, 85 estuary stations were monitored, analysed and reported as Marine Water Quality Index. The results from the monitoring programme indicated that 18 stations (21.18%) as Excellent, 21 stations (**24.71%**) as Good, 41 stations (48.24%) as Moderate and 5 stations (5.88%) as Poor (**Table 4.4**).

Jadual 4.4 : Status Kualiti Air Marin di Kawasan Kuala
Table 4.4 : Marine Water Quality Status for Estuary

NEGERI/ STATE	KLASIFIKASI STESAN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Perlis	Kuala/Estuary	Kuala Sungai Perlis	6401901	MMRE001	59	53	61	64	66	Sederhana/ Moderate
		Kuala Sungai Baru	6201902	MMRE002	76	56	60	64	70	Sederhana/ Moderate
Kedah	Kuala/Estuary	Kuala Kedah	6102908	MMKE001	53	50	77	62	61	Sederhana/ Moderate
		Kuala Jerlun	6302925	MMKE002	65	59	75	62	82	Baik/Good
		Kuala Segantang Garam*	NA	MMKE003	-	-	-	83	88	Baik/Good
		Kuala Sungai Muda*	NA	MMKE004	-	-	-	64	62	Sederhana/ Moderate
Pulau Pinang	Kuala/Estuary	Kuala Sungai Jawi	5204901	MMPE001	58	49	45	49	54	Sederhana/ Moderate
		Kuala Sungai Juru	5303904	MMPE002	63	59	70	49	47	Tercemar/ Poor
		Kuala Sungai Kerian	5104901	MMPE003	61	60	34	56	60	Sederhana/ Moderate
		Kuala Sungai Pinang	5403934	MMPE004	50	47	58	52	61	Sederhana/ Moderate
		Kuala Sungai Perai	5303908	MMPE005	53	56	64	52	59	Sederhana/ Moderate
		Kuala Sungai Tengah	5204935	MMPE006	60	67	65	58	37	Tercemar/ Poor
		Kuala Sungai Pinang (Balik Pulau)	5202929	MMPE007	67	46	60	55	64	Sederhana/ Moderate
Perak	Kuala/Estuary	Kuala Sungai Manjung	4205930	MMAE001	70	67	78	88	91	Terbaik/ Excellent
		Kuala Sungai Gula	4906926	MMAE002	68	60	67	82	84	Baik/Good
		Kuala Sungai Kurau	4994919	MMAE003	56	73	59	61	64	Sederhana/ Moderate
		Kuala Sungai Tanjung Piandang	5003921	MMAE004	75	73	57	59	61	Sederhana/ Moderate
		Kuala Sungai Sepetang	4806925	MMAE005	53	66	56	60	58	Sederhana/ Moderate

Jadual 4.4 : Status Kualiti Air Marin di Kawasan Kuala
Table 4.4 : Marine Water Quality Status for Estuary

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Perak	Kuala/Estuary	Kuala Sungai Perak	4007901	MMAE006	62	70	64	61	81	Baik/Good
Selangor	Kuala/Estuary	Kuala Sungai Sepang	2517922	MMBE001	71	78	85	92	89	Baik/Good
		Kuala Sungai Sepang (Kecil)	2612928	MMBE002	68	92	86	93	89	Baik/Good
		Kuala Sungai Sepang (Kawalan)	2616926	MMBE003	81	86	92	93	92	Terbaik/ Excellent
		Kuala Sungai Langat (Jugra)	2814925	MMBE004	69	55	72	82	62	Sederhana/ Moderate
		Kuala Sungai Klang	3013909	MMBE005	95	67	77	60	37	Tercemar/ Poor
		Kuala Sungai Langat (Lumut)	2913903	MMBE006	93	67	81	60	39	Tercemar/ Poor
		Kuala Sungai Buloh	3212930	MMBE007	64	66	67	64	62	Sederhana/ Moderate
		Kuala Sungai Selangor	3312915	MMBE008	90	90	74	85	69	Sederhana/ Moderate
		Kuala Sungai Tenggi	3311931	MMBE009	68	67	72	74	64	Sederhana/ Moderate
		Kuala Sungai Bernam	3808924	MMBE010	67	55	72	56	86	Baik/Good
Negeri Sembilan	Kuala/Estuary	Kuala Sungai Linggi	2319901	MMNE001	93	81	97	75	65	Sederhana/ Moderate
		Kuala Sungai Lukut	2517910	MMNE002	91	68	97	66	66	Sederhana/ Moderate
Melaka	Kuala/Estuary	Kuala Sungai Melaka	2123903	MMME001	59	55	56	63	65	Sederhana/ Moderate
		Kuala Sungai Sri Melaka	2121914	MMME002	59	52	53	57	59	Sederhana/ Moderate
		Kuala Sungai Merlimau	2124912	MMME003	62	86	71	81	75	Sederhana/ Moderate
		Kuala Sungai Kesang	2186905	MMME004	68	77	70	83	82	Baik/Good
		Kuala Sungai Sebatu	2186904	MMME005	61	58	69	86	87	Baik/Good
		Kuala Sungai Melaka 2*	NA	MMME006	-	-	-	64	64	Sederhana/ Moderate
		Kuala Sungai Baru*	NA	MMME007	-	-	-	84	83	Baik/Good
		Kuala Sungai Lereh	2221922	MMME008	-	-	69	63	64	Sederhana/ Moderate
Johor	Kuala/Estuary	Kuala Sungai Melayu	1437946	-	75	66	58	63	-	Stesen tutup/Close station
		Kuala Sungai Skudai	1437922	-	58	57	65	40	-	Stesen tutup/Close station
		Kuala Sungai Tebrau	1438943	-	61	59	56	62	-	Stesen tutup/Close station
		Kuala Sungai Segget	1437919	MMJE001	61	62	47	53	32	Tercemar/ Poor
		Kuala Sungai Kim-Kim	1439965	MMJE002	64	87	82	61	61	Sederhana/ Moderate

Jadual 4.4 : Status Kualiti Air Marin di Kawasan Kuala
Table 4.4 : Marine Water Quality Status for Estuary

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Johor	Kuala/Estuary	Kuala Sungai Johor	1440916	MMJE003	82	88	85	92	92	Terbaik/ Excellent
		Kuala Sungai Batu Pahat	1729930	MMJE004	51	84	87	90	80	Baik/Good
		Kuala Sungai Muar	2024932	MMJE005	64	81	88	92	66	Sederhana/ Moderate
		Kuala Sungai Mersing	2438905	MMJE006	64	89	85	67	67	Sederhana/ Moderate
Pahang	Kuala/Estuary	Kuala Kuantan*	NA	MMCE001	-	-	-	66	67	Sederhana/ Moderate
		Kuala Rompin Kecil*	NA	MMCE002	-	-	-	89	93	Terbaik/ Excellent
		Kuala Pahang*	NA	MMCE003	-	-	-	92	73	Sederhana/ Moderate
		Kuala Nenasi*	NA	MMCE004	-	-	-	93	94	Terbaik/ Excellent
		Kuala Sungai Balok*	NA	MMCE005	-	-	-	65	66	Sederhana/ Moderate
Terengganu	Kuala/Estuary	Kuala Sungai Besut	5825902	MMTE001	70	64	63	73	67	Sederhana/ Moderate
		Kuala Sungai Dungun	4734918	MMTE002	54	55	53	65	86	Baik/Good
		Kuala Sungai Ibai	5231949	MMTE003	70	63	61	90	93	Terbaik/ Excellent
		Kuala Sungai Kerteh	4534922	MMTE004	58	54	56	91	92	Terbaik/ Excellent
		Kuala Sungai Marang	5232911	MMTE005	67	63	72	90	91	Terbaik/ Excellent
		Kuala Sungai Paka	4634920	MMTE006	66	69	72	80	94	Terbaik/ Excellent
		Kuala Sungai Setiu	5627953	MMTE007	70	62	75	92	93	Terbaik/ Excellent
		Kuala Sungai Terengganu	5331907	MMTE008	57	72	55	66	67	Sederhana/ Moderate
		Kuala Sungai Kemaman/ Chukai	4234929	MMTE009	59	54	56	90	94	Terbaik/ Excellent
		Tioxide Utara (Kg. Bukit Kuang, Kijal)	4234950	MMTE010	66	63	63	89	94	Terbaik/ Excellent
		Tioxide Tengah (Pupuk Semangat, Kijal)	4234951	MMTE011	70	62	61	90	94	Terbaik/ Excellent
		Tioxide Selatan (KSB, T. Kalong)	4234952	MMTE012	69	53	-	94	94	Terbaik/ Excellent
		Pulau Duyung	5231908	MMTE013	50	48	57	66	66	Sederhana/ Moderate
Kelantan	Kuala/Estuary	Kuala Sungai Golok	6220911	MMDE001	52	57	76	75	67	Sederhana/ Moderate
		Kuala Sungai Kelantan	6222901	MMDE002	51	52	74	79	65	Sederhana/ Moderate
		Kuala Sungai Pengkalan Chepa	6223912	MMDE003	54	63	72	89	67	Sederhana/ Moderate

Jadual 4.4 : Status Kualiti Air Marin di Kawasan Kuala
Table 4.4 : Marine Water Quality Status for Estuary

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Kelantan	Kuala/Estuary	Kuala Sungai Pengkalan Datu	6123913	MMDE004	60	63	61	86	81	Baik/Good
		Kuala Sungai Kemasin	5824914	MMDE005	67	58	57	63	67	Sederhana/ Moderate
		Kuala Sungai Semerak*	NA	MMDE006	-	-	-	87	67	Sederhana/ Moderate
Sarawak	Kuala/Estuary	Kuala Sungai Semantan	1898901	MMQE001	95	80	90	86	90	Terbaik/ Excellent
		Kuala Sungai Sarawak	1604907	MMQE002	80	62	70	85	86	Baik/Good
		Kuala Sungai Bako	1704905	MMQE003	65	69	66	55	90	Terbaik/ Excellent
		Kuala Sungai Santubong	1702903	MMQE004	75	87	89	87	88	Baik/Good
		Kuala Batang Krian (Kabong)	1710922	MMQE005	79	64	73	64	76	Sederhana/ Moderate
		Kuala Batang Rejang	2111909	MMQE006	82	82	87	83	85	Baik/Good
		Kuala Mukah	2920920	MMQE007	51	70	89	72	83	Baik/Good
		Kuala Batang Kemena	3130911	MMQE008	64	77	69	68	87	Baik/Good
		Kuala Tanjung Similajau	3431903	MMQE009	85	90	92	84	89	Baik/Good
		Kuala Sungai Panipah	3332904	MMQE010	89	91	92	86	89	Baik/Good
		Kuala Pantai Nyalau	3431903	MMQE011	55	93	86	84	79	Sederhana/ Moderate
		Kuala Sungai Baram	4539919	MMQE012	96	97	66	72	76	Sederhana/ Moderate
		Kuala Sungai Miri	4349915	MMQE013	84	72	68	61	78	Sederhana/ Moderate
		Kuala Sungai Trusan*	NA	MMQE014	-	-	-	70	87	Baik/Good
Sabah	Kuala/Estuary	Kuala Penyu	5453901	MMSE001	82	65	66	71	92	Terbaik/ Excellent
		Muara Sungai Inanam	5050905	MMSE002	60	88	45	86	91	Terbaik/ Excellent

Nota/Note:

* (Stesen baru/New station)

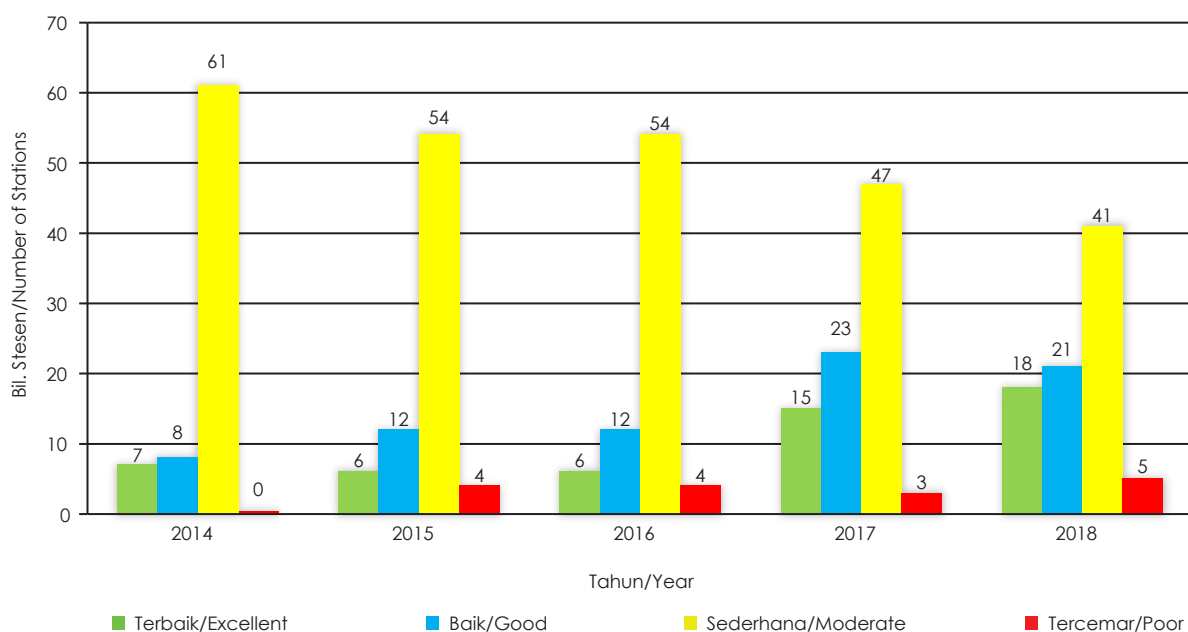
** (Stesen tutup/Close station)

- (Tiada data/No data)

NA (Tidak berkenaan/Not available)

Berdasarkan Indeks Kualiti Air Marin (IKAM), bilangan stesen Terbaik menunjukkan peningkatan daripada 15 kepada 18 stesen (17%). Tren ini ditunjukkan dalam **Rajah 4.2**.

Based on Marine Water Quality Index (MWQI), the number of estuarine water quality that recorded Excellent increased from 15 to 18 stations (17%). These trends are shown in **Figure 4.2**.



Rajah 4.2 : Tren Status Kualiti Air Marin bagi Kawasan Kuala, 2014-2018
Figure 4.2 : The Trend Of Marine Water Quality Status for Estuary, 2014-2018



KUALITI AIR MARIN PULAU

ISLAND MARINE WATER
QUALITY

Senarai stesen Pulau berdasarkan kategori stesen ditunjukkan dalam **Jadual 4.5**.

The list of island stations by island category is as shown in **Table 4.5**.

Jadual 4.5 : Stesen-Stesen Pulau, 2018

Table 4.5 : Island Stations, 2018

NEGERI/ STATE	BIL. PULAU/ NO. OF ISLAND	BIL. STESEN/ NO. OF STATION	PULAU/ ISLAND	ID STESEN LAMA/OLD STATION ID	ID STESEN BARU/NEW STATION ID	KATEGORI/ CATEGORY
Kedah	10	1	Singa Besar	7KR01	MMKR001	Peranginan/ Resort
		2	Dayang Bunting	7KR02	MMKR002	Peranginan/ Resort
			Dayang Bunting 2*	NA	MMKR003	Stesen Baru/ New Station
		1	Pulau Perak	7KP01	MMRP001	Dilindungi/ Protected
		1	Payar	7KM03	MMKM001	Taman Laut/ Marine Park
		1	Kaca	7KM04	MMKM002	Taman Laut/ Marine Park
		1	Segantang	7KM06	MMKM003	Taman Laut/ Marine Park
		4	Pantai Kuah	7KD07	MMKD001	Pembangunan/ Development
			Pantai Chenang	7KD09	MMKD002	Pembangunan/ Development
			Tanjung Rhu	7KD010	MMKD003	Pembangunan/ Development
			Teluk Ewa	7KD08	MMKD004	Pembangunan/ Development
		1	Pasir*	NA	MMKP001	Stesen Baru/ New Station
		1	Gasing*	NA	MMKP002	Stesen Baru / New Station
		1	Dangli*	NA	MMKP003	Stesen Baru/ New Station
Pulau Pinang	7	1	Tanjung Tokong*	NA	MMPP001	Stesen Baru/ New Station
		3	Batu Maung	7PD01	MMPD001	Pembangunan/ Development
			Padang Kota	7PD04	MMPD002	Pembangunan/ Development
			Teluk Bahang	7PD03	MMPD003	Pembangunan/ Development
		1	Aman	7PR05	MMPR001	Peranginan/ Resort
		1	Jerejak	7PR06	MMPR002	Peranginan/ Resort

Jadual 4.5 : Stesen-Stesen Pulau, 2018
Table 4.5 : Island Stations, 2018

NEGERI/ STATE	BIL. PULAU/ NO. OF ISLAND	BIL. STESEN/ NO. OF STATION	PULAU/ ISLAND	ID STESEN LAMA/OLD STATION ID	ID STESEN BARU/NEW STATION ID	KATEGORI/ CATEGORY
Pulau Pinang		1	Kendi	7PR07	MMPR003	Peranginan/ Resort
		1	Rimau	7PR08	MMPR004	Peranginan/ Resort
		1	Gedong	7PR09	MMPR005	Peranginan/ Resort
Perak	4	2	Pantai Teluk Gedong	7AR01	MMAR001	Peranginan/ Resort
			Pantai Puteri Dewi	7AR02	MMAR002	Peranginan/ Resort
		1	Pangkor Laut	7AR03	MMAR003	Peranginan/ Resort
		1	Sembilan	7AR04	MMAR004	Peranginan/ Resort
			Tukun Perak	7AP05	MMAP001	Dilindungi/ Protected
Selangor	3	1	Ketam	7BR01	MMBR001	Peranginan/ Resort
		1	Angsa	7BR02	MMBR002	Peranginan/ Resort
		1	Lumut	7BR03	MMBR003	Peranginan/ Resort
Negeri Sembilan	1	1	Arang	7NP01	MMNP001	Dilindungi/ Protected
Melaka	3	2	Upeh (Point A)	7MR02	MMMR001	Peranginan / Resort
			Upeh (Point B)	7MR02	MMMR002	Peranginan/ Resort
		2	Besar (Point A)	7MR01	MMMR003	Peranginan/ Resort
			Besar (Point B)	7MR01	MMMR004	Peranginan/ Resort
		2	Undan (Point A)	7MR03	MMMR005	Peranginan/ Resort
			Undan (Point B)	7MR03	MMMR006	Peranginan/ Resort
Johor	8	1	Setindan	7JR01	MMJR001	Peranginan/ Resort
		1	Babi Tengah	7JR02	MMJR002	Peranginan/ Resort
		1	Dayang	7JM03	MMJM001	Taman Laut/ Marine Park
		1	Nanga Besar	7JM08	MMJM002	Taman Laut / Marine Park
		1	Sibu Tengah	7JM11	MMJM003	Taman Laut/ Marine Park
		1	Pemanggil	7JM15	MMJM004	Taman Laut/ Marine Park

Jadual 4.5 : Stesen-Stesen Pulau, 2018
Table 4.5 : Island Stations, 2018

NEGERI/ STATE	BIL. PULAU/ NO. OF ISLAND	BIL. STESEN/ NO. OF STATION	PULAU/ ISLAND	ID STESEN LAMA/OLD STATION ID	ID STESEN BARU/NEW STATION ID	KATEGORI/ CATEGORY
Johor		1	Kukup	7JP17	MMJP001	Dilindungi/ Protected
		1	Pisang	7JP18	MMJP002	Dilindungi/ Protected
Pahang	9	1	Tioman (Teluk Salang)	7CM02	MMCM001	Taman Laut/ Marine Park
		1	Tioman (Kg. Nipah)	7CM01	MMCM002	Taman Laut/ Marine Park
		1	Tulai	7CM05	MMCM003	Taman Laut/ Marine Park
		1	Labas	7CM07	MMCM004	Taman Laut/ Marine Park
		1	Cebah	7CM04	MMCM005	Taman Laut/ Marine Park
		1	Sepui	7CM06	MMCM006	Taman Laut/ Marine Park
		1	Sembilang	7CM08	MMCM007	Taman Laut/ Marine Park
		1	Seri Buat	7CM03	MMCM008	Taman Laut/ Marine Park
		1	Tokong Bahara	7CM09	MMCM009	Taman Laut/ Marine Park
Terengganu	9	1	Gemia	7TR01	MMTR001	Peranginan/ Resort
		1	Perhentian Besar (South)	7TM04	MMTM001	Taman Laut/ Marine Park
		2	Perhentian Besar (West)	7TM05	MMTM002	Taman Laut/ Marine Park
			Perhentian Kecil	7TM06	MMTM003	Taman Laut/ Marine Park
		2	Redang (North)	7TM07	MMTM004	Taman Laut/ Marine Park
			Redang (South)	7TM08	MMTM005	Taman Laut/ Marine Park
		1	Lang Tengah	7TM11	MMTM006	Taman Laut/ Marine Park
		1	Pinang	7TM12	MMTM007	Taman Laut/ Marine Park
		1	Ekor Tebu	7TM13	MMTM008	Taman Laut/ Marine Park
		1	Lima	7TM14	MMTM009	Taman Laut/ Marine Park
		1	Kapas	7TM09	MMTM010	Taman Laut/ Marine Park
Kelantan	2	1	Panjang	7DP01	MMDP001	Dilindungi/ Protected
		1	Kundur	7DP02	MMDP002	Dilindungi/ Protected

Jadual 4.5 : Stesen-Stesen Pulau, 2018
Table 4.5 : Island Stations, 2018

NEGERI/ STATE	BIL. PULAU/ NO. OF ISLAND	BIL. STESEN/ NO. OF STATION	PULAU/ ISLAND	ID STESEN LAMA/OLD STATION ID	ID STESEN BARU/NEW STATION ID	KATEGORI/ CATEGORY
Sarawak	3	1	Satang	7QP01	MMQP001	Dilindungi/ Protected
		1	Talang- Talang Kecil	7QP02	MMQP002	Dilindungi/ Protected
		1	Talang- Talang Besar	7QP03	MMQP003	Dilindungi/ Protected
Sabah	16	1	Gaya	7SR01	MMSR001	Peranginan/ Resort
		1	Mabul	7SR03	MMSR002	Peranginan/ Resort
		2	Sipadan (N)	7SR04	MMSR003	Peranginan/ Resort
			Sipadan (W)	7SR05	MMSR004	Peranginan/ Resort
		1	Manukan	7SM09	MMSR005	Peranginan/ Resort
		1	Tiga	7SR10	MMSR006	Peranginan/ Resort
		1	Kapalai	7SR12	MMSR007	Peranginan/ Resort
		1	Molleangan Besar	7SR14	MMSR008	Peranginan/ Resort
		1	Banggi (South)	7SR15	MMSR009	Peranginan/ Resort
		1	Banggi (East)	7SR20	MMSR010	Peranginan/ Resort
		1	Balambangan	7SR16	MMSR011	Peranginan/ Resort
		1	Mantanani Besar	7SR21	MMSR012	Peranginan/ Resort
		1	Sapi	7SM08	MMSM001	Taman Laut/ Marine Park
		1	Kalampunian Besar	7SM11	MMSM002	Taman Laut/ Marine Park
		1	Selingan	7SP17	MMSP001	Dilindungi/ Protected
		1	Gulisan	7SP18	MMSP002	Dilindungi/ Protected
		1	Bakungan Kecil	7SP19	MMSP003	Dilindungi/ Protected
Labuan	4	1	Kuraman	7LM05	MMLM001	Taman Laut/ Marine Park
		1	Rusukan Besar	7LM07	MMLM002	Taman Laut/ Marine Park
		1	Rusukan Kecil	7LM06	MMLM003	Taman Laut/ Marine Park

Jadual 4.5 : Stesen-Stesen Pulau, 2018
Table 4.5 : Island Stations, 2018

NEGERI/ STATE	BIL. PULAU/ NO. OF ISLAND	BIL. STESEN/ NO. OF STATION	PULAU/ ISLAND	ID STESEN LAMALD/OLD STATION ID	ID STESEN BARU/NEW STATION ID	KATEGORI/ CATEGORY
Labuan		4	Pohon Batu	7LD01	MMLD001	Pembangunan/ Development
			Water Front	7LD02	MMLD002	Pembangunan/ Development
			Lubuk Temiang	7LD03	MMLD003	Pembangunan/ Development
			Ranca- Ranca	7LD04	MMLD004	Pembangunan/ Development

Nota/Note:

* (Stesen baru/New station)

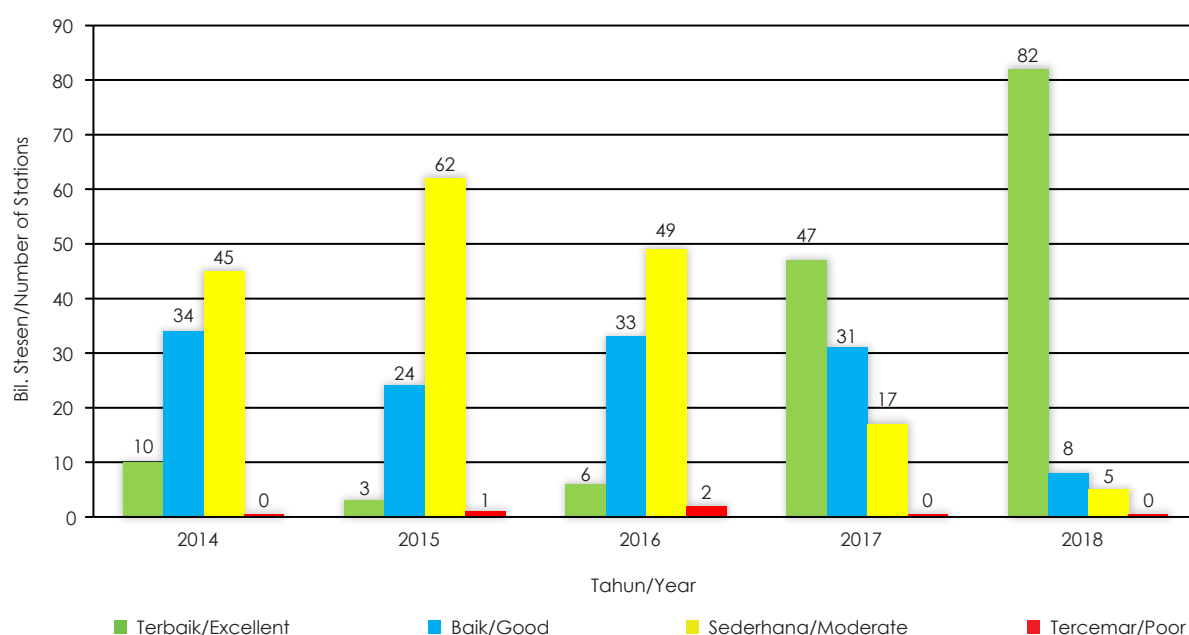
** (Stesen tutup/Close station)

- (Tiada data/No data)

NA (Tidak berkenaan/Not available)

Perairan di sekeliling 79 buah pulau telah dipantau dalam tahun 2018. Sebanyak 95 stesen telah dipantau dan dianalisis serta dilaporkan sebagai Indeks Kualiti Air Marin. Hasil analisis menunjukkan 82 stesen (86.32%) dikategorikan sebagai Terbaik, 8 stesen (8.42%) dikategorikan sebagai Baik, 5 stesen (5.26%) dikategorikan sebagai Sederhana dan tiada stesen dikategorikan sebagai Tercemar (**Rajah 4.3**).

The water bodies around 79 islands were monitored in 2018. A total of 95 island stations were monitored, analysed and reported as Marine Water Quality Index. The result indicated that 82 stations (86.32%) as *Excellent*, 8 stations (8.42%) as *Good*, 5 stations (5.26%) as *Moderate* and no station categorized as *Poor* (**Figure 4.3**).



Rajah 4.3 : Tren Status Kualiti Air Marin bagi Pulau, 2014-2018
Figure 4.3 : The Trend of Marine Water Quality Status for Island, 2014-2018

Jadual 4.6 : Status Kualiti Air Marin bagi Pulau
Table 4.6 : Marine Water Quality Status for Island

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Kedah	Pulau/Island	Singa Besar	7KR01	MMKR001	83	73	61	90	93	Terbaik/ Excellent
		Dayang Bunting	7KR02	MMKR002	89	71	60	91	93	Terbaik/ Excellent
		Dayang Bunting 2*	NA	MMKR003	-	-	-	93	93	Terbaik/ Excellent
		Pulau Perak	7KP01	MMRP001	-	72	56	94	94	Terbaik/ Excellent
		Payar	7KM03	MMKM001	79	73	75	91	94	Terbaik/ Excellent
		Kaca	7KM04	MMKM002	82	75	74	93	94	Terbaik/ Excellent
		Segantang	7KM06	MMKM003	84	75	70	91	94	Terbaik/ Excellent
		Pantai Kuah	7KD07	MMKD001	75	69	51	92	94	Terbaik/ Excellent
		Pantai Chenang	7KD09	MMKD002	86	73	63	74	82	Baik/Good
		Tanjung Rhu	7KD010	MMKD003	86	88	67	92	94	Terbaik/ Excellent
		Teluk Ewa	7KD08	MMKD004	67	74	74	92	94	Terbaik/ Excellent
		Lembu**	7KM05	NA	85	75	71	-	-	Stesen tutup/Close station
		Pasir*	NA	MMKP001	-	-	-	93	94	Terbaik/ Excellent
		Gasing*	NA	MMKP002	-	-	-	94	94	Terbaik/ Excellent
		Dangli*	NA	MMKP003	-	-	-	92	94	Terbaik/ Excellent
Pulau Pinang	Pulau/Island	Tanjung Tokong*	NA	MMPP001	-	-	-	63	66	Sederhana/ Moderate
		Batu Maung	7PD01	MMPD001	70	52	46	64	62	Sederhana/ Moderate
		Padang Kota	7PD04	MMPD002	51	47	82	52	65	Sederhana/ Moderate
		Teluk Bahang*	7PD03	MMPD003	-	-	-	61	82	Baik/Good
		Aman	7PR05	MMPR001	61	69	72	72	88	Baik/Good
		Jerejak	7PR06	MMPR002	54	68	46	57	65	Sederhana/ Moderate
		Kendi	7PR07	MMPR003	67	72	76	83	93	Terbaik/ Excellent
		Rimau	7PR08	MMPR004	61	72	51	85	93	Terbaik/ Excellent
		Gedong	7PR09	MMPR005	57	66	71	63	86	Baik/Good
Perak	Pulau/Island	Pantai Teluk Gedong	7AR01	MMAR001	70	68	56	85	92	Terbaik/ Excellent
		Pantai Puteri Dewi	7AR02	MMAR002	50	68	79	92	94	Terbaik/ Excellent
		Pangkor Laut	7AR03	MMAR003	66	63	52	89	92	Terbaik/ Excellent

Jadual 4.6 : Status Kualiti Air Marin bagi Pulau
Table 4.6 : Marine Water Quality Status for Island

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Perak	Pulau/Island	Sembilan	7AR04	MMAR004	70	63	58	93	94	Terbaik/ Excellent
		Tukun Perak	7AP05	MMAPO01	73	62	69	93	93	Terbaik/ Excellent
Selangor	Pulau/Island	Ketam	7BR01	MMBR001	93	54	93	88	89	Baik/Good
		Angsa	7BR02	MMBR002	93	59	88	85	92	Terbaik/ Excellent
		Lumut	7BR03	MMBR003	61	58	87	61	54	Sederhana/ Moderate
Negeri Sembilan	Pulau/Island	Arang	7NP01	MMNP001	92	94	97	68	92	Terbaik/ Excellent
Melaka	Pulau/Island	Upeh (Point A)	7MR02	MMMR001	60	56	58	65	85	Baik/Good
		Upeh (Point B)	7MR02	MMMR002	57	54	67	82	84	Baik/Good
		Besar (Point A)	7MR01	MMMR003	64	62	70	89	94	Terbaik/ Excellent
		Besar (Point B)	7MR01	MMMR004	58	56	70	90	93	Terbaik/ Excellent
		Undan (Point A)	7MR03	MMMR005	58	54	77	90	94	Terbaik/ Excellent
		Undan (Point B)	7MR03	MMMR006	71	56	61	90	94	Terbaik/ Excellent
Johor	Pulau/Island	Setindan	7JR01	MMJR001	88	89	89	94	94	Terbaik/ Excellent
		Babi Tengah	7JR02	MMJR002	89	89	89	94	94	Terbaik/ Excellent
		Dayang	7JM03	MMJM001	88	90	88	94	94	Terbaik/ Excellent
		Nanga Besar	7JM08	MMJM002	87	89	90	94	94	Terbaik/ Excellent
		Sibu Tengah	7JM11	MMJM003	88	89	88	94	94	Terbaik/ Excellent
		Pemanggil	7JM15	MMJM004	88	89	90	94	94	Terbaik/ Excellent
		Kukup	7JP17	MMJP001	81	87	83	91	87	Baik/Good
		Pisang	7JP18	MMJP002	87	89	86	93	93	Terbaik/ Excellent
Pahang	Pulau/Island	Tioman (Teluk Salang)	7CM02	MMCM001	85	76	78	92	94	Terbaik/ Excellent
		Tioman (Kg. Nipah)	7CM01	MMCM002	85	83	85	94	94	Terbaik/ Excellent
		Tulai	7CM05	MMCM003	84	88	85	93	94	Terbaik/ Excellent
		Labas	7CM07	MMCM004	86	85	86	93	94	Terbaik/ Excellent
		Cebah	7CM04	MMCM005	85	85	85	94	94	Terbaik/ Excellent
		Sepui	7CM06	MMCM006	85	79	83	93	94	Terbaik/ Excellent
		Sembilang	7CM08	MMCM007	85	58	75	93	94	Terbaik/ Excellent

Jadual 4.6 : Status Kualiti Air Marin bagi Pulau
Table 4.6 : Marine Water Quality Status for Island

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Pahang	Pulau/Island	Seri Buat	7CM03	MMCM008	86	57	84	94	94	Terbaik/ Excellent
		Tokong Bahara	7CM09	MMCM009	85	75	86	93	94	Terbaik/ Excellent
Terengganu	Pulau/Island	Gemia	7TR01	MMTR001	66	58	64	89	94	Terbaik/ Excellent
		Perhentian Besar (South)	7TM04	MMTM001	69	59	63	89	94	Terbaik/ Excellent
		Perhentian Besar (West)	7TM05	MMTM002	69	57	62	90	94	Terbaik/ Excellent
		Perhentian Kecil	7TM06	MMTM003	70	59	61	90	94	Terbaik/ Excellent
		Redang (North)	7TM07	MMTM004	72	58	78	90	94	Terbaik/ Excellent
		Redang (South)	7TM08	MMTM005	72	58	64	89	94	Terbaik/ Excellent
		Lang Tengah	7TM11	MMTM006	69	71	64	90	94	Terbaik/ Excellent
		Pinang	7TM12	MMTM007	71	59	63	90	94	Terbaik/ Excellent
		Ekor Tebu	7TM13	MMTM008	69	60	63	90	94	Terbaik/ Excellent
		Lima	7TM14	MMTM009	73	59	64	90	94	Terbaik/ Excellent
		Kapas	7TP16	MMTM010	67	58	76	90	93	Terbaik/ Excellent
Kelantan	Pulau/Island	Panjang	7DP01	MMDP001	67	65	66	88	93	Terbaik/ Excellent
		Kundur	7DP02	MMDP002	70	63	65	89	93	Terbaik/ Excellent
Sarawak	Pulau/Island	Satang	7QP01	MMQP001	83	75	90	87	90	Terbaik/ Excellent
		Talang-Talang Kecil	7QP02	MMQP002	84	87	77	87	91	Terbaik/ Excellent
		Talang-Talang Besar	7QP03	MMQP003	84	90	91	87	90	Terbaik/ Excellent
Sabah	Pulau/Island	Gaya	7SR01	MMSR001	81	85	85	73	93	Terbaik/ Excellent
		Mabul	7SR03	MMSR002	53	71	82	87	93	Terbaik/ Excellent
		Sipadan (N)	7SR04	MMSR003	58	70	84	88	93	Terbaik/ Excellent
		Sipadan (W)	7SR05	MMSR004	79	70	80	85	93	Terbaik/ Excellent
		Manukan	7SM09	MMSR005	80	84	82	70	93	Terbaik/ Excellent
		Tiga	7SR10	MMSR006	81	82	84	85	92	Terbaik/ Excellent
		Kapalai	7SR12	MMSR007	81	70	85	85	93	Terbaik/ Excellent
		Molleangan Besar	7SR14	MMSR008	79	83	83	88	93	Terbaik/ Excellent
		Banggi (South)	7SR15	MMSR009	76	82	84	87	93	Terbaik/ Excellent
		Banggi (East)	7SR20	MMSR010	79	83	83	88	93	Terbaik/ Excellent

Jadual 4.6 : Status Kualiti Air Marin bagi Pulau
Table 4.6 : Marine Water Quality Status for Island

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/NEW STATION NUMBER	NILAI IKAM/MWQI VALUE					KATEGORI (2018)/ CATEGORY (2018)
					2014	2015	2016	2017	2018	
Sabah	Pulau/Island	Balambangan	7SR16	MMSR011	77	84	83	88	93	Terbaik/ Excellent
		Mantanani Besar	7SR21	MMSR012	83	82	83	85	93	Terbaik/ Excellent
		Sapi	7SM08	MMSM001	81	84	84	72	93	Terbaik/ Excellent
		Kalampunian Besar	7SM11	MMSM002	84	83	81	86	93	Terbaik/ Excellent
		Selingan	7SP17	MMSP001	55	66	84	89	93	Terbaik/ Excellent
		Gulisan	7SP18	MMSP002	59	87	85	89	93	Terbaik/ Excellent
		Bakungan Kecil	7SP19	MMSP003	54	50	83	87	93	Terbaik/ Excellent
Labuan	Pulau/Island	Kuraman	7LM05	MMLM001	97	68	73	89	93	Terbaik/ Excellent
		Rusukan Besar	7LM07	MMLM002	94	66	50	91	93	Terbaik/ Excellent
		Rusukan Kecil	7LM06	MMLM003	93	66	50	90	92	Terbaik/ Excellent
		Pohon Batu	7LD01	MMLD001	97	67	67	63	92	Terbaik/ Excellent
		Water Front	7LD02	MMLD002	97	64	76	66	92	Terbaik/ Excellent
		Lubuk Temiang	7LD03	MMLD003	97	65	74	72	92	Terbaik/ Excellent
		Ranca-Ranca	7LD04	MMLD004	91	66	52	91	92	Terbaik/ Excellent

Nota/Note:

* (Stesen baru/New station)

** (Stesen tutup/Close station)

- (Tiada data/No data)

NA (Tidak berkenaan/Not available)



Jadual 4.7 : Stesen Marin dalam Kategori Tercemar dan Peratusan Sub-Indeks Mengikut Parameter
Table 4.7 : Marine Stations in Poor Category and Sub-Index Percentages by Parameter

NEGERI/ STATE	KLASIFIKASI STESEN/STATION CLASSIFICATION	KAWASAN/ AREA	NOMBOR STESEN LAMA/OLD STATION NUMBER	NOMBOR STESEN BARU/ NEW STATION NUMBER	NILAI IKAM/ MWQI VALUE	KATEGORI (2018)/ CATEGORY (2018)	PERATUSAN SUB-INDEKS/SUB-INDEX PERCENTAGES (%)						
					2018		OKSIGEN TERLARUT/ DISSOLVED OXYGEN	AMONIA (TIDAK TERION)/ AMMONIA (UNIONIZED)	FAECAL COLIFORM	JUMLAH PEPEJAL TERAMPAL/ TOTAL SUSPENDED SOLID	MINYAK DAN GRIS/ OIL AND GREASE	NITRAT/ NITRATE	FOSFAT/ PHOSPHATE
P.Pinang	Kuala/Estuary	Kuala Sungai Juru	5303904	MMPE002	47	Tercemar/ Poor	44	89	10	89	79	84	19
		Kuala Sungai Tengah	5204935	MMPE006	37	Tercemar/ Poor	10	96	10	89	79	81	36
Selangor	Kuala/Estuary	Kuala Sungai Klang	3013909	MMBE005	37	Tercemar/ Poor	10	92	10	86	79	86	39
		Kuala Sungai Langat (Lumut)	2913903	MMBE006	39	Tercemar/ Poor	10	97	10	90	79	74	63
Johor	Kuala/Estuary	Kuala Sungai Segget	1437919	MMJE001	32	Tercemar/ Poor	10	90	10	94	79	43	20

Jadual 4.7 menunjukkan sebanyak 5 stesen daripada 85 stesen kuala dikategorikan sebagai stesen tercemar pada tahun 2018. Pulau Pinang dan Selangor masing-masing merekodkan 2 stesen kuala yang tercemar manakala Johor merekodkan 1 stesen kuala yang tercemar dengan julat Indeks Kualiti Air Marin (IKAM) dari 32-47. Parameter oksigen terlarut (DO), faecal coliform (FC) dan fosfat (PO₄) adalah parameter utama yang telah memberi kesan terhadap nilai IKAM bagi kelima-lima stesen kuala tersebut. Selain itu, parameter nitrat (NO₃) juga didapati meningkat bagi stesen Kuala Sungai Segget di Johor dan Kuala Sungai Langat (Lumut) di Selangor. Manakala parameter minyak dan gris (O&G) kurang memberikan kesan pada nilai IKAM di stesen dalam rangkaian pengawasan kualiti air marin disebabkan oleh nilai bacaan / keputusan analisis kimia sering dilaporkan pada limit of reporting (LoR) iaitu had pelaporan yang paling minimum bagi analisis parameter O&G di makmal. Kesimpulannya, penurunan kualiti air marin di stesen kuala didapati dipengaruhi oleh pencemar nutrien yang berpunca daripada aktiviti kumbahan atau pertanian di daratan dan juga dipengaruhi oleh corak peredaran air yang turut menyumbang pada sifat dinamik perairan ini berbanding stesen-stesen jenis pantai dan pulau.

Table 4.7 shows that 5 stations out of 85 stations were categorized as polluted stations in 2018. Penang and Selangor recorded 2 polluted stations while Johor recorded 1 polluted station with a Marine Water Quality Index (IKAM) of 32 -47. The dissolved oxygen (DO), faecal coliform (FC) and phosphate (PO₄) are the main parameters that have affected the value of the IKAM for all five power stations. In addition, nitrate (NO₃) were also found in the Kuala Sungai Segget stations in Johor and Kuala Sungai Langat (Lumut) in Selangor. Whereas oil and grease (O&G) parameters have a slight impact on the value of IKAM at stations in marine water quality monitoring networks due to the readings / results of chemical analysis are reported in the limit of reporting (LoR) which is the minimum reporting limit for O&G parameter analysis in laboratory.

In conclusion, the decline in marine water quality at kuala stations was found to be influenced by nutrients contaminated by landfill or agricultural activities inland and also influenced by the water circulation pattern which also contributes to the dynamic nature of these waters compared to coastal and island type stations.

STATUS STESEN-STESEN KUALITI AIR MARIN

Jadual 4.8 dan Jadual 4.9 menunjukkan senarai stesen Pantai dan Kuala yang mencapai kategori Terbaik bagi tahun 2018.

STATUS OF MARINE WATER QUALITY STATIONS

Table 4.8 and Table 4.9 show the list of coastal and estuaries stations that indicated the *Excellent* Category in 2018.

Jadual 4.8 : Senarai Pantai Terbaik, 2018
Table 4.8 : List of Excellent Coastal, 2018

BIL/NO	NEGERI/STATE	KAWASAN/AREA
1	Terengganu	Pantai Kelului
2	Terengganu	Pantai Teluk Ketapang
3	Terengganu	KIPC Utara
4	Terengganu	Pantai Rhu 10
5	Terengganu	Pantai Tanjung Bidara
6	Terengganu	Pantai Teluk Kalong
7	Johor	Pantai Desaru
8	Terengganu	Pantai Kuala Abang
9	Johor	Pantai Sri Pantai
10	Terengganu	Pantai Rantau Abang

Jadual 4.9 : Senarai Kuala Kategori Terbaik, 2018
Table 4.9 : List of Excellent Estuaries, 2018

BIL/NO	NEGERI/STATE	KAWASAN/AREA
1	Terengganu	Tioxide Utara (Kg. Bukit Kuang, Kijal)
2	Terengganu	Kuala Sungai Paka
3	Terengganu	Tioxide Tengah (Pupuk Semangat, Kijal)
4	Pahang	Kuala Nenasi*
5	Terengganu	Kuala Sungai Kemaman / Chukai
6	Terengganu	Tioxide Selatan (KSB, T. Kalong)
7	Terengganu	Kuala Sungai Setiu
8	Terengganu	Kuala Sungai Ibai
9	Pahang	Kuala Rompin Kecil
10	Terengganu	Kuala Sungai Kerteh

Stesen Pulau yang mencapai Kategori Terbaik bagi tahun 2018 adalah seperti di Jadual **4.10**.

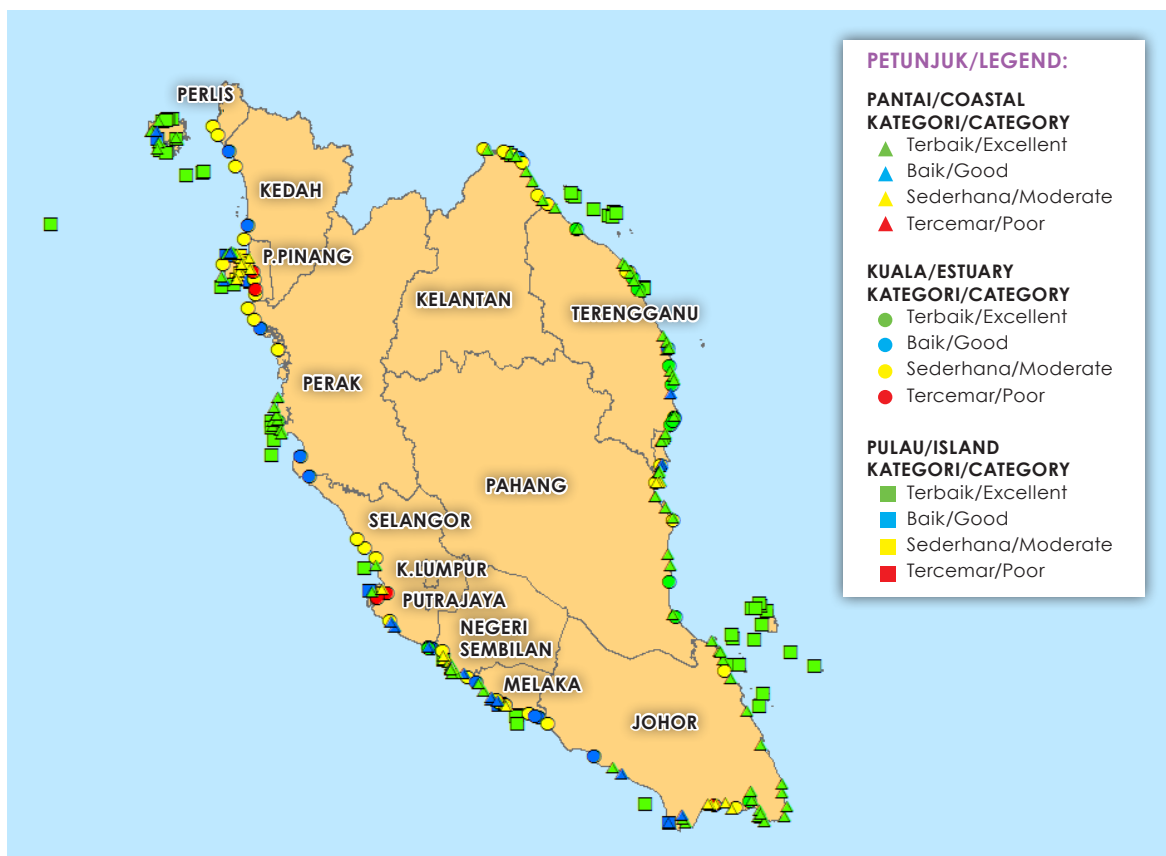
The islands that achieved the Excellent Category for Marine Water Quality Index in 2018 are listed in **Table 4.10**.

Jadual 4.10 : Senarai Pulau Terbaik, 2018
Table 4.10 : List of Excellent Islands, 2018

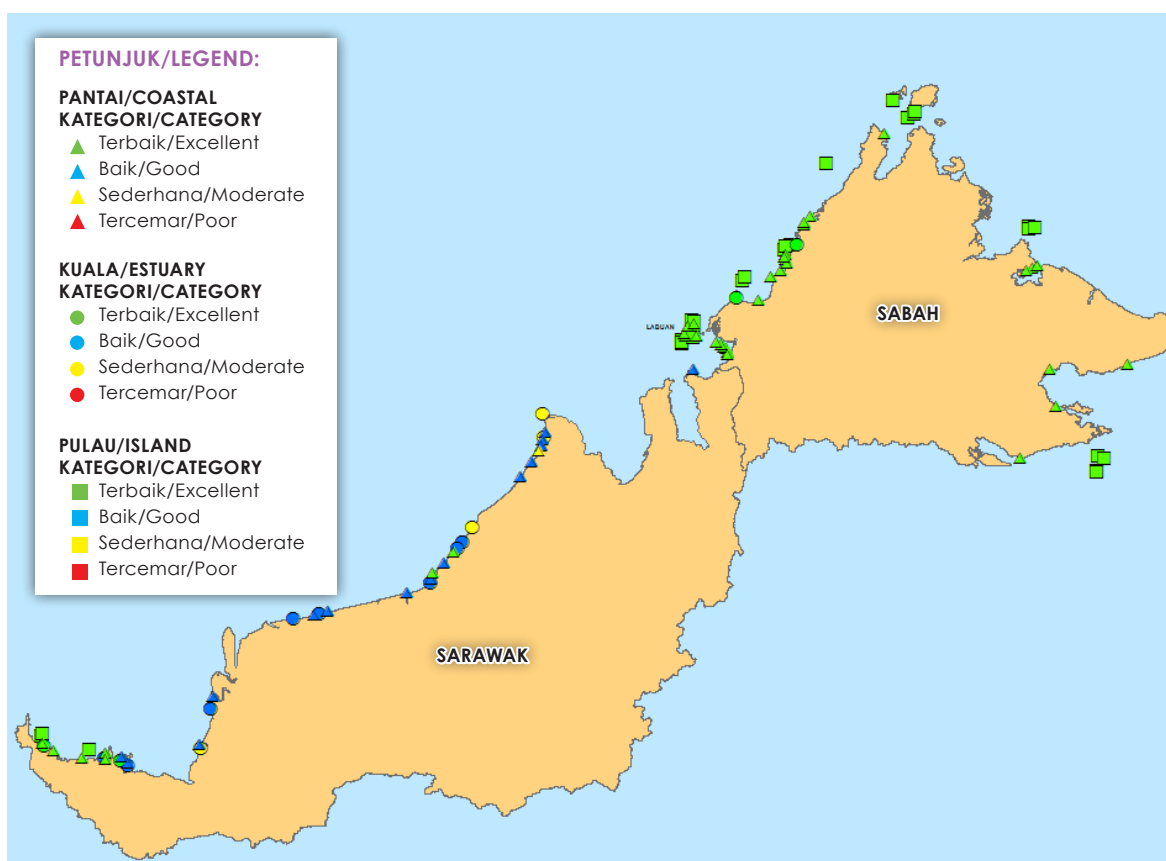
BIL/NO	NEGERI/STATE	KAWASAN/AREA
1	Terengganu	Gemia
2	Terengganu	Lima
3	Terengganu	Pinang
4	Terengganu	Ekor Tebu
5	Pahang	Tioman (Kg. Nipah)
6	Pahang	Tioman (Teluk Salang)
7	Pahang	Sembilang
8	Terengganu	Lang Tengah
9	Pahang	Labas
10	Pahang	Cebah



Peta : Semenanjung Malaysia : Lokasi Stesen Pengawasan Kualiti Air Marin
Map : Peninsular Malaysia : Location of Marine Water Quality Stations



Peta : Sabah & Sarawak : Lokasi Stesen Pengawasan Kualiti Air Marin
Map : Sabah & Sarawak : Location of Marine Water Quality Stations



PENGAWASAN KUALITI AIR MARIN BERTERUSAN

Rangkaian Pengawasan Kualiti Air Marin Berterusan (CMWQM) ditubuhkan di bawah Program Pengawasan Kualiti Alam Sekitar (EQMP) beroperasi untuk menyediakan data kualiti air marin secara berterusan bagi mengesan sebarang pencemaran marin, pelepasan daratan menggunakan partikal organik terlarut dan *chlorophyll-a* sebagai petunjuk. Kemasinan, oksigen terlarut, suhu dan pH adalah proksi yang menunjukkan tahap kebersihan dan pengaruh air masin di stesen. CMWQM memantau dua (2) kuala di Santubong dan Tanjung Piai, lima (5) stesen pada Kelas 3 diletakkan di jeti, satu (1) stesen pada Kelas 2 pada 2018. Oksigen terlarut yang dipantau melalui CMWQM pada tahun 2018 antara julat 0.34% hingga 150.89%, manakala kemasinan, suhu, kekeruhan, konduktiviti, pH, jumlah pepejal terampai, *chlorophyll-a*, fDOM, *polycyclic aromatic hydrocarbons* dan *phycoerythrin* kepekatan masing-masing antara julat 16.4 ppt to 34.3 ppt, 25.8 °C to 34.5 °C, 0 NTU – 2848 NTU, 29.6 mS/cm – 58.9 mS/cm, 6.75 – 9.37, 0 – 1278 mg/L, 0 – 108 µg/L, 0 – 230 µg/L, 0 – 702 µg/L and 0 – 189.4 µg/L.

Kepekatan bagi kebanyakan parameter adalah pada tahap semulajadi (ambien) dengan mengambilkira potensi gangguan sedia ada di stesen yang ditetapkan. Antara parameter yang dipantau di bawah rangkaian CMWQM, tiga (3) parameter yang disenaraikan di bawah Standard dan Kriteria Kualiti Air Marin Malaysia iaitu oksigen terlarut, jumlah pepejal terampai dan *polycyclic aromatic hydrocarbons*. Pada tahun 2018, semua stesen CMWQM telah memenuhi piawai pematuhan 99%. Jumlah pepejal terampai dan *polycyclic aromatic hydrocarbons* meningkat secara

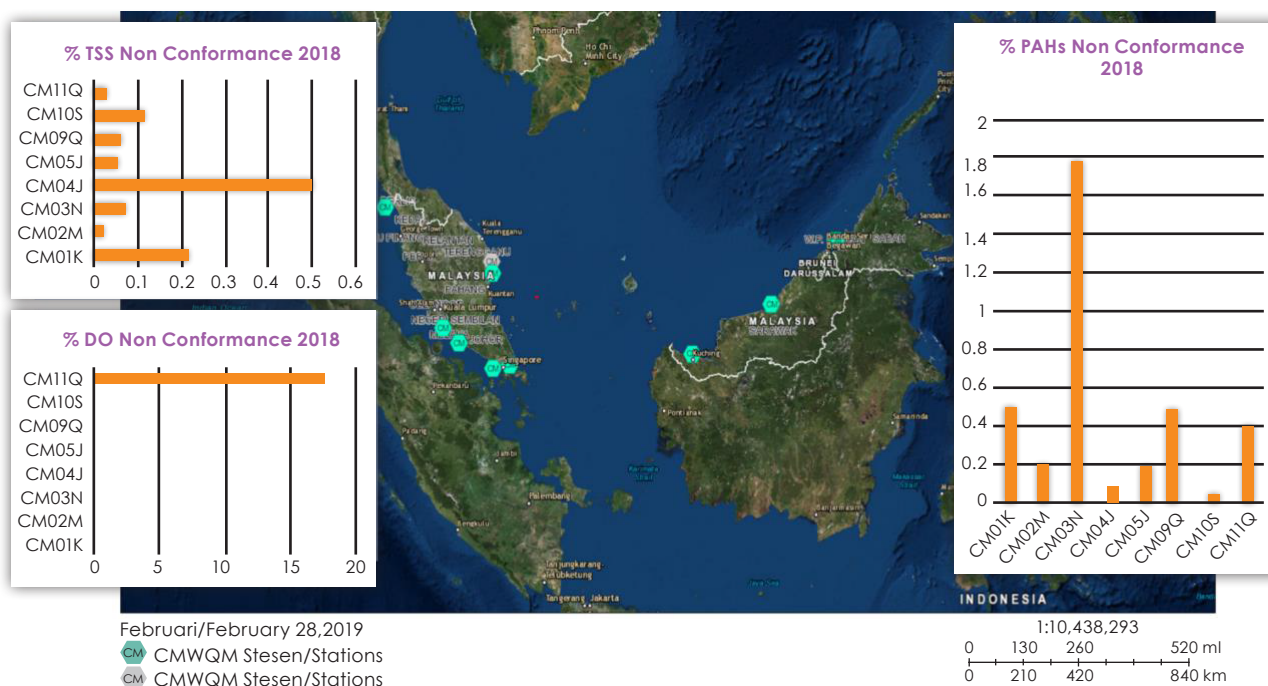
CONTINUOUS MARINE WATER QUALITY MONITORING

The Continuous Marine Water Quality Monitoring (CMWQM) network has been established under Environmental Quality Monitoring Programme (EQMP) to provide continuous marine water quality data to detect marine pollution and potential land-based discharges using dissolved organic matter and chlorophyll-a as indicator. Salinity, dissolved oxygen, temperature and pH are parameters that reflect the influences of freshwater and seawater at the station. CMWQM monitored two (2) river estuaries at Santubong and Tanjung Piai and five (5) Class 3 stations mainly at Jetties and One (1) Class 2 Station in 2018. The dissolved oxygen monitored under the CMWQM network in 2018 was ranging from 0.34% to 150.89% while salinity, temperature, turbidity, conductivity, pH, total suspended solid, chlorophyll-a, fDOM, polycyclic aromatic hydrocarbons and phycoerythrin concentration was ranging from 16.4 ppt to 34.3 ppt, 25.8 °C to 34.5 °C, 0 NTU – 2848 NTU, 29.6 mS/cm – 58.9 mS/cm, 6.75 – 9.37, 0 – 1278 mg/L, 0 – 108 µg/L, 0 – 230 µg/L, 0 – 702 µg/L and 0 – 189.4 µg/L, respectively.

Concentration for most of the parameters recorded at the stations were typical of the nature taking into account of the potential disturbance within the designated area. Among the parameters monitored under the CMWQM network, three (3) are listed under the Malaysia Marine Water Quality Standards and Criteria; i.e. dissolved oxygen, total suspended solids and polycyclic aromatic hydrocarbons. In 2018, all the parameters monitored the CMWQM stations met the stipulated standards with more than 99% compliance. Total suspended solid and polycyclic aromatic hydrocarbons spiked occasionally; most of these

berkala, kebanyakan yang meningkat disebabkan aktiviti kapal dan maritim yang berdekatan. Keadaan jangka pendek dan jarang berlaku ini tidak menyebabkan impak yang teruk kepada ekosistem marin. CM01K di Langkawi, CM05J di Tanjung Pengelih, CM09Q di Pelabuhan Bintulu, CM11Q di Santubong dan ke tahap yang lebih rendah, CM04J di Tanjung Piai menerima impak dari pelepasan di pantai manakala CM02M dan CM03N kurang dipengaruhi oleh pelepasan dari daratan. Pada tahun 2018 juga, terdapat tiga (3) amaran pencemaran yang dikesan di stesen CM02M dan CM03N. CM03N mengeluarkan amaran dua (2) kali disebabkan oleh PAHs pada tahun 2018. Status kualiti air marin yang dipantau di bawah CMWQM pada tahun 2018 dilihat sebagai baik.

spiked were due to the nearby vessel and maritime activities. These short and sparse exceedances were not causing acute impacts on the marine ecosystem. CM01K at Langkawi, CM05J at Tanjung Pengelih, CM09Q at Bintulu Port, CM11Q at Santubong river estuary and to a lesser extent, CM04J at Tanjung Piai were receiving the impacts from the coastal discharges while CM02M and CM03N were less impacted by land base discharge. In 2018, there were three (3) alerts triggered by PAHs in CM02M and CM03N. There were two (2) alert at CM03N due to PAHs in 2018. The status of the marine water quality monitored under the CMWQM network in 2018 is regarded as good.



Rajah 4.4 : Peratusan Ketidakpatuhan Parameter Berbanding dengan Standard Kualiti Air Marin Malaysia di setiap Stesen.

Figure 4.4 : Percentage of Non-Conformance Parameters Compared with Malaysia Marine Water Quality Standard by Station.

Peta : Semenanjung Malaysia : Lokasi Stesen Pengawasan Kualiti Air Marin Berterusan
Map : Peninsular Malaysia : Location of Continuous Marine Water Quality Monitoring Stations



Peta : Sabah & Sarawak : Lokasi Stesen Pengawasan Kualiti Air Marin Berterusan
Map : Sabah & Sarawak : Location of Continuous Marine Water Quality Monitoring Stations

