Table S1: Average values of environmental parameters and their significance variability in temporal and spatial scales.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sites** | **Station****Code** | **aFine fraction****(%)** | **Sand****(%)** | **TOC****(%)** | **bDepth****(m)** | **Salinity****(%)** | **DO****(mg/L)** | **Description of stations** |
| **North** **Port** | **1** | 60.1 ± 10.4 | 39.9± 6.7 | 12.5± 1.3 | 15.2± 0.32 | 30.2 ± 1.5 | 6.23± 0.53 | **D** Liquid berth line (**c**D= 100 m) |
| **2** | 49.63 ± 8.7 | 50.36±6.2 | 10.13± 0.56 | 20.5±0.25 | 30.8 ±1.5 | 6.3± 0.43 | Middle part of strait (D= 1000 m) |
| **3** | 73.77±13.4 | 26.22± 3.2 | 17.04± 2.3 | 10.3±0.15 | 31.24 ± 1.7 | 6.1± 0.45 | Mangrove and mudflat (D=2000 m) |
| **4** | 59.78 ±7.8 | 40.21± 6.3 | 11.4± 1.2 | 13.5±0.28 | 30.81 ±1.82 | 6.2± 0.61 | Container berth (D=100 m) |
| **5** | 50.89±10.3 | 49.1± 4.5 | 10.08± .94 | 21.6±0. 24 | 31.2 ± 1.62 | 6.3± 0.34 | Middle part of strait (D= 1000 m) |
| **6** | 65.19 ±5.6 | 34.8± 2.6 | 14.71±1.45 | 11.2±0.3 | 31.3±1.7 | 6.03±0.23 | Mangrove and mudflat (D=2000 m) |
| **West** **Port** | **7** | 53.57 ± 3.4 | 46.42± 5.6 | 10.24± 0.88 | 12.5± 0.15 | 30.86±1.70 | 6.09±0.42 | Dry and cement factory outlets (D=100 m) |
| **8** | 45.96 ± 6.7 | 54.03± 3.2 | 7.7±1.3 | 19.5± 0.42 | 30.98±1.64 | 6.4±0.44 | Middle part of strait (D=500 m) |
| **9** | 63.42±10.2 | 36.57± 1.7 | 11.98± 1.4 | 7.8±0.37 | 30.86±1.44 | 5.9±0.32 | Mangrove and mudflat (D=1000 m) |
| **10** | 56.33 ± 5.6 | 43.66± 4.3 | 9.14± .98 | 13.3± 0.45 | 30.44±1.45 | 6.2±0.42 | Liquid berth and palm oil and food factories outlets D=100 m) |
| **11** | 41.1 ± 0.9 | 58.89± 2.3 | 7.55± 1.2 | 20.3± 0.35 | 30.58±1.47 | 6.3±0.28 | Middle part of strait (D=500 m) |
| **12** | 70.81 ±7.5 | 29.18± 1.2 | 12.8± 1.9 | 8.8± 0.3 | 30.75±1.48 | 6.07± 0.52 | Mangrove and mudflat (D=1000 m) |
| **13** | 52.31 ±4.3 | 47.68± 2.3 | 10.63±1.89 | 15.5±0.25 | 30.51± 1.47 | 6.3± 0.49 | Container berth (D=100 m) |
| **14** | 50.69 ± 3.2 | 49.3± 4.2 | 10.15±1.7 | 21.11± 0.3 | 30.63±1.44 | 6.4±0.6 | Middle part of strait (D=500 m) |
| **15** | 70.36 ±6.4 | 29.63± 3.4 | 15.5± 2.3 | 6.8± 0.4 | 30.77± 1.46 | 6.3±0.41 | Mangrove and mudflat (D=1000 m) |
| **South Port** | **16** | 95.39 ± 9.3 | 4.6±0.34 | 22.7± 2.8 | 7.5±0.25 | 26.1± 0.77 | 5.2±0.32 | Mouth of Klang River (D= 100 m) |
| **17** | 93.16 ± 4.6 | 6.83± 0.23 | 21.55± 2.67 | 10.5± 0.3 | 26.12± 0.8 | 5.2±0.29 | Mouth of Klang River (D= 1000 m) |
| **18** | 64.69 ± 5.4 | 35.3± 1.5 | 15.59± 3.4 | 12.4±0.42 | 30.11±1.29 | 6.04±0.55 | Semi-urban (D= 2000 m) |
| **19** | 69.5 ± 3.2 | 30.49± 1.2 | 13.8±2.5 | 10.3±0.35 | 29.45± 0.63 | 5.8±0.41 | Liquid berth (D= 100 m) |
| **20** | 69.72 ± 3.6 | 30.27±2.3 | 14.9±1.98 | 11.3±0.25 | 29.54± 1.07 | 5.8±0.47 | Mangrove (D= 1000 m) |
| **21** | 57.73 ± 2.4 | 42.26± 4.5 | 11.89± 0.67 | 10.4±0.30 | 30.5± 1.012 | 6.1±0.42 | Semi-urban (D= 2000 m) |
| **Control Point**  | **22** | 51.6 ±3.6 | 48.39± 3.8 | 10.5± 1.4 | 17.5± 0.4 | 31.38± 1.62 | 6.7±0.39 | Remote (22 km far from Klang Strait at the north side) |

**aSilt and clay (<64 µm)%, bMeter , c** Distance from berth Line, **D** It is liquid bulk terminal to load and unload palm oil and oil products,

Table S2: Characteristic trophic categories based on methodological indices, and ranges used for the ecological assessment

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| AMBI | M-AMABI | BENTIX | H' | Disturbance Classification |
| ≤ 1.2 | > 0.82 | 4.5 - 6 | >4.6 | Unpolluted |
| 1.2 - 3.3 | 0.62 - 0.82 | 3.5 - 4.5 | 4 - 4.6 | Slightly polluted |
| 3.3- 5 | 0.41-0.61 | 2.5 - 3.5 | 3- 4 | Moderately polluted |
| 5 - 6 | 0.2-0.4 | 2- 2.5 | 1.5- 3 | Heavily polluted |
| 6 - 7 | < 0.2 | Azoic | 0- 1.5 | Extremely polluted |

Table S3: the values of contamination factor (Cf) and contamination degree (Cd) at all stations in Klang Strait

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Station** |  **Cu, Cr and Zn**  | **Pb** | **As** | **Cd** | **Hg** | **TPH, PAH** |  |
| 1 | unpolluted | moderate | high | high | moderate | unpolluted | Moderate |
| 2 | unpolluted | moderate | high | high | moderate | unpolluted | Moderate |
| 3 | unpolluted | moderate | high | high | moderate | unpolluted | Moderate  |
| 4 | unpolluted | moderate | moderate | high | moderate | moderate | High |
| 5 | unpolluted | moderate | moderate | high | moderate | unpolluted | Moderate |
| 6 | unpolluted | moderate | moderate | high | moderate | unpolluted | Moderate |
| 7 | unpolluted | moderate | moderate | high |  moderate | unpolluted | Moderate |
| 8 | unpolluted | moderate | moderate | high | moderate | unpolluted | Moderate |
| 9 | unpolluted | moderate | high | high | moderate | unpolluted | Moderate |
| 10 | unpolluted | moderate | high | moderate | high | unpolluted | Moderate |
| 11 | unpolluted | moderate | moderate | moderate |  high | unpolluted | Moderate |
| 12 | unpolluted | moderate | moderate | high | high | unpolluted | Moderate |
| 13 | unpolluted | moderate | high | high | high | moderate | High |
| 14 | unpolluted | moderate | high | high | moderate | unpolluted | Moderate |
| 15 | unpolluted | moderate | high | high | high | unpolluted | Moderate |
| 16 | unpolluted | moderate | 3high | very high | high | moderate | High |
| 17 | unpolluted | moderate | high | very high | high | moderate | High |
| 18 | unpolluted | moderate | moderate | high | moderate | unpolluted | Moderate |
| 19 | unpolluted | moderate | moderate | high | moderate | unpolluted | Moderate |
| 20 | unpolluted | moderate | moderate | high | moderate | unpolluted | Moderate |
| 21 | unpolluted | moderate | moderate | high | moderate | unpolluted | Moderate |
| Total | unpolluted | moderate | high | high | moderate | unpolluted | Moderate |
| Asymp. Sig between stations (KW) | 0.00 | 0.001 | 0.00 | 0.00 | 0.00 | 0.001 | 0.00 |
| Asymp. Sig between seasons (KW) | Sig Cr: 0.062Sig Cu, Zn: 0.00 | 0.00 | 0.002 | 0.001 | 0.00 | 0.063 | 0.00 |
| \*\*Background level in Klang Strait (mg/kg dry weight) | Cu: 23.21Zn:144.22Cr: 53.71 | 39.8 | 18.79 | 0.186 | 0.08 | TPH: 10 |  |

 This contamination factor was ranged as low, moderate , considerable, and very high. The contamination degree was estimated based on the sum of all contamination factors. The specific terminology is used to describe the contamination degree of sediment—low contamination degree, moderate contamination degree, considerable contamination degree, and a very high contamination degree; \*\* Back ground value was estimated based on the previous studies from 1196 until 2007: The concentrations of heavy metals were compared with their background values to estimate their contamination factor at different stations, while concentration of PAHs and TPHs were compared with threshold effect level (TEL) because there were no suffusion data in previous studies to estimate their background values.

**Table S4:** Concentration of heavy metals (mg/kg dry weight % ) in different medias ([Bowen, 1966](#_ENREF_39); [J.W Farrington, Davis, Tripp, Phelps, & Galloway, 1987](#_ENREF_109); [Pawlisz, Kent, Schneider, & Jefferson, 1997](#_ENREF_272))

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Metals | Igneous rocks | Soil | Sea water | Marine sediment | Mussel |
| Cd | 0.2 | 0.06 | 0.00011 | 1.1 | 1 |
| Cr | 100 | 100 | 0.00005 | 31 | 1 |
| Cu | 55 | 20 | 0.003 | 25 | 20 |
| Hg | 0.08 | 0.03-0.8 | 0.00003 | 0.1 | 0.5 |
| As | 1.8 | 6 | 0.003 | 4.2 | 1.4 |
| Pb | 12.5 | 10 | 0.0003 | 23 | 2 |
| Zn | 70 | 50 | 0.01 | 65 | 70 |



**Figure 2S:** Relationship between the organic content and N-content in the Klang Strait