

ECO-Bulk Cargo Ecosystem

2023

What is Bauxite?

Bauxite is a sedimentary rock with a relatively high aluminium content. In fact, bauxite is the primary ore of aluminum, which is converted to the metal via a wet-chemical caustic digestion process known as the Bayer process [1].

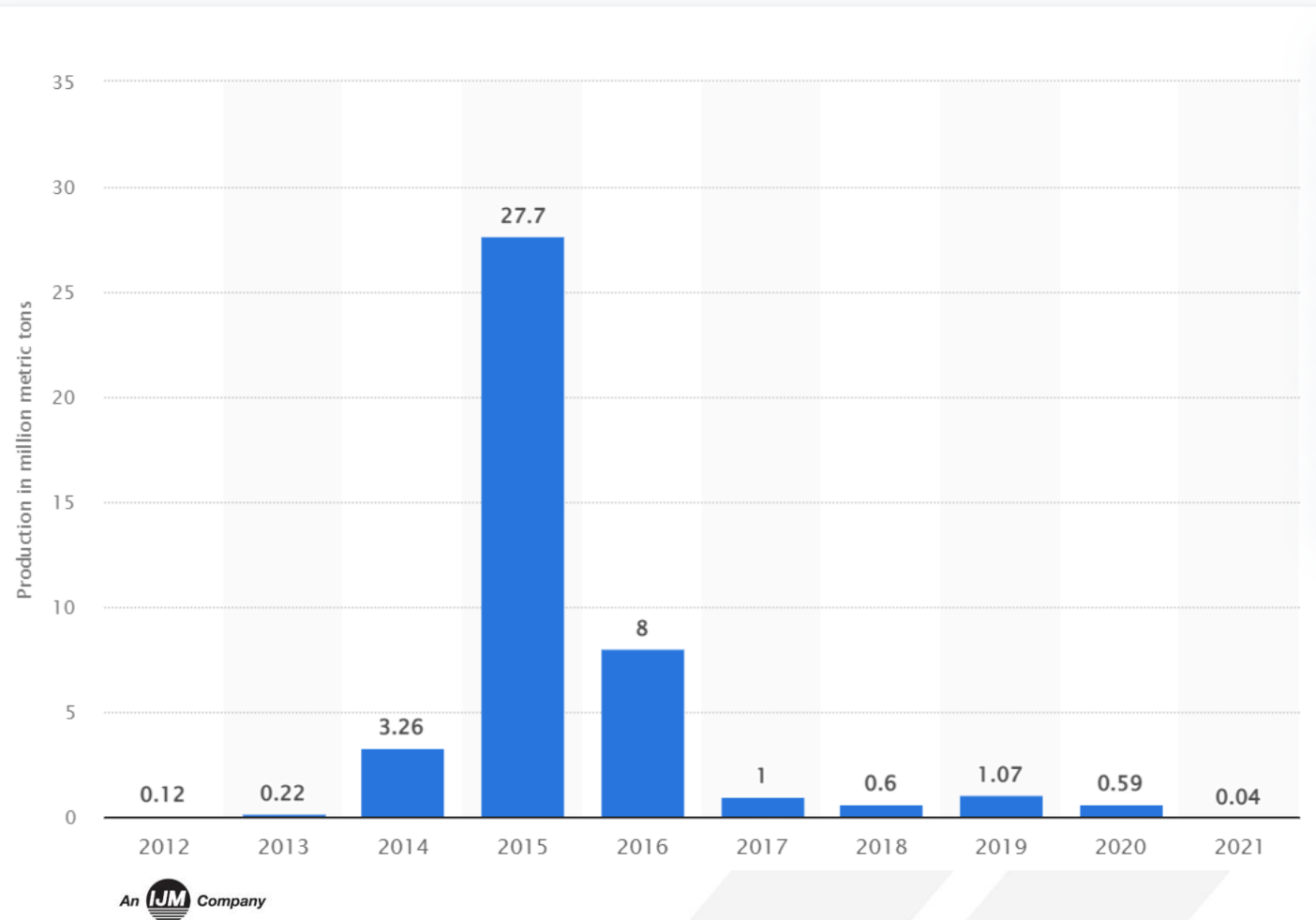


[1] Kuan, S.H et. al. 2020. Narrowing the Gap between Local Standards and Global Best Practices in Bauxite Mining: A Case Study in Malaysia. Resources Policy 66: 1-11.

Production of bauxite in Malaysia from 2012 to 2021

(in million metric tons)

- After the ban, China's imports from Malaysia surged from just 208,770 tonnes in 2013 to 962,799 tonnes in 2014.
- The momentum continued to build up with shipments from Malaysia to China recording an unprecedented volume of **27.7 million tonnes** in the year 2015.



Back in 2014-2016

- Over half of the world's primary aluminium demand and alumina production is currently being accounted by China and the trend is estimated to continue until year 2030 [2].
- China's major bauxite supply predominantly comes from Indonesia, Australia and India. In 2014, Indonesia banned its national export of bauxite and nickel in order to boost domestic smelting.
- This led China to suffer low bauxite supply to meet its national aluminium production demand. Consequently, mining companies in the region began prospecting in Kuantan, Malaysia where bauxite of a lower grade than those available in Indonesia and Australia could be found.
- This led to mining activities in Balok and Bukit Goh, Kuantan where ores were excavated and crushed. Haul trucks subsequently carried the ore to the Kuantan Port for storage before being shipped to China.

[2] International Aluminium Institute (IAI), 2018

Back in 2014-2016



Mining activities in Balok and Bukit Goh, Kuantan



Kuantan Port



An IJM Company



Back in 2014-2016



Red-coloured dust from the ore covered cars, roads and trees in the area.



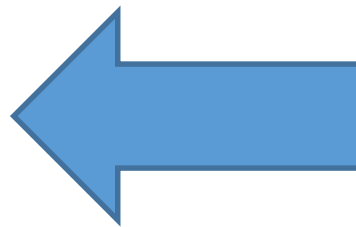
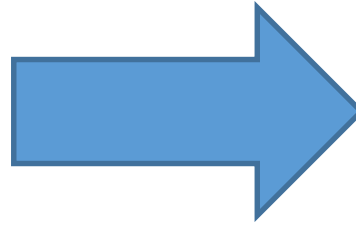
What is the environmental consequences?



River and sea are contaminated due to red residues from bauxite deposited into the waters nearby Kuantan area.



How is bauxite handled in Kuantan Port back then?



What do the authorities says about this issue?



Bauxite mining ban extended 3 more months

MINISTERIAL BRIEF

JULY 15: Cabinet gave miners time to clear stocks, head new call

MINISTERIAL BRIEF

The Minister of Natural Resources and Environmental Conservation, Datuk Seri Dr. Ahmad Zahid Hamidi, today announced that the government has decided to extend the moratorium on bauxite mining for another three months, until October 15, 2016.



Dr. Ahmad Zahid Hamidi today announced that the government has decided to extend the moratorium on bauxite mining for another three months, until October 15, 2016.

- On January 15, 2016, the authorities enforced a moratorium (temporary ban) on bauxite mining.
- The moratorium is extended for an astonishing nine times which span a period of 3 years.
- Finally, in April 2019, the Ministry of Water, Land and Natural Resources of Malaysia announced that there would be no further extension and mining could resume with new standard operating procedures (SOP).

Moratorium on bauxite mining extended

By JOURNALIST
Reporting from Kuantan

KUANTAN The moratorium on bauxite mining in Pahang has been extended for another three months, until October 15, 2016, the Minister of Natural Resources and Environmental Conservation, Datuk Seri Dr. Ahmad Zahid Hamidi, today announced.



Red earth in the ground during bauxite mining operations in Kuantan. (Photo: Datuk Seri Dr. Ahmad Zahid Hamidi)

The moratorium was first imposed in January 2016, following a court order that the government must ensure that the mining activities do not cause any harm to the environment.

Dr. Ahmad Zahid Hamidi said that the government will continue to monitor the situation and will extend the moratorium if necessary.

Strict rules to regulate bauxite mining

PROTECTION: Measures will allow Kuantan to recover, says minister



BY JOURNALIST
Reporting from Kuantan

Strict rules will be implemented to regulate bauxite mining in Kuantan, the Minister of Natural Resources and Environmental Conservation, Datuk Seri Dr. Ahmad Zahid Hamidi, today announced.

The moratorium was first imposed in January 2016, following a court order that the government must ensure that the mining activities do not cause any harm to the environment.

Then, what did Kuantan Port do to improve?



Moving Forward From 'Red' to GREEN Port

Layout of equipments involved.



Legend:

ITEM 1 : 4.9 acres dedicated Main Stockyard for bauxite cargo



This zone only dedicated for dry bulk cargo and is **separated** with other cargoes. This is to ensure that dust and pollutant from dry bulk cargo are controlled in this zone.

Legend:

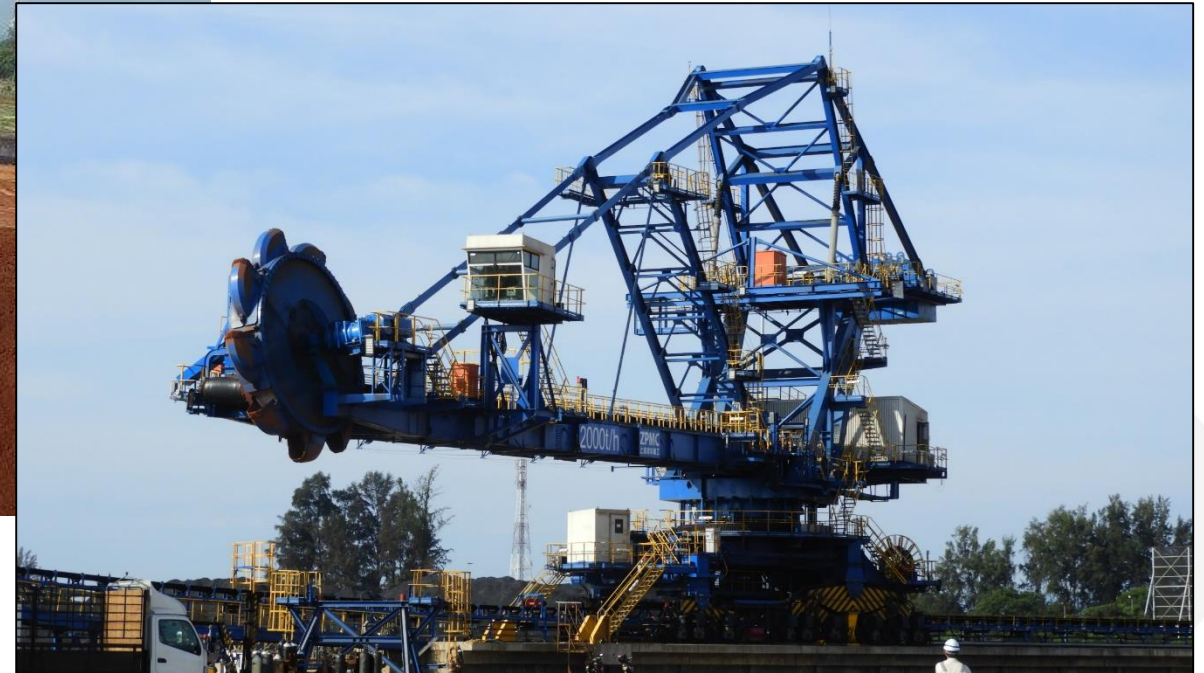
ITEM 2 : 400 meters length and 18 meters height Airborne Dust Barrier Fences



Airborne Dust Barrier Fences prevent dust from escaping the dry bulk zone

Legend:

ITEM 3 : 2000 tons per hour (TPH) rated capacity Reclaimer



Reclaimer helps reducing the number of lorries at berth and promotes **carbon emission reduction**

Legend:

ITEM 4 : Waste Water Treatment Plant (WWTP) and Washing Bays



Waste water from Main Stockyard and truck wash residue are channeled here to be treated with special treatment and reuse for operational purposes. This helps in **maintaining water quality** around the port and promotes **carbon emission reduction** by efficient usage of water

Legend:

ITEM 5 : 2000 tons per hour of Ship Loader System



The Ship Loader System prevents the airborne dust from **escaping** into the air by loading cargoes direct into the ship's hatch

Legend:

ITEM 6 : 805 meters of Conveyor Belt System



Conveyor Belt System helps in reducing the congestion of lorries in port and promotes **carbon emission reduction**

Legend:

ITEM 7 : 1400 meters long Perimeter Drain



Waste water from Main Stockyard are **channeled to the Waste Water Treatment Plant** to be treated and reuse for operational purposes

Portable Dust Prevention Equipment : Fog Cannon



Fog Cannon is used to prevent dust from escaping into the air by **blasting water mist** during cargo operation. Dust mixed with water droplets become heavy and fall to the ground

Road Cleaning Equipment : Double Layer Road Sweeper



Double Layer Road Sweeper is two Road Sweeper Truck operate simultaneously to clean excess dust on the road



Water Quality Monitoring By Department of Environment, Malaysia



What are the differences and the benefits?

1. Cargos are not piled up on the wharf. Wharf is **clean**.
2. Direct loading of bauxite into the ship's hatch. No residual cargoes **spilled** onto the road or wharf. **Reduce congestion** of lorries at wharf and promotes **carbon emission reduction**.
3. **Reduced air pollution** with the installation of the Airborne Dust Barrier Fences.
4. **Elimination of water pollution** to the sea as cargo is stockpiled at the main stockyard and **efficient usage of water** by using Waste Water Treatment System.
5. **Increased productivity** as rated capacity of Reclaimer is 2000TPH, **reducing loading period** per ship to 3 days. This helps in **reducing carbon emission** by ship in port.

How is the quality of the air at Kuantan Port?

Month	PM10 (µg/m3)	Malaysian Air Quality Standard, 2020 (µg/m3)
Jan-19	33	100
Feb-19	40	100
Mar-19	42	100
Apr-19	48	100
May-19	35	100
Jun-19	38	100
Jul-19	43	100
Aug-19	23	100
Sep-19	42	100
Oct-19	46	100
Nov-19	53	100
Dec-19	89	100

2019

Month	PM10 (µg/m3)	Malaysian Air Quality Standard, 2020 (µg/m3)
Jan-20	33	100
Feb-20	63	100
Mar-20	60	100
Apr-20	23	100
May-20	30	100
Jun-20	22	100
Jul-20	18	100
Aug-20	28	100
Sep-20	25	100
Oct-20	35	100
Nov-20	28	100
Dec-20	30	100

2020

Month	PM10 (µg/m3)	Malaysian Air Quality Standard, 2020 (µg/m3)
Jan-20	16	100
Feb-20	36	100
Mar-20	22	100
Apr-20	23	100
May-20	20	100
Jun-20	21	100
Jul-20	31	100
Aug-20	27	100
Sep-20	22	100
Oct-20	28	100
Nov-20	37	100
Dec-20	30	100

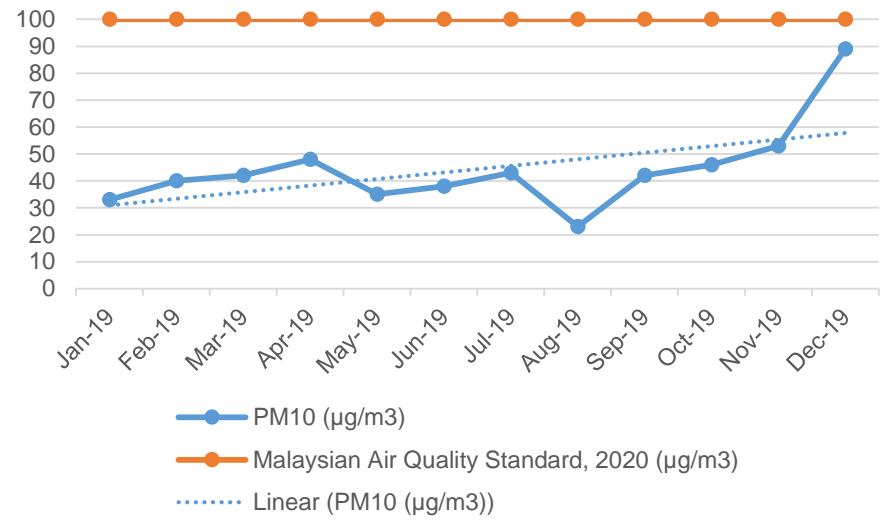
2021

Source: Air Quality Monitoring Station, Department of Environment, Malaysia

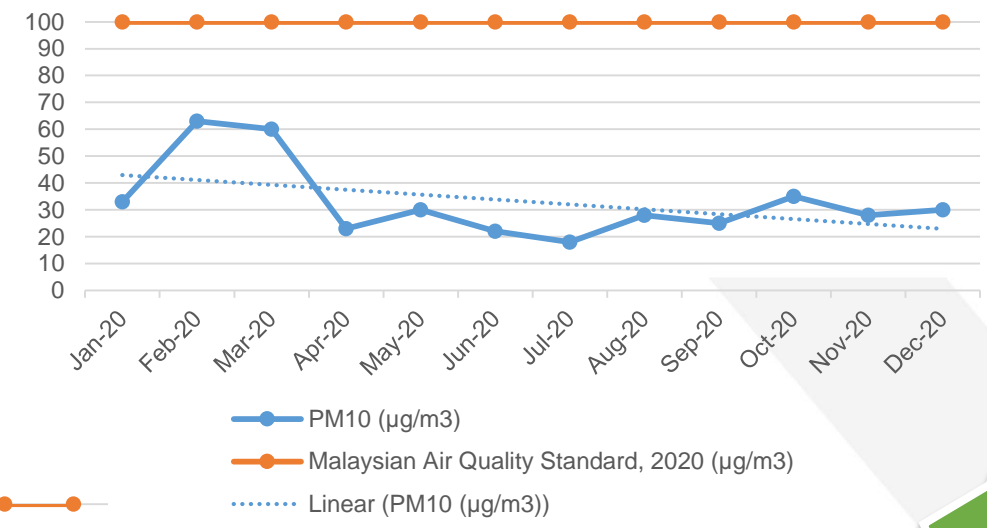


How is the quality of the air at Kuantan Port?

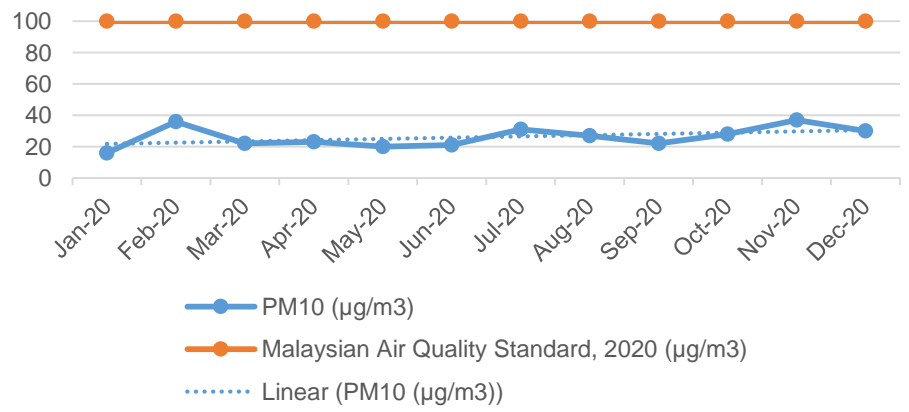
**TITLE: AMBIENT AIR QUALITY, PM10
YEAR 2019**



**TITLE: AMBIENT AIR QUALITY, PM10 YEAR
2020**



**TITLE: AMBIENT AIR QUALITY, PM10
YEAR 2021**



Achieved compliance with Malaysian Air Quality Standard



Source: Air Quality Monitoring Station, Department of Environment, Malaysia

Air Quality Monitoring Station at Kuantan Port



How is the quality of water at Kuantan Port?

Month	Jan		Mar		Apr		Jun		Jul		Aug		Sep		Okt		Nov			
Parameter	COD	TSS	COD	TSS	COD	TSS	COD	TSS	COD	TSS	COD	TSS	COD	TSS	COD	TSS	COD	TSS		
Results	12	4	15	12	14	5	12	6	10	8	8	14	6	16	8	6	9	20		
Standard	120	50	120	50	120	50	120	50	120	50	120	50	120	50	120	50	120	50		
Method Used	In-house Method (EST/L/W-07) based on APHA 5220 B, 2005		APHA 2540 F, 2005		In-house Method (EST/L/W-07) based on APHA 5220 B, 2005		APHA 2540 F, 2005		In-house Method (EST/L/W-07) based on APHA 5220 B, 2005		APHA 2540 F, 2005		In-house Method (EST/L/W-07) based on APHA 5220 B, 2005		APHA 2540 F, 2005		In-house Method (EST/L/W-07) based on APHA 5220 B, 2005		APHA 2540 F, 2005	

Month	COD (mg/L)	Standard (mg/L)
Jan	12	120
Mar	15	120
Apr	14	120
Jun	12	120
Jul	10	120
Aug	8	120
Sep	6	120
Okt	8	120
Nov	9	120

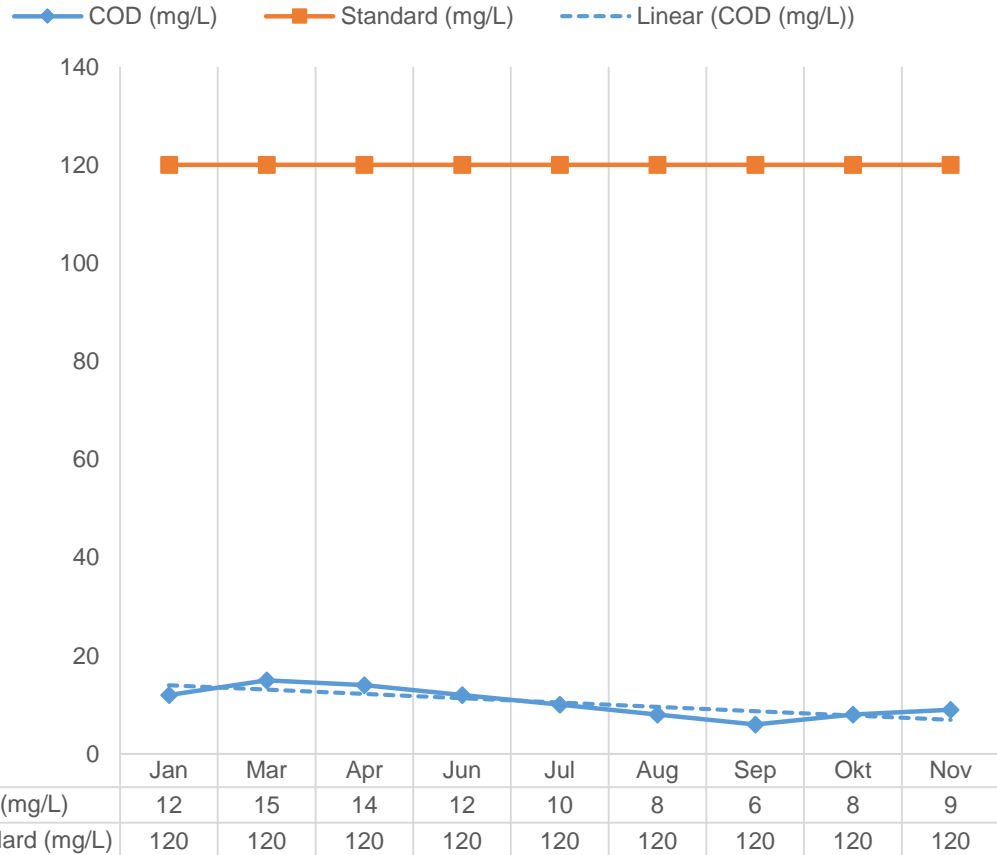
2021

Achieved compliance with Malaysian Water Quality Standard

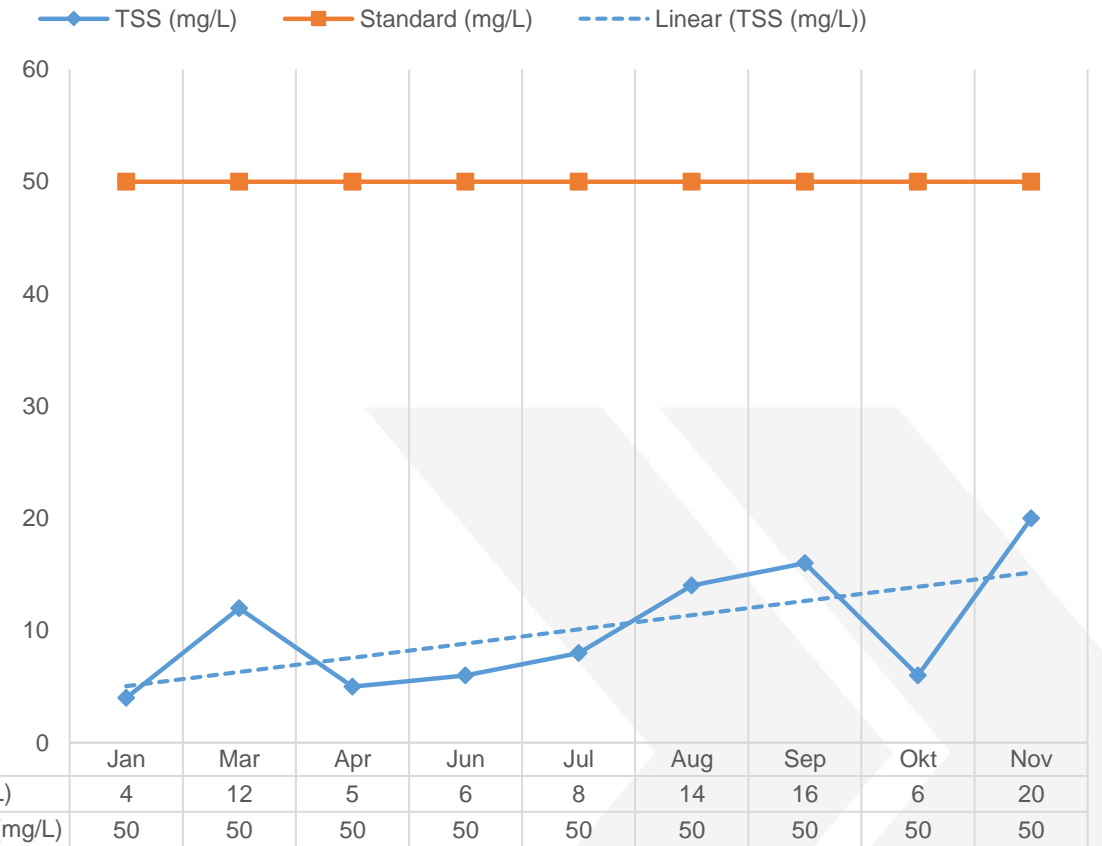
Month	TSS (mg/L)	Standard (mg/L)
Jan	4	50
Mar	12	50
Apr	5	50
Jun	6	50
Jul	8	50
Aug	14	50
Sep	16	50
Okt	6	50
Nov	20	50

How is the quality of water at Kuantan Port?

CHEMICAL OXYGEN DEMAND YEAR 2021



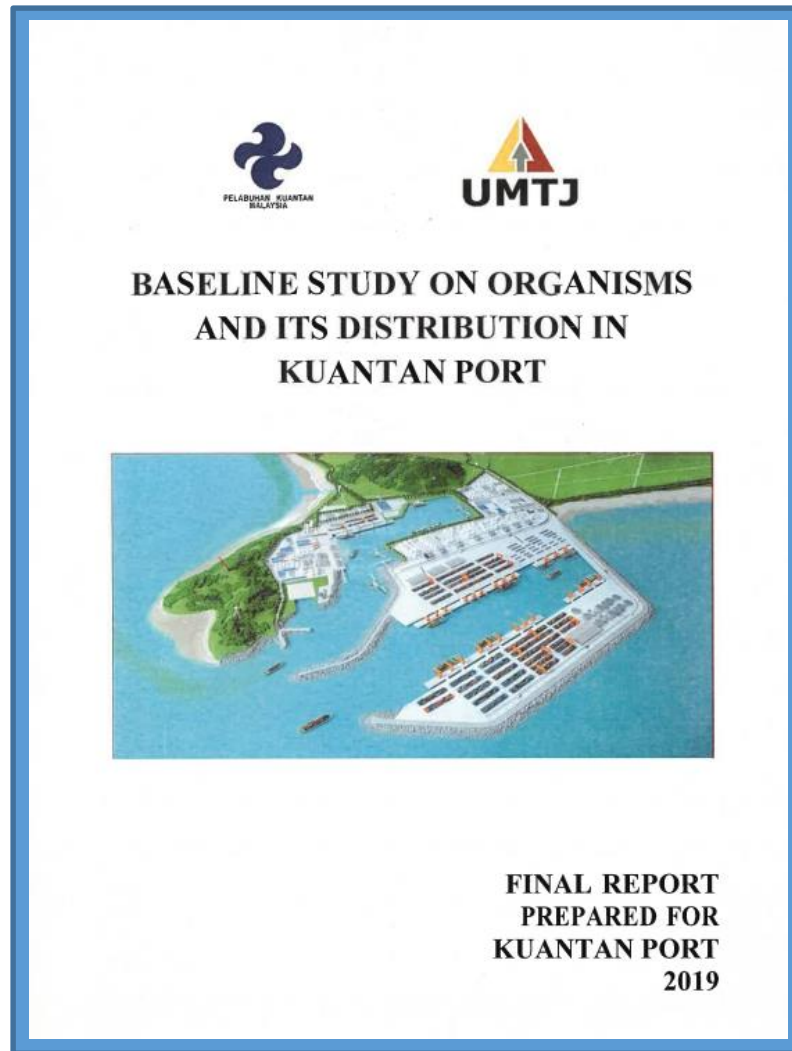
TOTAL SUSPENDED SOLIDS YEAR 2021



2021

Tables and Graphs Analysis

1. Based on the air quality monitoring tables and graphs, the air quality in Kuantan Port **improves drastically** from the year 2019 to the year 2021.
2. As of year 2021, the air quality **does not even exceed** $50\mu\text{g}/\text{m}^3$ which is 50% of the Malaysian Air Quality Standard, 2020.
3. On the other hand, the **water quality** monitoring indicate that the water quality in Kuantan Port is at an **optimum level** as well.
4. Both of the parameters (Chemical Oxygen Demand and Total Suspended Solids) did not exceed the Environmental Quality (Industrial Effluent) Regulations, 2009 set by the Department of Environment, Malaysia.



This port survey is done by Institute of Oceanography and Environment (INOS) from University of Malaysia, Terengganu indicate 3 main objectives:

1. To determine the biodiversity and abundance of marine organisms and characteristics
2. To determine the dynamic of environmental characteristics compared to the national and international standard
3. To define physico-chemical characteristics of seawater and seabed sediments

1.2 Scope of the study

The fieldwork involves the collection of water, sediment, plankton and macrobenthos samples as well as physical oceanographic data which are necessary for the assessment on the impacts arising from the ballast water discharges. The parameters that were studied are as follow:

I. Physical parameter in seawater sample and wind:

- i. Current speed and direction
- ii. Salinity
- iii. Conductivity
- iv. Temperature
- v. pH
- vi. Dissolved oxygen (DO)
- vii. Turbidity
- viii. Wind speed and direction

II. Marine organisms

- i. Macrobenthos (sediment)
- ii. Meiobenthos (sediment)
- iii. Phytoplankton with chlorophyll-*a* (seawater)
- iv. Zooplankton (seawater)
- vi. Bacteria
- vii. Macrofauna (fouling organisms)
- viii. Fishes

III. Water and sediment chemistry

- i. Sediment particle size
- ii. Total organic carbon
- iii. Nutrients
- iv. Heavy metals
- v. Oil & grease
- vi. Total petroleum hydrocarbon
- vii. Redox potential

13

1.3 Location of the study

The study area was within the Kuantan Port. Sampling was carried out on 16 until 21 December 2018. 18 station for physical, chemical, biology survey, 17 station for Fouling organism survey, 3 station nets and 2 deploy currents were established within the port limit area. The coordinate of sampling station are shown in table Table 1-1 to Table 1-4 and Figure 1-1 to Figure 1-4.

Table 1-1 : Coordinate of the sampling station (physical, chemical, biology survey)

Station Name	Latitude	Longitude	Remark
ST 1	103.3828806	3.930661111	Balok Estuary
ST 2	103.4742333	3.935033333	awac/st 3
ST3	103.414588	3.98307667	Turning basin
ST4	103.414472	3.979368	Berth 5
ST5	103.4184194	3.980928537	L.C.B #3
ST6	103.4180304	3.977986137	Multipurposed Berth
ST7	103.4206506	3.978267121	CSA Chemical
ST8	103.4197087	3.974766018	Container Berth
ST9	103.421322	3.972044	Container Berth
ST10	103.4266989	3.975586728	MOB Berth
ST11	103.4307701	3.971761997	Palm Oil Berth
ST12	103.4372886	3.971200689	Basin
ST13	103.425358	3.992426535	Berth 1A
ST14	103.4280998	3.98998631	Berth 1B
ST15	103.4301231	3.986019824	NDWT Phase 2
ST16	103.4329092	3.980269953	NDWT Basin
ST17	103.441136	3.975884	NDWT Basin
CONTROL	103.43085	3.930661111	Control Point

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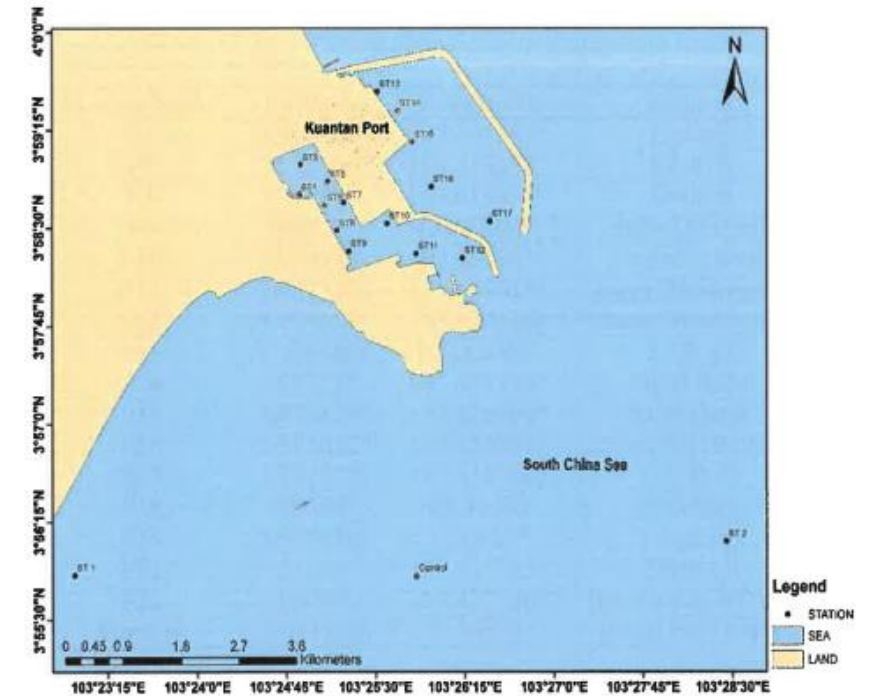


Figure 1-1: Map of physical, chemical and biology sampling stations at Kuantan Port.

The parameter of the survey is divided into 3 categories:

1. Physical parameter in seawater sample and wind
2. Marine organisms
3. Water and sediments chemistry

For ECO-Bulk Cargo Ecosystem, let's focus on 3 relevant sub-parameters:

1. Dissolved Oxygen (DO)
2. Total Suspended Solid (TSS)
3. Invasive Species

Dissolved oxygen (DO) refers to the level of free, non-compound oxygen present in the water or other liquids. It is an important parameter in assessing water quality because its influence on the organisms living within water body. The amount of dissolved oxygen needed varies from creature to creature. Bottom feeders, crabs, oyster and worms need minimal amounts of oxygen (1-6 mg/L), while shallow water fish need higher levels (4-15 mg/L). Dissolved oxygen level that is too high or too low can harm aquatic life and effect water quality.

Figure 4-5 shows the dissolved oxygen level in Kuantan Port. Dissolved oxygen levels in Kuantan Port ranged from 3.00 mg/L to 4.49 mg/L. Average dissolved oxygen level at surface, middle and bottom were 3.86 mg/L, 3.77 mg/L and 3.90 mg/L respectively. St14 recorded minimum dissolved oxygen level at surface, middle and bottom depth with the lowest at middle depth (3.00 mg/L). Highest dissolved oxygen level was recorded in St18 (4.49 mg/L) at bottom depth. The recommended dissolved oxygen level by MMWQCS for Class 3 is 3 mg/L. Figure 4-6 shows the distribution of the dissolved oxygen where lower value are mostly found within the port area. However, based on the result, dissolved oxygen level in all stations were within the recommended level.

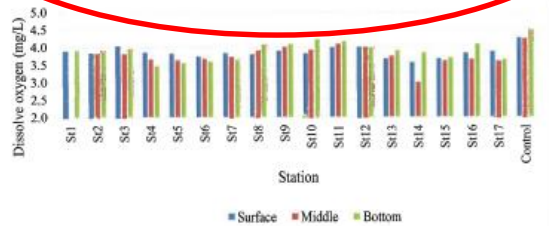


Figure 4-5: Dissolved oxygen level in Kuantan Port

Meanwhile, the following Figure 5-2 and Figure 5-3 show the distribution pattern for TSS concentration in kuantan Port. The distribution maps showed that the TSS concentration in surface and bottom of seawater. The results show that, the TSS concentration in Kuantan Port was high on bottom of seawater compared to surface of seawater result.

The present TSS level in the water was well within the MMWQCS Class 3 (100 mg/L or ≤ 10% increase in seasonal average, whichever is lower). It is interesting to find out that TSS in the water of the Kuantan Port area was low and still under control. The high TSS concentration could be due to slow water flow that enabled sedimentation process to take place and low TSS in the surface could be due to high water flow when tidal interchange inside port area .

Achieved compliance with Malaysian Marine Water Quality Criteria & Standard (MMWQCS) Class 3 : Industry & Commercial Activities

Invasive Species

An invasive alien species is a species introduced outside its natural past or present distribution; if this species becomes problematic, it is termed an invasive alien species (IAS).

IAS may lead to changes in the structure and composition of ecosystems detrimentally affecting ecosystem services, human economy and wellbeing. IAS are such a problem that Aichi Biodiversity Target 9 and one clause of UN Sustainable Development Goal 15 – Life on Land specifically address the issue.

The movement of people and goods around the world increases the opportunity for introduction of IAS. The most effective way to stop the negative impacts of IAS is through prevention of spread by regulating the trade or movement of a species. Once an IAS has arrived, early detection, monitoring and eradication can stop the species spreading.

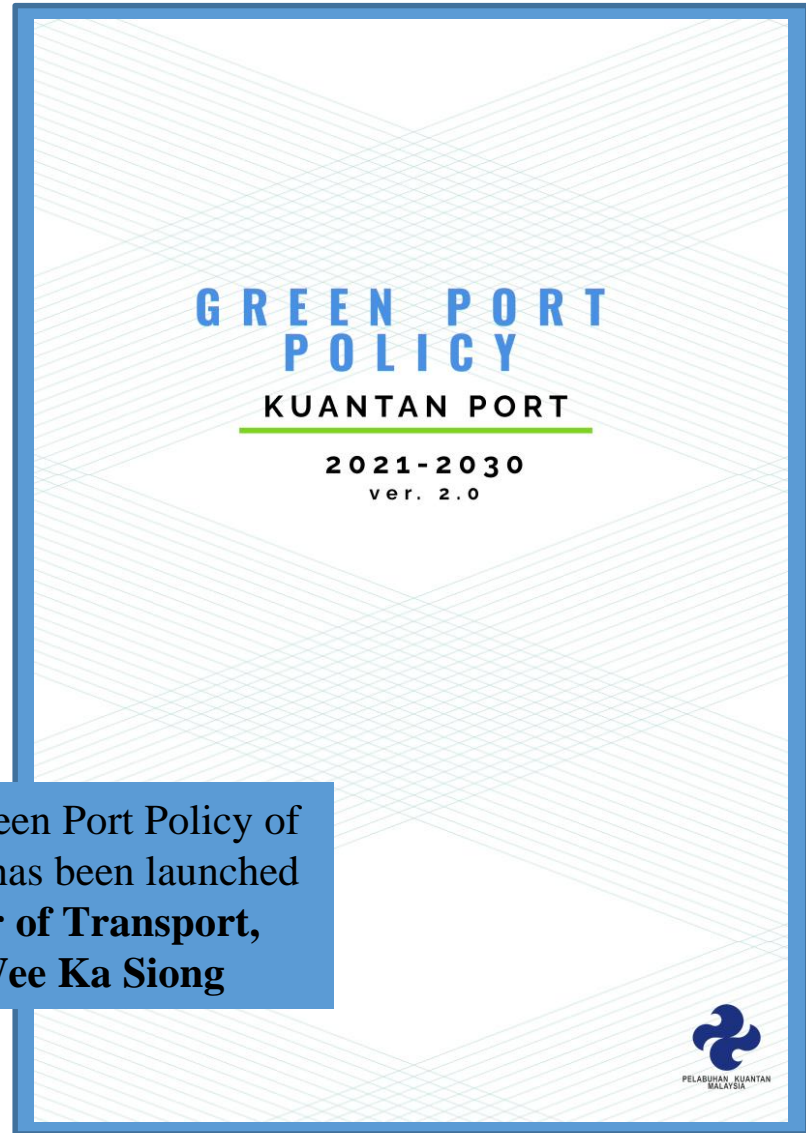
Nowadays, there are a lot of information about IAS has been published such as Global Invasive Species Database (GISD), Global Register of Introduced and Invasive species (GRIIS), Island Biodiversity and Invasive Species (IBIS), National Introduced Marine Pest Information System (NIMPIS) and more.

The Global Invasive Species Database is managed by the Invasive Species Specialist Group (ISSG) of the IUCN Species Survival Commission. It was developed as part of the global initiative on invasive species led by the Global Invasive Species Programme (GISP) and is supported through partnerships with the National Biological Information Infrastructure, Manaaki Whenua-Landcare Research and the University of Auckland. It has been listed 15 invasive species in marine habitats in Malaysia. The list were shown in Table 3-5: The list of invasive species in marine habitats in Malaysia

From this survey, there are no invasive species are found in Kuantan Port area.

NO Invasive Species found in Kuantan Port !

Green Port Policy of Kuantan Port 2021-2030 version 2.0



On 16th January 2022, Green Port Policy of Kuantan Port 2021-2030 has been launched by **Malaysian Minister of Transport, Datuk Seri Ir. Dr. Wee Ka Siong**



CERTIFICATE

Management system as per
BS EN ISO 9001:2015

In accordance with TÜV UK Ltd procedures, it is hereby certified that

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Tanjung Gelang, 25720 Kuantan Pahang
Malaysia

applies a management system in line with the above standard for the following scope:

Provision of port operating services

Certificate No: MAD0114
Annex No: N/A
Audit Report No: 2022/31214



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Initial Certification: 25/07/2022
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Annex No: N/A
Audit Report No: 2022/31214



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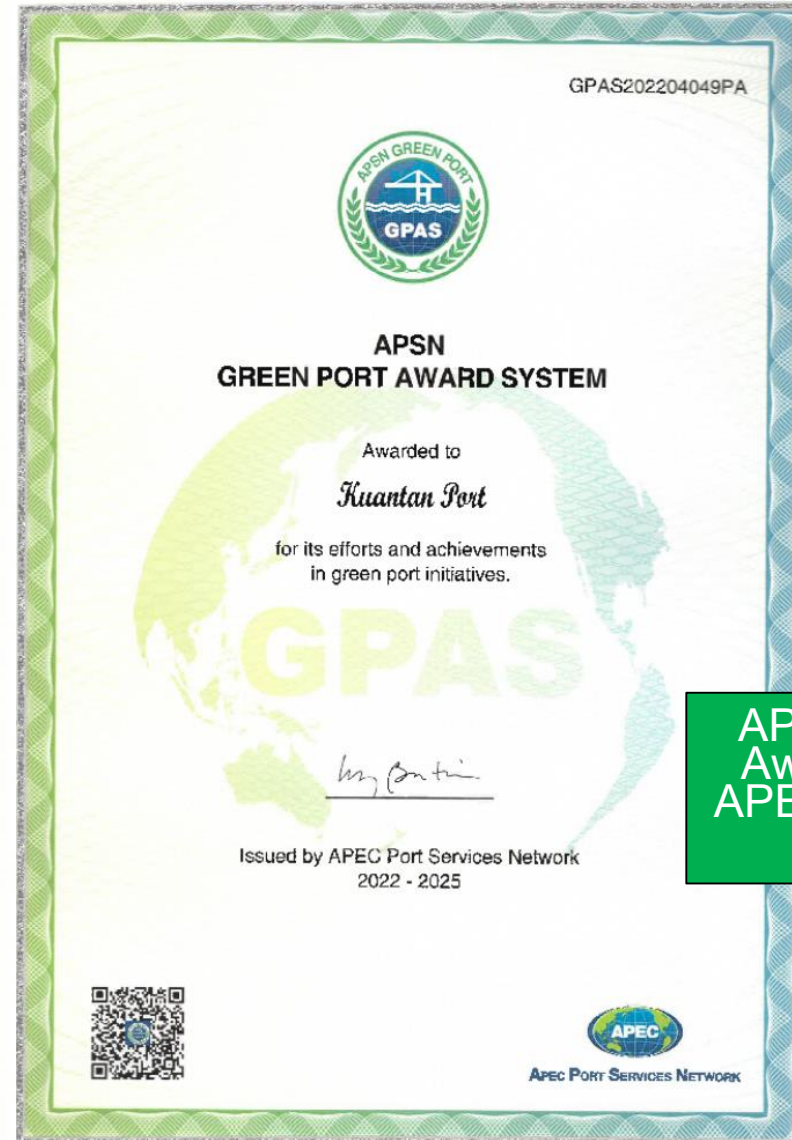
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**ISO 45001:2015
Occupational Health and
Safety Management
System**

Certification



Certificate of
Appreciation :
GreenVoyage
2050



APSN Green Port
Award System by
APEC Port Services
Network

Collaborations



Department of Environment,
Malaysia



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THANK YOU

