



**Fishermen** working at Pantai Penggorak in Kuantan. Their livelihoods have been affected by the red sea incident. Pix by Farizul Hafiz Awang



Bauxite ore is exported to China via Kuantan Port. Pic by Zulkepli Osman

## Many people oblivious to threat

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### Human health impact

The population of Kuantan face multiple health risks from bauxite. Bauxite ore can contain chemicals hazardous to humans, including toxic heavy metals such as aluminium, lead, mercury, arsenic, cadmium, nickel and chromium, the last four are cancer-causing. Naturally-occurring radioactive materials (NORM), which emit low levels of radiation, may also be present. These hazardous substances can reach humans through several exposure pathways.

### Dust pollution and respiratory health

Bauxite mining, ore transport and stockpiling generate high levels of respirable dust hazardous to human health. The most damaging are the respirable particles (PM10) and fine particles (PM2.5). The average human hair is PM70 in diameter.

The PM10 dust particles can easily penetrate the lower respiratory tract while the ones that measure PM2.5 will penetrate deeper into the lungs' alveolar region where gas is exchanged — causing or triggering respiratory problems such as asthma, lower respiratory tract infections, pneumonia, chronic bronchitis and emphysema. Depending on the chemical content of the dust, other health problems may also arise.

Children, pregnant women and the elderly are the most vulnerable to the PM10 dust.

### Mercury in river water

It was reported that a mercury level of 0.0093mg/L was detected in Sungai Riau, which is a source of raw water for the Bukit Goh Water Treatment Plant.

A bauxite ore washing area is also located upstream of the water intake point of the water treatment plant. According to the World Health Organisation, naturally occurring levels of mercury in ground and surface water is usually less than 0.0005mg/L (WHO, 2005). The level detected in Sungai Riau is therefore 18.6 times higher than the natural mercury level. It is also almost 10 times the 0.001mg/L allowable level of mercury in raw water, according to the Health Ministry's national standard for drinking water quality.

Since mercury will not be effectively removed by conventional water treatment plant, we can conservatively assume that the removal efficiency will not be greater than 50 per cent. At 50 percent removal efficiency, a mercury level of 0.0093 mg/L in raw water from Sungai Riau will be reduced to 0.0047 mg/L in the treated water. If we assume that an individual weighing 70kg consumes two litres of water per day, this translates into a mercury ingestion rate of 0.00015mg/kg/day.

This exceeds the chronic exposure threshold of 0.0001mg/kg/day for mercury intake. Chronic mercury ingestion exposure above the recommended threshold level may result in health outcomes such as hand tremors, memory distur-

bances and autonomic nervous system dysfunction.

### Heavy metals in aquatic organisms

The heavy metals in the river water may be taken up by fishes, shellfish and other aquatic organisms that form part of the human food chain. Many of the heavy metals can easily accumulate up the food chain through a process called bioaccumulation. Bioaccumulation is divided into two processes.

Bioconcentration is the process by which an aquatic organism bioconcentrates the metals from water. When one aquatic organism feeds on another contaminated organism, the contamination in the biota biomagnifies up the food chain. Humans beings at the top of several food chains become the most vulnerable species to any contamination of the aquatic environment, be it freshwater or marine.

### Inaction

Even though the bauxite issue has been highlighted regularly in both the print and broadcast media, and environmental experts and scientists have issued warnings, some members of the public seem oblivious to the danger of the bauxite-contaminated environment. The reason for this is believed to be the failure and inaction of the regulatory agencies in issuing advisory information of impending danger to the public and denying that the environmental problem exists. There seems to be a total lack of risk communication.



**Toxic dust is generated** when bauxite ore is transported by lorries from the mines to Kuantan Port.

## Recommended plan of action for the Pahang government



Immediately issue a **stop work** order for bauxite mining operations in Kuantan and impose the following conditions on each mine and mining operator:

- 1** Produce an **Erosion and Sediment Control Plan (ESCP)** for the mines and park it under an **Environmental Monitoring Plan (EMP)** to be monitored continuously. This is to **contain sediment at the mining site and prevent free flow of runoffs to adjacent drains and streams, and to the sea.**
- 2** Produce a plan to **stabilise the mines and rehabilitate them with greenery once mining ceases.** This will ensure that limits to the mine area and depth of excavation are planned and approved beforehand.
- 3** Produce a **bank guarantee or insurance coverage**, which will be used to rehabilitate the mines should the company abscond after exhausting the bauxite. The amount of coverage shall be equivalent to the estimated cost of rehabilitation.
- 4** Show a **sustainable way of transporting bauxite, which does not cause a detrimental impact.** Merely covering the loads with tarpaulin sheets has proven to be futile as fine dust escapes through the covers.
- 5** Contribute to the **Environmental Maintenance cost to ensure that there is no environmental degradation.** For example, temporary earth drains need to be excavated at regular intervals from the mines to Kuantan Port. The drains should be used to dissipate sediment back to vegetated land periodically along the way at low flow. During high flows (after heavy or continuous rainfall), the drains will overflow the diversions without causing local constrictions or flash floods in the area. This way, sediment **will not flow along the roadside drains to the rivers or the sea, as is presently the case.**
- 6** **Processing of bauxite, including washing** of excavated rocks to increase the mineral content, shall be done on site. Under no circumstances shall any mine be **allowed to wash bauxite away from its site, including into rivers or streams.** The ESCP needs to take into account any such washing, should they be required by the mines.
- 7** Stockpiling of bauxite at any location away from the mines, for example at Kuantan Port, shall be **subjected to the same requirements of an ESCP and an EMP.**



- 8** It is essential that a moratorium is declared immediately so that the monsoon rains can clear away the toxic dust that is enveloping Kuantan. However, it is essential that the temporary earth drains be excavated so that sediment does not flow into the rivers and the sea.