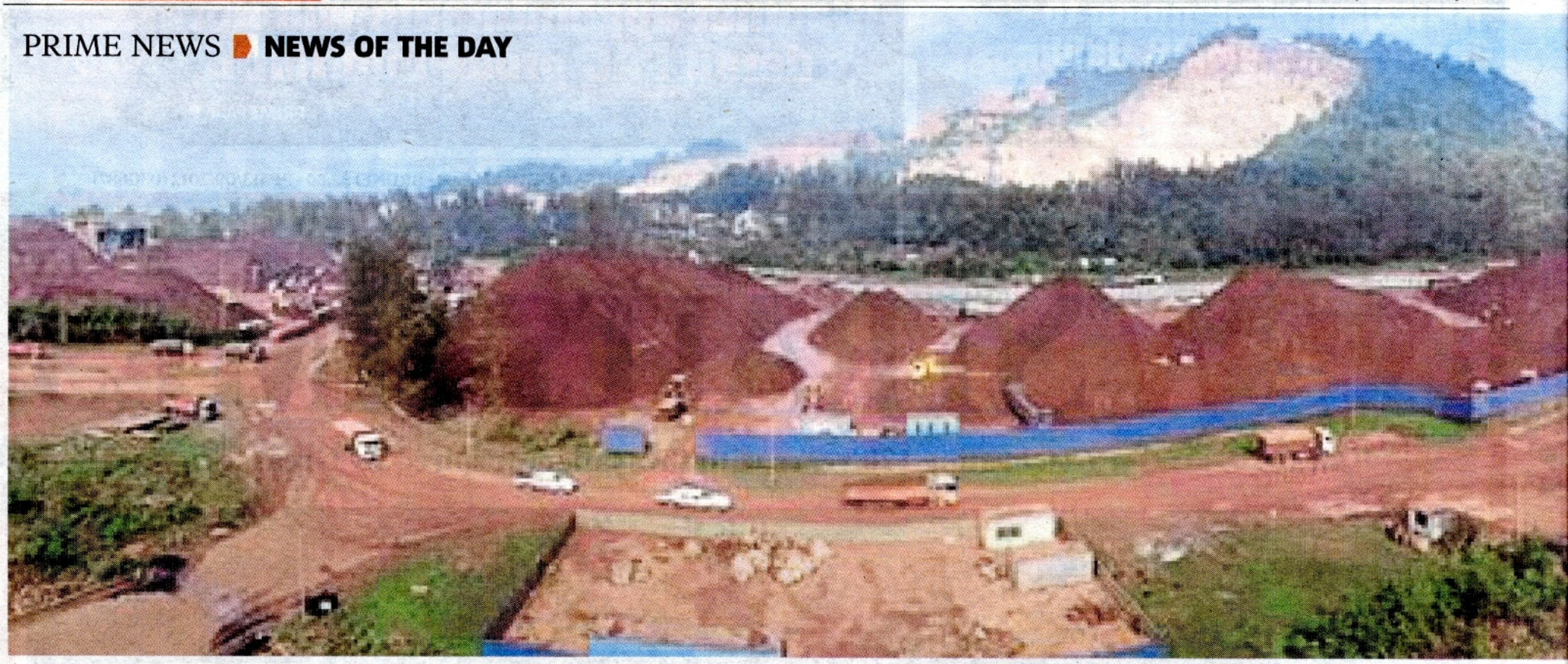

'Hot zone' near Kuantan?

BAUXITE HAZARD: NST team finds high levels of heavy metals, radiation in a river and seashore due to mining activities

EXCLUSIVE

ALIZA SHAH
KUANTAN
news@nst.com.my

THE fallout from uncontrolled and unregulated mining of bauxite in Pahang may be unleashing deadly radioactive material into the environment, contaminating the air and water sources.

This disturbing finding was made after the *New Straits Times* Special Probes Team commissioned an independent laboratory analysis of samples taken from a river and its estuary nearby that had been contaminated by bauxite residues.

The samples were obtained in Sungai Pengorak and Pantai Pengorak, near Kampung Selamat, where the waters had turned deep, dark red, instead of its natural green or azure hue. The photos created a buzz on social media recently, sparking concerns of a major contamination crisis.

Like most ores, bauxite contains traces of metals such as arsenic, beryllium, cadmium, chromium, lead, manganese, mercury, nickel and naturally-occurring radioactive materials, such as thorium and uranium. Most of these elements remain with the residue, and that is why many countries which mine bauxite for the extraction of aluminium, do it with sound extraction, disposal and rehabilitation processes.

Pahang Public Amenities and Environment Committee chairman Datuk Seri Mohd Soffi Abdul Razak, however, was quick to downplay the concerns. On May 26, he declared that the so-called "red sea" phenomenon was not harmful to humans or marine life.

Soffi said analysis conducted by the state Environment Department (DoE) showed that waters near Tanjung Gelang, which had apparently been contaminated by bauxite washed up from the stockpile in Kuantan Port after recent rains, were free of heavy metals.

The results of the independent analysis by the NST Probes team, however, contradicted the findings by the state DoE. Our results, which came from samples taken five days after Soffi's announcement, showed that not only had the uncontrolled mining resulted in the areas being contaminated with heavy metals, they also detected early stages of radiation contamination.

Four samples, two each from Sungai Pengorak and Pantai Pengorak, showed traces of thorium-232, thorium-230, uranium-234, uranium-238, and high levels of aluminium.

Thorium is a radioactive metal that is usually found in rocks and the soil. In the form of dust, thorium if inhaled, will remain in the lungs for a long time, while some may enter the bloodstream and be deposited in the bones. Inhaling thorium dust increases the risk of developing lung, pancreatic and bone cancers.

Uranium is highly radioactive and is used as a source of abundant, concentrated energy through nuclear fission. It can enter the body through inhalation, swells and cuts in the skin. Radiation poisoning can lead to cancer, or kidney and liver damage. In the long run, chronic ingestion of uranium through food, water or inhalation can lead to internal irradiation or chemical toxicity.

Bauxite ore contains 30 to 50 per cent hydrated aluminium oxide, making it the main source of aluminium. In its natural state, bauxite ores contain significant levels of natural radiation due to the

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> ***If indeed the contamination is the result of mining activities, appropriate measures,*** *such as the implementation of a comprehensive Erosion and Sediment Control Plan, must be carried out before we see further damage."*
>
> ***Dr Zaki Zainudin***
> *water expert*

Samples show initial stages of radioactive contamination

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presence of uranium (U-238) and thorium (Th-232). The levels of U-238 and Th-232 can range from 120 to 350 becquerel (Bq)/kg and 450 to 1,000 Bq/kg, depending on the ore.

However, there is a threefold increase in radionuclide content if the bauxite is in the form of "red mud" — the main solid residue that is the by-product alumina. This material contains iron, silica and titanium that have been removed from the digestion process.

Geochemistry and marine radiochemistry expert Professor Dr Che Abd Rahim Mohamed was presented with the lab results, and using the standard set by the World Nuclear Association, confirmed the initial stages of radioactive contamination as presented by the samples.

The NST had, in October last year, carried an exclusive report on the discovery of large deposits of bauxite in the vast oil palm plantations of Felda Bukit Goh. The settlers were told by mining companies in meetings to explain their proposals that they would each be able to rake in up to RM1.8 million in profits.

The NST was then made to understand that the discovery of bauxite deposits in the settlement was made by a company that tested the earth in the 1980s. However, the aluminium ores were not fully matured then and the company abandoned its plan to mine the bauxite.

Months before the aggressive mining activities began, the state Land and Mines Department said permits could be issued only after approval from the state executive council. The landowners were told that only they could apply for permits to unearth the aluminium ore.

The rules spelt out included that they must submit a consultant's report, how it would be transported and how the by-products would be disposed off.

Page 1 pic: A bauxite mining area in Felda Bukit Goh. *When red soil turns into red mud, including at this mining site, the radionuclide content of bauxite increases threefold.*

How bauxite is mined elsewhere

STAGE 01 Before mining commences, the land needs to be cleared of timber and vegetation. Alongside this process may be the collection of seeds and/or saplings, for inclusion in a seedbank, which will form the basis of post-mining revegetation of the site.

STAGE 02 The top soil is removed and stored for replacement during rehabilitation.

STAGE 03 Bauxite is extracted through open cast mining. The processes vary depending on the location. The layer under the top soil is known as the "overburden". The bauxite layer beneath the overburden is broken up using methods such blasting, drilling and ripping using bulldozers.

STAGE 04 Once the bauxite is loosened into manageable pieces it is generally loaded into trucks or conveyors and transported to crushing and washing plants or to stockpiles, before being shipped to alumina refineries, located close to bauxite mines. The conveyor system is quiet, dust-free and uses less land than road transport.

STAGE 05 Bauxite residue is washed and contained in the Bauxite Residue Disposal Areas (BRDA) or Residue Storage Areas (RSA) which varies depending on the land and technology availability, climatic & geographic conditions, logistics and regulatory requirements.

STAGE 06 Topsoil replaced and agreed crops re-established.

STAGE 07 Washed residue is filtered to produce a dry cake to minimise the land area required for storage and the risk of leakage to groundwater. The residue is thickened to a high density slurry, deposited and allowed to consolidate and dry before successive layers are deposited. This forms a slope on the deposit, allowing rainwater to run off and minimising liquid stored in the disposal area; lowering risk of leakage and improving structural integrity.

STAGE 08 The residue is pumped into land based ponds where naturally impervious layers or sealants minimise seepage. Bio-remediation is caried out to convert bauxite residue into a well-structured soil through chemical and physical treatment.

Bauxite residues are also recycled as an input to cement production, refractories, soil amelioration and landfill covering.

Note: Australia for instance goes to great lengths to promote sustainable bauxite mining to not only ensure the mines are later rehabilitated but also to prevent the side impacts. This is because, like most ores and soils, bauxite can contain trace quantities of metals such as arsenic, beryllium, cadmium, chromium, lead, manganese, mercury, nickel and naturally-occurring radioactive materials, such as thorium and uranium. Most of these trace elements remain with the residue after extraction of the alumina.

Source : Australian Aluminium Council/The International Aluminium Institute