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Media Release

by DATO' IR. JASENI MAIDINSA
CEO, PBA Holdings Bhd and PBAPP

IS LAND IN KELANTAN SINKING DUE TO GROUNDWATER WITHDRAWALS?

- **According to the findings of a 2018 scientific paper, land in Kelantan sank by about 29.07mm in the period 1999 – 2016.**
- **According to Air Kelantan Sdn Bhd (AKSB), high groundwater consumption in the urban areas has not caused land sinking.**

PENANG, Thursday, 24.6.2021: A 2018 scientific paper* published by researchers from the University of Otago in Dunedin, New Zealand, has suggested that land sinking caused by groundwater extraction is occurring in Kelantan.

The following abstract from the scientific paper reads as follows:

“Kelantan is one of the highest groundwater-consumption states in Malaysia. However, over-exploitation of groundwater can lead to harmful geomorphological effects.

We investigate the deformation rate due to land subsidence (land sinking) in Kelantan, using 17 years of GPS time-series (1999 – 2016) recorded at 11 GPS sites. Our results agree with a previous study, suggesting that northern Kelantan is subsiding at a maximum rate of 4.22 ± 0.17 mm/year.”

The researchers stated that their paper was based on data collected and calculated for the period 1999 – 2016, from 11 GPS Continuously Operating Reference Stations (CORS) in the “MyRTKnet” operated by the Department of Surveying and Mapping Malaysia (DSMM).

They reported that GPS CORS measurements showed ground subsidence (sinking) throughout much of the eastern side of the Kelantan River, from the catchment to the river deltas. The average subsistence rate was 1.71mm per year over 17 years (about 29.07mm in total for the period 1999 – 2016).

The following excerpts are quoted from the scientific paper:

“The measurements show a clear trend in subsidence based on the distance from the Kelantan River, and from the inland towards the coastal region. The rate of subsistence decreases from a maximum, in Kuala Kerai (KRAI), along the axis of the river approaching zero away from the river towards the coastal area of Geting (GETI) and Pasir Puteh (PASP).

The sandy soil with thick unconsolidated sediment presence in GETI and PASP optimises the rate of groundwater discharge, in which rainfall percolation can directly recharge the groundwater table of production wells. The silty clay area below the upper sediment is characteristically low in permeability with a high capacity in holding water.

Despite the fact that there are more production wells in the coastal areas region (near GETI and PASP) than the inland region (near KRAI), the subsidence rate is lower. These two geological factors suggest a possible hypothesis that constant groundwater table recharge could stabilise the groundwater table at the Kelantan rivermouth, and yet lower the rate of subsidence.”

The University of Otago paper is available for purchase and download from www.researchgate.net. It provides a wide scope of scientific data, spanning 17 years, to arrive at published results.

Meanwhile, in a report published by *Sinar Harian* dated 21.6.2021, the general manager of Air Kelantan Sdn Bhd (AKSB) was quoted as stating that “high consumption of groundwater in the urban areas of Kelantan does not generate a negative impact on geology, such as land subsistence.”

Is AKSB denying that groundwater withdrawals have caused land subsidence in Kelantan over the period 1999 - 2016?

If AKSB wishes to publicly challenge the findings of the University of Otago researchers, it should publish the relevant geodetic data to refute their findings.

In other words, AKSB should “prove” that land in Kelantan is not sinking with scientific evidence, instead of making a general statement that is not substantiated by any specific facts and figures.

After all, the data presented by the University of Otago researchers were reportedly collected and calculated from measurements recorded by GPS CORS operated and located in Malaysia.

PBAPP’s position on groundwater withdrawals

1. It has been documented that groundwater withdrawals have caused land subsidence (sinking) in Bangkok, Venice and Jakarta.
2. Groundwater withdrawal causes land to sink and exacerbate the effects of floods. This is evident in Bangkok and Jakarta and flooding threatens these cities annually, as related to environmental factors such as climate change, streamflow, rising sea levels, deforestation, high precipitation and land use changes.
3. The US Environmental Protection Agency (EPA)** and Centre for Disease Control and Prevention (CDC)*** have published online warnings regarding the dangers of using or consuming potentially contaminated groundwater, especially in areas where the human population is high and human use of land is intensive.
4. **It is more economical to safeguard rivers (surface water) and their water catchments by gazetting them. The rivers and its basins are easily replenished by rainfall in tropical Malaysia, which is blessed with the annual wet seasons. Hence, it is very practical to store excess water in raw water engineering infrastructures such as dams or off-river water retention ponds and to regulate these rivers during the dry seasons.**
5. **Rivers (surface water) are more economical as a raw water source for large volume situations whereby an appropriate sized water**

treatment plant can treat and distribute water to consumers in high density urban areas and suburbs.

However, groundwater is more economical as a raw water resource for small volume situations such as isolated villages/kampungs that are located very far from urban centres. It would be very costly to lay very long-distance pipes to supply potable water from the water treatment plant due to high pumping costs.

Thank You.

* "Groundwater extraction-induced land subsidence: a geodetic strain rate study in Kelantan, Malaysia" – Chien Zheng Yong, Paul H. Denys and Christopher F. Pearson, Journal of Spatial Science.

** <https://www.epa.gov/sites/production/files/2015-08/documents/mgwc-gwc1.pdf>

*** <https://www.cdc.gov/healthywater/drinking/groundwater-awareness-week.html>

Issued by : Syarifah Nasywa bt Syed Feisal Barakbah
Corporate Communications Unit
Tel : 04-200 6607
Email : syarifah@pba.com.my