

Impact of Sea Level Rise to the Coastal Groundwater Resources at Kuala Terengganu, Terengganu.

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Abstract

Global warming and climatic changes have been identified as a main factor lead to sea level rise. Sea level rise will have profound effect by increasing flooding frequency and inundating low lying coastal area, and threatens the communities residing along them. Rising sea level also could increase the rate of erosion along the coast, and some beaches could disappear. Continued population growth in low-lying coastal regions will increase vulnerability as the effects of climate change become more pronounced. This study is carried out at the mouth of Terengganu River area in Kuala Terengganu, Terengganu with approximately 6 km radius. The study carried out is aim to assess the potential impact of sea level rise by locating the fresh water-saltwater interface and the current status of groundwater quality. In-situ groundwater quality measurement and geophysical analysis were employed in this study. Results revealed that the fresh water and saltwater interface has been identified. The finding of the study could be used to characterise the occurrence and movement of saline groundwater and to better understand linkages between groundwater and seawater, and therefore to enhance the sustainability of coastal groundwater resources. Generally, groundwater levels in the study area are heavily influenced by recharge from rainfall; at the same time, the aquifers in the coastal area typically exhibit strong influence of tidal fluctuation due to high hydraulic conductivities and direct hydraulic connection with the sea. Due to low hydraulic gradient as the area is flat, the potential of seawater intrusion threat is likely to be higher; particularly during periods of low recharge (drier month). The EC and resistivity survey data indicated that the impact of sea level rise due to climate change could lead to saltwater intrusion as the aquifer is hydraulically connected to the sea. The rising sea level would increase the head of the saline water and hence pushing the fresh/saline water interface further inland. Finding of the study also identified that area of Pulau Ketam (Pulau Duyung) has higher potential for seawater intrusion compared to other places as this area is surrounded by brackish river water with direct hydraulic connection with the aquifer. The dynamic nature of the saltwater interface needs to be investigated in-depth and the potential of seawater intrusion under different approaches should be assessed. To achieve this, a more in-depth study and analysis of

seawater intrusion is required, involving the application of numerical modelling involving 3D dispersive image. To improve the confidence in the sustainable management of the groundwater resources with focus on impact of climate change, frequency of the monitoring at the higher-risk area typically at Pulau Ketam (Pulau Duyung) should be increased, and the number and depth of monitoring wells increased. Screen installation should also be improved by lengthening the screen to cover the whole length of the monitoring wells so that the in-situ monitoring of the EC could give better picture of the position of the interface of the fresh/saline water. There is a need for an improved understanding of the movement of the fresh/saline water interface over time and ensure protection of these crucial groundwater resources for their long term sustainability.

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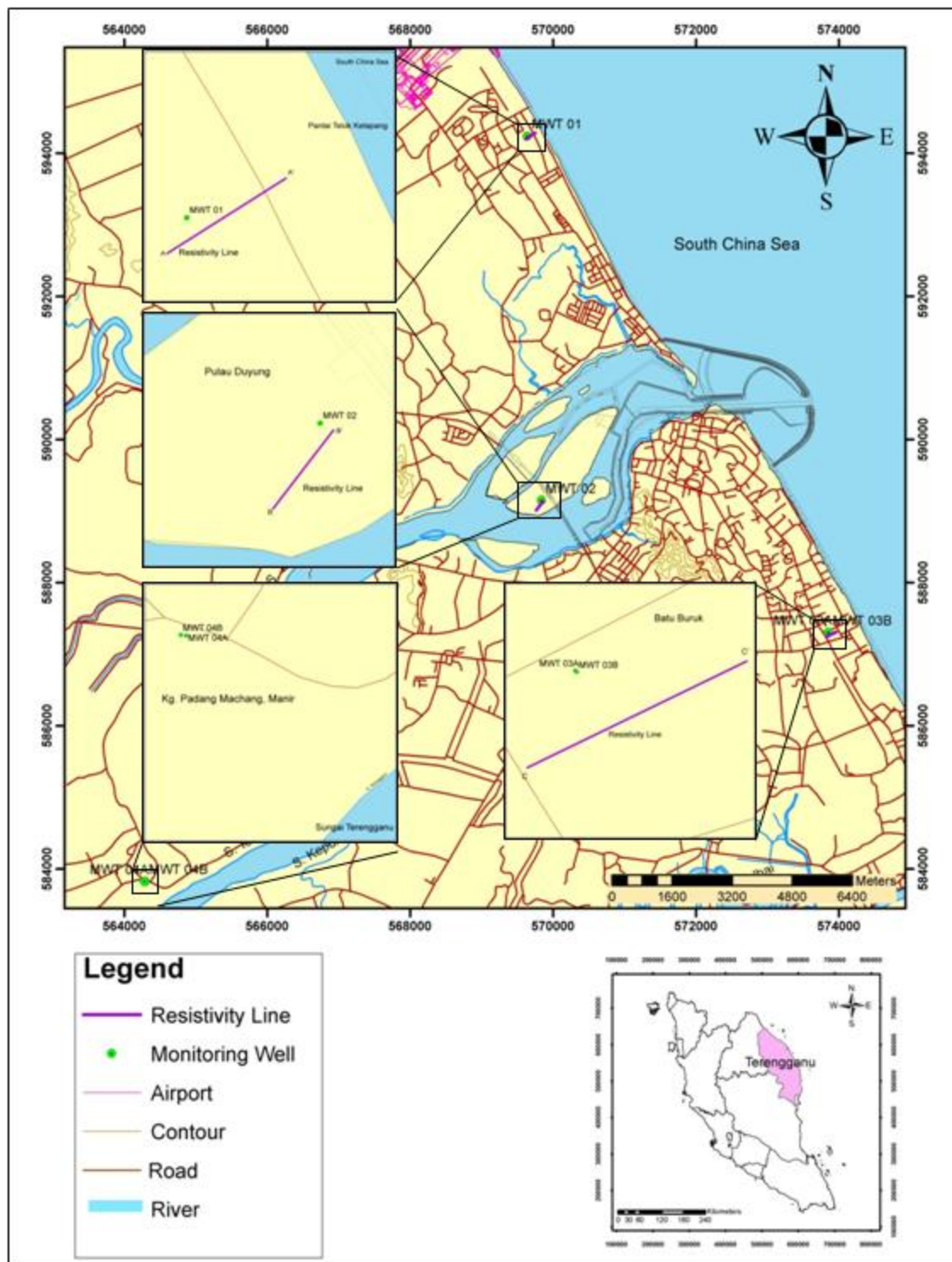


Figure 1: Location of monitoring wells and resistivity lines at Kuala Terengganu

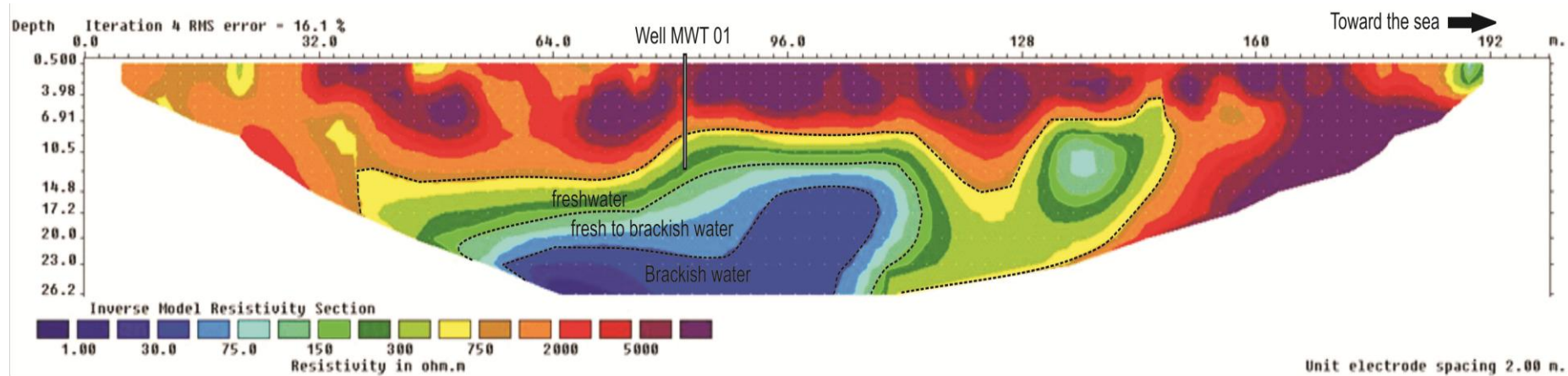


Figure 2: Resistivity profile at Kg. Teluk Ketapang area

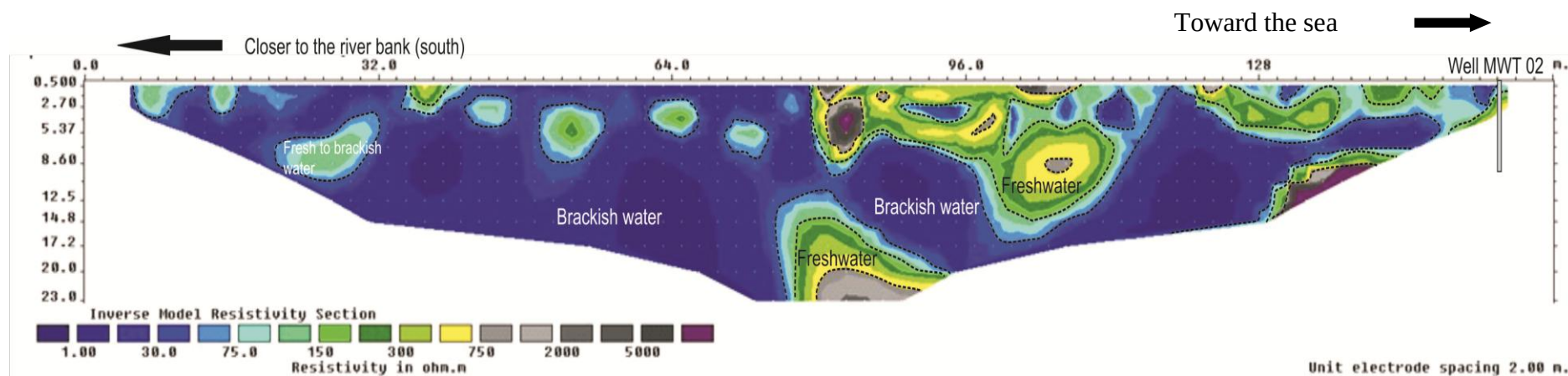


Figure 3: Resistivity profile at Kg. Pulau Ketam (Pulau Duyung) area

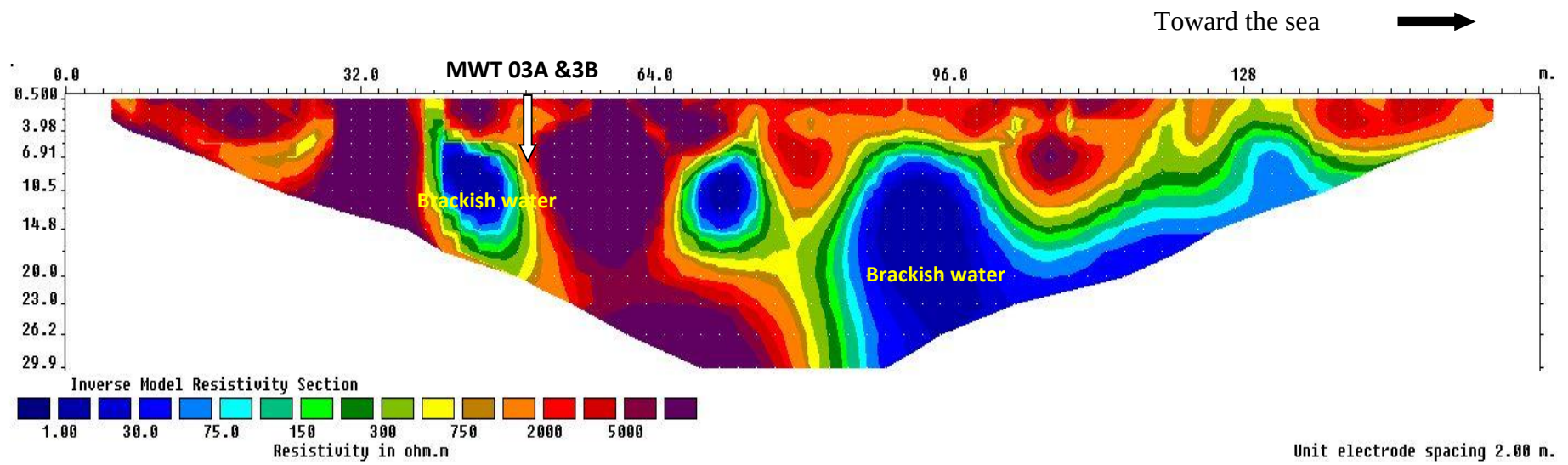


Figure 4: Resistivity profile at Batu Buruk area

