

UNIVERSITI TEKNOLOGI MARA

**ASSESSMENT OF SELECTED
PHYSICOCHEMICAL
PARAMETERS AND NATURAL
RADIONUCLIDES IN KELANTAN'S
WELL WATER**

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

Faculty of Applied Sciences

January 2016

ABSTRACT

Well water is groundwater that occurs beneath the water table and one of the important drinking water sources for Kelantanese. The residents in Kelantan, especially those in rural and remote areas are highly depending on groundwater as their drinking water and domestic use, which are mainly located within acid intrusive igneous rock that reported to contain high concentrations of natural occurring radioactive materials (NORMs). A study was conducted with the aim to determine and assess the water quality parameters: Ca^{2+} , Na^+ , K^+ , Cl^- , SO_4^{2-} , U, Th and ^{40}K in the water resources. Well water samples (dug wells and bore wells) were collected from 48 locations in 10 districts of Kelantan. In situ measurement were performed to determine basic physicochemical parameters of the water samples; pH, TDS, DO, salinity, conductivity and temperature. The concentrations of Ca^{2+} , Na^+ and K^+ were determined using Energy Dispersive X-ray Fluorescence (EDXRF) while the concentrations of Cl^- , SO_4^{2-} were determined using Ion Chromatography (IC). U and Th were determined using Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES). The variations of these results were due to the different geological formations and different surrounding areas of the groundwater systems. The source of the cations are mainly contributed by natural sources such as calcite, feldspar and ion exchange process, while most of the anions are from anthropogenic sources (domestic sewage waste, fertilizer, atmospheric pollution). Based on the basic parameters measured, the pH values (4.7 – 8.1) of well water were not comply with the permissible limit given by MOH and WHO. The turbidity values ranged from 0.3 to 52.7 NTU and also were not comply with the permissible limit given by MOH and WHO. From the activity concentrations of the NORMs, the annual ingestion dose of the natural radioactive materials is lower than WHO recommended value. The various sources of the chemicals in the groundwater systems were classified using PCA. Four principal components were extracted that covered 77.12% of the total variance. The results indicate that K^+ and ^{40}K , are from the same sources. Similarly for the U and Th that are from granite rock, Cl^- and SO_4^{2-} are from anthropogenic sources and Ca^{2+} from calcite rock materials.

ACKNOWLEDGEMENT

First and foremost, I owe my deepest gratitude to Allah S.W.T for his blessings throughout the course of my study. I am heartily thankful to my supervisor, Assoc. Prof Dr. Zaini Hamzah and my co-supervisor, Dr Ab. Khalik Wood whose encouragement, guidance and support from the beginning to the final stage which enabled me to successfully complete this thesis.

My gratitude also goes to Universiti Teknologi MARA (UiTM) and Ministry of Higher Educational Malaysia (MOHE) for financial support under Research Intensive Faculty (RIF).

I would like to express my appreciation to the staff of Faculty of Applied Sciences, especially the laboratory assistants who had made available for their help in a number of ways.

Last but not least, I would like to express my gratitude to my parents, family members and colleagues who had given never-ending help and support throughout the course of my study.

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