

# **APPLICATION OF 2D ELECTRICAL RESISTIVITY TECHNIQUES FOR GROUNDWATER INVESTIGATIONS (CASE STUDY ON JAFFNA LIMESTONE, SRI LANKA)**

I.G.C.I. KUMARA

Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka

Aim of this research was to apply the modern resistivity techniques for groundwater studies on Jaffna limestone possibly for the first time in the area where the karstic Miocene limestone is encountered. Scope of the work instigated through an analysis of two seasonal groundwater quality assessments. GIS interpolated maps were used identified vulnerable areas four groundwater threats in four divisional secretariats in Jaffna namely Jaffna Town, Nallur, Chavakachcheri and Pachchilaippallai. In-situ field analysis of chemical and physical quality of shallow groundwater has also done after initial selections. Finally Ariyalai headland was selected to carry out detailed 2D resistivity study while Kachchai, Pallai, Sarasalai and Kondavil locations were selected to perform control studies. Major objectives were application of 2D resistivity techniques, interpretation of groundwater quality, determination of sub surface condition and sea water intrusion possibilities and confirmation of geophysical data using test well drilling.

Ten numbers of 2D survey lines each of 112 electrodes in Dipole-dipole array type with electrode spacing of 5 m, 4 m or 3 m were performed during field studies. Then the data acquired processed using AGI EarthImager 2D software. Ariyalai 2D survey case study reveals that there is a sea water intrusion in headland area below 10 m depths and confirmed by test well drilling done in the mid-point of Ariyalai survey line 01. Sarasalai survey could identify different geological formations in sub surface which were slightly matched with surface geology map published by GSMB. And also sarasalai survey was shown some possibility to seawater fresh water mixing zone underneath the lagoon. Kachchai, Pallai or Kondavil surveys did not clearly identify a sea water intrusion but test well drilling found a high potential groundwater zone in Palavi north which is 1 km away from Kachchai survey. Pallai 2D resistivity output suggested some high resistive sand filled cavities below the surface and test well drilling done at Mirisuvil could not reach to the expected depth due to absence of returning drilling fluid at a depth of 22 mbgl. Pallai 2D survey and Mirisuvil test well location are located in same geological formation and nearby area.

Finally it is recommended that continue the groundwater quality monitoring in long term basis and extend the area to be studied by 2D geophysics. Furthermore, it is also recommended to run different synthetic model to find the best fit way to perform 2D survey in the field before commencement of field work and to construct deep tube well(s) to confirm the geophysical data obtained where the 2D resistivity techniques applied or vice-versa.

**KEYWORDS:** Jaffna limestone, groundwater, 2D resistivity survey, sea water intrusion