Electrical Resistivity Tomography (ERT) to Delineate Fresh Water-sea Water Interface

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Identification of the interface between the fresh and saline water is important in coastal regions as it plays an active role on economical and industrial development of those regions. Geo-electrical resistivity (GER) methods were suited to delineate the interface between such boundaries. Electrical Resistivity Tomography (ERT) is a significant tool in which we energize the sub-surface using a known amount of current (I) and measuring the response in the form of Voltage(V). With the use of injected current and measured voltage the apparent resistivity of the subsurface formations is calculated. This apparent resistivity is transformed to true resistivity of the medium by using appropriate inversion procedure (Res2D.INV).

A number of conventional electrode configurations are available for carrying out the above procedure which enables to find out the subsurface geological formations. Electrical Resistivity Imaging studies are applied to scan the subsurface for finding out the geological stratal architecture. A SYSCAL-PRO 96 measuring system has been used to carry-out the field studies using 96 electrodes with 5m inter-electrode separation in different geological environs to understand the subsurface situations.

In present study, Sea water intrusion effect has been studied at Karaikal. These studies have helped to identify exact boundaries between fresh and saline water bodies. Spontaneous Polarization (SP) studies have also been adopted for getting information about the ionic content of the pore fluids. 2D and 3D profiling have been carried out in different locations of the identified zones. Some profiles are run parallel to the coast and the other profiles perpendicular. The agriculture yield in the zones has also been studied. Agriculture productivity is found increasing inversely with depth extent of the seawater intrusion effect. Sliced 3D images have also been presented to have an in-depth understanding of the subsurface geological pattern.

Key Words: apparent resistivity, seawater intrusion, spontaneous polarization, electrical resistivity imaging