

# Statistical Analysis of Hydrogeological Parameters of Kantapara Block, Cuttack District, Odisha

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## Abstract

The hydrogeological parameters, which control the quantity, storage and movement of groundwater in the subsurface are of paramount importance and their study has become imperative now-a-days. The present research is concerned with the statistical analysis of hydrogeological parameters like ground slope, thickness of soil zone, pre- and post-monsoon depths of water table, water table fluctuation, porosity, specific yield, specific retention, permeability, static water level, discharge, draw down, specific capacity index, storativity, hydraulic conductivity, hydraulic diffusivity and transmissivity of the Kantapara block of Cuttack district, Odisha. The univariate, bivariate and multivariate statistical techniques depict both the inter- and intra-parameter as well as sympathetic and antipathic relationships between the hydrogeological parameters.

**Keywords:** Hydrogeological parameters, Correlation analysis, Factor analysis, Cluster analysis

## Introduction

Water is an essential constituent for existence of life. It occurs both on the surface and in the subsurface of the Earth. Increasing population growth, urbanization, industrialization and food grain production coupled with climate change and polluted surface water bodies have increased the importance of groundwater. As a result, most of the human population prefers to use groundwater. The quantity and quality of groundwater present in the aquifer depend on the amount of precipitation, ground slope, permeability of the soil cover in addition to the types of sediments and rocks present in subsurface (Murkute, 2023; Solanki and Murkute, 2019). Increased urbanization has appreciably reduced the recharge areas of the aquifers by construction of buildings and roads. At the same time, the quantity of rainfall is declining due to climate change. The water supply condition has become very bad in populous cities sitting on hard rocks. However, the per capita water consumption in alluvial terrains is more due to the porous and permeable nature of aquifer materials. Though the Central Ground Water Board (CGWB) mapped the aquifers of Kantapara block of Cuttack district of Odisha in 2013 and 2018, no systematic research has been undertaken so far. Though Nayak and Hota (2021, 2023a-b) studied the groundwater chemistry and quality, detailed study of hydrogeological parameters has not been done. Murkute (2014, 2017) has studied the interrelationships of texture and types of

sediments with aquifer parameters. In view of this, an attempt has been made in the present work to study the hydrogeological parameters of the Kantapara block of Cuttack district, Odisha by statistical methods.

## Geological Setting

### Study Area

The present research pertains to the Kantapara block of Cuttack district, Odisha. It is bounded by east longitudes 85° 57' 30" to 86° 03' 40" and north latitudes 20° 12' 30" to 20° 21' 30" featuring in the Survey of India toposheets F45T15, F45T16, F45U3 and F45U4 in 1:50,000 scale (Fig.1). It covers an area of about 119 Km<sup>2</sup>. The area experiences a warm humid tropical climate with annual rainfall of about 1.39 m and variable temperature of 20 - 40°C.

### Geology

The Eastern Ghats Supergroup of Precambrian age consisting of khondalite, charnockite, quartzite, granite and gneisses forms the basement of the Kantapara block. It is overlain by the rocks of Athgarh Formation that comprises conglomerate-sandstone-shale sequences. These sedimentary rocks are succeeded by Palaeocene to Miocene sediments of Tertiary period. The Quaternary gravels, sands and clays, which overlie the Tertiary rocks form the main aquifer system ranging in thickness from 200-400 m (Nayak and Hota, 2021). The area is characterized by moderate slope of about 5 degrees towards south.