

Identification of potential zones for artificial recharge of groundwater using GIS overlay technique in granitic terrain of Bommala Ramaram and Bhudhaan Pochampally watersheds, Yadadri Bhuvanagiri district, Telangana state (India)

G. Praveen Kumar¹ and Sreenu Kunsoth^{2*}

¹Central Groundwater Board, Ministry of Jal Shakti, Faridabad, Haryana- 121001, India

²Department of Geology, University College of Science, Osmania University, Hyderabad-500007, India

* Corresponding author: sreenukunsoth@osmania.ac.in

Abstract

The study area encompasses an area of 657 Sq. km, along the eastern peri-urban boundary of Greater Hyderabad Municipal Corporation. It is traversed by Musi River in the southern region. The area is underlain by granitic rocks of Archaean age, which have negligible to poor primary porosity while secondary structures like joints, fractures, shears and faults give rise to secondary porosity. The climate of the area is tropical to semiarid with normal annual rainfall of 730 mm. Excess pumping of groundwater for irrigation purposes, has imposed stress on the ground water resources in the northern parts of the study area, where deeper water levels are recorded up to 44 mbgl. Based on the post-monsoon water levels, the average unsaturated thickness estimated 3 mbgl is 5 m. which has a storage capacity of 60 MCM. Effective management of aquifer recharge is becoming an increasingly imperative in the context of water resource management strategies. In this study, Artificial recharge zones have been delineated through the integration of various thematic layers in the GIS environment. Weighted Index Overlay Analysis (WIOA) in spatial analysis is a simple and straight forward method for a combined analysis of multi-class layers. The study involves the mapping of potential zones and finding out various key frameworks influencing selection of suitable structures for artificial recharge of groundwater in granitic terrain using Geographical Information System (GIS) overlay technique. Based on the present study, the area is classified into three different categories of potential zones for artificial recharge namely, high favourable zone, moderate favourable zone and least favourable zone. The high favourable zone occupies 29% of the study area mostly in the northern part, while moderate favourable zones occupy 63% and low favourable zone, 8% occupying hilly areas in both the watersheds

Key Words: GIS, Potential zones, Artificial recharge, Archean granite, Bommala Ramaram, Bhudhaan Pochampalli, Bibinagar (Bhuvanagiri Yadadri district)

INTRODUCTION

With more than 70% of India's population dependent on agriculture, overexploitation of groundwater is an important factor leading to groundwater depletion. Nowadays, groundwater is being depleted not only in India but worldwide, and there is no adequate compensation for it. Therefore, this scarce situation indicates the importance of groundwater resources and its management in a water deficit region. Hence, it is essential to adopt important practices for groundwater augmentation for agricultural, industrial and domestic purposes. Artificial recharge is an effective technique for augmenting groundwater resources. The saturated zone of groundwater present below the Earth surface is termed as aquifer. Generally, aquifers are porous and permeable. Identifying potential zones for artificial recharge of groundwater is an important aspect thus becoming increasingly important in water resource management strategies (Gale, 2005). Present study area is devoid of perennial water sources like rivers, lakes etc.

STUDY AREA

The study area includes two watersheds namely, Bommala Ramaram and Bhudhaan Pochampally in Yadadri Bhuvanagiri district, Telangana state (Figure 1) which lies between 17° 14' 51'' - 17° 41' 34'' N and 78° 40' 05'' - 78°

55' 49'E. The area is located along the eastern peri-urban boundary of Greater Hyderabad Municipal Corporation (GHMC), extending far over 657 Sq.km.

GEOLOGY AND LITHOLOGY

The area under study forms a part of the eastern Dharwar craton located within the state of Telangana. It consists of granitoid rocks of the Peninsular Gneissic Complex which are generally massive, occasionally foliated and rarely gneissic. The rocks are leucocratic showing light grey to greyish pink in colour. The rock types occurring in the study area are broadly classified into three groups (Janardhan Rao, 1965; Janardhan Rao and Sitaramayya, 1968). Peninsular granites form first two groups of rocks which include grey and pink varieties of granites and intrusive dolerite dykes comprise the third group (Figure 2). The variations in the granites are quite clear having two major types. Each one of them shows several minor variations which are mainly due to mineralogical composition, textural identities, coarse to medium grained fabric and enclaves. Aplites, pegmatites, epidote veins and quartz veins are also responsible for lithological variations. The dolerite dykes varies both in width and length. All these variations exert considerable influence on weathering and consequent evolution of land forms. Black soils covering majority of the area may have been derived from grey granites.