

BOOK REVIEW

GROUNDWATER: GEOTECHNICAL INVESTIGATIONS AND QUALITY ASSESSMENT.

Y.A. Murkute and S.K. Humane (eds.). Gondwana Geological Magazine, Special Vol. No.14, 2014. Gondwana Geological Society, Nagpur, 2014. 201p. Price: India: Rs.1500/Foreign: US \$100.

The Peninsular shield which is the focus of study in the book under review had been the amphitheatre of multiple tectonic disturbances and erosional cycles over millions of years in the geological past. It has its characteristic geomorphic features and variations like plateaus, rugged mountains, vast erosional plains and mature river valleys. The geological formations consist of Archaean and Precambrian basement complex, Proterozoic sedimentaries, Palaeozoic coal bearing Gondwana sandstone-shale sequence, Mesozoic Deccan traps and intertrappeans, upland older alluvial valley fills, and recent coastal alluvial strips. Adding to this complexity, the climate of this terrain, too, varies widely from humid to semiarid with rainfall of >2500 mm over the Western Ghats, 1100 mm and less on the eastern coast, and <600 mm in a wide drought prone N-S belt inducing endemic surface water scarcity, and where groundwater is the major or often only source of water. This wide variation in physical setting is reflected in hydrogeology, too. The aquifers are generally thin, discontinuous, holding moderate to limited groundwater storages in weathered zones, fractures and fissures of hard rocks, as also in porous trappean vesicular beds or loosely cemented sedimentaries. While locating the aquifers is rather enigmatic, impacts of spiralling population growth, modernization of expanding agriculture, progressive industrialization and urbanization, and other anthropogenic activities, are dominating the scenario. Groundwater overexploitation and pollution are rampant. This has made groundwater management fraught with numerous uncommon problems and complexities requiring knowledge, skill and innovative solutions.

Alive to the need of the day, Gondwana Geological Society, Nagpur has been organizing National Seminars to deliberate on the various issues in this terrain revealed by the studies and their solutions. The product is several valuable publications on the Seminar Proceedings. The latest one is this Special Volume No.14 of Gondwana Geological Magazine, "Groundwater: Geotechnical investigations and Quality Assessment", edited by Y.A. Murkute and S.K. Humane. It contains twenty three (23) well edited papers, of course with a focus on Central India, particularly Maharashtra and Madhya Pradesh. The papers may be divided under two main themes, namely (i) groundwater assessment and management (12 papers), and (ii) groundwater quality and pollution (11 papers). In the 'PREFACE' of the book Murkute and Humane have nicely highlighted the brief findings of the articles.

GROUNDWATER ASSESSMENT AND MANAGEMENT

The papers primarily dwell on groundwater surveys and exploration using latest innovations of Science and Technology, seeking in-depth knowledge of aquifer disposition, distribution and potentials; unravelling areas of groundwater development prospects, role of fracture lineament, as also scope for its conservation. But groundwater is an inseparable part of the ecosystem and environment, its management, therefore, needs understanding of the total ecosystem. Hence the stress is on integrated multidisciplinary studies, starting with morphometric study based on satellite imageries, analysis of rainfall and surface hydrology, and hydrogeological field investigations aided by geoelectrical resistivity surveys revealing depth profiles, and integration of the results on a GIS platform. Still there are many

unknown factors like flow of infiltrating water in the vadose zone, from vadose zone to saturated zone as also within the fractured saturated media, which rather baffles groundwater assessment and management in the hard rock terrain. Groundwater flow in the fractured rocks does not strictly conform to conventional flow equations. Mathematical modelling helps in understanding and simulating this complex groundwater system and its behavior under stress conditions leading to dependable management options or strategies.

GROUNDWATER QUALITY AND POLLUTION

These papers highlight the importance of groundwater quality in its sustainable use. Groundwater pollution is an emerging crisis haunting its sustainability, such as high iron and fluoride contents from geogenic sources, high nitrate from agricultural chemicals, trace elements like Cu, Mn, Pb, Cr, Fe and other pollutants from industrial or municipal sources which may cause health hazards if ingested through drinking water. Control of pollution needs thorough understanding of the pollutant sources and their mobility, as also processes of quality evolution based on periodical monitoring and detailed quality analysis.

Thus, most of the papers are on interesting case studies which give insight into a variety of groundwater development and management problems and their innovative solutions. (1) Rainfall and aquifer response (Katpatal et al. p.21). (2) Drainage morphometry: evaluating water conservation potential, and artificial recharge structures (Shimpi et al. p.57). (3) Groundwater potential zones using Remote sensing and GIS (Jadhab & Babar p.35; Viveknath et al., p.41; Manjare et al. p.65; Muley et al., p.71). (4) Electrical resistivity surveys in tandem with remote sensing in delineating groundwater potential zones, lineaments etc. (Khadse & Bhojar, p.11; Narendra et al., p.53; Bopche et al., p.49). (5) Model of artificial recharge structures (Channe, p.29). (6) Groundwater pollution through anthropogenic activities and impact of mining (C.S. Reddy et al., p.177, Sridhar et al., p.85; Tiwari et al., p.195; Dharashivkaer et al., p.161). (7). Groundwater management using Modflow modelling (Lamsoge et al., p.1).

The articles apprise the readers about the nature of water management issues in hard rocks of Peninsular India. The papers lay down step by step approach in evaluation of groundwater potentials, scope of its management involving artificial recharge and augmentation of overstressed groundwater, along with quality management. Further, groundwater management plays a big role in mitigating impact of 'global warming'. Both the editors and authors have jointly put in praiseworthy efforts in conducting these studies. The book will be treasured keep in all reference libraries in geoscientific studies. The printing quality is excellent; papers are lucidly written and well-illustrated with valuable data tables and neatly drawn figures characterizing the papers for their enormous reference values for students and teachers alike. Murkute and Humane do deserve commendation for astute editing of this valuable publication.

Briefly speaking, the papers "deliberate the issues.....(which) have a bearing on sorting out groundwater problems nationwide" ('FOREWORD', para 3).

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