

Preface

While planning for the coastal zone management, the groundwater component of the vulnerable zone is invariably ignored or neglected, as it is invisible from the surface and needs indirect as well as modern scientific technologies to understand. It is needless to say that the Mahanadi deltaic region is very thickly populated and people depend on the groundwater for their domestic use, as surface water is insufficient particularly during summer, very often polluted, and many areas are submerged by saline water. Frequent floods and cyclones also contaminate the surface water. The groundwater of the area is contaminated both vertically and laterally by the ingress of seawater in various degrees.

Many organisations work independently in this area without any coordination with each other. Everybody withdraws water from the subsurface on his or her own will, assuming that the resource is unlimited and without realising the consequences of such abuse to the precious resource. Over the years, the population, industrialisation, demand for non-monsoon irrigation and wastage have increased manifold. This has led to the installation of a good number of high discharge pumping wells, which has put more pressure on the limited fresh groundwater resource. Lack of awareness and management, poor understanding of the aquifer system, absence of proper legislation or its disregard and poor enactment have multiplied the problem.

In this book, the nature and extent of the different aquifer systems in the coastal part of the Mahanadi Delta have been delineated by geological, geophysical, hydro-geochemical and remote sensing techniques and methods. Geophysical logs and lithological samples of more than 150 boreholes of the area were analysed and interpreted to understand the subsurface condition. The aquifers are found to be extensive and often interconnected. There is a vertical as well as lateral variation in the salinity of groundwater. Basing on the mode of occurrence, aquifer properties, interconnectivity, etc., seven aquifer systems have been identified and named according to their positions from the top. The characteristics of the individual aquifer have been discussed in the book. In the shallow aquifer, which is named as A0, fresh groundwater is controlled by the geomorphology of the area and restricted to certain geomorphic features such as beach ridges, natural levees and some palaeo-channels in shallow zone of the coastal area, under unconfined condition,

which need to be understood and protected. The deep aquifers are confined in nature and further classified into A1–A6. The A1 and A2 aquifers do not contain freshwater except very small brackish patch in the western part. The top surface of A3 aquifer is found at a depth of 78–104 metres and fresh in the north-western part with saline ingress from the northeast and southern sides. The top surface of A4 aquifer occurs at a depth of 120–140 metres with saline ingress from northeast and southeast sides. There is also a small patch of saline water in the west central part encircled by freshwater. The top surface of A5 aquifer is found at a depth of 173–220 metres in which freshwater extends from western side to the north-eastern part through the central part of the area. The A6 aquifer is found at about 285 metres and very little information is available for the understanding of its nature and disposition.

Chemical characteristics along with the usability of the groundwater from different locations and from different depths for drinking and irrigation analysis of the samples have been also discussed in the book. The freshwater is under hydrodynamic condition and with a delicate balance of saline–fresh interface. Ignorance, improper well construction and unregulated withdrawal may disturb the delicate balance and ultimately may cause the whole aquifer to turn saline. The available freshwater is precious and limited, and needs good groundwater management practice with different protective and corrective measures. Rearrangement of the pumping pattern, safe withdrawal of freshwater, scientific well design and adequate measures for artificial recharge should be taken up in the zone to protect the aquifers from saline ingress. Awareness among the people can also help in better management of this valuable resource.

As far as possible, the metric system of unit has been adopted, except in rare cases where the original units of expressions of the authors and the result of some of the instruments are maintained. I have endeavoured to acknowledge all sources of information and views of the original authors and the workers. Though care has been taken to incorporate correct information, some errors or omissions might have crept in inadvertently. I welcome pointing out of such omission, so that it can be rectified in the future edition.

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