Influence of Sea Water Ingress: A Case Study from East Coast Aquifer in India

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ABSTRACT

One of the sources of pollution, in addition to organic matter; pathogens and microbial contaminants; nutrients; acidification (precipitation and runoff); heavy metals; toxic organic compounds and micro-organic pollutants; thermal and silt and suspended particles, that impact water resources at local scale in parts of eastern coast of India, is SALINIZATION due to sea water ingress. The eastern coast of India is also hit by the cyclones every year. With the result drinkable water is becoming increasingly scarce. By the year 2025, it is predicted that water abstraction will increase by 50% in the region, as population growth and development drive up water demand. In recent years, the availability of water and its quality have emerged as the major constraints to economic development and quality of life.

In parts of Krishna - Godavari Basin of Andhra Pradesh, number of bore wells have been drilled for drinking water abstraction. Salinity hazards have occurred due to sea water intrusion as the aquifers are open to the sea, entraps sea water in the marine sediments and seawater intrusions through tidal cracks. Indiscriminate pumping has resulted in groundwater overexploitation and sea water ingress with salinization of aquifers and landward movement of saline water – freshwater interface for several kilometres in Krishna - Godavari Basin area. In parts of Krishna - Godavari Bsin bore wells yield saline / brakish water due to seawater ingress. The groundwater is of brakish type, having Na^+ : Cl^- facies. The soils of the area have the ability to pick up these ions during pre monsoon period and during post monsoon period the water becomes more saline thus, suggesting that the ions are leached from the soils by the infiltrating recharge waters and are added to groundwater bodies. The TDS (1912 / 1948 mg/l), TH (365/393 mg/l - Ca^{++} + Mg^{++}), Na^+ (721/ 739 mg/l), Cl^- (781/ 797 mg/l), SO_4^{++} (122/ 112 mg/l) and F(1.6/1.9 mg/l) concentrations are in excess of the safe limit in accordance with the domestic and industrial water quality standard of WHO. Excessive amounts of fluoride (more than 1.5 mg/l) in drinking water is toxic. Discoloration of teeth and crippling skeletal effects caused by long-term ingestion of large amounts are prominent in the region, where millions people suffer from chronic fluorosis disease. Thus, these ground waters are not safe to drink.

The basic problem of groundwater management of the region is its development without disturbing the saltwater / freshwater interface. This may be achieved by limiting the groundwater abstraction through enactment of groundwater legislation and recharging the aquifer artificially by rainwater.

Key words : Salinization, Aquifer, Brakish, Fluorosis, Leaching

INTRODUCTION

Needless to say that water is perhaps the scarcest commodity of the 21st century. On global scale it is assessed that over the next two decades, water use by human beings will increase by 40% and that 17% more water will be needed to grow more food for the increasing population. The World Water Vision Commission drew attention to the "gloomy arithmetic of water" as water