

## Flow and mass transport modeling in the ash ponds of Koradi in central India

S. S. Ramya, C. Padmakar, P. R. Pujari, Vijendra J. Khandekar, Piyush Mahore and P. K. Labhasetwar

National Environmental Engineering Research Institute, India

Groundwater is the principal source of drinking water in many countries especially in the urban and rural areas. The thermal power stations generate lot of waste in the form of ash and often mixed with water and disposed in ponds in slurry form. In most of the cases, the ponds do not have secured liner to prevent the seepage of the contaminants to the aquifer. It is essential to study the likely threat to the groundwater regime from such sources of groundwater pollution. The Koradi thermal power station is once such plant where the ash is mixed with water and the resulting slurry is disposed in the ponds which do not have secured liners. An attempt has been made to assess the impact of ash ponds on the groundwater quality in the sub-watershed surrounding the ash ponds. A holistic approach has been followed integrating different tools like hydrogeology, surface geophysics, groundwater chemistry, stable isotope studies and flow and mass transport modelling to study the impact of ash ponds vis-a-vis the groundwater quality in the sub-watershed. The study area has been delineated on the watershed principle. It covers approximately 57.8 sq km. The groundwater flow pattern indicates that sources in the eastern flank of the ash ponds will be vulnerable to contamination. The groundwater analysis results that the sulphate concentration in the samples nearer to the ash ponds are very high (>1000 mg/L). Geophysical soundings by Time Domain Electro-magnetics have been undertaken to decipher the aquifer geometry. Groundwater Flow and Mass Transport Model has been attempted through Visual MODFLOW Professional (Version 4.2) for steady state simulation. MODPATH module has been run to visualise the discharge zone for the ponds and capture zone of the contaminated wells. MASS Transport module has also been attempted to predict the contamination for the future years. The MODPATH and MASS TRANSPORT study do indicate the impact of the ponds on the groundwater sources in the downstream. A concrete lining of the ash pond has to be done to avoid the fly ash from leaching to the aquifer. A provision should be provided for the recycling of ash pond water. The future scope of work involves the transient modeling in the unsaturated zone with steady state model as basis including the reactive modeling.

s\_ramya@neeri.res.in