



Modeling impacts of change in Landuse/ Landcover on groundwater system in Shiwaliks of Punjab using Remote Sensing and GIS

C K Singh (2), S Mukherjee (1), and S Shashtri (2)

(1) Jawaharlal Nehru University, School of Environmental Sciences, Head (Geology and Remote sensing), New Delhi, India (dr.saumitramukherjee@usa.net, Fax: +91 11 26704312), (2) Jawaharlal Nehru University, School of Environmental Sciences, Research Scholar (Geology and Remote sensing), New Delhi, India

The dependency of people has increased on groundwater due to tremendous increase in crop production, population and industrialization in past few decades. The groundwater is the main source of irrigation in Shiwaliks of Punjab. Loss of massive forest cover in Shiwaliks is resulting in drying-up of several sub-rivers and natural stream, as a result, the groundwater availability in Punjab is drastically hampered. At present Jayanti, Budki, Siswan the three major tributaries of river Satluj flowing through the district of Rupnagar have disappeared. Since infiltration, recharge, accumulation, and flow of ground water is controlled by various geological, morphological, topographical and other surface parameters by different degrees, study and analysis of these parameters provide vital clues and knowledge about groundwater occurrence and recharge. The characteristic of groundwater is reflected on the soil and vegetation of the surface above it in unconfined aquifers. Hence, the characteristics of the groundwater at a particular area can be determined to a particular extent, by its surface manifestation in terms of the landuse/ landcover pattern. This is the basis on which the classification of the images was performed by using clustering algorithms, that examine the unknown pixels in an image and aggregate them into a number of classes based on the natural groupings or clusters present in the image values. Unsupervised classification was performed on landsat images of year 1989, 2000 and LISS III image of 2005. In the last two decades we observed certain trends that were not very encouraging from environmental viewpoint. Primary among these are the trends displayed by area under river, dense forest, cropland and settlements. In the first three categories there is a continuous decrease with the ultimate difference accruing to around 17% and 22% and 31% respectively, the fourth field, which is settlement, has registered an alarming increase of 534%. The effect of gradually increasing influence of green revolution is continuously being manifested in the form of escalating area under salinization; the total increase being registered is around 94%. The areas lying within the vicinity of river have shown concentrations of several heavy metals to be higher than the desirable limits. Impact of agriculture has also shown alarming increase in nitrate concentration in some of the areas. Thematic maps for geology, geomorphology, slope, drainage, lineament density, distance from the lineaments, soil type, were prepared using GIS platform and a suitability analysis was performed for quantitative variation of groundwater in the study area. Several water quality parameters were analyzed and to observe spatial variation of suitability of groundwater in terms of quality a water quality index (WQI) was generated. Parameters such as relative humidity, temperature and rainfall for the last two decades were also analyzed in relation to decline in level of groundwater.