**Study on Impact of Urbanisation on Groundwater Quality of Nagpur City using Remote Sensing and GIS**

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Groundwater availability in most of the urban areas in India seems to be improving due to provision of piped water supply, but the quality of groundwater is becoming a serious concern. Nagpur urban area has satisfactory groundwater availability but the quality is deteriorating in certain pockets and may not be used. In the present study, remote sensing and GIS has been used to estimate the impact due to fast changing urban scenario. Due to the development in the span of eight years, drastic changes in the land use/land cover and the quality of ground water have been observed in Nagpur urban area. High resolution satellite images of Nagpur urban area of year 2002 and 2010 are selected for recording the temporal variation in land use/land cover. The total change recorded in the land use area is 75.16 km². The values of ground water quality parameters like Calcium (Ca), Chloride (Cl), Fluoride (F), Bicarbonate (HCO₃⁻), Magnesium (Mg), Sodium (Na), pH value, Total dissolved solids (TDS) and Total Hardness (TH) collected from 45 different wells of Nagpur urban area were used for interpolation. The groundwater quality maps of 2002 and 2010 are generated in the Arc GIS and ERDAS Imagine environment. Inverse distance weighted (IDW) method of interpolation was applied to all the chemical parameters and the groundwater quality maps are prepared. Each parameter has been weighted based on its impact on human health and weighted sum overlay analysis was carried out to locate the areas in the city where ground water quality has changed. The change has been estimated and compared with desirable limit given by BIS Drinking Water Standards (IS 10500 - 91, Revised 2003). It is found that the quality of groundwater has improved in the eight years but it is still not within the desirable limit.

**Key words:** Land use/Land cover, Ground water quality, Remote sensing and GIS, Inverse distance weighted method, Weighted sum overlay analysis etc.

**Introduction**

With the population growth, the demand for housing is also increasing. Human will be always adapting to their environmental conditions; for building houses, forming a community, and working. However, sometimes the threat and danger of disaster are being forgotten (Haryana et al., 2013). According to United Nations estimates, the population living in urban areas exceeded 50% of the world total in 2006 and will approach 60% in 2020 (Shahraki et al., 2011).

Although the world population had historically lived in rural areas (Estoque and Murayam, 2011), Land Use Cover Change (LUC) is acknowledged as an important driver of changes in hydrology as well as the metabolism and productivity of hydrologic ecosystems (Shoyama et al., 2011). LUC results from the interaction of human activity (social and economic factors) and natural environmental changes (natural factors) (Qingqing et al., 2012). Land cover change, widely used in different areas, can be used to describe changes in urban settlements and vegetation patterns as an important indicator of urban ecological environments and as well plays an important role in the assessment of human settlements (Peijun et al., 2010). Remote sensing technology provides instruments for monitoring land use and land cover change (LULC) and the development of a coherent categorization of land cover units has been a main focus (Tovar et al., 2013). Satellite Remote Sensing (RS) and Geographic Information System (GIS) have been widely applied in identifying and analyzing land use/cover change. Remote sensing can provide multi-temporal data that can be used to quantify the type, amount and location of land use change (Zhang et al., 2011). Land use changes in a watershed can impact water supply by altering hydrological processes such as infiltration, groundwater recharge, base flow and runoff. For instance, covering large watershed areas with impervious surfaces frequently results in increased surface runoff and reduced local surface erosion rates (Pin et al., 2007). Large amounts of data is required for developing such LULC maps and remote sensing can be a source of accurate, detailed information over large areas. Remotely sensed data and the potential to

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