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WATER QUALITY ASSESSMENT USING SATELLITE REMOTE SENSING

Abstract

The two main global issues related to water are its declining quality and quantity. Population growth, industrialization, increase in agriculture land and urbanization are the main causes upon which the inland water bodies are confronted with the increasing water demand. The quality of surface water has also been degraded in many countries over the past few decades due to the inputs of nutrients and sediments especially in the lakes and reservoirs. Since water is essential for not only meeting the human needs but also to maintain natural ecosystem health and integrity, there are efforts worldwide to assess and restore quality of surface waters. Remote sensing techniques provide a tool for continuous water quality information in order to identify and minimize sources of pollutants that are harmful for human and aquatic life. The proposed methodology is focused on assessing quality of water at selected lakes in Pakistan (Sindh); namely, HUBDAM, KEENJHAR LAKE, HALEEJI and HADEERO. These lakes are drinking water sources for several major cities of Pakistan including Karachi. Satellite imagery of Landsat 7 (ETM+) is used to identify the variation in water quality of these lakes in terms of their optical properties. All bands of Landsat 7 (ETM+) image are analyzed to select only those that may be correlated with some water quality parameters (e.g. suspended solids, chlorophyll a). The Optimum Index Factor (OIF) developed by Chavez et al. (1982) is used for selection of the optimum combination of bands. The OIF is calculated by dividing the sum of standard deviations of any three bands with the sum of their respective correlation coefficients (absolute values). It is assumed that the band with the higher standard deviation contains the higher amount of 'information' than other bands. Therefore, OIF values are ranked and three bands with the highest OIF are selected for the visual interpretation. A color composite image is created using these three bands. The water quality of these lakes are assessed by comparing their reflectance values with the spectral signatures of distilled water. The layout water quality maps of these lakes are prepared in terms of these deviations. The results of the study can be utilized for preliminary water quality monitoring of the selected lakes.