

Detection of water cover and change in water bodies for Bhopal, Madhya Pradesh using AWiFs data from Feb 2009 to Feb 2018

Introduction

We took AWiFS data from 16th February 2009 and 17th February 2018 and compared the water surface area for Bhopal District (Topo Sector F43F). An increase in water surface area has been observed, primarily in the major water bodies of the district: Halali Dam, Hathaikheda Dam and Upper Lake.

Data and Methodology:

AWiFS was chosen for its large scene coverage (737 sq.km) and 2 Visible (G, R) and 2 IR (NIR, SWIR) spectral bands. Data was preprocessed by converting DN to Reflectance. Water Data was then extracted via the Normalized Difference Water Index (NDWI), with a threshold value of 0.2 to eliminate noise and isolate the water bodies.

$$NDWI = \frac{(Green - NIR)}{(Green + NIR)}$$

Isolated Water Raster was converted to a Vector, and the specific Water Bodies to be analyzed were selected by collecting all pixels where DN = 1.

Water Surface Area was calculated by multiplying pixel area (56*56 sq.m) with the total number of pixels (n) which met the DN = 1 criteria.

$$Area_{year} = (56 * 56 * n) m^2$$

n = 61 for 2009

$$Area_{2009} = 56 * 56 * 61 = 1,91,296 m^2$$

n = 185 for 2018

$$Area_{2018} = 56 * 56 * 185 = 5,80,160 m^2$$

Result: A clear increase of the water surface area by 3,88,864 sq.m, or 203.27% was observed.

Application and uses:

- Change detection is useful in many applications related to water cover changes, such as changes in water surface area, capacity of the water bodies and drought or flood prediction.
- As a result of this study, a long-term evolution of the large water bodies in Bhopal District has been observed.
- The patterns of water body growth can be utilized to predict future evolution patterns of the water surface area.
- This enables improved planning for urbanization, irrigation, and catchment projects in the district.

