Evaluation of the influence of land-use and land-cover changes on ecosystem services in Deepor Beel Ramsar Site using high resolution remote sensing

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It is important to assess the rapid land-use/land-cover change (LULCC) and its impact on ecosystem service value (ESV), affecting the socio-economic and climatic stabilization of wetlands. In this study, a multi-resolution image segmentation and *k*-nearest neighbours algorithm were used for the thematic classification of satellite images of 2003 and 2018 in the Deepor Beel wetland, a lake of international significance. A notable increase in built-up areas was observed from 9.07 to 32.19 sq. km during this period. Proximity analysis in the 500 m buffer from the Deepor Beel boundary revealed an increasing built-up areas in close proximity. The ESV evaluation estimated a net decrease in the monetary value of 4.85×10^4 USD of the wetland for the respective years. The study recommends strict demarcation of zones of influence on the ground and regular monitoring of LULCC to protect important wetlands and preserve their ecosystem services.

Keywords: Land-use/land-cover change, remote sensing, image segmentation, wetland ecosystem service value.

The present study uses fine spatial resolution satellite data and GIS techniques to map the temporal changes in land-use/land-cover (LULC) to identify the drivers of such changes and estimate the ecosystem service value (ESV) of the wetland ecosystem of Deepor Beel in Assam, North East India.

Materials and methods

Study area

Deepor Beel is a permanent freshwater lake located near the bank of the River Brahmaputra in the southwest direction of Guwahati city, Assam, NE India (Figure 1). This site was designated in 2002 under the Ramsar Convention due to its biological and environmental importance[9]. It is also included in Birdlife International's list of important bird areas (IBAs). An area of 4.14 sq. km within the Ramsar Site has been identified as a wildlife sanctuary[10]. The recorded wetland area is 40.14 sq. km, with its catchment covering an area of 230 sq. km. The wetland is located between