



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Change in Snow Cover Area and Flow Scenario of the Brahmaputra and Subansiri Basins Due to Climate Change

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SHORT ABSTRACT

In this study, the impact of the change in temperature on the snow cover area of both the Brahmaputra and Subansiri River basins has been analyzed from 2002 to 2015 for the months of January, April, July and October using MODIS data of 500m resolution and HadCM3 GCM temperature data of A2 scenario. The method adopted was Normalized Difference Snow Index (NDSI) Method. It has been found that except for the month of January, the snow cover area showed decreasing trends with respect to the increasing trends of temperature for the other months. The study on the effect of change in snow cover area on the discharges of the river Brahmaputra and Subansiri revealed that w.r.t. the decreasing trends of snow cover area, the discharge showed increasing trends. A study has been carried out to analyze the change in land use/land cover in both the basins from 2002 to 2012 for January, April and October using supervised classification method and maximum likelihood classifier algorithm. It has been found that dense vegetation and snow cover area decreased during this period, while light vegetation and bare soil showed significant increase.

Rainfall at 24 different locations over the Subansiri basin has been downscaled by multiple linear and non-linear regression based statistical downscaling techniques and by ANN based model. It has been found that multiple non-linear regression technique outperformed the other techniques. Future rainfall pattern of Subansiri basin has been analyzed for four different time periods, viz., 2020-39, 2040-59, 2060-79, and 2080-99. The spatial change in rainfall pattern showed a potential decrease of rainfall in the wet months and increase of rainfall in the dry months.

The future flow scenario of the river Subansiri has been analyzed up to the year 2099 using an ANN-based rainfall-runoff model and an ANN-SCS based hybrid model. The performance of the hybrid model was found to be better than the other model. Three different LULC scenarios have been created to study its impact on the future runoff of the river. No change in LULC from the present condition up to the year 2099 have been assumed in the first scenario, while various changes in the LULC categories have been incorporated in the other two scenarios. Decreasing trends of future runoff have been observed for the first scenario, while the future runoffs showed increasing trends for the other changed scenarios. To study the impact on the future power potential of the Subansiri Lower Hydroelectric Project, a reservoir simulation model has been developed. The runoff calculated for the different LULC scenarios by the ANN-SCS based hybrid model have been used as the inflow to the reservoir. For all the scenarios, lower power potentials have been observed compared to the power potential of the SLHEP during the historical period (1990-2014).