

Analysis and prediction of land cover changes by applying Cellular Automata-Markov model and geo-information: An arid and semi-arid river basin, Iran

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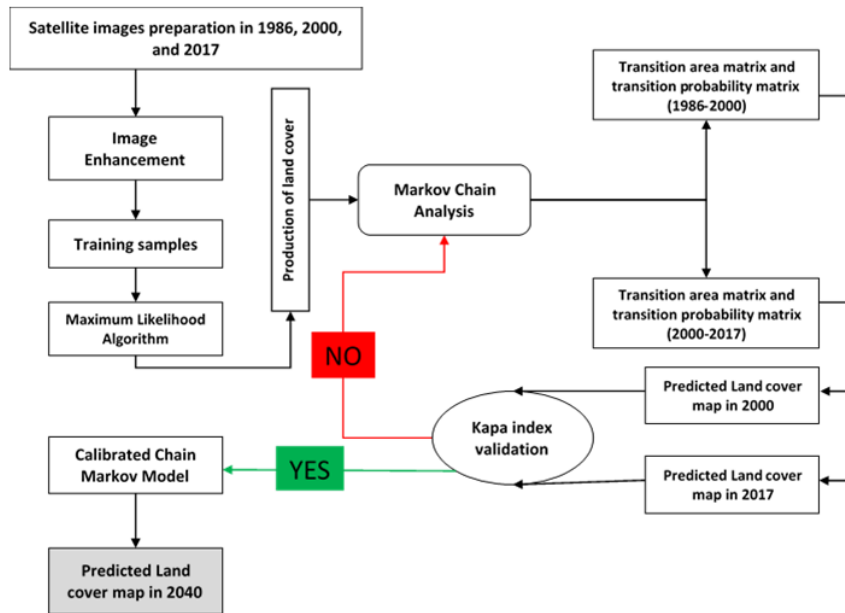
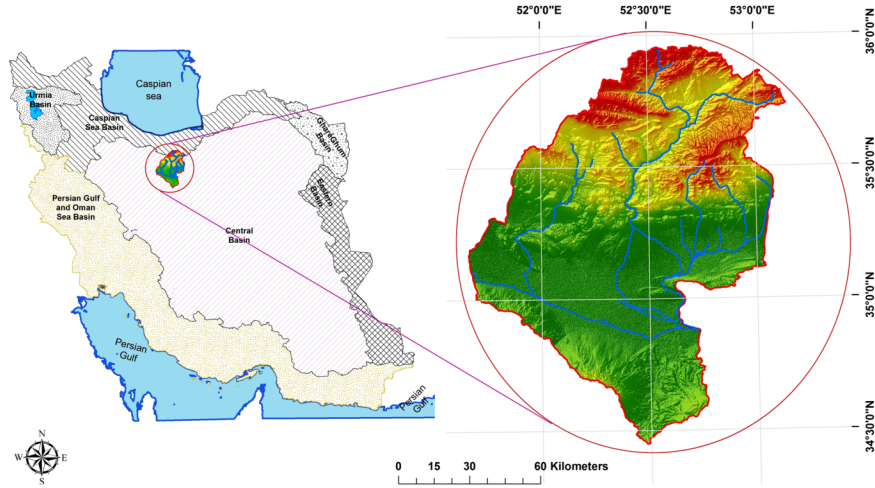
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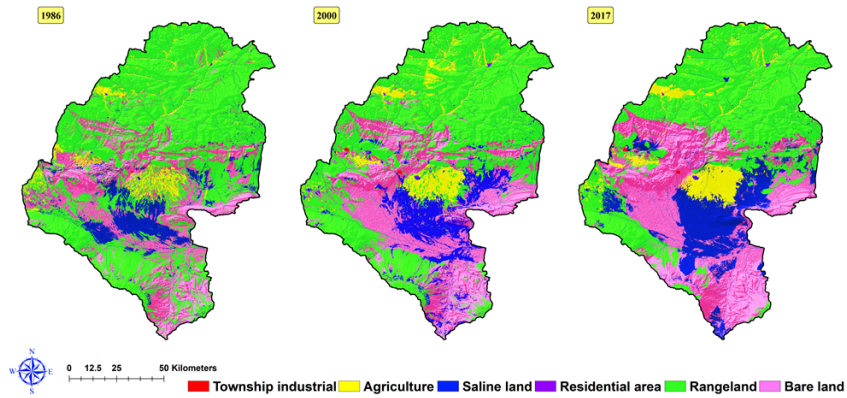
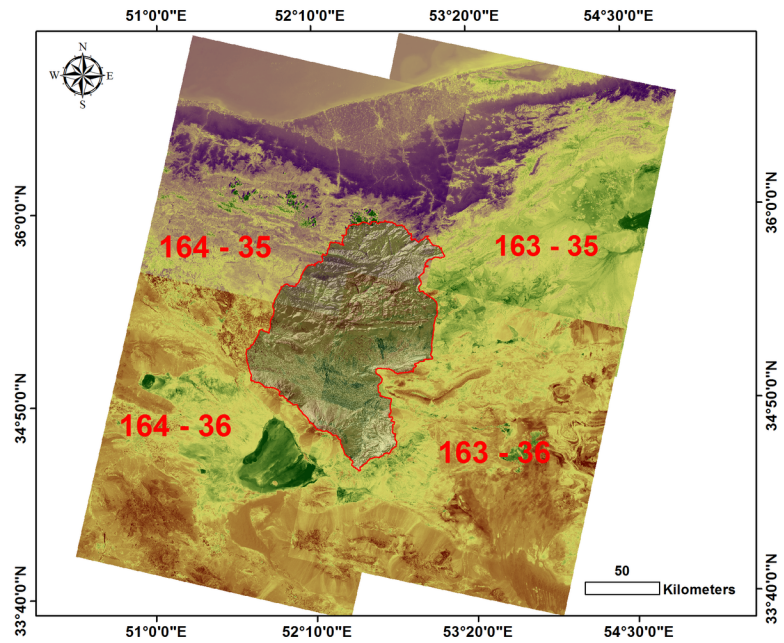
Abstract

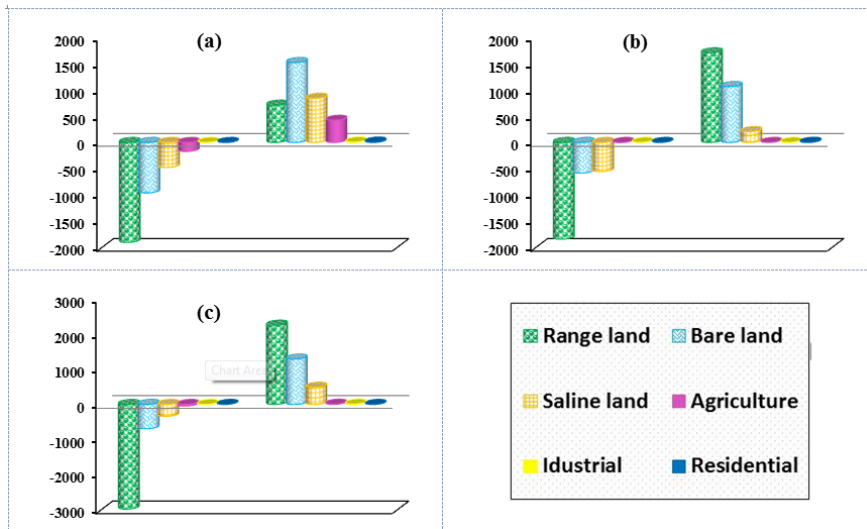
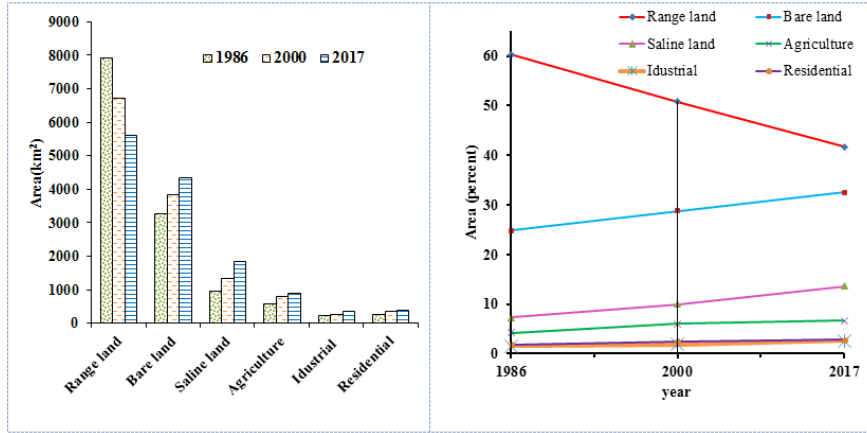
The prediction of future land cover changes is an important step in proper planning and management of watersheds. Various methods exist for this purpose. In this study, land cover changes were investigated in the Hable-Rud River basin in Iran, an arid and semi-arid region, using remote sensing and Geographic Information Systems (GIS). First, a supervised classification technique was applied to Landsat images acquired for 1986, 2000 and 2017 using the maximum likelihood method. Then, using pixel-by-pixel change detection, the land cover changes were predicted for 2017 and 2040 using a Cellular Automata (CA)-Markov model. The descriptive variables used included slope, aspect, elevation, and calculated distances from various land features such as rivers, roads, industrial areas, residential areas, saline land, and land in agricultural production. The predictions for 2017 were validated using the derived map from a Landsat image of 2017 with a resulting standard Kappa index of 0.74. According to the prediction results for 2040, the areas of rangeland and saline land will increase by approximately 6.5% and 2%, respectively, whereas the areas of bare land and agricultural land will decrease by approximately 6% and 2%, respectively. Moreover, the analysis of historical records since 1986 showed that the annual streamflow and precipitation have reduced by almost 44% and 29%, respectively. The reductions, particularly to streamflow, can be attributed largely to agriculture expansion, rapid population growth, and industrial developments. The analysis of the results indicates a need for more effective design, planning, and development of land cover policies for ecosystem protection.

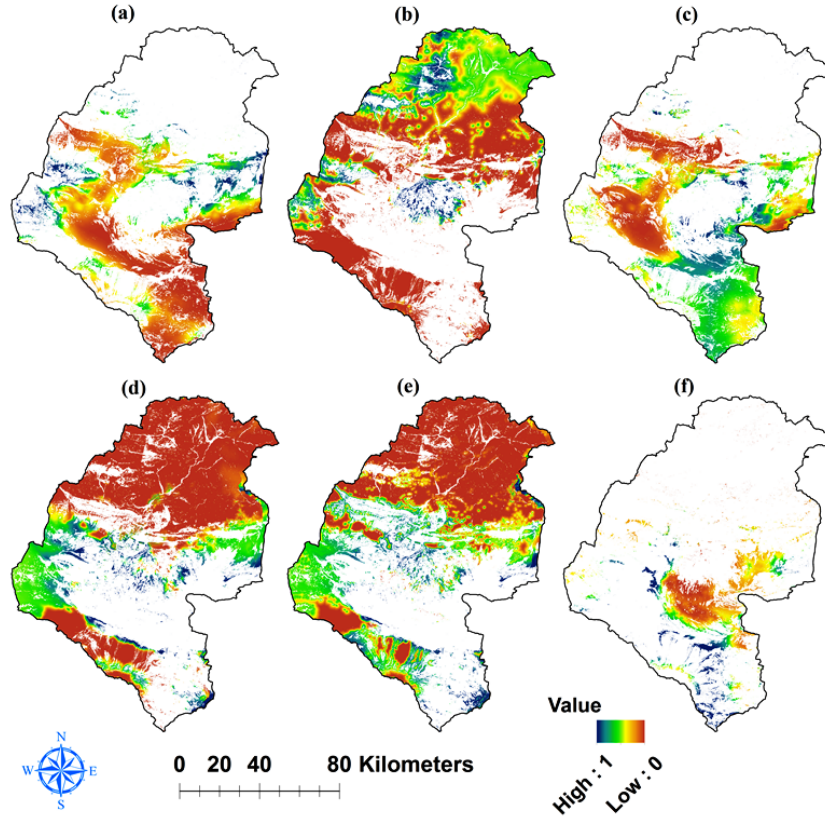
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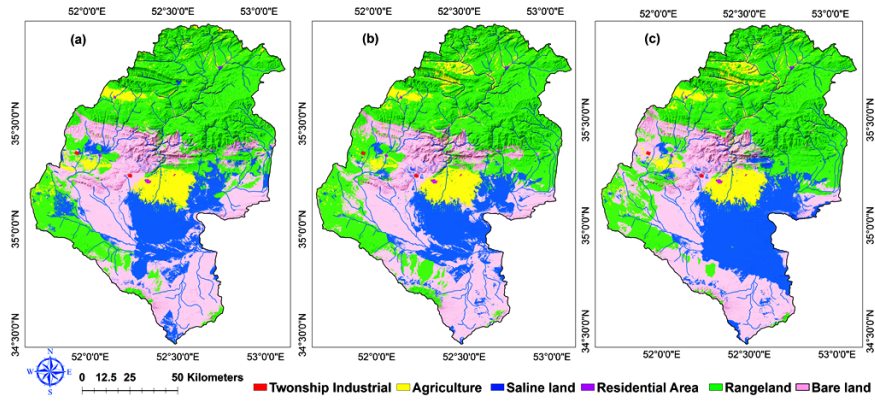
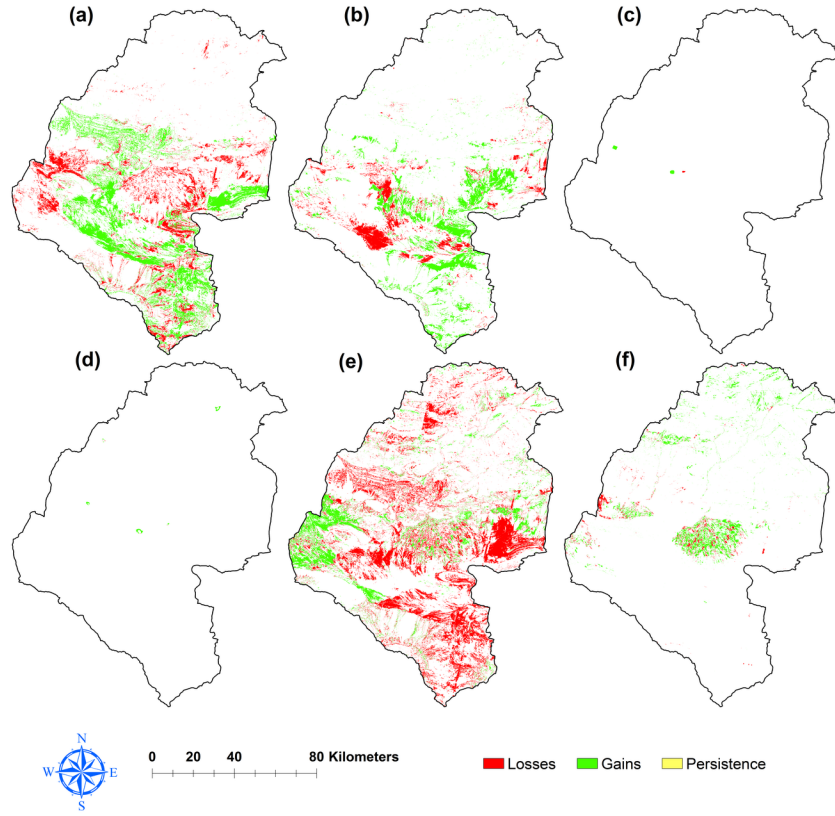
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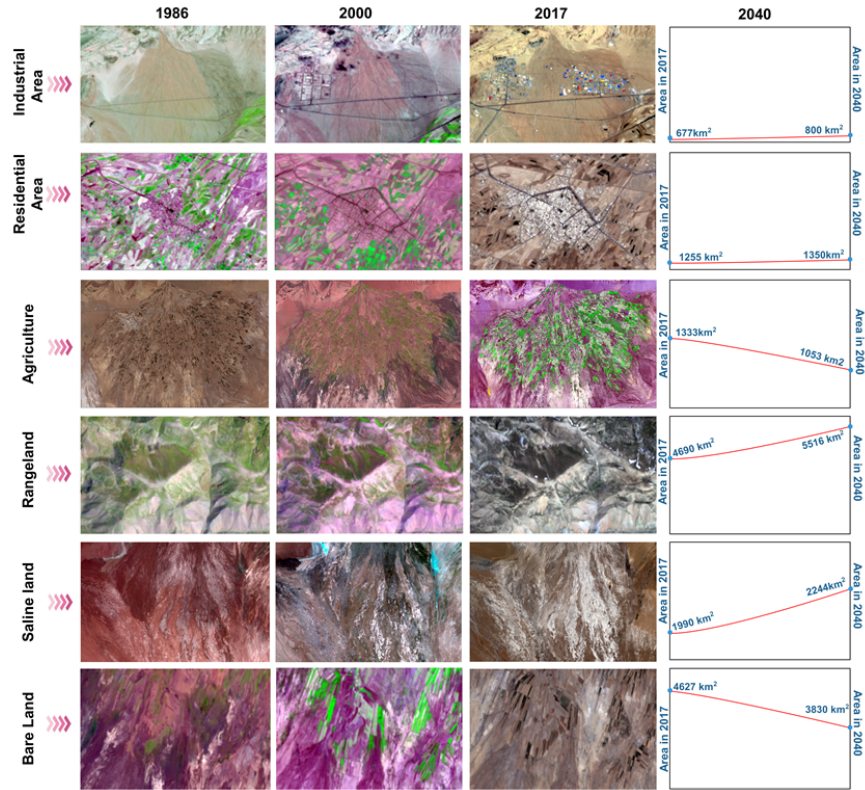
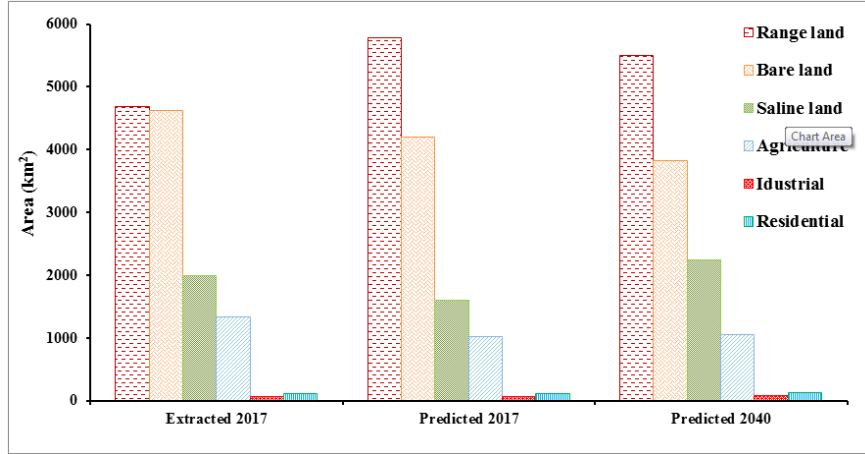


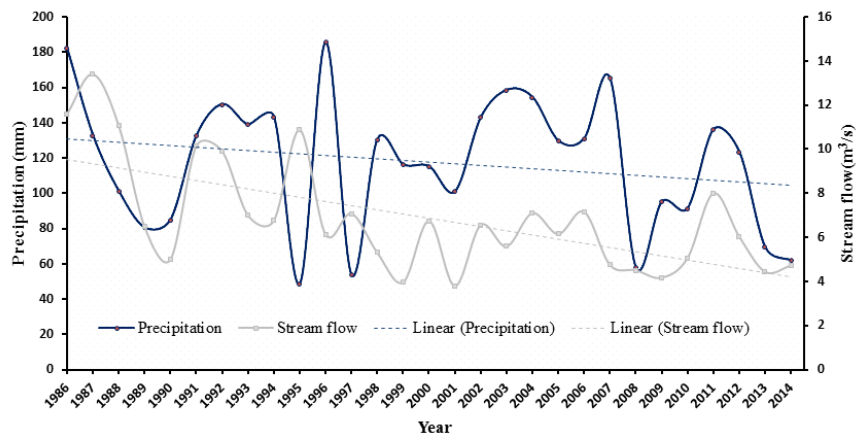












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