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Geographical Information System and Multi-Criteria Based Approach to Locate Suitable Sites for Industries to Minimize Agriculture Land Use Changes in Bangladesh

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Abstract : One of the most challenging issues to achieve sustainable development on food security is land use changes. The crisis of lands for agricultural production mainly arises from the unplanned transformation of agricultural lands to infrastructure development i.e. urbanization and industrialization. Land use without sustainability assessment could have impact on the food security and environmental protections. Bangladesh, as the densely populated country with limited arable lands is now facing challenges to meet sustainable food security. Agricultural lands are using for economic growth by establishing industries. The industries are spreading from urban areas to the suburban areas and using the agricultural lands. To minimize the agricultural land losses for unplanned industrialization, compact economic zones should be find out in a scientific approach. Therefore, the purpose of the study was to find out suitable sites for industrial growth by land suitability analysis (LSA) by using Geographical Information System (GIS) and multi-criteria analysis (MCA). The goal of the study was to emphases both agricultural lands and industries for sustainable development in land use. The study also attempted to analysis the agricultural land use changes in a suburban area by statistical data of agricultural lands and primary data of the existing industries of the study place. The criteria were selected as proximity to major roads, and proximity to local roads, distant to rivers, waterbodies, settlements, flood-flow zones, agricultural lands for the LSA. The spatial dataset for the criteria were collected from the respective departments of Bangladesh. In addition, the elevation spatial dataset were used from the SRTM (Shuttle Radar Topography Mission) data source. The criteria were further analyzed with factors and constraints in ArcGIS®. Expert's opinion were applied for weighting the criteria according to the analytical hierarchy process (AHP), a multi-criteria technique. The decision rule was set by using 'weighted overlay' tool to aggregate the factors and constraints with the weights of the criteria. The LSA found only 5% of land was most suitable for industrial sites and few compact lands for industrial zones. The developed LSA are expected to help policy makers of land use and urban developers to ensure the sustainability of land uses and agricultural production.

Keywords : AHP (analytical hierarchy process), GIS (geographic information system), LSA (land suitability analysis), MCA (multi-criteria analysis)
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