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Simulating Impacts of Regional Planning on Land Consumption Patterns using an Automated Retrospective Classification Approach and a Scenario-based Urban Growth Simulation Model in Western Germany from 1985-2030

Abstract

The future is urban. According to UN, 68% of the world population will live in urban areas by 2050. Urban sprawl is ubiquitous with a complex network of driving forces and human and natural impacts on various scales of the coupled human-environment urban system. In Germany, a land consumption of 30 ha per day is envisaged. The purpose of this goal is to reduce Germany's land consumption rate to a maximum of 30 ha per day on national level until 2020 from its current consumption rate of 66 ha per day - meanwhile the time limit has been extended to 2030. Accordingly, the objectives of the study are a) to extend urban land cover simulation efforts in Germany in a spatially explicit manner with a resolution of 30 m between 1985 and 2017, b) to investigate future land consumption rates in comparison with population development in particular keeping goal 11 of UN's SDG in the view, and c) analyze the spatial impact of planning policies in regard to land use planning and official climate change prevention strategies in Rhine Ruhr Metropolitan Region. The study makes use of retrospective land use and land cover classification of multispectral satellite data and the derivation of land surface temperature based on Landsat satellite in order to calibrate and validate the urban growth model SUSM (scenario-based urban growth simulation model). Two scenarios for future land consumption 2030 are implemented and the future impacts of urban growth with the projection of land consumption rate (LCR), population growth rate (PGR), and LCRPGR index on municipality level, as well as the impact on regions vulnerable to climate change evaluated.