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Land use change modelling

Abstract of the PhD Thesis

Land use change is a popular global phenomenon. Constantly changing surface areas of individual types of land use call for monitoring. It is also an obligatory task of the voivodeship marshal in Poland under the Geodesic and Cartographic Law Act. This PhD thesis, consisting of six publications focusing on a single topic, is intended to present an original approach to land use change modelling and developing models that help monitor the change.

The dissertation analysed whether and how voivodeship marshals carry out their statutory task. Next, it juxtaposed the findings with information published on websites of marshal offices. Furthermore, it investigated time series of land use variables using statistical methods to model their variability. It involved, first and foremost, two nonparametric statistical test to identify a monotonic trend (the Mann-Kendall test and the Cox-Stuart test) and two types of model, a regression model and an autoregressiv-moving-average model (ARMA). The ARMA model has not been employed in studies on land use change in Poland to date, which demonstrates the innovative nature of the research. The analyses involved calculus as well to assess the pace of land use change in various areas.

According to the study, statistical methods can be used to build an appropriate land use change model, look for a trend, and determine the pace of change in an individual voivodeship. The models built in the dissertation have provided important insight into land use change in the investigated regions. In addition, they facilitate the identification of an existing trend and appropriate remedial actions that can be taken based on them, if necessary. What is more, they can be used to draw conclusions regarding the sustainable rate of land use change and compare them with each other.

Note the pragmatic value of the dissertation, which lies in the possibility for voivodeship marshals (voivodeship surveyor) to use the results to monitor land use change.