Geophysical Research Abstracts
Vol. 20, EGU2018-6595, 2018
EGU General Assembly 2018

Rural Urban Interface scenarios in Portugal based on land cover changes

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The Rural Urban Interface (RUI) describes the transition zone between human development and wildland fuels, including forest and rural areas. In the RUI, human-caused wildfires have a very high probability of starting and spreading, thus representing a main hazard for people, houses and infrastructures. For this reason RUI is at present a central focus of wildland fire policy and its mapping is crucial to easily identify areas where to concentrate financial and technical means for fire prevention measures. Modern approaches proposed by the scientific community to map the RUI are prevalently based on the definition of a buffer at a certain distance around buildings, which defines an area overlapping the wild vegetation and forest covers. Although such maps are a useful support tool for fire managers, they do not account for uncertainty. Moreover, RUI's extension changes both spatially and temporally under the pressure of environmental and anthropogenic factors, such as urban growth, fragmentation of rural areas, deforestation and, more in general, land use/land cover changes (LULCC). A typical example is the urbanization, following the abandonment of remote rural areas; therefore, the abandonment of low-intensity agriculture, grazing practices and other rural activities causes the intensification of forest covers especially in poor accessible areas. This trend increases the likelihood of wildfires to affect houses and infrastructures prompting the RUI's expansion.

The objective of the present study is to introduce an approach alternative to the traditional RUI mapping, allowing to escape from the definition of fixed boundaries and to their dependency from predefined parameters. The newly proposed procedure is based on Multilayer Perceptron (MLP) and Fuzzy Set Theory (FST): first MLP is applied to model the probability of having changes in land cover, and then FST allows deriving 'fuzy' maps. This methodology led to elaborate future RUI scenarios (for the year 2030) based on land cover transitions between the past (year 1990) and the present state (year 2012), including driving variables for urban and rural developments (e.g. census data, distance from roads, DEM and derivatives). The case study is Portugal, a Mediterranean country particularly affected by fires, but the model is applicable worldwide. The main result is a continuous and non-categorical 'fuzzy' map for the entire country expressing the degree of possibility of an area of being included in the RUI in the near future.

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