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A methodological approach to assess sensitivity to desertification in two sub-Saharan urban areas: Ouagadougou (Burkina Faso) and Saint Louis (Senegal)

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The United Nations Convention to Combat Desertification (UNCCD) defines desertification as "land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities". Desertification is regarded as one of the major global environmental problems of the 21st century and the African sub-Sahara is often quoted as the most seriously affected region with a significant loss of biological and economic productivity of the land. In this geographic area, desertification processes are usually generated by soil erosion due to climate characteristics and fluctuations, unsustainable land uses, overgrazing and inappropriate agricultural practices. Preventing desertification requires an improved understanding of its causes, impact, degree and association with climate, soil, water, land cover, socio-economic factors and their combined effects. The development of methodologies capable of managing large amounts of data in an integrated approach is needed because of the complexity and variety of forms of desertification processes. The study was carried out within the FP7-ENV-2010 CLUVA project (CLimate change and Urban Vulnerability in Africa), aimed to estimate the sensitivity to land degradation in the urban and peri-urban areas of both Ouagadougou (Burkina Faso) and Saint Louis (Senegal) cities. The approach was based on the implementation and adaptation of the modeling methodology developed within the MEDALUS project (MEditerranean Desertification and Land Use). The model is characterized by a multi-factor approach based on the assessment of both environmental quality indicators (climate, soil, vegetation) and anthropogenic factors (land management). The methodology is adaptable to the local conditions, considering that some key indicators can be operationally defined through the inclusion or exclusion of parameters and the scores assigned in order to match the specific relevance of the factors. All local data, arranged in a GIS environment, allowed the generation of maps identifying Environmentally Sensitive Areas (ESAs) and Indices of Environmental Sensitivity (ESAI). As expected, the results highlighted an overall high sensitivity to desertification. In Ouagadougou, the poorly vegetated peri-urban zone, affected by an increasing demographic pressure as the result of immigration from surrounding rural areas, was found as the most vulnerable area; in Saint Louis, the critical zones were located mostly in the northern part of the study area, where both low quality of soil and overexploitation of vegetation, due to grazing and domestic use, increase the sensitivity to desertification. The described methodological approach has a potential to represent a valuable tool to orientate effective policies preventing and mitigating land degradation processes. Model validation and comparison with other widely applied methods to assess desertification are in progress.