
Spatio-temporal evolution of forest areas: A case study of the Maamora forest (North-West of Morocco)

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Abstract

The Maâmora forest, positioned between the longitudes of 6° and 6° 45' W and the latitudes of 34° and 34° 20' N in the region of Rabat-Sale-Kenitra in Morocco, represents a heritage of great economic and ecological importance, covering a vast expanse of 132 000 hectares, with 60 000 hectares dedicated to cork oak. The primary aim of this study is to monitor the changes in land use land cover (LULC) patterns of the Maâmora forest over a span of 33-years (1989_2022). This study applied supervised classification-maximum likelihood algorithm in ArcGIS 10.4 software to detect land cover/land use changes observed in the study area using multispectral satellite data obtained from Landsat 4-5 Thematic Mapper (TM), Landsat 7 Enhanced Thematic Mapper Plus (ETM+) and Landsat 8 Operational Land Imager (OLI), all of which possess a spatial resolution of 30 meters. The study area was classified into seven different land cover/use classes (cork oak, eucalyptus, pine, acacia, bare land, daya and others) based on field research, geographical conditions, and Remote sensing data. The classification assessment yielded a Kappa coefficient exceeding 85% and an overall accuracy surpassing 86% for all chosen dates. The findings reveal significant changes in forest cover between 1989 and 2022, primarily attributed to several factors, including introduction of non-native species, human and climate-driven pressures. The cork oak class decreased from 60.71% to 44.42%, while the eucalyptus class increased from 18.11% to 39.31%. Additionally, the bare land class expanded from 0.95% to 10.84%. During the period from 1989 to 2022, approximately 50.84% of the surface in the study area remained unchanged, while 49.16% of the area changed, transitioning to different land cover classes or experiencing degradation. Broadly, these findings can serve as foundational data for future research endeavors and offer valuable insights for policymakers to concentrate on the key factors driving this degradation in order to develop interventions aimed at preserving the sustainability of natural species and the overall ecosystem.

Keywords: Remote sensing, Supervised classification, LULC, Maamora forest, Morocco

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