Geophysical Research Abstracts
Vol. 12, EGU2010-292-2, 2010
EGU General Assembly 2010

Vulnerability assessment and risk level of ecosystem services for climate change impacts and adaptation in the High-Atlas mountain of Morocco

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Moroccan mountain biomes are considered endangered due to climate change that affects directly or indirectly different key features (biodiversity, snow cover, run-off processes, and water availability). The present article describes the strategy for achieving collaboration between natural and social scientists, stakeholders, decision-makers, and other societal groups, in order to carry out an integrated assessment of climate change in the High-Atlas Mountains of Morocco, with an emphasis on vulnerability and adaptation.
We will use a robust statistical technique to dynamically downscale outputs from the IPCC climates models to the regional study area. Statistical downscaling provides a powerful method for deriving local-to-regional scale information on climate variables from large-scale climate model outputs. The SDSM will be used to produce the high resolution climate change scenarios from climate model outputs at low resolution. These data will be combined with socio-economic attributes such as the amount of water used for irrigation of agricultural lands, agricultural practices and phenology, cost of water delivery and non-market values of produced goods and services.
This study, also analyzed spatial and temporal in land use/land cover changes (LUCC) in a typical watershed covering an area of 203 km2 by comparing classified satellite images from 1976, 1989 and 2000 coupled by GIS analyses and also investigated changes in the shape of land use patches over the period.
The GIS-platform, which compiles gridded spatial and temporal information of environmental, socio-economic and biophysical data is used to map vulnerability assessment and risk levels over a wide region of Southern High-Atlas. For each scenario, we will derive and analyze near future (10-15 years) key climate indicators strongly related to sustainable management of ecosystem goods and services.
Forest cover declined at an average rate of 0.35 ha per year due to timber extraction, cultivation, grazing, and urbanization processes. Historically, cultivation has resulted in such a high loss of plant communities in lowlands that regional diversity has been threatened. Grazing has increased due to low labor costs and economic policies that provide incentives for cattle production in Morocco.
Finally to address the interaction among ecosystem services principles, we will use the Integrated Valuation of Ecosystem Services and Tradeoffs tool (InVEST) recently developed by the Natural Capital Project. The “Tier 1” modes are theoretically grounded but simple, and are designed for areas where few data are available. The most useful applications of the simple, Tier 1 models are to identify areas of high and low ecosystem service production and biodiversity across the Mountain and illuminate the tradeoffs and synergies among services under current or future conditions. While some Tier 1 models give outputs in absolute terms, others return relative indices of importance.