



## **Assessment of soil erosion vulnerability using GIS and multicriterion analysis: case of the Fergoug river catchment in the western Algeria**

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Soil degradation is a process defined as the lowering and loss of the essential qualities of soils to fulfill its natural functions. In recent decades, it has become increasingly serious worldwide, posing the greatest threat to agro-systems. Overall, the natural process of land degradation can be amplified or mitigated by a variety of anthropogenic actions, such as inappropriate mountain farming, overgrazing and deforestation. In northern Algeria, the phenomenon of water erosion is the most serious form of land degradation affecting landforms; about 14 million hectares of land are affected. This phenomenon is related to the socio-economic context of the use of natural resources, beyond their ability to restore, often aggravated by fluctuations in climatic conditions. It leads to a permanent decline in economic activities, entrenching the local population in poverty and pushing them into a mass exodus.

The objective of this contribution is to achieve a zoning of the risks of soil degradation by water erosion, i.e. to establish a soil vulnerability map to erosion at the scale of a watershed in order to study the erosion process and evaluate its potential impact on the watercourse downstream of the dam (at the outlet of the basin) and on the coastal marine areas. To do this, we have chosen a qualitative model based on a multi-criteria analysis combining, in a GIS, the most representative erosion factors: the slope, the nature of the substrate, the climatic aggressiveness of the rains and the occupation of current soil.

The selected pilot site is a mountainous ecosystem located in the Beni-Chougrane mountains (northwestern Algeria), corresponding to the catchment area of Fregoug river with an area of about 170 km<sup>2</sup>. It is characterized by steep slopes, mainly marly lithology, rainfall irregularity and low vegetation cover, which makes it very sensitive to water erosion. The dataset used consists of a Landsat-ETM + satellite image, lithological maps covering the site, a 30 m resolution digital terrain model (DTM), daily rainfall data, and soil profiles. if you.

The synthesis of all the information in a GIS, as well as their confrontations with the geomorphological data, made it possible to draw up vulnerability maps to the water erosion according to five degrees (very dense vegetation, dense vegetation, critical state, degraded state and very degraded state), in which the degraded and very degraded areas cover 32% of the catchment area compared to 45% of the land with dense or very dense vegetation cover. The rest (23%) being in critical condition.

The comparison of the results obtained with the outputs of the revised soil loss model by erosion (RUSLE) as well as their validations by the reality on the ground show the interest of the joint use of multi-criteria analysis of multisource information and GIS for the monitoring of water erosion in the OuedFergoug watershed and its consequences on the disastrous situation, illustrated by the almost complete sedimentation of reservoir dams in this mountainous region, a water tower in western Algeria.