جامعة عبد المالك السعدي
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Université Abdelmalek Essaadi

**Pole for Doctoral Studies**
**Center for Doctoral Studies**
**Sciences, Technologies, and Medical Sciences**

# ANNOUNCEMENT OF DOCTORAL THESIS DEFENSE

**Ms. BELHAJ Fatima**

**Will present here research work with the aim of earning a Doctorate**

**Doctoral program:** Biology, Chemistry and Geology
**Discipline:** Geology
**Specialty:** Hydrology, Soil Water erosion, Climate Change and Geomatics

**On 12/07/2025 at 10H00 at the Meeting room of the Department of Chemistryof the Faculty of Sciences of Tetouan, UAE**
**Under the Theme**

**Monitoring and Forecasting Water Erosion in Response to Climate Change Effects Using the Integration of the Global RUSLE/SDR Model and Predictive Models: A Case Study of the Loukkos Watershed in Morocco**

**Front of the jury composed of :**

| First Name & Last Name | Establishment | Designation |
|---|---|---|
| Pr. AMRI Isma | Faculty of Sciences of Tetouan, UAE | President |
| Pr. CHAKIRI Said | Faculty of Sciences of Kenitra, UIT | Reviewer |
| Pr. MIHRAJ Abdelilah | Faculty of Sciences of El Jadida, UCD | Reviewer |
| Pr. MORARECH Moad | Faculty of Sciences of Tetouan, UAE | Reviewer |
| Pr. AASSOUMI Habiba | Faculty of Sciences of Tetouan, UAE | Examiner |
| Pr. SADKAOUI Driss | Faculty of Sciences of Tetouan, UAE | Examiner |
| Pr. MAATE Ali | Faculty of Sciences of Tetouan, UAE | Expert |
| Pr. HLILA Rachid | Faculty of Sciences of Tetouan, UAE | Supervisor |

***Research Laboratory:*** Environmental Geology and Natural Ressources (GERN)

# Abstract

Water-induced soil erosion represents a major environmental concern in Morocco, particularly in the Loukkos watershed located in the northwestern region of the country. The combination of clayey slopes, low-permeability soils, and increasing anthropogenic pressure exacerbates soil loss and reservoir siltation. This research aims to assess the spatio-temporal dynamics of erosion in the basin in relation to climate change, and to project its evolution through 2040 by identifying high-risk areas, estimating sediment yield (SY), and proposing recommendations for sustainable land management.

The methodological approach integrates multiple tools: the empirical RUSLE model coupled with the Sediment Delivery Ratio (SDR), the Analytic Hierarchy Process (AHP), the Linear Mixed-Effects (LME) model, and the CA-Markov spatio-temporal simulation model. These tools, informed by geospatial, rainfall, and remote sensing (NDVI) data, allow for the modeling of both current and future erosion patterns by accounting for R and C factors in the RUSLE framework.

The results indicate an average annual soil loss of 111.51 t/ha/year, with a sediment yield estimated at 6.81 million $m^3$, consistent with field observations at the El Makhazin dam. Projections reveal a 11.4% decrease in annual rainfall between 1999 and 2040, accompanied by a nearly 13% reduction in healthy vegetation cover. Erosive dynamics fluctuate, peaking in 2009 (138.27 t/ha/year), declining to 103.50 t/ha/year in 2029, and slightly rising again to 104.16 t/ha/year by 2040. These variations are strongly correlated with rainfall erosivity ($R^2 = 0.99$), confirming it as the principal driver of soil loss in the Loukkos watershed.

This study proposes a robust, transferable methodological framework and provides scientifically grounded insights to support the implementation of integrated land management strategies that respond to the challenges of climate change and water security.



**Keywords**: Climate change, water erosion, spatial modeling, RUSLE/SDR, remote sensing, GIS, Loukkos watershed.