Chapter 7
Quantification and Evaluation of Water Erosion:
Application of the Model SDR – InVEST in the Ziz Basin in South-East Morocco

Souad Ben Salem
Cadi Ayyad University, Morocco

Abdelkrim Ben Salem
 https://orcid.org/0000-0002-2283-5928
Cadi Ayyad University, Morocco

Ahmed Karmaoui
 https://orcid.org/0000-0003-3881-4029
Southern Center for Culture and Sciences (SCCS), Morocco

Mohammed Khebiza Yacoubi
Cadi Ayyad University, Morocco

Mohammed Messouli
Cadi Ayyad University, Morocco

ABSTRACT

The Ziz Watershed is located in the arid zones of South-Eastern Morocco and belongs to the large basin of Ziz-Rheris. In this basin, floods are related to natural factors and mainly to the occupation of the hydraulic public domain and the human intervention on the courses of the rivers. Increases in sediment yield are observed in many places in the Ziz, dramatically affecting water quality and reservoir management. In order to map overland sediment generation and delivery to the stream (studying the service of sediment retention), the InVEST sediment delivery ratio (SDR) model was applied. The sedimentation analysis in the Hassan Dakhil Dam, located in this watershed, shows that there is a very important erosion rate. The proof is the rapid filling of the dam. This is due to the transport of sediments in the rivers. If this situation continues at the current rate, the dam will no longer be fully operational for irrigation by 2050.

INTRODUCTION

Soil erosion and soil loss are natural resource degradation processes affecting, with varying intensities a large part of the national territory of Morocco. (Tahiri et al., 2017). Thus, a total area of watersheds close to 20 million ha, the risk areas represent 75% of the 15 million hectares studied until now. The cumulative annual soil loss is estimated at some 100 million tons and storage capacity lost to siltation was valued at 50 million cubic meters per year (*National Plan for Watershed Management*).

The Moroccan experience of erosion control and its effects is rich and diversified. Historically, the anti-erosion schemes initiated by the farmers have had the purpose of agricultural development and protection against flood damage. The collective dimension was limited to the size of the group that participated directly or indirectly in the development work.

The Ziz watershed located in south-eastern Morocco; in the upstream basin found the Imilchil region located to the peaks of the High Atlas Oriental, water split point in four watersheds: Umm Errabia, Ziz and Malouiya Ghris is an area known for its land very rugged, geology, its harsh climatic conditions and the deterioration of its vegetation cover due to anthropogenic pressure, is a typical case for the phenomenon of water erosion. Indeed, several studies (Lahlaoi et al., 2015; Ouallali et al., 2016) made in this direction in Morocco, revealed that water erosion affects 23 million hectares, causing a specific degradation from 500 t / km^2 / year to more than 5000 t / km^2 / year with soil loss over 10 t / ha / year in the High Atlas. These figures far exceed what the soil formation can occur to offset these losses. The consequences of such degradation are reflected in lower crop yields, a reduction in the area of already poor agricultural soils and an acceleration of siltation of reservoirs, and downstream water infrastructure. In addition to this phenomenon, which threatens the lives of vulnerable and needy populations, the situation is aggravated by a high rate of poverty and illiteracy that exceeds 80% for women and 65.8% according to official figures, which endangers the development of this territory (Imilchil., 2015).

To determine the rate of water erosion on agricultural soils and to evaluate the efficiency of appropriate response practices, as in other countries and regions the InVEST Sediment Delivery Ratio (SDR) model is used.

The objective of the Sediment Delivery Ratio (SDR) model is to map the production and distribution of surface sediments in the watercourse and to study the sediment retention service in a watershed.

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