DETERMINATION OF EROSION INTENSITY IN BRKA WATERSHED, BOSNIA AND HERZEGOVINA

Selman Edi KALOPER[1], Sabrija ČADRO[1],*, Mirza UZUNOVIĆ[1], Salwa CHERNI-ČADRO[2]

[1]University of Sarajevo, Sarajevo, Bosnia and Herzegovina; http://www.unsa.ba/en

[2]Hydro-Engineering Institute Sarajevo (HEIS), Bosnia and Herzegovina; http://heis.ba/en/about-us/institute

INTRODUCTION

Soil water erosion is one of the most important causes of soil degradation in **Bosnia and Herzegovina**, this is especially true for agricultural land and smallholder farms that are often located in marginal areas, where the soil quality is poor and the topography is complexed.

With its complex relief, geological and pedological structure, hydrography, precipitation regime and land use, BiH is highly vulnerable to destructive processes of erosion and floods, especially in the northern part of the country.

Latterly, there has been a substantial change in the values of most erosion factors, resulting in the change of erosion intensity. Changes relate to demographics, urbanization and land use as well as climate.

The main objective

of this study was to analyze the basic soil erosion factors and estimate the intensity of erosion processes in the River Brka watershed, taking into consideration current conditions and using modern hardware and software solutions.

MATERIALS AND METHODS

The Brka River Basin is located in the northeast of BiH, it covers the northern slopes of mountain Majevica and part of the Bosnian Posavina. The total watershed area is about 184.09 km^2. The highest point is the Okresanica peak at 815 m, while the lowest point is the delta of the Brka River at 84 m.

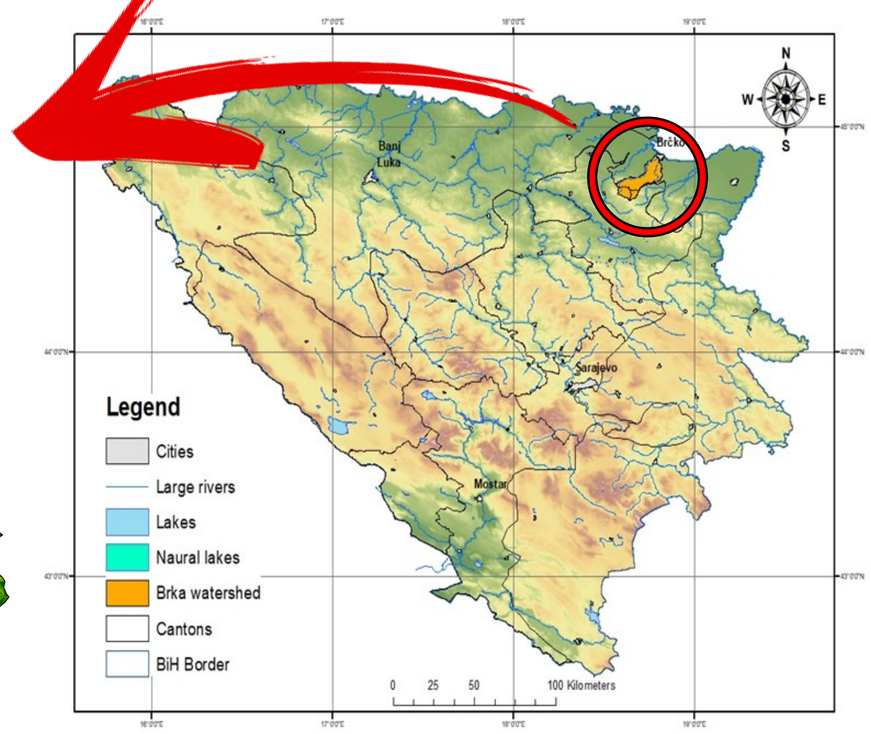
In this research, the Gavrilovic method (Gavrilović, 1972) also known as the Erosion potential method (EPM) modified according to Lazarević (1985a) and adapted for use in GIS was used to create maps and calculate **erosion intensity (Z), mean annual production of sediment (W_{year}) and basin sediment yield (G_{year}).**

The boundary of the basin area was determined using Digital terrain model (DEM: 25 m x 25 m) and Hydrographic network map of BiH; the soil protection coefficient (X) from CORINE 2018 (grid size 100 m x 100 m) land cover map based on the X values proposed by Globevnik et al. (2003). Soil erodibility (Y) was determined on the basis of the BiH soil map (scale 1: 50,000), while for the determination of type and extent of erosion (φ) coefficients open-source satellite images were used.

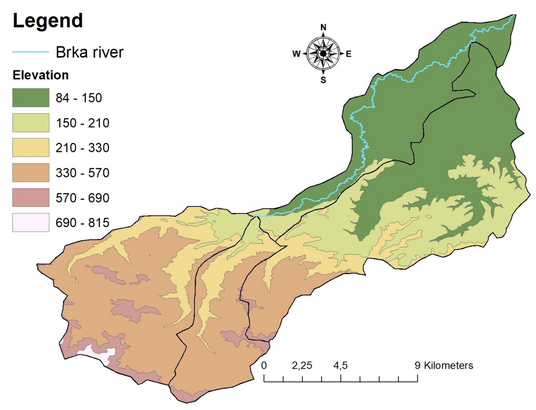
RESULTS

The largest area is occupied by the Zovičica river basin, with about 41% of the total area, while the Rahička river basin occupies the smallest area or about 13% of the total watershed. Pseudogley and Luvisol are in second and third place, respectively. These are heavy soils, with poor permeability and high erodibility. Nearly half (49%) of the watershed area is covered by forest vegetation, dominated by the broad-leaved forests. Agricultural production takes place at 82 km^2.

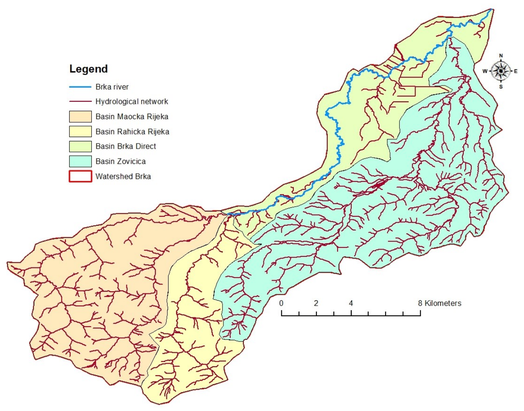
The intensity of the erosion process in Brka watershed has a **medium erosion character,** with an average erosion coefficient of **Z = 0.46** . The mean annual production of sediment per km^2 (W_{year}) varied between 672 and 1639 m^3 year^{-1} km^{-2}. The calculated mean annual sediment yield (G_{year}) varies from 5,746 for Rahička Rijeka to 57,089 m^3 year^{-1} for Zovičica, with total Brka river watershed sediment yield of 120,754 m^3 year^{-1}.



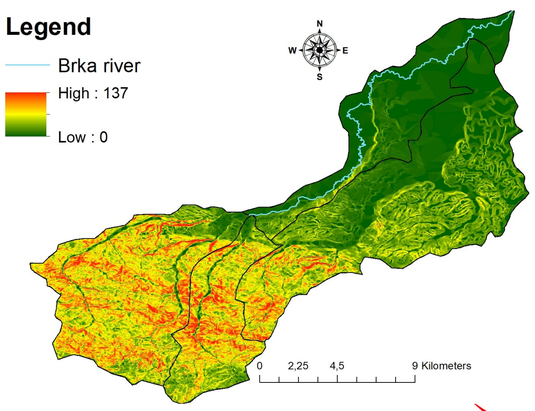
Geographical location, a digital elevation map of Bosnia and Herzegovina and location of Brka River watershed.



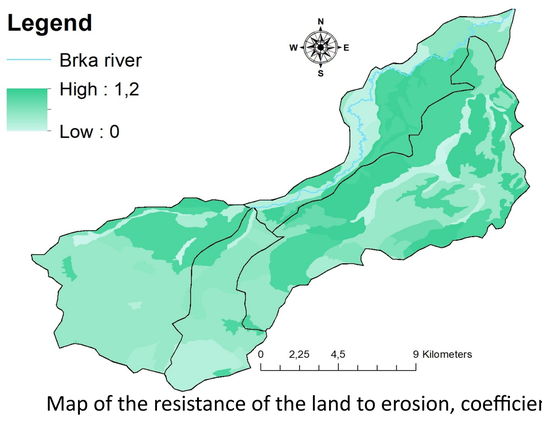
Elevation map of Brka watershed



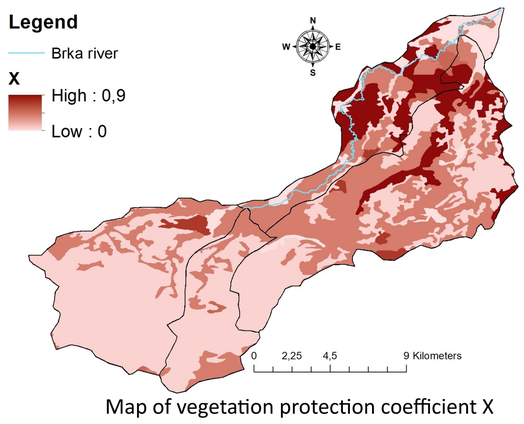
Hydrological network and spatial distribution of the four Brka sub-basins



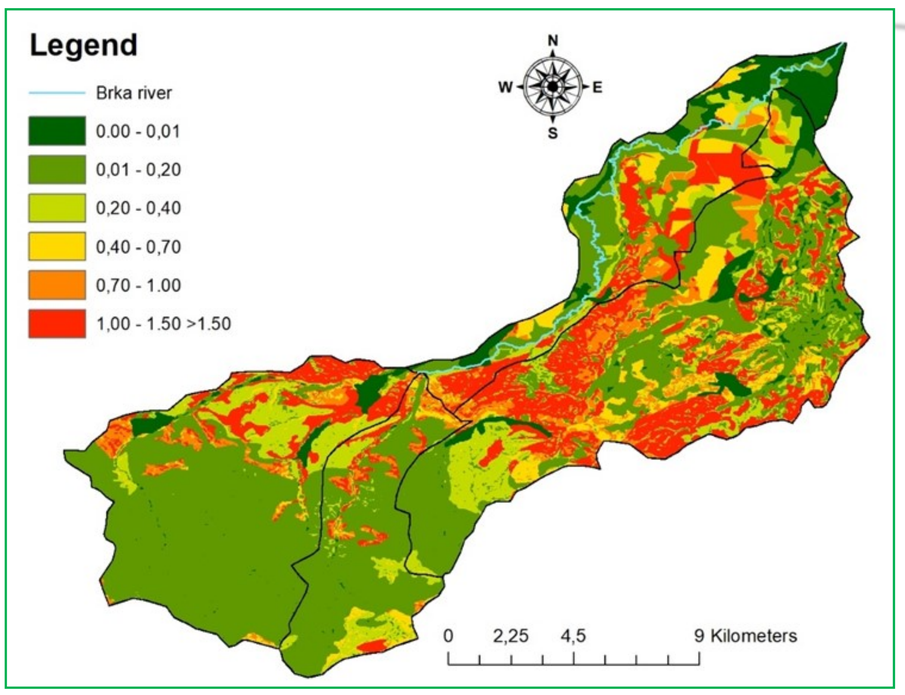
Slope map of Brka watershed



Map of the resistance of the land to erosion, coefficient Y



Map of vegetation protection coefficient X



Erosion intensity (Z) map of the Brka watershed area

CONCLUSIONS

The average Z value of 0.46 (medium erosion intensity), 43.89% of the territory threatened by water erosion, and 16.68% affected by excessive erosion indicates that at the Brka watershed certain soil conservation measures are more than necessary.

Since land use is an erosion factor that humans can control, it is necessary to act in this direction and prevent erosion conducting agro-technical and biological soil conservation measures.

In these circumstances, the cultivated soil should not be left bare - not sown at any cost, especially when it is plowed in the direction of the slope. Additionally, special attention should be paid to the length of parcels located on higher slopes. Contour soil cultivation and contour sowing/planting are recommended whenever the size and shape of the plot allow it.

Acknowledgments: The authors are very grateful to the Caritas Switzerland (CaCH) in Bosnia and Herzegovina which founded the research as well as the hydrometeorological institutes in BiH for providing some of the datasets and Federal Institute for Agropedology, Sarajevo for providing soil map used in this used in this study.

GEA International, Geo Eco-Eco Agro Conference

28-31 May 2020, Podgorica, Montenegro