

BOOK OF ABSTRACTS

2nd International and 14th National Congress of Soil Science Society of Serbia

Publisher

Faculty of Agriculture, Novi Sad, Serbia
Soil Science Society of Serbia

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Printed by:

Feljton, Novi Sad, Serbia

Organized by:

Soil Science Society of Serbia
Faculty of Agriculture, Novi Sad

ISBN 978-86-7520-410-7

Supported by:

1. ***Ministry of Education, Science and Tehnological Development of the Republic of Serbia***
2. ***Provincial Secretariat for Agriculture, Water Management and Forestry***
3. ***Provincial Secretariat for Higher Education and Scientific Research***
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IMPLEMENTATION OF A NEW EROSION MODEL (INVEST'S SEDIMENT EROSION MODEL) AT BLACE MUNICIPALITY (SERBIA) - CASE STUDY

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INTRODUCTION and OBJECTIVES:

Soil erosion is the most common form of land degradation, and as such represents a serious constraint to the sustainable development of economy and society. Nowadays, wide spectrums of models for erosion risk evaluation are available. The most commonly used erosion models in the world are: USLE (Universal Soil Loss Equation), RUSLE (Revised Universal Soil Loss Equation), WaTEM/SEDEM (K.U.Leuven, Belgium), ANSWERS (Areal Nonpoint Source Watershed Environment Response Simulator) and SWAT (Soil and Water Assessment Tool). The Natural Capital Project has developed a program that is engaged in spatial ecosystem management through the tool that is called Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST). InVEST's sediment erosion model is an integral part of the mentioned project and it is available in the form of open source software. Dominant data represented in this model are climate, soil, topography, land use and others. The paper aims to identify areas threatened by erosion processes and quantify the current erosion intensity of agricultural land in the Blace municipality by employing InVEST's sediment erosion model.

MATERIAL and METHOD:

InVEST's sediment erosion model estimate erosion processes, using method that is based on the Universal Soil Loss Equation (USLE) (Wischmeier and Smith, 1978). Model is a spatially oriented, and by employing raster structure the parts of the ecosystem can be divided into small spatial units (raster cells). The main unit in which the model estimated erosion processes is $t\ ha^{-1}yr^{-1}$. Data that are necessary for running the model are: Digital elevation model (DEM), Rainfall erosivity index, Soil erodibility, Land use/land cover (LULC), Watersheds (shapefile), Biophysical table (lucode, usle_c, usle_p), Threshold flow accumulation, Borselli k Parameter, Borselli IC0 Parameter and Max SDR Value. After main calculation, the model creates several raster, vector and text files, among which the most important are: rkls (tons/pixel), sed_export.tif (tons/pixel), usle (tons/pixel), sed_retention (tons/pixel), sed_retention_index (tons/pixel), watershed_results_sdr (.shp) and sed_export (tons/watershed).

RESULTS and CONCLUSIONS:

Annual losses of agricultural land in municipality of Blace using InVEST sediment erosion model is in the range from 0 to $182.22\ t\ ha^{-1}yr^{-1}$, with an average erosion intensity of $7.39\ t\ ha^{-1}yr^{-1}$, which this area according to OECD (Organisation for Economic Co-operation and Development) classified in a group with poorly risk of erosion processes. SDR (sediment delivery ratio) reflects landscape connectivity (connection between the source of runoff, sediment, and sinks), and inside the model was represented at the pixel level. Pixels are hydrologically connected to the characteristics of the upslope area (C factor and slope). SDR normally has a value in range between 0 and 1. The value of the SDR in the municipality of Blace is in the range from 0 to 0.21, with an average level of 0.06 tonnes per pixel. The current state of erosion processes on agricultural lands at municipality of Blace does not indicate concerns and the need for the conservation measures implementation. However, in agricultural areas that have intense erosion processes, should be performed crop rotation and reorientation from annual to multi-annual crops.

KEY WORDS: soil erosion, InVEST sediment erosion model, Blace.