

International Sava River Basin Commission

**Practical training course
on sustainable sediment management
with the Sava river basin as a showcase**

Bosnia and Herzegovina / Republic of Srpska

**Prepared by Zoran Lazić, Water Agency for Sava River District
(Bijeljina)**

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Sustainable sediment management in Republic of Srpska

- Balancing of sediment in the hydrographic network, with other analysis
- Defining the optimum locations for the exploitation of erosion sediment

Activities

- Currently being developed Erosion Map of RS (cca 70%)
- Erosion Map will be basic document for “Study for Sediment Management in river Basins in Republic of Srpska“




Erosion Map

Framework and Activities

Introduction

- Republic of Srpska and Bosnia and Herzegovina geographically are mostly mountainous and hilly.
- There is a substantial number of torrents of varying intensity destructiveness, and considerable areas attacked by erosion processes of all types and intensities, and there are all prerequisites for the creation of new streams and erosion hot spots.
- Such conditions influence to special energy landscape, geological and soil base, climatic conditions, manner of use of the land fund, vegetation.
- Water in these conditions is a major factor in the creation of soil erosion and the forming of torrents.

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- Total area of Bosnia and Herzegovina is 51.129 km² the Republic of Srpska accounts for 25.053,21 km². The territory of BiH has been affected by erosion of 45.574 km² or 89% as a percentage of the total area, and the accumulation of sediment, there is an area of 5.629 km² or 11%.
 - Republic of Srpska does not have the above information.
 - Bosnia and Herzegovina does not dispose with enough good soil. Per capita comes 0,59 ha of agricultural or 0,36 ha of arable land. According to international criteria, the lower limit is 0,17 ha and 0,40 ha of arable farmland.
 - Planning for the torrents and streams in general, environmental requirements are becoming increasingly important and are incorporated into the environmental flow regulation.
 - It is necessary to consider the financial feasibility of investment.
 - Erosion Map is a very important document and is significant for urban planning at the level of settlements, municipalities, as well as to protect the land from erosion and flood protection.

Erosion Map of SR Bosnia and Herzegovina (ex SFRY)

- Desining Erosion Map of SR Bosnia and Herzegovina began in 1979, its intense design lasted for 7 years, and was completed in 1985.
- Erosion Map to be one of the fundamental charts SR BiH, as were the geologic map, soil map, forest cover map, soil map production and other capabilities.
- Erosion Map was created in accordance with methodology of Ph.D Slobodan Gavrilovic, and it was amended and modified by new method of determining the coefficients of eroding of Radenko Lazarevic.
- The Map was designed on topographic maps scale 1:25.000 and had a total of 432 sheets (sections), which covered the entire territory of the SR BiH.
- Erosion Map was made in two copies.
- During the War (1992-1995) both copies are destroyed.
- The total average amount of sediment, created on territory of SR BiH per year is 16.518,031 m³, or 323 m³/km². The strongest erosion affected the Krka river basin (Butišnica), river Kupa and river Ukrina. The weakest erosion were the immediate catchment area of the Sava river basin and the Adriatic sea.



Erosion Map of Republic of Srpska

Erosion Map of Republic of Srpska is under design in two phases:

- Restructuring of Erosion Map
- Innovation of Erosion Map

Restructuring should include all aspects who had Erosion Map of 1985. and become a basis to all future activities.

Innovation should include all innovation that would ensure harmony between Erosion Map and state of erosion in watersheds.

- Erosion Map should be recorded and evaluated for all 110 river basins and watershed units in Republic of Srpska.
- Republic of Srpska will be covered by the topographic maps proportion 1:25 000, with 278 sheets.
- Of this number, 112 will be completed sheets, while 166 sheets will be intersected with state borders to Croatia, Serbia, Montenegro, and local border to FBiH, and Brcko District.



Spatial Plan of Republic of Srpska

- The Spatial Plan takes into account the priorities of economic sectors, such as agriculture, forestry, energy and water management, booking particular spatial units for the spatial plans of towns and cities, spatial units for water management and other infrastructure,
- Specifically relates to the construction of larger urban centers and major water facilities such as dams and reservoirs.



Water management aspects

- Erosion problems and sediment transports are present in almost all areas and sectors of water management.
- Sediment transport in rivers, in the case of intense erosion processes in watersheds, often exceeding the transport capacity of river.
- Consequence is the accumulation of sediment in the river basin, reservoirs, circumferential grooves and filling water facilities.
- Erosion of soil and sediment transports, characteristics of watercourses are reduced, and particularly undesirable effects in this area in the reservoirs (pile up Zvornik accumulation on the river Drina), flooding the river beds and channels.
- Direct effect of erosion - erosion degradation areas (except in the case of soil erosion directly threatens the structural stability of the water management facility) is minor importance, while it is much more important indirect effect of erosion - sediment water management infrastructure threat.
- Basic interest of water management is protection water management facilities of siltation.
- Also, interest of water management is the protection water management and other structures and systems of erosion and sediment.
- Protection of other structures water management role is to secure adequately technical solutions into integrated water management system.



Goals

Erosion Map Design

- Qualitative problems solving soil erosion, sediment transports and the threat of urban areas, industrial facilities, and water management systems,
- Establishing a system of administration and define responsibilities within the erosion, flood and sediment.



Study

Primary erosion factors:

- Geology,
- Relief,
- Climate,
- Vegetation, and
- Land use,

For design of Erosion Map the following activities should be provided:

- Defining of geographic coverage,
- Collecting documentation of Erosion Map SR BiH and analyzed in detail
- Preparing topographic surface,
- Analyzing different aspects (climate, soil, vegetation, relief, geological surface, water resources, development of erosion processes),
- Design of Erosion Map of Republic of Srpska




Geographic coverage:

- According to Dayton Peace Agreement, surface of Republic of Srpska is 25.053,21 km², or 49% of the total surface of BiH; Boundaries are not clearly defined yet.
- Topographic coverage: Erosion Map will be done on topographic maps proportion 1:25.000,
- Analysis of natural phenomena: the ability to identify areas that are potentially threatened by the action of erosion processes; Soil erosion (wind and water) is a very complex hydro and aerodynamic process.



Significant natural phenomenons

- Climate: most important climate parameters which effecting to erosion processes (water and wind) is precipitation (rain and snow).
- Temperature: movement of air currents – wind; Immediate impact to condition, development and intensity of erosion processes.
- Soil: Granulometric composition is one of the key features that affect soil erosion resistance of the forces of nature (clayey soil, sandy soil); Content of organic matter in the soil; Factors affecting the susceptibility of soil to erosion can be divided into two groups: first, mechanical, chemical and physical properties of the soil, which is usually determined through laboratory; second, release of land before sowing and during crop growing.

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- Vegetation: confluence of influences, retention, flushing and sink water, protects the soil from decomposition, improving its structure and increasing production capacity while reducing the effects of erosion and flood wave peak.
 - Relief: local erosion basis, density of the hydrographic network; slope of mountain slopes, ie. intermediate decline basin; relative (average) incline of riverbed.
 - Geologic structures: water permeability of rocks, which determinate type of erosion; resistantly of rocks, which determinate intensity of erosion.
 - Water resources: From the standpoint of appearance of intensity of water erosion, water is a basic requirement. Runoff water is also an important parameter erosion. It focuses primarily on the quantities that appear then flow duration and flow rate. These phenomena are expressed hydrologic and hydraulic parameters are especially characteristic in torrents.

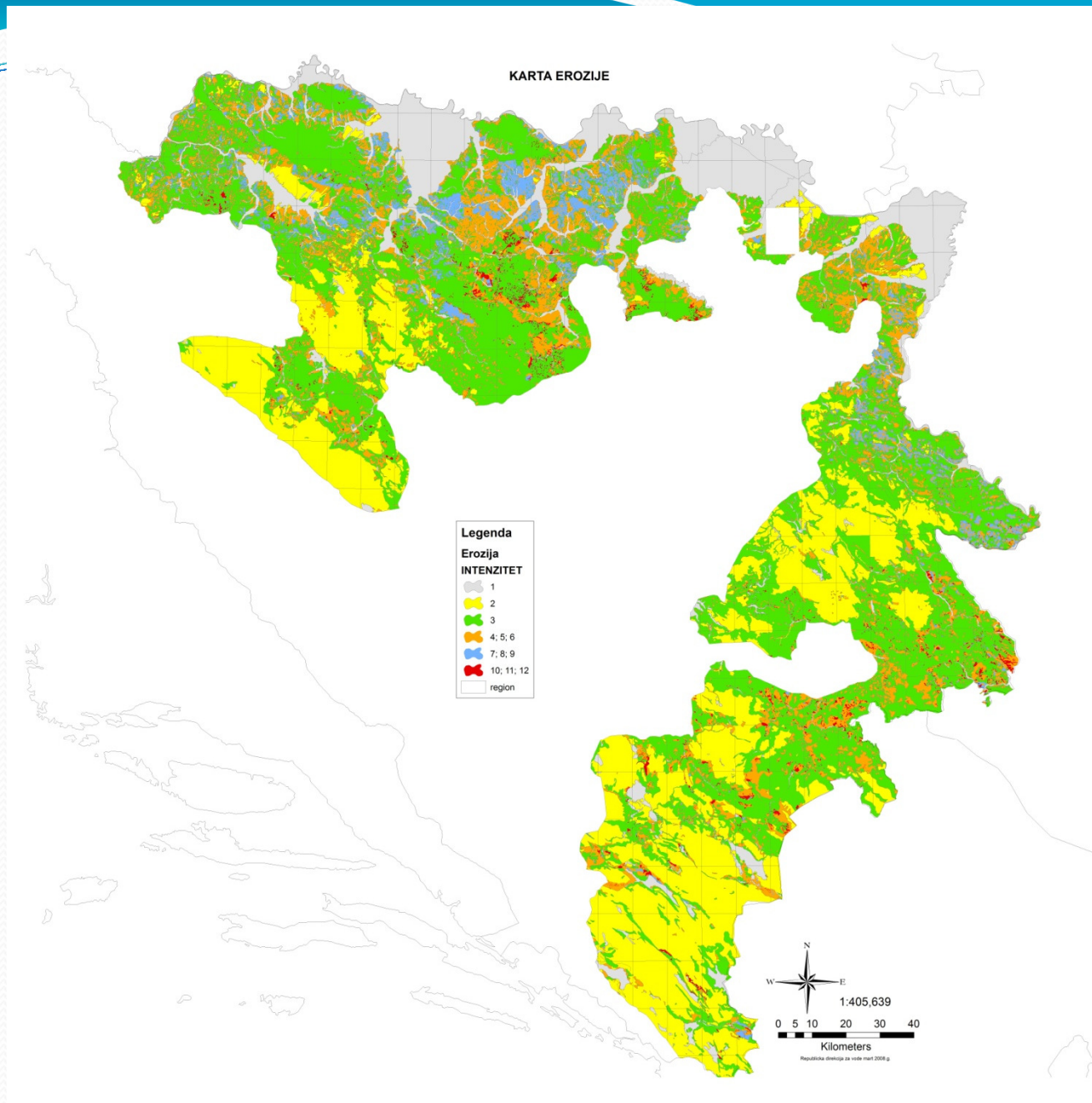


Development of erosion processes

- In order to successfully perform control and monitor erosion processes, it is necessary first of all to know all kinds of erosion processes.
- According to SR BiH Erozion Map of the total sediment production is permanently lost every year 8 805 286 m³/year, or 193 m³/km²/year in SR BiH.

Medium value of coefficient of erosion (Z)

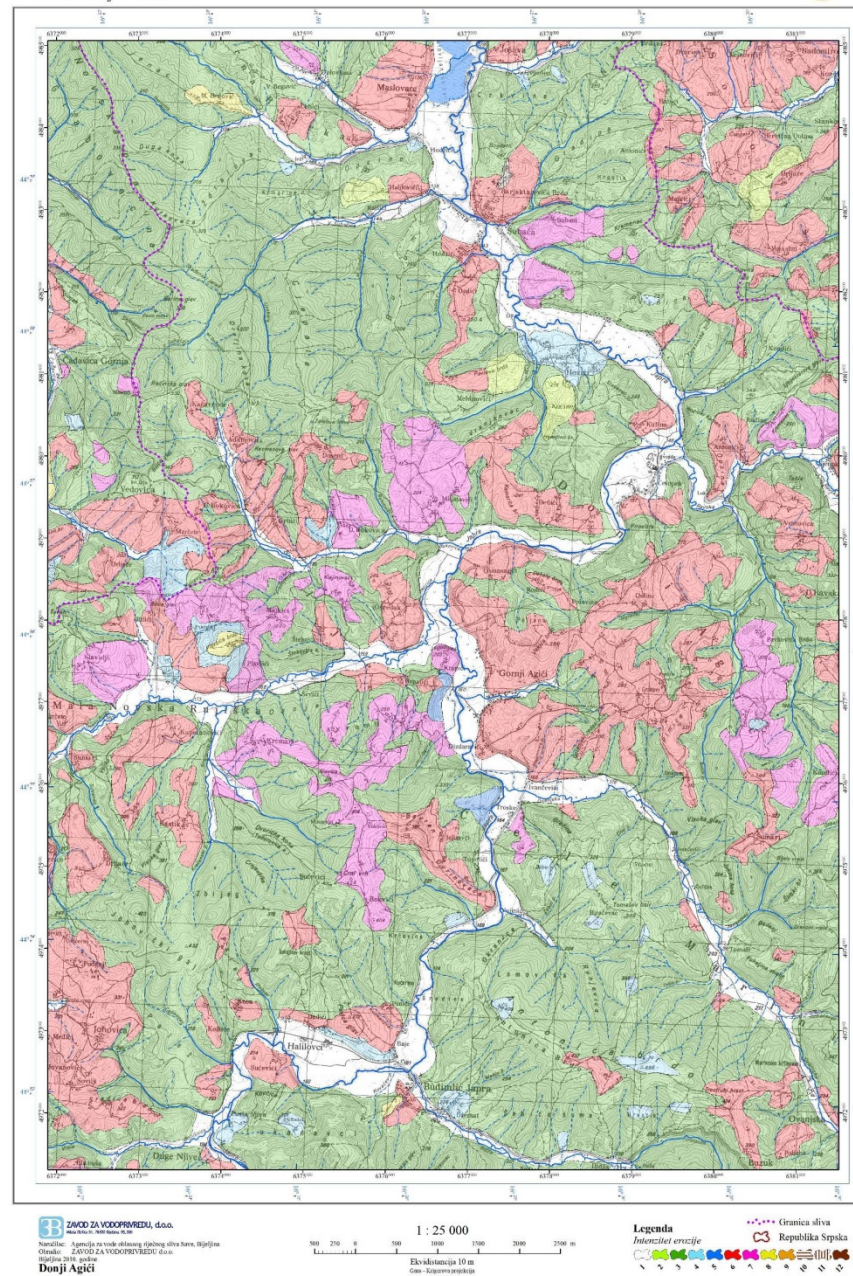
Category	Intensity of erosion processes in river bed and basin	Type of dominant erosion	Value (Z)	Quantity of sediment	
				m ³ /km ² /year	mm/km ² /year
I	Excessive erosion	Bed Med Surface	More than 1.5 1.25 1.00	3 000	3.0
II	Strong erosion	Bed Med Surface	0.99 0.8 0.7	1 200 – 3 000	1.2 – 3.0
III	Medium erosion	Bed Med Surface	0.69 0.5 0.4	800 – 1 200	0.8 – 1.2
IV	Poor erosion	Bed Med Surface	0.39 0.25 0.2	400 – 800	0.4 – 0.8
V	Very poor erosion	Tracks of all type of erozion	0.19 Less than 0.1	100	0.1 – 0.4

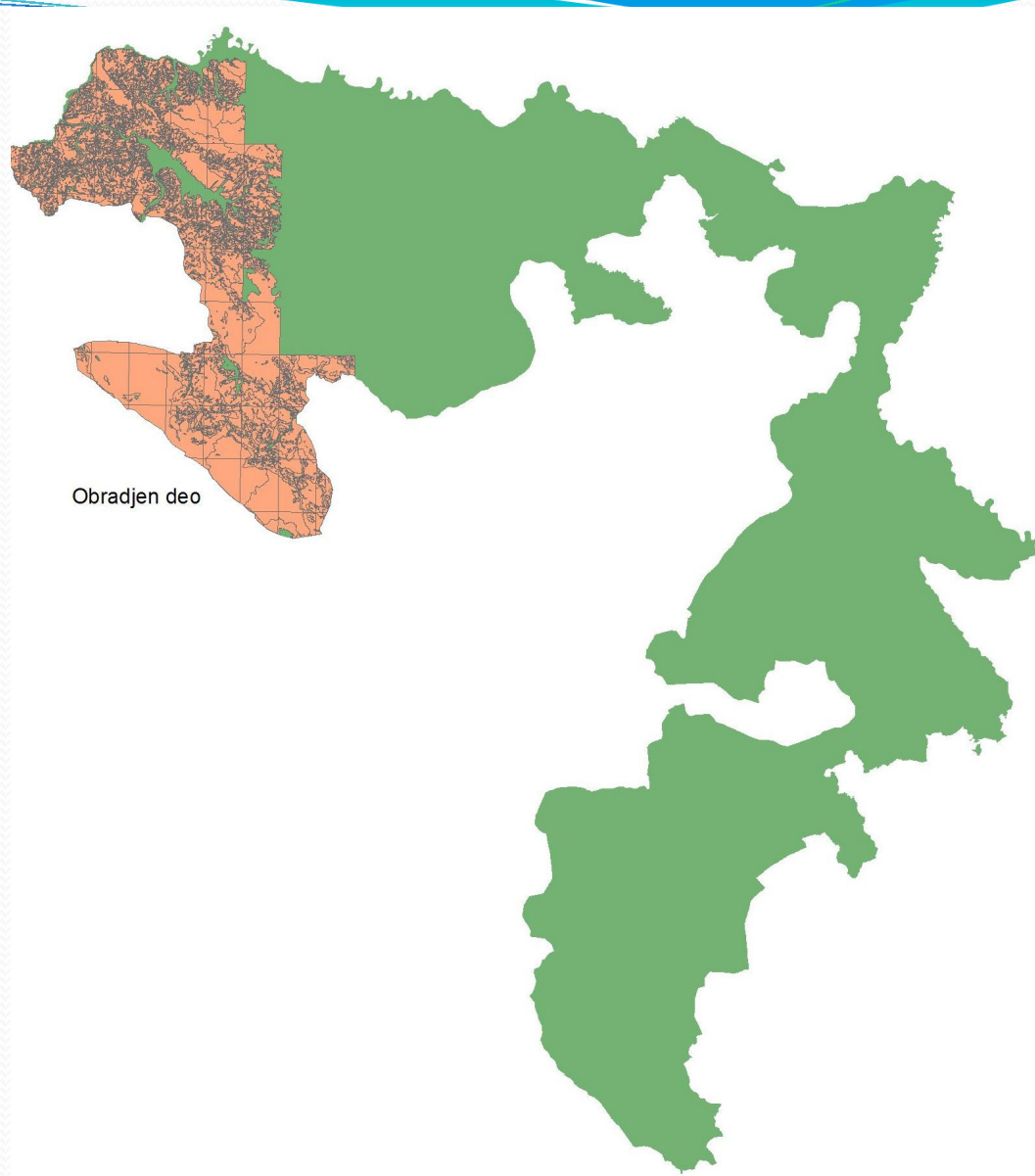
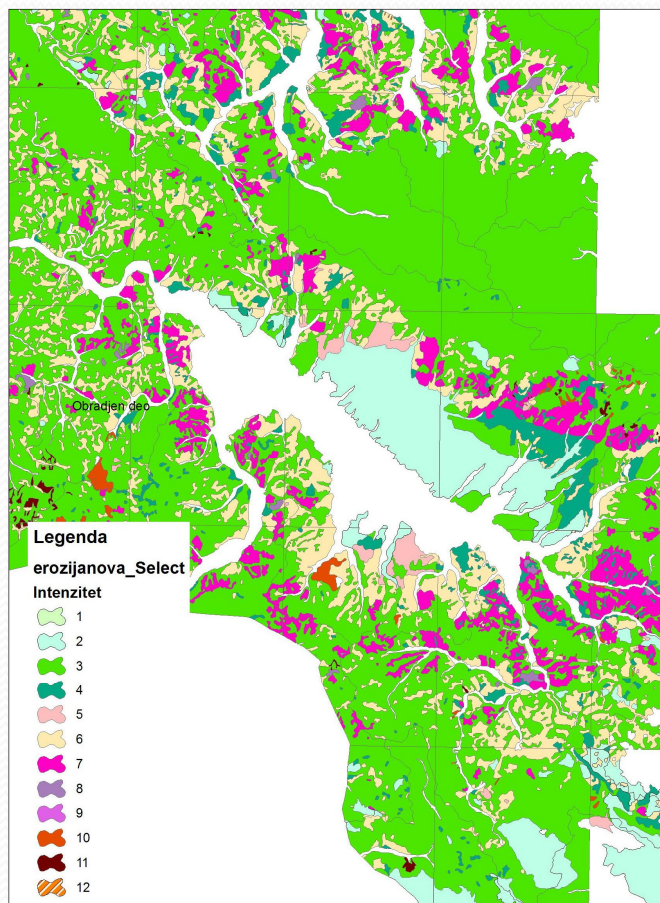


Donji Agići

Karta erozije 1 : 25 000

Republika Srpska
Ministarstvo poljoprivrede, šumarstva i vodoprivrede
Agencija za vode oblasnog riječnog sliva Sava
Bijeljina







Conclusions

- Erosion Map will represent thematic basis analysis of the spatial distribution of erosion processes, surface for access to the the value of production of sediment, and substrate necessary to define the values of the mean annual volume of the total size of suspended and bed load that the basins in the territory of Republic of Srpska reaches the main river flows.
- Basis for wide application in the fields of design.



Thank you for attention!