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BASIC GIS-DATASET NECESSARY FOR DIFFERENT ANALYSES IN FORESTRY

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 The GIS represents set of tools which can make the life easier to the user. GIS modeling presents an opportunity to automatise the process of production of output with standardized input and already set parameters.

 In recent time there have been several attempts to implement the already established scientific models into the GIS environment.

 Although, advantages of GIS are well known, this techniques hasn't been used in forestry in the country yet.

 Faculty of forestry – Dept. of Land and water is the only user of these techniques in forestry in the country.



Aims and objectives

The aim of this study is: to create a basic GIS dataset necessary for different analyzes related to forestry and based on it to made data conversion according to it and to test applicability.

The objectives of this study are:

- To create GIS dataset for part of the mountain Karsijak i.e. protected area "Park-forest Vodno" -Skopje
- To assess the possibility of calculating some other parameters using GIS;
- To use basic data, to reclassify and use for estimation i.e. erosion risk.

Methodology

- Office work -

- collecting paper version of maps
- collecting tabular data
- collecting other data
 Scanning, digitizing , georeferencing,
 Satellite image decoding
- Field measurements with GPS (paths, channels, ..) and downloading to PC
- Creation different layers
- 2-d model
- 3-d model

Erosion risk analyzes using EPM (model by Gavrilovic)

SOFTWARE and HARDWARE

Scanner HP A4 - FF
PC PIII and PIV - FF, MAICh, P
GPS – Garmin e-trex Vista – P

Landsat ETM+ satellite image - MAICh

Erdas Imagine – MAICh
ENVI
Idrisi Kilimanjaro
Adobe PhotoShop
Arc GIS 9.2. – MAICh & evaluation copy



VODNO BEFORE AND NOW



Erosion control works

- Mass afforestation of barelands
- Hydraulic structures
- Proclaimed as parkforest

Vodno 2007

Area: 4573 ha, Altitude : 266 – 1066 m asl slopes >45 % Vegetation: 868 domestic and 142 introduced plant species

Dataset

- The dataset was comprised of the following layers:
- Georeferenced and Digitized maps from the management plan of the park-forest Vodno
- Satellite imagery: Landsat ETM+ image
- 1:25,000 topographic maps
- CORINE land cover/use map (scale 1:100,000), vector
- Geology map (1:25,000), vector
- Climatic data, tabular data
- Soil map; (1:25,000), vector

- The study area was covered on four 1:25,000 topographic maps produces by the National Geodetic service (The maps were scanned on A0 scanner and after, the maps were georeferenced and registered according to the national geodetic system.
- The Land cover/use extraction was based on the CORINE land cover classification and it was used for establishing the vegetation parameters. The land cover classes were extracted from Landsat ETM+ satellite imagery using object oriented classification approach and after it was updated with the method of photo-interpretation using Ikonos imagery.
- The DEM was with cell size of 80m. The accuracy of the DEM was checked using trigonometric points from the topographic maps which are claimed to have accuracy of 0.5m by the producer. There were 198 points taken for accuracy and it yielded quite good results, the RMSE (Root Mean Square Error) was 18.9m.
- The Climatic data were taken from the National weather service, to be more exact rainfall (annual average rainfall) and temperature (annual average temperature) data was collected from a time series of 40 years (1961-2000).

Developed layers ("clever maps")

Border

- Soils; Geology; Geochronology
- Climatic ; Precipitation; Temperature
- Hydrology; Hydraulic net
- Contours >> Slope map; Aspect map
- Villages
- Roads and Paths >> Openness
- Electricity >> risk area
- Other infrastructure (houses. Hotels, motels ..)

Land cover

- 3-d terrain model
- Hyperlink with photos and data

Erosion risk analysis (1 catchment)













Isotermic map



LAND COVER - CORINE Classification











ATRIBUTES

Ville - Grillip - McTro-

Sin filt your press Selection Soch Manager Bart



Identify from:	'op-most layer>	
izohieti do 900mm	Location:	7.531.189,807099 4.646.477,880588 Decimal Degrees
	Field	Value
	FID	9
	Shape	Polygon
	VRNEZI	do 900mm
	AREA	19248890,895
	ACRES	115572,754
	PERIMETER	22770,325
	AT_ACRES	4756,505
Identified 1 feature	<u> iii</u>	





Прег рада бр.	Состо јба	м-јал	висина (м)	Нанос %
1	добра	камен	4	60
2	добра	камен	4	70
3	добра	камен	3.5	70
4	добра	камен	4.0	75
5	ошт. прели в	камен	3.5	90

3-d model

Park-forest Vodno and neigbourhood - DEM



SLOPE (Inclination) in °

Наклон на теренот на планината Водно









Зони долж далновод - просека



Обележани зони околу патиштата погодни при користење на шумите

Actual and potential Erosion risk analyses [Erosion Potential Model by Gavrilovic]



USED FORMULAS

 $Z = \gamma xa (\phi + Jsr^{0.5})$ - erosion coefficient $G = T H_{an} \pi Z^{1.5} F Rn$ - transported sediment $Q_{max} = A S_1 S_2 W (2gDF)^{0.5}$ water discharge





RESULT: Erosion risk analyses

	Ζ	Rn	Е	W	Gsp	G	
			m³/km².y	m³/y	m ³ /km ² .y	m³/y	
actual	0.21	0.47	167.07	552.86	78.79	267.63	
potential	0.94	0.47	1601.15	5235.75	746.13	2439.86	

- **Z** erosion coefficient by Gavrilovic
- **E** total annual erosion production
- **G** total annual transported sediment
- Z 4.5 times higher risk

W, G – 9.5 times larger quantities of sediment

Water discharge estimation – current and hypothetic situation

probability	2	10	5	4	2	1	0.5	0.1
return per	5	10	20	25	50	100	500	1000
H [mm]	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
K	0.4	0.5	0.67	0.75	0.85	1	1.5	1.7
H _n [mm]	0.021	0.026	0.035	0.039	0.044	0.052	0.078	0.088
W	0.291	0.361	0.477	0.531	0.597	0.693	0.995	1.107
А	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
S ₁	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
2gDF	140	140	140	140	140	140	140	140
S ₂	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Q [m ³ /s]	8.10	10.04	13.27	14.75	16.58	19.26	27.65	30.77
S ₂ – hyp.	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Q – hyp.	11.54	14.30	18.90	21.01	23.61	27.43	39.38	43.83







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RIMADIMA Risk-, Disaster-Management & prevention of natural hazards in mountainous and/or forested regions Ref.nr.: 5D102 RIMADIMA





Conclusions and future recommendations

 The ongoing trend in forestry and related sciences is to standardize and normalize the data so it can be used in integrated fashion.

 GIS is standard tool for this purpose.

Благодарам на вниманието



Thank you for your attention