UPDATING SIG-MZP DATABASE FOR BRAILA PLAIN

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Abstract: *The main objective of this paper is to emphasize the distribution of soils in Braila Plain taking in the account the subunits of relief and pedogeoclimatic microzones. The final goal is to update the pedogeoclimatics microzones limits. Microzonation of Romania territory was carried out in two successive editions (FLOREA et al, 1989, 1999), when they separate microzones as distinct cartographic units based on 3 characteristics: climate, relief and soil. Some years later, in a project during 2002 - 2004, a Geographic Information System, SIG-MZP, has been developed, the database being stored in digital format. For Braila Plain, COTEȚ et al (2009) carried out a study regarding the microzones from Braila Plain, each microzone handling adequate information from its own database. A statistics on the soil percentage from each microzone has been done. In this paper, an ovelay of microzone and soil map has been done. The resulting map was achieved by processing information from Microzones map at the scale 1:1,000,000, from the existing database of ICPA, and a series of papers regarding this area. From the map pedogeoclimatics microzones, the area of Braila Plain has been cropped using GIS techniques, with ArcView 3.2. The limits of the microzones of the study area have been modified, and information has been taken on the microzones map. In this paper the limits for pedogeoclimatic microzones from Braila Plain are corrected and updated. The information from SIG-MZP database was analyzed for the territory studied. By correcting and updating the limits of pedogeoclimatic microzones of Braila Plain one could specify the exact soil types in each microzone, their distribution and surface, soil amelioration activities in each microzone, land use, as well as the risk assessment at different soil degradation processes.*

***Key words*:** *pedogeoclimatic microzones, Braila Plain, soil maps*

INTRODUCTION

The microzonation of all Romanian territory was accomplished in two successive versions (FLOREA et al, 1989, 1999). The common feature was for both cases, the separation of microzones as distinct cartographic units according to 3 main characteristics: climate, relief, and soil. In the framework of an AGRAL project, between 2002 and 2004, a Geographic Information System, named SIG-MZP was developed, resulting the digital microzonation database (CANARACHE et al, 2003).

For the delineation of the first approach of the Microzones Map, for climatic conditions, 3 climatic zones have been used (BERBECEL et al., 1984), namely warm-dry climate, moderately warm - semihumid and cool - humid. For the second approach, 2 additional climatic types have been included: cold - very humid climate, corresponding to the mountainous (nonagricultural) regions and very cold - very humid climate, corresponding to the alpine ones. Climatic zones are characterized by annual mean temperature, solar radiation, annual precipitations, evapotranspiration deficit in the growing season and other indices.

Secondly, for the relief characterization, slope, fragmentation density and relief energy have been taken into consideration. Therefore, 6 main categories have been established: flood plain, plain, wavy, slightly sloping, moderately sloping and strongly sloping. It has to

highlight that these characteristics refer to the prevailing conditions in the respective microzones, the variations inside them not being taken into account, even though they are important. In the relatively often cases in which the same microzone/area is larger, occupying more than one relief unit, it is subdivided in different subareas.

Thirdly, for soil conditions, the first approach (FLOREA et al., 1989) found 27 taxonomic units, while the second one (FLOREA et al., 1999) 28 taxonomic units, mainly soil types. Not all the soil types from the Romanian classification are found in the final map, some of them being not so widely spread. Sometimes, taxonomic subdivision of the soil types are also given. The soils mentioned in the description of the microzone, as well as their characterization, are those prevailing in the respective microzones.

The microzones map has been digitized and a Geographic Information System has been developed, in the frame of a national research program (DUMITRU et al, 2008). The MZP layer has 455 separately polygons, corresponding to 101 microzone types. The ID for each polygon is the label of each microzones. Each polygon has only a record in the database, with several attributes (indices, parameters, properties). Additionally, for each polygon others parameters could be computed using pedotransfer functions.

Using the information stored in this SIGMZP, several applications have been developed, as well as a set of Pedotransfer Rules, and some maps about soil degradation processes have been drawn at a general scale of 1:1,000,000. The main issue is due to the lack of information for a larger scale that 1:1,000,000, which is appropriate for a national level, but not so precise at regional scale.

The aim of this paper is to redraw the Microzones map, taking into account the specific relief and soil conditions, for a test area of Braila Plain. The test area has been chosen taking into account the available information about it.

Braila Plain is a part of the Romanian Lower Danube Plain and belongs to Northern Baragan. It is known as a geographic subunit with large areas of saline soils and groundwater with high mineralization. It represents the eastern part of the Buzau-Calmatui interfluve and is bounded by Calmatui river plain (valley) to the south, eastward by the Danube valley, northward by the Buzau valley and westward by the Buzau floodplain which continues south with Buzoel valley (between Faurei and North Ulmu) (COTEŢ and EFTENE, 2009).

In Braila Plain (northern Baragan) soils distribution exhibits a zonal character on the East-West direction: Vermic Calcaro-Calcic Chernozems, characteristic for the Danube terrace, passing toward West in Vermic Calcic Chernozems, then in Haplic Chernozems.

MATERIAL AND METHODS

An important issue regarding Braila Plain was its delimitation. By overlapping the Microzone map with the soil map and topographical maps, 1:25,000 scale, it could be noticed that the 4 microzones describing Braila Plain were not fitted to the others maps. The flood sector had to be excluded from this area. The information about soil types from the soil map and about the floodplain limits from topographical maps has been taken into consideration.

Therefore, the main data used in this analysis, taking into consideration the various input types, are as follows: a) the Microzones map of Romania, 1:1,000,000 scale and its attributes table; b) the soil map of Romania, 1:200,000 scale, version 1 (1995); c) the topographic maps at a scale of 1:25,000, as georeferrenced images.

The steps followed to achieve the goal of the paper are as follows:

- Identifying the input data sources (maps, databases);
- Preparing the topographic maps for that area in order to use it in digital format by georeferrencing them;

- Redrawing the new limit for the microzones in Braila Plain area, by overlapping the microzone layer with the soil map and the topographic map imagines;
- Cropping the outcome for Braila Plain;
- Assessing the areas occupied for each microzone by each soil type.

The main issue was to redraw the new limits, and the procedure has been done using ArcView modules, and on screen digitization. At background, the soil map and topographic imagines have been used alternatively. The process was not automatic.

At the end, the new redrawn microzones map and soil map have been overlapped, in order to improve the SIGMZP database with more detailed information about soil types of Braila Plain.

RESULTS AND DISCUSSIONS

The SIGMZP is a spatial database, handling spatial data about land characteristics, but not about soils. The additional attribute database stores data for each microzone map unit regarding the climate type, the main topographical characteristics, as well as some information about up to ten soil components for each microzone, including the percent of total area occupied by each soil component, but not their spatial distribution. The test area of Braila Plain covers 4 microzones, as follows: 4/3, 13/2, 109/1 and 109/2. In table 1, the data from the existing SIGMZP database are presented, showing the soil components for the four microzone of Braila Plain stored as additional attributes of microzone map units.

Table 1

Soil distribution in Braila Plain (northern Baragan) in different pedoclimatic units (microzones)
(% of units)

Soil		Texture	Northern Baragan Microzones*				Total
			4/3	13/2	109/1	109/2	
Chernozems (CZ)			90.50	86.00			
Chernozems (Czti)		coarse-middle	*13.50*	*79.00*			*58.03*
Chernozems (CZvm)		middle					
Chernozems (Czti) a		fine		*1.40*			*0.96*
Vermic/ carbonatic chernozems (CZvm/k)		middle	*58.20*	*0.40*			*16.82*
Salinized chernozems (CZsc)		middle	*18.80*	*4.80*			*8.62*
Cambic chernozems (CCti)		coarse		*4.40*			*3.00*
Soloncheaks (SC)		middle	1.80	5.40			4.20
Solonets (SN)		middle to fine		1.10	7.70		1.48
Psamosols (PS)		coarse			92.30	100.00	0.15
Alluvial soils (SAti)		middle to fine		2.60			2.08
Lakes				0.5			0.30
Total percentage			100.00	100.00	100.00	100.00	100.00
Unit surface	ha		44.59	107.01	1.77	3.42	156.79
	%		28.44	68.25	1.13	2.18	100.00

After analyzing the input data, new limits of Braila Plain have been drawn as shown in figure 1. The limits of the two small microzones located on sandy soils have been modified also, taking into account the sandy soil polygons.

The south-eastern corner of the test area has been moved according to the level curve from topographic map (arrow 1), in order to exclude the Danube flood plain, and the alluvial soils too. The all east side of 4/3 microzone has been moved to west, for the same reasons. The north-eastern corner of the same microzone has been moved in order to extend the area and to integrate the soils that are not alluvial ones (arrow 2). The north side of both 4/3 and 13/2 microzones have been changed in the same direction.

Both small microzones located mainly on sandy materials (109/1 and 109/2) have been moved (arrow 3), taking into consideration the Psamosols and other sandy soils location on soil map.

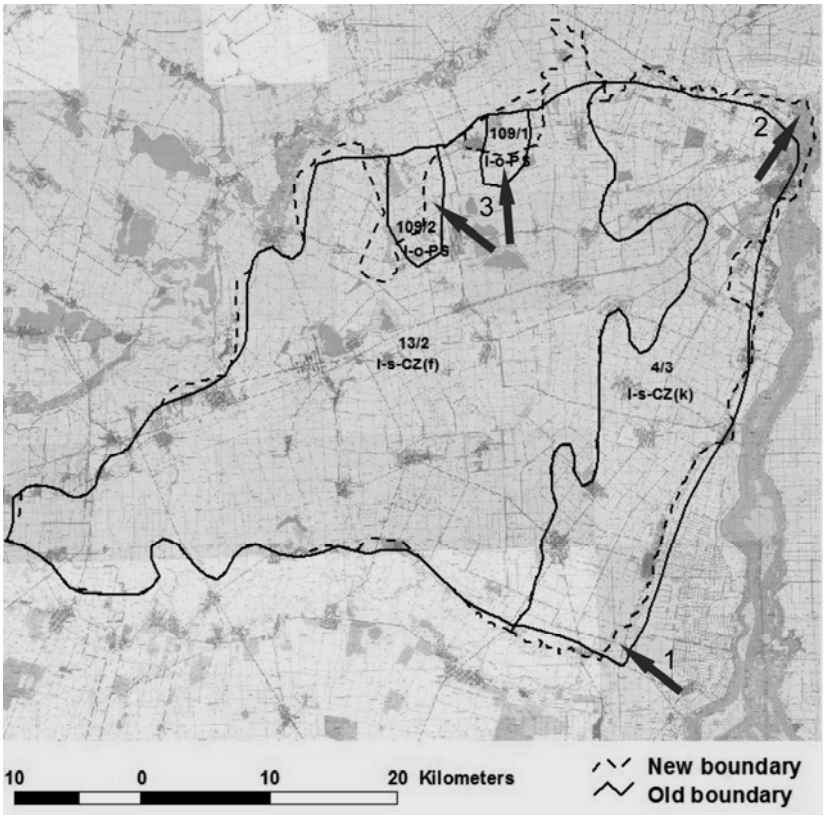

Figure 1. Redrawing the new limits for Braila Plain (northern Baragan) microzones map

The first result was the changes in the total area of the 4 microzones comprising the Braila Plain, as well as the changes in the area of each microzone, separately. These differences between the old and new areas of the microzones of test area could be noticed in table 2. The total area of the four microzone covering Braila Plain increased to 2918 ha, especially due to the microzone 13/2.

Table 2

Microzones distribution in Braila Plain (northern Baragan)

Cod_unit	Microzone symbol	Surface (ha)		Differences
		Old	New	
4/3	**I-s-CZ (k,f)**	44,585	44,479	**-107**
13/2	**I-s-CZ (f)**	107,014	109,590	**2,577**
109/1	**I-o-PS**	1,772	2,042	**270**
109/2	**I-o-PS**	3,418	3,596	**178**
Total		156,788	159,706	**2,918**

The output layer has been cropped for Braila Plain, in order to analyze the area. By overlaying it with the soil map, 1:200,000 scale, information about the soil cover for each microzones of Braila Plain has been obtained (fig. 2).

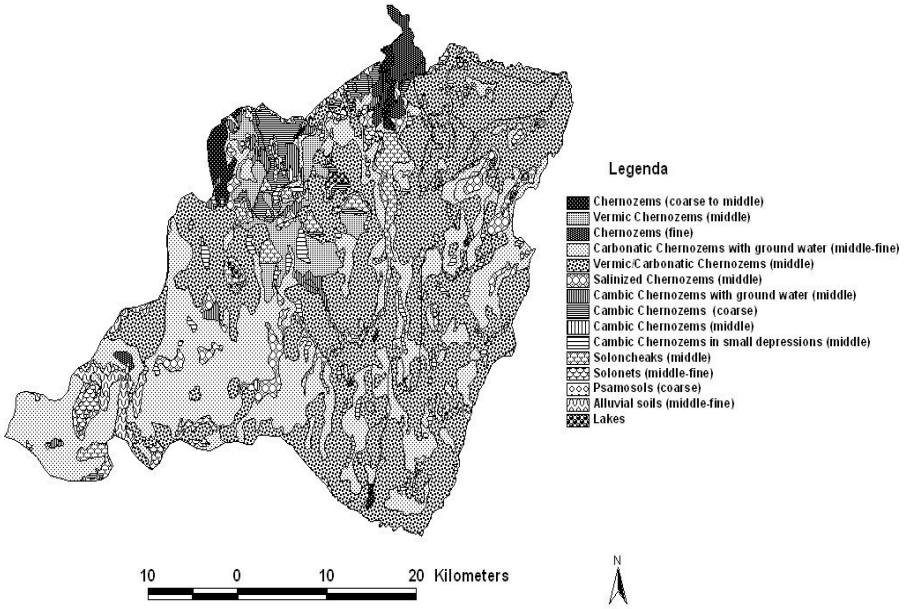

Figure 2. Soil distribution in Braila Plain (northern Baragan)

In table 3, the new percentages of each soil component of each microzone after the new boundaries have been delimited are presented.

Table 3

Soil distribution in Braila Plain (northern Baragan) in different pedoclimatic units (microzones) after redrawing (% of units)

Soil		Texture	Northern Baragan Microzones*				Total
			4/3	13/2	109/1	109/2	
Chernozems (CZ)			97.91	90.85	87.68	84.39	
Chernozems (Czti)		coarse to middle	*0.20*	*2.18*	*1.09*	*0.72*	*1.58*
Chernozems (CZvm)		middle	-	*5.48*	-	*5.92*	*3.89*
Chernozems (Czti) a		fine	*0.05*	*2.25*	*9.83*	-	*1.68*
Carbonatic/with ground waters Chernozems (CZti/f)		middle-fine	*23.50*	*36.86*	*14.13*	*2.80*	*32.08*
Vermic/carbonatic chernozems (CZvm/k)		middle	*69.42*	*35.31*	*13.99*	*0.27*	*43.75*
Salinized chernozems (CZsc)		middle	*1.96*	*3.95*	*6.54*	-	*3.34*
Cambic chernozems with ground water (CC)			-	*1.52*	*4.27*	*10.24*	*1.33*
Cambic chernozems (CCti)		coarse	-	*0.73*	*37.83*	*57.23*	*2.28*
Cambic chernozems (CCti)		middle	-	*0.05*	-	*2.35*	*0.09*
Cambic chernozems in small depressions (CC-d)		middle	*2.78*	*2.52*	-	*4.86*	*2.61*
Soloncheaks (SC)		middle	0.80	4.48	-	3.09	3.36
Solonets (SN)		middle to fine	0.90	1.72	-	2.00	*1.48*
Psamosols (PS)		coarse	-	-	-	6.52	*0.15*
Alluvial soils (SAti)		middle to fine	0.12	2.62	12.32	4.00	*2.08*
Lakes			0.27	0.33	-	-	*0.30*
Total percentage			100.00	100.00	100.00	100.00	100.00
Unit surface	ha		44.48	109.59	2.04	3.60	159.71
	%		27.85	68.61	1.27	2.25	100.00

Therefore, after overlaying the microzone map with the soil map, more information about soil components and their distribution are obtained. This information was used in redrawing the new limits of Braila Plain.

A difference between the information stored in the old database of microzones and the updated information are highlighted firstly through the differences in number of components, especially for the two I-o-PS microzones. For example, no information for the test area about Vermic Chernozems (CZvm), or Carbonatic/with ground waters Chernozems (CZti/f), Cambic chernozems (CCti) on middle txture, Cambic chernozems with ground water (CC), or Cambic chernozems in small depressions (CC-d) was found in SIGMZP. The two small microzones I-o-PS have more detailed information about soil components.

CONCLUSIONS

The microzone map is very useful for delineation of different soil degradation processes at national scale, several Pedotransfer Rules being developed for this scale. The main issue of the paper is to enhance the SIGMZP database.

New limits have been redrawn for the microzones in Braila Plain area, by overlapping the microzone layer with the soil map and the topographic map imagines.

The new soil components of microzone map are settled up, described and spatial presented. The information about soil components is more detailed, both for soil attributes and for their location.

The enhancement of SIGMZP database could lead to a more accurate description of microzones, as well as to a more detailed modelling of Microzones Map. The Pedotransfer Database developed for SIGMZP could be use more successfully.

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