# SIGNIFICANT DIFFUSED POLLUTION SOURCES IN SOILS AND WATERS OF BEGA HYDROGRAPHIC BASIN

# PRINCIPALELE SURSE DIFUZE DE POLUARE ALE SOLURILOR SI APELOR DIN BAZINUL HIDROGRAFIC BEGA

**Ioana A. COSTESCU**

*Politechnic University Timişoara, România*
*Corresponding author: Ioana Costescu, e-mail: ioanafair@yahoo.com*

***Abstract:*** *The paper presents the main diffused pollution sources from the Hydrographic Basin of the River Bega, and the way it affects the quality of waters and soils. It is also described the territorial spread of the pollutants.*

***Abstract***: *Lucrarea prezintă principalele surse de poluare din surse difuze prezente în Bazinul Hidrografic al râului Bega, dar şi modul în care acestea influenţează calitatea apelor şi solurilor. Este descris şi modul de răspândire în teritoriu al poluanţilor.*

***Key words*****:** *diffused pollution sources, fertilizers, pesticides, water quality, and soil quality*.
***Cuvinte cheie*** *:surse de poluare difuză, îngrăşăminte, pesticide, calitatea apei, calitatea solului:*

## INTRODUCTION

Bega springs from Poiana Ruscă Mountains at the altitude of 890 m under the Padeş Peak, and the catchment's area surface (4470 $km^2$) has a general east – west orientation (the course length is 170 km). The hydrographical lattice from the Hydrographic Basin of the River Bega is 1418 km length, the density being 0.32 $km/km^2$. Bega discharge herself in the Tisa River on the Serbian territory.

Bega Veche represents an old path of the Bega River and practically is a continuance of the Bergsău River that on a length of 107 km drains a surface of 2108 $km^2$. The medium multiannual flow varies with the altitude with values between 2 $l/s/km^2$ and 18 $l/s/km^2$.

## MATERIAL AND METHOD

Land usage

In the Hydrographic Basin of the River Bega we can observe (Fig. 1) that is a clear difference of land usability according to the relief:

In the hydrographic Basin of the River Bega - Veche the agrarian surfaces represents about 75% from the total surface, the land covered with forests are insignificant fractions – things that influence essentially and negatively the flowing conditions from this region.

In the Hydrographic Basin of the River the agrarian field and the forests represents each about a third from the total surface.

In the Bega Hydrographic Basin exits various types of soils depending on the relief forms encountered. In the Poiana Ruscă Mountains dominants are the Districambosoils a type of soil with humus of type moder rich in fulvic acids and in a smaller manner we find here Prepodzol and Podzol along with Leptosoils.

The hill area (Lipova Hills) is covered with Luvosoils of different subtype's typical, stagnig and albic. They usually need fertilizing, removal of water excess and liming.

An important part of the Bega Hydrografic Basin is spreading over the plains area where soils like Chernozem dominates. They come highly mineralized because of the presence of the aquifer at small depths leading to the formation of Gleyc and Saline, Sodas Chernozem.

Locally we encounter the Sodic Soils like Solonceac and Saliniferous. In the meadow area are present the Aluviosoils generated by the suspensions from the rivers flooding.

The waters and soils from the Bega Hydrographic Basin are affected by the diffused pollution sources with an important impact for their quality and a proper use for a sustainable development.

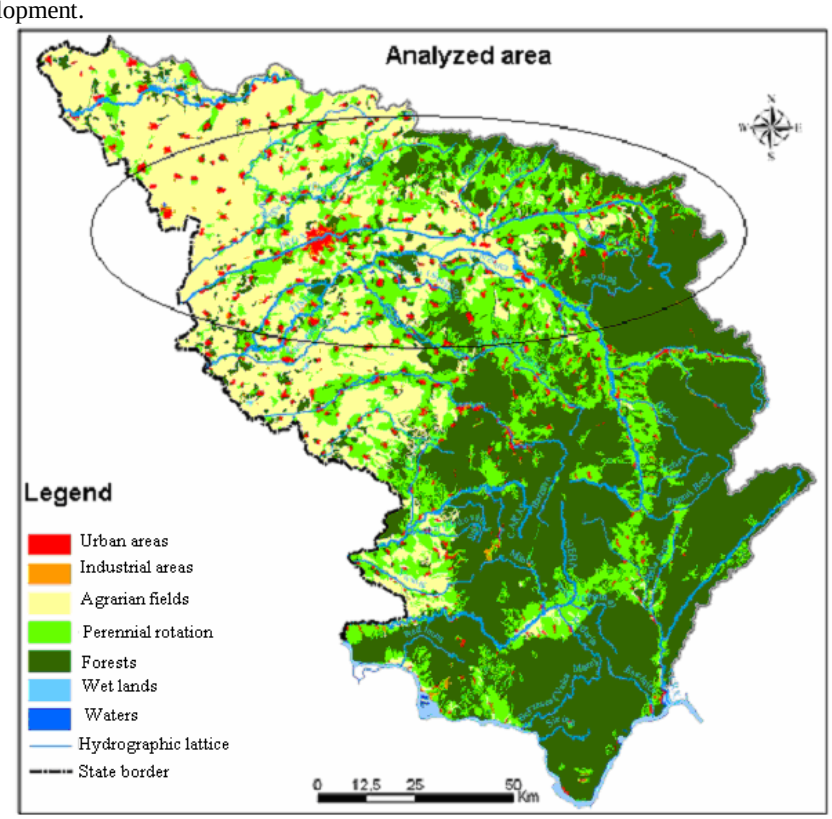


Figure 1 – Land usage

*Manner of fertilizers usage*

The data regarding the fertilizers, pesticides and domestically animal's quantities came from the Agrarian Direction Timiş.

The specifically nutrients quantity used in the Hydrographic Basin of the River Bega at the year 2005 level la were 3.40 kg P/ha of agrarian field, respectively 11.99 kg N/ha of agrarian field. In the figures 2 and 3 is presented the chemical fertilizers manner usage on every hydrographic basin from the Hydrographic Space Banat, noticing the high quantity of fertilizers from the Hydrographic Basin of the River Bega, Aranca and Timiş.

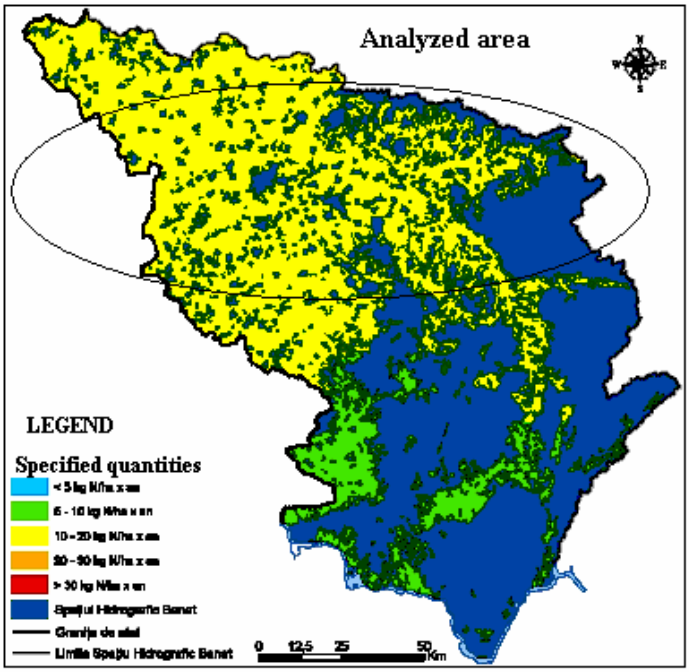


Figure 2 – Manner of nitrate usage

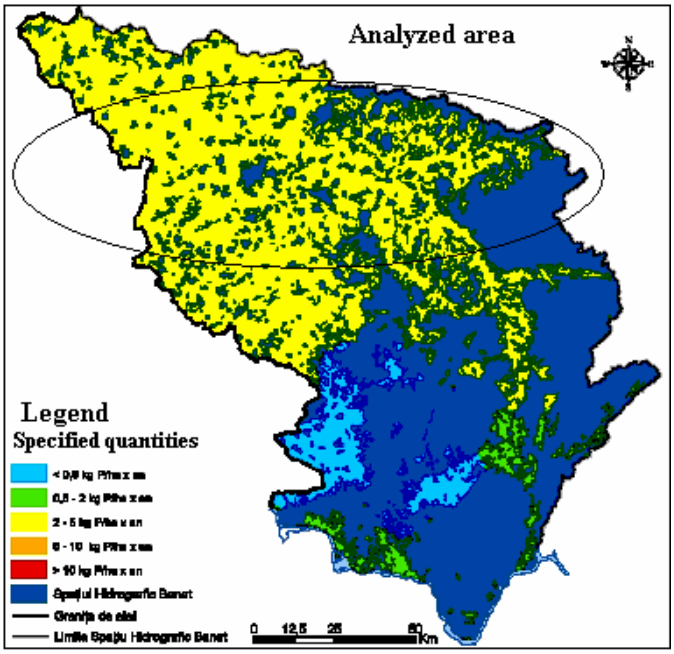


Figure 3– Manner of phosphorus usage

*Manner of pesticides usage*

Pesticides are classified depending on the target organism as: herbicide, insecticide, fungicide, acaricide, nematocide, moluscocide, raticide and with mixed action. All pesticides are biologically active substances that show secondary effects over the environment and human health.

The distinctive quantities of pesticide used in the Hydrographic Basin of the River Bega at the year 2002 level, were 0.22 kg/ha of agrarian field. Figure 4 shows the pesticide manner usage on every hydrographic basin from the Hydrographic Space Banat.

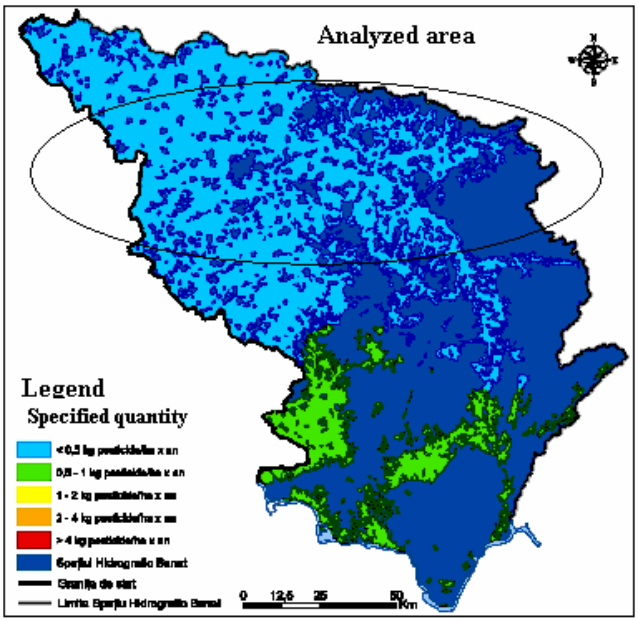


**Figure 4 – Manner of pesticides usage**

*Domestically animals*

In the Hydrographic Basin of the River Bega, exists a number of 1 227 894 of domestically animals (5. 59/ha de of agrarian field), which represents 52 624 equivalents cows (0. 24/ha of agrarian field), calculus effectuated according to the Good Agrarian Practices Code and taking into consideration the agrarian surface. We stipulate that an equivalent cow produces 85 kg N/year. Figure 5 represents the density of domestically animals in the Hydrographic Space Banat.

The presentation of the criteria for the diffused significant pollution sources evaluation

To asses the significant diffuse pollution sources were established the criteria shown in the table 1, criteria that regards the nutrients emissions from diffused sources and not the quantities applied.

In the Hydrographic Basin of the River Bega, the phenomenon of diffused pollution is accentuated by the fact that only 37.5 % from the population is connected to the centralized canalization systems.

This diffused pollution is amplified by the existence of the agrarian and zoo technical farms, most of then out of use in present but with an historical impact over the environment,

and also by the intensive agriculture practiced in the Hydrographic Basin of the River Bega especially in his north – western part.

In some areas may be overstepped the limits of the definite degree of the significant pollution sources.

*Table 1*

Criteria for the definition of the significant diffused pollution sources

| Pression | Parameters taken into consideration | Degree |
|---|---|---|
| Diffused pollution from urban, industrial, agrarian, and other installation and activities (urban areas, drainage, erosion, surface leakages, atmospherically sediments) | Agrarian areas | 0.5 kg P/ha/year<br>5 kg N/ha/year |
| | Urban areas | 0.15 kg P/ha/year<br>1.5 kg N/ha/year |

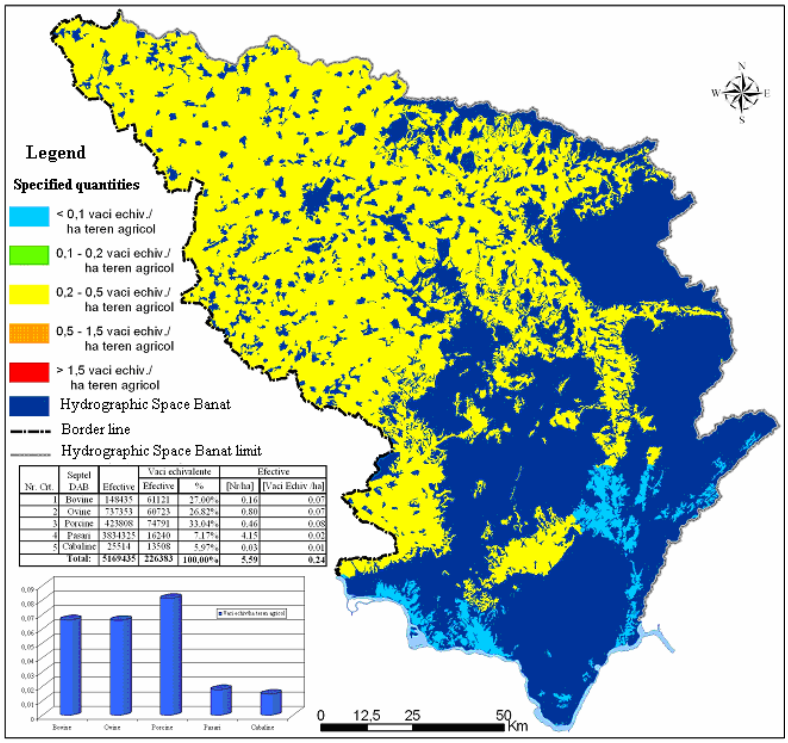


Figure 5 – Domestically animal's density

## RESULTS AND DISCUSSIONS

The diffused pollution sources are represented mainly by:

- Chemical fertilizers used in agriculture that were 3.40 kg P/ha agrarian and 11.99 kg N/ha agrarian, much smaller then the media from the Danube River Basin of de 5.9 kg P/ha agrarian and respectively 31.4 kg N/ha agrarian;
- Pesticides used to fight the pestilent were 0.22 kg/ha agrarian, less then 1.39 kg/ha –the media of 7 states from the Danube River Basin;

- Domestically animals from the analyzed hydrographical basin have a density of 0.24 equivalent cows/ha agrarian, smaller then the media from the Danube River Basin - 0.45-0.55 equivalent animals /ha (depending by the used calculus method);
- Human agglomeration from the rural and urban area considering the small percents of population connected to the canalization channel by 1.3%, respectively 64%.

## CONCLUSIONS

Due to the economical development from the years 1960-1989, the waters and soils quality has suffered serious degradation regarding the reference estate from the '50. After the year 1989, the water and soil quality was ameliorated because of the restriction of the economically-social activity and the application of the economical mechanism in the environment area, including the principle "the polluter pays".

Still there are numerous water bodies and soils from the analyzed area that have an estate different from the "good estate", due to the punctual, diffused and hydro morphological pressures.

It is well known that farmers' management practices and land use decisions influence ecological processes and soil - water - plant interactions. However, farmers' decisions are often made to achieve short-term goals rather than long-term management of soil productivity and health. Unsustainable land use practices and agricultural intensification are significant causes of soil biodiversity loss and related impacts on ecosystem function and resilience. A better understanding of the linkages among soil life and ecosystem function and the impact of human intervention will allow us, not only to reduce the negative impacts, but also, to more effectively capture the benefits of soil biological activity for sustainable and productive agriculture.

## LITERATURE


BERTICI R., „Vertisolurile din Banat şi efectul variaţiei de volum asupra unor elemente constructive din amenajările funciare" Ed. Politehnica, Timişoara Teza de doctorat, 2007.

KAMPA, E., HANSEN, W., „Heavily Modified Water Body" ("Corpuri de apă puternic modificate"), Editura Springer Verlag Berlin, Heidelberg 2004

ROGOBETE GH, ŢĂRĂU D. – „Solurile şi ameliorarea lor. Harta solurilor Banatului" Ed. Politehnica, Timişoara 1997

SERBAN, P.,"Aspecte privind implementarea în România a directivelor europene în domeniul apei", Curs postuniversitar "Managementul integrat al resurselor de apă",Timişoara 2004

SERBAN, P.,"Pressure and impacts on water bodies" („Presiune şi impact asupra corpurilor de apă"), Curs postuniversitar "Mamagementul integrat al resurselor de apă", Timişoara, 2004

SERBAN, P.,"Planul de Management al Spaţiului Hidrografic Banat", Raport 2004, Timişoara, 2005