USAGE OF FREE DATA IN NATURAL RESOURCE MANAGEMENT AND TERRITORIAL PLANNING

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Abstract: *Technology information development has led to higher performance of GIS programs that can be easily used in various fields. Natural resource management and territorial planning, lead to these resources, can be an area where the processing of data from different sources (satellite images, aerial photographs, maps, plans, geological data, data from ground measurements, data from different institutions - both public private, etc.) can contribute to the sustainable development of a region or entire state. GIS programs may prove useful in the power of analyzing multiple sets of data that can allow: visualization, analysis and management of resources for a long time exploitation, territorial development necessary resources exploitation, analysis of risk situations that require certain types of exploitation, etc.*

1. Introduction

Modern spatial analysis systems based on geographic information systems technology (GIS), allow using data obtained from multiple sources and of different types, such as graphical data (maps, satellite images, orthophotos, plans, etc), digital data (shapes, polygons, lines, points, etc), databases (Oracle, MySQL, PostgreSQL, etc.), for all sorts of situations and problems that can influence both negative and positive, environment and adjacent population.

These systems can be used easily in different areas such as scientific research, natural resource management, mineral resources, environmental impact, territorial planning, route planning, natural hazard mapping, health, endangered species monitoring, etc.

Mismanagement, or nonexistent, of natural resources is a problem faced by many countries. Romania is no exception, so the implementation of a GIS system to be used for better management proves to be a useful choice that can contribute to the economic development of the country. Lack of subjectivity procedures for conducting tests in different areas and how quickly they take are the key points of such a system that also create a great advantage in comparison with another type of system.

2. Using "free data" to create geodatabase.

Contribution of data taken from different sources is significant when creating or updating geographical database requires a larger accuracy and data acquisition costs as low. Institutions and private companies can provide data of high accuracy, which can be easily used in various research and evaluation programs. However the collection of information from such sources or by performing measurements is often a time consuming process, expensive and laborious while, and as an alternative, in some cases, can easily use "free data"

that found on the internet or can be acquired from other sources and does not require acquisition costs.

Some of the advantages and disadvantages of using data obtained from free sources can be found in table 2.1.

Tab. 2.1 – Advantages and disadvantages of using free data sources.

Advantages.	**Disadvantages.**
Does not require acquisition costs.	Discovering data sources can be time consuming.
Data accuracy can meet the requirements of the project concerned.	If the desired data don't have the needed accuracy they must be purchased from another source.
Data can suffer multiple changes and can be further distributed without the consent of the source.	Data may need a post processing that can be expensive, both in time and the fund.
With the centralization of data they can be used by many institutions, organizations and other type of users.	The integrity and quality of the data and the source should be always checked.
Can meet national and international standards.	Lack of metadata and their incomplete existence can lead to mistakes processing / use / analysis.
Data sources independence allow discovery and use data for a long time after the owner give up to their maintenance.	Due to incompatibility some data sets can't be processed by some programs and may require purchase of additional software.
Data can be obtained from geoportals that offers WMS / WMTS or WFS / WTC services and don't require storage space.	The disadvantage of these services is the inability to change the data that goes into the analysis.

Storage, maintenance and proper management of data must be provided if the information is made available for rapid analysis and manipulation by the user, such as planners and decision makers involved in various projects analysis. Meanwhile, the database must meet minimum requirements for interoperability and accuracy so that their use does not generate errors when loading data or to the test results.

Representation of the database created for this project can be found in Figure 2.2.

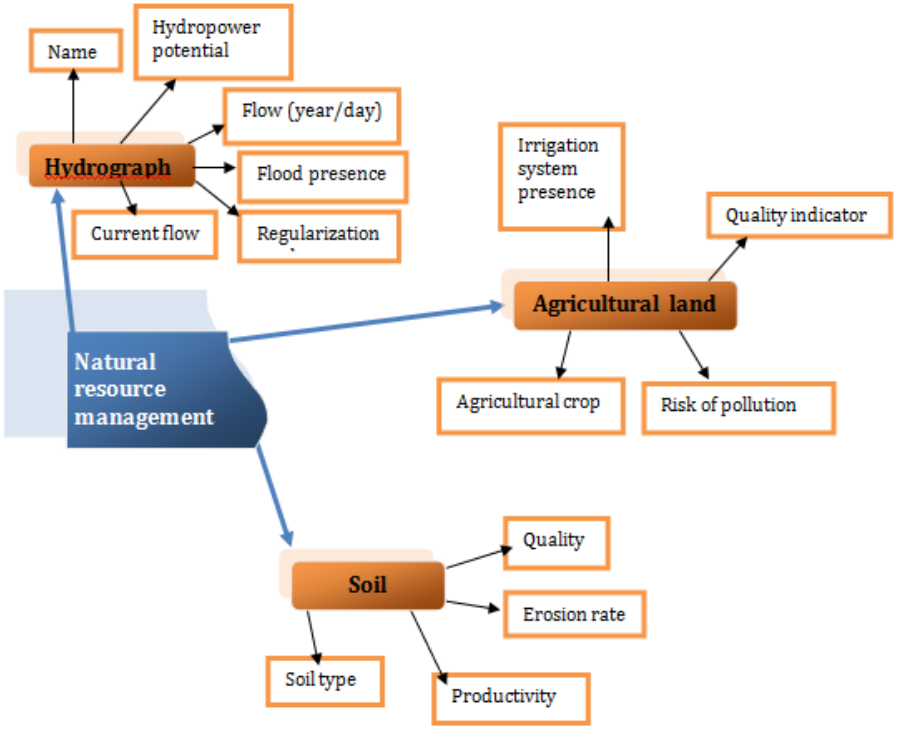

Fig. 2.2. Natural resource management database.

3. The management system of natural resources.

3.1. ”Free data” integration in GIS.

Land cover is the most important feature of nature because it can be used in multiple processes of analysis and evaluation. Regarding this feature, the European Environment Agency provides a collection of data and geodatabase, for free use, which contains information on land cover, natural and anthropogenic habitats, soil maps, hydrographic maps, maps of air quality, etc.

For this project we used data Corine Land Cover 2000 and 2006 related to land cover, fig. 3.1.1, and the remaining data were selected from official data, standards, reports and scientific papers, WMS services, etc.

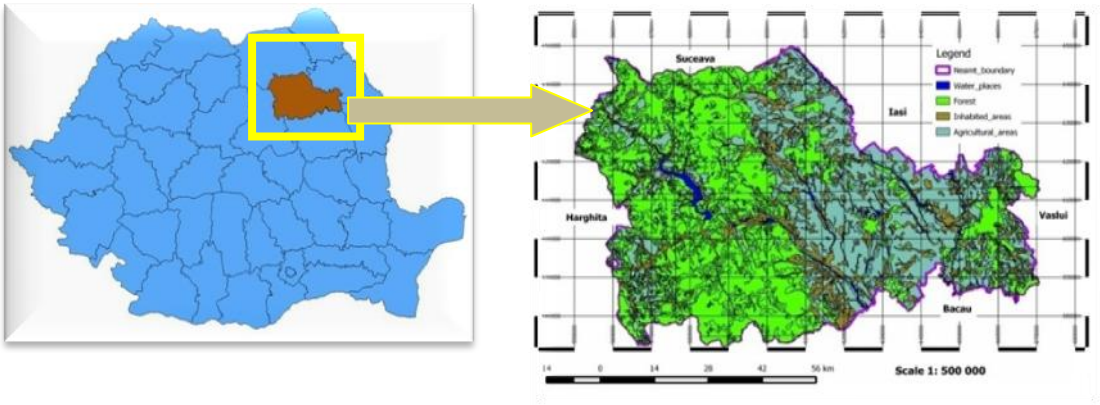

Fig. 3.1.1 – Study zone –Neamt county.

From the data used for this project was obtained the land use map, fig. 3.1.1 from which one can observe how the distribution of the main uses of the land for the entire county. Given the need for knowledge of the distribution was made the graph of fig. 3.1.2

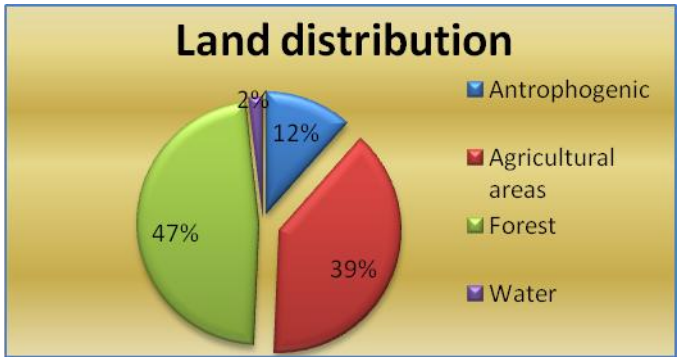

Fig. 3.1.2 – Land distribution graph.

3.2. Agricultural land management.

Maintaining agricultural land to the highest levels of quality must be the most important feature of the agricultural system of a country whose soil contributes, to a large extent, on its economy. It focuses mainly on management of: land, water, biodiversity and other environmental resources to meet human needs while sustaining ecosystem services in time and means of subsistence.

With time, the criteria for evaluating the quality (after which performance is assessed land) have evolved: from a small number (usually productivity, respectively the harvest of some crops) to a large number, often conflicting with each other. Currently are used four main evaluation criteria:

- Physical criteria - which focuses on land use results.
- Economic criteria - which is based on gross registered.
- Social criteria - important land adjacent to population.
- Sustainability criteria - which focuses mainly on land vulnerability.

These criteria are combined, according to valuation models to obtain global land suitability for different uses.

At the same time due to the necessity of knowledge of soil quality, the need for information and evaluation of the impact of agriculture on the environment highlighted variation of surveillance indicators system that show the interaction between agricultural activities and natural resources and environmental and economic performance of the agricultural system in a time.

The first analysis, after loading data into the program will be used for the interpretation and analysis - Quantum GIS, will be of cognitively related soil quality and production capacity, the importance of soil characteristics in terms of physical criteria of evaluation. For this is used a WMS layer of the main types of soil that provides the information necessary for this step. To check the data but also other qualities of the soil was used the European soil database, made available by the Joint Research Centre.

The analysis of the two layers, WMS layer and crops layer, have highlight the main agricultural areas of the county, which are found mainly in the eastern and central part of the county, in areas washed by the rivers: Ozana, Toplita, Cracau, Bistrita, Moldova and Siret, fig. 3.2.1, and soil quality. Soils found in this analysis are rich in mineral resources, most part of the class that gives a high soil resource for agricultural crops (haplic luvisol, luvic phaeozem, haplic phaeozem, etc) and from here it can get the degree of productivity in those crop areas.

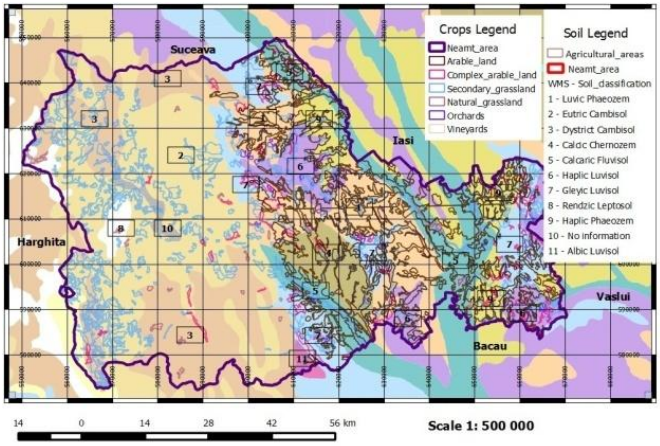

Fig. 3.2.1 – Land distribution map based on soil distribution.

From the point of view of a sustainable evaluation, soil quality factor is influenced by the texture of the soil erosion factor that plays an important role in the quality analysis for long periods of exploitation. Thus, the crop overlay layer over the WMS layer, which contains erosion soil characteristics, fig. 3.2.2, have been highlighted areas whose soil require special attention in this regard.

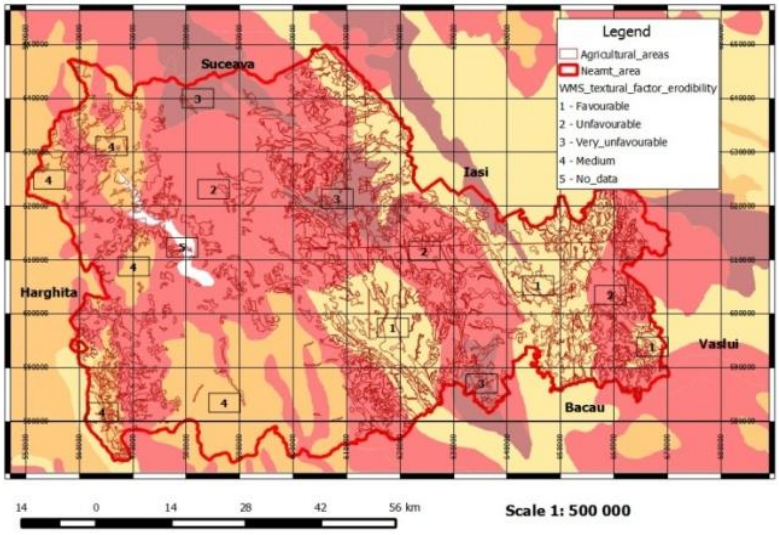

Fig. 3.2.2 – Map of textural soil erosion factor.

Currently, due to inappropriate management practice, Romanian agriculture generates various types of pollution, by focusing too much chemicals / hectare as a result of using inappropriate traditional practices of soil fertilization and plant protection from pests.

Incorrect use of the irrigation system with water of poor quality can cause a favorable soil degradation process. In addition, the most common problems encountered in Romanian soils are: silting, salinity, alkalinity, acidification, decrease of fertility, excess of humidity and infestation with pathogenic germs. (F. Statescu, D.C. Zauca, EEMJ - 2008).

Segmentation of land uses hampers resource management plans offer by the agricultural system, fig. 3.2.3, and also creating new features for increased productivity and soil quality.

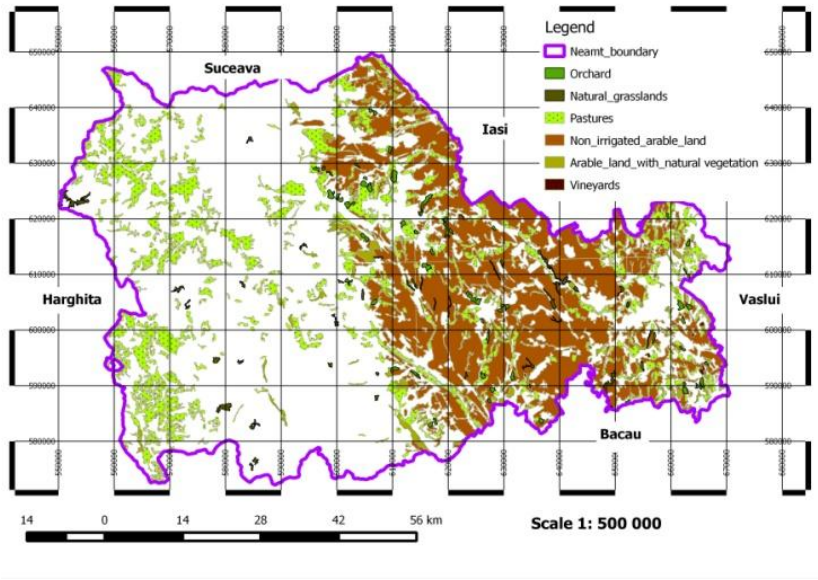

Fig. 3.2.3 - Map of main agricultural use.

Due to the segmentation of land, the present project can't include crops on these surfaces to estimate production on large areas, so using data from the National Statistics Institute yearbooks proves to be a viable option in highlighting the agricultural potential of the land for the main types of crops, fig 3.2.4.

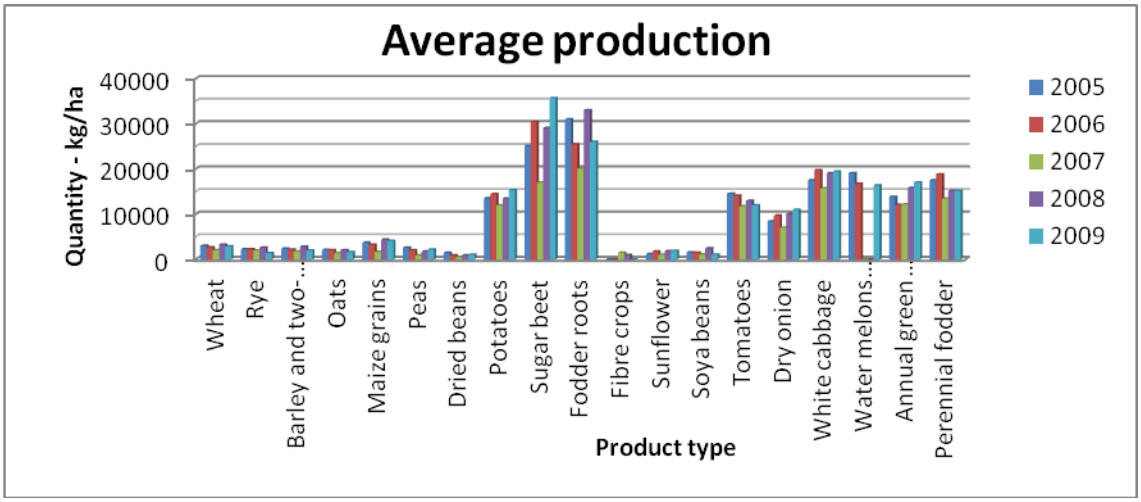

Fig. 3.2.4 - Average production per hectare of major crops.

4. Analysis of risk situation and territorial planning.

Unconditional exploitation of natural resources, unrestrained technological race and the frenzy growing economy are pilasters for supporting the current economic policies and development of modern society. The subtle balance between dynamics and anthropogenic environmental system has made territorial transformation processes become the subject of

scientific interest and have taken considerable political significance. Environmental impact assessment and strategic environmental assessment is the first functional tools for analyzing and evaluating the effects of specific actions that can reflect on the territory.

A conceptual logic sweep away the fees imposed by the current economic system, describes a good design as a set of planned actions to address and solve practical problems by consulting viable options on participatory approaches and knowledge to control events and uncertainty future.

Analyzing the information available, that have been mentioned so far, as well as other types of data and database, specifically designed for this project, we can perform a territorial planning based on several criteria and issues. This can easily determine which development priorities at the community or county level.

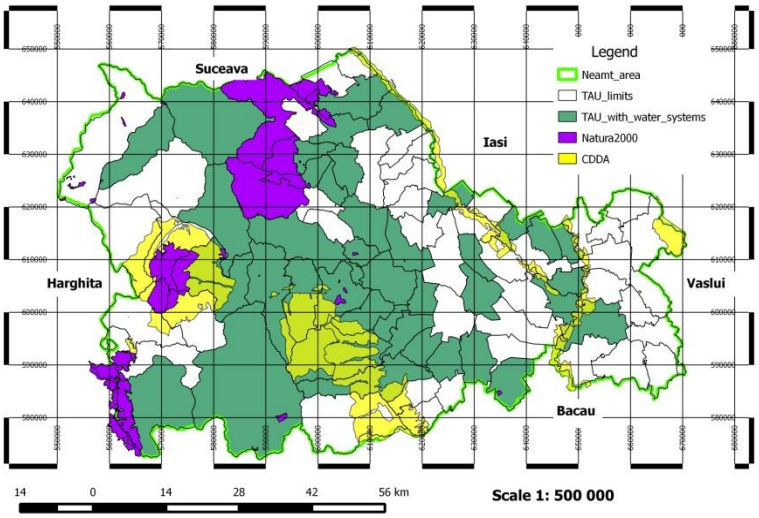

Figura 4.1. Protected zones map (CDDA and Natura 2000), Territorial Administrative Units(TAU) with water supply systems.

Loading the database in the work program, Quantum GIS for spatial data analysis related, in this case highlighting areas that have certain restrictions on use of resources due to certain factors that need special protective measures, the result map in fig. 4.1. From the analysis of the resulted map we can do management plans of targeted areas that do not have water supply systems and works to establish protected areas are needed (regulation of Siret and Moldova rivers to prevent flooding, creating better infrastructure for unlocking the potential protected areas, etc).

To meet the specific needs related to water consumption of the population, as mentioned above in fig. 4.1, it can use the information about the needs of the population that will help to establish a management plan for water resources more efficiently by connecting the water supply to villages that do not yet have this feature and find new sources of water exploitation in areas that still do not have water to reduce transportation costs and minimize water epidemic where water quality is not required to be consumed.

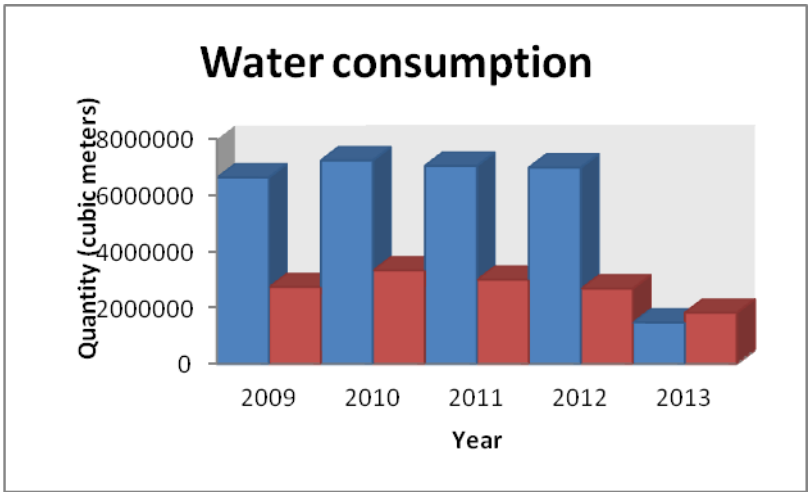

Fig. 4.2. Graph of water consumption at the county level.

Because of the land segmentation, farms and associations that own large agricultural areas may require irrigation systems which will help to increase crop production. At the same time we have to take into account the quality of water used as well as other measures specified in section 3.2, to maintain a high quality soil.

Doing a spatial query for delimitation of areas that presenting a favorable risk regarding erosion degree of soil and areas where massive pollution with nitrates has a high degree of production are achieved most vulnerable areas for crops. From the analysis we can see, fig. 4.3, that the risk is increased by the location of major rivers in the targeted areas and drinking water systems.

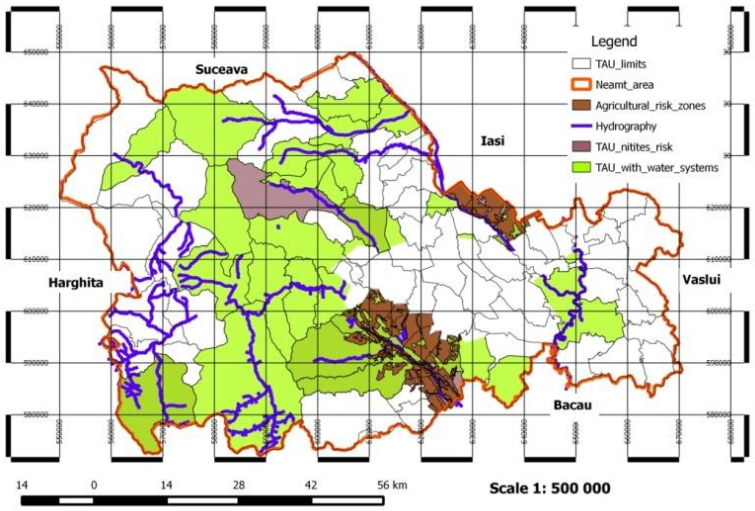

Fig. 4.3. Agricultural areas whose soils map show a favorable degree of erosion and susceptibility to nitrate pollution and TAU that have drinking water systems.

The presence of water supply systems, many localities having their catchments, can have consequences disastrous only locally, both the population and the environment and therefore agriculture, if not permanent monitoring the nitric level from water and soil, especially in the extraction pits.

Time evolution of water courses is a problem that requires a detailed analysis of the patterns in which it unfolds and the main causes underlying them.

So to highlight the evolution in time were used, for example, two rivers - Moldova and Siret. It will analyze the digitized surfaces based on orthophotos made in 2005 and 2008 Figure 3.3.3. Thus, the overlapping surfaces of the two riverbeds, old Siret area that was approximately 4159 km^2 in 2005 and 4463 km^2 in 2008 and Moldova in 2005 was approximately 4000 km^2 and in 2008 approximately 3850 km^2.

Because we want to highlight the annual evolution, from the calculations, it can be seen that Siret shows an increase of 1 % / year and Moldova fell by 0.5 % / year to riverbed. Although in 2006 and 2008, the two rivers have experienced massive flooding, which played a decisive role in modifying the riverbed, sandy soil and minimum daily flow rate of about 5 cm/s of the Siret and 3 cm/s of Moldova are also factors influencing this growth. Have yet taken into account the period in which they were made orthophotos and river flow at the time since both play an important role in this analysis.

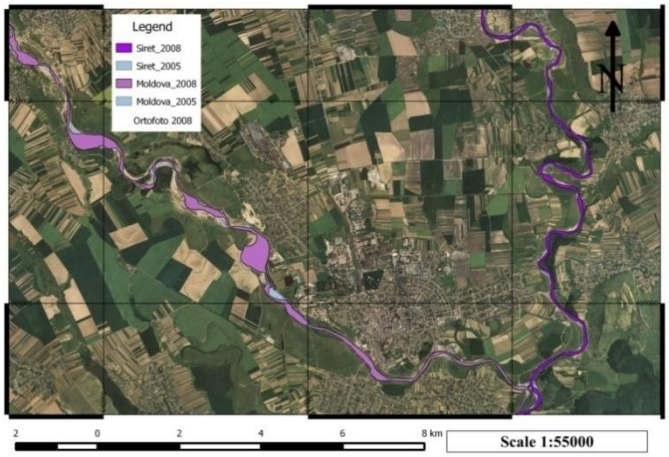

Fig. 4.5. Evolution of the riverbeds - Siret and Moldova – in the period 2005-2008.

5. Conclusions.

The objective of an effective management system is to select the optimal intervention method by analyzing the factors set out in the decision making process so that the decision can't be influenced by subjective factors. In this way, computerized management system is designed to become a necessary tool in the decision making process to get a realistic intervention strategy, in accordance with the policies used by the project requirements.

The importance of maps and spatial data used in the analysis process is critical because it depends on the test results. Based on these forecasts it can create multiple scenarios of progression, risk analysis and detailed simulations.

As we noted, "free data" can contribute easily to analysis and planning models in different situations of interest, both public and private sectors. The need for such data becomes a viable option for process analysis projects that do not have the funds for the acquisition of all data or for educational use.

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