

NITRATE RISK EVALUATION OF THE AGRICULTURAL CROP FIELDS, USING TERRITORIAL INFORMATIC SYSTEMS

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Unlike the classical methods used in territorial analysis, the teledetection and T.I.S. techniques (territorial informatic systems) can quantify the environmental impact upon large areas based on the hydrographic basin notion. Using teledetection and T.I.S., some multitemporal and multispectral analysis methods can be established for the analyzed territory using satellite images, such as NOAA-AVHRR and Landsat Thematic Mapper – TM, which offers some geometrical resolutions on a certain scale, global, regional, or local.

Based on this analytical method the were determined the risk of nitrate pollution for an agricultural territory, the informative plans were synthesized and overlapped two by two on informatic levels, thus resulting the intermediary vulnerability maps, which, by their overlapping it resulted the map of territory vulnerability synthesis or the map of analyzed territory ecological risk, when polluted with nitrate.

Key words: territorial informatic systems, teledetection, risk, nitrate

Unlike the classical methods of territorial analysis, the teledetection and T.I.S. techniques (territorial informatic systems) are of a high accuracy, quantify the environment impact on large territorial areas, and are based on the notion of hydrographic or sub-hydrographic basin. With the help of teledetection and T.I.S. some methods of synoptic, multitemporal and multispectral analysis for the analysed territory are improved, using satellite images such as: NOAA – AVHRR and Landsat Thematic Mapper (TM), which provide certain geometrical resolutions at a certain global, regional or local scale.

All these data are georeferencial, classified, interpreted and integrated with thematic and table information of a T.I.S., considered the reference one. With the help of this system, the maps of vulnerability or those of ecological risk can be worked out, for different ways of territorial usage, in case of impact given by pollution, soil erosion or unappropriate use of resources on that land.

MATERIAL AND METHOD

The aspects considered to be developed by T.I.S. are:

- historical evolution evaluation of the territory in order to accomplish a rational analysis of resources and to correct the territorial planning;
- identification and grading the surfaces cultivated with some certain crops;

- the study of spectral behavior for some certain crops connected with some phenological and agronomical parameters, in order to make a diagnose of the crop;
- evaluating the pollution risk in the reference hydrographic basin from the cultivated territory taken into study, following the pesticides treatments;
- evaluating the pollution risk in connection with the loading given by nitrate, resulted from the livestock farms in the area.

For the study of the historical evolution of the territory, there have been digitalized maps at a scale of 1: 25000, where, urban and arable surfaces, pastures and orchards, as well as the unproductive land are perfectly inserted. The results obtained are comparable to Landsat TM images and classified through MLL method,, thus determining the urban expansion to the detriment of cultivated surfaces. Identically, through digitalized images of the multitemporal, georeferencial and overlapped data, it can be emphasized the crops evolution in terms of cultivated surfaces, agricultural crops history etc.

On confronting the traditional statistical data, resulted from Landsat images classification and the thematic data digitalized by the topographical cartography, precise information with regard to the different cultivated surfaces can be obtained.

In this direction, there can be done radiometric measurements on the soil from different experimental areas, for many years. Thus, the agricultural parameters, the biomass quantity, the vegetation index can be compared with the radiometric parameters.

In T.I.S. there can be introduced territorial data and/or data refering to geology, soil permeability, depth water level, soil and subsoil pollution risk etc. The ecologic risk-vulnerability relation is at the base of T.I.S. use in territorial analysis (*fig. 1*).

The computation scheme regarding the development of the maps of pollution risk synthesis for the main actions provided by the no more use of chemicals in agricultural crops, is based on the principle of geohierarchical overlapping of thematic maps (*fig. 2*).

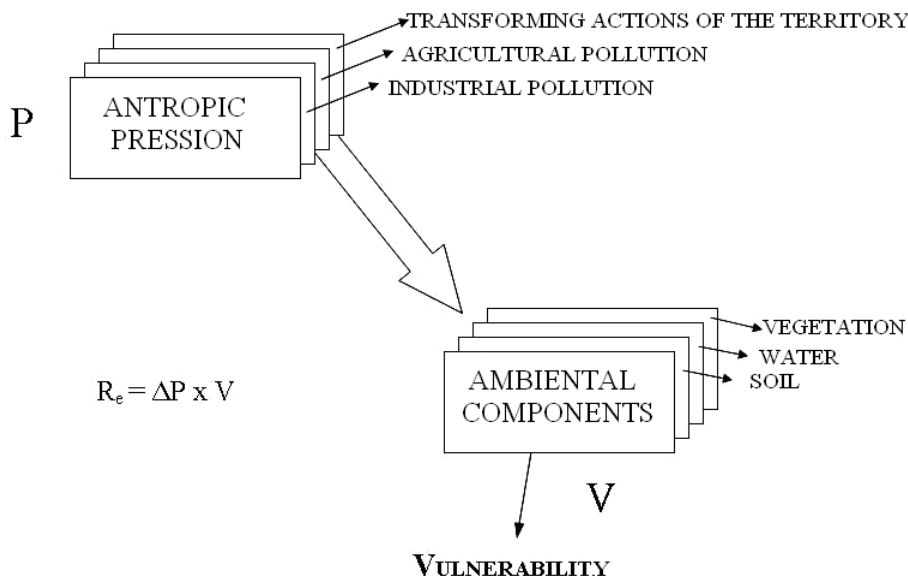


Figura 1 Ecological risk relation in connection with the territory vulnerability

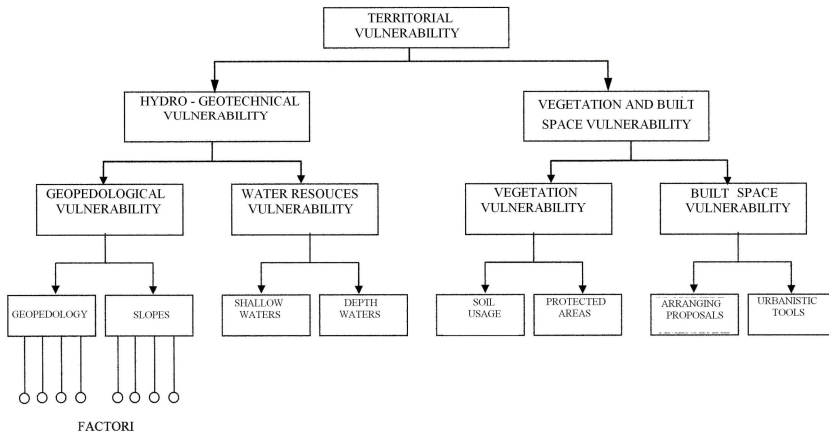


Figura 2 Developing scheme of synthesis thematic maps for pollution risks

RESULTS AND DISCUSSIONS

Progressively, the resulted informatic plans are then synthetized and overlapped two by two on informatic levels (*fig. 3*), thus resulting intermmidiare or partial vulnerability maps of primary and secondary level which, at their turn, are overlapped two by two, resulting the synthesis map of vulnerability of the territory from the hydrographic basin considered for the study, meaning the ecological risk maps (*fig. 4 and 5*).

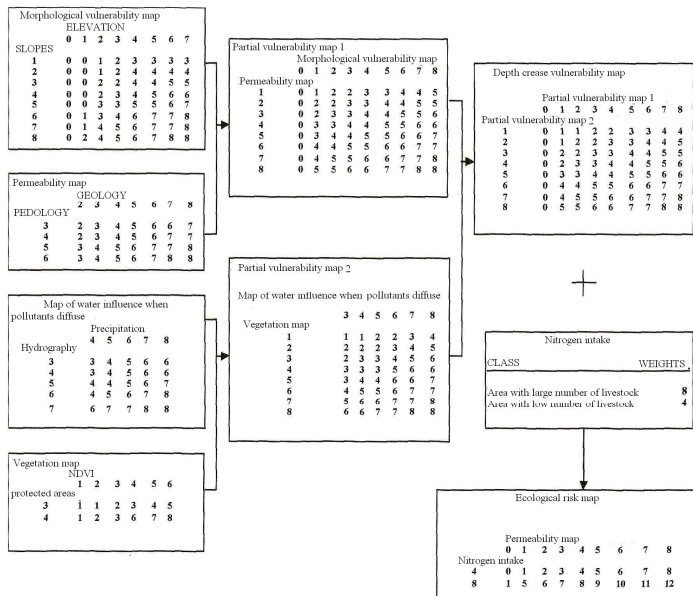


Figura 3 Overlapping scheme of thematical informative plans

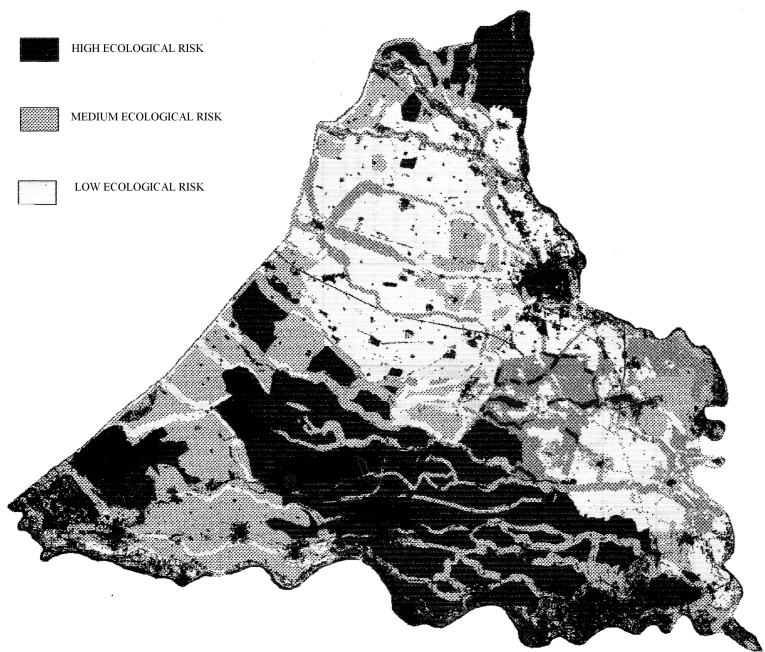


Figura 4 Ecological risk map (2D)

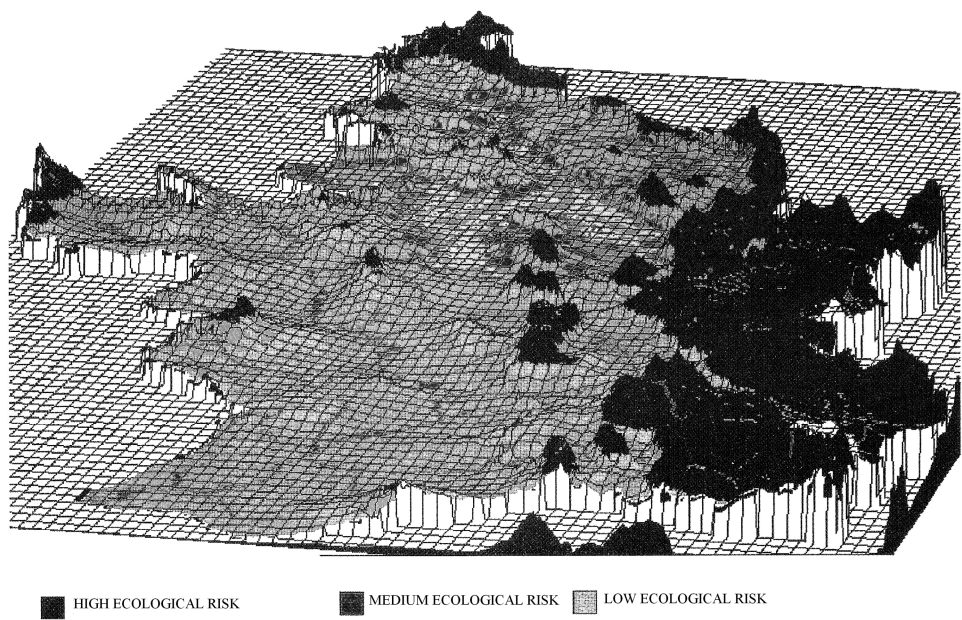


Figura 5 Ecological risk map (3D)

CONCLUSIONS

The methodology used, which is based on T.I.S. has some advantages:

- the ecological risks a territory is submitted to are automatically determined;
- it is an easy and elastic method to use in territorial analysis at local but especially global scale;
- the territorial analysis are done at a common station which has a PC using the IDRISI applicative package;
- the IDRISI software is a T.I.S. computer-assisted, which allows the aquisition, stockage and representation of territorial data.
- the computation programme has aproximatively one hundred different moduluses;
- the IDRISI system has a special database which describes the territory shape and, an attribute database which describes the territory characteristics;
- the teledetection perfectly integrates with the traditional data, to watch the territorial analysis at different scales;
- there is a permanent territorial control on the area taken into study, meaning that the validity of the computations is checked out by experts;
- the obtained maps are tools of synthesis of the ambiental reality, based on which, important decisions are made with the view to territorial planning, or the interventions upon the territory are established so that, a sustainable agriculture to be practiced.

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