BULETINUL INSTITUTULUI POLITEHNIC DIN IAŞI

Tomul LVI (LX)

Fasc. 2

HIDROTEHNICĂ

2010 **Editura POLITEHNIUM**

BULETINUL INSTITUTULUI POLITEHNIC DIN IAŞI
PUBLISHED BY
„GHEORGHE ASACHI" TECHNICAL UNIVERSITY OF IAŞI
Editorial Office: Bd. D. Mangeron 63, 700050, Iaşi, ROMANIA
Tel. 40-232-278683; Fax: 40-232 237666; e-mail: polytech@mail.tuiasi.ro

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S U M A R

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HYDROTECHNICS

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ASPECTS OF SOIL POLLUTION BY HEAVY METALS IN COPŞA MICĂ AND MEDIAŞ, SIBIU COUNTY

BY

ANIŞOARA UNGUREANU

Abstract. This paper presents some results of experimental research performed in areas of Copşa Mică and Mediaş, Sibiu county.

The concentration in soil of lead, zinc and cadmium was analysed and compared with corresponding values of the threshold for intervention, provided by the Ministry of Waters and Environment Protection, Order no. *756*/1997. Soil reaction was also analysed because it influences the mobility of heavy metals in soil.

The research was especially want to identify areas affected by heavy metal content and also to find the most appropriate solutions for sustainable management of soil.

Key words: pollution; heavy metals; lead; cadmium; zinc.

1. Introduction

Soil is the most important source of life with a fundamental role in the environment. It is an essential factor for ecological balance as well as an essential factor in society.

Soil pollution includes a full range of phenomena and processes of degradation, and represents a critical problem, leading to reduced fertility and normal functioning of soils.

At Sibiu county level, the most extended chemical pollution, with quite strong, aggressive effects, is the pollution by heavy metals (lead, zinc, cadmium) of Mediaş and Copşa Mică areas. Although, the reduction of soil concentrations of heavy metals is rather more noticeable than in previous years. Concentrations exceeding the alert threshold can still be found.

Pollution in this zone is serious, being mostly caused by SC SOMETRA SA, a company specialized in the production of metals (Zn, Pb) from concentrated mining.

Now, there is a sensible reduction of the maximum intensity of pollution with heavy metals in the area in question. Nature and the synergic action of pollutant emissions affect microbiological activity in soil, slowly causing the disappearance of the process of humification in soil.

Soil pollution in Copşa Mică area affects agricultural and forest ecosystems; soils will thus have low fertility and come to belong to lower grades of fertility. The soils contamination level depends on the rainfall regime.

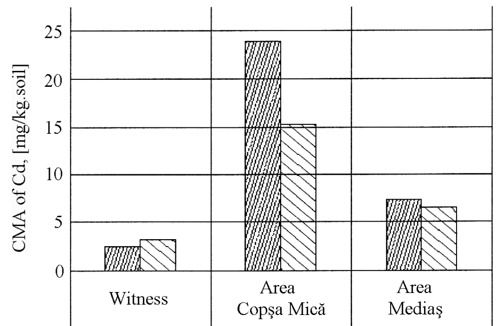
The rains generally wash the pollutants in the atmosphere and deposit them on the ground, also wash the soil, helping to transport pollutants to the emissaries. It is note worthy that rains also favours a depth contamination in soil.

Accumulation of excessive amounts of lead, zinc and cadmium in soil adversely affects most processes in soil. Excess of heavy metals cause changes in the physical and physical-chemical properties of the soil, reducing soil biological activity. They act on microorganisms both directly and indirectly, destroying the transformation of the soil organic matter.

2. Materials and Methods

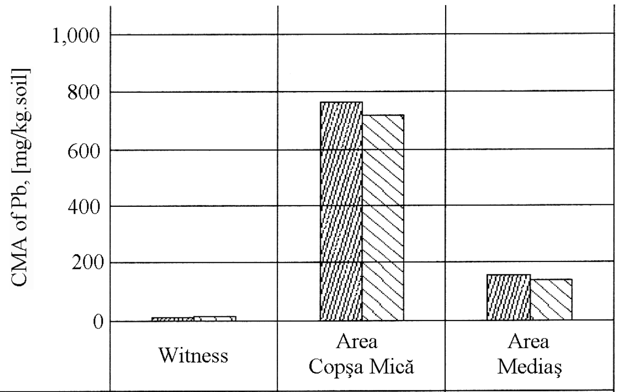
For a more complete description, soil samples from the areas of Copşa Mică and Mediaş were collected from depths of 0…10 cm and 20…40 cm. Analyses were performed on samples taken from the average area of 25…250 m^2.

Figs. 1,…,3 show the annual average concentrations (CMA) for Pb, Cd and Zn in 2006.



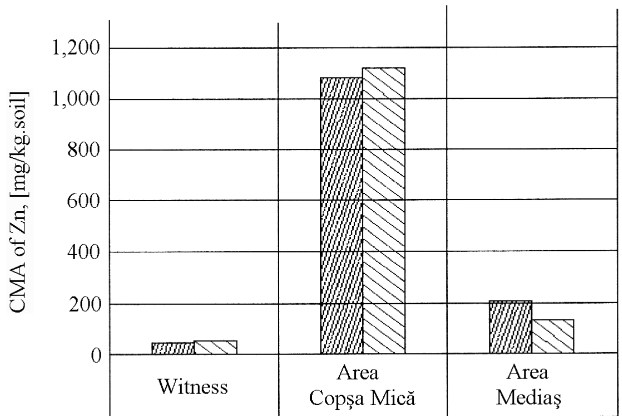
	Witness	Area Copşa Mică	Area Mediaş
0...20 cm	2.500	23.8540	7.3750
20...40 cm	3.2375	15.2725	5.900

Fig. 1 – Annual average concentrations of Cd in 2006;
CMA = 5.0 mg / kg soil.



	Witness	Area Copşa Mică	Area Mediaş
0...20 cm	12.500	762.250	156.565
20...40 cm	14.375	717.275	138.462

Fig. 2 – Annual average concentrations of Pb in 2006;
CMA = 250 mg / kg soil.



	Witness	Area Copşa Mică	Area Mediaş
0...20 cm	44.875	1,083.460	200.70
20...40 cm	51.250	1,121.875	131.41

Fig. 3– Annual average concentrations of Zn in 2006;
CMA = 700 mg / kg soil.

Generally, cadmium is usually associated with zinc, it is weakly retained by soil and therefore easily adsorbed and translocated by plants. The cadmium toxicity for plants is higher than the zinc, one which thing substantially reduces production at susceptible plants. The harmful effects of cadmium in soil consist in blocking microbiological processes, slowing the synthesis of atmospheric nitrogen, and also such processes as ammonification, nitrification and denitrification.

The lead content in soil adversely affects its biological activity, neutralizing the ferments (especially dehydrogenase and urease), reducing removal of carbon dioxide and limiting the number of microorganisms in it.

Excessive accumulation of zinc in soil adversely affects most processes in the soil. The excess of zinc causes the modification of physical and physical-chemical properties of the soil, reducing its biological activity. Zinc acts on microorganisms both directly and indirectly, disturbing the transformation processes of soil organic matter. In plants, zinc is toxic in levels higher than 400 ppm, preventing the adsorbtion of other elements wich are essential to their development.

Analysing the figures one could see that the excess of CMA (annual average concentrations) are registered only in Copşa Mică (Pb, Zn and Cd). Pb concentrations in soil samples fall within the CMA, in the profiles of 0…20 cm and 20…40 cm, but Cd and Zn concentrations have exceeded the CMA in sampling points. To assess the content of heavy metals in soil, alert thresholds were used; in the contaminated areas less sensitive soils to pollution were found.

The negative impact of pollution with heavy metals and iron content is significant on all of the environmental factors in the area.

3. Results and Discussions

During the period 2000…2006, the pollution measurements for the contamination intensity of Pb, Cd and Zn showed that the frequency of exceeding the CMA at Pb (Fig. 4) content ranged between 24% and 85% (85% representing the frequency peak in 2003).

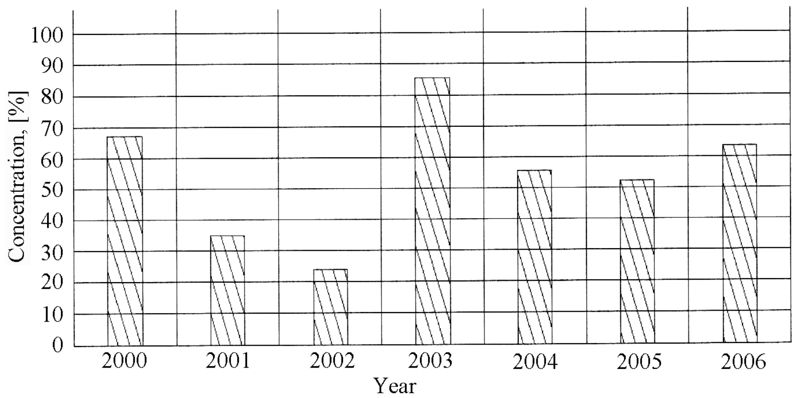


Fig. 4 – Frequency of exceeding CMA at Pb.

The highest annual frequency of surpluses of maximum concentrations admissible were registered in 2003, both with the content of Pb and of Cd. Lead causes serious poisoning when the plants wich have been subject to it are consumed as food, the consequences are very serious chronic illness. Fig. 5 shows that the frequency of a surplus at the contents of Cd has values between 55% and 88.15%.

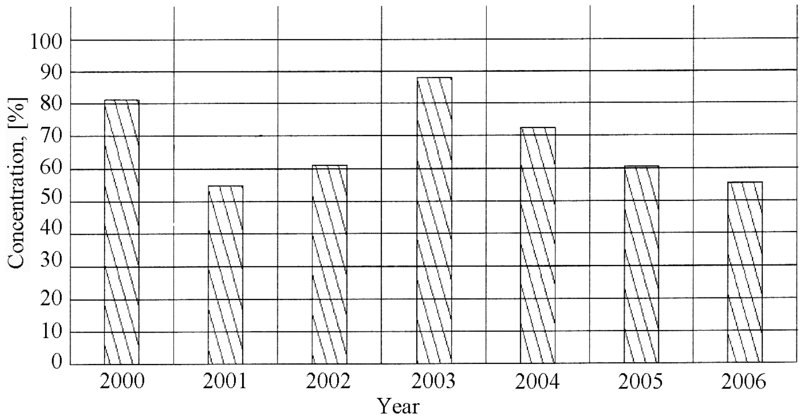


Fig. 5 – Frequency of exceeding CMA at Cd.

Against the background of the factors: high slope, petrographic brittle substrate, alternating layers of different rocks, that favour the soil water deficit and the total disappearance of vegetation under the impact of pollution, pollution friendly processes are developed.

The land degradation with the pollution of heavy metals of the areas in question is quite extensive. With a high capacity for adsorbtion, a high content of clay and organic matter, the soils may retain those elements especially in their upper horizons.

The amount of toxic compounds in these soils acts negatively on crop production and forestry. Table 1 shows the distribution of land surfaces depending on the degree of pollution.

Table 1
Distribution of Land Surfaces Depending on the Degree of Pollution

Plots of affected land ha	Environmental surfaces of contaminated land, [ha]		Seriously polluted plots of land, [ha]	
	Forestry fund	Agricultural	Forestry fund	Agricultural
180,750	31,285	149,465	3,245	18,630

Forest soils are affected by heavy metal accumulation, especially in the upper horizon (0…20 cm) against the agricultural soils in which the effects are higher in the horizon 20…40 cm.

Statistics show that life expectancy is around 13% less in the area at issue than the national average.

Given the specific sources of pollution of soil a slow progress and remanence of soil contamination with heavy metals in these areas are observed.

4. Conclusions

Analysing the presented data one could say that the sources of pollution have a negative impact, for a long time, on the soil quality, on the ecosystems in the area and on human health.

Mention must be made that the degree of pollution in soils remains at high levels, the main source that causes the pollution with heavy metals being SC SOMETRA SA enterprise. The causes of pollution are provided by a technological factor (breakdown of equipment, interruption of the technological process, mechanical damages) and the weather conditions (totally unfavourable conditions).

Evaluation of soil samples was conducted in order to provide useful indications regarding soil quality in the area.

Because heavy metals stay in soil for long historical periods, dozens, hundreds or even thousands of years, the process of adsorbtion in plants of heavy metals in soil will continue. It is highly advisable that we should not cultivate vegetables, trees, fodder on contamineted soils because heavy metals reach out to plants, including their edible part.

Preventing the contamination of soil and groundwater with heavy metals is the best way to reduce pollution.

Received, July 14, 2010

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R E F E R E N C E S

1. Buchaner M.J., *Contamination of Soil and Vegetation near a Zinc Smelter by Zinc, Cadmium, Copper and Lead*. Environment Sci. Tehnics, **7**, *2*, 131-135 (1973).
2. Răuță C. *et al.*, *Aspecte ale poluării solurilor în România*. ICPA, Bucureşti, 1978.
3. Robu B., *Evaluarea impactului şi a riscului induse asupra mediului de activități industriale*, Edit. Ecozone, Iaşi, 2005.
4. Gavrilescu E., *Surse de poluare şi agenți poluanți ai mediului*. Edit. Sitech, Craiova, 2007.
5. Zamfir Gh., *Efectele unor poluanți şi prevenirea lor*. Edit. Academiei, Bucureşti, 1979.
6. Răuță C., Cârstea S., *Prevenirea şi combaterea poluării solului.* Edit. Ceres, Bucureşti, 1983.
7. www.apmsibiu.ro.

ASPECTE PRIVIND CONTAMINAREA SOLULUI CU METALE GRELE ÎN JUDEȚUL SIBIU

(Rezumat)

Se prezintă rezultatele unor cercetări experimentale efectuate în zonele Copşa Mică şi Mediaş din judeţul Sibiu.

A fost analizată concentraţia de plumb, zinc şi cadmiu din sol comparativ cu valorile corespunzătoare pragului de alertă, respectiv pragului de intervenţie, prevăzute în Ordinul Ministerului Apelor şi Protecţiei Mediului nr. *756*/1997.

De asemenea a fost analizată şi reacţia solului, deoarece aceasta influenţează mobilitatea metalelor grele în sol.

Cercetările au avut ca obiectiv principal identificarea zonelor afectate de conţinutul cu metale grele şi găsirea celor mai potrivite soluţii pentru managementul durabil al solului.

BULETINUL INSTITUTULUI POLITEHNIC DIN IAŞI
Publicat de
Universitatea Tehnică „Gheorghe Asachi” din Iaşi
Tomul LVI (LX), Fasc. 2, 2010
Secţia
HIDROTEHNICĂ

THE IMPORTANCE OF THE CREATION, IMPLEMENTATION AND DEVELOPMENT OF THE URBAN INFORMATION SYSTEM

BY

GEANINA ADAM

Abstract. The necessary mechanisms in the process of taking decisions are essential elements in any system of management. In the urban communities that deal with incomplete data and information, in real time, these mechanisms may be broken up and influenced by these factors. In these circumstances, one of the best solutions is to create, develop and implement a functional *Urban Information System*.

Key words: Geographic Information System; Urban Information System; urban management; arrangement and organization of the territory; data base; cadastral plan.

1. Introduction

In a society that tends to achieve the free market and competition economy, like the Romanian society, in which the development and consolidation of the democratic structures as well as development of the economic reform and the speeding up of the process of privatization, the necessity for a better record of the land property and the exact delimitation and the juridical enactment of all the land owners, with or without constructions, represents one of the components that conditions the success of the reform.

In these circumstances, a strategy must be created and adopted for the development and bringing up to date of the survey, geodesy and cartography according to the fundamental objectives of the Romanian society reform, aiming to a sustainable development of the national economy and Euro-Atlantic integration.

Though the survey has an extremely important function in the economic-social activity, the public perceives it as a specialized field, concerning a narrow area of professionals. Contrary to this opinion, the survey, by its function of providing a technical, economic and juridical record of all the properties, has a major role in the organization of the society in its whole; few are the economic and social fields on which the way of organization and functioning of these activities didn't have important consequences.

In a view of accomplishing Romania's objectives, as a member state of the European Union, a special attention is given to the field of survey, as a means of providing a real record from the technical, economic and juridical points of view, of all the plots and constructions, no matter their destination and form of property, as a basis in the development of the rural and urban infrastructure and for creating the conditions for the free movement of plots, as well as attracting foreign and native investors.

The survey data and the urban data banks represent, in the complex activity of management computerization (for a system made as a support of the political, technical, economic and social decision) a means of administration and analysis of all the data concerning the built-up area of a place, connecting all the departments of the public administration.

2. The Geographic Information System

The Geographic Information System (GIS) represents an organized collection made of hardware, software, geographic data and professionals, dedicated to the acquisition, storage (recording), updating, processing, analysing and presenting the geographic information according to the requirements of a domain (Fig. 1).

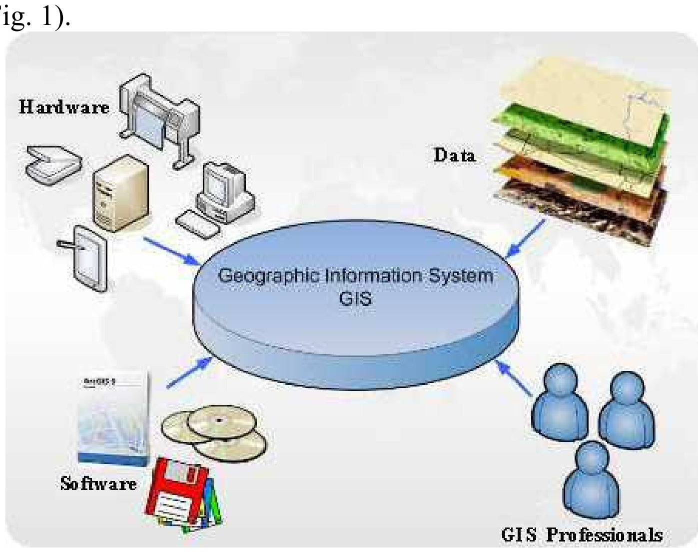

Fig. 1 – GIS components.

The characteristics of the GIS are the following:

a) Dealing with the information taking into account its spatial, geographic localization in the territory by coordinates.

b) Suppose the unitary treatment in a unique and irredundant data base of the graphical, cartographical, topological and tabular components.

c) Include a collection of spatial operators that deal with a spatial data base in order to provide geographically real information. A GIS data model is complex as it must represent and interconnect both graphical data (maps) and tabular data (attributes).

d) Are used to simulate real situations and events.

The Geographic data represent the complex made of spatial data (geographic coordinates – latitude, longitude, Cartesian coordinates *x*, *y*, etc.) and descriptive data (non-graphic data – attributes) associated to the geographic objects/phenomena (streets, constructions, plots, homes, accidents, etc.).

Fig. 2 – GIS applications.

The Geographic data base is a collection of *geographic data***,** organized so as to facilitate the storage, examination, bringing up-to-date and presentation of the information in an efficient way.

The GIS prove their usefulness in any field of activity that is based on processing the spatial information (Fig. 2):

a) *Survey:* real estate survey, public utility survey (assessment of the water, gas, central heating, phone networks, etc.) geotechnical survey, etc.

b) *Town planning, territory systematization and local administration:* establishing the best location for the new sights (public utility equipment, residential districts, industrial sights, socio-cultural sights, etc.), floor space, distribution on certain criteria, town planning studies, granting the construction/demolishing permits, assessment of land use, population record, organization of the gathering and storage of domestic refuse.

c) *Geology:* assessment and supervision of the deposits, etc.

d) *Environment protection:* analysing the areas affected by different polluting agents (chemical, sound, physical, etc.).

e) *Agriculture and soil science:* pedological plotting.

f) *Forestry and land improvement:* forest survey, forest health state supervision, etc.

g) *Oil and methane gas:* assessment and supervision of the deposits.

h) *Cartography:* making and bringing up-to-date the maps, topographical plans and thematic maps, etc.

i) *Politics:* different studies (interactions and influence areas, etc.).

j) *Trade:* the best location of shops according the car access, competition, costumers, stock management.

k) *Transport:* specialized survey of the optimization of the transport routes (railways, roads, etc.).

3. Urban Management

The urban management represents a complex activity, a very important one that supposes the involvement of a great number of professionals in several fields of activity, as well as the information that is spread spatially and dynamically.

The efficient urban management is based on a complex and objective analysis of the situation; that is why it is necessary for a real data base to be provided, in order to perform this activity, so as to obtain results in the urban development.

From the synthetic point of view, the urban management may be described in the manner indicated in Fig. 3.

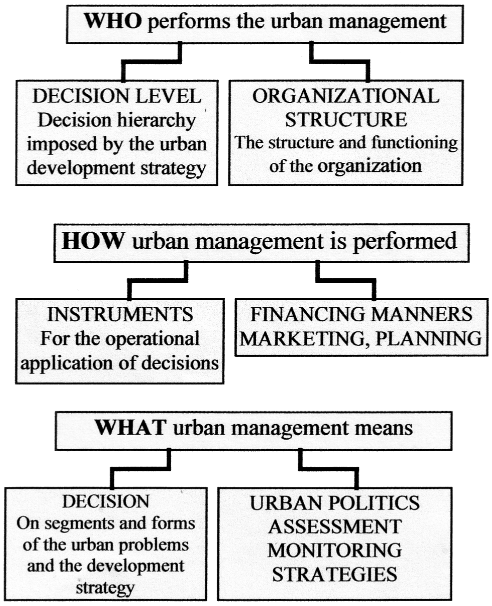

Fig. 3 – The urban management.

4. Urban Information System

The purpose of the information system typical of the real estate–public utility domain, by the data and information that it provides to the local public administrations, assures not only the record of the real estate–public utility facilities and property record, but also has an important role in determining the right tax system, in developing the real estate market, environmental protection, urban planning, etc., and the citizens may also have access to them, having an important role in the process of spreading the information, transparency and de-bureaucratization.

The technical work of identification, measurement and record of the buildings and public utility networks and making the urban data bases managed by the program of implementation of the Information System typical of the real estate–public utility domain and urban data bases, are thought and organized so as to contain the built-up area of the urban and rural places, that is 267 towns and cities having a surface of approx. 220,000 ha and 13,456 rural places having a surface of approx. 1,300,000 ha.

The Information System that is typical of the real estate–public utility domain and of the urban data banks, as a legal instrument, both administrativelly and economically, that is implemented in order to support the institutional capability, the planning and the urban development, contributes to taking decisions in everybody's benefit namely

a) Represents a spatial instrument of support for political, technical and economic decisions.

b) Consists of the urban information management and urban analyses performed by interconnecting all the administrative services. The system defines the necessary and essential elements for: *property identification, recording and guaranteeing the property, plot and construction assessment, developing a fair tax system and for the implementation of the infrastructure development according to the urban management programs.*

c) Supports the development of plot and construction market for the stimulation of foreign investments and creating a secure mortgage system for loans on the real estate market.

The global objective of the new urban record politics of the towns is the *efficient use and the protection of all the territory resources on a national level.*

5. Conclusions

By the Urban Information System, as a modern and efficient information system for providing a real record of all the plots and constructions within the built-up area of towns, we may provide the data base for

a) developing the urban infrastructure;

b) creating the circumstances for the free movement of plots and constructions;

c) attracting foreign money;

d) developing and improving the loans guaranteed by mortgage;

e) establishing the value of real estate that is necessary for a fair tax system;

f) designing the politics regarding the sustainable development at the town level;

g) the reform of the local public administration, by implementing an efficient information system, by providing the cadastral plans of towns, in a digital format, as well as creating urban data banks.

The activity of real estate–public utility survey and that of creating the urban data banks is a dynamic process and, like any other product of the structural reform, it can never be perfect and finished.

Received, January 27, 2010

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REFERENCES

1. Băduț M., *Geo-Information Systems (GIS) for the Administration and Internal Affairs* (in Romanian). Conphys Publ. House, Râmnicu-Vâlcea, 2006.

2. Bernhardsen T., *Geographical Information Systems: an Intoduction.* Ed. John Wiley & Sons, NY, 1999.
3. Davis D., *GIS for Everyone*. Ed. Esri, Redlends, California, 1999.
4. Lisboa F. *et al.*, *Analysis Patterns for GIS Data Schema Reuse on Urban Management Applications*. CLEI Electronic J., **5**, *2* (2002).
5. Longley P. A. *et al.*, *Geographic Information Systems and Science*. Ed. J. Wiley & Sons, NY, 2001.
6. Petrescu F., *Geographic Information Systems in Urbanism and Territory Arrangement* (in Romanian). MatrixRom Publ. House, Bucharest, 2008.
7. * * * *GIS for Sustainable Development.* ESRI, December 2007.

IMPORTANŢA REALIZĂRII, IMPLEMENTĂRII ŞI DEZVOLTĂRII SISTEMULUI INFORMAŢIONAL URBAN

(Rezumat)

Mecanismele necesare procesului de luare a deciziilor sunt elemente esenţiale pentru orice sistem managerial. În comunităţile urbane care se confruntă cu date şi informaţii teritoriale incomplete, în timp real, aceste mecanisme pot fi fragmentate şi influenţate de o serie de factori. În aceste circumstanţe, una dintre cele mai bune soluţii este crearea, dezvoltarea şi implementarea unui *Sistem Informaţional Urban* funcţional.

BULETINUL INSTITUTULUI POLITEHNIC DIN IAŞI
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Universitatea Tehnică „Gheorghe Asachi" din Iaşi
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Secţia
HIDROTEHNICĂ

STUDIES ON DEFORMATIONS IN 1970 STEREOGRAPHICAL PROJECTION AND CALCULATION OF A LOCAL STEREOGRAPHIC PROJECTION FOR THE RĂDĂUŢI-PRUT TERRITORY, BOTOŞANI COUNTY

BY

VALERIU MOCA and *VALERIA-ERSILIA ONIGA

Abstract: For the cadastral territories where the linear relative deformation exceeds ±10...15 cm/km it is recommended the use of local stereographical projections, derived from 1970 stereographical projection on unique secant plan. Using this stereographic projections on local secant plan ensures null deformation circle passing through the central point of the considered region and hence the reduction or cancellation of linear and surface deformations. In the case study efectuated for the Rădăuţi-Prut territory, Botoşani county, the caracteristic elements of a local stereographic projection were calculated. For the study territory where linear deformation is +0.235 m/km in 1970 stereographic plan, the local secant plan depth of 6,190.957 m and, respectively, the secant circle radius of 280.972 km were determined. For the coordinates transformation from STEREO-70 projection plan into the local stereographic projection plan and *vice versa*, for the Rădăuţi-Prut territory central point, the transformation factor $K =$ $= 0.999764677$ has been determined.

Key words: linear deformation; local stereographic projection; local secant plan depth; the transformation factor of rectangular coordinates.

1. Introduction

The stereographical projection on unique secant plan-1970 satisfies under the aspect of graphic precision all the plan representations for 1:2,000, 1:5,000, and 1:10,000 scales, in the regions where linear deformation does not exceed ±10...15 cm/km. In works where the general urbanistic-cadastre was introduced in within the built up area of towns or city residences, it was proposed that the size of relative linear deformations not to exceed ±5 cm/km.

On the unique secant plan of STEREO-70 projection, linear deformations register negative or positive values depending on the position of the considered point compared with “null deformation circle for lenghts and surfaces” *with a* 201.718 km radius from the central point of the projection Q_0 ($\varphi_0 = 46°$, $\lambda_0 = 25°$). *Inside the null deformation circle*, the linear deformation increases in negative value to –0.25 m / km in the central point, and *outside the circle,* the linear deformation increases in positive value to +0.60 m/km in Timiş, Satu-Mare, Botoşani, Tulcea and Constanța counties.

The central point of the geographical area afferent to Rădăuți-Prut commune is situated at a distance of 280.970 km from STEREO-70 projection pole, thus being outside the null deformation circle (Fig. 1).

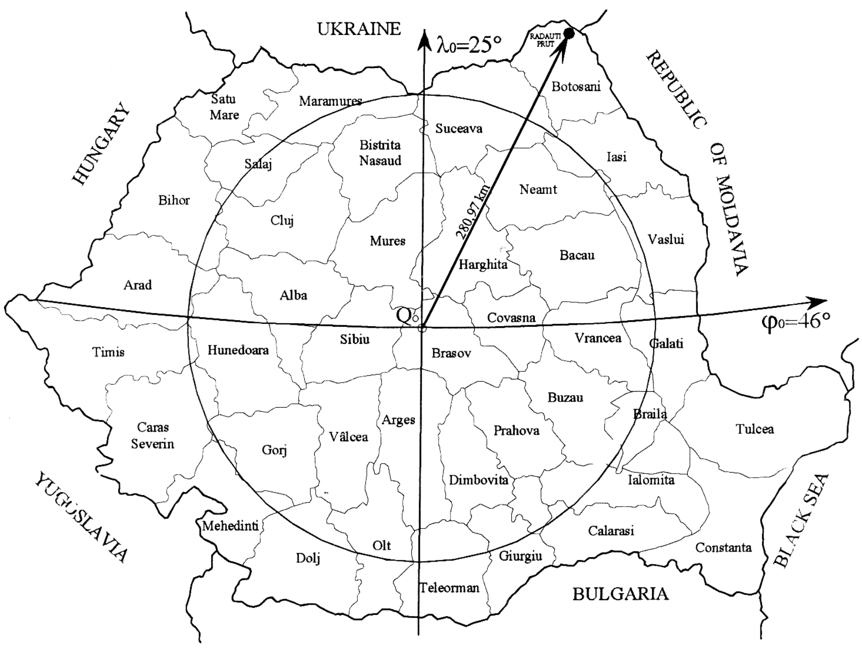


Fig. 1 – The position of the administrative territory of the Rădăuți-Prut commune compared to the STEREO-70 projection pole.

The administrative territory of the Rădăuți-Prut commune, Botoşani county, is situated at the north-eastern county limit, having the following boundaries: at north Romanian state border with Ukraine, at east and south the Cotuşca commune territory boundary, and at west the boundaries of Păltiniş and Viişoara commune territory is situated between 48°08'45" south and 48°16'15" north, northern latitudes and, respectively, between 26°45'00" west and 26°56'15" east, Greenwich east longitudes.

The nomenclature of the cadastral maps at 1:50,000 scale, made and published in 1970 stereographical projection, with geographical dimensions on meridians direction ($\Delta\lambda' = 15'$) and on parallels direction ($\Delta\varphi' = 10'$), includes the geographical location of the Rădăuţi-Prut commune territory in two trapezes: M-35-138-B and M-35-138-D.

The cartographic representation of the boundary of Rădăuţi-Prut commune territory includes the following map and plan sheets: 4 trapeziums, at 1:25,000 scale; 11 trapeziums, at 1:10,000 scale and 28 trapeziums, at 1:5,000 scale (Fig. 2).

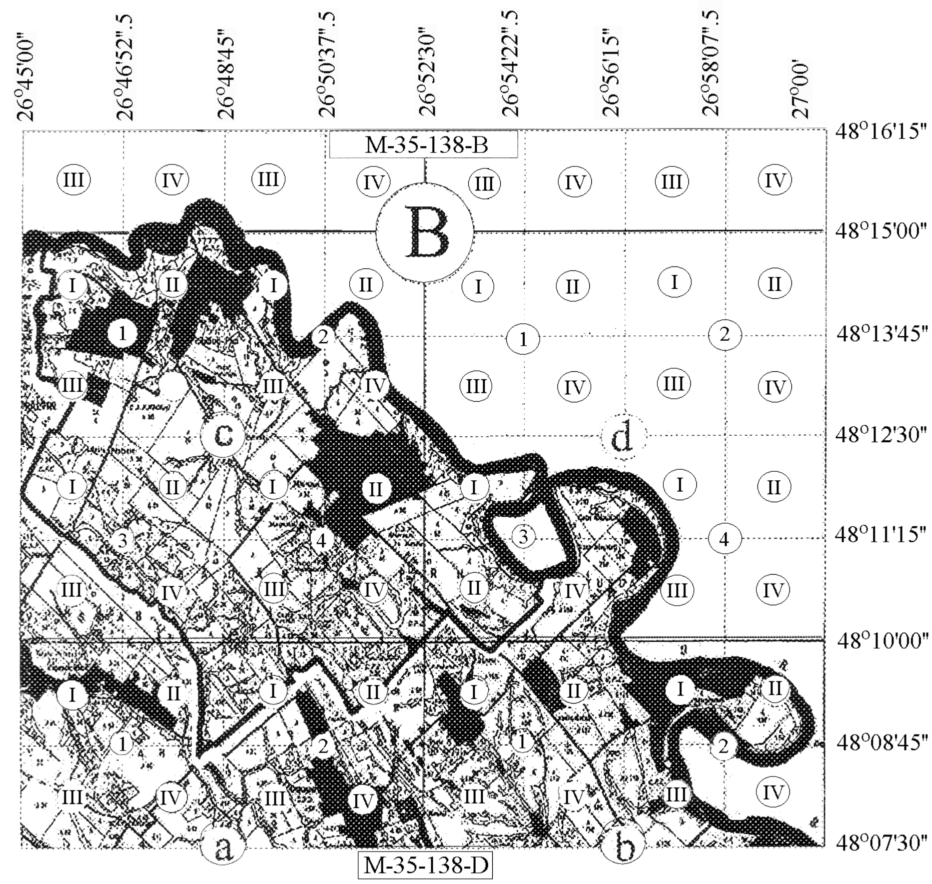


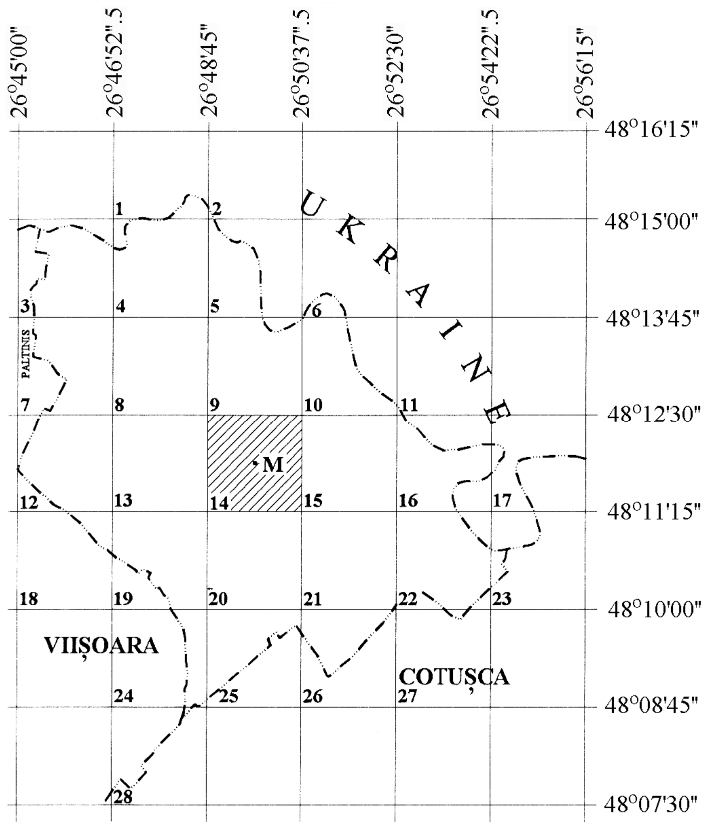
Fig. 2 – Cartographic representation of the Rădăuţi-Prut commune territory.

2. Material and Method

Depending on the space configuration of the geodetic trapeziums at 1:5,000 scale, the trapezium with M-35-138-B-c-4-I nomenclature was considered as being located aproximately in the central zone of the Rădăuţi-Prut cadastral territory.

Firstly, the STEREO-70 plane rectangular coordinates of the four corners, for the trapezium in the study, have been calculated. Then, the dimensions and the area of the trapezium, considered on the KA-1940 reference ellipsoid surface and in secant plan of the STEREO-70 projection, have been determined.

Linear and surface deformations have been calculated for the central point, *M*, of the number 14 trapezium, with M-35-138-B-c-4-I nomenclature (Fig. 3).



LEGEND

1. M-35-138-B-a-3-IV
2. M-35-138-B-a-4-III
3. M-35-138-B-c-1-I
4. M-35-138-B-c-1-II
5. M-35-138-B-c-2-I
6. M-35-138-B-c-2-II
7. M-35-138-B-c-1-III
8. M-35-138-B-c-1-IV
9. M-35-138-B-c-2-III
10. M-35-138-B-c-2-IV
11. M-35-138-B-d-1-III
12. M-35-138-B-c-3-I
13. M-35-138-B-c-3-II
14. M-35-138-B-c-4-I
15. M-35-138-B-c-4-II
16. M-35-138-B-d-3-I
17. M-35-138-B-d-3-II
18. M-35-138-B-c-3-III
19. M-35-138-B-c-3-IV
20. M-35-138-B-c-4-III
21. M-35-138-B-c-4-IV
22. M-35-138-B-d-3-III
23. M-35-138-B-d-3-IV
24. M-35-138-D-a-1-II
25. M-35-138-D-a-2-I
26. M-35-138-D-a-2-II
27. M-35-138-D-b-1-I
28. M-35-138-D-a-1-IV

Fig. 3 – Representation of the administrative territory of the Rădăuți-Prut commune on the base cadastral plan sheets at 1:5,000 scale.

3. Results and Discussions

The STEREO-70 projection surface deformations have the same signs as those of linear deformations, being negative inside the secant circle and positive outside the secant circle. The areolar deformations values vary depending on the distance from the central point of STEREO-70 projection $Q_0(X_0, Y_0)$.

3.1. Calculation of Surface Deformations in 1970 Stereographical Projection

Depending on the geographical coordinates of the M-35-138-B-c-4-I trapezium corners, on the Krasovski-1940 reference ellipsoid surface, the STEREO-70 plane rectangular coordinates were calculated, using the constant coefficients method (Table 1).

Table 1
The Geographical Coordinates and the STEREO-70 Plane Rectangular Coordinates of M-35-138-B-c-4-I Trapeziums Corners (Rădăuți-Prut)

Point no.	Point pos.	Geographical coordinates		STEREO-70 coordinates	
		φ, [° ' "]	λ, [° ' "]	X, [m]	Y, [m]
1	NV	48°12'30"	26°48'15"	747,041.390	634,724.586
2	NE	48°12'30"	26°50'37".5	747,095.702	637,047.182
3	SV	48°11'15"	26°48'15"	744,779.212	637,101.809
4	SE	48°11'15"	26°50'37".5	744,724.888	634,778.288

For the calculation of areolar deformations in the trapezium central point M, on a 1:5,000 scale, linear deformation module (μ_M) was firstly determined, and,on this basis, areolar deformation module (p), relative areolar deformation (P) and total areolar deformation were also determined (Fig. 4).

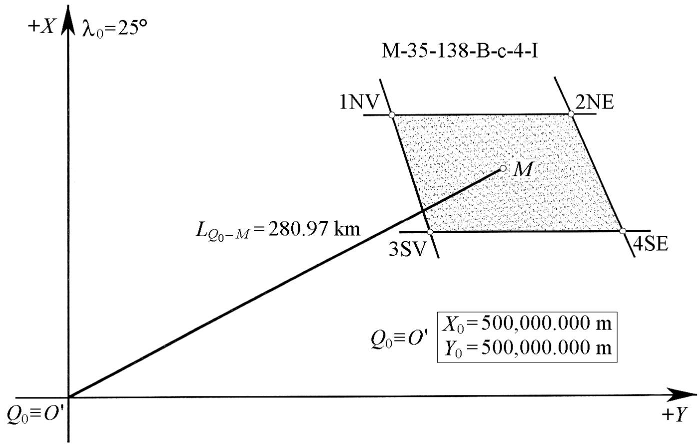


Fig. 4 – The deformations calculation of M-35-138-B-c-4-I trapezium, in 1970 stereographical projection.

The mathematical operations of deformations were performed starting from the plane rectangular coordinates of the point *M*, as follows:

a) *The central point*, *M*, *plane rectangular coordinates* were expressed as the arithmetic mean of the trapezium four corners coordinates:

$$X_M = \frac{\sum_{i=1}^{4} X_i}{4} = 745,918.298 \text{ m}, \quad Y_M = \frac{\sum_{i=1}^{4} Y_i}{4} = 635,912.966 \text{ m}.$$

b) *Relative linear deformation* (D_{sec}) *in point M* was calculated with the relation

$$D_{\text{sec}M} = D_0 + \frac{\Delta X^2_{Q_0 M} + \Delta Y^2_{Q_0 M}}{4R_0^2} = 0.000\,235\,021 \text{ km/km},$$

where: $D_{\text{sec}M}$ represents the regional deformation or relative linear deformation per length unit (1 km) on 1970 unique plan; D_0 = –0,000250000 km/km – the relative linear deformation in the central point Q_0; L_{Q_0-M} – the distance from the central point Q_0 of STEREO-70 projection to the middle point of the considered trapezium; R_0 = 6,378.956681 km – average radius for the sphere curvature for the projection central point Q_0.

c) *Linear deformation module* (μ), at *M point* was obtained with the expresion

$$\mu_M = 1 + D_{\text{sec}M} = 1.000\,235\,021.$$

d) *The areolar deformation module* of the trapezium *central point*, *M*, was expressed with the relation

$$p_M = \mu_M^2 = 1.000\,470\,098.$$

e) *The relative total surface deformation* of the *central point*, *M*, was calculated according with the surface deformation module (p) with the relation

$$P_M = p - 1 = 0.000470098.$$

f) *The total surface deformation* (ΔT) of the trapezium area considered in the 1970 stereographical projection plan was calculated according to the relative surface deformation (P) and the trapezium area on the Krasovsky-1940 reference ellipsoid

$$\Delta T = PT_{\text{ellipsoid}} = 0.000470098 \times 538.1768 = 0.2530 \text{ ha}.$$

g) *The calculation checking of the total surface deformation* was performed based on the difference between the trapezium area (S) from the secant plan of the STEREO-70 projection and, respectively, the trapezium area (T) on the Krasovsky-1940 reference ellipsoid, practically resulting the same value, within an approximation of ±1 m^2 namely

$$\Delta T = S - T = 538.4297 - 538.1768 = 0.2529 \text{ ha} .$$

3.2. Calculation of Geometrical Elements for the Local Stereographical Projection

For a cadastral administrative territory, a *local stereographical projection system, derived from 1970 stereographical projection can be used*, by lowering or raising the local secant plane, parallel with the 1970 unique secant plan, so that the null deformation circle to pass through the central point of the considered territory.

Depending on this point position the local secant plan is set out, parallel to the 1970 stereographical projection plan and the basic geometrical elements of the local stereographical projection system are determined: *the local secant plan deph (H_L) and the null deformation circle* (r_{0L}), (Fig. 5).

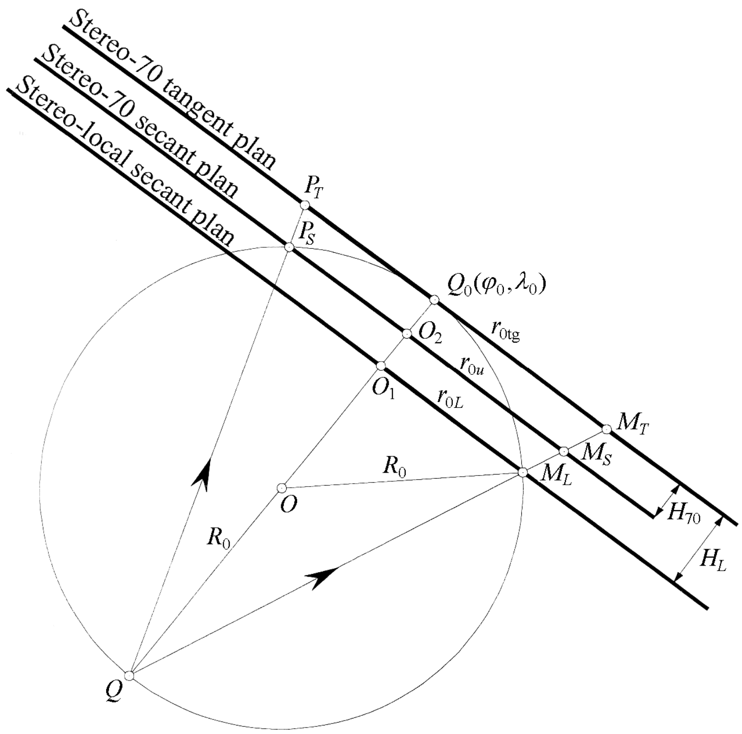


Fig. 5 – The geometric elements (H_L, r_{0L}) and the stereografic local secant plan position, compared to the tangent and unique secant projection plans (H_{70}, r_{0u}).

The computing algorithm of the characteristic features of the local stereographical projection derived from the 1970 stereographical system and the method of direct coversion coordinates from the 1970 unique secant plan, to the local secant plan, and of reverse transformation, included the following steps and operations:

A. *Determination of parameters for the local stereographical projection*

For the *Rădăuţi-Prut cadastral territory*, *Botoşani county*, where will be efectuated survey measurements, for the drawing up of a cadastral topographical plan, *1:5,000 scale*, the $M_{S\text{-}70}$ *point* in the middle of M-35-138-B-c-4-I trapezium was considered, having the coordinates known in the secant plan of STEREO-70 projection

$$M_{S\text{-}70} : X_M \langle 70 \rangle = 745{,}910.298 \text{ m}, \ Y_M \langle 70 \rangle = 635{,}912.966 \text{ m}$$

a) The STEREO-70 axes system translation was canceled, obtaining

$$\begin{cases} X_M \langle 70 \rangle_{\text{sec}} = X_P \langle 70 \rangle - 500{,}000 \text{ m} = 245{,}910.298 \text{ m}, \\ Y_M \langle 70 \rangle_{\text{sec}} = Y_P \langle 70 \rangle - 500{,}000 \text{ m} = 135{,}912.966 \text{ m}. \end{cases}$$

b) The $M_{S\text{-}70}$ point coordinats were transformed from the 1970 unique secant plan, in the tangent plan, $M_{T\text{-}70}$, using the return to scale factor $C' =$ $= 1.000250063$

$$M_{T-70} \begin{cases} X_M \langle 70 \rangle_{\text{tg}} = X_M \langle 70 \rangle_{\text{sec}} \times 1.000250063 = 245{,}971.791 \text{ m}, \\ Y_M \langle 70 \rangle_{\text{tg}} = Y_M \langle 70 \rangle_{\text{sec}} \times 1.000250063 = 135{,}946.953 \text{ m}. \end{cases}$$

c) The distance from the projection pole $Q_0(X_0, Y_0)$ to $M_{T\text{--}70}$ point from the tangent plan was calculated too

$$r_{0\text{tg}} \cong r_{0L} = \sqrt{\left[X_M \langle 70 \rangle_{\text{tg}} - X_0 \right]^2 + \left[Y_M \langle 70 \rangle_{\text{tg}} - Y_0 \right]^2} = 281.040 \, \text{km} \, .$$

d) The regional deformation per unith lenght (1 km) in the tangent plan, in $M_{T\text{–}70}$ central point was determined

$$\Delta r_{\text{tg}} = \frac{r_{0\text{tg}}^2}{4R_0^2} = \frac{\left[X_M \langle 70 \rangle_{\text{tg}} - X_0 \right]^2 + \left[Y_M \langle 70 \rangle_{\text{tg}} - Y_0 \right]^2}{4R_0^2} =$$
$$= 0.000485264 \, \text{km/km} \rightarrow 0.485 \, \text{m/km},$$

where: R_0 = 6,378.956681 km is the Gauss average radius of the terrestrial sphere, calculated in the central point: $Q_0\,(\varphi_0 = 46^{\circ};\lambda_0 = 25^{\circ})$ of the STEREO-70 projection.

e) The coefficient of scale reduction for the distances transformation from the tangent plan to the local secant plan was represented according to the regional deformation in the tangent plan per lenght unit (1 km), with the relation

$$U = 1\ \text{km}\,(\text{ellipsoid}) - \Delta r_{\text{tg}} = 1\,\text{km} - \frac{r_{0\,\text{tg}}^2}{4R_0^2} = 0.999514736.$$

The transformation coefficient of coordinates was calculated from the STEREO-70 unique secant plan projection, in the local stereographical system and reverse

$$K = \frac{U}{C} = \frac{U}{0.999\,750} = 0.999764677.$$

B. *Calculation of geometrical elements of the local stereographical projection*

a) The local secant plan Rădăuţi-Prut (H_L) depth, corresponding to the central point of the cosidered territory, was calculated with the relation

$$H_L = 2R_0(1 - KC) = 6{,}190.957\ \text{m}.$$

b) The null deformation circle radius of the Rădăuţi-Prut local secant plan was obtained, depending on the local secant plan depth, with the relation

$$r_{0L} = \sqrt{R_0^2 - (R_0 - H_L)^2} = 280.972\ \text{km}.$$

C. *Plan rectangular coordinates transformation from the 1970 secant plan to the local secant plan and reverse*

Based on the transformation coefficient (K), from the STEREO-70 unique secant projection in the local stereographical system and taking into account the origin of the system axis translation with 500,000 m, the direct and reverse transformation was performed.

a) The $M(X,Y)$ central point coordinates were transformed from STEREO-70 system*,* to STEREO-LOCAL system

$$\begin{cases} X_M\,\langle L\rangle = 500{,}000 + X_M\,\langle 70\rangle_{\sec}\,K = 745{,}852.430\ \text{m},\\ Y_M\,\langle L\rangle = 500{,}000 + Y_M\,\langle 70\rangle_{\sec}\,K = 635{,}880.983\ \text{m}.\end{cases}$$

b) The $M(X,Y)$ central point coordinates were transformed from STEREO-LOCAL system, to STEREO-70 system

$$\begin{cases} X_M \langle 70 \rangle = \dfrac{1}{K}\left[X_M \langle L \rangle + 500,000\,(K-1) \right] = 745{,}910.298 \text{ m}, \\ Y_M \langle 70 \rangle = \dfrac{1}{K}\left[Y_M \langle L \rangle + 500,000(K-1) \right] = 635{,}912.966 \text{ m}. \end{cases}$$

c) Similarly, the plane rectangular (X,Y) coordinates transformation of the M-35-138-B-c-4-I (Rădăuți-Prut) trapezium corners was efectuated, from the STEREO-70 system, to the STEREO-LOCAL system and reverse (Table 2).

Table 2

The Plane Rectangular Coordinates Calculation of the M-35-138-B-c-4-I (Rădăuți-Prut) Trapezium Corners from the 1970 Unique Secant Plan, to the Projection Local Secant Plan and Reverse

Point no.	STEREO-70 rectangulat coordinates		STEREO-LOCAL rectangular coordinates	
	X_{ST}, [m]	Y_{ST}, [m]	X_L, [m]	Y_L, [m]
1NV	747,041.390	634,724.586	746,983.255	634,692.882
2NE	747,095.702	637,047.182	747,037.554	637,014.931
3SV	744,779.212	637,101.809	744,721.610	637,069.546
4SE	744,724.888	634,778.288	744,667.299	634,746.571

3.3. The Surface Deformation Calculation in the Local Stereographical Projection

The total surface deformation ($\Delta T = S - T$) was determined, similarly, according to the difference between the trapezium area from the secant plan of the local stereographical projection (S) and the appropriate area of the Krasovsky-1940 reference ellipsoid (T) (Table 3).

Table 3

The Total Areolar Deformation from the Local Stereographical Projection Plan

Point no.	STEREO-LOCAL rectangular coordinates		Trapezium area, [ha]		Total surface deformation
	X, [m]	Y, [m]	STEREO-LOCAL	KA-40	$\Delta T = S - T$, [ha]
1NV	746,983.255	634,692.882	538.1763	538.1767	–0.0004
2NE	747,037.554	637,014.931			
3SV	744,721.610	637,069.546			
4SE	744,667.299	634,746.571			

By using the stereographical projection on Rădăuți-Prut local secant plan, which is derived from the stereographical projection on 1970 unique secant plan, was realized the significant reduction of the linear and surface deformations.

In the case study examined for the geographical location of the trapezium with M-35-138-B-c-4-I nomenclature, 1:5,000 scale, a total surface deformation, of –4 m^2 was obtained. This value of the total surface deformation can be considered negligible in terms of surface calculation accuracy, in works of introduction of general cadastre in the administrative territories.

4. Conclusions

In works regarding the introduction of general cadastre in the administrative territories, where linear relative deformations exceed the value of ±10...15 cm/km, it is recomanded the use of local stereographical projections, derived from 1970 stereographical projection.

In the territory of the Rădăuți-Prut commune, situated at the NE boundary of Botoşani county, was obtained a linear relative deformation of +0.235 m/km, in the M-35-138-B-c-4-I trapezium middle point**,** situated at 290.970 km distance from the central point of the 1970 stereographic projection.

For the plane rectangular coordinates transformation, from the 1970 secant plan, to the local secant plan and reverse, the coefficient K = 0.999764677 was determined.

The geometric elements of the local stereographical projection, calculated for the central point (M) of the Rădăuți-Prut territory were determined, according to technical requirements, through: local secant plan depth (H_L = 6,190.957 m) and null deformation circle radius (r_{0L} = 280.972 km).

By using stereographical projection on Rădăuți-Prut local secant plan, derived from the stereographical projection on 1970 unique secant plan, the reduction of the linear and surface deformations to negligible values, in terms of accuracy requirements for calculating the areas of general cadastre work, was realized.

Received, September 4, 2010

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R E F E R E N C E S

1. Boş N., *Cadastru general*. Edit. All Beck, Bucureşti, 2003.
2. Moca V., Hogaş H., Fronea L., Huțanu Cr., *Aplicarea sistemelor de proiecție locale, derivate din proiecția stereografică −1970, în lucrările de cadastru imobiliar din municipii*. Lucr. Conf. Tehn.-Şt. Jubiliare „Tehnologii moderne în construcții" , Univ. Tehn. a Moldovei, Chişinău, 24-26 mai 2000, **2**, 133-136.

3. Moca V., *Utilizarea unor proiecţii cartografice sub aspectul reducerii deformaţiilor liniare şi areolare, în lucrările de introducere a cadastrului din intravilanul municipiului Iaşi.* Lucr. Şt., s. Agronomie, **47**, U.Ş.A.M.V., Iaşi (2004).
4. Moca V., Popia A., Sălceanu Gh., *Studies of Linear and Surface Deformations of Cartographical Projections Used in Introduction Works of General Survey in Iaşi City.* Internat. Sci. Symp. „GeoCAD'06", May 5-6, 2006, Alba Iulia, Rev. de Cadastru, *6*, 19-28 (2006).
5. Săvulescu C., Moldoveanu C., *Puncte de vedere privind harta digitală a României.* Rev. de Geodezie, Cartografie şi Cadastru, **6**, *2*, 20-28, Bucureşti (1997).

STUDIU PRIVIND DEFORMAŢIILE ÎN PROIECŢIA STEREOGRAFICĂ-1970 ŞI CALCULUL UNEI PROIECŢII STEREOGRAFICE LOCALE PENTRU TERITORIUL COMUNEI RĂDĂUŢI-PRUT, JUDEŢUL BOTOŞANI

(Rezumat)

Pentru teritoriile cadastrale unde mărimea deformaţiilor relative a lungimilor depăşeşte valoarea de ±10...15 cm/km se recomandă folosirea proiecţiilor stereografice locale, derivate din proiecţia stereografică pe planul secant-unic 1970. Prin folosirea acestor proiecţii stereografice pe plan secant local se asigură trecerea cercului de deformaţie nulă prin punctul central al zonei considerate şi, implicit, reducerea sau anularea deformaţiilor liniare şi areolare. În studiul de caz care s-a efectuat pentru teritoriul comunei Rădăuţi-Prut, judeţul Botoşani, au fost calculate elementele caracteristice ale unei proiecţii stereografice locale. În cazul teritoriului studiat,unde deformaţia lungimilor este de +0,235 m/km în planul stereografic-1970, s-a determinat adâncimea de 6 190,957 m a unui plan secant local şi, respectiv, a razei cercului de secanţă de 280,972 km. Pentru transformarea coordonatelor din planul proiecţiei STEREO-70 în planul proiecţiei stereografice locale şi invers s-a determinat, pentru punctul central al teritoriului Rădăuţi-Prut, coeficientul K = 0,999764677.

BULETINUL INSTITUTULUI POLITEHNIC DIN IAŞI
Publicat de
Universitatea Tehnică „Gheorghe Asachi” din Iaşi
Tomul LVI (LX), Fasc. 2, 2010
Secţia
HIDROTEHNICĂ

DANGEROUS HYDROLOGICAL PHENOMENA ON THE HYDROGRAPHIC BASIN BÂSCA CHIOJDULUI

BY

RĂZVAN ZAREA

Abstract. High-waters on Bâsca Chiojdului are strong, with a large destruction force, but short, quick. Their peak last few hours and rarely exceeds 24 hours.

Intensity and damages caused by floods are enhanced by various inappropriate human activities (deforestation, works carried out on high gradient slopes, building in flood plains, bridges, undersized bridges and culverts, dumping of garbage and other materials in riverbeds, etc.). The biggest floods in the past 50 years were recorded in 1972, 1975, 1991 and 2005, years regarded as exceptionals.

Bâsca Chiojdului catchment requires a series of measures (structural and non-structural) to address hazardous hydrological phenomena. The most important are forest expansion (through afforestation of land, especially where slopes are greater than 20…25°) and improvements of torrential formation.

Key words: hydrological phenomena; floods; high-waters.

1. Introduction

Bâsca Chiojdului River rises in the Siriu mountains (belonging to the Curvature Carpathians), below the Tărtărău peak. The water in the mountain area is called the Bâsca cu Cale, the point of junction with Bâsca fără Cale being located at the boundary between the Carpathians and Subcarpathians, at the north of Bâsca Chiojdului village.

On the sub-Carpathian sector it receives a number of tributaries, most important being those on the right side (Stâmnicul, Zeletin, Frăsinet etc..) and flows into the Buzău river at the municipality of Cislău.

The total length of the river is of 42 km, total catchment area of 340 km^2 and has multiannual average flow values of 1.20 m^3/s at Chiojdu hydrometric station, respectively 3.65 m^3/s at the influx in Buzău.

Catchment is part of the territory of two counties (Buzău and Prahova).

2. High-waters

High-waters are moments in the evolution of peak water flow of a river. They are characterized by extraordinary spectacular growth, very fast (on the order of hours), of water level and consequently of the flow, until a maximum followed by decrease also fast, of water (but at a somewhat slower pace than increasing) which then returns to normal flow parameters [1].

High-waters production is closely linked to climatic conditions. They occur either as a result of torrential rains with great intensities and amounts of water (rain high-waters) or from rapid melting of snow (slush high-waters). There are situations where torrential rains are combined with the disposal of snow. In these situations occur mixed high-waters (rain-slush).

In winter parts, on some sectors of the rivers may occur ice gorges (natural dams formed by agglomeration of floes). They block the drainage, leading to increases in levels behind them or strong leakage upon breakage. There are exceptional situations where strong high-waters occur after destruction of the reservoirs dams.

Depending on the time distribution of rainfall, high-waters can be simple (single), characterized by a single peak and complex (compound), with two or more peaks [1].

High-waters generation and their characteristics are influenced by a combination of factors such as permeability, soil moisture content and temperature, vegetation, river beds and flanks slopes, shape and surface of catchments, river beds features, etc. Through the uncontrolled deforestation and misuse of land on slopes, man contributes indirectly to increase the frequency and intensity of high-waters.

High-water can be defined by a series of parameters such as: base flow, maximum or peak flow, rise time, decay time, total time of the high-water, high-water volume (without the base flow due to the underground base), layer of drained water, the form factor.

Regarding the recorded precipitation at Chiojdu hydrometric station, multi-annual average recorded a value of 710.8 mm (above the national average), which is explained by the location of the station on sub-mountain zone. The wettest months of the year are July and June (108.4 and 98.4 mm, respectively), but high values are recorded in May and August too.

Torrentiality variability degree and of rainfall is very high, as great differences are between the rainy and dry years. During the period analysed, the most rainy year was, by far, 2005 (1,280.3 mm), while 2000 was the driest (496.0 mm), which means that 2005 was 2.58 times more rainy than 2000.

One year particularly rainy was 1991 (total 893.8 mm); on this year are remarked four months consecutively (May, June, July and August) which have exceeded 100 mm. Moreover, in these four months were totaled 588.8 mm.

Regarding the monthly amounts, were recorded 4 months with amounts exceeding 200 mm (June 1992, July 2004, and July and August 2005). Quite exceptional was the period May to September 2005, when within only five months were totalized 885.3 l/m, explaining the high-waters produced in May, July, August and September 2005.

Reffering on the maximum quantities of rainfall recorded in 24 hours, the years 1991 and 2005 are stand out with recorded levels of 73.1 mm (registered on November 18, 1991) and 79.3 mm (on May 7, 2005). Torrential rainfall occur especially during the hot season of the year, but they are not excluded at any time of year, always exists the risk of dangerous hydro-meteorological phenomena.

Further analyses were taken in the most powerful four high-waters that occured during the period 1975...2008, high-waters that exceeded the value for 20 years return period (138 m^3/s, Chiojdu hydrometric station). These high-waters occurred in July 1975, December 1990, June 1991, July 2005, respectively.

The strongest high-water in recorded history of Chiojdu hydrometric stations was in the first decade of July 1975, when was recorded a maximum historical flow of 300 m^3/s. The reached level (398 cm) is 55 cm higher than the corresponding value for 100 years return period (insurance for a flow of 244 m^3/s).

High-water of July 1975 was a simple, single peak one, with symmetry between the growth and decay period. It had as cause the rain with torrential character in the first days of July 1975.

In the period under review there have been recorded two historical high-waters. Thus, one in June 1991 had a maximum flow of 268 m^3/s, exceeding the value for 100 years return period and in July 2005 had a flow of 236 m^3/s (only 8 m^3/s under the value for 100 years return period).

The fact that within only 30 years there have been no less than three high-waters that have reached or exceeded the value for 100 years return period proves the destructive force of Bâsca Chiojdului River.

High-water of July 1991 is noted by a main peak (268 m^3/s), with increased growth and decay, and a much smaller second peak (46.2 m^3/s), negligible.

A very special high-water was in July 2005. It was characterized by two very strong peaks (first of 236 m^3/s and the second of 179 m^3/s); the two peaks were succeeding at an interval of only 12 hours.

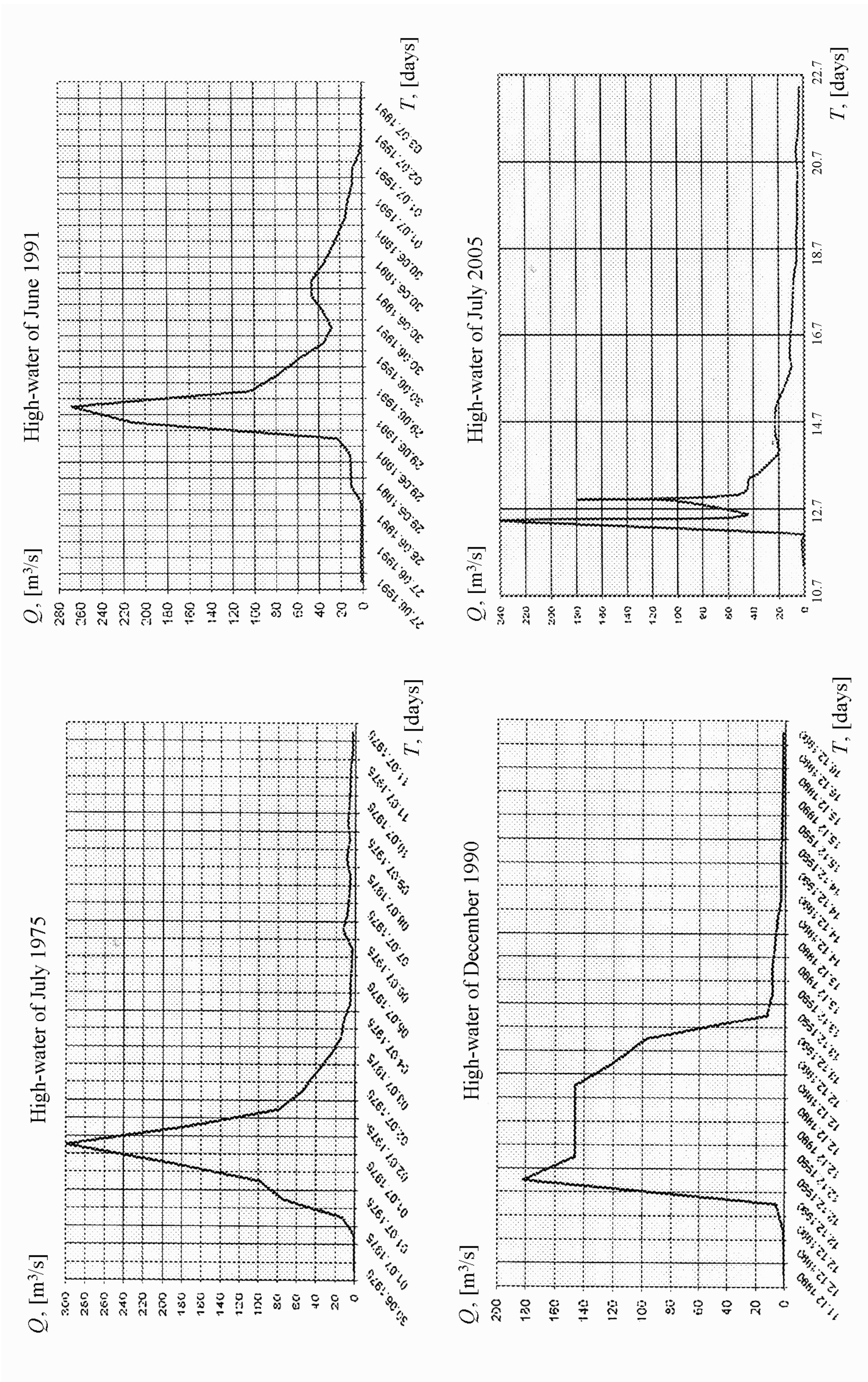

Fig. 1 – Hydrographs of the major four high-waters

High-water of December 1990 was more complex in terms of factors that generated it (heavy rains, snow water disposal and production of ice gorges on the narrower sections of the river).

The main conclusion that can be drawn is that the high-waters of Bâsca Chiojdului are strong, with a large force of destruction, but short, quick. Their peak last few hours, are rare cases when they exceed 24 hours.

The rapid evolution of high-waters can be explained by high energy landscape (river basin is located in the mountains and the sub-Carpathian), river slope is quite pronounced (12.5 ‰ at Chiojdu).

There are high-waters caused by tributaries, high-waters not registered by Chiojdu hydrometric station, but which cause extensive damage to downstream. Is the case of high-water that occurred in May 2005, the "culprit" was mainly Stâmnicul (the largest tributary of the Basca Chiojdului river). Although the maximum flow recorded at Station Chiojdu was 45 m^3/s, upstream of the confluence with Zeletin it has been recorded a value of about 230 m^3/s (value reconstituted from measurements made on land).

In Fig. 1 are presented in graphical form the four major high-waters occurred at Chiojdu hydrometric station that have been taken into analysis.

3. Floods

The flood means cover a territory with a layer of stagnant or on the moving water as a result of raising the level of this layer over land level in that territory [2].

The term "high-water" should not be confused with the "flood". Not all high-waters produce flooding of agricultural or constructed land (such as to cause damage), as not all the floods are caused by high-waters produced on the close river. There are floods caused due to water accumulation (direct drain on the slopes) during sudden torrential rain or snow melting, but without occuring the river overflow. An example is that land is flooded due to groundwater level rise over the basic level of land (so-called *sub-flooding*).

Classified about how are produced, the flooding can be: on surface (generated by overflow of rivers or by water leakage from the slopes) and sub-floodingd (resulting in groundwater level rising above ground level [2].

World practice has shown that the occurrence of floods can be avoided, but they can be managed and their effects can be reduced through a systematic process that leads to a series of measures and actions to help mitigate the risk associated with these phenomena.

Flood management is facilitated by the fact that their place is predictable and often is possible a *prior* warning and is usually possible to specify who and what will be affected by flooding.

Flood risk management means the application of policies, processes and practices with the objectives of identifying risks, their analysis and evaluation, treatment, monitoring and reassessment to reduce their risk so that human communities, all citizens, can live, work and satisfy their needs and aspirations in a sustainable physical and social environment.

3.1. Flood Occurrence Causes

Floods can be classified according to genetic conditions in floods caused by natural phenomena, accidental events and those caused by human activities.

The main cause of floods occurrence in the Bâsca Chiojdului catchment is the high-waters leading to rivers overflow. They are mainly produced from rains of torrential nature, but also because of sudden melting of snow or in terms of ice gorges occuring (blocks of ice) on some sectors of the narrow river.

Intensity and damages caused by floods are enhanced by various inappropriate human activities (deforestation, works carried out on high gradient slopes, building in flood plains, bridges, undersized bridges and culverts, dumping of garbage and other materials in riverbeds, etc.).

3.2. Negative Effects and Damages Caused by Flooding

In the Bâsca Chiojdului catchment floods occur frequently, resulting in enormous material damage and sometimes victims.

The biggest floods in the past 50 years were recorded in 1972, 1975, 1991 and 2005, years regarded as exceptionals.

Floods of 1972 and 1975 were particularly strong, with extremely high damages (on the conditions of almost entirely absence of defense work). Were affected many elements of infrastructure (roadways, roads, bridges, footbridges, culverts), housing, the household annexes, institutions headquarters, etc.

An example in this regard is a county road segment of 500 m length initially destroyed by floods in 1972, the process being "perfected" in July 1975. The affected portion is between the village of Bâscenii de Sus (Calvini commune) and Cătina (Cătina commune), a few hundred meters from the intersection with county road connecting the city Vălenii de Munte with Bâscenii de Sus, Prahova County. Subsequently, the road was rebuilt and its route reconfigured.

Another example is the 1975 destruction of two bridges over the River Bâsca Chiojdului located between the villages of Lera and Chiojdu from Chiojdu commune [3].

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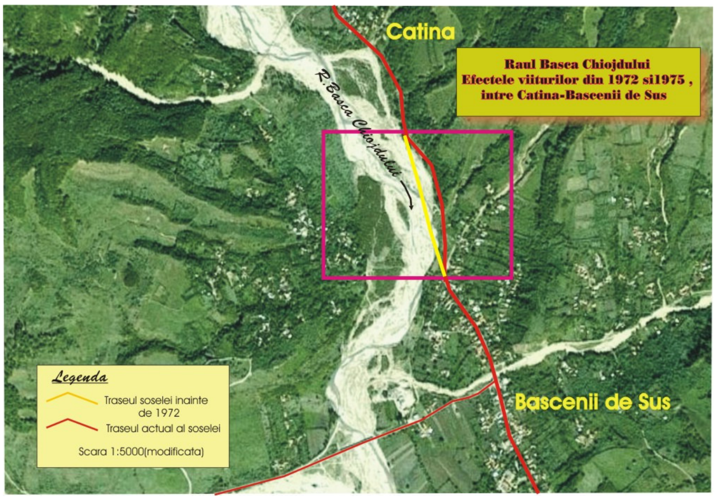

Fig. 2 – County road segment between Bâscenii de sus and Cătina destroyed by floods in 1972.

Another example is the 1975 destruction of two bridges over the River Bâsca Chiojdului located between the villages of Lera and Chiojdu from Chiojdu commune.

The year 2005 was noted by a large number of high-waters from which there have been floods, but also lateral erosion, causing serious damages. Most floods occurred in May, July, August and September.

According to the Inspectorate for Emergency Situations, Buzău, floods on the night of May 8/9, 2005, affected over 50 ha of farmland and meadows and many animals were taken by the waters.

The county road 102B linking Cislău with Vălenii de Munte was closed in May 9, 2005, due to destruction of the bridge over Bâsca Chiojdului at Bâscenii de Sus (Fig. 3). Because of particularly strong high-water, the bridge's concrete pipes were moved from place and covered by water.

At that time the Starchiojd commune, Prahova County, Stâmnic Creek high-water affected six housings and a concrete bridge at the point “Gresianu”, its recovery costing about 200,000 lei. At the same time was destroyed a concrete bridge located on Bătrâneanca Valley, upstream of Bătrâni locality, Prahova County .

The high-water produced on the night of July 11/12, 2005, strongly affected Chiojdu and Cătina communes, the balance as follows:

a) weakening of the supporting pillars and destroying gabions of the road bridges on county roads DJ 102L and DJ 103P;

Fig. 3 – Bridge between Bâscenii de Sus and Zeletin destroyed by the high-water of May 2005.

b) destruction of a footbridge on the village road DC 57;

c) disruption on roads DC 58 and DC 63;

d) flooding of ten households and a veterinary clinic:

e) temporary interruption of electricity supply in the two localities.

The floods of August 2005 mainly affected the same localities (Chiojdu and Cătina), damages of over 100,000 RON namely

a) two schools in Chiojdu commune;

b) two schools and a kindergarten in Cătina commune.

The same communes, Chiojdu and Cătina, were serious affected in September 2005 too

a) On the commune Chiojdu were broken several bridges and roads, a number of villages and hamlets were isolated with more than 100 people remaining isolated.

b) The biggest problems were reported in the territory of Cătina commune where several roadways were destroyed. A family was displaced from Zeletin village, five homes were isolated. With the 17 wells were flooded, and water supply pipe was broken in several portions there were big problems in terms of municipal drinking water supply. There have been problems in terms of electricity supply.

3.3. Legislation in the Domain of Flood Defence

Flood defence activity is subject to a framework developed for this purpose.

The fundamental law remains the Water Law (No. *107* of September 25, 1996), updated and republished in the Official Gazette on November 16,

2007. The text has been updated based on the following legislation modifications:

a) Government decision nr. *948*/1999;

b) Law no. *192*/2001, with subsequent changes;

c) Law no. *404*/2003;

d) Law no. *310*/2004;

e) Government Emergency Ordinance no. *73*/2005, approved with amendments by Law no. *400*/2005;

f) Law no. *112*/2006;

g) Government Emergency Ordinance no. *12*/2007, approved by Law no. *161*/2007

h) Government Emergency Ordinance no. *130*/2007.

4. Defence Measures against Dangerous Hydrological Phenomena

The most effective measures are the preventive ones. Were identified five basic principles, that should be considered in preventive flood protection activities caused by high-waters [2] namely

a) water is a part of a whole;

b) water should be stored on slopes and in bed;

c) river should not be prevented entirely to pour;

d) there is always a risk;

e) protective action must be concerted and integrated.

Starting from these basic principles one can identify two types of defensive measures against dangerous hydrological phenomena

a) Structural measures – building hydro facilities, catchment, improvements, etc.

b) Non-structural measures – reduction of flood damage without hydraulic works or structures.

From the structural measures category the most important remains the slopes improvements on catchment and in particular afforestation works.

Of all types of plant formations, forest utmost influences the hydrological regime of a region and ensures soil conservation. Forest soil retains and stores important quantities of meteoric water, cover and minimize surface water runoff, protect soil against erosion and protect river banks against erosion [4].

The rainfall quantity that penetrates the forest and reaches the ground is up to 50% of total for quantities between 10...25 L/m^2. Even on torrential rains, trees canopy manages to retain about 20% of the water. Coniferous forests have a greater capacity for water retention than hardwood. Of pine woods, larch and pine have lower retention capacity (15...25%), while spruce and fir have a greater capacity (40...80%).

The figures are all about the influence of forest on surface runoff. Thus, if on land without vegetation the runoff reaches 74% of recorded rainfall, on land with rare grassy vegetation the value drops to 67%. In mature stands with normal litter layer, surface runoff are very low (1.3% mixed forests, beech and spruce 1.7% on forests of beech 1.9...2.4% in oak forests (cvernicee) and 2.4% in pine forests). In spruce stands with thin and discontinuous litter the runoff reach 6.4%, and those of juniper, it reaches 10.3% of precipitation fell [5].

Bâsca Chiojdului catchment is characterized by a high degree of afforestation in its upper part (in the mountains) but the lower part (Calvini and Cătina communes within the county of Buzău, but also Poseşti, Prahova County). Forest has a total area of 151 km^2, which means 44.4% of the total catchment.

In the middle of the catchment, instead, it feels a lack of forest vegetation (especially the sides near the Starchiojd and Chiojdu Carpathian depressions. Almost total absence of forests in this area results in increased frequency, intensity and force of floods produced both on Bâsca Chiojdului and on its main tributary (Stâmnicul). The lack of forests is responsible for many geomorphological processes that occur in hilly area (landslides, mud flows, gullying, etc.).

On the long-term strategy for a real improvement of the negative effects caused by hazardous hydrometeorological phenomena is essential a concerted action by afforestation of sides that have currently degraded lands or, at best, pasture and meadow [6]. Priority sectors must be the slope whose gradient exceeds 25...30 degrees.

Fig. 4 – Surfaces proposed for aforrestation in Chiojdu-Cătiaşu area.

The Fig. 4 offers a concrete example of afforestation of slopes situated between the villages Cătiaşu and Chiojdu. There were three areas in the total area of 270.55 ha (2.7 km), with surfaces of 175.58 ha, 84.80 ha, respectively 10.17 ha.

Of particular importance in preventing and combating dangerous hydrological phenomena are the improvements of torrential formations. It seeks to protect residential areas, passageways, land, water management objectives and environmental protection, etc. Classical cross-works in form of thresholds and dams made of different building materials used in these facilities are firm works with high consumption of materials and energy embedded.

Therefore it is necessary to introduce the practice on market economy conditions and environmental protection measures of some types of works which have flexible or semiflexible resistance structures that can replace the classic works with big advantages because they have

a) reduced consumption of materials (iron, concrete, etc..) and embedded energy;

b) growth of service reliability;

c) aesthetically pleasing;

d) easy implementation in difficult places;

e) higher productivity of labour;

f) volume of construction and production costs lower than all types of works used to date;

g) a better behaviour in service since it can provide design slope adjustment and a dissipation of high-water wave better than the classics dissipators.

Improvement works of torrential bodies are works that seeks the reinforcement of peak works, thalweg and banks, works of transforming the formations in areas of deposition and works in the area of unloading – evacuation [7].

Received, February 15, 2010

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REFERENCES

1. Diaconu D., Pişota I., Zaharia L., *Hydrology* (in Romanian). Edit. Univ., Bucureşti, 2005.
2. Giurma I., *High-Waters and Defence Measures* (in Romanian). Edit. Gh. Asachi, Iaşi, 2005.
3. * * * Soc. Română de fotogrammetrie şi Teledetecţie, Bul. de Fotogrammetrie şi teledetecţie, *32* (2006).
4. Arghiriade C., *Hydrologic Role of the Forest* (in Romanian). Edit. Ceres, Bucureşti, 1977.
5. Vlad I., Chiriţă C., Doniţă N., Petrescu L., *Ecosystem-Based Forestry* (in Romanian), Edit. Acad. Române, Bucureşti, 1990.

6. Cenuşă Militaru G., *Realizarea hărţilor de risc natural la inundaţii – o prioritate pe plan naţional şi mondial*. Rev. de Geod., Cartogr. şi Cadastru, **17**, *1-2* (2008).
7. Giurma I., *Constructive Solutions for Improvements of Torrential Formations* (in Romanian). Edit. Performantica, Iaşi, 2006.

FENOMENE HIDROLOGICE PERICULOASE ÎN BAZINUL HIDROGRAFIC BÂSCA CHIOJDULUI

(Rezumat)

Viiturile pe Bâsca Chiojdului sunt puternice, cu o forţă mare de distrugere, dar scurte, repezi. Perioadele de vârf ale acestora durează câteva ore, rareori depăşindu-se 24 de ore.

Intensitatea şi pagubele provocate de inundaţii sunt amplificate de diverse activităţi antropice neadecvate (defrişări, lucrări executate pe versanţii cu declivitate mare, construirea în zonele inundabile, poduri subdimensionate, aruncarea gunoaielor în albiile râurilor etc.).

Cele mai puternice inundaţii din ultimii 50 de ani au fost consemnate in anii 1972, 1975, 1991 şi 2005, consideraţi ca fiind excepţionali.

În bazinul hidrografic Bâsca Chiojdului se impun o serie de măsuri (structurale şi nestructurale) în vederea combaterii fenomenelor hidrologice periculoase. Cele mai importante sunt extinderea fondului forestier (prin împădurirea unor terenuri, în special acolo unde sunt pante mai mari de 20...25°) şi amenajarea formaţiunilor torenţiale.

BULETINUL INSTITUTULUI POLITEHNIC DIN IAŞI
Publicat de
Universitatea Tehnică „Gheorghe Asachi" din Iaşi
Tomul LVI (LX), Fasc. 2, 2010
Secţia
HIDROTEHNICĂ

PREVENTION AND PROTECTION AGAINST FLOODING

BY

HORAŢIU HOGAŞ, D. ILIOI and VALERIA-ERSILIA ONIGA

Abstract. Amid climate of the planet manifested in Romania have been atypical and dangerous hydro-meteorological phenomena, especially of a particular intensity in recent years. Romania's territory instead of joining the three areas of physical and geographical Europe: Central Europe, Eastern Europe and Southeast Europe. Each of these separate units meet the country's territory and creates a complex situation of knitting, the mutual penetration and influence of climate, which combined with varied topography and geological structure, soils and vegetation, creating an exceptional variety of specific natural conditions. These phenomena were the triggering factor and catalyst of great change in the approach to these phenomena, the acceptance of flooding as a freak of nature, to attempt to oppose human nature through approaches such as the fight against floods, to the defense flood until not long ago to prevent flooding.

Key words: hydro-meteorological phenomena; flooding; GIS.

1. Introduction

Topography plays an important role in the distribution and flux of water and energy within natural land surface. Classical examples include surface runoff, evaporation, infiltratinon and heat exchange which are hydrologic processes that take place and the ground–atmosphere interface. The quantitative assessement of the process depends on the topographic configuration of the land surface, which is one of several controlling boundary conditions. This automates extraction of topographic parameters from Digital Elevation Model's (DEMs) is recognized as a viable alternative to traditional surveys and manual evaluation topographic maps, particularly as quality and coverages of DEM data increase.

2. Analysis of Runoff Vectors in the Basin of the Rediu River Basin

2.1. General Descripsion

Rediu river is a tributary to Bahlui, which is a major river from the Prut – Bârlad basin. With an 11 km^2 catchment's area, situated in the South-East side of Iaşi County, the Rediu river flows from an upstream altitude of 140 m to a downstream altitude of 40 m in the NW-SE direction. The river catchment's area relief is described by lower hill with a medium altitude of 125 m and a slope of 13%.

2.2. Precipitation

a) The most rainiest year was 1996 – 782.7 L/m^2;

b) the most droughty year was 1990 – 397.4 L/m^2;

c) the most droughty years, with precipitation level under the multiyear average were 1990, 1992; 1994, 1998, 2003;

d) the rainiest year, with precipitation level upper as the multiyear average were 1991, 1993, 1995, 1996, 1997, 1998,1999,2001,2002.

In June 1991 was registered the higher precipitation quantity – 205.9 l/m^2/month.

2.3. Average Flow

The average flow in this catchment in natural regime is of 0.0116 m^3/s.

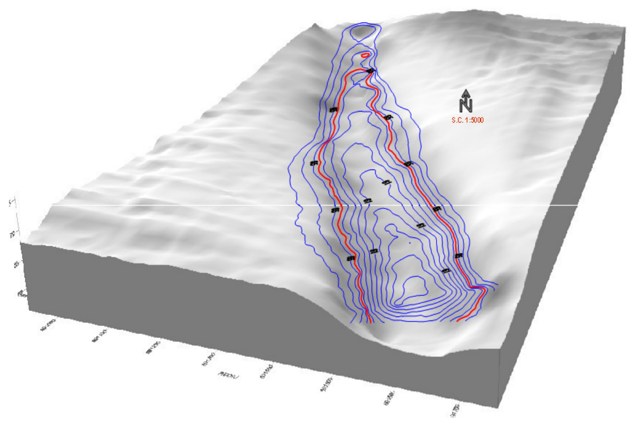

Fig. 1 – Characteristic values for the Rediu reservoir: area at the normal retention level (NRL)–15 ha; volume at NRL – 0.3 Mm^3; reservoirs length at NRL – 1.2 km; reservoirs depth in dam section – 4.5 m.

For main flood prevention and control purpose in North-West part of Iaşi city in 1986-1988 was build on this tributary the Rediu reservoir (Fig. 1), as part of Bahlui river basin hydro technical flood prevention and control works ensemble.

This reservoir contributes to reduce the frequently of flow higher than 40 m^3/s by integral retaining of the component of flood at 1% probability under crest of overfull level (this flood also could affect the lower area of Iaşi city (two wards – Păcurari and Canta) by pressuring the collectors located on the Bahlui banks). It also serves as water source for irrigation of a 120 ha area and one L/s sanitary flow.

The main concern regarding the existence and utility of the Rediu storage lake is that it can be easily filled with silts due to the nature of the terrain which is very steep on certain location.

3. Modeling of Datas

3.1. Necessity of Geographical Informational Systems Usage

Geographical Informational Systems (GIS) organizes geographic data so that a person reading a map can select data necessary for a specific project or task. A thematic map has a table of contents that allows the reader to add layers of information to a base map of real-world locations.

Dimensional model of the land has become a kind of must have, because it is increasingly necessary as the world around to be represented by models to play as true reality.

Digital terrain modeling is a set of techniques which permit to obtain a numerical altitudinal model (DEM). However, as expected, as regards the land surface modeling, the representation was in a virtual space, comprising some issues related to the specific area and how we measure it. Numerical modeling land altimetry approach assumes a portion of the topographic surface using electronic computing and a mathematical model based on the appropriate coordinates (X_i, Y_i, Z_i) points "known" on it so that by interpolation to obtain listing Z_j in any point on the surface, defined by its planimetric coordinates, (X_j, Y_j), with an accuracy corresponding goals envisaged and means available to take.

3.2. Flow Vector and Drainage Area Analysis

Following the preprocessing operation, a flow vector code is assigned to each grid cell using the D8 method. The flow vector indicates the direction of the steepest downward slope to an immediately cell. Where more than one downward slope maximum exists, the flow vector is arbitrarily assigned to indicate the direction of the maximum first encountred. At cells situated on the edge of the definite DEM, the flow vector points away from the definite DEM is no other downward slope to a neighbor is avaible. All flow originating on or entering a cell is assumed to move in the direction indicated by low vector, and no divergent flow out of a cell is accommodated.

The catchement area of each grid cell is determined using the method Martz and Jog. The flow vectors are used to flow the path of steepest descent from each cell to the edge of the DEM, and the catchement area of each cell along this path is incremented by one. After a path has been initiated from each cell, the catchement area value accumulated at each cell gives the number of upstream cell which contribute overland flow to that cell 4.

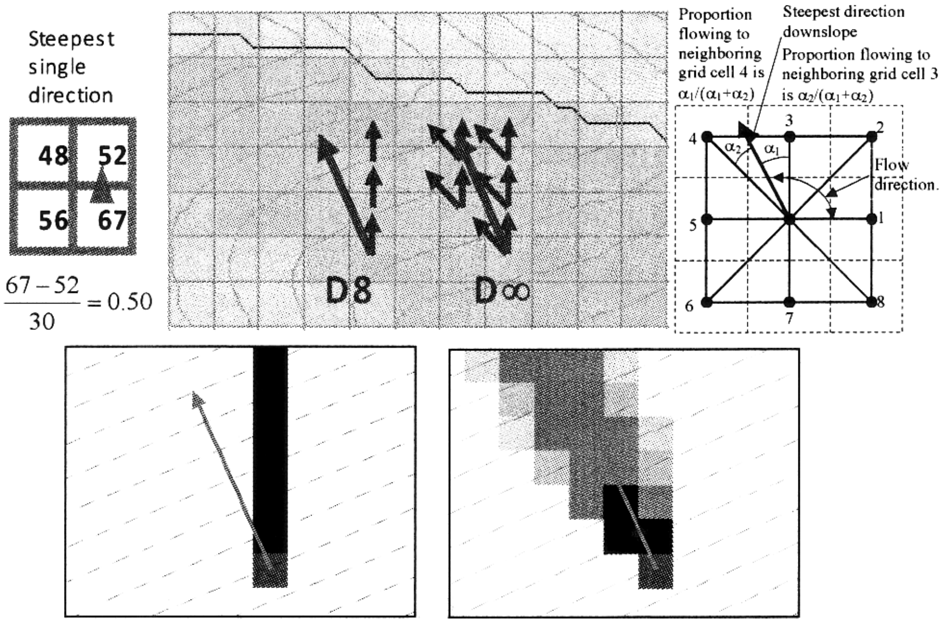

Fig. 2 – Vectors of runoff.

3.3. Chanel Network Analysis

The channel network within the watershed is delineated from the catchment area grid. All cells with a catchment area greater than a user specified critical source area are classified as part of the channel network. This yields a fully connected, unidirectional network (Fig. 3).

Once the network has been pruned, the length, starting and ending cell coordinates, and Strahler order of each channel link are determined. Each exterior link is traced downstream from its source until a junction is marked as

Strahler order 1, while the cell at the junction is market as Strahler order 1, while the cell at the junction is market as Strahler order 2 (Fig. 4).

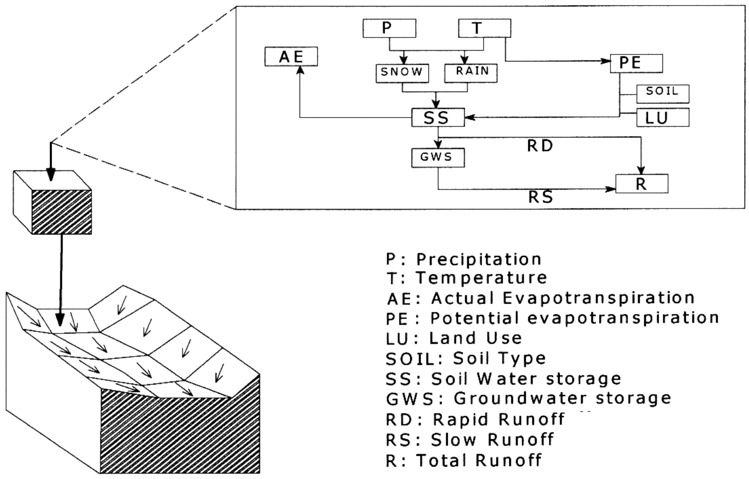

Fig. 3 – Flow diagram.

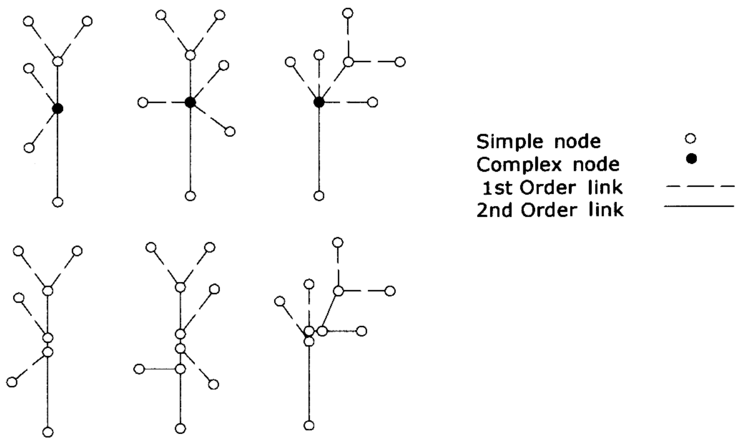

Fig. 4 – Watershed segmentation.

4. Conclusions

A main factor of flooding, the surface runoff is not sufficient assessed nowadays, due to the difficulty of correct calculation of the water dripping on slopes. But using such a tool, on small basins, where the surface flow is easier to asses, the results can be then applied to calibrate the model more accurately.

The present paper intended to show how is possible to calculate the surface runoff by using a small basin (only 11 km^2) and DEM data available.

Off course, the results can be improved by adding data from topographical survey, as the one seen on the reservoir Rediu.

These results will be of course closer to reality, making an important step on the path of correct modeling the water action on small basins, with possibilities to interpolate on the big basins, with direct impact over the flooding protection.

Received, February 15, 2010

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R E F E R E N C E S

1. Băloiu V., *Amenajarea bazinelor hidrografice şi a cursurilor de apă.* Edit. Cermi, Iaşi, 1980.
2. Giurma I., *Viituri şi măsuri de apărare*. Edit. Cermi, Iaşi, 2003.
3. Giurma I., *Hidrologie specială*. Edit. Politehnium, Iaşi, 2004.
4. Marks D.M., Dozier J., Frew J., *Automated Basin Delineation From Digital Elevation Data*. Geo. Proc., **2,** 299-311 (1984).
5. Roşca D., *Hidrologia agricolă*. Edit. Agro-Silvică, Bucureşti, 1959.
6. * * * http://www.ems-i.com/WMS/WMS_Overview.
7. Wolock D.M., McCabe G.J., *Comparison of Single and Multiple Flow Direction Algorithms for Computing Topographic Parameters*. Water Resources Res., **31**, *5*, 1315-132 (1995).
8. * * * Waters Law (Legea Apelor), Romanian Government *107*/1996.

PREVENIREA ŞI PROTECŢIA IMPOTRIVA INUNDAŢIILOR

(Rezumat)

Pe fondul schimbărilor climatice manifestate la nivel planetar şi în România au avut loc fenomene hidrometeorologice atipice şi periculoase, de o intensitate deosebită mai ales în ultimii ani. Teritoriul României este locul de îmbinare a trei zone fizico-geografice ale continentului european. Fiecare dintre aceste unităţi distincte se întâlnesc pe teritoriul ţării şi creează o situaţie complexă de împletire, de pătrundere şi influenţă reciprocă.

Aceste fenomene au constituit factorul declanşator şi catalizatorul unor mari schimbări în modul de abordare a acestor fenomene, de la acceptarea inundaţiilor la încercarea omului de a se opune naturii, la cele de apărare împotriva inundaţiilor şi până nu cu mult timp în urmă la prevenirea inundaţiilor.

BULETINUL INSTITUTULUI POLITEHNIC DIN IAŞI
Publicat de
Universitatea Tehnică „Gheorghe Asachi” din Iaşi
Tomul LVI (LX), Fasc. 2, 2010
Secţia
HIDROTEHNICĂ

CONSIDERATIONS ON PARCEL MAPS ELABORATION FOR CADASTRAL SECTORS IN RURAL ADMINISTRATIVE TERRITORIES

BY

HORAŢIU HOGAŞ, D. ILIOI and VALERIA-ERSILIA ONIGA

Abstract. This paper presents solutions for parcel maps preparation for the cadastral sectors in rural area. These parcel maps represent a basic support for the registration works in the Land Registry Lodging Book, as well as to introduce the cadastre in rural administrative territories.

Key words: cadastre; satellite; survey; parcel maps; cadastral sectors.

1. Introduction

The Land Property Law No.*18*/1991 has provided the legal framework necessary to establish and reconstitute the property rights over land. The implementation of the mentioned law was often difficult, especially in rural administrative territories, where land appropriations were made without accurate measurements or up-dated maps, with the latter rarely at the scale required for such steps. Thus, parcel maps should be drawn up in order to keep a clear record of the real properties in all well-defined cadastral sectors from the rural administrative territories. A well-developed parcel map offers the graphic and alphanumeric support for all registered works of land ownership rights from the Land Registry Lodging Book. Also, it constitutes the basic information necessary to execute general-cadastral works on the rural area from any administrative territory. The parcel map contains the boundaries of the property, the component plots, numbering and the plot's use, owner name, surname or denomination, type, registration number and date of issue/preparation of the real property act, areas of the buildings and of the plots, the numerical values for the distances from the contour. Besides the proper graphical representation, the parcel map shall contain the name, scale, administrative territory, the native name of the cadastral sector, true North, the names and surnames of the members of the Land Fund Commission, and those of the surveyors. Reflecting the concordance between the situation on the field and that presented in the documents, the development of a parcel map represents the result of a collaboration between the surveyors, the special-service representatives of the City Hall, owners, the Cadastre and Land Registration Office and the natives that know very well the history related to the land fund. The technical support for the parcel map is given by precise measurements made using GPS satellites or Total Station technologies. Mapping support provided by orthophotomaps represents also a solution for parcel maps preparation. The present study shows a concept of preparing such plans, and a comparative analysis between parcel maps obtained based on precise measurements with a Total Station and those achieved based on orthophotomaps.

2. The Parcel Maps Elaboration Model for Rural Areas

For the present study were considered a total of nine cadastral sectors in the rural administrative territory area of Gorban village from Iaşi County (Fig. 1).

The total area of the cadastral sectors is approximately 350 ha. In order to obtain the parcel maps, after an analysis of the existent topographic-cadastral documentation for the work area and the land recognition, a topographical survey network was created. Thus, it was created a principal traverse supported on two existing geodetic points in the vicinity of the work area, rigorously refined using the processing software TopoSys 4.4. *Prior*, the distances were reduced to the projection plan, considering that the calculated deformation module of distances for the studied area is of +14.5 cm/km. In Table 1 are shown the results of processing the measurements, and the estimation of the accuracy of the obtained results. In order to measure and to map all the details, additional traverses were considered, supported on the points of the main traverse, whose routes were conducted along private roads bordering the cadastral sectors. After processing the performed measurements, parcel maps were drawn using the method of parallel polygon rendering by means of the MapSys 5.5 program. Areas of the lots created by parceling were then compared, according with their property title, with the existing land records from the specialized office of the City Hall.

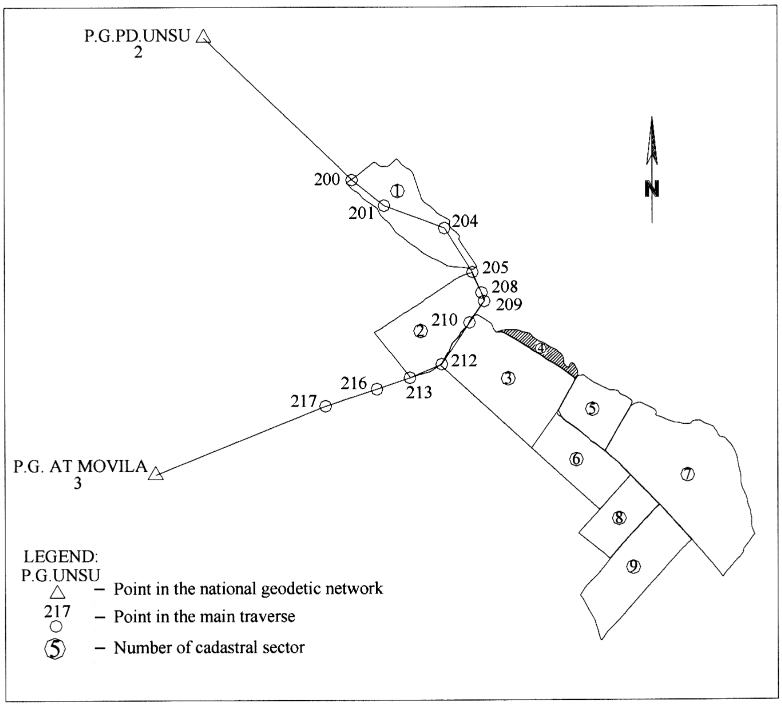

Fig. 1 – Schetch of the main topographical survey network and cadastral sectors.

Table1

Inventory of Coordinates and Accuracies of Determinations for the Points of Main Topographical Survey Network

Point No.	Initial rectangular coordinates		Compensated rectangular coordinates		Average errors of compensated rectangular coordinates	
	X_0, [m]	Y_0, [m]	X, [m]	Y, [m]	s_x	s_y
2	607,221.986	729,651.085	–	–	–	–
200	606,018.304	730,885.272	606,018.304	730,885.268	0.806	0.832
201	605,802.326	731,152.251	605,802.325	731,152.251	0.726	0.783
204	605,614.403	731,652.952	605,614.404	731,652.950	0.802	0.837
205	605,246.218	731,887.303	605,246.218	731,887.302	0.677	0.711
208	605,073.197	731,962.863	605,073.198	731,962.862	0.443	0.671
209	605,000.394	731,983.968	605.000.396	731,983.968	0.440	0.710
210	604,818.317	731,862.280	604,818.318	731,862.282	0.715	0.699
212	604,463.004	731,630.120	604,463.003	731,630.121	0.768	0.728
213	604,350.007	731,363.967	604,350.008	731,363.968	0.703	0.675
216	604,255.900	731,090.277	604,255.901	731,090.280	0.705	0.744
217	604,114.387	730,663.039	604,114.387	730,663	0.746	1.005
3	603542.070	729233.947	–	–	–	–
	ex = 0.028 m	ey = 0.070 m				

The parcel maps were prepared so that will have all the mandatory elements presented in the introduction part of the present work (Fig.2).

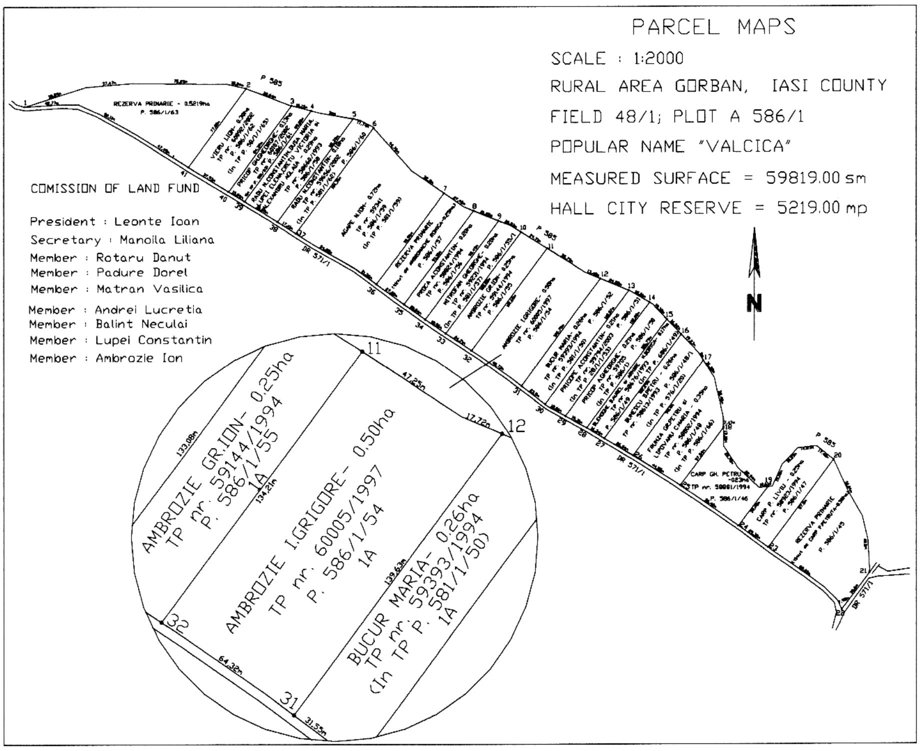

Fig. 2 – Parcel maps of the cadastral sector No. 4.

Table 2 shows a comparative analysis for the areas of the cadastral sectors resulted from topographic surveying with Total Station measurements and those resulted from the digitization of the existing orthophotomaps for the studied area. The obtained differences between surfaces were ranged within the tolerance of 2%, accepted by technical standards of preparing cadastral documentation required for registering in the Land Registry Lodging Book.

An analysis was also performed for a number of three component plots of the cadastral sector shown in Fig. 2, which presents the rectangular coordinates for the contour points of the mentioned buildings resulted from measurements, and by digitizing the orthophotomaps, respectively. It can be noted as shown in Table 3 that the obtained differences are relatively high, not falling within tolerances.

Table 2
Inventory of Areas of Cadastral Sectors from Measurements and Orthophotomaps

No.	Cadastral sector name	Area from measurements m^2	Area from ortophotoplans m^2	Differences m^2	Differences %
1	T41-Pietrărie	386,321.4962	386,449.0703	–127.57	0.03
2	T44-Unsu	398,025.1067	401,348.4800	–3,323.37	0.83
3	T-46-1-Rosasca III	213,465.2812	225,717.4203	–12,252.14	5.74
4	T-46-1-Loturile mari	297,222.3301	299,162.6342	–1,940.30	0.65
5	T-46-1-Tabla	617,683.1039	627,089.4958	–9,406.39	1.52
6	T-48-Vâlcica	59,818.7653	60,670.7442	–851.98	1.42
7	T-48-1-Lac	214,315.3879	215,404.2469	–1,088.86	0.51
8	T-63-1-Schimbare	920,567.2160	922,650.8206	–2,083.60	0.23
9	T-64-1-Rosasca	413,330.6881	412,793.8870	536.80	0.13
		3,520,749.375	3,551,286.799	–30,537.42	–0.87

Table 3
Coordinate Inventory of the Points from the Perimeter of the Buildings Established with Measurements, and by Digitizing the Orthophotomaps Respectively

Plot name	Point No.	Coordinates based on measurements		Coordinates determined on ortophotomaps		Differenced between coordinates		
		m	m	m	m	*ex* m	*ey* m	*et* m
P. 586/1/63	1	604738.013	732091.807	604738.407	732094.761	–0.394	–2.954	2.980
	2	604752.314	732267.724	604749.755	732275.507	2.559	–7.783	8.193
	41	604690.305	732221.745	604686.020	732228.440	4.285	–6.695	7.949
P. 586/1/54	11	604625.393	732508.157	604625.730	723511.520	–0.337	–3.363	3.380
	12	604600.759	732550.581	604602.737	732553.698	–1.978	–3.117	3.692
	31	604515.725	732487.528	604514.880	732488.820	0.845	–1.292	1.544
	32	604543.694	732447.629	604541.890	732449.610	1.804	–1.981	2.679
P. 586/1/45	20	604456.937	732736.004	604454.740	732737.570	2.197	–1.566	2.698
	21	604366.049	732764.548	604368.153	732764.072	–2.104	0.476	2.157
	22	604336.876	732742.443	604334.572	732740.863	2.304	1.580	2.794
	23	604386.409	732683.707	604382.030	732683.870	4.379	–0.163	4.382

3. Conclusions

The parcel maps for the cadastral sectors in rural area represent land registry documents essential for an accurate land registration. They are required for both the provisional registration in the Land Registry Lodging Book and for the introduction of the cadastral work in the rural administrative territories, and must be designed and constructed to meet the full requirements for completion of the land cadastre.

The realization of the parcel maps having as support orthophotomaps might be a solution for solving the issues of land records, on the one hand with an optimal ratio between costs and completion time, and on the other hand with proper accuracy in determining the areas. However, the use of the orthophotomaps in determining accurately the rectangular positions of the points from the perimeter of the buildings is not a technical solution, and thus is not recommendable.

Received, November 15, 2009

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R E F E R E N C E S

1. Tămăioagă Gh., Tămăioagă D., *Cadastrul general şi cadastrele de specialitate*. Edit. Matrix Rom, Bucureşti, 2005.
2. * * * *Ordinul 634/2006 pentru aprobarea Regulamentului privind conținutul şi modul de întocmire a documentațiilor cadastrale în vederea înscrierii în cartea funciară*. Monitorul Oficial al României, Partea I, nr. *1048*, 29 dec. 2006.

CONSIDERAȚII PRIVIND ÎNTOCMIREA PLANURILOR PARCELARE ALE SECTOARELOR CADASTRALE DIN EXTRAVILANUL TERITORIILOR ADMINISTRATIVE

(Rezumat)

Se propune soluții de întocmire a planurilor parcelare pentru sectoarele cadastrale din extravilan astfel încât acestea să constituie un suport de bază al lucrărilor de înscriere în cartea funciară a imobilelor, precum şi pentru introducerea cadastrului în extravilanele teritoriilor administrative.

BULETINUL INSTITUTULUI POLITEHNIC DIN IAŞI
Publicat de
Universitatea Tehnică „Gheorghe Asachi” din Iaşi
Tomul LVI (LX), Fasc. 2, 2010
Secţia
HIDROTEHNICĂ

METHODS FOR REDUCING THE EFFECTS OF CURRENT ENVIRONMENTAL CRISIS BY IMPLEMENTING RENEWABLE ENERGY

BY

M. DIMA and TEODORA-MANUELA CORNEA

Abstract. Current climate change and world energy consumption, which exceeds the existing traditional sources, represent the most serious problems that mankind is facing worldwide. Serious effects of climate change, which in most cases generate real environmental disasters, can be avoided only by drastically reducing of greenhouse gases emissions (GHG).

In this paper the authors will highlight the main aspects of global warming in terms of air pollution. It intends to eliminate acid rain, photochemical smog and reduce the concentration of GHG by firm and deep methods applied to the current energy domain by promoting clean energy that guarantee sustainable development.

Key words: ecological crisis; climate change; extreme weather; clean energy.

1. Introduction

Air pollution has profound effects in various fields, being the main reason for the manifestation of global warming; its climatic implications are already expressed by extreme weather phenomena such as: rapid alternation between rainfall and severe heat waves, severe drought, altered meanings of traditional seasons, acid rain, photochemical smog, etc.

The increase in global consumption of oil and coal since the early '40s led to a substantial growth in carbon dioxide which increases the greenhouse effect, influences the trend of atmosphere warming and affect global climate.

The energy sector, particularly the electricity generation sector, is the largest contributor to emissions of greenhouse gases (GHG) (an average of 30% from total emission come from the power generation sector).

To mitigate the effect of global warming from air pollution, the European specialists had met in Brussels, in 2007, and signed The International Agreement on reducing CO_2 emissions in the next 40…50 years. The most important and drastic measures were directed to the energy domain and are listed in Table 1.

Table 1

The Proposals Stated by the International Agreement on Reducing CO_2 Emissions Mandatory for EU Member States

Year	Energy proposals concerning the reduction of air pollution sources
2020	Increasing the share of renewable energy (wind, solar, hydraulic, etc.) representing 20% of the total energy produced.
2030	To reduce CO_2 emissions will be used special power plants on fossil fuel, but with insignificant gas emissions, carbon capture and storage of CO_2.
2050	Use of renewable energy sources, sustainable sources of coal, gas and hydrogen, fourth generation nuclear fission and fusion energy.

In terms of current environmental crisis it is considered the introduction of policies to conserve energy and increase of energy efficiency by superior capitalization of renewable energy sources.

Implementation of renewable energy gives the guarantee of sustainable development and protects the environment by reducing pollution caused by combustion gases of conventional fuels.

Given the requirements of environmental regulations and restrictive legislation imposed by the European Union, the authors identifies the main impacts of air pollution with adverse effects on the lives and the measurements for their mitigation.

2. Pollution, the Main Cause of the Ecological Unbalances

For a right approach of an analysis study of environmental crisis and its effects it is necessary to diagnose the pollution by highlighting its sources and their impact on environmental factors.

In the last years scientific researches have shown that the chemical structure of the atmosphere is changing, so the attention is focused on the impact of human activities on the atmosphere.

Main substances contributing to air pollution and enhancing the natural greenhouse effect are: oxides of sulfur and nitrogen, CFCs , carbon and carbon monoxide, this being only part of the billions of tons of polluting material generated each year by industry and energy sector in developed countries.

Main polluting countries are presented in Table 2.

Table 2

World's Main Countries whose GHG Emissions Present a Great Risk to the Planet

No	Country	Annual Emissions of CO_2, [thousands of metric tons]	Percentage of total, [%]
World		27,245.758	100
1	United States	6,049.435	22.2
2	China and Taiwan	5,010.170	18.4
3	European Union	4,001.222	14.7
4	Russia	1,524.993	5.6
5	India	1,342.962	4.9
6	Japan	1,257.963	4.6

Emissions of pollutants affects aquatic and terrestrial ecosystems when pollutants are dissolved in water, retain solar radiation heating land surface, a phenomenon known as GHG effect, and contribute to generating processes such as photochemical smog or precipitate under as acid rain.

3. Extreme Weather Phenomena Caused by Pollution

3.1. Acid Rain

The term "acid rain" or "acid precipitation" includes all types of precipitation – rain, snow, sleet, fog, whose pH is lower than the natural pH of rain water, which equals 5.6.

Acid rain is formed from the reactions in the atmosphere of oxides of sulfur and nitrogen with water vapour from which results mixed acids that are lowering the pH of rainwater. Large quantities of oxides in the atmosphere due to industrial emissions from burning oil and coal are the main pollutants that contribute to acid precipitations.

Acid rain is now a major subject of controversy due to its action on large areas and the possibility of spreading to areas down-wind from the pollution point.

The severity of the effects of acid pollution was recognized locally, exemplified by acidic smog from highly industrialized areas, but nowadays the problem widespread globally.

The area that received special attention is the north-western part of Europe. In 1984, for example, the report on the environment indicates that almost half of the forest mass of Black Forest from Germany was affected by acid rain.

In Romania, most thermal plants using fossil fuel are the largest sources of environmental pollution in the form of acid rain. Important areas near thermal power stations have undergone major changes in ecosystems due to acid precipitation.

The worst effects of acid rain are: structures erosion, destruction of crops and forest plantations, threatening terrestrial and aquatic animal species, produces corrosion of bridges and architectural monuments; raises water toxicity resulted from the dissolution of Pb from water pipes, and lead to lower soil fertility.

In the twentieth century, air acidity and acid rain were recognized as a major threat to environmental quality.

Effects of acid rain are felt in all ecosystems and life forms, endangering also human health causing respiratory problems.

3.2. The Greenhouse Effect

Atmosphere, one of four key environmental factors of life on Earth, is a mixture of gases including major components, by volume, nitrogen, oxygen, argon, and smaller quantities of carbon dioxide, neon, helium, methane, water vapour, etc. These gases provide the necessary breathing air, temperature control and filtration of dangerous solar radiation.

Carbon dioxide, methane, nitrogen oxides, ozone and water vapour naturally forms GHG.

The Earth's natural greenhouse effect control temperature, maintaining living conditions on the planet.

GHG allow short length of light rays, visible light of the sun to pass through, heating the atmosphere, oceans, the surface of the planet and the organisms.

The Earth receives energy from the Sun mostly in the form of visible light and nearby wavelengths. About 50% of the sun's energy is absorbed at the Earth's surface, the rest being radiated back in space in the infrared range. GHG in the atmosphere absorb and retain most of the infrared radiation emitted by the surface heating the Earth.

In recent years scientific research has shown that the chemical structure of the atmosphere is changing and this has enhanced the natural greenhouse effect, disturbing the thermal balance of the Climate System by triggering the process of global warming (Fig. 1).

The main cause for emitting significant amounts of GHG are human activities, particularly in energy domain, industry and transport. The most important impact of modern human activities is the release of large quantities of carbon dioxide, methane and nitrogen – primarily due to fossil fuel use – responsible for 50% increase in concentrations of GHG in the atmosphere (Fig. 2).

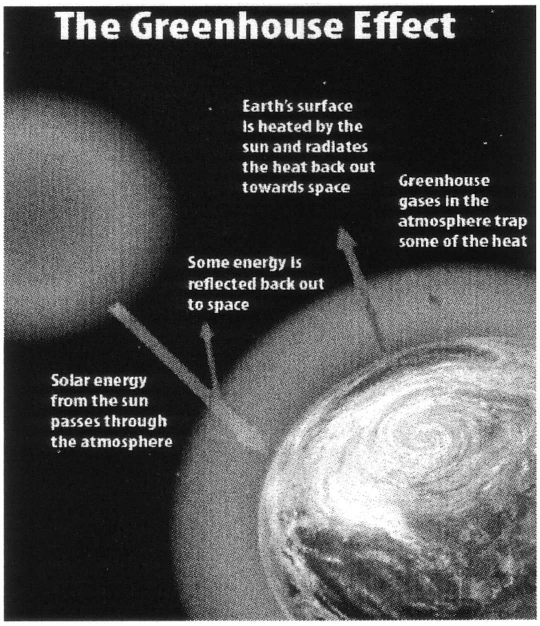

Fig. 1 – Enhanced greenhouse effect due to apprehension infrared radiation by anthropogenic emissions of GHG.

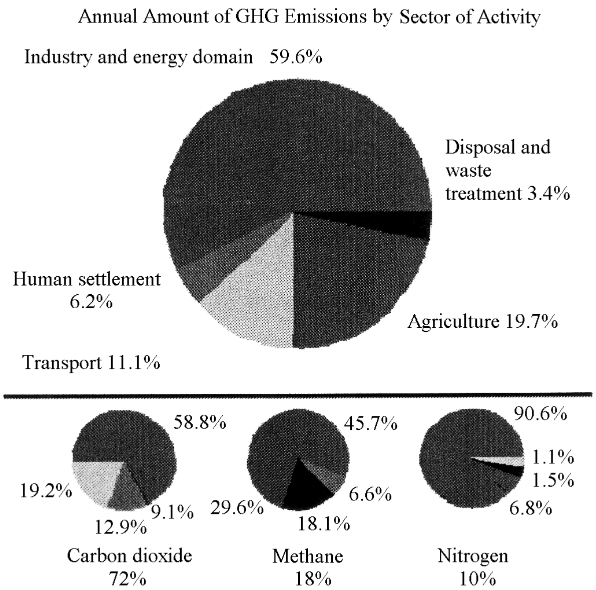

Fig. 2 – The main sectors of activity that produce large quantities of GHG emissions.

According to research results of numerous international scientific committees, increasing the greenhouse effect started a new planetary warming of a unprecedented magnitude during the history.

These results describe and argue the global warming phenomenon, the climate change, and accelerated greenhouse effect.

The interest for global warming has been the central issues of world leaders for decades, but only in 1997, representatives of 160 countries established, in Japan, reductions in emissions of GHG of the polluting countries. The agreement negotiated in December 1997 in Kyoto, between the political leaders of 160 states, requires industrialized countries to reduce emissions by 5.2% in 2008…2012 period compared to their level in 1990.

3.3. Photochemical Smog

The smog is known as representing the atmospheric phenomena of overlapping smoke pollution and harmful gases with fog. The word smog is formed from two English words – smoke and fog, so the smog is a mixture of fog and smoke particles formed when the humidity is high and the air is so calm that smoke and emanations accumulate near their sources.

Smog is formed in urban highly industrialized areas when nitrogen dioxide is decomposed by sunlight, releasing ozone, aldehydes and ketones.

Their combined effect results in an extreme harm of various toxic gases (especially SO_2 and NO_2) even below the maximum permissible concentrations.

Photochemical smog is a toxic fog produced by the chemical interaction between pollutant emissions and solar radiation. The most common product of this reaction is ozone, a form of oxygen molecules consisting of three oxygen atoms, unlike the normal form of two atoms. Ozone from lower atmosphere is very poisonous and has a devastating action on ecosystems and human.

During high hours in major urban areas atmospheric concentration of nitrogen oxides and hydrocarbons increases rapidly as these substances are emitted by industrial activity, the energy domain and not least the car. The most famous for smog are the metropolis (Los Angeles, London, New York), where over the last 50 years there were real disasters of smog pollution form.

A case of major air pollution was the great smog of London, which lasted between December 5 and December 9, 1952. This disaster has caused the deaths of thousands of people and created a strong environmental movement.

4. Measures to Mitigate the Effects of Current Environmental Crisis by Implementing Renewable Energy

The 21st century introduces in the world's energy domain the possibility of conversing heat and mechanical energy into electricity. This process has led to over 20% of total energy consumption nowadays to be electricity.

Switching from 2 kWh/day needed to ensure the requirements of a persons life in a primitive society, to 270 kWh/day, representing the human consume in a modern society, had as repercussions not only the increase of comfort but the evolution of energetic domain as well.

Increased energy consumption has led to a power problem at the moment in the form of increased emissions of GHG. In this context, a solution to mitigate climate change posed by extreme events is the promotion of clean energy (renewable).

Exploitation of renewable energy gives the guarantee of real prerequisites for achieving the strategic objectives for increasing security of energy supply based on sources diversification and reducing the share of imports of energy, namely sustainable energy sector development and environment protection.

Renewable energy sources are inexhaustible, completely clean, low priced, have a high degree of spread around the globe, and are in the non-fossil category.

4.1. Wind Energy

Wind energy represents a consequence of wind energy potential. Wind energy has been used since ancient times in areas characterized by the existence of permanent air movements due to temperature differences between land and water, or due to pressure differences in different regions.

Wind energy has proven the power generation technology with the fastest growth rate in the world, growing annually by more than 40%.

4.2. Solar Energy

Solar energy proceeds from solar radiation, from which is obtained electricity through photovoltaic technology or heat energy through solar thermal conversion methods.

This is the most natural, more abundant, inexhaustible time scale, the most available and the cleanest of all green energy.

With solar installations are achieved substantial savings in energy consumption used for domestic hot water, heating water in swimming pools, heating the floor but also contribute to reducing toxic emissions into the atmosphere.

4.3. Hydro Energy

Because the water cycle in nature is maintained by the sun, this is considered a form of renewable energy.

Hydropower represents actually a mechanical energy consisting of potential energy water’s given by the difference in level between the lake and the energy plant, namely the kinetic energy of moving water.

Operation of this energy is made in hydro power plants that convert potential energy of water into kinetic energy, which is then captured using a hydraulic turbine that operates electric generators to transform it into electric energy.

4.4. Biomass

Biomass is a biological material, representing the biodegradable fraction of products, waste and residues from agriculture, forestry or related industries, including plant and animal material and industrial and urban waste.

By means of biological fermentation these products become cheap and reliable sources of fuel gases, especially methane. Aerobic decomposition reactions of wastes take place whether they are directed, controlled and recovered or not, but in the latter case all these compounds are discharged freely into the atmosphere.

Knowing the impressive quantities of waste that currently exist and that the resulting average of methane is 500 m^3 N from a ton of fermented organic waste, we can to imagine what huge quantity of gas is eliminated into the atmosphere.

This gas, called biogas in the literature, which has stayed in the waste, captured and used, can become a tremendous source of energy, being almost inexhaustible.

4.5. Geothermal Energy

This form of green energy results from energy stored in warehouses and underground hydro-geothermal deposits operated in conditions of economic efficiency. Geothermal energy consists of heat and fluids contained in underground rocks. It is clean, renewable and can be used for various purposes: heating, industry or to produce electricity.

These forms of energy can be harnessed for power and heating needs of the population, currently provided by conventional power.

In the current energy crisis, caused by resource depletion, and the current ecological crisis triggered by excessive pollution, the Brussels Conference of 2007 proposed as the first viable and accessible solution the increase of the share of renewable energy to 20% of the total energy produced.

5. The Advantages of Using Unconventional Energy Sources to Avoid Environmental Disaster

Environmental issues have gained momentum in the last 30 years due to climate change and global effects that are felt increasingly stronger.

Worldwide energy needs are increasing, global reserves of fossil oil fell and burning fossil fuels are causing negative effects on the environment due to CO_2 emissions.

Reducing emissions of greenhouse gases from energy domain can occur in several ways, for example by developing new technologies, clean energy production and, in this process, renewable energy offers a guaranteed medium and long term affordable solution.

Exploitation potential of renewable energy and bio-fuels is currently used below capacity all over the world but their promotion is recognized as a priority measure in the 21st century, their exploitation contributes to environmental protection and sustainable development.

The increased use of electricity and heat produced from renewable energy sources is an important component of the package of measures necessary to comply with the Kyoto Protocol concluded to the United Nations Framework Convention on Climate Change.

In most states of the world there is a reconsideration of the energy sector and it's priorities on improving safety in the supply of consumer and environmental protection.

Exploiting renewable energy sources gives the guarantee of real prerequisites for achieving the sustainable energy sector development and, meanwhile, the environmental protection.

When favouring the development of a market for renewable energy sources is necessary to take into account the positive impact on development and export possibilities, social impact and employment opportunities and of course the fact that the exploit of this potential can accelerate the achievement of Kyoto targets.

Their most important advantage is that through their implementation may stabilize by 2050 the emission of gases producing the greenhouse effect. It was shown that such methods used in an organized manner, can produce large amounts of clean energy and at the same time can bring a huge economic incentive because of their efficiency on long-term costs.

6. Conclusions

Current climate change and world energy consumption, which far surpasses the existing traditional sources, presents the most serious problem that mankind is facing worldwide. Serious effects of climate change can be avoided only by drastic reduction of emissions of GHG.

Switching to a world economy with low emissions of GHG is therefore the core of integrated EU policy on climate change and energy.

Renewable energy sources provide enhanced quality of life in terms of environment and sustainable economic development. These requirements are made in national policy through the implementation of energy conservation, energy efficiency and renewable energy superior capitalization.

Received, February 15, 2010

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R E F E R E N C E S

1. Dima M. *et al.*, *The Bases of Biological Treatment of Waste Water* (in Romanian). Ed. ETP Tehnopress, Jassy, 2002.
2. * * * European Parliament and Council Directive 2001/77/EC of September 27, 2001, on the promotion of electricity from renewable energy sources in the internal electricity market
3. * * * Law No. *220*/2008 to establish the system to promote energy production from renewable energy, Official Gazette. Part I No *743*, November 3, 2008.
4. McKendry P., *Energy Production from Biomass*. Part **2**, *Conversion Technology, Bio-resource Technology*. Appl. Environm. Res. Centre Ltd, Colchester, UK, 2001.
5. * * * http://biogaz-luethe.weblog.ro.

METODE DE REDUCERE A EFECTELOR SCHIMBĂRILOR CLIMATICE PRIN IMPLEMENTAREA DE ENERGII REGENERABILE

(Rezumat)

Schimbările climatice actuale şi consumul mondial de energie, care depăşeşte cu mult sursele tradiţionale existente, prezintă cea mai gravă problemă cu care omenirea se confruntă la nivel global. Efectele grave ale schimbărilor climatice, care în majoritatea cazurilor generează adevărate dezastre ecologice, pot fi evitate doar prin reducerea drastică a emisiilor de gaze cu efect de seră (GES).

Autorii evidenţiază principalele aspecte ale încălzirii globale din punct de vedere al poluării aerului. Se are în vedere eliminarea ploilor acide, a smogului fotochimic şi reducerea concentraţiei de GES, prin măsuri ferme şi profunde în domeniul energetic actual prin promovarea de energii ecologice care conferă garanţia unei dezvoltări durabile.

BULETINUL INSTITUTULUI POLITEHNIC DIN IAŞI
Publicat de
Universitatea Tehnică „Gheorghe Asachi” din Iaşi
Tomul LVI (LX), Fasc. 2, 2010
Secţia
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STUDY ON THE INFLUENCE OF NEGATIVE PRESSURE COEFFICIENT OVER GRAVITY DAMS USING THE POCKET PC

BY

DORIN COTIUŞCĂ ZAUCĂ, NICOLETA MAZILU and *CONSTANTIN-VICTOR STĂTESCU

Abstract. In recent years, the use of small computers in various fields of activities took an increasing scale. This is mainly due to the convenience of their small size and similar performance with an average power computer. Moreover, they offer the ability to connect remotely *via* the built-in modem to any other computer or data base storage place. Shortly, they have the necessary facilities for land use activities. The aim of this paper is to write a program for Pocket PC and use it mainly for demonstration purposes and study the development of characteristic parameters of gravity dams based on variation of the negative pressure coefficient, *m*. The research results are presented in the form of charts and tables accompanied by an interpretation of them.

Key words: gravity dam, negative pressure, Pocket PC.

1. Introduction

The influence of friction coefficient, *f*, and negative pressure coefficient, *m*, on the upstream and downstream-side slope of dams is well known for triangular profiles. In the present study we aim to illustrate this influence using a computer tool came recently in the use of engineers and researchers, the Pocket PC. For now, the software available for these computers is limited to operating systems, incompatible with those on regular computers and other specific applications focused mainly on networking, internet, mobile telephony and GPS. These computers have a great advantage for field research because they are powerful computing machines while very small. We have tried to compensate this shortfall due to lack of specific software for studied issues. So, we have purchased at an affordable price a programming language used on this mini-computers: *Visual Basic for Pocket PC*. The only downside of this programming language is the limited number of characters allowed for line program (see the extract of program code below).

We have designed a computer mainly program for teaching purposes, able to calculate the overturning and sliding stability coefficients, the efforts in horizontal sections for the following circumstances: construction or operating, with and without earthquake. The research results were represented as charts and tables accompanied by a discussion over them.

2. Presentation of the Program

The program has two working screens

a) An input screen for entering the following data (Fig. 1): the height of the dam, H_b, [m]; width of the coping, b_c, [m]; coping height, h_c, [m]; negative pressure coefficient , *m*; reduction coefficient of pore water pressure; the concrete – rock friction coefficient, *f*; calculation section, *Z*, [m], and some option boxes for taking into account or not the loads according to a specific loading scheme (self weight, water, earthquake); three other buttons are designed for running (Enter), reset screen (Reset) and an exit button.

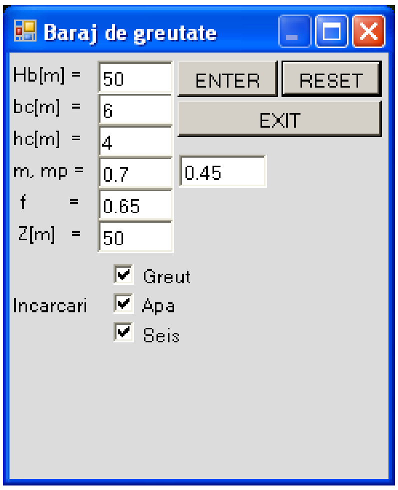

Fig. 1 – The input screen.

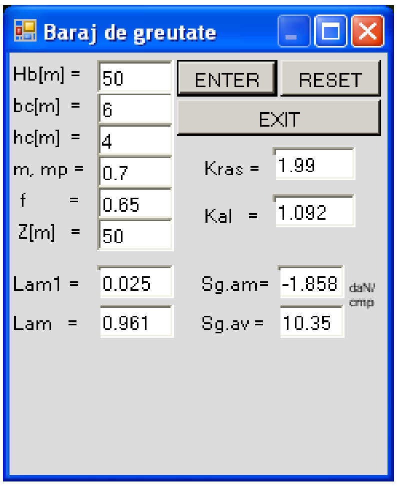

Fig. 2 – The result screen.

b) The second screen (Fig. 2) contains additional windows for displaying results: upstream and downstream slope: $1/\lambda_1$ respectively $1/\lambda$; the coefficient of sliding stability, k_{al}; the overturning stability coefficient, K_{ras}; efforts at the upstream side, σ_{amonte} and at the downstream-side slope, σ_{av} , [daN/cm^2]. The screen becomes available after hitting the *run* button of the first screen.

Both screens have a standard form of Pocket PC computers and have the bottom space of each of them reserved for the on-screen keyboard.

Here are some of the code lines, only for demonstration purpose.

```
   Sub Button1_Click
   label1.Visible=True
   label2.Visible=True
   textbox1.Visible=True
   textbox2.Visible=True
   label6.Visible=True
   label7.Visible=True
   textbox6.Visible=True
   textbox7.Visible=True
   label11.Visible=True
   label12.Visible=True
   textbox11.Visible=True
   textbox12.Visible=True
   label16.Visible=False
   textbox13.Visible=False
   textbox14.Visible=False
   label15.Visible=False
   checkbox1.Visible=False
   checkbox2.Visible=False
   checkbox3.Visible=False
   label13.Visible=True
   ...

   mg=bc*hc*(B-
bc/2)+bc^2/2*H/B*(B-
2/3*bc)+B^2*H/3+x*H/2*(B+x/3)
   mr=((B+x)*H/2+(2*hc+bc*H/B)
*bc/2)*(B+x)*2/3
   ...

   'Text6.Visible=-1
   'Text7.Visible=-1

   TextBox6.Text=kr
   TextBox7.Text=kal

   ...
er=(bc*hc*(l*z-
bc/2)+bc^2/2/l*(l*z-
2/3*bc)+l*z^2/2*2/3*l*z+l1*z^2/2
*(l*z+l1*z/3))
   er=er/(bc*hc+bc^2/2/l+l*z^2/2
+l1*z^2/2)
   ...
   'Remcalc.ef.seismG
   'Remerg
   erg=(bc*hc*(z+hc/2)+bc/2*bc/l
*(x-
bc/l/3)+(l1+l)*z*z/2*z/3)/(bc*hc
+bc/2*bc/l+(l1+l)*z*z/2)
   ssga=6*0.1*2300*(bc*hc+bc/2
*bc/l+(l1+l)*z*z/2)*erg/((l1+l)*
z)^2
   ssgv=-
6*0.1*2300*(bc*hc+bc/2*bc/l+(l1+
l)*z*z/2)*erg/((l1+l)*z)^2
  ssga=Int(ssga/10000*1000)/1000
'transf in daN/cmp,3zec
  ssgv=Int(ssgv/10000*1000)/1000

   If CheckBox1.Checked=True
Then
   kg=1
   Else
   kg=0
   End If
   If CheckBox2.Checked=True
Then
   ka=1
   ksemn=-1
   Else
   ka=0
   ksemn=1
   End If
   If CheckBox3.Checked=True
Then
   ks=1
   Else
   ks=0
End If
```

```
    'ef.apa S-a LUAT IN CONSID
SUMA V (PV pt z <H si -S pt H;
apa am la cota max coronam)!!
    If z<H-ha Then
    m=TextBox14.Text
    'se poate da lui m alta
valoare daca se cons pres pori
    ha=0
    Else
    m=TextBox8.Text
    'ha=3
    ha=z-(H-ha)
    End If
    bz=(l1+l)*z
    saa=(500*l1*z^2-m*500*(z-
ha)*bz+1000*ha*bz+500*l*ha^2)/
bz
    saam=500*l1*z^2*(bz/2-
l1*z/3)-500*z^3/3-m*500*(z-
ha)*bz*(bz/2-
(l1+l)/3)+500*ha^3/3-
500*l*ha^2*(bz/2-l*ha/3)
    saam=saam*6/bz^2
    saa=saa+saam
    saa=Int(saa/10000*100)/100
    sav=(500*l1*z^2-m*500*(z-
ha)*bz+1000*ha*bz+500*l*ha^2)/bz
    sav=sav-saam
    sav=Int(sav/10000*100)/100
    sta=sa*kg+saa*ka+ssga*ksemn*k
g*ks+ssaa*ka*ks
    'sta ef total, saa
ef.apa,ssga ef seism greut.am,
ssaa seism apa am
    stv=sv*kg+sav*ka+ssgv*ksemn*k
g*ks+ssav*ka*ks

    TextBox11.Text=sta
    TextBox12.Text=stv
    End Sub
    End Sub
    Sub Button3_Click
    AppClose
    End Sub
    Sub CheckBox2_Click
    label16.Visible=True
    Textbox13.Visible=True
    End Sub
```

3. The Developing of the Research

The research team has analysed the influence of two parameters over the characteristics of a gravity dam.

They are the negative pressure coefficient, *m*, ranging between 0.5 and 1 for a constant friction coefficient of 0.65 and coefficient of friction, *f*, ranging between 0.5 and 0.8 for a constant value of the negative pressure coefficient of 0.7. Based on the results obtained by running the program we have been prepared the following tables and graphs to show the evolution of the following parameters: λ_1, λ, K_{ras}, k_{al} , σ_{am}, σ_{av} in the construction and operating hypothesis, with and without earthquake. Because of luck of space, for now, we shall only discuss the influence of *m* parameter

Table 1
Changes in the Characteristics of the Dam According to m

Nr.	H_b	m	f	b_c	h_c	λ_1	λ	σ_{am} $(G+A)$	σ_{av} $(G+A)$	σ_{am} $(G+A+S)$	σ_{av} $(G+A+S)$	K_{ras}	k_{al}
1	50	0.5	0.65	8	4	0.032	0.854	1.24	8.64	−1.015	10.89	2.196	1.14
2	50	0.55	0.65	8	4	0.032	0.879	1.06	8.55	−1.108	10.71	2.16	1.138
3	50	0.6	0.65	8	4	0.033	0.904	0.85	8.47	−1.234	10.554	2.122	1.137
4	50	0.65	0.65	8	4	0.033	0.932	0.649	8.39	−1.349	10.38	2.085	1.135
5	50	0.7	0.65	8	4	0.033	0.961	0.42	8.33	−1.498	10.24	2.046	1.133
6	50	0.75	0.65	8	4	0.033	0.992	0.19	8.27	−1.648	10.1	2.008	1.13
7	50	0.8	0.65	8	4	0.033	1.025	−0.04	8.23	−1.799	9.989	1.969	1.128
8	50	0.85	0.65	8	4	0.033	1.061	−0.29	8.19	−1.97	9.87	1.931	1.126
9	50	0.9	0.65	8	4	0.033	1.098	−0.549	8.17	−2.156	9.776	1.891	1.123
10	50	0.95	0.65	8	4	0.033	1.139	−0.809	8.15	−2.34	9.68	1.853	1.121
11	50	1	0.65	8	4	0.033	1.183	−1.08	8.14	−2.536	9.596	1.815	1.119

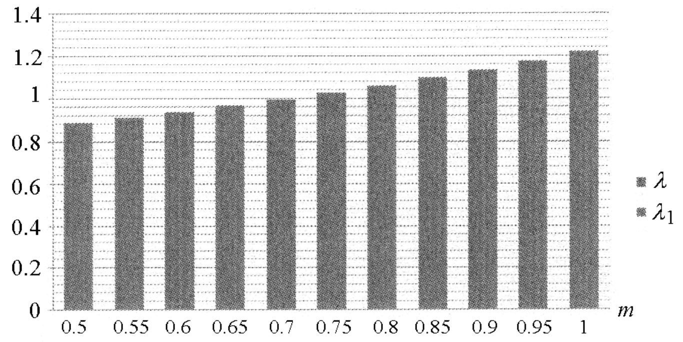

Fig. 3 – Variation of λ and λ_1 *vs. m*.

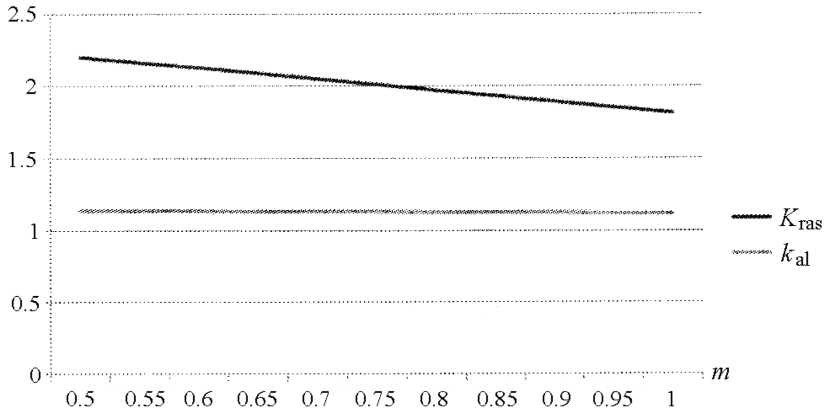

Fig. 4 – Variation of K_{ras} and k_{al} *vs. m*.

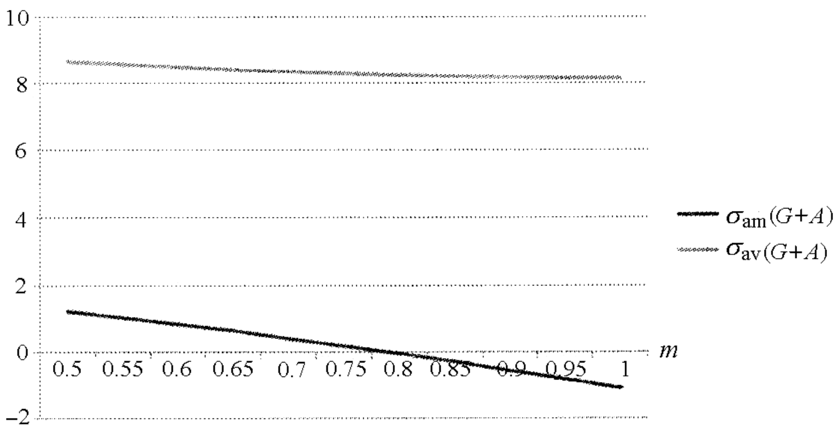

Fig. 5 – Variation of σ_{am} and σ_{av}, if lake full, *vs. m.*

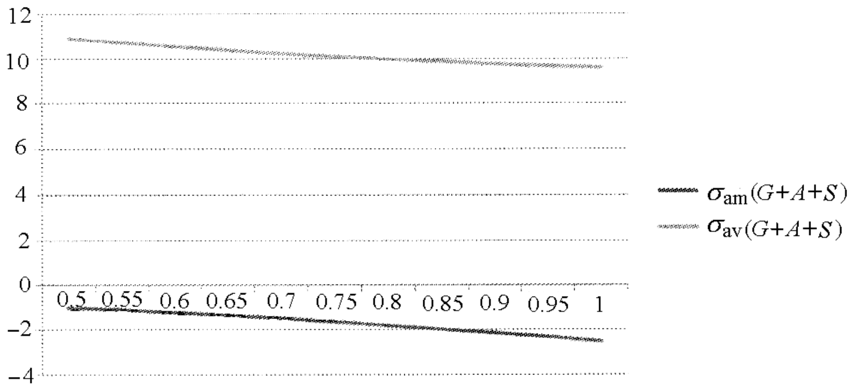

Fig. 6 – Variation of σ_{am} and σ_{av} , lake if full and earthquake, *vs.* *m*.

4. Conclusions

The analysis of the results from Fig. 3 show that the values of λ are quite strongly influenced by the variation of m whilst the values of λ_1 (the upstream tilt) remain almost constant. We need to mention that upstream and downstream tilt were calculated by the program as follows: λ, the downstream tilt, results from the conditions of stability whilst λ_1, the upstream tilt, comes from the condition that the resultant of all forces acting on the dam is located at the upstream limit of the central core.

Analysing Fig. 4 one can observe that the variation of m visible affects the stability coefficient of the structure, K_{ras}, whereas the sliding stability factor, k_{al}, remains relatively constant. This is because the downstream tilt, which largely dictates the size of the dam and consequently the size of the friction force, is also determined by m.

The increase of stability that is obtained by increasing the cross section because a higher λ is offset due to about the same rate of increase of the negative pressure resulting almost constant values for k_{al} with respect to the variation of m. We recall that the situation refers to the step of sizing the cross section of the dam when λ is calculated as a function of m.

The variation of σ_{am} , respectively σ_{av} efforts *vs.* the negative pressure coefficient, m, is represented in the Fig. 5. It is noted that σ_{am} has positive and negative values, with value 0 for $m \cong 0.78$. σ_{av} values are always positive, ranging between the 0.9 ... 0.8 daN/cm^2.

As expected the values of σ_{am} , respectively σ_{av} , are small compared to the resilience of the concrete, emphasizing the lack of these types of dam construction: inefficient use of the strength capacity of the concrete.

Similarly, Fig. 6 shows concrete efforts for the two sides when lake if full and earthquake occurs. Efforts are higher at both sides; the upstream values are all negative not exceeding 2.5 daN/cm^2. In this case too, the resilience of the concrete is not rationally used.

Received, January 15, 2010

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REFERENCES

1. Prişcu R., *Construcţii Hidrotehnice*. Ed. 1, Vol. **1**, **2**, EDP, Bucureşti, 1974.
2. * * * http://www.basic4ppc.com/Documentation

STUDIUL INFLUENŢEI COEFICIENTULUI DE SUBPRESIUNE LA BARAJELE DE GREUTATE UTILIZÂND POCKET PC-UL

(Rezumat)

În ultimul timp utilizarea calculatoarelor de mici dimensiuni în diverse domenii de activitate a luat o amploare tot mai mare. Aceasta se datorează în principal facilităţilor oferite de dimensiunile reduse ale acestora şi de performanţele comparabile în ultimul timp cu cele ale unui calculator de putere medie. Mai mult, acestea oferă posibilitatea conectării la distanţă prin intermediul modemului incorporat. În concluzie, au dotările necesare pentru utilizarea lor la activităţile de teren.

Autorii şi-au propus elaborarea unui program pentru pocket PC şi utilizarea acestuia mai mult în scop demonstrativ pentru urmărirea evoluţiei unor parametri caracteristici barajelor de greutate în funcţie de variaţia coeficienţilor de reducere a subpresiunii, *m* şi de variaţia coeficientului de frecare beton – rocă, *f*. Rezultatele cercetării au fost reprezentate sub forma unor grafice şi tabele însoţite de o interpretare a acestora.

BULETINUL INSTITUTULUI POLITEHNIC DIN IAŞI
Publicat de
Universitatea Tehnică „Gheorghe Asachi" din Iaşi
Tomul LVI (LX), Fasc. 2, 2010
Secţia
HIDROTEHNICĂ

ASPECTS REGARDING THE EVALUATION OF HISTORICAL MONUMENTS PROPERTIES

BY

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Abstract. The criteria that influence the financial and cultural value of the historical and architectural monuments are analysed, as well as the influence given by their uniqueness. The paper synthesizes the researches made by the authors in the evaluation domain, and mainly in the evaluation of the historical monuments properties, using two methods: the replacement value method and the comparison method.

Key words: historical monuments; consolidation; rehabilitation.

1. Introduction

The historical monuments are recognized in Europe as having a positive value, not only cultural, but also economic, in terms of tourism, social status and commercial efficiency. Many historical monuments are monitorized seeing the protection of the unique qualities and characteristics that give their architectural, cultural and/or historical value.

When analysing such properties, the evaluators must be aware of the financial and cultural value of the historical monuments, and the potential negative influence exerced by the augmentation of their financial and cultural values, as well as the consequences of some intervention measures. This is the reason why the evaluators must identify and inspect the historical monuments in the process of evaluation, so that their financial, cultural, architectural and historical interest can count, including any intervention of protection, in determining the value of the monument and the requirement of intervention.

2. Evaluation of Historical Monuments

The evaluation of the historical monuments represents a very complex activity, that must consider the knowledge of the monument's exigency, as well as the interpretation of the contribution of the intrinsic valoric components in determining the value, in the context of the structural and functional exigency, of the adequate intervention technologies, and last but not least, the proper materials used in this interventions.

When advising about repair works inside an evaluation, it is imperative that the evaluator has the certitude that, in case of performing the evaluation, the project does not affect the stuctural or historical integrity of the monument, its future structural state, or its preservation.

When there are doubts about possible influences or consequence of any works or modifications, the evaluator must mention a subsequent recomandation from a proper qualified person, with no financial interest and adequate training in repairing and maintenance of the historical monuments. Considering this simple approach, it will be a sure fact that the evaluator will not make inadequate recomandations, or that they could deteriorate the value of this limited and important resource.

The notion of historical monument includes both the architectural conception and the urban or rural settlement that show evidence of a certain civilization, of a significant evolution, or a historical event. Therewith, the notion of historical monument extends also on small works that over time aquired a cultural signification.

Historical monuments are immovables, buildings and fields situated inside Romania`s territory or outside the borders, properties of the Romanian state, significant for the national and universal history, culture and civilization.

The preservation of the historical monuments represents the whollness of measures with scientific, legal, administrative, financial, fiscal and technical character, intended to ensure the identification, research, inventory, rating, tracking, preserving, including custody and maintenance, strengthening, restauration, and valorization of the historical monuments, and their social, economic and cultural integration in the local communities.

To preserve the historical monuments, legal economical measures are established. Public servitudes can be applied on historical monuments, legally established. The attribute of historical monument must be marked on the building by a note applied by the City Hall agents, according to the legal norms of signaling of the historical monuments.

The obligation regarding the usage of the historical monuments represents the act that defines the conditions and rules of usage or exploitation and maintenance of the rated real estate, called *obligation concerning the usage of the historical monument*, wich accompanies the title deed, concession act or leasing act, on the entire life of the monument in question.

The obligation concerning the usage of the historical monuments is a servitude constituted in the building`s benefit, and it is inscribed in the Land Register by the owner, in a 30 days term from the comunication date.

The obligation concerning the usage of the historical monument is a part and parcel of the Technical Book of the monument. In case it doesn`t exist, the obligation concerning the usage of the historical monument holds place for the techical documentation of the utilization of the real estate, according to law.

The protection area of the historical monuments represents the field areas with the afferent immovables delimited by the town plans, approved according to law; wich establishes rules regarding the works execution.

Until the establishing of the protection area of each historical monument, according to art. 8 from *422*/2001 law, it is considered protection area the surface defined by a radius of 100 m in the urban localities, 200 m in the rural localities and 500 m outside localities, measured from the outer limit, around the historical monument.

The protected area represents field areas with te afferent immovalbes, situated in the urban area or outside it, delimited by the town plans, approved according to law, wich establishes the rules for interventions in the built or natural protected areas.

The following historical propertie can be protected:

a) urban and rural historical configurations, along with natural or cultural landscapes and their topography;

b) historical architectural buildings and urban complexes and their configurations;

c) urban or rural architectural works, along with afferent accessories and surroundings;

d) cemeteries, parks and gardens, and other forms of organized landscape;

e) fortifications and other military works;

f) water tanks along with technical afferent equipment;

g) archeological sites and every object discovered during the archeological research, including ground degradation or improving, such as caves, mines, castles, graveyards;

h) ethnographic buildings, such as typical urban or villages habitations;

i) industial buildings, structures, manufactories, equipments additions or improvement for mines, workshops, steel works, that reflect the industry, culture and science development, wich are characteristic for old and new forms of businesses and industries;

j) places and buildings that reflect traditions or commemorate historical events or the activity of eminent people or institutions;

k) other properties that deserve the monuments being conserved because of their scientifical, artistic, historical or cultural value.

3. Aspects Regarding the Uniqueness of the Historical Properties

Elements that differentiate the historical estates from the other ones include:

a) high level of legal protection;

b) architectural, historical, scientifical or artistic value;

c) limitations concerning: their availability, their removal, any change in their utilization, modernization works;

d) the obligation of making them accessible to the community, and for scientifical and education purposes.

The elements that differentiate the historical estates from the other estates include:

a) the aspects of the immediate vicinity, as a part and parcel of the real estate-field, settlement, sights of the property and its background;

b) rare occasions when they appear on the market;

c) frequently, the partial or complete modification of their initial utilization.

4.Data Sources and Informations about Historical Properties

Before beginning the evaluation process, the evaluator must gather sufficient data and information about the historical property, allowing him to make an evaluation that considers all relevant factors. The data sources and informations about the current status of the real estate inscribed in the Building Book, cultural and historical values, and preservation works include (besides the sources that are usually engaged in the evaluation process) documents contained in the Building Book.

These documents can include (depending on the property's location)

a) the official decision that rates a cultural asset as a listed property;

b) any kind of demonstrative paper;

c) iconographic and photographic documentation;

d) any kind of legal documentation;

e) any kind of technical documentation about the preservation or other works concerning the monument;

f) records about foregoing preservation works, along with estimations about the cost of these works and the finance sources;

g) any other documents that define unique aspects of the historical property.

In the case of historical properties that are not included in the record and rating register, the evaluator must search data and informations wich will probably be put at his disposal by the culture directorat who administrates the monument. The typical sources can be

a) historical documentation; inventory;

b) descriptive or illustrated documentation;

c) iconographic or photographic documentation;

d) stipulations of the local maps regarding the real estate's position, or other decisions concerning the development conditions.

Documents and specialist's opinions can be used as an informig source if, according to the evaluator; they are indispensable in the evaluation process.

5. General Rules for Determining the Historical Property's Value

Before attempting to determine the historical property's value, the evaluator must consult the authorities responsible for the historical properties, congruent with the historical properties maintenance laws.

In the case of historical properties, wich contain mostly parks, gardens, forests and other landscape areas, authorities can be involved, beside those who deal with real estates consisting mostly in buildings.

Unless legal stipulations furesee otherwise, the historical property's value must be determined as the integral value of the field and its improvement, including close surroundings, landscapes, external influences about the properties, with a particular attention on the environment elements that can increase the property`s value, by amplifying the landscape's characteristics.

If the evaluation process requires the separate determination of the value of the field and other elements, the evaluator must keep in mind that the sum of the real values of separate elements is not always equal to the property's value. As a part of the historical properties evaluation process, the evaluator must consider the criterion he will adopt in approaching the method and technique, with a special attention on

a) any kind of decisions from the authorities responsible with the maintenance and preservation of the historical real estates;

b) local maps stipulations concerning the usage of the historical real estate and its surroundings;

c) the purpose in which the evaluation and the evaluation report will be used;

d) data and market informations availability;

e) the repair condition of the real estate to be evaluated;

f) any other circumstances concerning the historical character of the real estate.

The value of the historical property is determined after the simultaneous consideration of the technical state and actual usage, wich can differ from the authorisation emitted by the qualified authorities. In the last case, the value must be diminished by the sum of the costs required to bring the real estate at the actual exigencies level.

If the legal stipulations do not specify the method which must be used for the value establishing (market value or substitution value), the evaluator determines both values, and adjusts them, thus justifying the final result.

If the real estate or any of its elements have been introduced in the building list registry, the evaluation must not consider any other special condition concerning the sale, the establishing of any successor or other legal title for the property usage, especially lease or tax exemption.

6. Determining the Market Value for Historical Monuments Real Estates

The market value for a historical property is obtained by adopting the comparison approach, or the revenue approach, depending on the current state of the real estate market, regarding the real estate`s position, grade, type and character.

Due to the unique character of the historical monuments real estates, it is also necessary the utilization of the informations from the following real estates markets:

a) local market;

b) regional adjacent markets;

c) national or inter-regional market (concerning similar real estates from the point of view of the type and function);

d) international markets (concerning real estates with peculiar significance, unique value).

The market value of a historical real estate that generates or could generate incomes must be considered by approaching and utilizing income based techniques. The evaluator must consider the benefits obtained, and as well the costs to be stood up, along with the legal requirements concerning the real estate’s protection, and the limitations which the owner or the occupant will be subject to, such as

a) the owner’s or tenant’s benefits (rent, incomes from businesses with the real estate, the unique prestige and attraction by the real estate);

b) the costs of real estate usage or tenement;

c) the costs of financing need, for the real estate’s improvement, imposed by the authorities for the preservation;

d) any limitations imposed by the real estate’s uniqueness;

e) any connection with adaptation or preservation works, requested to bring the real estate to the imposed state;

f) any limitations concerning the possibility of extending the expectation period for the technical documentation, wich is a condition for receiving the approval for the preservation or construction works;

g) any tasks related to the requirement of using traditional methods in the preservation works, that can involve high price building materials, and high qualified specialists in civil engineering or preservation works, forestry specialists, or landscape artist to upkeep the adjacent area of the real estate;

h) any other obstacle of individual nature that depends on the real estate's type and prestige.

Historical real estates that at the evaluation date do not have a commercial character can be evaluated using the income method only in special cases, if at the cost accounting can not be used the comparison method, and when the purpose of the evaluation requires determining the market value of the properties, for alternative usage. In these cases, the evaluator must justify in detail the presumptions used in his analysis, which can not appear in the preservation authority's requests.

The market value determination for the historical property using the comparison method is based on the trade affair market value of the similar properties (as type, rank, number and functional character). When making such an evaluation, the following aspects must be considered:

1. *Physical aspects*

a) location;

b) acces to transportation facilities;

c) the nature of close vicinities;

d) the field area;

e) technical – economical parameters of the building;

f) the position of the mentioned elements, and the relation between them, the state of usage;

g) the state and character of the media services;

h) the possibilities of development, congruent to the special conditions, imposed on the real estate, and the development plans stipulations.

2. *Non-physical aspects*

a) the unique attraction of the location, and spatial–architectural hypothesis;

b) the homogeneity of the style and the architectural form aestethics;

c) the historical and cultural value;

d) the sparseness of historical properties in the limited real estates market.

When using the comparison method, the real estates to be compared with must be choosed adequate by the evaluator, depending on their relevance. When choosing similar market transactions, legally restrained transaction must be omitted. In cases when circumstances (such as limited database) obligate the evaluator to consider these transactions, the data must be adjusted, and the evaluator must justify these corrections. When comparison method is used, it is not utilized a statistical market analysis, considering the individual characteristics of the real estates, and the limited transactions on this market.

7. Determining the Replacement Value of the Historical Monuments Real Estates

The replacement value of the historical real estate is equal to the reconstruction costs minus the devaluation; this represents the sum of the market value of the field and the replacement value of all the improvements and real estates (buildings and other immobilized elements, as well as natural elements). The replacement value of the historical monuments real estates can not be, in any circumstances, perceived as the market value.

The replacement value is detemined by using

1. The comparison approach, regarding the field evaluation (*e.g*. cost accounting of the field).

2. The constructive approach, to determine the replacement value of the buildings and other real estates.

In legal specified cases that require a separate evaluation of the land, the evaluator must choose a comparison approach, given that for unbuilt space he must not consider trade affair prices of the rural fields or forests for his comparison. In special cases, if disposing of sufficient data, the evaluator will evaluate such a field with the composite technique, the residual method that uses the present usage income method and a cost analysis for the necessary investment funds in order to achieve the necessary exigencies. The result of subtracting the last from the first represents the residual value of the field.

In the cost method, the evaluator determines the replacement value of the ordinary buildings. By using the cost method in the historical monuments real estates evaluation, the technique of the replacement cost is not used. The replacement value calculation requires a detailed analysis of the real estate`s status from the evaluator, analysis wich must include the determination of the devaluation level, as well as the loss of architectural details and functional character of the real estate, construction elements and combination of these elements if they constitute an architectural entity.

To determine the devaluation levels above mentioned, further considerations must be made, concerning the costs of bringing the real estate to the following stage:

1. The stage of total technical usage of the real estate.
2. The stage of total architectural and cultural value.
3. The stage of total functional usage.

The repair level must be correlated to the guidance validated by the preservation authorities. The costs involved by bringing the real estate to the above stages must be compared to the actual value loss of the real estate.

Except from the case of contrary legally stipulations, the evaluator must effectuate the real estates and their elements evaluation, and when determining their market value or replacement value, to utilize adequate evaluation methods and techniques, and to pay attention to

a) the landscape integrity, which denotes the harmony between natural surroundings and the real estate's architecture;

b) the landscape's attractiveness, which reflects the environment's influence on the close vicinity of the architectural elements, who has a visible effect on the whole historical monument real estate;

c) using the landscape and space, which combines the utility of a certain environment element with the architectural and spatial structure of the real estate concerning possible preservation works.

These can be

a) preserving or maintaining the actual state;

b) renewal and exposure of the elements that block the settlement, replacing the missing parts;

c) adapting, which, besides preservation works, requires changes in composition related to the introduction of new function;

d) restitution, replacement based on the original and iconographic materials, disaffection due to lack of historical style, over investment or over decorating the historical monuments real estate.

The mentioned elements influence the real estate's value more than the environment elements, who do not usually have an intrinsic value, because of the limitations to which are subject.

If the evaluator considers the above conditions in his evaluation, he must always justify the influence which these aspects had on the evaluation's result.

Received, December 2, 2009

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R E F E R E N C E S

1. Curinschi Vorona Gh., *Restaurarea monumentelor istorice.* Edit. Tehnică, Bucureşti, 1968.
2. Georgescu E.-S., *Compatibilitatea şi reversibilitatea intervenţiilor structurale la construcţiile monumente istorice în zone seismice*., Tribuna Construcţiilor, *215-222* (2003).
3. Nistor C., Troia L. *et al.*, *Consolidarea si intreţinerea construcţiilor*. Edit. Tehnică, Bucureşti, 1991.

4. Crişan R., *Reabilitarea locuirii urbane tradiţionale*. Edit. Paideia, Bucureşti, 2004.
5. * * * Legea *422*/2001 privind protejarea monumentelor istorice.

ASPECTE REFERITOARE LA EVALUAREA MONUMENTELOR ISTORICE

(Rezumat)

Se prezintă criteriile de analiză structurală şi parametrii de comportament obţinuţi pe studii de caz, cuantificaţi prin coeficienţi care permit stabilirea gradului de vulnerabilitate pentru construcţiile monument istoric.

Totodată autorii selectează criteriile de bază utilizate în stabilirea lucrărilor de intervenţie pentru siguranţa structurală şi funcţională a monumentelor istorice sau a construcţiilor amplasate în situri istorice, în concordanţă cu problemele de compatibilitate dintre materialele noi şi vechi şi cu tehnologiile utilizate.