ANALELE
UNIVERSITĂŢII DIN CRAIOVA
- SERIA GEOGRAFIE -

ANNALS
OF THE UNIVERSITY OF CRAIOVA
- SERIES GEOGRAPHY -

ANUL 2011, VOL. XIV

E U C

E D I T U R A U N I V E R S I T A R I A

2 0 1 1

ANNALS OF THE UNIVERSITY OF CRAIOVA
- SERIES GEOGRAPHY -

Review approved by CNCSIS
We exchange similar publications with similar institutions of our country and from abroad

Address:
University of Craiova, Faculty of Social Sciences,
Department of Geography, Al. I. Cuza Street, no. 13, 200585, Craiova, Romania
Tel. 0251/414548, 419503, Int. 4110, Fax: 0251418515,
e-mail: geography@central.ucv.ro, costelaiordache@yahoo.com
website: http:// cis01.central.ucv.ro/geography/
http://analegeo.ro/
ISSN: 1224-4112

CONTENTS

METEOROLOGY AND HYDROLOGY

GEOMORPHOLOGY

HUMAN GEOGRAPHY

TOURISM GEOGRAPHY

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

ANALYSIS OF 24-HOUR MAXIMUM PRECIPITATION IN NORTH-EASTERN BULGARIA THROUGH RELATIVE PERCENTAGE CRITERION

ANALIZA PRECIPITAŢIILOR MAXIME ÎN 24 ORE ÎN NORD - ESTUL BULGARIEI CU AJUTORUL CRITERIULUI PROCENTAJULUI RELATIV

Nina CHENKOVA[1]

Abstract: The paper presents the results of investigation of the 24-hour maximum precipitation in the region of North-Eastern Bulgaria by applying the relative criterion of Fukui. According to this criterion, 24-hour precipitation equal to or exceeding 10% of the yearly rainfall amount is "extraordinarily heavy rainfall" and this rainfall has significant effects on river flow, soil, natural and agriculture vegetation.
The criterion was applied to 24 stations from the National meteorological network during the period 1992-2008. The territorial and temporal distribution of 24-hour maximum precipitation and their impact on the natural complex and the society are analyzed.

Key-words: North-Eastern Bulgaria**,** 24-hour maximum precipitation, relative percentage criterion, floods
Cuvinte cheie: Nord-Estul Bulgariei, maximul precipitațiilor în 24 ore, criteriul procentajului relativ, inundații

Introduction

It is important to determine the regularities, both in theoretical and practical aspects, in terms of regime and territorial distribution of pouring and intensive (heavy) precipitations. We are witnessing the negative effects of heavy rainfalls during the recent years - floods, soil erosion, landslide activation, problems with the hydro-technical, transport and drainage infrastructure, which is tightly connected with considerable property damage and financial losses.

There are different quantitative criteria that are used for defining torrential (heavy) precipitations. When measuring the maximum precipitation of a 24-hour period, those considered potentially hazardous for Bulgaria are: quantities equal or

[1] "Konstantin Preslavsky" University of Shumen", Faculty of Natural Sciences, Shumen, Bulgaria

above 50 mm/24 hours (Tishkov, Vladev, 1999) or 20-25 mm/24 hours (Velev, 1990). Those are not the only opinions expressed upon hazardous daily precipitation maximums (Sueva, 1960; Golub, 1973 etc.)

Fukui (1970) introduced the relative percentage criterion that would define, the measuring of 24-hour maximum precipitation that is to be included in the category of "hazardous rainfalls". In his view, each measured daily precipitation quantity, exceeding 10% of the annual precipitation amount (for the respective year) is defined as extraordinary heavy rainfall that causes considerable negative effects on the river flows, soil surface and vegetation (natural and cultivated). The author suggested the relative percentage index is to be used instead of absolute values as it would be of bigger practical importance, because the hazardous precipitation depends on the rain conditions during the respective year.

The Fukui criterion is applied by Penkov (2002) for his research of spatial distribution of maximum precipitation quantities for 24 hour duration in Bulgaria.

The objective of this research is to determine the regularities in territorial distribution and the temporal variability of 24-hour maximum precipitations in North-Eastern Bulgaria, by applying the relative percentage criterion.

By using both absolute and relative percentage criteria for the research of a certain region, we have the chance to compare the obtained results.

Object, data and methods

Special scientific interest is expressed in heavy precipitation of North-Eeastern Bulgaria, because this region is one of the driest in the country, regarding the non-precipitation periods that last more than 10 days (Kyuchukova, 1991). The annual rainfall amounts in the eastern part of the country are the smallest in Bulgaria (below 500 mm). In Krasen weather station (in the region of Dobrich) and Vetrino (in the region of Varna), annual absolute rainfall minimums (146 mm and 168 mm, respectively) are reported (Geography of Bulgaria, 2002). That is the reason why the recorded cases of heavy precipitation, compared to the drought periods, during the warm six months of the year, has turned out to be natural disaster.

The geographic area of North-Eastern Bulgaria, from a natural-geographic point of view, is outlined by the following borders: the river Danube to the North; the land border with Romania to the North-East. The western border is the watershed between the Yantra River and the Rusenski Lom River. To the south, the area stretches as far as the Fore-Balkans. It is bordered by the Black Sea to the East.

The relief is predominantly occupied by lowlands, plateaus and hills.

The catchment of the Rusenski Lom River (with its tributaries: the Beli, the Cherni, the Malki Lom), the Provadiyska and the Botova Rivers run only on the territory of North-Eastern Bulgaria. The Golyama Kamchiya River appears to be a transitional river. Its northern tributary – the Vrana River flows through utterly plain relief. The widely-spread karst limestone in Ludogorie-Dobrudzha plateau, is the reason for the insignificant surface flow here, but still there are many dry valleys with episodic flow (the Voina, the Krapinets, the Senkovets etc).

The climate in North-Eastern Bulgaria is moderate-continental, as the continental influence is more severe here in comparison to the rest of North Bulgaria. In the context of the prevailing northwestern winds during the year, one of the climate features is the importance of northeastern cold winds for the climate formation during winter. Strong, dry winds, blowing from northwest, are usually recorded. They are formed in the South Russian and Ukraine steppes every summer. They cause prolonged dry periods (over 10 days - Kyuchukova, 1991). Due to the expressed continental climate from west to east, the Black Sea coast is characterized by small annual precipitation amounts (Varna, Shabla). As a whole, the hilly and uneven relief in North-Eastern Bulgaria is the ground for the scattered precipitations distribution, as the windy north and northwestern slopes of mountains, plateaus and hills are characterized by heavier rainfall amounts. The precipitations in the region have a continental regime, with a summer (June) maximum and winter (February) minimum.

The study is carried out on the basis of daily data regarding the precipitation amounts, measured in 24 weather stations (rain-gauge) of the National Meteorology Network (towns and villages), located in North-Eastern Bulgaria during the period 1992-2008 (17 years). Most of the analyzed stations are located in river valleys and dry valleys. In 2005 and 2007, some of these stations recorded heavy (even record) precipitation amounts, which caused floods and significant damage of properties.

In every station, the cases of 24-hour rainfall which either equal or range above 10% of the precipitation amount for the respective year are highlighted. The frequency rate is calculated for the need of comparison (the number of cases is divided by the number of the observed years). It is presented as relative values – 0.1; 0.2 etc.

Research results

According to Fukui criterion, the territory of Bulgaria can be divided into two districts with roughly the same territorial scope - one with cases in which the frequency rate is below 0.1 and the other with rate of above 0.1 (i.e. below and over 1 case for 10 years) (Penkov, 2002). North-Eastern Bulgaria belongs to the district with precipitation frequency above 0.1. It should be mentioned that according to the present research, this is the district that encompasses most of the weather stations where the frequency rate is 0.2 and 0.3. The results are shown in Table 1.

From all the 24 researched stations, only three frequency rate of 24-hour maximum precipitation above 0.1 is recorded (Glavnitsa, Vetovo and Provadiya). Two stations have frequency rate of 0.1 (Kaynardzha and Novi Pazar). In the other 19 stations, the rate is 0.2 or more. It should be noted that in 5 of all stations, the recorded frequency rate is 0.3 (Samuil, Topchii, Tsar Kaloyan, Venets, Vladimirovo) and in 4 stations - the rate is 0.4 (Krushari, Harsovo, Karapelit, Vetrino). In the last case, rainfalls above 10% of the annual precipitation amount are registered every 2.5 years on average.

It is important to highlight that in the majority of cases, the analyzed 24-hour precipitation maximums (above 10% of the annual rainfall amount) are not notably heavy. Excluding the maximum absolute values, the predominant daily amounts vary between 50 and 80 mm.

There are particular cases with significantly lower precipitation quantities (30-40 mm), even 25 mm.

Table 1

24-hour precipitation maximums by percentage criterion in North-Eastern Bulgaria in the period between 1992 - 2008

1- frequency of 24-hour precipitation
2- maximum 24-hour precipitation, mm
3- date
4- % from the respective annual precipitation amount
5- other cases - rainfall above 100 mm; two cases above 10 % for a year

Station	**1**	**2**	**3**	**4**	**5**
Isperih	0.2	136	August 8, 2006	15	
Samuil	0.3	158	July 2, 2006	23	
Alfatar	0.2	62	September12, 2003	10	
Glavinitsa	below 0.1	52.7	January 2, 2001	10	
Dobrich	0.2	75.2	September 3, 1999	11	
Krushari	0.4	66.5	April 28, 2008	16	
Vetovo	below 0.1	84.7	August 27, 2007	13	
Chereshovo	0.2	55.6	July 13, 1994	10	
Topchii	0.3	126	October, 2, 1992	25	
Yonkovo	0.2	67	August 8, 2007	11	
Harsovo	0.2	82.6	August 8, 2007	12	
Tsar Kaloyan	0.3	291	July 7, 2007	31	121 mm; 2 cases in 2007
Kubrat	0.2	77.5	September 5, 1999	12	
Sitovo	0.2	66.4	September 5, 1999	11	
Kaynardzha	0.1	75	September 4, 1999	12	
Dulovo	0.2	109	September 5, 1999	16	
Novi Pazar	0.1	192.2	July 3, 2005	18	
Harsovo, Shumen.	0.4	85	August 28, 2006	19	
Todor Ikonomovo	0.2	94.5	August 29, 2006	17	
Venets	0.3	112.2	August 29, 2006	16	102,5
Karapelit	0.4	103	May 23, 2008	19	2 cases in 1999 and 2 in 2008
Vladimirovo	0.3	108	September 4, 1999	20	2 cases in 1999 and 2 in 2008
Vetrino	0.4	75	September 4, 1999	16	2 cases in 2001
Provadiya	below 0.1	56.8	July 13, 1994	11	

It is clear that by applying the percentage criterion, it is possible to distinguish, not only the extreme maximum rainfalls, but also the frequency rate of smaller precipitation quantities, which would not be included the category "heavy" and "hazardous" if using the absolute value criterion.

When studying every case of those with 24-hour maximum precipitation above 10%, it can be noticed that in the majority of stations, at least one case of rainfall amount above 15% is recorded.

Larger rate (over 20%) of annual precipitation amounts is registered in the following cases - Samuil in 2006 (158 mm - 23%), Topchii in 1992 (126 mm - 25%) and Tsar Kaloyan in 2007 (291 mm - 30 %). The last one is ranked in the list of absolute maximum 24-hour precipitation quantities in North-Eastern Bulgaria - above 250 mm. Those are cases of record elemental rainfalls, as the consequences were natural disasters. They are stated as absolute maximum quantities for Bulgaria in scientific literature, namely - in the town of Varna in August 1951 (258 mm) and the resort of St. Konstantine (342 mm) (Geography of Bulgaria, Sofia, 2002).

The risky natural phenomena in North-Eastern Bulgaria are also facilitated by the considerable number of registered cases of precipitation quantities above 100 mm and by the cases with two rainfalls above 10% in one year.

From a genetic point of view, the 24-hour precipitation maximums are determined by the moist and unstable air masses pushing in/penetrating through cold fronts of the Atlantic cyclones and colder and occlusion fronts of the Mediterranean cyclones. Considerable precipitation amounts are recorded in the presence of well-developed cyclones or occlusion, as a cold front of cyclones, when the effect of the cold front in the precipitation field is intensified by strong thermal convection. It is also essentially affected by the processes, provoking intramass precipitations.

The concentration of extreme heavy rainfalls in the region is due mainly to the relief, namely the plateaus and heights there. Those places, with the highest precipitation frequency rate by applying the Fukui criterion, are defined by the orography. This regularity is also determined by other authors, who analyzed the precipitation within the region (Tishkov, Vladev, 1999).

According to Koleva and Peneva (1990), in the regions with moderate continental climate, such as the analyzed region, the 24-hour precipitation maximums are recorded in May and June (20-30% of all cases). The frequency rate remains high in July and August: 10-15%. It decreases in autumn, and reaches its minimum in winter - around 0-5%.

The application of the percentage criterion when studying the period between 1992 and 2008 shows different trends in the interannual variability of precipitation maximums distribution. The greatest number of registered cases is in September (27% of all cases of rainfalls above 10% of the annual precipitation amount); then comes August (24%) and July (15%). The frequency rate is low during spring (3-5%), as its value is higher in January (9%). In none of the

analyzed stations in North-Eastern Bulgaria during February 24-hour rainfall fitting the Fukui criterion has been registered.

Consequences

The high frequency rate in August and September coincides with the frequent dry periods that are typical for the climate in North-Eastern Bulgaria. During those months, the dry periods last for 16-19 days, on average; and the periods over 20 days - 21-24 days and nights (Tetovski, 2004). The combination of these conditions serves as a ground for the formation of catastrophic high waters and with significant consequences - destruction of the surface soil layer, intensified erosion processes, mud streams, landslides activation (Penkov, 2002).

The concentration of a large number of stations with considerable precipitation maximums frequency rate above 10% in North-Eastern Bulgaria (one of the driest regions in the country, as previously mentioned), indicates the vulnerability of this territory to extreme rainfalls (past and future) and the subsequent consequences.

The high waters are typical features of the effluent variability of the rivers, flowing through the territory of North-Eastern Bulgaria. In most cases, it causes floods with significant damages. Erosion and accumulation processes appear because the dried soil (especially during summer and at the beginning of autumn) lay down the conditions for the formation of mud and stone streams when raining heavily. The heavy day and night precipitations determine the activation of landslides (not only along the Black Sea coast, but also inland).

Some of the biggest floods, which caused significant property damages to people and nature, are recorded in North-Eastern Bulgaria. For example, as a result of the heavy rainfalls during July 2005, the Provadiyska River and the Golyama Kamchiya River swept over buildings, roads and farm lands. In August 2007, Tsar Kaloyan municipality declared emergency to pouring rainfalls which caused a small dam to overflow and the Hlebarovska River, tributary of the Beli Lom River burst its banks. The consequences were: flooded buildings and roads and 8 casualties. In September, Rusenski Lom River overflowed buildings and farm lands. It resulted from torrential rainfalls. More examples can further be given.

Conclusion

The main conclusions to be drawn about the 24-hour precipitation maximums in North-Eastern Bulgaria by applying the 10% percentage criterion are the following:

In the period between 1992 and 2008 at least one case of 24-hour precipitation above the limit of 10% has been recorded in 21 out of 24 researched weather stations. This is a very significant phenomenon regarding the considerable short duration of the studied period (17 years).

Five of all stations registered frequency rate 0.3 and four stations - even 0.4 (i.e. at every 2.5-3 years have been recorded rainfall quantities of 10% above the

annual precipitation amount). This frequency rate is high regarding the weather conditions in Bulgaria.

The repetition of 24-hour precipitation maximums, above the 10% limit, in North-Eastern Bulgaria is the greatest in August and September, when dry periods are the most frequent. The combination of these weather conditions lay down the foundations for elemental natural phenomena in the region, causing considerable negative consequences for nature and community.

REFERENCES

FUKUI, E., (1970), *Distribution of extraordinarily heavy rainfalls in Japan*, Geographical Review of Japan, 43-10, p. 581-593

GOLUB E., (1973), *Spatial and time characteristics of heavy rainfalls*, In: Hazardous hydrometeorological phenomena in the Ukrainian Carpathians, p. 46-54

KOLEVA E., PENEVA R., (1990), *Climate guide - Precipitations in Bulgaria*, Bulgarian Academy of Sciences, Sofia

KYUCHUKOVA, M., (1991), *Droughts*, In: The climate in Bulgaria, Bulgarian Academy of Sciences, Sofia, p. 238-240

PENKOV I., (2002), *Territorial distribution of 24-hour precipitation maximums in Northeastern Bulgaria by percenrage criterion*, Symposium from a science conference in memory of Prof. D.Yaranov, Varna, p. 122-132

SUEVA, V., (1960), *Characteristics of maximum daily rainfall in Northeastern Bulgaria*, Hydrology and meteorology, № 2, p.53-62

TETOVSKI M., (2004), *Dry periods in Northeastern Bulgaria*, Symposium "Natural sciences", Shumen, p. 373- 378

TISHKOV H, D. Vladev, (1999), *Potentially dangerous (risk) precipitations in Bulgaria*, Scientific Session "25 years University of Shumen", p. 159-167

TOPLIYSKI D., (2006), *The climate in Bulgaria*, Sofia

VELEV, St., (1990), *The climate in Bulgaria*. Sofia, p.73-88

VLADEV D, CHENKOVA N., STANKOVA S., PENERLIEV M., VLADEVA P., KRASTEV T., (2010), *Degree Evaluation of the Extreme (Heavy) Precipitations Vulnerability in Northeastern Bulgaria*, Shumen University year-book, volume XXB4, Shumen, p. 23-36

******* (2002), *Geography of Bulgaria*, ForCom, Sofia

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

GEOGRAPHICAL PARALLELS TO THE REACHES OF THE RIVERS THE DANUBE AND THE DOURO (RIVERS OF DESTINY BY DESTINY OF RIVERS)

COMPARAȚII GEOGRAFICE PRIVIND PARTICULARITĂȚILE ARTERELOR HIDROGRAFICE DUNĂREA ŞI DUERO (RÂURI ALE DESTINULUI PRINTR-UN DESTIN AL RÂURILOR)

Stela DERMENDJIEVA, Helena PINA, Slavi DIMITROV[1]

Abstract: The Danube and the Douro rivers are geographic objects of international importance as a result of their direct influence on the territories surrounding them.
The present article attempts to make a geographic parallel on the importance of both rivers in their respective geographic locations - Southwest Europe and Southeast Europe. It explores the influence of Douro River on Northern Portugal and the Atlantic, as well as the history of the Eastern-European people who resided alongside the Danube River. Moreover, it also examines the future of the lands they occupy.

Key-words: integration, rivers, the Danube, the Douro
Cuvinte cheie: integrare, râuri, Dunărea, Duero

During the last decades of the 20th century, humankind enters upon a new information era when globalization in all spheres changes the conditions for existence of the elements of the social system – politics, science, education, economics and culture. The Danube River is not only a natural Northern border of Bulgaria, but also a main socio-cultural axis and a bridge connecting it with the European family. It is a window on the culture of the Old continent and a connecting section in contemporary integration processes.

Bulgaria is the Southeastern gateway of Europe to the Near East. Its territory acts like a bridgehead to the European values, and also a condition for the more effective uniting of the continent in global aspect. Geographically situated in the periphery, this position has some advantages – direct contact with other continents, other cultures, generating a buffer territory effect, which can have a strengthening influence on the state.

[1] Department of Geography, "St. Cyril and St. Methodius" University of Veliko Tarnovo, Bulgaria

The diversity of cultures, the result of different manners, customs and traditions involves a lot of spectra, but also demands consolidation. It is based on the main infrastructure lines of communication in Europe, one of which is the Danube. The river has uniting functions and "takes care of" straight corresponding with its state territories as well as remote lands.

The Danube is the longest European river after Volga, but it is most cosmopolitan. The outlet to its banks offers incredible chances to many countries. Through the river they project in the spiritual and economic life of the continent and the planet.

The Danube has the role of a uniting life-giving force for Bulgaria. Through it, in our country comes the whiff of European culture – first in Vidin and Ruse and later in the interior of the country.

The topic examining the Danube has a huge scientific file and presenting whatever aspect of it is too obliging.

It demands two main questions to be clarified: to clarify the meaning of the term 'borders' as a cultural and political marker of human development and to compare the definition of 'our' Northern, historical, geographical and cultural border with the emblematic meaning of the river as a factor of the trans-border cultural, political and economic activity of the countries from Central and South-Eastern Europe.

Comparative and descriptive methods, as well as actual statistical data from the National Statistical Institute and Eurostat have been used.

Etymology and Geography

There is no other river in the world with so many names – *Istros, Danuvius, Dunaj*, *Duna, Duná, Tuna, Dunav, Dunărea*… and having such a rich biography – both geographical and historical. Its riversides have been crossed by Thracians, Celtics, Scythians, Romans, Hellenes, Bulgarians... The river curve has been the outline of empires, the beginning of a new life for many peoples, but also a reason for conflicts and wars.

The Danube is the only river, flowing from the West to the East, crossing the continent against the logic of geological structures. That's why it is difficult to find aa better symbol of natural unity of Europe. The distance from its sources in the Schwarzwald Mountains in Germany to its delta, where it flows into the Black Sea through three branches – Chilia, Sulina and Saint George – is 2,859 km.

The Danube becomes navigable after it receives a lot of Alpine tributaries. About 30 from its 300 feeders are also navigable. Its tributaries come from seven other countries, besides these through which it flows. Some of them are important rivers, navigable for barges and shallow-draft river ships. More important are: the Inn (flowing into the Danube near Passau), the Morava, the Drava, the Tisa, the Sava (influx near Belgrade) and the Prut. In some places, the Danube reaches more than 30 m in depth.

Many of the Bulgarian rivers run into the Danube and the majority of them are artefacts of the social and economic development of the country. In that sense, they are also historical and geographical cultural markers.

- **The Timok river** has a specific position in the Bulgarian space and time. Its name derives from the Thracian 'dark', i.e. dark river. The Roman castle Tierna was situated on its mouth.
- Afterwards, the following rivers are: the **Topolovets, the Voinishka, the Vidbol, the Lom, the Skat, the Ogosta** (named after the Roman fortress Augusta).
- **The Iskar river** (*Oskios*, later Eskus), is the biggest Bulgarian feeder and is in many ways unique: the oldest river on the Balkan peninsula and the only one which kept its initial flow after the big changes of the earth surface; the only river that rises from South Bulgaria (the Rila Mountains), crosses over the Stara Planina, forming the incredible Iskar gorge (an inspiration for many popular Bulgarian poets and writers); and the only catchment area on the Bulgarian territory that is situated between the Black Sea and the Aegean Sea.
- **The Vit river** has a relatively large catchment basin and asymmetrical valleys. Close to its mouth traces of the Roman fortress Utus have been found.
- In 1877 at the mouth of the **Tekirdere rive**r the Russian army crossed the Danube.
- **The Yantra river** has the biggest catchment basin (7,861 sqkm). The river formes picturesque curves around the hills of the old Bulgarian capital Turnovo (Tsarevets, Trapezitsa, Sveta Gora); before it runs into the Danube, the Yantra river makes the confluence with its left feeder, the Studena river. Close by, the Roman castle Yatrus is situated.
- **The Rusenski Lom** is the Danube's largest feeder in the eastern part of the Danube plain. The nature park of the 'Rusenski Lom' in the vicinity of Ivanovo village is the home of the monastery St. Archangel Michael, which is one of the UNESCO world heritage sites.

The islands in the Bulgarian section of the Danube:

- Bulgaria has 57 Danube islands which are estimated to 86 square km.
- The **Vardim island** is 4.9 squarekm (right after Belene). The reserve 'The old oak' is situated on its territory.
- Opposite to Batin island, the remains of the Roman castle Sakidava can be found.

Close to the city of Ruse is the island Lulak (Lilac).

Historical notes

A bridge to Western Europe, but also between Western Europe and the Black Sea, the road giving access to Constantinople, as if the Danube has accumulated in itself the main history of the Balkans – "historical", as well as mythologized. If we paraphrase the most generalized meaning of the name of the

Danube river – "flow, run through", the flowing "through time, space, people", the Danube is the "eyewitness" of the earliest civilization activities of peoples, inhabiting from antiquity the wide geographical region through which it flows. Being a main waterway through mainland and at the same time border, dividing this mainland, it has attracted to itself in its valley different ethnoses. For the time of its existence, at least in the memory of people (mythological and historical), the Danube unites and disunites, disunites and unites unusually wide conglomeration of peoples, languages and traditions. In this sense, it has always been and it remains a giant bridge/mediator and in the same time – a border.

Especially significant is the role of the Danube river in the Slavonic history. During the centuries of Ottoman rule, when the inconstant political borders from the time of the Balkan Middle Ages lose their concrete outlines, in Bulgarians' opinion, the Danube is the only one, exactly fixed, and not an imaginary border line, which closes the Bulgarian space.

As a merchant connection, the Danube begins to be used during the 18th century, preserving this significance until now. Mary Theresa, the queen of Hungary from the Habsburg dinasty, forms a group, which had to regulate sailing along the river. It has been considered that the first commercial ship sailing took place in 1830 from Wien to Budapest. During the XIXth century, the Danube becomes an important commercial connection between the Western and the economies of the Balkan peninsula.

Area

The border between Bulgaria and Romania stretches on the distance of 610 km, and 470 km of them follow the stream of the Danube River.

Eight Bulgarian provinces are situated alongside the Bulgarian-Romanian border. They are administrative units (level NUTS III), which belong to the following three regions (level NUTS II):

- provinces Vidin, Vratsa, Montana and Pleven (Severozapaden region);
- provinces Veliko Tarnovo, Ruse and Silistra (Severen tsentralen region);
- province Dobrich (Severoiztochen region).

They cover an area of 32,613 sqkm.

Population

The number of population is 1,841,701, and the average density is 66 people per sqkm. (NSI, 2010).

There are significant differences among the distribution of population between urban and rural inhabited regions, in the presence of high-urbanized provinces on one hand (in Ruse more than 70% of the population lives in towns) and low-urbanized provinces on the other hand (only 45% of the population of Silistra live in towns). The percentage distribution between urban and rural

inhabited regions is almost 2/3 to 1/3. The demographic tendencies for the region as a whole, show that its population is aging and the labour force is decreasing.

The low density of population and the model of scattered settling outline the peripheral and rural character of the bigger part of the region. The economic status (wage rate, income and employment) of the rural areas is low as a whole. The general character of changes during the last decade supposed the concentration of population around larger settlements. In the whole cross-border region, especially rural areas suffered from the constant migration.

Economics

The economic results of border territories are very weak, as compared to the average standards of the European Union member states. GDP per capita of the population in the region is 3,400 euro (2008) lower compared to the average GDP of Bulgaria – 4,700 euro and that of the EU – 28,100 euro (Eurostat, 24.02.2011).

In the economic structure, traditionally dominates agriculture (especially under irrigation). The specialisation is based mainly on production of grain crops, vegetables, grapes and fruits, complemented by the stock-breeding sector. The predominant small family farms are distinguished by low productivity.

Industry develops mainly in town centres. In many cases, industry is represented by enterprises, connected with worsening production and they need reorganization. There are main economic centres as Pleven, Vratsa and Ruse, in which enterprising activity, foreign investments and productivity are relatively high.

There are good opportunities for the development of economic tourism (The Baba Vida Fortress, The Belogradchik Rocks, The Rock-Hewn Churches of Ivanovo, Lake Srebarna - a biosphere reserve under the protection of UNESCO and others.)

The Bulgarian Danubian settlements – cultural-historical markers

Vidin, Lom, Russe, Svishtov, Nikopol, Silistra play a vital role in Bulgaria's culture and urban development.

Vidin is the first big Bulgarian port, down the Danube. It emerged over the ruins of the old Celtic settlement of Dunonia. Later on, the Romans built a fortress and named it Bononia, called Bdin by the Bulgarians and Vidini by the Greeks. Since the second half of the 13th century, it became the main town of the Vidin Protectorate and during the second half of the 14th century was the capital of the Vidin Kingdom.

Vidin is the home of a few of the symbols of multiethnic symbiosis, political and cultural development: the wholly preserved medieval fortress Baba Vida; the oldest synagogue in Bulgaria; the mausoleum of exarch Antim I, who was the first Bulgarian exarch and the first chairman of the Bulgarian parliament.

- **Lom –** is founded by the Thracians, who called it Artanes. Later on during the years of the Roman empire the name changed to Almus. Its present name was first mentioned in 1704.

- **Nikopol** – is a successor of the ancient settlements Sekuristika and Nikopolis ('A City of Victories'). It became an important place during the Ottoman rule due to its strategic location.
- **Svishtov** is the successor of the Roman castle Nove.
- **Ruse** is the biggest and the most 'European' city among the Danubian towns. During the Ist century, the ancient fortreess of Sexaginta Prista was built on its grounds. During the IXth–Xth century, it was restored as a medieval Bulgarian settlement called Rusi (Russe). It gradually transformed into a well-embattled fortress, later on called Giurgevgrad. After the XVIth century, the town became Ruschuk.

Ruse was a part of the defence quadrangle Ruschuk-Silistra-Varna-Shumen during the Ottoman rule.

In 1935, Ruse became the headquarters of the state-owned company Bulgarian river sailing.

The construction of the Danube Bridge as well as the expansion of a ferry line contributed to the economic development of the city.

During the Middle Ages, Silistra pertained the role of an important fortress and a pillar for the Christianization of the population.

During the Ottoman rule, Silistra was a strategic administrative centre as well as one of the main ports along the Danube. After the World War IInd, Silistra was industrialized and industries such as electronics, chemical, textile and furniture production were developed.

The Srebarna Reserve (1997) is a UNESCO world heritage site.

- **Kozloduy,** a hometown to the first and so far only Bulgarian Atomic Power Station; **Tutrakan; Archar**; **Oryahovo; Gigen; Belene.**

They had their prime during the Roman empire rule, however, they are of secondary importance during the urbanization along the Danube nowadays.

Only Belene is an exception, due to the fact that the second Atomic Power Station is planned to be built in its vicinity.

The Danubian ports

- **Lom –** The Lom Port Complex, encompassing the ports Lom and Oryahovo is an important transport link to Western Europe and the Rhein-the Main-the Danube Channel.
- **Svishtov –** there are projects major industrial units to be built such as the Hydro-technical complex Nikopol–Turnu Măgurele, the Second Atomic Power Station, etc.
- **Ruse** is second regarding the shipment volumes. It is a focal point of two of the major European corridors – Seven and Nine.

The Bridges

- The first Bulgarian Danube bridge was built between Eskus (village of Gigen) and village Celei (Romania). It was opened for land traffic from Constantinople through the Troyan passage to Dakia in 328 AD and was destroyed in 376 AD. Until the middle of the 20th century, attempts for the construction of a new bridge were never made.

- The bridge Ruse-Giurgiu (The Bridge of Friendship) was built in 1954. Its meaning increases even more now, with the development of the European Corridor Number Nine (Helsinki–Aleksandropolis).
- Negotiations between Bulgaria and Romania led to the agreement of the construction of a new bridge between Vidin and Calafat and are considered to be an important precondition for the development of an European Corridor Number Four (Central Europe-Vidin-Sofia-Thessaloniki), which will arguably stimulate the economic, social and cultural development of Western Bulgaria.

The Danube has been and will be important, because it is:

- A 'river highway' for transport and shipment.
- A local factor for industrialization, in close connection to the import and export along the river.
- A factor for the development of agriculture on the productive lands alongside the Danube.
- An important factor for the development of industrial and sport fishing, recreation, sport and tourism.

In short, the Danube has been and still is a bridge/mediator and in the same time a border.

That is why when speaking about the Bulgarian cultural and historical heritage and its dimensions, we should acknowledge the main influences - ancient, Roman, the most determinative the Byzantine, later on the Ottoman/Islamic, which have developed mainly Southwards of the Danube and the Central European, which were oriented towards the Habsburg Monarchy but have also made an imprint on the Danube.

Geopolitical challenges

We can find them in the sense of the words Aristotle spoke more than 2,300 years ago: "It is not borders that protect rivers, but people!"

In a contemporary geopolitical aspect, the river will not play a dividing barrier role, but the role of an axis of integration, uniting the Danubian countries. The evidence lies in that they are the economic zones which are being built in its lower course, in the intensification of traffic, expansion of the geography of the European Union in the area of the Lower Danube (Photo 1), the realisation of supraregional and supranational infrastructure, the cultural and socio-economic projects with the active participation and partnership of neighbours, the well-intentioned stretched hand to economic introvert states like Moldova for example.

When we speak about the Bulgarian cultural-historical heritage and look for its Eurocivilization dimensions, we must give an account of the two directions of influence – antique, Roman and mostly determinative Byzantine and later Ottoman-Islamic – which spread out mainly South of the Danube, and Middle-European, orientated towards the Habsburg monarchy, which left its mark on the Danubian space, or, in other words, on the Northern part of Southeastern Europe.

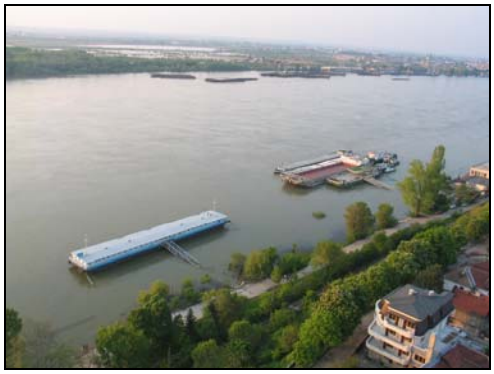

Photo 1. The Danube River

Maybe the most precise and magnificent illustration of the role the Danube has as a mediator, a symbol of communication and sociality and also, of an unusual type of cultural activity, gives the Nobel prize winner Elias Canetti in his book "The Tongue Set Free" (Die gerettete Zunge). He himself, emblematic for the Balkan-Danubian type of culture – Sefard, who was born in Ruse and wrote in German, presents his "Bulgarian-Danubian childhood" in Ruse (Ruschuk) among Bulgarian, Turks, Sefards, Greeks, Albanians, Armenians, Gipsies, Russians in a unique way:

"Ruschuk, in the lower course of the Danube river, where I came into the world, was a marvellous town for a child, and when I say it was situated in Bulgaria, I don't give the full idea of it, because there lived people of most different origins and in only one day you could hear seven or eight languages... And from the opposite riverbank Romanians were coming."

These impressions are the base for the conclusion: "Everything I experienced later, had already happened in Ruschuk." This is the ethnical, linguistic and therefore cultural diversity, which sets up a puzzle, forming the unique Balkan-Danubian aspect.

The Douro River, a historic waterway in Northern Portugal

The Douro River (Photo 2), the second largest in Portugal, rises in the Urbion Mountain in northern Spain, at about 2,080 meters in altitude, and flows to the sea in Porto, Portugal. Summing up 927 km in length, only 213 run through Portuguese territory, while 112 correspond to the International Douro, a stretch crossed by the border with Spain. It is currently navigable for the last 325 Km, which only became possible after the construction of 5 dams with floodgates, between the 1950s and 1970s, as the only way to overcome the differences in altitude throughout its course, creating large reservoirs with wide-ranging potential (Gonçalves, 1978).

Considered dangerous and "untameable" for centuries, the Douro did however serve as the main access route to the Douro winegrowing region (NE Portugal) for centuries, given the lack of safe land routes. Indeed, it was only

during the 20th century that strategic investments were to be made in access routes, particularly roadways, since the existing ones were scarce and unsafe, subject to regular ambushes, as well as highly deficient technically. Thus, the Douro region was supplied via the Douro River, with provisions, commercial products (among which textiles, metal and chemical products, etc.), and even passengers, and by which regional products were transported, such as fruit, olive oil and cereals, as well as wine, brandy and vinegar (Pina, 2007). However, there were many narrow, silted canals throughout its course, as well as rapids, which made navigation difficult for the boats (Pereira, 2001).

Given its importance to regional development, the Douro River was regularly travelled on, even though the task was quite epic in difficulty, subject to tragedy associated with the need to overcome countless physical obstacles (sandbanks, strong undercurrents, narrow canals), but only thus it was possible to connect Porto to the Douro region until the 19th century.

Photo 2. The Douro River

The importance of this waterway was such that as early as 1502, during the reign of King Manuel I (D'Abreu, 2007), it was determined that all the canals considered necessary were to be opened from its mouth in Porto to the town of S. João da Pesqueira, where the Cachão da Valeira (waterfall) was located. The advantages of navigating beyond S. João da Pesqueira were also considered at the time, extending navigability to Ribacôa upstream, and perhaps even as far as the kingdom of Castile. There were boats carrying 1,500 to 1,800 bushels of grain which, having reached S. João da Pesqueira, could go no further because of the Cachão da Valeira. The demolition of this waterfall in 1792, as well as other

obstacles, opened up navigation to the border, making the river navigable to the mouth of the Sabor River in 1809 and Barca de Alva in 1811 (Pereira, 2001).

It was however the production of wines of excellence, particularly Port, that drew international renown to the region. The vineyards were expanded to produce this nectar which rapidly conquered England and then the entire world, and once again the Douro River, despite the obstacles along its course, was the means by which, as well as other types of wine, brandies, and vinegars, were transported on small wooden boats called "Rabelos", built to overcome the "rapids", to Porto, from where they were exported.

Despite deficiencies in terms of access routes, it was only during the 19th century that investments were to be made in the railway, reaching Régua in 1879. As for the road system, only at the beginning of the 20th century, under the government of João Franco, some efforts were made to expand it, reason by which the Douro River, although having been partially substituted by the "via acellerada" ('rapid route') (Pina, 2007), the railway 2, in the second half of the 19th century, remained a major route between Porto and the Douro region. The road network was only really expanded in the 1960s, leading to the transport of wines by truck, and finally to the end of the Douro River as the main access route to the Portuguese NE.

Currently, the main strategy for the Douro is tourism, despite several attempts to increase the waterway's profitability, such as for example the direct export of granite from northern Portugal to Germany on barges. In 1985, the *Gabinete de Navegabilidade do Douro* (Douro Navigability Office) was established, lasting until 1994, substituted then by the *Instituto de Navegabilidade do Douro* (Douro Navigability Institute). The institute's main goals comprise management of river traffic and several projects which aimed at revitalizing the river banks, apart from the maintenance and signalling the navigable canal.

However, tourism is the main factor underlying the Douro River's recent revitalization. In all its various dimensions, this activity has boosted the superb heritage surrounding the river. In 1999, over 100,000 tourists travelled the river, and by 2009, the number had risen to about 350,000 (IPTM, 2009), providing these visitors with a sublime scenario, not only in terms of a magnificent landscape, but also a rich architectural, cultural and oenological heritage. The landscape displays human intervention over the centuries, in multiple dimensions such as the economic, social, cultural technical and morphological (Pina, 2008).

The Demarcated Douro Region, a heritage to preserve

The Douro Demarcated Region is a paradigmatic area extending over 250,000 hectares, of which 45,000 are covered by continuous vineyards, offering unforgettable, highly varied landscapes where the terrace dominates. Indeed, it is the only technique possible to overcome the steepness of the slopes surrounding the Douro River, in a valley where schist soils and a Mediterranean-type microclimate

[2] The railway did not totally substitute the 'Rabelo' boat, merely for financial reasons, since it was quite expensive.

are home to specific, regional grape varieties, producing wines of excellence such as Port. Classified as World Heritage by UNESCO in 2001, the region was the first to be delimited and regulated as the producer of this nectar as far back as 1756. This measure led to profound interventions on a harsh landscape where the forests framing the river disappeared, to be replaced by a landscape carved with terraces laden with vines.

Another aspect worth noting is the region's landscape diversity, derived from different degrees of vine coverage and its morphological characteristics, distinct according to the period analyzed. The terrace as the only technique to grow vines was used in the Douro region for centuries, whereas, as from the 1970s, new technologies and economic imperatives, namely the need to mechanize the vineyards, led to new types of vine morphologies on the landscape. Thus, the traditional terraces, enclosed by dry stone walls, were substituted by the "vinha ao alto" (vertical planting of rows of vines up the face of the slopes) or the "vinha em patamares" (narrower terraces), diversifying the scenario.

But there are many other points of interest along the Douro River's banks. Although the vine will always be the region's economic mainstay, other potentialities have emerged, holistically taking advantage the different spatial dimensions (Pina, 2010). This is the case of a vast and diversified cultural and built heritage. Leaving the historical city of Porto with its 240,000 inhabitants (INE, 2001), Portugal's second largest city, and travelling upstream to the Douro Demarcated Region, manor houses from the 18th and 19th centuries appear, dispersed throughout the slopes, part of wine estates and surrounded by vineyards. In other places, one can find a concentration of buildings from those same centuries, offering a remarkable wealth of fine architecture. There are also urban centres, home to an outstanding architectural heritage, as well as classified and protected areas. Centres such as Vila Real, the district capital that developed on the crossway of the main regional access routes. The town underwent profound development dynamics in the 1970s following the establishment of the Polytechnic Institute, today the University of Trás-os-Montes e Alto Douro. Religious architecture abounds (churches, chapels, etc.) from different eras, apart from the Mateus Palace, located in the parish next to the urban centre, a prime example of Baroque architecture in northern Portugal, built under the aegis of Nicolau Nazoni; the town of Peso da Régua, called the "Port wine capital", or Torre de Moncorvo and Vale da Vilariça, and still Freixo de Espada à Cinta, a Manueline (Portuguese late Gothic) town close to the border with Spain. On the river's left bank, there is Lamego, an episcopal town with a remarkable history and heritage covering different periods. Going further East, we come across the towns of Tabuaço and S. João da Pesqueira, with their manor houses and cultural wealth. Lastly, one cannot ignore the Côa Valley Archaeological Park, also classified by UNESCO, and the Douro International Natural Park, with its cliffs and promontories, aimed at preserving the local fauna and flora. It is the valuable landscape and architectural diversity that stands out in the Douro Valley, in which the Douro Demarcated Region undoubtedly occupies a privileged place.

A few concluding remarks

To sum up, the strategies historically associated with the Douro River were based on the trade of merchandise as a means to revitalize and boost NE Portugal, whereas, as from the 1980s, tourism came to be seen as the "magical" solution to development, contributing to achieving the goals set out in regional spatial planning proposals, namely the "Plano de Desenvolvimento Turístico do Vale do Douro 2007-2013" (Douro Valley Tourism Development Plan 2007-2013) (Magalhães, 2008). The aim is the growing enhancement of the Douro and, most particularly, of the Douro Demarcated Region, viewed as a priority 'hub' in the development of tourism in northern Portugal.

Despite the existing deficiencies, the Douro River presents a heritage full of history, successes and difficult moments, derived from its natural setting, particularly the steepness of its slopes, and where this waterway played a crucial role within the regional dynamics. Having received differing degrees of attention throughout its history, including periods where it was practically ignored, the river today enjoys a new opportunity to revive the experiences rooted in its banks. Apart from the tourism dimension, advantage should be taken of the river's hydroelectric potential (Leitão, 2001), dissected by dams with floodgates, thus also contributing to the development of a modern, safe communication route able to boost and preserve the cultural and social identity of the Douro wine country. The potential of the landscape as well as the environmental, social, cultural, oenological and gastronomic dimensions can thus be taken advantage of and enhanced.

The Douro River, bearing in mind the different scales, presents similarities with the history and dynamics of the Danube River, but also great differences. It was for centuries the main access route to the Upper Douro and, following the delimitation of the Douro Demarcated Region in 1756, comprised the prime means by which wine products were transported from the region, particularly Port wine. Its importance gradually declined with the construction of the railway as from 1879, and later, from the 1960s given the government's preference for roadways. However, following the construction of several dams to regulate its discharge and, particularly, the winegrowing region's classification as World Heritage in 2001, in recognition of its landscape, architectural, cultural and oenological heritage, the river has been revived as a strategic axis, particularly from a tourism perspective.

Thus, the preservation/revitalization of the Douro region can be boosted.

If Bulgaria is the Southeastern gateway towards Europe, Portugal is the Southwestern one. And one house must have some exits leading to the world. We Bulgarians and the Portuguese are predestined by one fate – to revive hopes and to give benevolent shelter to anybody, who recognizes us as friends. Both peoples, at least in our mind, are such. This makes us members of one family, grown and preserved due to our common affection.

The Danube and the Douro Rivers, two watercourses surrounded by distinct landscape and cultural settings, but whose destiny reveals many similarities.

REFERENCES

BACHVAROV, M. (2001), Geopolitical analysis. Publishing House "Zahari Stoyanov" Sofia.

CANETTI, E., (1994), Die gerettete Zunge. München, 1994.

D'ABREU, C., (2007), Navegação no rio Douro - o sonho (re)corrente de Castela, in. Douro: Estudos & Documentos, FLUP, pp. 37-78.

DEVEDJIEV, M., (2008), Bulgarian geopolitical odds. Veliko Tarnovo.

DERMENDJIEVA, S., (2008), 100 things to know about the geography of Bulgaria. Nature. T. VII., S. Ed. World Library Ltd, Sofia, p. 80.

DIMOV, N., (1999), N. Political geography of the border between the twentieth and twenty-first century. -In: Problems of Geography.

DOYKOV, V., A. DERMENDJIEV., (2002), Danube and territorial-administrative structure of Bulgaria. -In: Scientific Works of the University of Rousse, Volume 39, Series 9, Rousse, p. 10-20.

DOYKOV, V., N. GENCHEV., (2001), At the River. From Shvartsvaldskite sources to the Delta. Rouse.

DOYKOV, V., N. GENCHEV., (2002), Half a century of service to the Danube waterway. Rouse, 2002.

GEORGIEVA, TS., (1997), Danube river - Bulgarian border area during the XV-XVII century - Bulgarian Ethnology, 1-2, p. 25-26.

GARKOVA, C., (1997), C. Border - features in the Middle Ages. - Balkanistic Forum, № 1, p. 68-88.

GONÇALVES, A., (1978), A Navegação Organizada do rio Douro, Ministério da Habitação e Obras Públicas, Secretaria de Estado das Obras Públicas, Direcção Geral dos Recursos e Aproveitamentos Hidráulicos, Lisboa.

HISTORY OF BULGARIA., (1987), T. 6. Bulgarian Revival from 1856 to 1878. Academy of Sciences Publishing Sofia, 424-430.

KIIL, M., (2005), M. Urban development in Bulgaria during the Ottoman period: the place of Turkish architecture in the process. - In: Kiil, M. People and villages in Bulgaria during the Ottoman period. Sofia, p. 17-97.

KUZEV, AL., (1968), Contributions to the history of medieval castles in the Lower Danube. III. Gigen, Oryahovo, Vidin and Florentin. - INMV, Varna, Vol. 4, p. 37-49.

KUZEV, AL., V. GHIUSELEV., (1981), Bulgarian medieval towns and castles. T. 1. Sofia.

LEITÃO, R., (2001), A hidroelectricidade na bacia portuguesa do rio Douro – situação e perspectivas de desenvolvimento, EDP, Lisboa.

MALLORY, A., D. ADAMS, (1997), The Encyclopedia of Indo-European Culture. London: Fitzroy and Dearborn, 1997.

MUTAFOVA, K., S. DERMENDJIEVA, (2008), "The Danube – Our Northern Border", Regional Process of the 5th World Water Forum, Roundtable: Water as the Historical Scene for the Alliance of Civilization, November 08-09, Istanbul.

MAGALHÂES, Ricardo (coord.) (2008), O Plano de Desenvolvimento Turístico do Vale do Douro 2005-2013, CCDR, 2008.
PANTEV, A., (1999), Borders and Identities in the Balkans in a historical retrospect. - In: International Relations, book 4.
PEREIRA, G. e BARROS, A, (2001), Memória do Rio, Edições Afrontamento, Porto.
PEREIRA, G. (coord.), (2008), As águas do Douro, Águas do Douro e Paiva / Edições Afrontamento, Porto.
PINA, H., (2007), O Alto Douro- um espaço contrastante em mutação, colecção Temas Portugueses, Imprensa Nacional Casa da Moeda, Lisboa, 4 volumes.
PINA, H., (2008), The multi-functionality of the Douro landscapes, a strategy for its sustainability, in Actas de "XVI Annual Conference Commission on the Sustainability of Rural Systems", International Geographical Union, Universidad Zaragoza, Zaragoza, p.405-429.
PINA, H., (2010), "The importance of Complementarity in the Territorial Cohesion and Sustainability of Rural Areas: The case of Cambres, a Douro Winegrowing Area, and Magueija, a Mountainous Area", in Revija Za Geografijo, Journal for Geography, 5-2 (G10), Department of Geography, Faculty of Arts, University of Maribor (Slovenia), p.27-42.
TSIVYAN, T., (1997), Danube - signature of mythological and mythical time limit. - Bulgarian Ethnology, 1-2.

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

MAJOR BASINS WITHIN THE DANUBE HYDRO-GEOGRAPHICAL REGION WITHIN BULGARIA

BAZINELE MAJORE DIN REGIUNEA HIDRO-GEOGRAFICA BULGĂREASCĂ

Nelly HRISTOVA [1]

Abstract: The present paper discusses the division of some sub-basins in the Danube River Basin Directorate. It proposes the division of the main river basin the Ogosta and the rivers west of the Ogosta and the unification of the catchment of the Erma and the Nishava River in a major river basin. This suggestion is based on the similarity of natural features, hydrographic and hydrological parameters and typification of water bodies according to UE Water Framework Directive. The result will be a better water management in these river basins.

Key-words: the Danube River Basin Directorate, major basins, hydrographic and hydrological parameters
Cuvinte cheie: Administraţia Bazinală a Fluviului Dunărea, bazine principale, parametrii hidrografici şi hidrologici

Introduction

EU Water Framework Directive (2000/60) establishes a single classification of surface water system for the first time. It separates the aquatic ecosystems in several groups arranged in strict subordination: eco-regions, categories water ecosystems (river, lake, coastal waters and transitional water), types of water ecosystem, water bodies – unit for assessment and management of waters. Meanwhile, at the core of the Directive is an integrated approach for sustainable water management in the river basin. According to Water Framework Directive, the EU member states have to identify all the river basins lying within their territory and assign them to individual river basins. For the management of the water basin, 4 Basin Directorates were established by the Ministry of Environment and Water in 2002-2003 – Danube district, Black Sea district, East Aegean district, West Aegean district. The Danube River Basin Directorate coincides with the Danube hydro-geographical region and covers 47,235 sqkm (42.5% of Bulgaria). It includes the catchment areas of the tributaries of the Danube River. There are 15

[1] Sofia University St. Kliment Ohridski, Faculty of Geology and Geography, Bulgaria

tributaries of the Danube on the territory of Bulgaria. Fourteen rivers flow into the Danube directly. The Nishava River is a tributary of the Juzna Morava. The Danube Dobrudja Rivers, which have surface runoff in their upper sections, flow into the main river in the underground. Each of the tributaries forms its own river system and can be regarded as the main river in the Danube hydro-geographical region. The River Basin Management Plan (2003, 2010) identifies nine major river basins into the Danube drainage area without any criteria. This division does not correspond to the natural differentiation and to the scientific investigations, published in Hydrological Atlas of Bulgaria (1964).

This work proposes the division of the river basin "Ogosta and rivers west from the Ogosta" and the unification of the basins of the Erma and the Nishava rivers. This idea is based on complex parameters: hydrographic characteristics, river regime, annual river discharge, number of water bodies, dominant flowing water types, use of water resources.

Data and methods

In the hydrological literature of Bulgaria there are not strict rules or scientific methodology for defining the major river basins. The only differentiation, published in Hydrological Atlas of Bulgaria (1964), used is the size of the catchment area. Thus, in the Danube hydro-geographical region there are identified nine major river basins – the Lom, the Ogosta, the Iskar, the Vit, the Osam, the Yantra, the Russenski Lom, the Danube Dobrudja Rivers and the Nishava. The other three tributaries - the Topolovets, the Tsibritsa and the Skat, are defined as watersheds of the first rank with catchment areas above 500 sqkm. The Voinishka, the Vidbol, the Archar and the Skomlja rivers have not been included in any category. Sarafska (2000) uses the catchment area (the length of the river) for the hydrographic classification and proposes six categories (extra small - up to 10 sqkm and up to 20 sqkm, small – L = 10.1 - 20.0 km, F = 20.1 - 100.0 sqkm, medium – L = 20.1 - 50.0 km, F = 100.1 - 500.0 sqkm, medium-large – L = 50.1 - 100.0 km, F = 500.1 – 2,000.0 sqkm, large – L = 100.1 - 200.0 km, F = 2000.1 – 10 000.0 sqkm, extra large (L above 200.0 km, F above 10,000.0 sqkm) for scientific investigation and three categories for simple usage. The parameters for the characterization of the flowing water types using System A according to WFD are: Altitude (high > 800 m, mid-altitude – 200 - 800 m, lowland < 200 m), Catchment area (small: 10 – 100 sqkm, medium: 100 – 1,000 sqkm; big 1,000 – 10,000 sqkm; very big 10,000 sqkm) and Geology (calcareous, siliceous, organic). This classification refers to the water bodies, which are defined for each river, but this work will use it for the classification of major rivers. So, the size of watershed is the first mark for establishing major river basins. The mean annual stream flow and water regime are important hydrological characteristics and they are the next sign for differentiation in this work. The type of stream flow regime for Bulgaria is defined by Hristova (2004) and this work will use it. Arguments for the proposed changes in the definition of major river basins are flowing water types, specified in the River Basin Management Plan (2010) and prevalent type of water consumption.

Discussions

There are more than 500 streams in the Danube river basin in Bulgaria. The density of the river network is between 0.1 (Dobrudja) and more than 3.0 km/sqkm (in the alpine region, above 1800-2000 m). The highest density of the river system from Bulgaria is reached in the West Balkan Mountains - 3.8 km/sqkm. The tributaries of the Danube collect their water from the northern slopes of the Balkan Mountains and Predbalkan. There are some exceptions: the Iskar, springing from Rila and the tributaries from the mountains in southern Bulgaria; the Danube Dobrudja Rivers start from the high plateaus and descend into dry river valleys. The proximity of the Balkan Mountains to the Danube is not conducive to the formation of 'extra-large' watersheds. According to length, the Iskar, the Osam and the Yantra, are extra-large rivers, but they are 'medium-large' according to the surface of their catchment (Table 1). The reason for this peculiarity is the meandering of these rivers - curvature coefficient is 3.1. Category 'large' according to both parameters, includes the Ogosta, the Vit, and the Rusenski Lom. 'Medium' category corresponds to the rivers in northwest of the Danube drainage area. The Topolovets River is 'medium' according to length and 'medium-large' according to the catchment area. According to System A of WFD, the watersheds are of two types – medium and big (Table 1).

In Bulgaria, there were identified 34 types of water bodies, of which 12 types are to be found in the Danube catchment area (Table 2). The types of surface waters are determined by system - B (under Annex II 1.2.1 category of surface water rivers) of EU Water Framework Directive. Most rivers are of type 'small and medium karst rivers', 'foothill stone rivers' and 'small and medium gravel-sandy rivers' (Table 2).

The major river basins in the Danube drainage area according to River Basin Management Plan (2002) are the Ogosta and the rivers west of the Ogosta, the Iskar, the Vit, the Osam, the Yantra, the Russenski Lom, the Nishava, the Erma, the Danube Dobrudja Rivers and the Danube River (Fig. 1). The major river basin – the Ogosta river and the rivers west of the Ogosta, have a total area of 8,022 sqkm. It includes eight tributaries of the Danube. This paper proposes the division of this main catchment in three major watersheds – North-west Rivers, the Lom River and the Ogosta River.

The basin *North-west Rivers* covers an area 1,717.3 sqkm and includes the Topolovets, the Voinishka, the Vidbol, the Archar and the Skomlia rivers. All streams spring from the West Balkan Mountains and run from south-west to north-east. The rivers are 'medium' according to length and catchment area. The density of the river network is below 1 km/sqkm, altitude – under 1,000 m. All sub-basins in this catchment area have similar natural conditions and river regime (Fig. 1).

Table 1

Classification of Danube tributaries according to length and catchment area

River	Length (*L*), km	Area (*F*), (km^2)	Category according to length and catchment area (Sarafska, 2000)	Category according to System *A*, WFD
Topolovets	67.6	582.8	medium *L*/medium-large *F*	medium
Voinishka	55.2	276.5	medium	medium
Vidbol	61.8	329.8	medium	medium
Archar	59.4	365.4	medium	medium
Skomlja	41.6	162.8	medium	medium
Lom	92.5	1139.8	medium *L*/medium-large *F*	big
Tsibritsa	87.5	933.6	medium *L*/ medium-large *F*	medium
Ogosta	144.1	3157.1	large	big
Skat	134.0	1074.1	large *L*/medium-large *F*	big
Iskar	368.0	8642.2	extra large L/ large *F*	big
Vit	188.6	3225.0	large	big
Osam	314.0	2824.1	extra large *L*/ large *F*	big
Yantra	285.5	7861.6	extra large *L*/ large *F*	big
Rusenski Lom	196.9	2946.9	large	big
Nishava	40.0	1137.1	Medium *L*/medium large *F*	medium

All the rivers belong to the continental type of river regime, second below type (Hristova, 2004). The period with high waters is from February till June, the period of low waters – from July till October (about 100-140 days). November, December and January are months with transitional river flow. Maximum flow is 32.5 (the Archar) – 53.7 m^3/s (the Topolovets), minimum flow is between 0.022 – 0.076 m^3/s (Bulgarischen Donauzuflusse, 1994). There are identified three flowing water types - small and medium loess rivers, small and medium karst rivers (62% of the total number bodies), small and medium gravel-sandy rivers (River Basin Management Plan, 2010). This typification improves the similarity in geology of the sub-basins and is a good argument for the differentiation of this basin like major

basin. Water resources are about 200.10^6 m^3. The coefficient of variation is the biggest in the Danube hydro-geographical region. It is between 0.38 (the Skomlj River) and 0.52 (the Topolovets River). There are two irrigation systems and some small dams in this basin. The greatest water consumer is households.

Table 2

Flowing water types

Name of type	Number of water bodies	Total length of water bodies (km)
Big karst rivers	6	406.35
Big gravel-sandy rivers	2	319.31
Small and medium sandy rivers	5	126.41
Very big sandy rivers	1	650.65
Big loess rivers	6	161.56
Small and medium loess rivers	11	223.66
Foothill stone rivers	22	938.436
Temporary rivers	10	481.41
Small and medium karst rivers	35	1595.53
Gravel-sandy rivers	1	245.89
Small and medium gravel-sandy rivers	22	1440.17
Mountain rivers	2	100.41
Total	**123**	**6689.77**

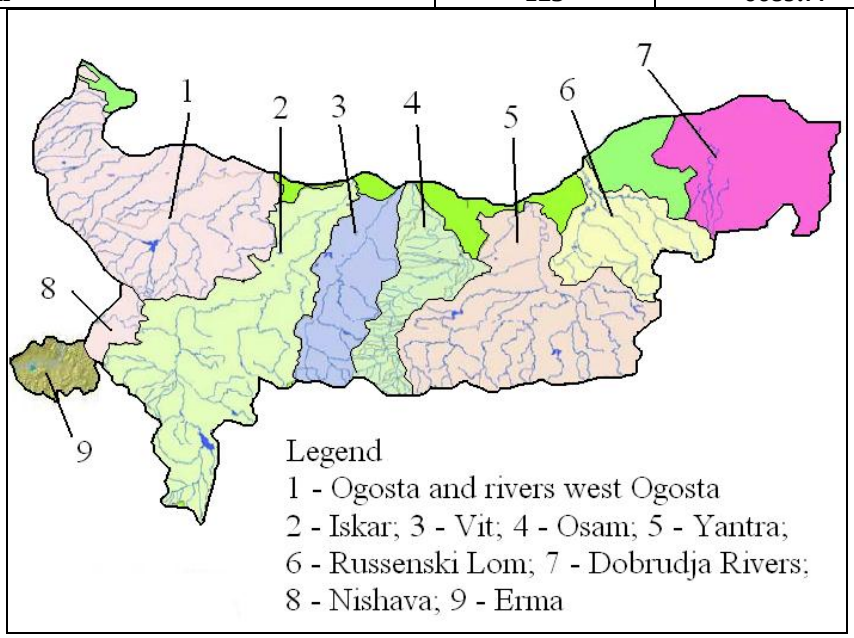

Figure 1. Major rivers in the Danube River Basin District (*source: River Basin Management Plan, 2002*)

The Lom river basin covers an area 2,073.4 sqkm. It includes the Lom River and the Tsibritsa River, which are 'medium' according to length and 'medium-large' according to area. The Lom River springs from the Balkan Mountains, while the Tsibritsa River – from Predbalkan. The density of the river network is between 0.2 and 2.0 km/sqkm. The altitude of the Lom River basin is above 1,000 m; the Tsibritsa River basin is located at mid-altitude and lowland. Both rivers have similar hydrological regime in their lower stream (Fig. 2).

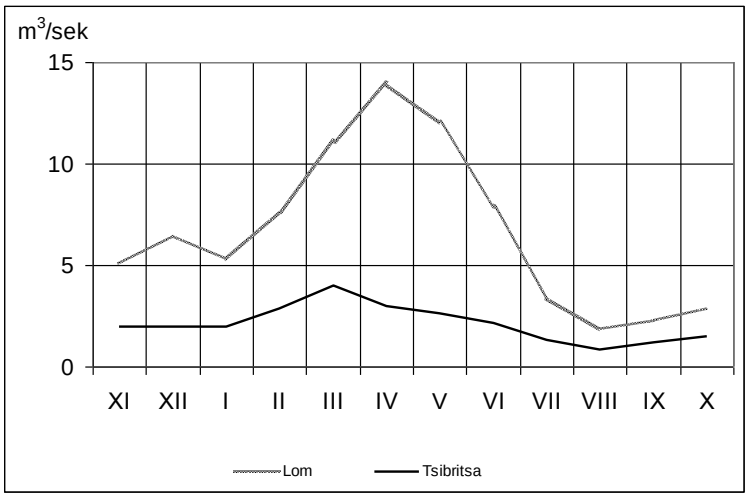

Figure 2. River regime of the Lom River and the Tsibtritsa River

The periods with high waters in the upper stream of the Lom River appears in spring (March – June) and in autumn (November – December). The low flow is typical for summer (July – October) and for winter (January – February). The duration of this period for the Tsibritsa River is 76 – 100 days. The maximum flow is 36.5 (the Tsibritsa) – 170.0 m^3/s (the Lom), while minimum flow is 0.25 m^3/s (Limnologie der Bulgarischen Donauzuflusse, 1994).

There are three flowing water types in this basin - big loess rivers, small and medium loess rivers, small and medium gravel-sandy rivers (River Basin Management Plan, 2010). Loess rivers are dominant.

Water resources are 300.10^6 m^3. The coefficient of variation is 0.32 for the Lom River and 0.40 for the Tsibrista River. In the upper Lom river and its tributaries, there are constructed many small HPS on the fluent water. In the lower basin of the Lom River, there are built irrigation systems. There is not a seizure of water in the Tsibritsa River. The domestic water supply is prevalent.

The Ogosta river basin includes the Ogosta River and the Skat River. The Skat River, after correction in the lower reaches, flows into the Ogosta. This is why both rivers were accepted as one basin. The watershed covers an area 4,231 sqkm. Both rivers are 'large' according to length, but the Ogosta River is 'large' according to the catchment area, while the Skat is 'medium – large' (Table 1). The

density of the river network is between 0.2 and 3.5 km/sqkm. The river system of the Ogosta is composed of a large number of tributaries. Its regime is of continental type (Fig. 3). The high waters are registered in five months (February - June), low waters – four months (July – October), transitional waters – 3 months (November - December). Monthly maximum runoff is in May for the Ogosta River and in March for the Skat River. The maximum flow is 365 (the Ogosta) – 38.5 m^3/s (the Skat), while the minimum flow is between 1.48 and 0.24 m^3/s (Limnologie der Bulgarischen Donauzuflusse, 1994).

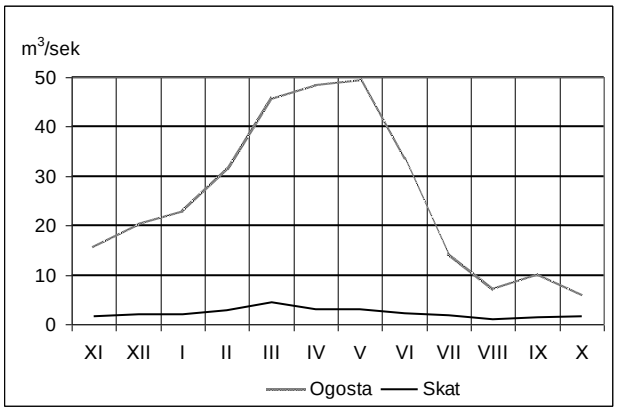

Figure 3. River regime of the Ogosta River and the Skat River (in lower stream)

This major basin includes 14 water bodies with a total length of 753.2 km. Small and medium gravel-sandy rivers (50% of total number) and small and medium sandy rivers (36%) are dominant. The water resources of the Ogosta river basin are 740 million m^3. Their coefficient of variation is 0.46. There are 14 irrigation systems, 8 hydropower plants and more the 50 dams within the catchment. In the upper reaches of the Ogosta is the largest hydropower cascade in Northern Bulgaria – 'Petrohan' (16 MW). Industry and the domestic water supply are prelevant.

The Nishava river basin separates Bulgaria from Serbia. The catchment area is 1137.1 sqkm. It is situated in the western periphery of Bulgaria. The River Basin Management Plan (2002) defines two major basins – the Nishava River and the Erma River. It is known that the Erma River is a tributary of the Nishava River, like the Gaberska River and the Visochka River (Fig. 4). The major river and its tributaries – the Edrma, the Gaberska and the Visochka are cross-border rivers. We propose the Erma and the Nishava to be one sub-basin in the Danube river basin directorate, in view of their natural connection.

The Nishava basin is medium large according to area (Table 1). The density of the river network is 1.09 km/sqkm and varies between 0.85 and 1.30 km/sqkm. There are some karst areas in the Nishava catchment. The river basin is high (above 800 m) and mid-altitude.

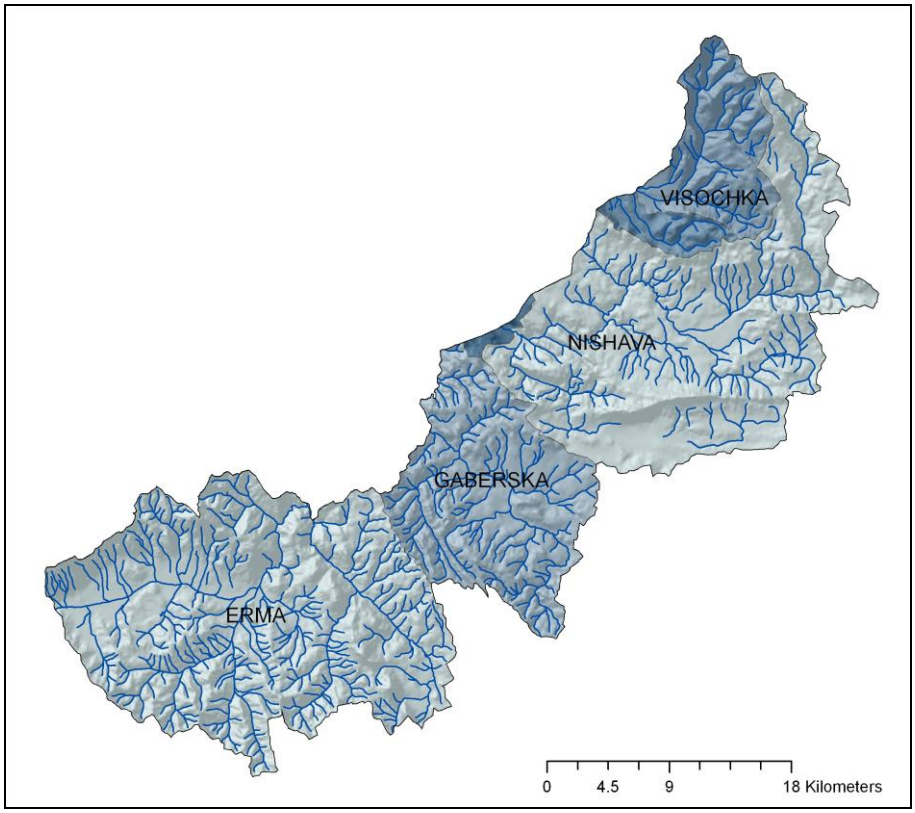

Figure 4. Scheme of the Nishava river basin

The river regime includes a short period of high water (April – June) and a long period with low water (July – October and January – March) in the mountainous basin. The maximum of monthly stream flow appears in March.

The River Basin Management Plan (2002) identified only two water bodies and defines two flowing type of rivers - foothill stone rivers for the Erma and small and medium karst rivers – for the Nishava. There is not a typification for other tributaries of the major rives in the management plan.

The water resources of the Nishava river basin are 173 million m^3. The coefficient of variation – 0.19 – 0.37, shows small fluctuations for the mountainous rivers and big fluctuations for the the lower courses of the Erma and the Nisava. The domestic water supply is prevalent.

Conclusion

The division of the river basin "the Ogosta and the rivers west of the Ogosta into three major basins, as well as the unification of the Erma and the Nishava will be better for the integrate management of water resources and will enable a more equitable distribution of river waters between water users. The Danube River Basin Directorate in Bulgaria has to use more results of scientific research and results.

REFERENCES

HRISTOVA, N., (2004), *Types of river's regime in Bulgaria*. Annuaire de l'Universite de Sofia "St. Kliment Ohridski", Faculte de geologie et geographie, Livre 2 – GEOGRAPHIE, Tome 96, pp. 129 - 153.

SARAFKA, N., (2000), *Classification of rivers in Bulgaria according to length and catchment's area*. Annuaire de l'Universite de Sofia "St. Kliment Ohridski", Faculte de geologie et geographie, Livre 2 – GEOGRAPHIE, Tome 93, pp. 167 - 196.

*** (1982), *Hidrologichen spravochnik na rekite v Bulgaria*, Sofia.

*** (1960), *Hydrolozki atlas na Bulgaria*, Sofia. pp.14.

*** (1994), *Limnologie der Bulgarischen Donauzuflusse,* Verlag "Paper Tiger", Sofia, pp. 19.

*** (2003), *River Basin Management Plan for the Danube River Basin Directorate* (RBMP), Pleven.

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

HYDROLOGIC CHARACTERISTICS OF THE DANUBE RIVER IN THE REPUBLIC OF SERBIA

CARACTERISTICILE HIDROGEOLOGICE ALE DUNĂRII ÎN SERBIA

Svetislav SOSKIC, Jovica CURCIC [1]

Abstract: Regarding the influence of the Danube hydrological features on navigation, primarily flow rate and water level, is great. They directly work on speed, latitude and depth of the waterway. We considered and handled with statistic data provided by the hydrological stations Bezdan, Novi Sad and Smederevo from 1985 to 2004.

Key-words: hydrologic characteristic**,** the Danube, Serbia
Cuvinte cheie: caracteristici hidrogeologice, Dunărea, Serbia

Introduction

The system of internal waterways (IWW) in Serbia includes navigable rivers, canals and lakes. The waterway of the Danube River with its tributaries and the Danube-Tisa-Danube (DTD) canal system represent the unique system of the Black-Sea basin (which receives the largest part of our flowing rivers).

The important communication ways from the Middle Europe toward the Near East and vice versa run through this area. The system of IWW spreads in the direction NW-SE with transversal communications, which widely extend from the Danube River and its tributaries. Together with land communications, the waterways make beam of communications known as 'communication beam of the 45th parallel'. The most important place on that waterway, which at the same time represents the communication hub, is Belgrade.

Economies of many European countries rely on the Rhine-Main-Danube canal system, where daily turnover amounts up to a few billion of American dollars. The Danube Convention, which was signed by majority of the European countries for providing an undisturbed navigation along the Danube, confirms the interest for this waterway (Fig. 1, Fig. 2).

There is a plan to connect Belgrade with the Thessalonica port, by a canal which will run trough the Vardar - Morava valley. Besides the Republic of Serbia,

[1] Department of navigation, Military academy, Belgrade, Serbia

other European countries are interested in this project as well, due to the fact that the waterway from the Middle Europe to the Suez Canal and farther will be shorten.

Figure 1. Waterway of the Danube River

Figure 2. The pan-European traffic corridor VII

The internal waterways are rivers, canals and lakes, whose width and depth provide a safe navigation.

The River-Canal system of Serbia consists of three sea basins: Black-Sea, Adriatic and Aegean. The areas of those basins and their average sizes are given in the Table 1 (Dukic, D. 1977).

Table 1 Features of the three sea basins

Sea basin	Basin area		Average basin size	
	Square km	%	length in km	width in km
Black-Sea	81,703	92.4	343,.5	238.0
Adriatic	4,732	5.4	75.0	63.0
Aegean	1,926	2.2	72.5	26,5
Serbia	88,361	100.0	484,0	182.0

Source: Dukic, D. 1977

The total area of Serbia is 88,361 square km (Dukic, D. 1977). The Black-Sea basin is the largest and covers the area of 81,703 square km, that is 92.4% of the total territory. The main rivers of the basin are the Danube and the Sava with their tributaries, the Tisa with its tributaries, the Velika Morava with its tributaries, the Drina, the Kolubara, and the Timok. The Aegean basin covers an area of 1,926 square km or 2.2% of the Serbian territory. The main rivers are the Lepenac, the Pcinja, and the Dragovistica. The Adriatic basin covers the area of 4,732 square km or 5.4% of the geo-space. The main river is the Drim with its tributaries, (Sekulovic, D. 2004).

The average length of water flows on the area of 1 square km of a basin can be obtained by using (Dukic, D. 1977) the Nojman' pattern. It depends on many parameters and the most important are: climate, especially geologic structure and relief and vegetation. The average density of the river system in our Karst terrains permeable to water is only 0.05 km/square km, in plains terrains of Vojvodina, which lack in precipitation it is only 0.075 km/square km, and in our mountain terrains with normal erosion it is 0.70 km/square km. The river system of Serbia is 65,980 km long or averagely 747 km/square km.

The Danube

The Danube is an international river, which is, after the Volga, the longest river in Europe. It connects the South-Eastern Europe with the North and the West (Hamburg and Amsterdam), and at the same time it represents a direct and cheap way toward oil and natural gas of the Caspian Sea and the Caucasus Mountains. The Danube divides Europe in two parts - North-Eastern and South-Western. It has it source at the foot of the mountains of Schwarzwald. It is made of two smaller rivers, the Brega and the Brighat, which join near Donaueschingen at 687 m above sea-level. The Danube is an important navigable river of the Middle and South-Eastern Europe. By connecting with the Rhine, the big navigable canal, which was completed in 1981, the Danube was included in the system of the Western

European waterways. Thus, the unique 3,400 km long waterway was made. It connects the North Sea with the port of Rotterdam at the mouth of the Rhine, and the Black-Sea with the port of Sulina.

The Danube has big water-management importance for ten Danube-basin countries it flows through or represents the natural border of countries on the opposite banks: Germany, Austria, Slovakia, Hungary, Croatia, Serbia, Romania, Bulgaria, Moldova, and Ukraine. The basin of the Danube includes bigger parts of Slovenia and Bosnia and Herzegovina, as well as smaller parts of Switzerland, Italy, Czech Republic, Poland and Albania.

Therefore, the Danube receives water from 17 countries, so it is rightly taken as 'the most international river' in the world.

Due to its importance, the water-way of the Danube was proclaimed the pan-European traffic corridor VII (Picture no. 2). About 140 millions of tones turnover was realized annually through this waterway, and through the Serbian part of the Danube 40 millions of tones. It should be kept in mind that river transport is four times cheaper than railway and fourteen times cheaper than road transport.

Downstream navigation of a motor ship from Rotterdam to Sulina lasts 11 days, and on the way back it lasts 17 days, while a pusher with lighters would spend 14, that is 19 days.

The Danube enters the territory of Serbia at NKM[2] 1433 about 8 km upstream from the village of Batina. The general direction of the Danube extent over the territory of Serbia is northwest-southeast. The river stream is broken, so some parts have an approximate north-south direction (from the entrance to the territory of Serbia to the city of Vukovar, than east of Fruska Gora, a short part east of Belgrade, in Djerdap – the Iron Gate and part from the village of Kostol to the mouth of the Timok). All other parts of the Danube stream, which, at the same time, represent the biggest length of the stream in our country, have the general direction northwest-southeast, and in some parts they have the west-east direction.

The Danube basin (Dudik & Gavrilovic,)[3] is asymmetrical: its right side covers 44%, and left side 56% of the basin area. The basin asymmetry coefficient (ac) is an important hydrological indicator, especially for the basins of big rivers. The right side of the Danube basin, even though smaller, gives to the Danube 66%, and left side only 34% of the water flowing through its bed; the explanation for this difference can be found in bigger precipitation amount and more favourable conditions of its outflow from the Alps and the Dinaric Mountains.

Width of the The Danube River

The width of the Danube River during small or medium water level is almost the same, because during these water levels the river remains in its narrower bed,

[2] NKM - navigable kilometer - mark of the mileage measured from the mouth to the Black Sea upstream

[3] D. Dukic, Lj. Gavrilovic: Hydrology, ZUNS Belgrade, p. 90

which has fairly steep and uniform banks. During high and very high water levels, predominantly right side, and dam on the left side makes flood areas.

The average width of the Danube through Serbia is 600 m. It is the widest at the entrance to the Iron Gate Gorge, up to 2000 m, and the smallest width is in the Gospodjin vir Gorge, 132 m, where the Danube[4] has the biggest depth - 82 m. The width of the Danube during small and medium water level, which corresponds to the width of the narrower river bed, in some places is considerably different, but in the main lines it can be noticed that it grows from the Danube entrance to the territory of Serbia to the Iron Gate, than in the Iron Gate it narrows, and when it flows out from the Iron Gate it gets wider again.

From its entrance to Serbia all the way to the Iron Gate, the Danube has two characteristic sections according to the width of its bed:

- from the Hungarian border NKM 1433 to Slankamen NKM 1217, during medium water level the Danube has an average width of the water mirror from 350 to 500 meters,
- from Slankamen to the Iron Gate NKM 1048 the Danube has an average width from 500 to 800 meters.

The Danube is supplied by atmospheric precipitation, which flows together down the slopes of exalted basins, with thawed snow and ice, as well as with abundant underground waters. Along the stream, the supply is different: in the upper part of the basin, the above mentioned factors have a dominant role, while the lower part of the basin receives water from surface and underground waters.

In the city of Uzice, the average annual precipitation level is 791mm, in Belgrade 687mm, Sremska Mitorivca 652mm, Novi Sad 620mm and Palic 538mm, and at the east part of the country in Leskovac 601mm, Nis 551mm, Bela palanka 526mm, Zajecar 641mm, Golubac 617mm and Bor 706 mm. In Potisje, north of the village of Backo Petrovo Selo, the average annual precipitation level is 600 mm, approximately as in Deliblato Sand, Veliko Pomoravlje, in the valley of the Southern Morava to the Grdelica Gorge, in the Western Pomoravlje to the city of Trstenik, in the major part of the Ibar valley, in Kosovo and the lowest part of Metohija.

The altitude elevation of the Danube River's floor

The altitude elevation of the Danube River's bed floor is 72.30 meters at the entrance to the territory of Serbia, and 20.00 meters above sea-level at the way out at the mouth of the Timok River, which means that an average fall of stream is about 0.09 meters per kilometre. However, the fall of the stream floor in some parts of the stream suddenly varies. In some parts, the altitude differences are up to 15 meters at a distance of a couple of kilometres (Military-engineer description of the Danube River, 1960). The lowest continental height above sea level in Serbia (27 meters during medium water level) is at the mouth of the Timok River into the Danube.

[4] This depth is the maximum sounded river depth in Europe

From the viewpoint of the navigable characteristics, the Danube, on its way through Serbia, can be divided in four parts: from the Serbian-Hungarian border to Belgrade, from Belgrade to the Iron Gate 1, from the Iron Gate 1 to the Iron Gate 2 and from the Iron Gate 2 to the mouth of the Timok River.

The Danube River basin has temperate-continental climate.

Latitude, atmospheric circulation and relief are causes of big differences in air temperature in the Danube basin. The mean temperature in the coldest month – January varies from -1°C to -4°C. The temperature in the warmest month – July, in Schwarzwald, in the Alps, is 14°C, in Bavaria 16-18°C, on the middle Danube 17-22°C, and on the lower Danube 22-24°C.

Water temperature

The water temperature varies depending on the season of the year. Firstly, it is connected with air temperature and sun radiation, but also with the water temperature of the Danube tributaries. The maximum water temperature in July and August averagely is 18-19˚C in the part of the upper Danube and 24-26˚C in the part of the lower Danube.

Water flow

As a consequence of the precipitation unevenness, snow thawing, underground and other waters, in different period of a year, the Danube water flows vary a lot. Differences between minimum and maximum reach 29 times in Linc and 6 times in Bogojevo. The physical – geographic conditions of the basin considerably influence the big quantity of the mean multi-annual water flow. Severe changes are characteristic only for the upper stream. The characteristic of the parts of the Danube with wide basin areas and plain relief is that when the water level changes rapidly, floods occur.

The unit, which indicates the flow, is cubic meter per second (m^3/s).

The tables which indicate the flow values usually include the following parameters: year, elevation 0, daily, month and annual flow values.

Daily flow values are measured in the water gauges. Daily data refer to minimum, maximum and mean month flow values. Maximum, minimum and mean annual flow is calculated based on the month flow values (Table 2).

'Elevation 0' represents the height above sea level where a hydrologic station is located.

The average water flow through the Iron Gate is 5,750m^3/s. In the territory of Serbia, the Danube tributaries increase the total water quantity for about 3,100m^3/s (the Sava in Belgrade 1,690 m^3/s, the Tisa about 945 m^3/s and the Velika Morava about 520 m^3/s).

Water level

The most important parameters for the navigation are water level and its variation. Ship commandants need data concerning water levels for determining

probable depths on waterways in shallow spots and pier areas, as well as for determining axes of navigable canals and borders of the river bed navigable part.

Table 2 Monthly flow values

Weather station	Distance from Sulina (km)	Flow (m^3/s)		
		min	max	mean
Bezdan	1,428.6	863	6,200	2,177
Novo Selo	834	1,526	13,840	5,569
Svistov	554	1,624	14,404	5,941

Source: *Dukic, D. 1977*

Now, in the regulated stream of the upper Danube, where there are located 7 dams with reservoirs, there remained only 4 shallow spots; in the middle or Pannonian stream of the Danube, there are 58 shallow spots, and in almost the same length long lower stream of the Danube, there are only 16 shallow sports, that is averagely 1 on every 58 kilometres.

A water level varying in some parts of the river depends on weather conditions in the first place, and, often, on the quantity and intensity of precipitation, height of snow cover and character of the weather during snow thawing. Staggering impact on water levels drop and form beds and its asperity, intensity of channel deformations, the appearance of ice, wind regime and the regulation of channel.

The Danube River has a complex water level regime, but water level characteristics can be defined by periods: flood, mean height and winter period.

The water level varies a lot and it is different in various parts of a flow (Fig. 3). The highest water level is in April and May when snow thaws in the stream of its tributaries, and the lowest in autumn. High spring waters appear up to two times a month. Their rise lasts 15 – 20 days.

Anvelopes are used to show a water level. Those are curved lines, which represent water level changes during a year. Daily water levels on one water gauge station during one year are used for making anvelopes. Anvelopes of maximum, minimum and mean water levels for a certain year or period of time are obtained based on the maximum, minimum and mean daily water level values during a year.

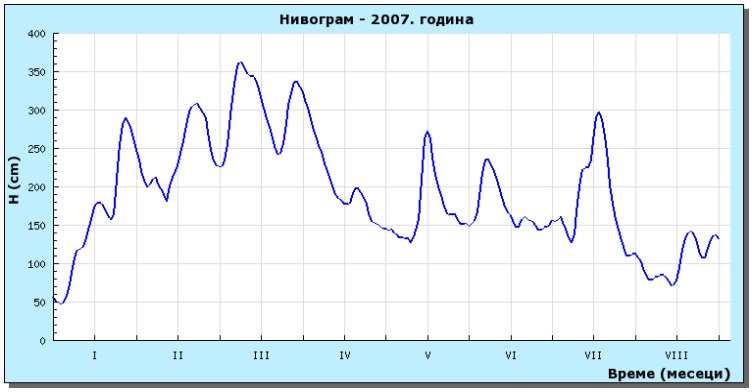

Figure 3. Water level state in Novi Sad in the period between January and August 2007[5]

Depth of the Danube River water

The depth of the Danube River water varies a lot along the entire stream. The averages are:

- during low water level from 4 to 8 m,
- during mean water level from 9 to 13 m,
- during high water level from 11 to 15 m.

The Danube River is the deepest between Apatin and Opatovac, Belgrade and Smederevo and in the Iron Gate (Veliki and Mali Kazan), and it is the shallowest between Ilok and Slankamen, Dubravica and Ram.

The characteristic feature is that, in some places, these depths are much bigger than the average ones in that part of the stream. The most characteristic places with these depths, without including the extreme depths in the Iron Gate Gorge where the artificial lake lies now, are showed in the Table 3[6].

Table 3 Depths artificial lake

Places	During low water level	During mean water level	During high water level
Bezdan	13.5	17.0	20.0
Dalj	26.0	30.0	33.0
Sotin	13.0	16.0	19.0
Novi Sad	11.0	14.0	17.0
Beograd	15.0	18.5	21.5
Vinca	13.0	17.0	20.0

Source: *Military-engineer description of the Danube River*

[5] *Taken in September 2007 from* www.hidmet.sr.gov.yu

[6] *Data taken from the book "Military-engineer description of the Danube River, 1960 "*

As shown in the table, the average differences between low and mean water levels are mostly 3 m, and the same is between mean and high water levels. The highest water levels on the Danube are from April until the middle of July, which depends on the time used for ice thawing in the area of the stream.

Fall of stream

The general fall of the Danube River, from its source to Sulina, is 678 m, and the mean fall is 0.25m/km. The general fall of the middle Danube is 73.5 m. The fall from Genjija to Moldova Veka is from 0.05 to 0.10m/km. In the part of the Iron Gate, before the hydro system 'Djerdap' was built, the fall in some places was up to 2m/km. The general fall of the lower Danube is 0.344 m/km.

The medium speed of the Danube River stream

The speed of the stream depends on the longitudinal profile of the river bed, water level, bed transversal section, form of the bottom and banks, speed and direction of wind, size of ice cover. The medium speed of the water during low water level average about 0.5 m/s (1.8 km/h), during medium water level about 0.85m/s (3 km/h), and during high water level about 1.40m/s (5 km/h).

Freezing of the Danube

The main Danube bed freezes rarely and only when it is bitterly cold and when the water level is low. Even then the river freezes only in some parts of its stream, but never along the entire river. Freezing of the main bed starts when the temperature is lower than -10°C three or four days constantly, starting from the bank. When the temperature goes under -20°C and when these conditions last two or three days, the whole surface of the Danube in that part of the stream can be frozen. The biggest measured thickness of ice until now has been about 50 cm.

However, the accumulation of ice floes can lead to the even bigger thickness of ice, which is a specific phenomenon. In the period of ice movement in many places ice floes accumulate, which provokes stoppage in water flowing, which further provokes floods upstream. The places where it usually happens are the areas of Bezdan, Bridge of Bogojevo, Daljska krivina, Bridge of Novi Sad, Bridge of Pancevo, the area between Kovin and Dubovica and downstream of Golubac and Iron Gate.

It was registered that such accumulated ice floes formed ice jams, which were dangerous for bridges and waterworks. In such cases those ice jams were broken with explosives.

Freezing (Dukic & Gavrilovic)[7] of our rivers starts after a certain number of frosty days (temperatures under 0°C): on the Backa and Banat canals, on the Begej, the Tamis and the Bosut with tributaries it starts after 7 frosty days – because in those canals and rivers, water flows very slowly, which provokes, so called, static

[7] D. Dukic, Lj. Gavrilovic: Hydrology, ZUNS Belgrade, p. 115.

ice formation (water speed up to 0.5 m/s); the Tisa starts to freeze after 7-12 days with frost, the Danube after 15-18 days, and the Sava only after 21 days with temperatures under 0°C, etc.

In (Dukic & Gavrilovic)[8] the Hydrologic Annuals in tables with reports about water there is also shown the information about ice on rivers. If ice stops and if such circumstances last a certain number of days, than for that period before water level, a thick black line is drawn. The ice movement is marked with big black dots. The day following the day when the last dot was put, represents the date when the river liberates from ice. In our country that is usually the second half of February, although the ice on the Danube, in Belgrade, thawed only on 27 March in winter 1928/29. It should be emphasized that that winter was the coldest one in the first half of the 20th century. The thickness of ice was 50 cm, so that farmers from Banat, coming to Belgrade, passed the river in horse-drawn.

The Tisa

The Tisa is the river that in the future may be an alternative way for river transport. It springs in the Ukraine Carpathians and to the mouth into the Danube, in Slankamen, it flows through Ukraine, Hungary and Serbia. It is 965km long. The length of its flow in Serbia is 164km, 6 km of which it is a border river. The area of the Tisa stream is 20% of the entire area of the Danube stream. The average width of the Tisa is about 150m, and in some places even wider: in Senta 220m and in Titel 250m. The depth of the Tisa is from 4 to 12m. The Tisa has a very small fall, averagely about 4 cm/km, which results in its meandering and slow flow (about 0,5m/s). The river's bed is mostly regulated, possibilities of floods are reduced and the navigational conditions of sailing are improved. The geologic bottom composition is mostly sandy and silty. The bed depth is from 4 to 12m. At the mouth the Tisa is 7m deep.

The highest water level of the Tisa is in April and the lowest in October. Winter storages exist at the entrances to canals.

From the navigational point of view the Tisa can be divided in the stream part from the mouth to the dam in Novi Becej (66.1km) and the part from the dam to the Serbian-Hungarian border. The river bed is not significantly indented, it does not have small river islands and backwaters, and levees are relatively close to the high bank, so that the inundations are very narrow. Due to the slow flow, the first ice cover in the territory of Serbia appears on the Tisa at the temperature under -5°C after 2-3 days.

As on the Danube, the strongest wind is the east wind. The winds that blow in this area obstruct the traffic. The wind blows very strongly, because the river runs through the valley. The winds that blow on the Tisa stream are: east wind, mountain wind and west wind.

[8] ibid, p. 117.

The most favourable water level for navigation is when the water gauge in Senta shows from +100 to +300cm. The low water level is considered when the water level in Senta is under 0, and high is when the water level is over 500cm.

Due to the unequal water level, certain changes emerge on the Tisa and the Danube, such as slowing up or rising of the river stream speed. When the water level on the Danube is high, and on the Tisa low, than the river slows up all the way to Segedin. If the water level on the Tisa is high, and on the Danube low, the river speed surpasses 5km/h. When the water level is low on both rivers, the river speed is from 1.8 to 2.5km/h.

In the part of the Tisa through the territory of Serbia, stable parameters of navigation and marking for the night-and-day navigation are provided. The weather factors provoke a navigation halt on the Tisa for about 63 days a year, so that the period of the physical navigation is 302 days.

The Sava

The entire length of the Sava is 945 km. It enters Serbia at 178th navigational kilometre near the village of Raca and joins the Danube in Belgrade. The Sava is navigable along its entire length for ships up 1,500 t. The river stream is just partly regulated, because of its meandering stream, with big bends and meanders. Due to the frequent bed change and low banks, it provokes floods, transforming large areas into impenetrable marshes and pools (marshy areas).

The river stream speed is insignificant, from 0.5 to 1m/s. It means that the river speed does not affect speed of ships during the upstream and downstream navigation. Twice a year small waters and twice a year big waters arise, in spring (April, May) and in autumn (October, November.

When the temperature is under -10°C and lasts more than six to eight days, the Sava freezes. In that case, the Sava can be blocked in some places and over the entire width.

The valleys' width around Sava is 11km in the city of Sremska Mitrovica, and 25 km in the city of Sabac. On the Sava there exists only one permanent winter storage, in Bezanija in Belgrade, and numerous temporary winter storages.

The visibility on the Sava is similar as on other rivers and it is characterized by very changeable number of foggy days, from 20 up to 158 days a year. The most frequent winds are east and west winds.

The Velika Morava

The Velika Morava emerges near the city of Stalac by merging the Southern and Western Morava Rivers. It is the longest river in Serbia. It flows into the Danube at the navigable kilometre 1105. The total length of the Velika Morava is 118km. The depth is two to three meters, in some places up to five meters.

The Velika Morava's valley represents a significant area, because, through the Morava-Vardar valley, it connects the Podunavlje area with the Aegean

geographic area, and further through the Marica valley with the geo-area of the Black Sea.

The stream direction is meandering. The bed width is from 50 to 120m, and in the downstream, in some places, it surpasses 200m. In Stalac it is about 100m, wide and downstream from the Bargdan Gorge it is wide up to 250m. The depth is 4m, and in vortexes up to 10m. The highest water level is in March and April. Before the dams were made, the river often had flooded the areas in the width of 5 kilometres. It is navigable for ships when the water level is medium or high from Ljubicevo Bridge to the mouth into the Danube, (about 10km).

The Tamis

The Tamis springs in the east part of the Banat Mountains, and it flows into the Danube in the city of Pancevo, at 67 meters of the height above sea level. It is 352km long, in Serbia 121km. In the village of Jasa Tomic, it enters the territory of the Republic of Serbia, where it flows with its down stream as markedly plains-river, with low and even banks and mud-covered bed. In that part it is very meandering and it makes numerous backwaters and marshes. The highest water level is in April, and the lowest in September.

It is navigable for ships to 1,000 tons, from the mouth all the way to Pancevo (3km), and for ships to 500 tons from Tomasevac to Jasa Tomic, where it is canalized (36km). All the way to Orlovat, it is navigable for smaller ships (74km). The backwater Karasec is connected with the Danube and it is navigable for smaller ships during high water level along entire length (5km).

The most favourable navigation is during the water level of +320 cm in Pancevo, and during the water level of +200 the navigation is stopped. During high water level, the navigation is performed alongside the right bank.

The Begej

The Begej is the biggest tributary river of the Tisa in Vojvodina. It is 244 km long. It flows into the Tisa in the city of Titel at 69 m above sea level.

Almost straight 72 km long canal was made between Tomasevac and Klek. It is navigable for small ships during medium and high water levels, and during low water level the navigation is stopped. 670 t tug boats can navigate along entire canalized length all the way to Timisoara (114 km).

The Begej gives to the Tisa averagely 50 m^3/s of water. Since during spring the flow is up to 450 m^3/s, the surplus is taken to the Tamis by 8 km long canal, which was made upstream of Timisoara. Sometimes during summer, through the canalized Begej it flows 1.5 to 2.5 m^3/s of water, and in that case water is brought to the Begej from the Tamis by other canals. That canal is closed during high water level on the Begej. Navigation is stopped from December to March, due to ice covers.

The canal system Danube-Tisa-Danube

The canal system DTD is a system composed of a few big navigable canals and of numerous smaller canals. The canal system has two purposes: to disburden the main waterway, so that big ships, which cannot go through the canal, can navigate without being disturbed, and to improve fields in Vojvodina.

The base of this canal consists of 80 channels, 24 dams, 16 locks and 6 security barriers. Of the total 929 km, 664.1 km are navigable. For the 1000t ships, 37.9 km are navigable; for the 500t ships, 258.8km are navigable, and for the 200t ships, 28 km are navigable. By building the lock on the Tomasevac-Opovo canal, the navigation along the Tamis in the length of 81.1 km will be provided for 1300t ships, what increased the total length of the navigable canal for 764 km.

The canals of the hydro system 'Danube-Tisa-Danube' pass through 100 inhabited places, under 84 bridges (Fig. 4).

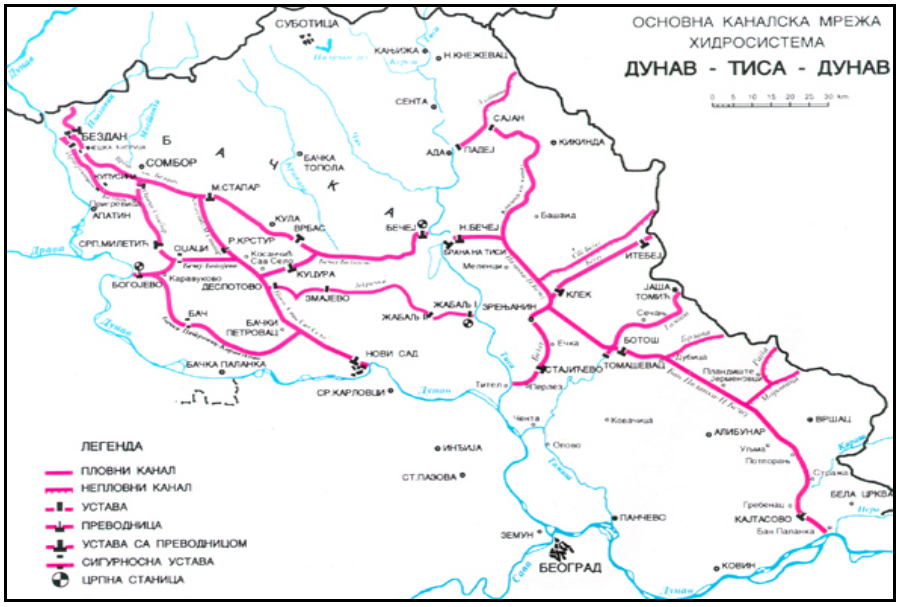

Figure 4. The canal system Danube-Tisa-Danube

REFERENCES

ANTIC, B., (1979), *Inland waterways of Yugoslavia*, Belgrade

DUKIC D. (1977), *Climatology*, Scientific book, Belgrade

TUTUNOVIć, D., (1990), *Nautical's manual of the Danube*, Belgrade

SEKULOVIC, D., (2004), *Generalization of watercourses*, Belgrade

ROSIC, S., (2001), *Hidronavigation and hydrometeorological support of combat operations on IWW*, The New journal, 1/2001, Belgrade

ŽIVANIĆ, S., (1988), *River Navigation*, ZUNS, Belgrade

****Military-engineer description of the Danube River*, (1960), Belgrade

***The Danube Commission, (1993), *General provisions on navigation on the Danube*, Budapest

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

CRYOGENIC PROCESSES

PROCESELE CRIOGENICE

Sergey M. GOVORUSHKO[1]

Abstract: Cryogenic processes are quite numerous, but among them the most significant, from the viewpoint of influence on human activities, we mention frost swelling, thermokarst processes, thermal abrasion, thermal erosion, cryogenic cracking, and solifluction. *Frost heaving* represents a danger for motor roads, railroads and airfields, communication and transmission lines, bridges, and other structures. *Thermokarst* endangers the safety, stability, and normal operation of structures. *Thermoabrasion* affects industrial and civil site development, water transport, pipeline transport, mineral resource industry, hydropower engineering, and agriculture. *Frost cracking* constitutes a certain danger for the following engineering structures: motor roads (roadways may go over the discontinuity); residential and industrial buildings (breakage of continuous footings, cracks in the walls); airfields (damage to airfield pavements); pipelines (deformations and even breaks of underground steel pipelines); underground communication cables. The influences of fast and slow *solifluction* are the most urgent for the following kinds of human activity: mineral resource industry; transport (motor, rail, pipeline); and industrial and civil engineering. Thus, the present paper aims at rendering the global dimension of these processes stressing their consequences worldwide.

Key-words: cryogenic processes, frost swelling, thermokarst processes, thermal abrasion, thermal erosion, cryogenic cracking, solifluction.
Cuvinte cheie: procese criogenice, procese temocarstice, abraziune termică, eroziune termică, crăpături criogenice, solifluxiune

Cryogenic processes are those that take place in freezing and thawing rocks and in permafrost rocks under conditions of changing temperatures and the rocks' transitions through the melting of ice.

The area of *distribution* of cryogenic processes is considerable (Fig. 1). The area of the cryolithozone (permafrost zone) of the Earth is 38.15 million km^2, which corresponds to 25.6% of the land surface, and 21.35 million square kilometres fall in the northern hemisphere. Permafrost underlies 20–25% of Earth's land area, including about 99% of Greenland, 80% of Alaska, 50% of Russia, 40–50% of Canada, and 20% of China. Seasonally, frozen rocks are more widely

[1] Pacific Institute of Geography, Russian Academy of Sciences, Far East Branch Vladivostok, Russia

distributed. They occupy vast territories with the exception of regions with tropical and subtropical climates.

The number of cryogenic processes is quite high, but among them the most significant processes, from the viewpoint of influence on human activities, are frost swelling, thermokarst processes, thermal abrasion, thermal erosion, cryogenic cracking, and solifluction.

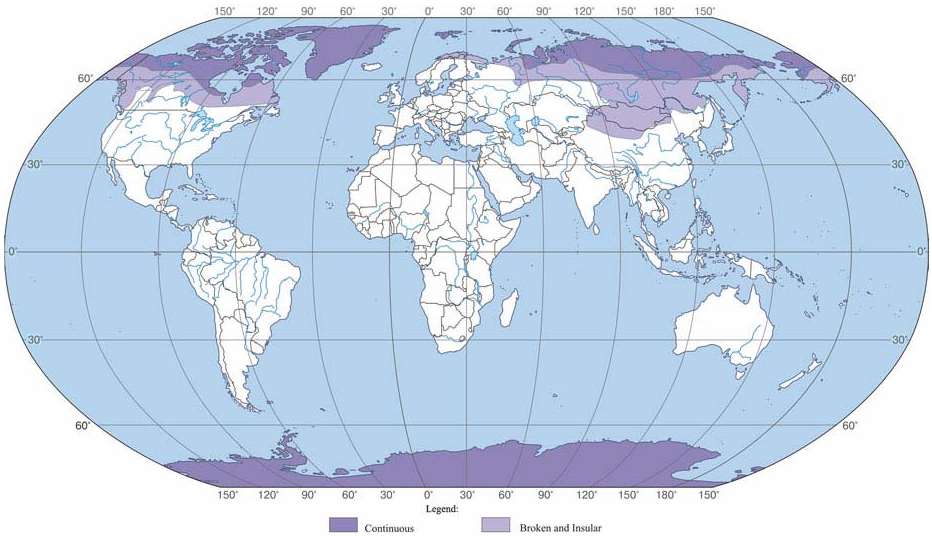

Figure 1. Distribution of permafrost (Resources and environment 1998. Reproduced with permission of the Institute of Geography of the Russian Academy of the Sciences)

1. Frost heaving

Frost heaving is a rising of the soil surface caused by an increase in its volume in the course of freezing due to the spreading of particles by growing ice crystals. *The intensity* of the swelling depends on the degree of water saturation, and it is especially high when the moisture content increases through inflow from neighbouring areas.

In determining *the mechanism* of the influence of frost heaving on engineering facilities, the tangential and normal forces of a swelling are identified. When freezing occurs near the foundation, the ground freezes to its side face. The swelling forces tend to move the foundation up, together with a layer of frozen ground. If the forces of ground freezing with the foundation are less than the mass of the structure, then the frozen layer moves relative to the foundation. The shear strength of the foundation when it freezes along with the ground determines the *tangential forces* of swelling.

When a frozen layer increases in thickness, the force of ground freezing with the foundation can exceed the load resistance. In this case, there will be 'bulging' of the foundation; that is, its heave, together with the ground will result in loss of

stability and normal operation of the structure. The normal swelling forces act at right angles to the foundation. The straight freezing of the swelling ground near the side faces of a foundation results in their all-round pressurization. When this occurs, a swelling nonuniformity can lead to one-sided pressure and horizontal displacement. The soil freezing under a foundation determines the development of *normal forces of swelling* at its foot.

Under the action of the forces of frost ground heaving on a foundation, secondary stresses arise in the bearing members of the structure and result in deformations; these deformations can disturb the normal operation of the building or make it unusable. *Deformations* can cause the formation of cracks in foundations, ceilings, floors, and walls and skewing of door and window openings. These deformations have a cyclic, seasonal nature and repeat every year. During the spring melting of swelling ground, water permeability and compressibility increase, while the carrying capacity decreases, which results in differential settlement of a building.

Frost heaving represents a danger for *motor roads* and *railroads* and for *airfields*, causing disruptions in their continuity and evenness. These disruptions, in turn, can lead to emergency conditions in transport due to pushes and strokes in the course of its motion (bursting of rails, automobile accidents, and aircraft accidents on takeoff etc.). In Norway, 300 km of railroads go out of service due to frost swelling every year. In the United States, the railroads in the states of Wisconsin, North Dakota, Nebraska, and Idaho are affected, to the maximum extent, by this phenomenon (Geocryological dangers, 2000).

Frost heaving also constitutes a certain danger for *communication and transmission lines, bridges*, and other structures. The centre of one of the bridges in the Alaskan Railroad rose by 35.5 cm during the winter of 1952–1953. In order to replace the rails in their original position, the upper piles had to be cut (Anderson and Trigg 1981). Swelling is a primary cause of underground *pipeline* deformation, especially where the pipes cross rivers. So, in November 1972 through January 1973, a pipe break at a weld accompanied by a gas release happened as a result of frost swelling in a section of the Messoyakha-Norilsk pipeline where it crossed the Yenisey River (Atlas of natural and technogeneous dangers and risks, 2005).

Frost heaving also has adverse effects on *grassland farming* and *crop production*. During freezing, the soil (especially loose soil) is slightly raised, and as a result, the roots of plants are detached. After melting, the soil subsides and plants with detached roots remain under the sun and wither. To some extent, frost swelling also adversely affects *hydropower engineering*. The straight freezing of clayey dam cores results at times in destruction of their watertight integrity (Natural-anthropogenic processes and environmental risk, 2004).

In regions where permafrost is present, perennial mounds caused by cryogenic heaving (pingos) are abundant. Since they are observed in less developed regions of the world, damage related to them for the present is not great. The effects of frost swelling on human activities are illustrated by Photos 1 and 2.

Photo 1. Pingos emerge in areas of permafrost or seasonally frozen ground due to non-uniform ice formation within the ground. Long-term pingos appear in the course of frost penetration into thawed grounds, usually below lakes, should the lake grow shallow or completely dry up. The largest pingos reach 50 m high and 600 m in diameter. The photo shows pingos near Tuktoyaktuk, Northwest Territories, Canada (Photo credit: Emma Pike)

Photo 2. Mounds of heaving ground do not have considerable impacts on humans since the lands where they occur are usually sparsely inhabited and poorly developed. The photo shows mounds of heaving ground on the Tynda–Zeysk section of the Baykal—Amur Railroad, Russia (Photo credit: V.S. Afanasenko, Department of Geocryology, Moscow State University, Russia)

2. Thermokarst, thermoerosion and thermoabrasion

The term *thermokarst processes* means a melting of ground ice accompanied by strain in beds (initiation of subsidence and depressions or formation of cavities in these beds).

Thermokarst constitutes a serious danger to the safety, stability, and normal operation of structures (*railroads, motor roads, pipelines, buildings*, etc.). For example, in the summer of 1984, subsidence of the Tynda-Berkakit village railroad body base near the village of Magot, Russia, took place due to thawing of ice-saturated ground. As a result, the rail track was destroyed, and a train was derailed (Atlas of natural and technogeneous dangers and risks, 2005). Practically, all the buildings erected in Magadan oblast (Russia) prior to 1951 (when they were constructed without regard for the frozen subsoil properties) were deformed due to ground bearing capacity failure as a result of thawing (Russian Arctic, 1996).

The cause of damage to the buildings was generally the formation of a thawing basin, resulting in irregular settlement of foundations and, as a consequence, initiation of cracks, subsidence of quoins, warping of door frames, etc. Thermokarst subsidence deforms the beds of *motor roads* and *railroads* and surface and underground pipelines, frequently resulting in accidents.

The term *thermoabrasion* means a process of destruction of shores composed of perennially frozen rocks or ice due to the heating effects of water. Thermoabrasion (thermal abrasion) is an important process in forming the shores of Arctic seas (primarily in Russia, the United States, and Canada). Distribution of thermoabrasive shores is shown in Fig. 2.

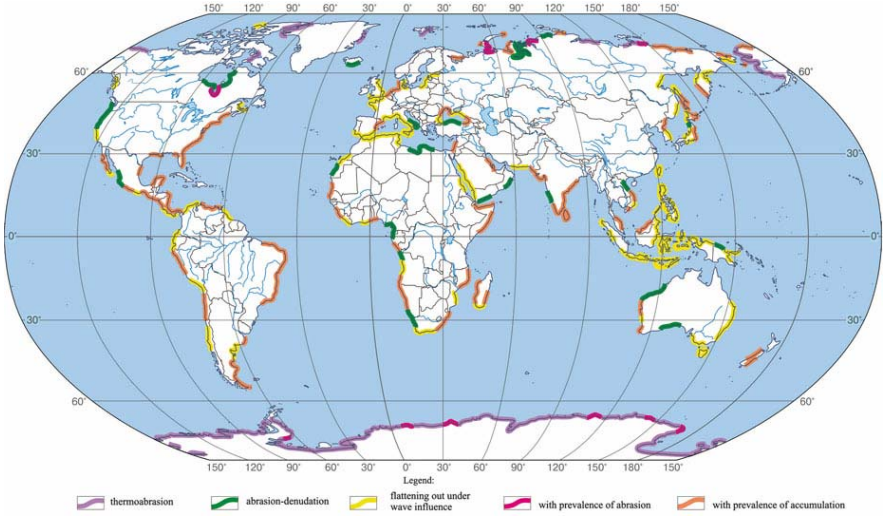

Figure 2. Distribution of thermoabrasive, abrasive, and accumulative shores (Shores 1991. Reproduced with permission of Moscow State University, Russia)

The *basic process* of thermoabrasion is a washout of the underwater shoreface under the action of roughness and currents. It results in the formation of a niche, and further deepening causes frozen rock blocks to fall. The rate of thermoabrasion depends on the lithological composition (the likelihood of washing out of rocks

increases in the following order: clays, loams, clay sands, sands) and the ice content in the rocks (the greater the ice content, the higher the erosion rates).

The *rates* of shore retreat in the case of *marine thermoabrasion* range from 0.2 to 8 m/year. The total value of thermoabrasion for the Russian segment of the Arctic is estimated at 338 million tons per year; this much sediment comes to the coastal zone, owing to thermoabrasion (Stolbovoi, 2002). The volume of deposits entering the Laptev Sea due to washout of the islands in the Lena River delta reaches 1.8 million tons per year (Grigoriev and Schneider 2002). A number of in situ observations have been aimed at estimating the losses of land. So, according to data of J. Brown and J. Jorgenson (2002), an 11-km sector of the shore near Barrow (north-western Alaska) lost 28.2 ha during a period of 50 years.

Long-term average annual rates of *lake thermoabrasion* are frequently 2–10 m/year. The intensity of land elimination on inland water bodies may also be extremely high. For example, over 25 years of the Bratsk Reservoir (Russia) storage operation, thermoabrasion has destroyed about 270 km^2 of the coast (Theoretical principles of engineering geology, 1985). Here, events of extremely high intensity were recorded. So, in 1962–1967, the shore retreated by 759 m near the Artumei settlement, and the erosion rates reached 435 m/year and 150 m/day (Myagkov, 1995).

Thermoabrasion affects the following *kinds* of human activity: (1) industrial and civil site development; (2) water transport; (3) pipeline transport; (4) mineral resource industry; (5) hydropower engineering; and (6) agriculture.

The effects on *site development* are expressed as a threat to beach installations. In September 1986, a sharp intensification of thermoabrasion on the Alaskan coast of the Chukchi Sea took place as a consequence of two storms. The boroughs of Barrow and Wainwright experienced serious losses. In the first settlement, 152 people were evacuated and, later, 32 houses were transported to a new site (Walker 2001). Several power transmission line poles also had to be moved and, in addition, the storm damaged an archaeological monument: peat houses (Walker, 1991). Effects on *water transport* involve changes in navigation conditions. Thermoabrasion processes result in a reduction in depths and create problems for shipping. Water transport is also affected by the demolition of lighthouses and navigation markers. In addition, thermoabrasion causes problems where *underwater pipelines* make landfall. The influences of thermoabrasion on the *mineral resource industry* are rather positive and lie in the fact that, to a large degree, it forms off-shore placer deposits of minerals.

The impact on *hydropower engineering* lies in the fact that thermoabrasion creates an abundance of solid particles. This causes the sedimentation of reservoirs and reduces their usable storage. When woody and peaty shores are destroyed, there is also clogging of waterways and chemical pollution. The effects on *agriculture* are expressed as the destruction of croplands and grazing lands; however, considering the small scales of this kind of human activity in the regions subjected to thermoabrasion, the effects are considered to be minor.

Thermoerosion is a process that causes the break-up of frozen rocks. Simultaneous thermal and mechanical actions of water flows result in intrusion of the water flow into the frozen mass, with the formation of fur rows, ruts, and cavities. Thermoerosion is initiated where the vegetation cover is discontinuous, which can be caused by both natural factors (frost crack formation, solifluction, slip-outs, etc.) and anthropogenic factors. For thermoerosion to develop, the following conditions are necessary (Dynamic geocryology 2001): (1) presence of perennially frozen ground; (2) a grade of more than 1.5°; and (3) sufficient rainfall intensity. The *intensity* of gully erosion is high. Elongation of gullies occurs at rates of 1–2 to 5–7 m/year, reaching, in some cases, 20–30 m/year, while, within ravines and hollows, they can be up to 100–150 m/year.

Thermoerosion is subdivided into two types: bed and gully. The mechanism of *bed thermoerosion* is, to a large extent, similar to that of thermoabrasion. When a shore is being undercut, thermoerosion niches are formed, followed by the fall of blocks. When *gully thermoerosion* develops, gravitational failures result in blockages in channels and, as a consequence, intense cutting and detachment of sides. Riverbed thermoerosion affects different installations located within the coastal zone (harbour installations, transmission and communication lines, roads, pipelines, and other structures). H.J. Walker (2001) uses as an example the thermoerosion effects on the Nigilik village in the Colville River delta (Alaska, United States). From 1949 to 1986, a shore retreated there by more than 50 m, and a threat of one house failure appeared. In order to prevent the destruction, the house was transported over a distance of 30 m from shore. The effects of thermokarst processes, thermoabrasion, and thermoerosion on human activities are illustrated by Photos 3–7.

Photo 3. The photo shows a wall collapse in a dwelling in Yakutsk, Russia, caused by thermokarst. Nobody was injured. To prevent such collapses, houses must be built on piles. Hereby, the air space under the house should prevent the heat impact on the frozen ground. This house was erected 'low-sitting', and for the long time it was occupied, the air space became stuffed with finely dispersed material. This led to gradual melting of frozen grounds lying below (Photo credit: Y.A. Murzin, Institute of Permafrost Studies, Russian Academy of Sciences, July 1993)

Photo 4. Thermokarst poses a formidable threat to railroad maintenance. The photo illustrates the numerous deformations of the Northwestern Railway near Strelna, 75 miles northeast of Valdez, Alaska (United States). The thermal equilibrium of the fine-grained sediments underlying the roadbed was disrupted during construction, and the permafrost started to thaw differentially. Maintenance and use of the railroad were discontinued in 1938. Subsidence, as well as lateral displacement, has continued (Photo credit: U.S. Geological Survey, September 1960)

Photo. 5. The average rate of thermoabrasion does not exceed 0.5–1.0 m/year; however, it may become as high as 10 m/year. Coastal retreat occurs mostly during 2–3 summer months; the process dramatically intensifies at times of heavy storms. The photo shows the coast of the Chukchi Sea in Alaska, near the Wainwright settlement. The severe storm of October 1986 exposed ice wedges, and by that, speeded up coastal destruction which imperilled dwellings (Photo credit: H.J. Walker, July 1987)

Photo 6. The nature of riverbed thermoerosion is, in many ways, similar to that of thermoabrasion. Coastal cut-down forms thermoerosion niches, after which, large blocks fall down. The photo demonstrates the process of coastal destruction in the Colville River delta, Alaska (United States) (Photo credit: H.J. Walker, 21 June 1966)

Photo 7. Thermoerosion also intensifies in cases of human-related breaching of vegetation cover. The construction of a pipeline and parallel power line triggered thermoerosion processes along the pipeline, which threatened the balance of power transmission towers (Photo credit: A.N. Kozlov, Department of Geocryology, Moscow State University, Russia)

3. Cryogenic cracking and solifluction

Cryogenic (frost) cracking is a dissection of a frozen rock mass with cracks that develop when temperatures fall. It occurs in regions of both permafrost and

seasonally frozen rocks. The cracks form during the fall through winter period. They are most pronounced in areas with an acutely continental climate and insignificant snow depths. *The widths and depths of cracks* depend on the composition of the rocks, their uniformity, and temperature distribution. Their maximum lengths reach tens and hundreds of metres, while depths are 5–6 m. The widths of cracks at the top are generally 2–4 cm, though cracks more than 10 cm wide occur. Frost cracking constitutes a certain danger for the following engineering *structures*: (1) motor roads (roadways may go over the discontinuity); (2) residential and industrial buildings (breakage of continuous footings, cracks in the walls); (3) airfields (damage to airfield pavements); (4) pipelines (deformations and even breaks of underground steel pipelines); and (5) underground communication cables.

Solifluction is a slow viscous plastic flow of thawing waterlogged soils and fine-dispersed ground on gentle slopes. It occurs in Russia, the United States (Alaska), Canada, Norway (especially on the Svalbard Islands), the Falkland Islands, and mountain regions of central Asia.

The *conditions* necessary for the development of solifluction include the following (Romanovsky 1993): (1) increased content of pulverescent particles, (2) increased humidity, (3) presence of surface slopes (usually 2–3 to 10–15°), and (4) absence of woody and large shrub vegetation.

A *distinction* is made between mantled and differential solifluction. For the former, relative areal uniformity, low drift velocity (2–10 cm/year), and an absence of sinter relief forms are characteristic. The distinctive feature of *differential solifluction* is the presence of characteristic forms of micro- and mesorelief: solifluction 'tongues', flows strips, terraces, etc. Their formation is caused by differences in drift velocities of thawing rocks on different parts of a slope. The rate of this type of solifluction may reach 10 cm/day. The areas of the solifluction relief forms range from several square metres to thousands of square metres.

One kind of solifluction is the *slip-out* (so-called fast solifluction). It is characteristic of steeper slopes (not less than 10°) formed by silt sandy loams or clay loams; fast solifluction has a catastrophic character but develops within relatively small areas. In the case of fast solifluction, rates reach tens of metres per day (Geocryologic dangers, 2000).

The influences of fast and slow solifluction are most urgent for the following *kinds* of human activity: (1) mineral resource industry; (2) transport (motor, rail, pipeline); and (3) industrial and civil engineering.

A negative influence on the *mineral resource industry* is expressed as the *complication of operation* of enterprises due to sloughing of pit walls. Another consequence is *dilution* (reduction in concentrations of the commercial component). During mining operations, rocks containing the commercial component are stored in certain places for the purpose of downstream processing. Grounds that move under the action of solifluction increase the volume of rocks requiring processing, which reduces the economic efficiency of the operation of a

mining enterprise. At the same time, slow solifluction has a certain *positive importance* for the transportation of heavy minerals to the valleys of rivers and streams and the formation of *placer mineral deposits*.

The effects on *transport* lie, first of all, in the deformation of hollows in the bodies of motor roads and railroads and complications in the operation of surface pipelines. Problems for *industrial and civil engineering* are similar and consist mainly of sloughing of construction pit walls. The effects of cryogenic cracking and solifluction on human activities are illustrated by Photos 8–11.

Photo 8. Cryogenic cracking is generated by stretching strains developing in frozen ground. In spring, water from melting snow penetrates into the ground and freezes. Repetition of the process leads to cavern-load ice formation. The photo shows polygon wedge ice (and melting pingo) near Tuktoyaktuk, Northwest Territories, Canada (Photo credit: Emma Pike)

Photo 9. Cryogenic cracking oftentimes creates problems for auto road and railroad exploitation. The photo shows frost-induced cracks that deform a roadbed in Zabaikalye, Russia (Photo credit: S.Y. Parmuzin, Department of Geocryology, Moscow State University, 1967)

Photo 10. A feature of differential solifluction is generation of micro- and mezo-landforms that are conditioned by different velocities of shifting of melting ground on different spots of the slope. At times, the speed of this kind of solifluction can reach 10 cm/ day, but customarily it does not exceed 10 cm/year. The photo shows solifluctional flows near Suslositna Creek, Alaska (United States) (Photo credit: U.S. National Geophysical Data Center)

Photo 11. A slip-out (so-called fast solifluction) is one kind of solifluction. It is characteristic of the steeper slopes formed by silty loams or sandy clays. Rates reach several tens of metres perday. The photo shows solifluction slip-out on a bank slope in Yakutia, Russia (Photo credit: V.E. Tumskoy, Department of Geocryology, Moscow State University, Russia)

REFERENCES

ANDERSON G. K., TRIGG K.F.(1981), *Interesting cases from the practice of engineering geology.* Nedra, Moscow;

BROWN J., JORGENSON J.(2002), *Key areas of the Beaufort Sea (Alaska) as a part of a program of the Arctic coast dynamics monitoring*, In: Extreme cryospheric phenomena: fundamental and applied aspects. Izd., PNTs RAN, Pushchino;

GRIGORIEV M.N.(2002), *Shore erosion processes and sediment flux from eroded islands in the apex of the Lena delta.* Ber Polar und Meeresforsch, 426: 52-56;

MYAGKOV S.M.(1995), *Geography of natural risk*, Moscow University, Moscow;

ROMANOVSKY N.N.(1993), *Fundamentals of lithosphere cryogenesis*. Izdatelsky dom of Moscow State University, Moscow;

STOLBOVOI V.(2002), *Carbon content in coastal ecosystems of the Russian Arctic,* In : Abstracts of international workshop on arctic coastal dynamics. Ber Polar und Meeresforsch, 413: 75- 76

WALKER H.J.(1991), *Bluff erosion at Barrow and Wainwright*, Arctic Alaska. Z .Geomorphol N.F., Suppl.- Bd. 81: 53- 61, Berlin- Stuttgart;

WALKER H.J.(2001), *Coastal processes and their influences on the people of Alaska's North Slope,* In: Norton D.W.(ed.) Fifty more years below zero: Tributes and meditations for the naval arctic research laboratory's first half century at Barrow, Alaska, The Arctic Institute of North America, Calgary, Alberta;

*** (2005), *Atlas of natural and technological dangers and risks of the emergency situations in the Russian Federation*, IPTs, Design. Information, Cartography, Moscow;

*** (2001), *Dynamic geochronology*, Izdatelsky Moscow State University, Moscow;

*** (2004), *Natural – anthropogenic processes and permafrost risk,* Gorodes, Moscow;

*** (1998), *Resources and environment. World atlas*, Russian Academy of Sciences, Institute of Geography, Ed.Holzel, Vienna, vol. I-II

*** (1996), *Russian Arctic : on the threshold of catastrophe*, Centre of the ecological policy of Russia, Moscow;

*** (1991), *Shores*, Mysl, Moscow

*** (1985), *Theoretical principles of engineering geology: social- economic aspects,* Nedra, Moscow

*** *Internet Resource*: http://tsun.sscc.ru/tsulab/20041226fat_r.htm

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

GEOMORPHOLOGY AND MORPHOGENESIS OF THE BELI LOM RIVER VALLEY

GEOMORFOLOGIA ŞI MORFOGENEZA VĂII BELLI LOM

Svetla STANKOVA[1]

Abstract: The present paper renders the results of a geomorphology research performed in North-Eastern Bulgaria. It focusses on the geomorphology and the main stages of evolution of the Beli Lom River. On the base of field research, geology and geophysics research, detailed analysis of the specialized literature, it is concluded that the formation of this impressing relict erosion relief can be explained only with the factor-geology time. It formed long before the limits of the Quaternary. The aim of the present paper is to draw scientists' attention on the issues regarding the Pleistocene – Holocene paleoclimatic conditions and relief in North – East Bulgaria and South - East Romania so to clarify its evolution.

Key-words: dry valley, rivers with constant flow, paleokarst, relict erosion relief, neokarst, Aptian, Albian
Cuvinte cheie: vale seacă, cursuri cu scurgere permanentă, paleocarst, paleorelief erodat, carst, Apțian, Albian

The Beli Lom river valley is located at the border between the relict river – valley net in North-East Bulgaria, well known in the studies as dry valleys, and the rivers with constant flow – in the central part of the South Misian (Danube) valley.

This circumstance induced special features in morphology, foundation and development of the valley as well as of the entire basin. Together with the dry valleys, it represents an enigmatic morphological phenomenon in Bulgaria mainland.

The purpose of this study is to clarify morphology, morphogenesis and the main stages in the development of theBeli Lom river valley.

According to K. Shkorpil the name of the river comes from the Albanian word 'lumi' – river, but according to V. Marinov it means deep engraved into the relief slowly flown river.

The Beli Lom river valley is located in south-west part of Ludogorie, between Samuil uplands in the east and Razgrad uplands in the west.

[1] Shumen University "Ep. Konstantin Preslavski", Shumen, Bulgaria

The north boundary of the region passes along the watershed of dry valleys, which flow into the Danube River, while in the south it bounds with the water catchment basin of the Vrana River (left feeder of the Big Kamchia River). The western boundary passes along the watershed with the Cherni Lom River basin. In the east, there is the Topchiiska river.

In these outlined there develops the catchment basin of the Beli Lom River has about 1,300 km^2.

Morphologically it belongs to the South Misian plain, but hydrographically it belongs to the catchment basin of the Ruse Lom River, which is joined to the Black Sea basin through the transit valley of the Danube.

It begins from Razgrad uplands near Ostrovche village, Razgrad Municipality, 400 m above sea level. Its length is 142.1 km, with average rise – 1.7 %. The mouth of the Beli Lom River is 60 m above sea level. It flows into the Ruse River near Ivanovo village at 'Smesovete', where the Cherni Lom River flows.

The Beli Lom River and many of its left tributaries have constant flow. However, its right tributaries are dry valleys, 'swallow holed' into the karst, which supply the deeper aquifer levels. Here, shallow waters appear episodically, mainly into engraved slopes of the dry valleys, during snow thawing and intensive rainfalls.

Lithological - stratigraphic and tectonic precondition for the development of the relief. The researched region is distinguished due to low tectonic style; structurally, it belongs to the range of Misian platform.

The Beli Lom River is cut into sub-horizontally limestone layers, which outline the edges of canyon- shaped sections. They appear in the southern deep-engraved parts of the valley but in the northern sections, in the river valleys and ravines, there appear limestones, sands and clays.

The presence of the stratigraphic units from the Cretaceous system in a fixed sequence determines the availability of different morphology of the river valley in these sections.

There, where the sediments of Razgrad suite (formation) outcrop, the valley is runway – shaped, the slopes are relatively aslant, the valley bed is wide.

With the spreading of the limestones from Ruse suite (formation), the valley changes its pattern – gets narrow, canyon aspect. That is due to the bigger hardness of the limestones from this formation against wind erosion and pliability to karstification.

The relief in the North-East Bulgarian plain is mainly formed on early-aged limestones, which favour karst processes.

The Beli Lom River runs through the area with old (buried) and young karst. The wide spreading of strong karstificated, hydro-carbonated limestones are the main reason for the absence of shallow flow waters – availability of dry valleys, which drain the forms of epikarst and mesokarst. In Ludogorie region, the karst has evaluated mostly in the limestones of Ruse suite (formation).

In the catchment basin of the Beli Lom River the wide spreading have Quaternary agglomerates.

There are mostly gravel, rubble, sands, aleurite, clays loess (Pleistocene), also clay sands, and sandy clays, which fill out numerous lowers (Holocene). These agglomerates and mainly the loess complex in a bigger grade lack the main characteristics of the current relief and make unclear the transition between the separate denudation surfaces and between surfaces and slopes of the dry valleys or valleys, between the slope and valleys bed, etc.

The loess complex represents with 3 to 5 buried soil levels and with 4 to 6 loess soil levels. The whole lift is up 5 to 10 m in the south and increases up 30 to 40 m in the north. Above this, it has formed the current soil cover .

Morphology. As a result of the conducted field research within the borders of the catchment basin of the Beli Lom River, there were identified two pre-Quaternary morphostratigraphic (denudation surfaces) structures (Fig. 1).

The oldest level here dates back in the Sarmatian-Pontian and it is preserved along the watershed ridge in the range of Razgrad and Samuil uplands and this way enclose the springs of the Beli Lom River.

It is covered with loess and loess-like clays and its surface is karstified as in places the paleokarst meso-forms and microforms are fill with quartz-kaolin sands.

It is spread out in hypsometric interval 450 – 350 m. The big rise of the slopes (14 – 16º) and V – shaped cross – section in this part of the valley shows comparatively active current rising movements. The second denudation surface is from Pliocene (Levant), widespread in hypsometric interval 320 – 200 m.

These areas have undergone active river erosion and, consequently, they are strongly rended up. They are ‘tongue’ – shape and develop between the tributary valleys and glens of the Beli Lom River (Fig. 1) being disposed from south to north.

The evolution of the valley during the Quaternary is reflected in numbers and hypsometric lay of the remnants of old valley beds marking former profiles of balance. The terrace spectrum in the Beli Lom river valley cover flowed terrace – T_0 on 2 – 5 m and five overflowed terraces T_1 on 10 – 12 m, T_2 on 22 – 25 m, T_3 on 35 – 40 m, T_4 on 60 – 65 m and T_5 on 80 – 90 m. Due to the general wide-spreading of the loess cover the whole terrace complex is hardly under-covered.

The greatest widespread is registered by T_0 in the section Razgrad town – Dryanovets village (Fig.1). Here it develops on both banks of the river reaching 400 – 500 m width, with a maximum in Gecovo quarter. The present landforms are dominated by forms of complex geomorphological valleys (a close –meshed river – valley net, most of them dry valleys) and the karst geomorphological complex (present, active karst forms in combination with buried and fossil forms).

The aggregate in the development of the river-valley net in the region is that in the upper areas the valleys are slightly engraved into. The cross – section profile is wide, bed – shaped, in some places chest – shaped, the width of the riverbed

reaching 70 – 90 m. Loess and clay cover up the roughness of the pre-Quaternary relief.

Figure 1. Geomorphologic map of the Beli Lom Valley

The river valleys are deepest engraved in their middle sections, the hypsometric range 150 – 200 m, where they have canyon characteristics. The slopes are steep, almost vertical in certain places.

Between Senovo town and Pisanetc – Nisovo villages there can be observed expressive engraved meanders. One of the reasons for the canyon-shaped cross – section of the valleys is the lithological foundation represented by hard limestones of Ruse suite (formation).

Field research in the catchment basin of the Beli Lom River emphasizes the next characteristics in morphology of the valley. In section Razgrad – Dryanovets, it is widely open sue to the removal of clay – marl limestones and has asymmetrical cross-section profile. The left valley slope is slight, terraced, with agricultural lands, while the right slope is steep and affected by erosion due to deforestation.

The asymmetric profile of the valley is especially well marked in the section Senovo quarter – Dryanovets village. Probably this asymmetry is induced by the northern and northwestern rise of the strata. The midstream of the Beli Lom River is closer to the northern watershed outlining the lack of symmetry in the catchment basin of the river. There are strongly developed left tributaries that compensate the right ones, which are poorly developed. The right tributaries of the river are shorter and deeper but the left ones are longer and with smaller rise. According to Krastev,

Krasteva (2003) this asymmetry have to relate to the displacement in southern direction of the watershed between indirect flow (with the Beli Lom River) and direct flow (to the Danube river) as well as to the geomorphological progress of the Danube valley and to the northern rise of the strata.

The Beli Lom river valley in the section between Dryanovets village and Senovo town has typical chest- shaped form – flat bed, which goes northward from Senovo, 500 – 600 m wide, steep almost vertical slopes. In the last 1 – 2 km of this section, the valley bed is reduced and the cross-section profile acquires canyon characteristics.

The typical feature of the longitudinal profile of the Beli Lom bed is the weak rise; thus, it forms meanders in its alluvial deposits, which fill up the wide (200 – 300 m) valley bed and mobile meanders (typical for the section Razgrad – Pisanets). On places, the river forms branches surrounded by small alluvial isles.

Downstream, the Beli Lom River makes several sharp changes in the direction. Probably these bends in the valley direction are due to tectonic destructions of the foundation. The first sharp bend occurs after the reservoir 'Beli Lom', the second one before Ushinci, the third bend at the Senovo town and the last one after Nisovo village, near the confluence with its biggest tributary – the Malki Lom River. The maximum depth of the erosion is 160 m.

It is interesting that the Beli Lom river has no right tributary glens and valleys in the section Gecovo quarter – Senovo town and no left tributaries between Dryanovets village and Senovo. This is due to the geological texture and palaeographic evolution of the region in these sections.

As young karst forms (shallow and underground), in the researched area, there are well represented the forms of the underground mesokarst – caves and niches. They are mostly attached to the slopes of the Beli Lom and the Malki Lom Rivers, etc.

Caves and big niches appear on the territory of Vetovo town, around Pisanets village, in the valley of the Malki Lom River near Svalenik village, in the territory of Nisovo village at the confluence of the Malki Lom with the Beli Lom, etc. The characteristic feature of the underground karst in the Beli Lom valley is that the cave entrances are mainly on the right valley slope and on floors. According to Krastev, Krasteva (2003) this is induced by the growth of the caves closely with the formation of the separated profiles of the river balance.

The dominant forms of the surface karst morphological complex are the dolines (sink hole). They developed on the Valogs and Uvalas in the blind dry karst valleys. The whirlpools are particularly widespread west of Ezerche village, north-west of Svalenik village, between Dryanovets village and Senovo town.

Main stages in the growth of the valley. Regarding the formation and development of the river – valley net on the Bulgarian territory it is affirmed the conception that the main stage in the formation of the river valleys is Quaternary (Galabov, 1966; Mihailov, Mishev, Popov, 1966; Minkov, 1968).

According to Krastev, 1974; Krastev, 1975 a,b; Krastev, 1977 a,b; Krastev, Stankova, Stoyanova, 2002, the river – valley net in North–East Bulgaria has relict characteristics e.g. its nascent and growth come out far from over Quaternary borders. As confirmation of this it can be shown some characteristic features of the rivers (dry valleys in North–East Bulgaria), in particular – the Beli Lom valley could not be explained only with the vital force of the river but with the factor – time.

For instance, the Beli Lom valley is deeply-engraved into resistant to erosion thick lifted limestones as the maximum engraving is 160 m; in the middle-stream and down-stream part, the valley has canyon characteristic; the average rise of the riverbed is small – 1.7% and the longitudinal profile is near to the ideal curve; on places in the middle-stream and down-stream constant flow is absent.

On other hand, the presence of engraved meanders proves the imposed epigenetic origin of the whole river – valley net, included the Beli Lom River.

Pre-Neogene stage. To the first sub-stage it is related the Early Apt when in Lower Cretaceous sea formed thick carbonate clays and carbonate sediments. At the end of Barem and in the beginning of Aptian the eastern part of South Misian plain underwent positive tectonic movements as a result of the activation of the North Bulgarian vaulted rising – also result of the activities of Austrian folded phase (Nikolov, 1969). Consequently, the sea basin regressed to western and south-western direction and, at the same time, there occured processes of diagenesis and lithification of carbonate sediments. On newly created mainland, surface flow became active tracking the coastal line of the retreated sea basin. The extended speed of rising clearly outlined lines of an erosion – denudation relief, which dominated over the neighbouring areas.

Beginning with the Garg sub-age from the Apt age, it is mark the beginning of the second sub-stage.

In the conditions of a temperate humid and hot climate typical for the tropical zone, there formed huge surface paleokarst forms. In the evolution of the erosion-denudation relief it occurred fundamental changes, as the leading factor in morphogenesis become – karst processes. They are directly related to the lowering of the underground water. On the slopes of shallow lowering areas, there formed typical well-shaped and cracked shallow holes. Otherwise, this hydrographical net, which was preceeded by shallow fractures gave certain direction of the karst process, predetermined the orientation in developing the karst forms (Kratsev, Krasteva, 2003).

During the third sub-stage (Albian age), it occurred the fossilisation on the already created tropical to subtropical paleokarst relief – agglomerations with subaquatic (sea) origin. After the regression of the Albian basin, it formed a wide polyfacial aligned surface, the area of which occupied the largest part of the dry valleys.

The fourth sub-stage can be referred to as the nascent stage of the river – valley net in North-East Bulgaria as a result of the regression of the water of

Albian basin in northern, north-western and western directions, due to the activation of North Bulgarian vaulted rising. With the regression of the shallow, epicontinental sea basin northwards and west – north-westwards, the first land increased its area and height.

The shallow flow has arisen and it was orientated towards the coastal line of the retreated sea basin.

Following the retreated coastal line onto the wide Albian surface, the river - valley net developed as a pro-form of the present one. The rivers during this sub-stage were characterized by great vitality determined by the climatic conditions – close to the tropical ones (Krastev, 1977a). This vitality was sufficient for engraving of the valleys into the Albian agglomerates, represented mainly by sands, clays and very seldom by marls. The slightly gradient and lithological substrata determined meandering of the rivers.

Parallel with the arising of the periphery, the south and southeast parts of the researched region was modelled and the Albian sediment cover was carried away from between watershed areas. Thus the initial river – valley net projected onto the pre-Albian denudation surface, formed on limestones of Ruse suite (Hotriv-Aptian). Parts from the Albian shallow sea agglomerates preserved only in wide paleokarst forms, which appeared during the Garg sub-age (Late Aptian age).

Deep engraving of the rivers – their meanders could be explained by the continuous rate of rising and with the big river discharge. Furthermore, the smooth, constant rising rate of southern and south-eastern periphery of the dry valleys could explain the absence of terraces along the valleys. This process continued until the beginning of the Neogene (Krastev, Stankova, Stoyanova 2002).

Fifth sub-stage. During the period end of the Albian till the end of Pliocene the palaeographic regime of these lands is unclear. According to Krastev, Krasteva (2003), if it supposed that through this long-time period (111 – 112 Ma BP) North–East Bulgaria region was mainland, it is very difficult to explain how paleokarst has been ‘spared’ from prolonged denudation. In the researched area, there are available compensable rhythms of sedimentation and denudation sequential changed during the whole period from Aptian until middle Miocene. Thus, the paleokarst preserved unaffected by planation processes until the beginning of the Paleogene despite tectonic activity in the region.

The Neogene stage. During this stage, there formed denudation surfaces. Their formation was induced by the lowering of the main erosion basin – the Black Sea, which led to the deepening of the rivers into the geological base.

In the researched area, there are available two denudation surfaces – Sarmatian-Pontian preserved on the level 350 – 450 m and Pliocene (Levant) on the level 220 – 320 m.

During the Miocene, the Sarmatian Sea occupied a wide part of South Misian plain.

In this large basin there settled mainly limestones, less marls, clays and clay sands. This Sarmatian surface grew due to its specific stability. It underwent

erosion processes and that is why the age of this primary surface is consented for Sarmatian– Pontian. It is the base for later development of the terrestrial forms.

In the second half of Neogene stage – Pliocene, due tolocal epeirogenetic elevations, the Sarmatian Sea reduced. This led to the separation of several Pliocene basins within South Misian plain, one of them being around Ruse town (Georgiev, 1991).

The Quaternary stage. During the transition from Pliocene to Pleistocene, significant immersions in the Black Sea basin led to different risings in our land. It activated regressive erosion not only in case of the rivers flowing directly in the Black Sea, but also for their tributaries. This led to the engravings of the rivers into the geological base and formation of the present river – valley net. It formed the Quaternary terrace complex – five up swamped terraces and two swamped ones.

During the Lower Pleistocene, it began intensive loess drifting and final fossilization in watershed ridges. During the Quaternary erosion – karst process in the Beli Lom valley destroyed paleokarst relief in the region.

Conclusion

On the basis of the analysis of up to now geological and geophysical research and terrain examinations in the region, it can be concluded that the morphological aspect and the spatial conduct of the separate elements in the Beli Lom river valley represent a summary result of karst and erosion – denudation processes. The lithological substrata – thick limestones and clay limestones and marls favoured denudation and erosion. There should be also mentioned the role of the tectonic movements during the Neogene – Quaternary periods – ascending movements in North Bulgarian upland and several multiple lowering movements in the erosion basis – the Danube river and the Black Sea.

The beginning of the evolution of the Beli Lom river valley assigns to the beginning of the Garg sub-age of the Aptian age when, in the conditions of a hot and humid climate typical for the tropic zone, there appeared huge surface paleokarst forms. Afterwards they fossilized from agglomerates with subaquatic (sea) origin of the Albian basin.

Tthe arising of the Beli Lom river valley is assigned to the end of the Lower Cretaceous period, when on wide Alb sediment surface, the river net developed. Parallel with the rise in periphery, the south and southeast parts of the region underwent engraving and carrying out of the Albian sediment cover. Thus, the primary river – valley net developed on the pre-Albian denudation surface, formed onto the limestones of Ruse suite (Hotriv-Aptian).

REFERENCES

GEORGIEV, M., (1991). Physical Geography of Bulgaria publication Sofia University, 406

GALABOV, J. (1966), Main stages in relief growth. Geography of Bulgaria. vol. 1 – S., BSU, p. 547

KRASTEV, T. (1974) Morphology of the buried karst in Ludogorie. Geographical problems vol.1, 43 – 54

KRASTEV, T. (1975) The role of the tectonic movements in growth of the buried karst in Ruse and Razgrad regions. Geographical problems, 3, 29 – 34

KRASTEV, T., (1975) Geomorphology of the buried karst in Ruse and Razgrad regions and related to it kaolin fields. – dissertation

KRASTEV, T., (1977) Role of the paleoclimate for the growth of the buried karst in Ruse and Razgrad regions. Published Bulgarian Geographical Society, XV (XXV), 45 – 50

KRASTEV , T., (1977) Origin of the kaolin fields in North – east Bulgaria. Nature, 4, 42 – 27

KASTEV , T., S. Stankova, M. Stoyanova, (2002), The problem for the origin and geographicalgrowth of the valleys (dry valleys) in North–East Bulgaria. Scholarly conference with international participation in memory of Prof. Dr. Dimitar Yaranov (1909-1962), vol.1. Scientific contributions of Prof. Dr. Dimitar Yaranov. Relief, crust, mineral resources, (Varna, 09 – 11.09.2002), S., 2002, TerArt 328 – 343

KRASTEV, T., T. KRASTEVA, T. NIKOLOV, (2002) Origin and age of the paleokarst and connected with it kaolin sands in North–East Bulgaria. Scholarly conference with international participation in memory of Prof. Dr. Dimitar Yaranov (1909-1962), vol.1. Scientific contributions of Prof. Dr. Dimitar Yaranov. Relief, crust, mineral resources. (Varna, 09 – 11.09.2002), S., 2002, TerArt 168 – 198

KRASTEV , T., T. KRASTEVA, (2003) Paleokarst and kaolin fields in North–East Bulgaria, S., 2003, TerArt

MARINOV, V., (1941), Deli – orman (south part): Territotial geographical study. – S. 244

MIHAILOV, C., K. MISHEV, V. POPOV, (1966), Dunabe hill plain/Mihailov, C., K. Mishev, V. Popov// Geography of Bulgaria, S., BSU, page 57 – 80.

MINKOV, M., (1968), Loess in North Bulgaria/ M. Minkov, S., BSU

NIKOLOV , T., (1969), About geological growth in North- east Bulgaria during early chalk age / T. Nikolov. // Bulgarian geological society magazine, 3 № 2, page 147 – 162

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

SPATIAL DISTRIBUTION OF PASTORAL ACTIVITIES IN ROMANIA BASED ON ANTHROPONIMY

DISTRIBUŢIA SPAŢIALĂ A ACTIVITĂŢILOR PASTORALE DIN ROMÂNIA ÎN FUNCŢIE DE ANTROPONIME

Ionel BOAMFĂ [1]

Abstract: Shepherding is an ancient activity, with a great economic importance. The importance of this activity in the area inhabited by the Romanians, both in the past and nowadays, is highlighted by the large number of terms that have created anthroponomy. The spatial extension of these names goes far beyond the current Romanian living space, both south and north of the Danube. The most frequent names derived from *baci*, *cioban* and *mocan*.

Key-words: pastoral activities, Romanian territory, anthroponimy, pastoral names
Cuvinte cheie: activităţi pastorale, România, antroponimie, denumiri pastorale

Introduction

This paper aims at highlighting the spatial distribution of shepherding in the past based on the Romanian antroponyms: *baci, stânar, stru(n)gar*, *păcurar, ber(be)car, mocan, cioban*, etc.

We have some problems: first of all, we mention the difficulty of finding a unitary level of cartographic representation of these particularities at the level of the states taken into consideration within the documentation. We referred to the Carpathian space and to the entire Balkan Peninsula, that were influenced by the Romanian pastoral activities. Generally, we used national administrative units of NUTS 3 level for the member states of the European Union, as well as for those in the European Economic Area or countries candidate to join the EU, as well as for some countries that are not in this situation (*the R. of Moldova*, where we used the level of former counties up until 2005; *Bosnia-Herzegovina, Serbia*, including *Kosovo*). In other situations, we either resort to a more detailed level (*Montenegro, Albania*) or to a less detailed one (the case of *Ukraine* or *the R. of Belarus*).

[1] *"Alexandru Ioan Cuza" University of Iaşi, Romania*

Also, another problem was the access to onomatological information. Thus, in order to collect anthroponyms related to our study, in the case of some countries (*the R. of Belarus*, partially *Bulgaria* or/and *Poland*) we had to predominantly use information that exists at the level of some subscribers such as firms or/and companies or the existing information was accessible only at the level of the capital (Sofia, in the case of *Bulgaria*). Then, at the level of *Ukraine*, the anthroponymical information can be accessed (almost) entirely, and for the names whose frequency prevails, at national level, 200 subscribers, a study is necessary at the level of each locality, which would require a vast period of time, so we limited ourselves, in the case of such anthroponyms, only to capitals of regions, as well as to districtual ones and other localities (only for the neighbouring regions of *Romania* and *the R. of Moldova*)[2]. For the *R. of Belarus* and the eastern part of *the R. of Moldova* (Transnistria), the identified anthroponymical information referred only to a few localities (Minsk, Pinsk, Lida – in the first case, Tiraspol and the localities under the control of the authorities at Chişinău – in the second one). As for the research methods, whereas in *Greece* and *Cyprus* (where the Greek alphabet is used), *the R. of Macedonia, Bosnia-Herzegovina, Serbia* (that use, even partially, the Cyrillic alphabet) there is the possibility to search by using the Latin alphabet, in *Bulgaria* (Sofia), *Ukraine*, the eastern part of *the R. of Moldova* (Tiraspol) and *the R. of Belarus*, the quested names were introduced directly in the Cyrillic alphabet. Recently, in April 2010, the Romanian landline operator (Romtelecom) limited the search possibilities to only a maximum of 10 subscribers (compared to 500 previously) making the search at the level of *Romania* extremely difficult, if not impossible. Moreover, the topographical maps we had access to were made at a large scale only at the level of a significant part of the area, so that the identified micro-toponymy does not present the same degree of detail. We eliminated from the toponyms those that derive from the appellative *bacila*, which created sheepfold names in *the R. of Macedonia*.

Finally, the inclusion in the area of some countries that had no real connection with the Carpathian area (*the R. of Belarus*) or with the Balkan Peninsula (*Slovenia, Cyprus* and, largely, *Turkey*) was based on several reasons. The south-western part of *the R. of Belarus* is crossed by the Western Bug, a branch of Vistula, which springs from the Carpathians. Also, a large part of this country, as well as the western part of *Ukraine*, was, in different historical periods, a part of *Poland*, a Carpathian country. Although it is considered that *Slovenia* is not (really) a Balkan country, taking into account the close historical connections with the Croatians, the Bosnians, the Serbians or/and the Hungarians, whose countries are included in the area, we chose to retain this country, too, among those that are included in this area. *Turkey* (also) belongs to the Balkans, not only through its European part, but also through the name given to the Balkan range,

[2] In the current stage of the study, we managed to identify, by region, over a third of the anthroponyms related to sheep breeding existing at the level of the subscribers in Ukraine. This amounts to approximately two thirds (66.62%) of the total number of identified anthroponyms, of the over 112 000 extant.

from which, through extension, the south-eastern European peninsula also took its name, as well as based on the fact that the Ottoman Empire, the precursor of the current Turkish state, ruled (directly or indirectly) not only a large part of this peninsula, but also Central- and East-European territories included in this area. Finally, *Cyprus* was added to the area due to its important Greek ethnic component, as well as to the fact that this is completed by the Turkish one, *Turkey* being also included. Considering this context, we believe that the ideas and the conclusions presented, even if resulting from an important documentary-bibliographical basis, still have, at this moment in our research, a provisional character.

Data and methods

We will mainly refer to the recording in the database and the mapping of anthroponyms that we prevailingly used in our work.

The first stage was one of documentation, which, with the (already mentioned) limitations, provided a number of approximately 70,000 people that bear names more or less related to the shepherding activities in the past in this area. Considering the close connection between *mocani* and *cojani* (names that resulted into many variants and derivatives), we also included over 5,000 subscribers that bear names such as *Cozan, Cozar, Cojar* or *Cojan* (with derivatives), so that the total number of patronyms used in the analysis amounts to approximately 75,000 people. The general total of anthroponyms that can be identified exceeds 112,000, the difference that was not allotted per administrative units belonging, as we have already mentioned, to *Ukraine*. Out of the 260 million inhabitants of this area, 28.47% have a landline phone, that is, a total of over 74.2 millions of subscribers.

This was followed by the sorting and introducing of the anthroponomical material in the database, made in Microsoft Excel. In some cases (*Bosnia-Herzegovina, Croatia, Slovakia*), some subscribers were also listed with their mobile phone number: if the specified address was identical, they were counted only once, which also happened in the case of landline subscribers in *Ukraine* (where the elimination of the double recordings was based on the identical surname of the father and/or address). Overall, the centralization, per 506 Carpathian-Balkan spatial units, led to the delineation of some 350 variants of names taken into account, given the characteristic suffixes, spelling, etc. In 153 administrative units we did not record any patronym related to shepherding.

Subsequently, the database was processed, first, in order to obtain the percentage of people bearing each name/each name variant of all the people bearing that patronym in the study area. Then, the coefficients of spatial distribution were calculated by reporting the percentage held by each patronym and/or its variant to the percentage held by each spatial unit out of the total of the population of the countries included in this area.

Thereafter came the mapping of the statistical information and the map processing. Data in absolute format were used for the representation through the proportional circles method. Data in percentage format served in the mapping of

the spatial distribution of the anthroponyms derived from each term, as well as in the design of the representations using the ascending hierarchical classification method and for its combination with the analysis in main components. Finally, the data obtained by calculating the spatial distribution coefficients led to the design of numerous maps by using this method[3]. The variables considered are anthroponomy derived from terms such as: *baci, strungar, mocan, stânar, păcurar, berbecar, cioban, sălăşan, câşlar, odăian*.

The spatial distribution of pastoral names

The appellative *baci(u)*[4], about whose origin several opinions were presented, is widespread. We think that it is Thraco-Dacian (I. I. Russu, 1981), because of its large spatial expansion, in onomatology, but, mostly, because of its many derivatives, created in the Romanian language (this proves the great ancient character of the term). Thus, we noted many toponyms and anthroponyms derived from it, present especially in areas where both Daco-Romanians, as well as Aromanians better resisted the assimilation from neighbouring peoples. Regarding the most significant concentrations of the anthroponym, with all its variants and derivatives, although it is emphasized by greater than one factors, *Romania, the R. of Moldova,* southern and western *Ukraine, Hungary, Slovakia* and the northern half of *Serbia*, the largest values of that coefficient can be found on the Dalmatian coast of *Croatia*, in *Montenegro* and in some prefectures in *Greece.*

Among the variants, the most common is *Baci*, with many derivatives (several hundreds). The most important nuclei of spatial distribution are found in *Romania, the R. of Moldova,* southern and western *Ukraine, Slovakia, Hungary,* as well as in the western part of the Balkan Peninsula, from *Slovenia* to *Serbia,* western *Bulgaria* and southern *Albania.* The highest values of the coefficient of spatial distribution are in southern Transylvania, northern and southern *Serbia*, in Slavonia and on the Croatian Adriatic coast. However, the theme *Baţi* (*Batsi*) can be found especially in the south of the Balkan Peninsula, with the greatest concentrations in *Greece* and in *Montenegro,* but also with a significant presence in *Serbia, Croatia, Hungary, Romania* and *Ukraine.* In *Serbia, Romania* and southern *Ukraine* we can talk about immigrations from the south of the Balkan Peninsula[5], where the Greek influence changed *Baci* into *Batsi*, but in *Croatia,* northern *Serbia, Hungary* and western *Ukraine,* regions that were for several centuries

[3] We selected only the maps accomplished by using the method of the spatial distribution coefficients.

[4] Ion Iosif Russu, *Etnogeneza românilor (The Ethnogenesis of the Romanians)*, Bucharest, Editura Ştiinţifică şi Enciclopedică, 1981, p. 253-254.

[5] The imigration, from the south of the Balkan Peninsula, of some Aromanians or even of some Greeks (descendants of denationalized Aromanians) bearing such names would not be surprising, on the one hand because, either as a result of getting rich from sheep breeding (which transformed them into traders), or due to the disturbances in the Balkans (18^{th}-19^{th} centuries), many Aromanian *chervangii* settled in central- and eastern-European cities (Vienna, Buda, Miskolc, Odessa, etc.). Alexandru V. Boldur, *op. cit.*, p. 289 (including the infra page note 2) mentions the development of Odessa, after 1794, in particular due to the trading activities carried out by people originating from Greece. Among them there were also many Aromanians, as proved by the existence of the *Association of Greek Aromanians* in *Odessa.*

under Austrian (Austro-Hungarian) rule, we can also talk about the erroneous transcription of *Bacs* as *Bacz* (or even *Batz*), a fact which also led to the above-mentioned phonetic modification (Fig. 1).

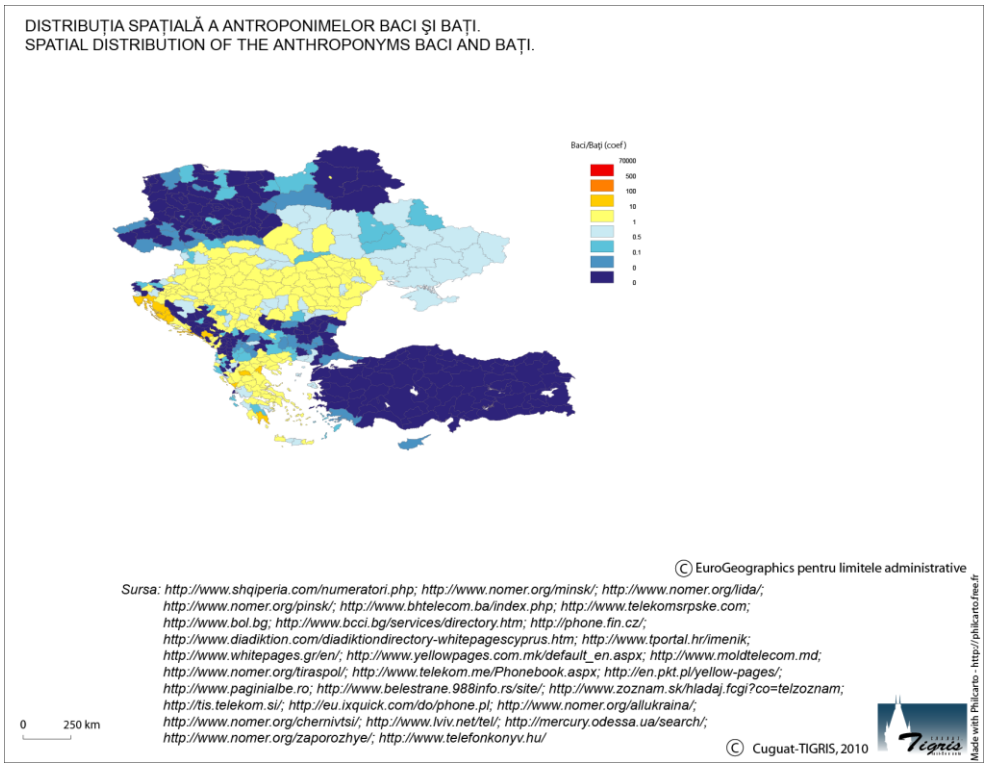

Figure 1. Spatial distribution of the anthroponyms Baci and Baţi

Mocan originates from a term whose meaning is that of *inhabitant* (especially shepherd) *of the mountains* (sometimes with reference to the mountainous area of Transylvania) (Fig. 2). There is also attested the meaning *"purtător de moacă"* (rod bearer) (the latter term with the meaning of shepherd's rod, carved on top, often in zoomorphic and/or anthropomorphic forms). Under etymology, it is mentioned "unknown" phrase, but the large number of anthroponyms related to this term, which ranks *mocan* on the third place in the Carpatho-Balkan area, after *cioban* and *baci* and because the term is also known among the Aromanians and Megleno-Romanians, thus, away from the Transylvanian mountainous area, there can also to be assumed a Thraco-Dacian origin.

Also, the very fact that the shepherd's rod (*moaca*) carved at the top to form *balaurul cu cap de lup* (the wolf-headed dragon), the war flag of the Dacians, present among the Aromanian shepherds even today, leads us to believe that it was inherited by the Romanian branch on the south of the Danube, as well as that at the

north of the Danube, from the Thraco-Geto-Dacian ancestors. To the same end argues the acceptance of the changes of *o* into *u*, manifested in Thraco-Dacian, as well as in Latin terms (thus, we have *Mucan* in the Romanian-speaking area at the north of the Danube – the *R. of Moldova*, as well as in *Ukraine*, especially in Odessa, where there is also an important Romanian element, but also in *Greece* in the area inhabited by the Aromanians[6]), the presence of the rhotacizing forms (especially in north-western Romania and in the Trans-Carpathian region – old area of rhotacizing Romanian habitation, but also in the *R. of Moldova* and in other regions of *Ukraine*, as well as in *Serbia*, *Bulgaria* and *Greece*) or *Mocar* (especially in Trans-Carpathia, north-western *Romania*, *the R. of Moldova* and *Bulgaria* – where it seems to have migrated, probably from the Timoc area of *Serbia* – in the area of the rhotacizing Romanians, too) or *Mucar* (in *Greece*, where there occur derivatives such as *Moukarika* – **Mucărică*). The Greek people bearing the name seem to have migrated from the same rhotacizing area, largely, superimposed in the Pannonian Plain.

The unrhotacized variants are mostly localized in *Romania*, but also in the neighbouring countries: north-eastern *Hungary*, western and southern *Ukraine*, the *R. of Moldova*, isolated in eastern *Ukraine*, the *R. of Belarus*, *Slovakia*, the *Czech Republic*, *Serbia*, *Bulgaria*, the *R. of Macedonia* and *Greece.*

However, to strengthen the "reputation" of a traditional rhotacizing area, northern Maramureş (including, today, in the Transcarpathian region), along with the Romanian County of Satu Mare, has the largest concentration of rhotacizing variants derived from *Mocan*. From here seem to have migrated the people bearing the name towards western, southern and eastern *Ukraine*, *Poland*, *the R. of Belarus*, just as from the other end, the southern one, of the area with rhotacizing Romanians (Bor district) have migrated people bearing such names towards eastern *Bulgaria* or towards the northern half of *Greece.*

Another element that seems to strengthen an indigenous, Thraco-Dacian, origin, of *mocan* is given by its absence from western area of the Balkan Peninsula (the former Yugoslavian area), where appears *stânar* (also of Thraco-Dacian

[6] Notes that the old terms, either Thraco-Dacian or entering the Latin language during cohabitation with the Slavs (VI-IX centuries) or one of its product a diphtongation of *o* in *oa* or the phoneme *o* became often *u*. Thus, verbs of *a muri*, *a purta*, respectively, *a turna*, evolved from the Latin *morire, portare*, respectively, *tornare*, are found in forms *eu mor, eu port,* respectively *eu torn* (present, first person, singular) and *noi murim, noi purtăm,* respectively *noi turnăm* (present, first person, plural), the Latin forms *florem* and *solem* gave rise to the Romanian *floare* and *soare*, from the Dacian (possibly) **moc(a)* resulted, on the one hand *moacă* but also *mucan/mucar*, while from Slav *koža* evolved to the Romanian forms *coajă/*coază* (last, in areas with sibilant phonetism, who preserved and forms as *cozan/cozar* or *sluzbă*). Interesting parallelism possible forms derived from the Thracian-Dacian **moc(a)* and Latin *mola*: in addition to *moacă*, respectively, *moară*, fall and *mucan/mucar* respectively *murar* (forms, but with/alongside *mocan/mocar*, respectively *morar*). It seems that some forms have circulated in parallel as a proving period, with the rhotacized form, *mormânt*, with the Aromanian variant *murmânt* resulting, both from Latin monumentum. Most prominent form of alternation between diphthongize form – *coroană* and with *u* – *cunună*, at the same time (second form is a false rhotacised form), evolved from the Latin *corona*. A similar phenomenon (but only in terms of evolution *o>u*) is found in French, where appear the verbs *mourir, tourner* and the noun *couronne*. This, as the pronunciation of a Portuguese or event that same phonetism in the Raeto-Roman (*rumantsch* resulting from *Romanus*, with same origin with *rumân*) gives an aural beginnings of these changes during the popular Latin III-IV centuries.

origins), with the same meaning as *mocan – păstor din ţinuturile muntoase* (the shepherd from the highlands). The two terms do not overlap but complement each other, as proved by the Carpathian-Balkan pastoral antroponymy.

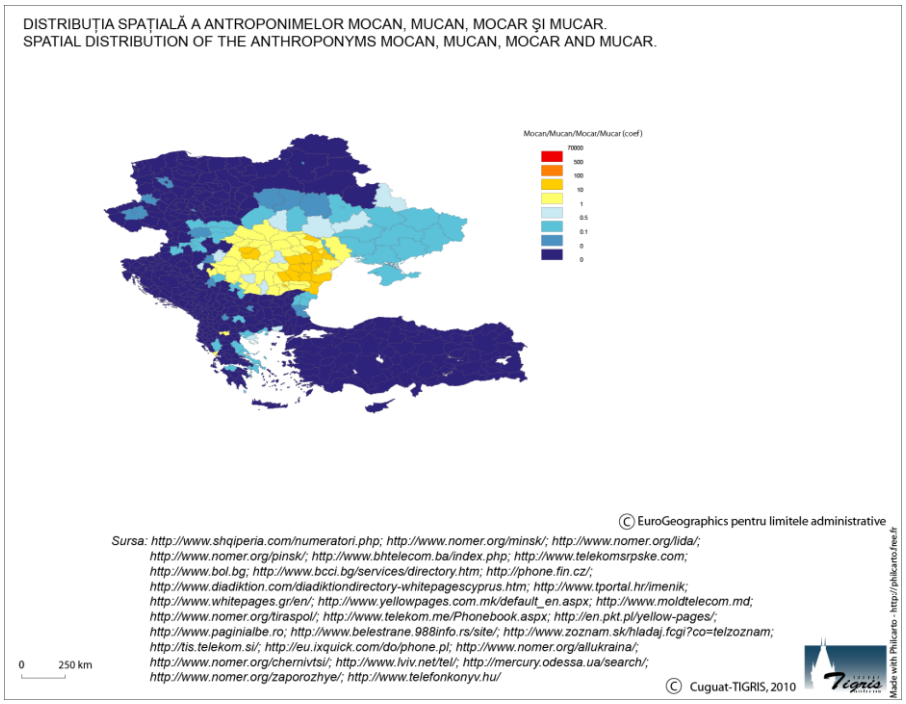

Figure 2. Spatial distribution of the anthroponyms Mocan, Mucan, Mocar and Mucar

A term of Thraco-Dacian origin is *strungă* (I. I. Russu, 1981), also present among the Daco-Romanians and within the territories where the Balkan Romanians lived and/or still live today[7]. The term is noted throughout the Carpathian area, from southern *Poland* to the Western and Southern Carpathians (also being present in hilly areas, for example, in the Moldavian Plateau), but also to the south of the Danube, up to *Albania* and northern *Greece*. It also gave rise to anthroponymical derivatives, among which we specify *Strungar*, with the meaning of inhabitant and user of a sheepfold. From this evaluated the toponyms *Struga* (south-western *R. of Macedonia*) and the patronym *Strugar*, due to the Slavic influence that affected the Balkan area and, to some extent, that to the north of the Danube (Fig. 3).

The most important concentrations of the two variants are found in two areas: one in northern *Romania*, continued with the northern half of the *R. of Moldova* and the other, to the south of the Danube, particularly in the former Yugoslavian area, where the most notable are *Serbia*, *Croatia* and, especially, *Montenegro*, and to these is also added northern *Greece*.

[7] *Op. cit.*, p. 393-396.

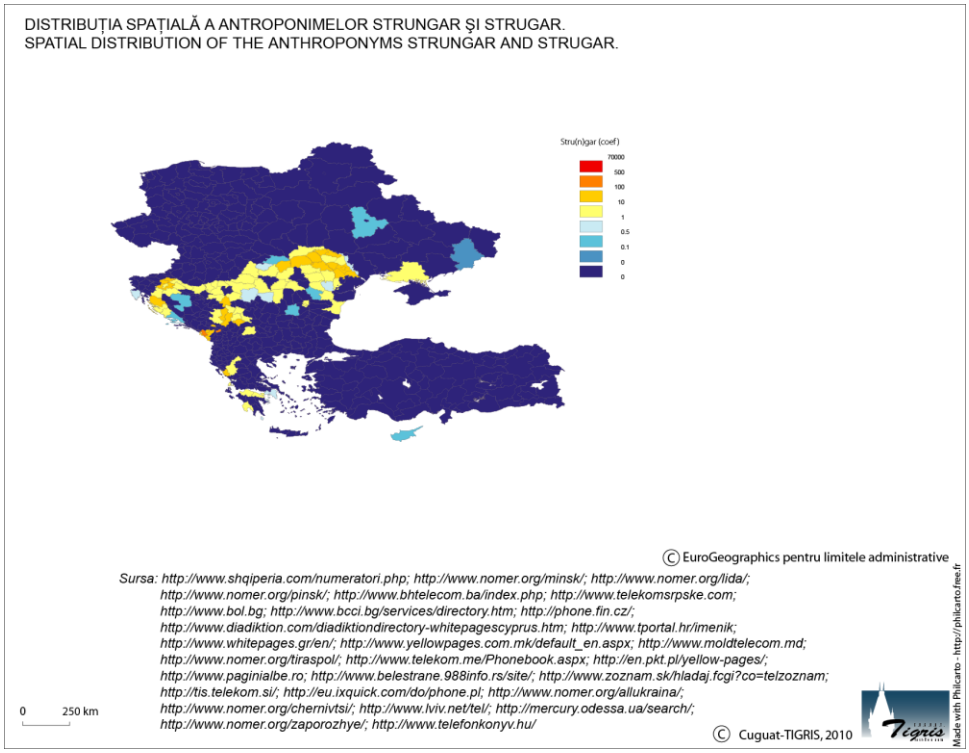

Figure 3. Spatial distribution of the anthroponyms Strungar and Strugar

Strungar is attested both to north of the Danube, where it is identified in the *R. of Moldova*, *Romania* and *Ukraine*, as well as in the Balkan area, in *Greece*. These are the regions where the phonetism of *strungă* and its derivative, the theme *strungar*, were not altered by the Slavic influence, other than partially (in the Romanian Carpathian-Danubian area) or not at all (*Greece*).

However, as a result of the Slavic influence, intervocalic *n* fell, thus explaining the name of the city of *Struga* in south-western *R. of Macedonia*, as well as the patronym *Strugar*, present, first of all, in *Montenegro*, but also in *Serbia*, *Croatia*, as well as in *Romania*, with extensions to the east and north of the Prut river.

As a reflection of the Romanization of the Thraco-Dacian element in the Balkan-Carpathian area, we underline the fact that another Thracian appellative, *stână*[8], gave rise to another term (equivalent to *baci, păcurar, cioban*), *stânar,* in which the suffix *-ar*, with occupational meaning, is of Latin origin. The appellative was very productive especially southwards of the Danube, namely in *Slovenia*, *Croatia*, *Bosnia-Herzegovina*, *Montenegro* and *Serbia*. To the north of the Danube, it is less frequent in onomatology, noting, on the other hand, its use as a popular geographical term, in south-western *Romania* (a fact attested by the inclusion of

[8] *Idem*, p. 388-389.

the form *stâner* in *The Toponymical Dictionary of Romania. Oltenia*). However, in the current Romanian area, especially in the western part of the country, there is the patronym *Stânean*[9].

The spatial localization of the variants and the derivatives of *Stânar* in *Romania* gives an indication of a wider distribution of the theme, limited in circulation only to south-western part of the country, but present in onomatology both in Transylvania, as well as in Moldavia (Fig. 4). However, the most important area of distribution of *Stânar*, at least anthroponomically, is observed in the western part of the Balkan Peninsula, from *Slovenia* to the *R. of Macedonia*, but with a significant presence especially in *Serbia, Bosnia-Herzegovina* and *Croatia.* Isolated, the term is also found in *Poland.*

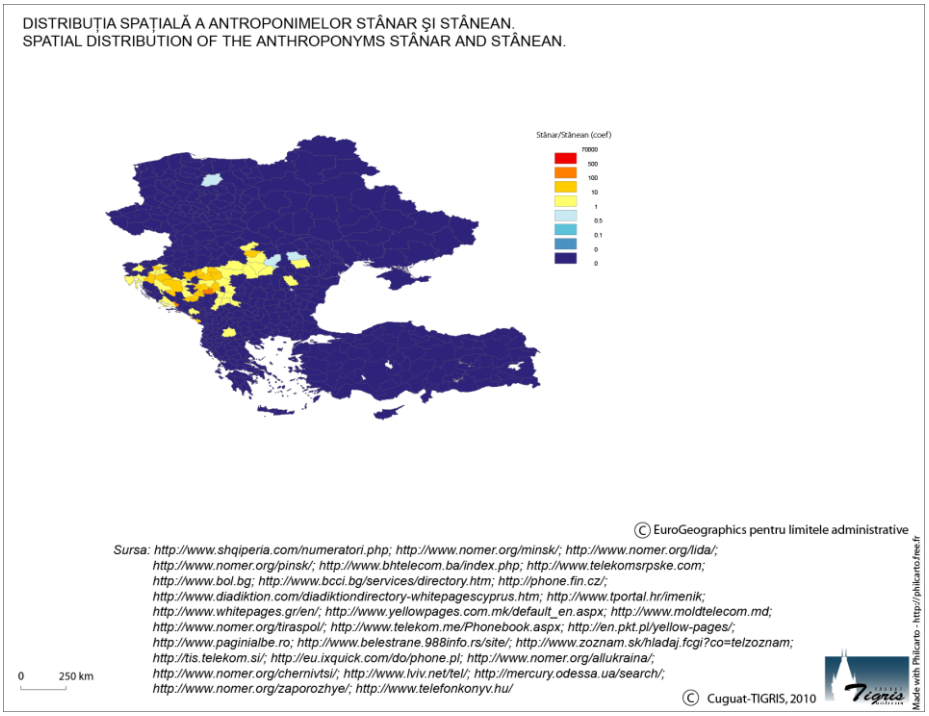

Figure 4. Spatial distribution of the anthroponyms Stânar and Stânean.

We aimed at highlighting the spatial distribution of anthroponymy related to shepherding, we highlighted the distribution of some toponyms and/or anthroponyms resulted from the evolution of the terms of Latin origin related to this activity. The terms of this origin are derived from *peccorarius* and

[9] The localisation of the anthroponym especially in the western part of the country, around the Western Carpathians, may connect it with the oiconym *Stâna de Vale*, opinion which was presented cautiously.

berbecarius[10]. Thus, we see that *peccorarius* gave rise to some toponyms in *Bosnia-Herzegovina* and *Romania* (forms derived from *păcurar*), *Croatia* – *Pekorari*[11], *Hungary*, *Serbia*, *Greece*, *Romania*, *the R. of Moldova* and *Poland*. The toponymy in *Bosnia-Herzegovina* (*Paklarič*) and the anthroponyms identified in *Poland*[12], *Hungary* (*Pakular*), *Serbia* (*Pakurar*), *Croatia* (*Paklar*), *Bosnia-Herzegovina* (*Paklarčić*) and *Greece* (*Pakoulieris*) emphasize the fact that at the origin stands the Romanian variant, *păcurar*.

It is worth mentioning that in the areas inhabited by Aromanians and Megleno-Romanians in the *R. of Macedonia* and *Greece*, it is used, in the current speech and in folklore, the appellative *picurar*, which, at least at this stage of our research, is not reflected in onomatology, too (Fig. 5).

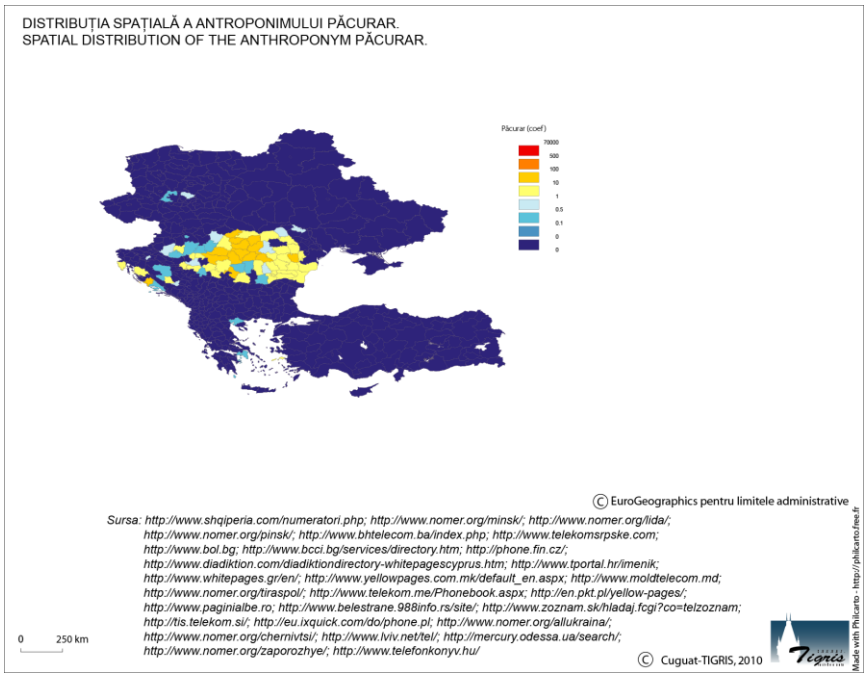

Figure 5. Spatial distribution of the anthroponym Păcurar

We specify that this form was derived, like the Daco-Romanian one, from an older Romanian form, **picurar*, created and used before the 10th century (when the connection between the ancestors of the Daco-Romanians and those of the

[10] It is interesting how, in the pastoral language, the first term, derived from *pecus/pecoris* gave, with the suffix –*arius*, *pecorarius* – *sheep farmer*, while the second, resulted from *vervex/vervecis*, with the same suffix, gave *berbecarius* – *ram farmer*.

[11] The Istro-Romanians in western *Croatia* still use the form *pecuror*, close enough to this anthroponym. However, this name, attested in *Zagreb*, would derive more likely from the Italian variant.

[12] Here we noted the form *Pakura*, which may be derived from *Pakurar*.

Aromanians/Macedo-Romanians was irrevocably broken). Also, the Istro-Romanians use, in speech, the form *pecuror*, which confirms the existence of an older form, **pecurar*[13].

The presence of the anthroponyms derived from this theme of Latin origin especially in the central and western parts of *Romania*, in *Hungary*, *Bosnia-Herzegovina*, as well as on the Adriatic coast of *Croatia*, is explained through the fact that these lands belonged to the Roman Empire and through a greater resistance, in time, of these names. Within the lands of eastern and south-eastern *Romania* and southern *R. of Moldova* we believe it is due to the migration of some people from Transylvania to the east and south-east of the Carpathians.

The onomatology derived from *vervecarius/berbecarius* is present especially in the Romanian area and/or that of Romanian influence (Fig. 6). In the Carpathian-Balkan area, the patronym is represented especially in the extra-Carpathian regions of *Romania*, in the *R. of Moldova* and in *Ukraine*, appearing, more rarely, also westwards of the Carpathians, either in northern Transylvania, or in Banat and even in south-eastern *Hungary* or in northern *Serbia*.

The presence of the patronym *Berbecar* is more significant, from the point of view of the coefficient of spatial distribution, in northern Transylvania, southern Oltenia and Walachia and, especially, in north-eastern Moldavia, continued both northwards, in the Cernăuţi region, as well as to the east of the Prut river, in the *R. of Moldova*. Actually, the patronym is found almost all over *Romania*, with some extensions in the eastern part of *Hungary* and in southern *Ukraine.*

The other variant, *Bercar*, has, in this area, the largest concentration in the south of the *R. of Moldova*, continued with the eastern and south-eastern regions of *Romania*. This kernel continues in the southern part of *Ukraine*, joined by spatial units distributed discontinuously in the south and west of *Romania*, as well as in the western and eastern parts of *Ukraine* and in northern *Serbia*.

For the appellative *cioban* too, several specialists argue that it is Turkish. Even if the idea is credible, we think that, the term may very well be based on a word of Cuman origin. Romanians coexisted with the latter, beginning at the turn between the first and the second millennium of the Christian era and which lasted at least two-three centuries. Until the assimilation of the Cuman communities by the Romanian element, or precisely because of this process, both terms of Cuman origin entered the Romanian language (*bugeac/buceci*, *cioban/ciobar*, etc), as well as many names, of places or/and or people, used by this Turkish people (Fig. 7).

[13] A form that also appears attested in anthroponymy, both in *Romania* (in Transylvania, which was temporarily under Hungarian rule), as well as in northern *Serbia*, but this is more likely due to the modification of the theme *Păcurar*, because in Hungarian and/or Serbian the phoneme *ă* does not exist.

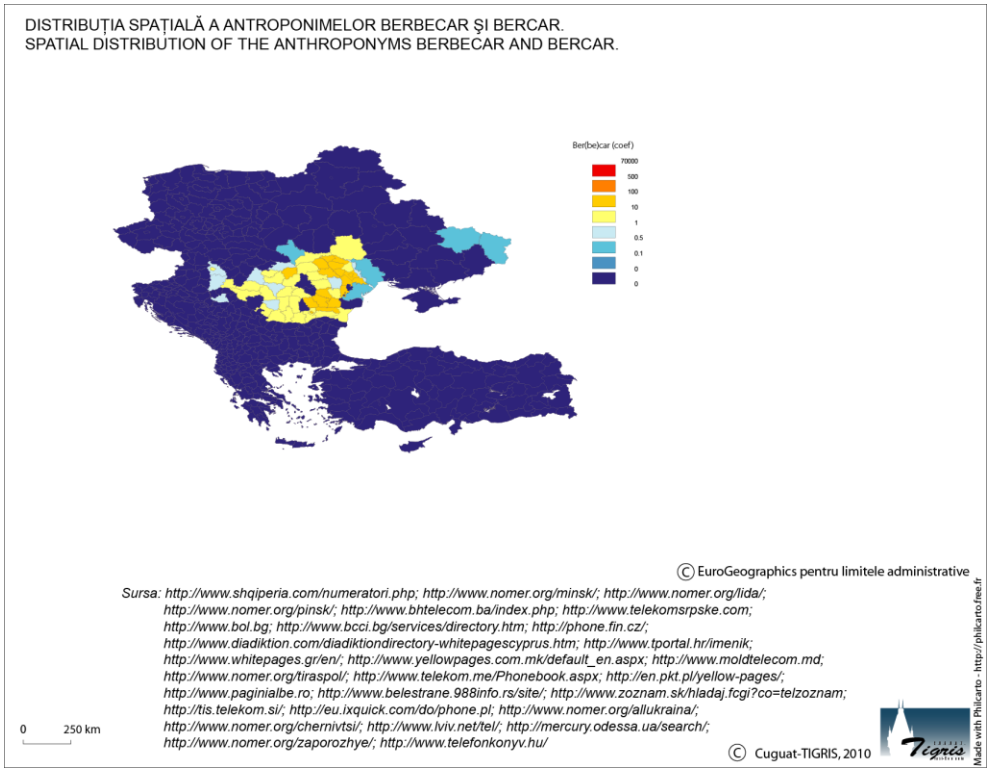

Figure 6. Spatial distribution of the anthroponyms Berbecar and Bercar.

The ancient character of the term and the Cuman origin in the Romanian language seem to be proven by the fact that in the Romanian language, this appellative "took up" two phonetic phenomena specific to the Romanian language: the transformation of the vowel *o* into *u* (a Latin "inheritance": see the evolutions *mons/montis>munte*, *frons/frontis>frunte*, *pons/pontis>punte*, *ponere>punere*, *exponere>spunere*, *potere>putere*, *dolor>durere*, *tornare>turnare*, *romanus>rumân, dormire>durmire,* the toponyms **Moreş>Mureş, Donaris>Dunăre, Salona>Sărună* etc.), respectively, the rhotacization of intervocalic *n* (also present in other Romanian words of Latin origin: *măra, bire* – at the Istro-Romanians, *gerunche, bură, rărunchi, irimă* – noted at the Moţi or the people from Maramureş).

The fact that this evolution *o* > *u* manifested even in late folk Latin is also explained by the presence of the same phonetic change in other marginal areas of Romanity: at the Portuguese (e.g. *peccorarius>pegureiro*, with an evolution identical with that of the Romanian forms *păcurar/pecuror/picurar*), in the western part of Europe and at the Occitans (here there also appears a form *pégourier*, from which, through a false derhotacization, resulted *pégoulier*), at the French, former north-western "margin" of the Roman Empire (where there is, from the Latin *tornare*, the verb *tourner*, similar to the Romanian *a turna/turnare*), at the

Sardinians (where we noted a *Monte Petrosu*, almost identical in shape with numerous peaks in the Carpathians called *Pietrosul*), but also at the Rhaeto-Romans (who call their language *rumantsch*, just as, in the Middle Ages, the descendants of the Thraco-Daco-Romans spoke *rumâneşte*)[14].

The three areas are also those where rhotacism occurred (in Portuguese there are terms such as: *branco, escrava, dor, igreja* – the latter also being present in Galician and in the French onomatology preserves names like *Le Hâvre*, derived from the Germanic *haven* and *Londres*, derived from Celtic-Roman *Londinium*), as well as words in which rhotacism occurred – *l'orme* (derived from the Latin *ulmus*).[15] Rhotacism also manifested in Sardinia, a peripheral area in relation to Rome, through its insular position (where there can be found *cresia*, derived from *ecclesia* or *crai*, derived from *clave*). The linguistic innovations, present especially in the marginal areas, which will have circulated for a time in parallel with the official forms, from "literary" Latin, are also explained by the weakening of the central authority in the 3rd-5th centuries, a phenomenon that occurred amid the internal crisis and the repeated external attacks of different groups of migrants.

This is why we find, in onomatology, on the one hand, anthroponyms and toponyms derived from *ciuban* and on the other hand – names with the form *Ciobar*. The phenomenon of the modification *o>u* is still used widely by Balkan Romanians and the Romanian-speaking Băieşi Gypsies in *Hungary*. The isolated attestation of these latter forms is explained by the fact that, around the year 1000, in most part of the area inhabited at that time by Romanians, rhotacization was not used anymore, but still to be used by Western Romanians only (represented, until today, only by Istro-Romanians, Moţi and Maramureşeni).

The very name of the Cuman people seems to have suffered this influence *o>u*, from a **coman* – which gave rise to many toponyms *Comana, Comăna, Comani, Comanca*, etc.) and the Romanian anthroponyms (*Comănescu, Coman, Comanici*, etc.), unchanged until today, changing, in Romanian, into *cuman* (onomatologically less productive, precisely because it appeared more recently – we noted, for example, an anthroponym, *Cumeneanu*). The name was transmitted,

[14] The Romanians in eastern *Serbia* call themselves even today *rumâni*, and with the Aromanians, along with the frequent expression *armân*, with which they define themselves, there also appears, more infrequently, *arumân.* Also, the term with which the Istro-Romanians defined themselves, before the generalisation of the Slavic term *vlah* was that of *rumăr*, and with the Megleno-Romanians there was, also before the generalisation of *vlah*, *rumon.*

[15] As a matter of fact, the „anti-reaction", sometimes erroneous, to rhotacization, through which the rhotacizing speakers tried to "correct" a falsely rhotacized form manifested, identically, in two rhotacizing area belonging to different languages. Thus, in the Occitan area resulted *Pégoulièr*, probably, from a **Pegurariu(s)* (from which also derives the Portuguese *Pegureiro*), and in the area once inhabited by rhotacizing Romanians, from **Pecurariu(s)* – a form from which will also have resulted the old Occitan-Portuguese one **Pegurariu(s)* – derived, either through a *Păcurar(u)*, or a *Pecular(u)* – the variant *Pak(u)lar*, attested in the west of the Balkan Peninsula and in Pannonia. We observe the phonetic evolution, identical, *o>u*, specific to folk Latin in the *Thraco-Daco-Roman*, *southern Galo-Roman* (subsequently, Occitan), respectively, *Lusitano-Roman* areas, which will have given rise to *peccorarius>*pecurariu(s)*. The evolution must have happened during the 3rd-5th centuries (when Dacia still belonged to the Roman Empire, at least in the beginning, but at the same time, the Empire was in crisis, its authority over the provinces, especially the marginal ones, weakened considerably, a fact that allowed linguistic innovations and led, in the end, to the rise of the modern Romance languages).

then, to the neighbours to the west and south, the Hungarians calling the Cumans with the appellative *kun*, derived from a *cu(ma)n* (the term creating numerous toponyms and anthroponyms)[16], while in the Balkan Peninsula, with the Slavs here, we noted the oiconym *Kumanovo* (*the R. of Macedonia*).

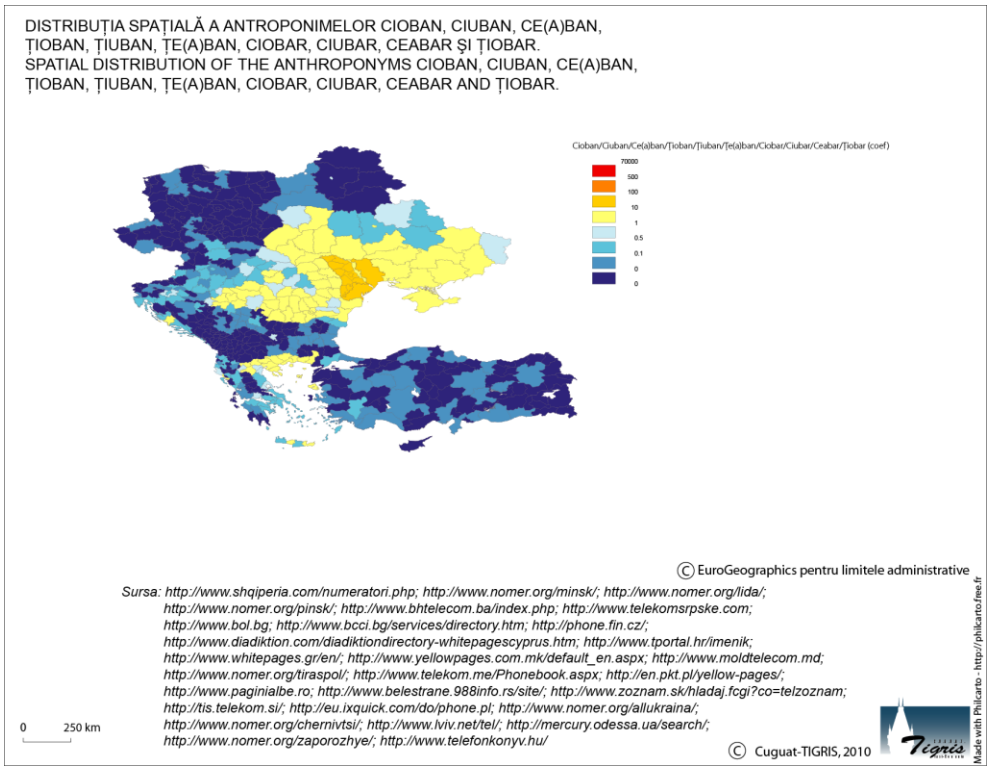

Figure 7. Spatial distribution of the anthroponyms Cioban, Ciuban, Ce(a)ban, Țioban, Țiuban, Țe(a)ban, Ciobar, Ciubar, Ceabar and Țiobar

The length of the period of time linked to the Cuman presence in the eastern Carpathian area is reinforced both by the large number of variants, as well as the fact that they found are in a total of 100 derivatives. These are first of all distinguished phonetically. Of all patronyms related to shepherding, we think that none has so many variants, created due to phonetic changes. There is the form *Baci*, but also *Baţi*, especially as a result of the Greek influence. There is both *Mocan*, as well as *Mucan*, but also *Mocar*, and *Mucar*. *Cioban*, however, has,

[16] Subsequently, until the half of the 13th century, the Hungarian Empire tried, by creating the Bishopric of Cumania, in the area outside the Curburii Carpathians, to convert to Catholicism the Cumans here, as well as the Romanian Orthodox "schismatic" (unsuccessfully, however), a large part of the Cumans requesting the Court of Buda to be moved, for fear of a possible Tatar invasion (which took place in 1240-1241). They were setlled in Pannonia, where two counties remind of *Cumania Mare (Nagykun*), respectively, *Cumania Mică (Kiskun*) – *Jász-Nagykun-Szolnok*, respectively *Bács-Kiskun*.

through its variants, derivatives that have been affected by one or even two of the above-mentioned phonetic changes, overall it was affected by all of them. Thus, due to the rhotacizing influence, alongside *Cioban*, there also appears *Ciobar*. This form has also suffered the transformation of the group of phonemes *ci* into *ţi*, which led to the occurrence of the form *Ţiobar*, alongside with *Ţioban*. The old habit, dating from the Roman period, of changing *o* into *u*, resulted not only in the development of the variant *Ciuban*, but also in the forms *Ciubar* or *Ţiuban*. Moreover, in the Polish-Ukrainian-Belarusian Slavic area, from *Cioban* resulted the variants *Ceaban* or *Ceban*, changes that are also found in the variants *Ţeaban, Ţeban* or *Ceabar.*

The proof that the term *cioban* is of (probable) Cuman origin and not Turkish[17] is also given by other aspects: the presence of anthroponyms especially in the extra-Carpathian Romanian area and eastward of it (which shows that the theme was taken up by the first groups of shepherds who entered into contact with the Cumans, that came from the east); this term also entered among the western Romanians, who derived it, giving rise to forms from which resulted the anthroponyms *Ciobar, Ciuban* or *Ciubar* (modified in the area inhabited today by the Eastern Slavs into *Cebar, Ceabar*), a part of these Romanian migrating towards the south of the Balkan Peninsula, where there appear *Ţiuban*, as well as *Ţiobar*, alongside with *Ţioban*, resulted, with the Aromanians, from the modification, under Greek influence of *ci* into *ţi.*

The original version must have been *Cioban*, for at least two reasons: it can be found among unrhotacized, as well as rhotacized variants, affected or not by the modification *ci>ţi*; then, it also has the largest number of people bearing the name and the largest spatial expansion, the other variants, with *u*, rhotacized or with *ţi* having a local distribution, regional at the most.[18] This is emphasized by greater than one value of the coefficient of spatial distribution in *Romania* (especially in its eastern part), the *R. of Moldova* and southern *Ukraine*, also emphasized in northern *Serbia*, western *Bulgaria* and in the Adriatic area of *Croatia* and *Albania.*

---

[17] The occupation, following the battle of *Mohacs* of a large part of Pannonia by the Ottomans (and the transformation in the *Buda pashalic* of a large part of the Hungarian Kingdom) brought into contact, for the first time, the Ottomans and the Cumans, giving the Cuman language the chance to preserve itself until the 18th century.

[18] The variants *Ceaban* and *Ceban*, present especially in *Ukraine*, but also in the *R. of Belarus, the R. of Moldova* and in *Poland* also resulted from *Cioban.* In Russian, but also in Polish, *o* becomes *a*, the resulting forms being *Чабан* (in Russian, Ukrainian, Belarusian) or *Czaban* (in Polish). The form *Чебан* seems to have developed from the variant *Чабан.* As a large part of these areas was under Tsarist and/or Soviet occupation, the localization in this area of such forms is explicable, including the presence, especially in Bessarabia, of the forms *Ceoban, Ceaban* or *Ceban*, with their derivatives. On the other hand, we think that the evolution *Ceaban>Ceban* could have, still, occurred on Romanian "linguistic territory," in an area where bilingualism manifests itself (the Romanians being in course of assimilation), starting with the forms that circulate in parallel, in the same area or in different Romanian areas and dialects. Thus, we note the Moldavian pronunciations *deaja*, *am aşteaptat* (instead of *deja, am aşteptat*), respectively, the Istro-Romanian, Aromanian, and Megleno-Romanian forms *feată/feată, vează*, etc, from which derived the Daco-Romanian ones *fată, vară.* It seems that the "fault" for the diphtongation *e>ea* "rests" with the Slavs, the time of the Romanian-Slavic coexistence being the period of the change of the Thraco-Daco-Latin forms (the second form is the plural):**me(n)sa-me(n)se, *feta-fete, *sera-sere, *vera-vere* into *m(e)asă-me(a)se, f(e)ată-fe(a)te, seară* (in Transylvania and Moldavia – *sară*) *-se(a)re* (latter changed into *seri*), *v(e)ară-ve(a)re* (latter changed into *veri*), etc.

The *Ciuban* variant best appears in western *Ukraine* and north-western *Romania*, countries that have a much larger spatial expansion, but also in the *R. of Belarus*, *Slovakia*, *Croatia* and *Serbia*. Isolated, it is also mentioned in western *Bulgaria* and in the *Czech Republic.*

The spatial distribution of the *Ceaban* variant emphasizes first of all in *Ukraine*, mainly its southern and western parts. This form can also be found in the *R. of Moldova* and, more modestly, in the *R. of Belarus* and *Poland.*

The *Ceban* variant, a modification under Slavic influence of *Cioban*, derived, apparently, from the previous (*Ceaban*), is best represented in the *R. of Moldova*, western and southern *Ukraine*, a country where it also has the most notable spatial expansion. More rarely, the variant can also be found in *Romania.*

Turning to the rhotacized forms, the oldest one seems to be *Ciobar*, localized, especially in northern *Romania* and southern *Ukraine*, the (probable) direction of the migration appears to be from Maramureş (classical area of manifestation of rhotacism), through northern Moldavia, towards the steppe near the Black Sea. The patronym is also identified in *Bucharest*, but here we think it was a recent migration.

Ciubar has representatives only in the *R. of Belarus*, where, we think, it probably arrived from Maramureş, migrating northwards. This version includes most representatives[19], followed by one from which it derived (both accounting for one third from the scores of subscribers with such names).

The patronym *Ceabar* can also be found at the level of *the R. of Belarus*, being, as we have already mentioned, a variant derived from the original form, *Ciobar*, under the phonetic influence of the Russian language or, perhaps, even Belarusian, within the framework of an assimilatory process of the Romanian shepherds in the crowd of Slavic ethnic element.

The forms influenced by the Greek language are represented, primarily, by the variant *Ţioban*. This is best represented in *Greece*, in the Balkan Peninsula can also be found in *Bulgaria*, *Croatia* and *Slovenia* (the two latter cases might be deformations made by the Imperial Chancellery in Vienna). We also note the isolated presence of the variant in southern, central and western *Ukraine.*

The variant *Ţiuban* is localized only in the eastern Slavic area, particularly in the eastern part of *Ukraine*, but also in the western part, as well as in Kiev and Minsk. We think that, with no people to bear the name in *Greece*, it is possible that the variant might be a modification, produced under the influence of the Habsburg Court, somewhere in western modern *Ukraine*, from where the people bearing the name migrated northward and eastward.

[19] Largest number of carriers of the name justifies the possible formation of *Ciubar* in the old principality of Maramureş. It is shown both in the area of rhotacism (today proved by the existence of such terms as *corindă/corindiţă, irimă*) and its occurrence in the evolution of *o>u* (as shown and place names – *Trei Hutare* at limit of Galicia – and current popular speech: using, for example, the verb form *a durmi* in, instead of *a dormi*). From here, where is attested *Ciuban* seem to have migrated *Ciobar* variant carriers (both having spatial distribution coefficients well above average) and the patronymic *Ciubar* (not attested yet in the area, probably disappeared in the meantime).

The form *Ţeban* is located only in *Ukraine*, its presence in the western regions of this country making us presume the same influence of the Habsburg authorities. Subsequently, like in the previous case, the people bearing the name migrated towards the southern and eastern regions of *Ukraine*.

The case of the variant *Ţeaban* is almost the same, located in about the same Ukrainian regions as is the case of *Ţeban*. Probably, the earlier version derives from it.

The presence, among the variants that suffered, from various causes, the modification *ce/ci>ţe/ţi*, of the form *Ţiobar*, also affected by rhotacism and its localization, isolated, only in *Greece* constitutes a further argument that supports the Cuman origin of the term *cioban*. Thus, we think that, in the area with rhotacizing Romanians in western *Romania*, *Hungary* and/or western Balkan Peninsula, from a variant *Cioban* it resulted *Ciobar*.[20] The people bearing the name then migrated southwards, where, as a result of the Greek influence, it ended in the current form, *Tsiobar*.

Conclusions

The following ideas result:

- the spatial distribution of these terms highlights two natural areas related to pastoral anthroponomy in which shepherding has particular significance: the mountains (summer use) and the low pond – *bălţile* (used as wintering sites);

- the distribution of pastoral names highlighting the importance of these activities and the frequence of old Romanian terms, derived from Thraco-Dacian language and from Latin: *baci, mocan, strungar, stânar, păcurar, berbecar*;

- we added the importance of the term *cioban*, with numerous derivatives, present especially in the eastern area of the Carpathian space; our opinion highlighting the cuman origin (not otoman) of this term.

REFERENCES

ARMBRUSTER A.,(1993), *Romanitatea românilor. Istoria unei idei*, Editura Enciclopedică, Bucureşti, ISBN 973-45-0058-9;

BOAMFĂ I., (2003), *The historical stratification of the toponimy from the Banate of Severin, the Loviştea County and the Olt County – comparative study* – The 5th Edition of The Regional Conference of Geography "Geographic Researches in the Carpathian-Danube Space", Editura MIRTON, Timişoara;

BOAMFĂ I., (2003), *Comparative study between the Occitan and Romanian onomatology* – The 5th Edition of The Regional Conference of Geography "Geographic Researches in the Carpathian-Danube Space", Editura MIRTON, Timişoara;

BOAMFĂ I., (2003), *Aspecte din domeniul geografiei umane reflectate în onomastica Ţinutului Secuilor/Aspects from the Domain of Geography reflected in the*

[20] The people who bear the name, in this variant, can still be found in Maramureş, an area known for its rhotacizing tendencies.

onomatology of the szeklers country – „Forum Geografic", no. 3/2003, Editura Universitaria, Craiova;
BOAMFĂ I., (2004), *Aspecte geografice reflectate în onomastica Masivului Ceahlău* – Lucrările Ştiinţifice ale Seminarului Geografic "Dimitrie Cantemir", nr. 24, Iaşi;
BOAMFĂ I.,(2005), *Pe urmele strămoşilor noştri cu ajutorul onomasticii* – „Terra", nr. LII-LV, 2002-2005, Bucureşti, ISSN 0373-9570;
BOAMFĂ I.,(2006), *Câteva consideraţii cu privire la onomastica din bazinul Trotuşului* – Memoriile Secţiilor Ştiinţifice, seria IV, tom XXVII, 2004, Editura Academiei Române, Bucureşti;
BOAMFĂ I., (2006), *Utilizarea mijloacelor multimedia pentru evidenţierea, cu ajutorul unor elemente folclorice, lingvistice şi onomastice, a unor realităţi uman-geografice din centrul şi sud-estul Europei* – Geographia technica, nr. 1, Cluj University Press (Presa Universitară Clujeană), Cluj-Napoca, ISSN: 1842-5135;
BOAMFĂ I., (2007), *Ţara Oltului – studiu de geografie istorică cu privire specială asupra relaţiilor cu toponimia*, Editura Fundaţiei AXIS, Iaşi (reprinting 2008), ISBN: 978-973-7742-59-9;
BOLDUR A., (1992), *Istoria Basarabiei*, Editura Victor Frunză/„Logos", Bucureşti/Chişinău, ISBN 5-85886-027-3
BRĂTIANU G.,(1988), *O enigmă şi un miracol istoric: poporul român*, Editura Ştiinţifică şi Enciclopedică, Bucureşti;
BREZEANU S., (1999), *Romanitatea orientală în Evul Mediu*, Editura All, Bucureşti, ISBN: 973-684-062-2;
BREZEANU S., (2002), *Identităţi şi solidarităţi medievale. Controverse istorice*, Editura Corint, Bucureşti, ISBN: 973-653-347-6;
CONEA I., (1935), *Ţara Loviştei. Geografie istorică*, Monitorul Oficial, Imprimeria Naţională, Bucureşti;
CONEA I., (1969), *Îndrumător de cercetări geografice. Cercetări economico-geografice*, extras din „Biblioteca geografului", 7, Bucureşti;
CONEA I., (1993), *Vrancea. Geografie istorică, toponimie şi terminologie geografică*, Editura Academiei, Bucureşti;
DRAGOMIR S., (1922), *Vlahii din Serbia în sec. XII-XV*, Institutul de Arte Grafice „Ardealul", Cluj;
DRAGOMIR S., (1924), *Vlahii şi morlacii*, Imprimeria Bornemisa, Cluj;
FÉNIE BÉNEDICTE, FÉNIE J.J., (1997), *Toponymie occitane*, Edition Sud Ouest, Saint-Germain-du-Puy;
IVĂNESCU GHE., (2000), *Istoria limbii române*, Editura Junimea, Iaşi;
METEŞ Şt., (1977), *Emigrări româneşti din Transilvania în secolele XIII-XX*, Editura Ştiinţifică şi Enciclopedică, Bucureşti (ediţia a II-a);
MUICĂ N., ROBERTS L., TURNOCK D., (1998), *Transformation of a border region: dispersed agricultural communities in Brasov County, Romania*, GeoJurnal, Volume 46, Number 3 / November, 1998, p. 305-317, Springer Netherlands, ISSN: 0343-2521 (Print) 1572-9893 (Online);
MURNU G., (2003), *Istoria românilor din Pind. Vlahia Mare (980-1259). Studiu istoric după izvoare bizantine*, Editura Europa Unită, Bucureşti, ISBN: 973-96238-0-4;
NISTOR I., (1991), *Istoria Bucovinei*, Editura Humanitas, Bucureşti;
POGHIRC C., (1981), *„Berger" en roumain et ses correspondants balkaniques*, Cahiers balkaniques, 2, 1981, p. 57-76;
ROSETTI A., (1986), *Istoria limbii române*, Editura Ştiinţifică şi Enciclopedică, Bucureşti;

RÖSENER W., (2003), *Ţăranii în istoria Europei*, Editura Polirom, Iaşi, ISBN 973-681-303-7;
RUSSU I. I., (1981), *Etnogeneza românilor*, Editura Ştiinţifică şi Enciclopedică, Bucureşti;
STAN ANA-ELENA, BOAMFĂ I., (2005), *Particularităţi de demografie istorică reflectate în onomastica din localităţile cu populaţie romano-catolică din Moldova* – the volume of International Symposium PROBLEME DEMOGRAFICE ALE POPULAȚIEI ÎN CONTEXTUL INTEGRĂRII EUROPENE, Editura ASEM, Chişinău, ISBN 9975-75-290-X;
STAN ANA-ELENA, BOAMFĂ I., (2006), *Eléments de géographie humaine reflétées dans la terminologie géographique populaire du Pays d'Olt* – Analele Ştiinţifice ale Universităţii „Alexandru Ioan Cuza", Iaşi (serie nouă), tom LII, s. II – C, Editura Universităţii „Alexandru Ioan Cuza", Iaşi, ISSN 1223-5334;
TOMESCU D., (2001), *Numele de persoană la români. Perspectivă istorică,* Editura Univers Enciclopedic, Bucureşti;
UNGUREANU A., BOAMFĂ I., (2006), *Toponomastică*, Editura SEDCOM LIBRIS, Iaşi, ISBN (10) 973-670-193-X; (13) 978-973-670-193;
VANDERMOTTEN C., DÉZERT B., (2008), *L'identité de l'Europe. Histoire et géographie d'une quête d'unité*, Armand Colin, Paris; ISBN 978-2-2003-4748-2;
****Dicţionarul explicativ al limbii române* (1998), Editura Univers Enciclopedic, Bucureşti;
****Dicţionarul toponimic al României. Oltenia* (1993) vol. I, Editura Universitaria, Craiova,
****Harta topografică românească*, ediţia 1963-1973, scara 1:50000, D. T. M., Bucureşti, 1963-1973.
****Harta topografică sovietică (Peninsula Balcanică)*, ediţia 1973-1984, scara 1:50000, Moskva, 1973-1984.
***http://www.bcci.bg/services/directory.htm
***http://www.belestrane.988info.rs/site/
***http://www.bhtelecom.ba/index.php
***http://www.bol.bg
***http://www.diadiktion.com/diadiktiondirectory-whitepagescyprus.htm
***http://en.pkt.pl/yellow-pages/
***http://www.herby.com.pl/indexslo.html
***http://eu.ixquick.com/do/phone.pl
***http://www.lviv.net/tel/
***http://mercury.odessa.ua/search/
***http://www.moldtelecom.md
***http://www.nomer.org/allukraina/
***http://www.nomer.org/chernivtsi/
***http://www.nomer.org/lida/
***http://www.nomer.org/minsk/
***http://www.nomer.org/pinsk/
***http://www.nomer.org/tiraspol/
***http://www.nomer.org/zaporozhye/
***http://www.paginialbe.ro
***http://phone.fin.cz/
***http://www.portal.edu.ro
***http://www.shqiperia.com/numeratori.php

***http://www.telefonkonyv.hu
***http://www.telekom.me/Phonebook.aspx
***http://www.telekomsrpske.com
***http://tis.telekom.si/
***http://www.tportal.hr/imenik
***http://www.whitepages.com
***http://www.whitepages.gr/en/
***http://www.white.yellowpages.pt/
***http://www.yellowpages.com.mk/default_en.aspx
***http://www.zoznam.sk/hladaj.fcgi?co=telzoznam

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

GEODEMOGRAPHIC CHARACTERISTICS REGARDING THE POPULATION FROM THE SOUTHERN OLTENIA

CARACTERISTICILE GEODEMOGRAFICE ALE POPULAŢIEI DIN OLTENIA DE SUD

Anca CEAUŞESCU [1]

Abstract: The analysed geographic region knew an uninterrupted autochthon dwelling, starting with the Neolithic era and until nowadays. The numeric evolution of the rural population from this region, beginning with the 19th century, was similar to that from the national level. After a continuous ascendant evolution until 1956, when it was reached the maximum value (155,992 dwellers), the numeric dynamic of the population followed a descendant curve. The analysis of the demographic indicators (1977-2006) evidences the next situation: decreasing birth rate, increasing mortality rate and migration, the installation of a slow but continuous process of demographic aging, higher share of the feminine gender population, the growing demographic and economic dependence ratio, the lowering of the population's activity rate.

Key words: population, numerical evolution, demographic indicators, depopulation, demographic ageing.
Cuvinte cheie: populaţie, evoluţie numerică, indicatori demografici, depopulare, îmbătrânire demografică

The human component is the main element in the development of civilization and culture in each territory. Its dynamics represents the materialization of the rapports between the economic development and the social structure, two important factors that continuously acted in different ways from one age to another.

Until the 19th century, the field regions (landform that characterizes the south of Oltenia), a result of their open character, exposed in front of the invasions and plunders, offered less favourable conditions for dwelling. The density of the settlements and the number of people from here were much lower to the mountain, piedmont, hilly and plateau regions that offered a more appropriate natural environment, as a shelter (massive afforestation, accentuated degree of relief fragmentation, less available ways of access etc.). This phenomenon is evidenced, at least in the first half of the 18th century, by Schwartz's map (1722) that shows an area of maximum concentration of the settlement at the mountain's foot and in the

[1] Institute of Socio-Human Research „C. S. Nicolaescu Plopşor" of the Romanian Academy, Craiova, Romania

sub-Carpathian depressions, followed by a gradually decreasing of their number towards the Danube.

Yet, it must be mentioned the fact that in the field regions also, with a high degree of afforestation (the north of the Wallachian Plain and the valleys of the main rivers, the last being considered real "natural citadels"), the human communities established durable settlements, where they created a civilization and a specific traditional culture.

In the first part of the 19th century, after the retreat of the Ottoman power and the signing of the Treaty of Adrianopole (1829), when the commerce along the Danube and the Black Sea was liberalized, the field regions started to be more intensely populated. Through their content, the actions of extension of the agricultural lands by afforestation and fallowing of the steppe "led to changes, greater than in all the anterior periods".

Although the Băileşti Plain (sub-unit of the Oltenia Plain, studied in the present paper) known, along time, an uninterrupted autochthon dwelling, starting back in the Neolithic era and continuing until nowadays, a more clear and exact geodemographic analysis can be done no later than the beginning the 19th century, when the informational sources, the written and cartographic documents have a more precise content. As in this geographic area the rural population represents the majority (56 villages and only 2 towns) we aimed at rendering its geodemographic characteristics.

In the second half of the 19th century, the social, political and economic events (The Union of the Principalities from 1859, The Independence War from 1877-1878, The Rural law from 14/26 of August 1864 etc.) produced important economic-social transformations, but also changes as regarding the population fluxes. In the entire country it was registered a positive dynamics in the population's number in the region that we studied as well, where the population had reached (in 1892) a number of 98,912 dwellers, from which 96,142 dwellers were in the rural region. Later, during the 20th century and he beginning of the next century, the field population registered a dynamics determined by the political and socio-economic events, following the demographic tendencies that existed at the national level. Among the rural population, the analysis of the statistic data shows a positive dynamic until the 5th decade of the last century, followed by a negative trend that had been lasting up until now (Table no. 1).

Thus, at the beginning of the 20th century, at the census from December 19th 1912, in the Băileşti Plain, there were 136,897 dwellers, from which the rural population represented 129,889 dwellers (94.9% from the plain's population). By comparing it with the end of the 19th century (1892) we notice an important numeric growth, in only 20 years the rhythm of growth being of 26%. The absolute growth, for the entire field region, was of 38,685 dwellers, and for the rural population, of 33,747. Between 1912 and 1930, the rural population registered a numeric diminishing, with 1,954 persons (the growth rate being of -1.5%) which was caused, among others, by the human lives loses from the First World War and

by the transformation of some rural localities in urban communes: Pleniţa (in 1925) and Băileşti (in 1926) – Fig. 1.

Table no. 1

The numeric evolution of the rural population from the Băileşti Plain (1912-2006)

Year	Rural population (total)	Absolute growth (no. of persons)	Growing rate (%)
1912	129,889	-	-
1930	127,935	-1954	-1.5
1941	141,931	+13,996	+10.9
1948	141,147	-784	-0.5
1956	155,992	+14,845	+10.5
1966	145,938	-10,054	-6.4
1977	139,867	-6,071	-4.1
1992	118,200	-21,667	-15.4
2002	112,877	-5,323	-4.5
2006	107,684	-5,193	-4.6

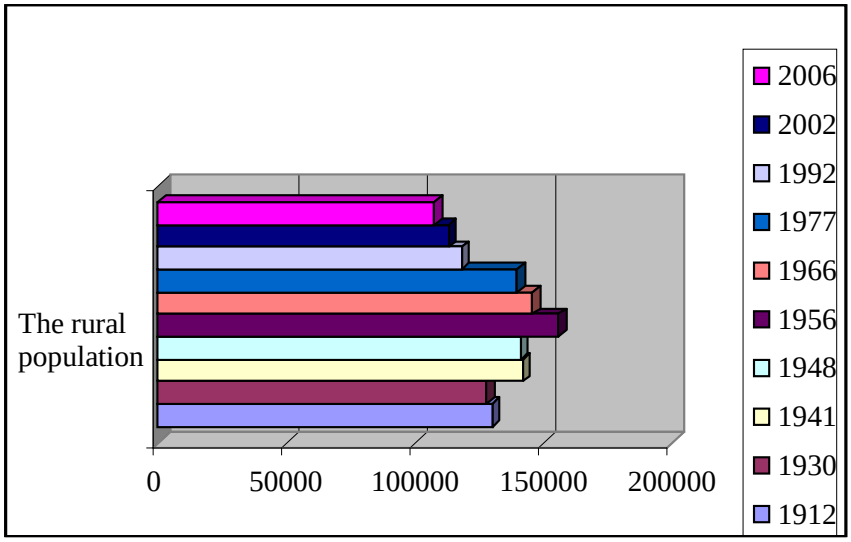

Figure 1. The numeric evolution of the rural population from the Băileşti Plain (1912-2006)

It follows a stage (1930-1941) of flourishing in terms of the number of dwellers, with a growth rate of 10.9%, the absolute growth being of 13,996 dwellers. The maximum number, of 155,992 dwellers (86.5% from the field's population), was reached in 1956, the growth rate, as compared with 1948, registered the value of 10.5%, while at the entire country's level was of 1.1%. The relative political and economic stability, the surpassing of the famishing years, the straightening out of the birth rate and the reducing of the mortality can explain the

high demographic rate. A special contribution to the numeric growth of the population also had the definitive migrations from other regions of the country, as a consequence of the appropriation process, the extension of the arable land and the development of agriculture.

In the next period, in the field's rural environment it appeared an obvious demographic decrease, in the same time with the growing of the urban population. Thus, between 1956 and 1966, it was registered a diminishing of the rural population with 10,054 dwellers, 6,071 dwellers during 1966-1977, 21,667 dwellers between 1977-1992 and 10,516 dwellers in the next interval, until 2006. To the numeric decrease of the population it contributed both the dynamics of the demographic indicators (regressing birth rate, mortality rate and increasing migration) and especially the administrative-territorial reorganization from 1968, when 4 rural settlements (Basarabi, Golenţi, Ciupercenii Vechi, Balasan) were included in the administrative area of the towns Calafat and Băileşti. In addition, the agricultural profile of the area, the attracting of the labour from the rural regions towards the heavy industrialized cities, determined a negative migratory result. Even if after 1997 it can be observed a migration from the urban area to the rural one and a diminishing of that from the village to the city, the rural population continues its decrease. In the same time, the feminization phenomenon of the population, the demographic ageing and the modifications in the socio-economic structure of the country after 1990 also constitute important factors that contributed to the descending of the demographic curve. The number of the dwellers from the villages decreased from 129,889, in 1912, to 107,684 dwellers in 2006, when it is registered the lowest number of the rural population from the field region.

Analysing the numeric evolution of the population *at the village level*, during 1912-2006, there can be identified territorial disparities, manifested, on one side, through the growth in the number of dwellers, in some settlements and, on the other side, through the standstill or the decrease of their number in other settlements. 29 villages from the 52 that existed, for which the statistic information is complete, registered a diminishing regarding the population's number with values encompassed between -2.01% and -49.3%. They represent an area in the northern half of the field and in its southeastern region.

The regions most affected by this phenomenon were the settlements Bistreţ and Boureni and few more villages from the north of the field, where the population dwindled, in 2006 as compared to 1912, with 15-40%. A standstill or a lower decrease in the dwellers' number can be noticed in the north of the plain, in the perimeter of the localities Galicea Mare – Perişor – Cioroiaşi and in its western side, between Cearângu and Maglavit. On the other side, in the south of the plain it started to take shape an area with a positive demographic evolution that includes villages situated along the Danube, in the areas with fertile land and developed agriculture. Here, the growth reached between 10% (Smârdan, Piscu Nou, Rast, Poiana Mare, Negoi) and over 100% (Desa, Catanele Noi).

The modification of the demographic volume was, in a high percentage, the result of the evolutionary direction of the natural moving and of the migratory

one, in tight correlation with the evolution of the society and its socio-economic development during various historical periods.

The natural growth of the population from the Băileşti Plain was constantly reduced, having values lower to the national average. If until the beginning of the 1960s it was continuous, later, the technological, cultural, educational, etc. implementations left their marks on the demographic behaviour. Gradually, it begins to be installed the less numerous family model of the urban civilization. From positive values, in 1977, of 2.9‰ (three times smaller than the national one) it passed to negative values, -11.4‰, in 2006 (Fig. 2).

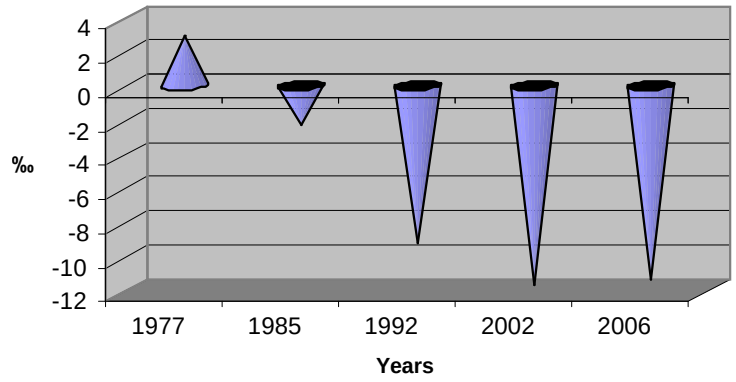

Figure 2. The dynamics of the population's natural growth (1977-2006)

The phenomenon was sustained by the ratio between the birth rate and the mortality rate, which knew different evolutions. *The birth rate* had a maximal point in 1977, of 15.7‰ (lower to the country's average, of 19.6‰). Most of the communes had high and medium values of the birth rate (13-19‰), with very high rates also, of 22.2‰ (Punghina) and 22.1‰ (Unirea). After this year, it can be noticed a decreasing tendency of the birth rate that will be accentuated in the next period, reaching 14.3‰ in 1985, 9.6‰ in 2002 and 8.4‰ in 2006 (value lower than the national average, of 9.9‰ and the Dolj district average, of 8.7‰). In 2006, the values of this indicator were between 20.1‰ (Negoi) and 1.7‰ (Galiciuica), no less than 17 communes registering values lower than 8‰. The average value of the birth rate, for the entire studied interval (1977-2006) was of 11.7‰. At the territorial level, the highest indexes were registered in some settlements from the north-west and south of the plain: Negoi (17.3‰), Punghina (15.7‰), Desa (14.7‰), Caraula (14.1‰). The northeastern side (including the communes Cioroiaşi, Galiciuica, Întorsura, Perişor) and the southwestern one (with the communes Ciupercenii Noi, Maglavit, Seaca de Câmp) are shaped as areas with low values of this parameter (below 10‰).

The more and more reduced natural growth that installed in the plain rural region after 1975, is also justified through the high numbers of *the mortality rate*. Because of the high and constantly growing values of this indicator, for most of the

communes within the plain, even if it was registered an improvement of the living conditions, the mortality rate, during 1977-2006, continued to have an ascendant trend. Thus, if in 1977, in neither of the field localities there were registered values over 24‰, in 2006, seven localities exceeded this threshold: Afumaţi (24‰), Cioroiaşi (24.1‰), Perişor (24.2‰), Obârşia de Câmp (24.5‰), Giubega (25.1‰), Seaca de Câmp (26.2‰), Izvoare (31.1‰). As regarding the average index of the mortality rate, on the entire period (1977-2006), it was of 18.2‰, because of the very high values from 1992 and 2002. From the territorial point of view, the highest average mortality rate was registered in most of the settlements from the north and the east of the plain (over 19‰), all of them being affected by the demographic ageing phenomenon. In the south, the communes located along the Danube (Ciupercenii Noi, Desa, Negoi, Piscu Vechi, Poiana Mare, Rast) evidenced through a lower mortality rate for the last 29 years (below 17‰).

To the numeric diminishing of the population from the Băileşti Plain, it also contributed *the territorial mobility of the population*. In the structure of the migratory fluxes, for the interval 1977-2006, it is noticed the numeric preponderance of the persons who left. The reduced capacity of the rural economy to generate working opportunities and a proper remuneration encouraged the labour exodus towards economic developed regions, therefore producing disequilibrium and even depopulations in the territory. The major political and economic changes from the second half of the 20th century (the collectivization, the forced industrialization from the sixties and eighties, the urban development) had negative and long lasting consequences on the rural area. As a matter of fact, the profound transformations from the legislative system, such are both the free circulation of people and the collapse of the living standard, constituted the premises in the accentuation of the international migration. After 1995 and especially after 2000, the main motivation becomes the economic one, manifested through the temporary external migration to working. The regaining of the property in the nineties and the economic crisis of the urban centres could be found in the rural region under different presentations and variable relations between departures and arrivals. The demographic decline continued but it diminished in some way.

On the whole, the average rate of the departures had high values, registering two peaks: at the end of the 1970s (19.6‰, in 1977) and in the first years after the revolution from December 1989 (16.6‰, in 202), once with the reopening of the possibility regarding the establishing of the domicile in a city and with the liberalization of the population general mobility.

"Starting with 1977, the urban-rural component becomes, maybe for the first time in Romania's contemporary history, the main migration direction". It is actually about a phenomenon of resettling concerning the migratory fluxes, started in the last decade of the past century and not by a sudden reorientation occurred during the last years.

The statistical data for the interval 1977-2006 show that the rate of the arrivals from the Băileşti Plain had an ascendant dynamic, from 8.2‰, in 1977, to 17.6‰, in 2006, with a maxim point in 2002, of 19.1‰ and with a minimum in

1985, of 3.7‰. The rural localities from the analysed space reach the lowest values of the immigration rate in the eighties. 20 communes registered values below 5‰ and among these, 4 were below 1‰: Lipovu (0.8‰), Caraula (0.6‰), Dârvari (0.5‰), Cioroiaşi (0.3‰). It is the time when the urban localities register very high values of the immigration rate (Calafat 21.1‰).

The year 1990 that was marked by powerful transformations in the political and socio-economical life of the country, constituted the start for a renewal of the arrivals in the rural localities. The loss of the jobs (especially in industry), the more and more expensive city life and the retirements made that the urban-rural migration gain importance in the structure of the migratory fluxes. The phenomenon was also facilitated by the adopting of The Landed Fund, in 1991, many of the city dwellers returning in the rural region, where they had small land properties. The maximum point as regarding the average point of the immigration on communes was reached in 2002 (19.1‰), when three communes registered values over 30‰: Seaca de Câmp (31,9‰), Negoi (32,8‰), Radovan (33,5‰) and other 19 administrative unities, values of over 15‰. The phenomenon is explicable through the massive dismissals in the urban region industry, fact that unleashed an inversed migration (urban-rural), sustained also by the clarification of the landed situation. Soon after 1989, when Romania "opened its frontiers", allowing the free circulation of the citizens, flourished the abroad migration phenomenon. The main motivation was the economic one. After the accentuation of the unemployment rate, phenomenon generated by the restructuration of the industry, by the lack of opportunities on the internal market of the labour and of an extremely low waging system, this phenomenon, preponderantly circulatory, intensified.

The dynamic of the demographic phenomena determines changes in *the structure of the populations on age and gender groups*, with important implications on the economic activities, the demographic indicators and on the social phenomenon. On the entire rural population from the field, this structure reflects a slow but continuous process of demographic ageing and a greater share of the feminine gender population.

The age groups had different evolutions. Thus, the share of the younger population continuously decreased, from 21.1% in 1977, to 16.8% in 2002 (a reduction of 4.4% in 25 years). Concordantly, the share of the old group increased (from 60 years and over) from 20.7% in 1977, to 30.8% in 2002 (growth of 10.1% in 25 years), which reflects in the modification of the general mortality rate (table no. 2, Fig. 3). It can be observed that the growing rhythm of the old group overtook that of the young population decrease.

The demographic ageing index had a growing general tendency, from 0.7 in 1966, to 1 in 1977, 1.7 in 1992 and 2 in 2002. At the village level, in 2002, the values of this indicator oscillated between 0.8 (Catanele Noi) and 5 (Brânduşa). 9 villages, situated in the east and north-west of the plain, have a high demographic ageing degree, registering values of the index of over 3 and 19 villages, also occupying areas in the east and west of the field, confronted with a moderate demographic ageing (values between 2.1 and 3). A 48.2% percentage from the plain

villages (27 villages), located mainly in the south of the analysed locality, have values of the index between 1.1 and 2, denoting a low demographic ageing, while only one village (Catanele Noi) is not affected by this phenomenon (Fig. 4).

Table no. 2

The evolution of age groups structure of the population from the Băileşti Plain

Group	Total population						Total feminine gender population					
	1977		1992		2002		1977		1992		2002	
	no.	%	no.	%	no.	%	no.	%	no.	%	no.	%
0-14	31,439	21.2	21,658	17.3	20,170	16.8	15,169	48.2	11,447	52.8	9,718	48.1
15-59	86,294	58.1	68,499	54.6	62,627	52.3	43,252	50.1	32,500	47.4	30,411	48.5
≥60	30,678	20.7	35,263	28.1	36,931	30.8	17,274	57.7	19,047	54	20,734	56.1

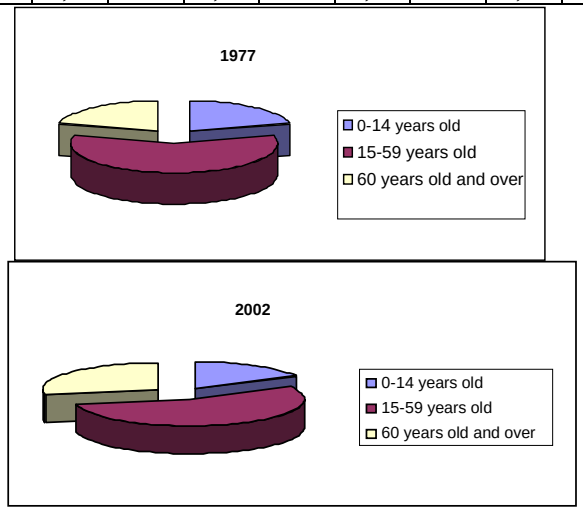

Figure 3. The structure of the population on age groups in 1977 and 2002

The ageing of the population leads to the growing of *the demographic dependence ratio*, denoting the pressure exercised by the inactive groups (0-14 years old and over 60 years old) on the active population (the adult population). In 2002, on the village level the values oscillated between 680‰ (Castrele Traiane) and 1.583‰ (Brânduşa). High values of the dependence relation (over 1100‰) were registered in 12 concentrated villages, especially in the south-west of the plain; in 17 villages, most of them in the east of the plain, the demographic dependence relation was between 1,000 and 1,100‰ and in other 20 villages from the south and the west of the plain, the values were smaller (800-1,000‰). Only in six villages, dispersed in the north, centre and south-west of the studied unit, this indicator had very low values, under 800‰. Taking into consideration the changes that occur at the level of the population's age groups structure, the future tendency regarding the evolution of the demographic dependence ratio is growing.

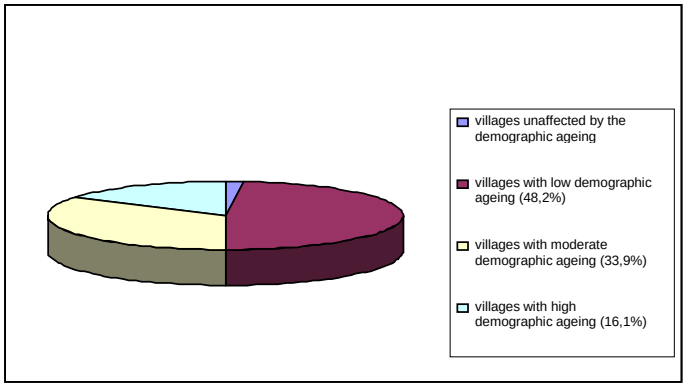

Fig. 4 The share of the villages according to the demographic ageing index (2002)

After the numeric decrease of the population from the studied unit, it can also be noticed a diminishing of the feminine population in the total number of the population, although the feminine gender continues to represent the majority. *The feminine ratio*, calculated by comparing the total number of women with the number of men, was, for the interval 1977-2006, 105.9, resulting 105.9 feminine gender persons to 100 masculine gender persons. In all the years when the analysis was made, the values remained supraunitary (>100%) in most of the localities, while in 2006, 5 localities were subunitary: Giubega, Moţăţei, Rast, Siliştea Crucii, Unirea. The number of the administrative unities where the feminine index registered high values (over 108.1%), reduced gradually, from 10, in 1977, to 3, in 2006, evidencing the tendency of balancing the share of the two genders. In the Băileşti Plain it is also confirmed the statistic rule according to which, although there are always born more masculine gender persons (105-106 masculine gender persons to 100 feminine gender persons), depending on time (age), the ratio does not speak in their favour. The higher mortality among the old persons of masculine gender, cumulated with the fact that women live more, leads to the feminization of this group. A feminization can also be found for the group 0-14 years old, in the communes Afumaţi, Caraula, Cioroiaşi, Obârşia de Câmp, Pleniţa and Punghina, and also at the adult group, of 15-59 years old, in the communes Izvoare and Lipovu.

On age groups, this ratio is under 100 to the young and adult groups (97.5 and 95), while at the old group, the values favour the feminine gender population (127.6).

Directly, the demographic indicators (the total population, the structure on age and gender groups, on social environments, etc.) correlated with economic activities, condition the socio-economic structure of the population. At the level of this structure, there were registered important mutations. The active population knew, along the last decades, a continuous decrease, from 81,420 persons (in 1977), representing 54.9% from the entire population, to 58.965 persons (in 1992), representing 47% and 51,960 persons (in 2002), representing 43.4% from the entire population. In the same time, the share of the inactive population had an opposed dynamics: 66,991 persons (in 1977), representing 46.1% from the entire

population, 66,414 persons (in 1992), representing 52.9% and 67,778 persons (in 2002), representing 56.6%.

From the analysis of the distribution and share of the active and inactive population in 2002, we can notice the difference between the two categories of population that grew very much. Generally, the rural localities have low values, below 50% from the active population. There is an exception, 5 communes, where the share of the active population is higher than 50%: Seaca de Câmp (61.3%), Maglavit (54.1%), Desa (54.6%), Ciupercenii Noi (51.4%), Cioroiaşi (51.2%). Simultaneously, the inactive population registered growths, we might say, explosive, no less than 9 administrative units having values higher than 60%: Punghina (69.5%), Obârşia de Câmp (69.2%), Radovan (67.2%), Siliştea Crucii (66.1%), Urzicuţa (61.4%), Caraula (60.9%), Negoi (60.8%), Perişor (60.6%), Poiana Mare (60.5%). Besides the demographic ageing (accentuated more and more by migration) an important contribution to the emergence of this phenomenon had the untimely retiring (due to an illness) of many people, after 1990.

The activity rate registered, as it was natural, decreases from values of 54.9% (in 1977) to 47.1% (in 1992) and 43.4% (in 2002). This phenomenon can be explained through the increase of the old population share, which leads to the significant growth of the retired persons' number (the inactive population), phenomenon that was not attenuated when the young generations started to work. At the beginning of the 21st century, for most of the communes, the activity rate registered values below 30%. Only eight communes from the analysed space had over 40%: Unirea (40%), Piscu Vechi (42.5%), Izvoare (44.3%), Ciupercenii Noi (45%), Cioroiaşi (47.4%), Maglavit (49.6%), Desa (51%), Seaca de Câmp (57.3%).

In the sectors of the national economy, in the analysed space, it is dominant the population from the primary sector that, during 1977-2002, registered a growth of the share from 77.4% to 87.4%. The reorganization of industry, on one side, and the retrocession of lands, on the other hand, are two of the phenomena that maintained this situation and not only that. They were also felt in the industrial sector, actually weakly represented in the rural space of the plain, knowing important reductions from almost 13% in 1977, to only 3% in 2002. The tertiary sector knew a feeble positive dynamics, the occupied population having higher shares than at the beginning of the transition period.

On genders, the rural space of the Băileşti Plain takes part in the general situation of the Romanian rural area, as regarding the share of the active masculine gender population. The reorganization from the economy after 1989 affected the share of the active population, which diminished its number, especially the feminine gender labour. The factories from the textile and food industry from Calafat, with preponderant feminine staff, after the reorganizations following the revolution from December, increased the number of the feminine gender unemployed population. Although "The ready-made clothes factory" was privatized, the action did not prove its viability, the feminine gender persons losing

further on their jobs. So, the values of the activity rate for the feminine gender were surpassed by those of the masculine gender.

For the analysed space, *the unemployment rate* had a descendant course, the number of the registered unemployed workers decreasing with 3.255 persons (66%) – Fig. 5.

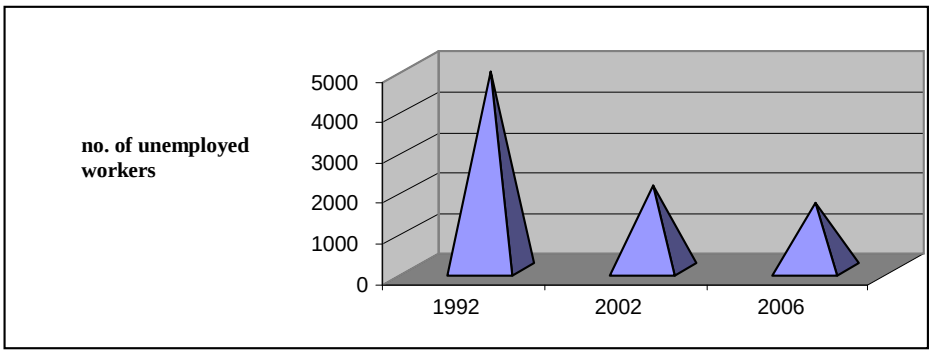

Fig. no. 5 The dynamics of the unemployed workers (1992-2006)

The period after the revolution from December (1992) was characterized by the highest rate of the unemployment (8.5%), a consequence of the massive dismissals from the textile, food and chemical industry from Calafat. This negative demographic phenomenon led to the increase of the unemployed workers among the feminine population. Seven administrative units registered values of the unemployment rate of over 10% (among these, Cetate, with 16.3%). In 2006, the number registered in the documents and paid was 416 persons lower (20.2%) as compared to 2002 and 3,255 persons (66%) compared to 1992. Yet, this diminishing is more likely a statistical one, contrasting with the reality, because it is actually about pointing out of the specialized institutions, many persons continuing to lack a job. On the other hand, the revitalization of the economy from this region after the privatization of some factories from Calafat and Băileşti, the founding of some small trading companies, the increase of the individual workers, showed new directions for the employment in the studied region.

The dynamics of the population's number, the disappearance of some economic activities, the retirement before the age limit are causes that determined modifications of *the economic dependence* in the localities from the studied region. The evolution of this indicator, at the plain level, shows a growth of 57.2% in a time interval of 25 years (from 84.4 inactive persons to 100 active persons, in 1977, to 132.7 inactive persons to 100 active persons, in 2002). The numeric diminishing of the active segment, in parallel with the increase of the population's number that corresponds to the inactive segment determined, in time, modifications of the inactivity degree. If in 1977 it corresponded less than 1 inactive individual (0.8) to an active person, starting with 1992, the situation changes, evidencing a

disequilibrium, the number of the inactive persons to an active individual being of 1.3% (in 2002).

The analysis of the indicator regarding the village, for the beginning of the 21st century (2002), evidences quite large discrepancies, between a maximum of 319 (Tunarii Noi) and a minimum of 60.5 (Piscu Nou). For 19 villages, concentrated, most of them, in the east of the plain, the value of the indicator was of over 150, showing an accentuated disequilibrium; for other 12 localities, with a dissimilar repartition, the degree of employment is also reduced (values of 120-150). The situation is good in 17 villages that form two areas, one in the south-west and the other in the north-east of the plain, the values of the indicator being below 100.

On the whole, the numeric evolution of the rural population from the Băileşti Plain was similar to that from the national level. After a continuous ascendant evolution until 1956, when it was reached the maximum value, the numeric dynamics of the population followed a descendant curve caused, on one hand due to the administrative reorganizations from 1968, when some villages had been included in the administrative area of the towns and, on the other hand, due to the values of the demographic indicators (the decreasing birth rate, the mortality rate and the growing migration, the accentuated demographic ageing).

REFERENCES

RĂDULESCU N. Al., VELCEA I., PETRESCU N. (1968), *Geografia agriculturii României,* Ed. Ştiinţifică, Bucureşti

CEAUŞESCU Anca, LAZĂR Simona (2007), *Human settlements from the south of the Dolj District until the Pre-Feudal Age. Geographical opinions and archeological evidences* in "Analele Universităţii din Craiova", Seria Geografie, no. 8, Ed. Universitaria, Craiova

AVRAM C., CEAUŞESCU Anca (2007), *Atestări documentare de aşezări din secolele XIV-XVI în sudul Olteniei*, in „Anuarul Institutului de Cercetări Socio-Umane <<C.S. Nicolăescu- Plopşor>>", no. 8, Ed. Aius, Craiova

AVRAM C. (coord.) (2004), *Dicţionarul istoric al localităţilor din judeţul Dolj,* vol. I (A-C), vol. II (D-M), vol. III (N-V), Ed. Alma, Craiova

T. ROTARU, E. MEZEI (1999), *Asupra unor aspecte ale migraţiei interne recente din România*, in "Sociologie Românească", no. 3

*****,** The general censuses of the population and dwellings from Romania in 1912, 1930, 1941, 1956, 1966, 1977, 1992, 2002.

***, *Enciclopedia României*, vol. I-IV, Bucharest, 1938-1943

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

IMPORTANCE OF BODY LANGUAGE IN EFFECTIVE MULTICULTURAL COMMUNICATION

IMPORTANŢA LIMBAJULUI CORPORAL ÎN COMUNICAREA MULTICULTURALĂ EFICIENTĂ

Jaya NATYAVIDUSHI[1]

Abstract: Communication is the transfer of information and ideas during the interaction between people. It is of two types: verbal and non- verbal, body or gestural. Gestural, body or non-verbal communication is as rich and complex as any language and organizes elementary and meaningless units into meaningful units. The gesture theory states that vocal human language developed from a gestural language. On the other hand, it is visual and exploits the unique features of the visual and performing media. This is considered as universal language. Cultural assimilation leads to multiculturalism. Multiculturalism is the appreciation, accepting, promotion of multiple ethics applied at the organization level in multicultural society. The need for effective multicultural communication is more prevalent in today's world as countries do more business globally and borders are disappearing. Here gestural language plays a vital role in establishing relationship where people have no language in common. As this language is universally accepted and understood, serves as the main channel of communication in multicultural society. Body language is broad term for gestural language, which includes gestures, facial expression, eye movements, posture, body movements and the use of time and space. This Para language including body or gestural language serves as main factors in multicultural communication. Recognizing the importance of body or gestural language in communication, our ancient preceptors evolved, codified and propagated each body movements for effective communication. Natyashasthra[2], which is the earliest text in this direction authored by Sage Bharathamuni, discusses the gestural language in detail. Analyzing the importance of traditional gestural language, Identifying its relevance in changing human values and creating modified version of the same for adopting in multicultural communication - are the main aims of this paper.

Key words: body language, gesture, multicultural, communication. Natyashastra, Abhinaya[3]
Cuvinte cheie: limbaj corporal, gest, multicultural, comunicare, Natyashastra, Abhinaya

[1] 30 Sirur Park Road, Sheshadripuram, Bangalore -560020. Karnataka. India
[2] Earliest reference book on dramaturgy, written by Bharathamuni – 2century BC
2 Abhinaya is a concept in Indian dance and drama derived from Bharata's Natya Shastra. Although now, the word has come to mean 'the art of expression' (Bing – Wikipedia)

1. Introduction

1.1 Communication is a process that allows people to exchange information by several methods. It requires feedback. Communication is the articulation of sending a message, whether it is verbal or nonverbal, so long as being transmits a thought provoking ideas, gestures, etc.[4]

Communication can be defined as the process of meaningful interaction among human beings. It is the art of passing information and the process by which meanings are exchanged so as to produce understanding. It is the process by which any massage is given or received through talking, writing and making gestures. Body language, sign language, paralanguage, touch, and gestural language, eye contact are recognized as the media of nonverbal communication.

It is of two types: verbal and non-verbal or gestural. Gestural, body or non-verbal communication is as rich and complex as any language and organizes elementary and meaningless units into meaningful units. The gesture theory states that vocal human language developed from a gestural language. On the other hand, it is visual and exploits the unique features of the visual and performing media. This is considered as universal language.

1.2 Aims of communication: Conferring the knowledge, expressions, giving the advice and commands and asking the question are the aims of communication.

1.3 Non-verbal communication: Non-verbal communication is usually understood as the process of communication through sending and receiving of wordless messages and can be communicated through gesture, touch, posture, facial expressions and eye contact. It is focused on face-to-face interaction. It can occur through any sensory channel that is Panchendriyas – sign, sound, smell, touch and taste.

1.4 Gestural language: Gestural or body language is the broad term for the language system that depends on gestures as the main channel of communication. This would include the notion of manually coded language and the sign language.

There is a dire need to establish gestural language in multicultural society:

- To understand each other;
- To remove the cultural distances;
- To strengthen the trust;
- To eradicate the cultural conflicts;
- To establish the social harmony.

1.5 History of gestural language: From the prehistoric time, before the evolution of speech, people expressed their hopes, joys and aspirations through gestures. Even in common conversation the speaker uses gestures appropriately. Therefore, it is common tendency to use gestures in communication. It can be

[4] http://Communication, wikia.com

considered that they are the most expressive part of the body like eyes, the hands and so on. They can reveal a number of actions according to the moods and sentiments. People still use gesture when they speak, especially when there meet people who have no language in common. Even in general conversation the speaker uses gestures according to his/her expression. Recognizing the importance of gestures in communication, these have been stylized and taught to make the communication more effective.

1.6 Gesture: A gesture is a non-vocal body movement that intends to express meaning. They may be articulated with the hands, arms, body, head, face and eyes. Gesture or Mudra[5] encodes sophisticated information accessible to the initiator that as privy to the subtlety of elements encoded in their tradition. These gestures have been analyzed form time to time based on Natyashastra and Abhinaya[6]darpana and practiced even today in the classical dance fields of India.

1.7 Dance and non-verbal communication: Dance is a form of non-verbal communication that requires the same underlying in the brain for conceptualization, creativity and meaning as lies in verbal communication. Dance also has vocabulary in the form of steps, gestures, grammar**,** mathematics, chemistry, physics, etc. Dance assembles these elements in a manner of poetry with its ambiguity and multiple symbols and elusive meaning.

1.8 Culture[7]: Learning and transmitting the integrated pattern of human knowledge, belief, behaviour that is knowledge to succeeding generation is called Culture. Culture thus consists of language, ideas, beliefs, customs, taboos, codes, institutions, tools, techniques, arts, rituals, ceremonies, and symbols. The word Culture derived from the Latin word Culture stemming from Colure means to cultivate. It has different meanings. A. Crober and others compiled a list of 164 definitions for Culture in their book "Culture: A critical review... of concepts and definitions". Hence, there is no single definition for Culture. According to E.B. Taylor "*Culture is that complex whole, which includes knowledge, belief, art, morals, laws, customs and other capabilities and habits acquired by man as a member of the society*"[8].

1.9 Indian Culture**:** Indian culture is a blending together of different components like religion, spirituality, language, literature, music, sculpture, painting, dance, theatre, different festivals, food habits and many more alike, which are specially interrelated.[9] Through the ages, it has absorbed outside influences but maintained its ancient heritage and evolved a distinct culture, which is living and growing. The Cultural heritage of India is the most ancient, extensive, varied and exclusive. It retained its vitality, originality and stability by practicing its

[5] A mudrā is a symbolic or ritual gesture in Hinduism and Buddhism While some mudrās involve the entire body, most are performed with hands and fingers (Bing – Wikipedia)
[6] Treatise on Indian Classical Dance, written by Nandikeshwara – 200 BC.
[7] WikiAnswer.com
[8] B.P Singh. Indian Culture The State, the art and Beyond. Oxford University Press. 2009 Page NO 42
[9] By P Nag, Cultural Heritage of India , 2007, NATMO

Sanathana Dharma[10]. The Indian Culture has inner strength in tolerance, respect of faiths and beliefs and a great attitude of understanding.

1.10 Multicultural**:** Cultural assimilation leads to multiculturalism. Multiculturalism is the appreciation, accepting, promotion of multiple ethics applied at the organization level in multicultural society. The need for effective multicultural communication is more prevalent in today's world as countries do more business globally and borders are disappearing. Here gestural language plays a vital role in establishing relationship where people have no language in common. As this language is universally accepted and understood, it serves as the main channel of communication in multicultural society.

2. Aims and objectives

2.1 Analysing the importance of traditional gestural language or body language and creating the modified version if necessary and adopting it in multicultural communication.

2.2 Identifying its relevance in changing human values by discussing on how this will promote the trust among people, how it removes cultural distance, conflicts and establishes social harmony.

3. Key questions

Can't we use already established theories of body or gestural language for effective multicultural communication?

Can we use gestural language directly or do they need modifications?

4. Hypothesis

Whether identified classical gestures are really beneficial to multicultural society at large;

Whether the multicultural society accepts the existing classical gestures or interested in modified version;

If modification required – at what range?

5. Methodology

Historical: Historical method is used since the topic mainly depended on the historical sources. Qualitative method is also used since the analysis and the interpretation of the data is based on human behaviours, emotions and communications.

Qualitative analysis through practical approach: To interpret and analyse the data, which is mainly based on human behaviour, emotions, communications**,** the author has carried out various workshops, summer camps, intensive training camps, seminars, visited to historical places, discussed with scholars and experts. These experiential exercises contributed largely to develop this article.

6. Sources: The following sources are available to understand these gestures:

6.1 Literary sources: This is the primary source, which includes several sub sources. In the post Natyashatra period the texts have followed Natyashastra by

[10] Sanatana Dharma, meaning "Eternal or Universal Righteousness" is the original name of what is now popularly called Hinduism. - Bing Wikipidea

absorbing the contemporary values except Abhinayadarpana. Therefore, for this research article, majorly Natyashatra, Abhinayadarpana, and Lasyaranjana are used apart from other sources.

6.1.1 *Treatises*: There are many treatises pertaining to classical dance from the 2nd century B.C. and most of the treatises are in Sanskrit[11]. Recently these works have been translated into regional languages. Among them, some are well known.

6.1.2 *Natyashasthra*: This is considered to be the Encyclopaedia of dramaturgy. This comprises several topics like music, drama, and dance. It comprises 36 chapters and 6,000 Shlokas[12], written by Bharathamuni in the second century B.C. Adhya Rangacharya translated this Sanskrit work into Kannada[13]. Dr. Manmohan Ghosh has translated it into English. 10 chapters are devoted to gestural language in detail.

6.1.3 *Abhinayadharpana*: This work in Sanskrit is another treatise on Lakshana[14] on gestural language written in the third century A.C by Nandhikeshwara. This work is translated into all the languages of the world. In this text, Angikabhinaya that is gestural language, is described. Dr. Ananda Coomaraswamy and Dr. Manmohan Ghosh have translated this into English. M. Sridhara Murthy has translated this work into Kannada.

6.1.4 *Dhasharupaka*: There are four chapters in this treatise and two chapters are dedicated to gestures of moods and sentiments, written by Dhananjaya in the 10th century A.C in Sanskrit. K.V.Subbanna translated this text into Kannada and Geroge C.O. Haas in English.

6.1.5 *Sangetha Rathnakara*: Sarangadheva has written this book in 13th century A.C. It consists of seven chapters. It is in Sanskrit. The last chapter is devoted to dance. Dr. K. Kunjunni Raja and Radha Berniar have translated this into English.

6.1.6 *Lasyaranjana*: This is the first and foremost treatise comprising eight chapters on classical dance in Kannada written by King Simhabhupala, in 16th century A.C. This treatise is based on Natya Shasthra.

6.2 (Secondary Sources) Architectural

6.2.1 In Karnataka we find dance sculptures in all the temples built during the historical times from time to time. Ancient temples located at Belur, Halebidu, Somnathpur, Pattadhakallu, Badhami, Aralaguppa, Hassan, Chikamagalur, and Hampi are famous for the dance sculptures carved on the temple structure[15].

---

[11] Official language of ancient India

[12] A śloka (also anglicized as shloka or sloka, meaning 'song', from the root śru, 'hear') is a category of verse line developed from the Vedic Anuṣṭubh. (Bing – Wikipedia)

[13] Regional language of Karnataka state. India

[14] Characteristics

[15] Dr. Choodamani Nandagopal. Shile Kale.Sundaraprakashana .2007 pg 79 to 102

6.2.2 Various gestures can be explored from the sculptures such as Nataraja, women dancing with Krishna, several dance postures, sculptures showing various musical instruments and deities of eight directions[16].

6.3 Inscriptions: following inscriptions throw much light on dance**.**

- Arichalluru Inscription of 4th century A.C, Tamil Nadu. India
- Kudumiyamalai Inscription of 7th century A.C, Tamil Nadu.
- Malayakovil or Malekovel – 7th century A.C, Tamil Nadu.
- Pattadakallu Inscription – 8th century A.C, Karnataka.
- Inscription of Someshwara Temple, Gadag, 15th century A.C, Karnataka.
- Hadagali Inscription – 16th century A.C, Karnataka.

7. Data extracted from the Primary Sources: Abhinaya is the life breath of dance. Concealed thoughts can be revealed through Abhinaya. The word 'Abhinaya' derived from the Sanskrit words 'Abhi', which means 'towards' is added to the predicate 'Ne', which means 'giving'. There are four kinds of Abhinayas known as Chaturvidha Abhinaya; a) Angikabhinaya - expression through body movements, b) Vachikabhinaya - verbal expression, c) Aharyabhinaya - expression through make-up and costumes d) Sathvikabhinaya. - Facial expression. Of these four Abhinayas, Angikabhinaya focuses on body gestures. Hence, information is derived from Angikabhinaya.

7.1 Angikabhinaya[17] is of pivotal importance in dance. This Aangikaabhinaya is divided into three groups.

- *Anga* – Major limb. In Anga, which is a chief variant of Aangikaabhinaya, expressions of face, hands, chest, elbows, waist, and feet are included. Some add neck in this division.
- *Prathyanga* - Minor limb. Even this is another principal variant of Aangikaabhinaya. Expressions of six Angas are included in this division, namely: shoulder bones or shoulders, arms, back, stomach, thighs and knees. Some have added wrists, forearms and knee joints.
- *Upanga* - Subsidiary limb. Under this category expression of eyes, eyebrows, eyeball, eyelids, nose, chins, cheeks, lips, teeth, tongue, face, head are explained. In some texts we find the saying 'Vadhanam Shiraha'.[18] But it is not included in many texts. Moreover, head, fingers and toes, forelegs and forearms have been described as Anganthara[19]. Description and usage of all these Angas have been given in treatises and commentaries, which are based on Natyashastra and Abhinayadarpana.
- Our ancients[20] have designed, experimented, practiced. Propagated and codified each part of the bodily movement for the purpose of effective communication since 200 B.C. It is a very wide-ranged and complicated

16 Dr. Choodamani Nandagopal**.** Shile Kale.Sundaraprakashana .2007 pg. 151 to 204

17 Natyavifhushi Prof. Jaya . Bharathanayam Text and Digest. 2009. pg no 123 to124

19 In the divisions of head face also should be considered

20 After angas or apart from Angas

20 Preceptors or Gurus

subject. I strongly feel that a single life is not sufficient to study this subject in depth. Therefore, I have focused on five major limbs, which are used in all the walks of life. They are**:**

- *Shirobhedha* - head movement and their usages;
- *Dhrushtibhedh*a - movements of the glances, and their usages;
- *Grevabhedha* - neck movements and their usages;
- *Hastha* - hand gestures and their usages;
- *Paadhabhedha* - leg movements and their usages.

Gestures explained under these five divisions are comprehensive, universal in nature and are used in all communications expressed by human beings. Therefore, this part of the source is dealt in detail:

7.2 Angikabhinaya as in Abhinayadharpana of Nandhikeshwara: Abhinayadharpana explains the above mentioned five major gestures in detail.

7.2.1 Shirobhedha: Head movements as in Abhinayadarpana: This is one of major limb in Anga, which is a major division of Aangikaabhinaya. There are 9 head gestures in Abhinayadarpana, 13 in Naatya Shastra and 19 in Laasya Ranjana along with their usages. One of the shloka from Abhinayadharpana says about the head movement as:

Samam Udvaahitha Adhoomukha Aalolitham Dhutham ||
Kampithaschiva Paraavrutha Uthkshiptha Parivaahitham ||
Navadhaa Kathitha Sheersha Natyashastra Vichakshanai ||
Abhinayadarpana

English version of the shloka

- *Sama:* Keeping head straight without moving, shaking, lifting, bending is called Sama. Usages: In the beginning of dance, while praying, while showing arrogance, to show anger in love, while astonishment and in static posture.
- *Udhwaahitha:* Lifting up the head is called Udhwaahitha Shira. Usage: To see flag, moon, sky, mountain, flying birds, things, which are placed at high level.
- *Adhomukha:* Bending down the head is called Adhomukha Shira. Usages: To indicate shyness, sadness to for salutation, to show anxiety, fainting, to see the things placed on the ground.
- *Aalolitha:* Turning the head circularly is called Aalolitha Shira. Usage: In sleep, menace of evil spirits, intoxication, fainting, traveling, laughing.
- *Dhutha:* Turning the head left and right or side-to-side and vice-versa is known as Dhutha Shira. Usage: To see side to side, to say no, to indicate unwillingness, cold, fever, wonder, in sorrow, martial art, to take revenge, to call somebody from sideward.
- *Kampitha:* Shaking the head up and down very fast is called Kampitha Shira. Usages: To indicate anger, to say stop, to ask questions, to direct, to call, to evoke God, and to frighten.
- *Paraavrutha:* Turning the head backward is called Paraavrutha Shira. Usages: To order, in anger, shyness, to ignores, hair, bow and arrow or Archery and similar to these.

- *Uthkshiptha:* Turning the head sideward a little and lifting it up is called Uthkshiptha Shira. Usages: To say take, come here, to protect, to show acceptance and similar to these.
- *Parivaahitha:* Moving the head like a fan while projecting it a little in the front and moving side-to-side is called Parivaahitha Shira. Usage: To indicate love, desire, to turn, to show Joy, to show acceptance to indicate alternative ideas.

7.2.1.1 Shirobhedha: Head movements as in Natya Shastra[21]: According to Naatya Shastra there are 13 head gestures, which are as it follows.

- *Akampitha:* Moving the head slowly up and down is called Akampitha Shira. Usage: To give suggestion, to teach, to question, to talk, to order.
- *Kampitha:* Moving the head very fast up and down repeatedly is called Kampitha. Usages: In anger, while arguing, to advise, while forcing, to indicate illness and in tolerance.
- *Dhootha:* Turning the head slowly left and right is called Dhootha Shira. Usages: In unwillingness, sad, wonder, assurance, to see sideward, to respect and in calmness.
- *Vidhootha:* Turning the head very fast right and left is called Vidhootha Shira. Usages: In cold, fear, fever, drinking alcohol.
- *Parivaahitha:* Turning the head repeatedly towards both sides. Usages: This head gesture is used in wonder, joy, ordering, intolerance, worry, concealment, love, etc.
- *Udhwaahitha:* Raising the head up at once is called Udhwaahitha Shira. Usages: To indicate self-confidence, pride, height, looking upward and similar to these this head gesture is used.
- *Avadhootha:* Bending the head down at once is known as Avadhootha Shira. Usages: To communicate news, worship, and converse, calls somebody near.
- *Anchitha:* Bending the neck a little towards a side is called Anchitha. Usages: To indicate fever, fainting, intoxication, anxiety and sorrow.
- *Nihanchitha:* Lifting up both the shoulders and bending the head towards one side is called Nihanchitha. Usages: To indicate arrogant woman, politeness, negligence, silent, affection, anger out of jealousy.
- *Paraavrutha:* Turning the head backwards is called Paraavrutha Shira. Usages: To turn the face back, to see backside.
- *Uthkshiptha:* Lifting up the head a little up is called Uthkshiptha Shira. Usages: To look at things above, while using holy weapons.
- *Adhogatha:* Bending the head downward is called Adhogatha. Usages: To show disrespect or humiliation, bending the head, in sorrow, etc.

[21] The NatyaSastra Of Bhraramuni Trans- By a board of Scholars – Satguru Prakashana -1986, pg 116 to 117

- *Parilolitha:* Turning the head on all sides. Usages: To indicate fainting, fever, intoxication, being captured by evil spirit, sleep.

7.2.1.2 Shirobheda as Laasya Ranjana: There are 19 kinds of head movements out of which 13 head movements are of the same as mentioned in Naatya shastra and sama is of Abhinaya Darpana. The remaining new five head gestures are as it follows:

- *Adhootha:* lifting the head sideward only once in Adhootha. Usages: To indicate self-admiration with pride, to justify, head weight, to see sideward.
- *Theeryagunnatha:* Turning the face 15^0 angle and lifting it up a little is called Theeryagunnatha Shira. Usages: To indicate the negligence on beloved one.
- *Skandhaanatha:* placing the head on the shoulder is called Skandhaanatha. Usages: To indicate sleep, intoxication, fainting anxiety, etc.
- *Araathrika:* Touching the head with both shoulders and walking is called Araathrika. Usages: To indicate happiness, expressing other opinion and other similar gestures.
- *Paarshwaabhimukha:* Turning the head crosswise and lifting up a little is called Paarshwaabhimukha Shira. Usages: To indicate reject and to see sideward.

7.2.2 Ghreevabhedha – Neck Movement as per Abhinayadharpana: Generally, neck movements follow the head movement. However, dance preceptors have designed and classified various neck movements, which are entirely different from the head movements. In Abhinayadarpana the neck is included in Anga whereas in other treatises this is included in Prathyanga. According to Abhinayadarpana there are four neck movements. They are Sundari, Thirascheena, Parivarthitha, and Prakampitha.

Sundaree cha Thiraschina Thathaiva Parivarthithaa ||
Prakampithaa cha Bhaavagnergneya Greevaa Chathurvidha ||
Abhinayadarpana

- *Sundari:* Moving the neck crosswise towards right and left in a graceful manner is called Sundari. This is called 'Addami' in dance language. Usages: To indicate the beginning of love, efforts, perfection, width, joy and beginning of dance.
- *Thirascheena:* Moving the neck up towards both sides like a serpent glides. Usages: To indicate the use of sword and gliding of a serpent.
- *Parivarthitha:* Turning the neck towards both sides like a half moon shape (crescent). Usages: To indicate and adapt in dancing, in graceful dance, to kiss.
- *Prakampitha:* Moving the neck like a dove is called Prakampitha. Usages: To say you and I, in folk dance swinging Joola and in love.

Ghreevabhedha – Neck Movement as per Natya Shastra[22]: Nine types of neck gestures are explained in Natya Shastra.

[22] The NatyaSastra Of Bhraramuni Trans- By aboard of Scholars – Satguru Prakashana -1986, pg 130 to131

- *Sama:* Keeping the neck normal and straight as usual. Usages: To indicate normal position, in meditation, in chanting slokas.
- *Nivrutha or Vivrutha:* Turning the straight neck is called Nivrutha. Usages: To indicate going to one's own place and standing in front of somebody from their own place.
- *Valitha or Vaahitha:* Lifting up the neck sideward, which is bent down, is called Valitha. Usages: To see things that are placed sideward up, looking with pride or neglect.
- *Rechitha:* Turning the neck excessively to make it look like churning is called Rechitha. Usages: To indicate which is shaking, churning, in illusion, to show grace in dance.
- *Kunchitha:* Bending the neck slightly as if it is folded is known as Kunchitha. Usages: To denote plea to save the neck from something, heavy on the neck.
- *Anchitha:* Slacken the neck; stretching it little front and looking up is called Anchitha. Usages: While knotting the hair after combing, while coming, while pulling the hair and while looking up.
- *Thryasya:* Bending the neck close to the shoulder bone is called Thryasya. Usages: To indicate misery, looking aside, excessive burden.
- *Natha:* Bending the neck forward is called Natha. Usages: To wear the neck ornaments, garlands and while placing the hand on the others neck.
- *Unnatha:* Lifting up the neck is called Unnatha. Usages: To show the neck ornaments, to see up and to see the road at the distance.

Ghreevabhedha – Neck Movement as per Lasyaranjana: It follows Natyashastra while explaining Ghreevabheda.

7.2.3 Hasthaa – Hand Gestures: The Hand Gestures, which accompany the recitation of the Hyms and Mantras are called Mudras and some say that 'Mudra' is of Persian origin and it means seal. The Tantrik[23] school says that Mudra derived from the world 'Mud' that means bliss. This bliss is attained through the divine power of Mudra or hand gesture, which emphasis and intensifies the concentration. These are the source of pleasure. Performance of Mudra purifies, energizes and divinizes the spiritual aspirant in a similar way as the recitation of the Mantra. Based on these aspects and recognizing the importance of hand gesture in non-verbal communication, our ancient preceptors have designed hand gestures and their usages, which play a vital role in communication in general and in Indian classical dances in particular. Thus, expressive and meaningful hand movements are called Hastha in dance fraternity, which communicate a thought or feeling and can express extreme joy or unexplainable grief. One can express all kinds of emotion, imagination and subject through these gestures. These hand gestures contribute to the understanding of the dance, accompanied by the foot work, body

[23] Tantric can refer to - Tantra, especially Hindu Tantra and tantric yoga. Tantra, hence "principle, system, doctrine", from the two root words tanoti "stretch, extend, expand", and trayati "liberation (Bing – Wikipedia)

movements, posture and facial expressions. It conveys the meaning of a song. The important feature of the Indian classical dance is the use of hand gestures by the artist as a shorthand sign language to narrate the moods and sentiments. Hand gestures are universal and serve as words in language. May be this is the reason, why Plato quotes Socrates saying as **"**If we hadn't a voice or a tongue and wanted to express things to one another, wouldn't we try to make a sign by moving our hands?" – Plato's Cartylus, 5th century BC".

Divisions of Hand Gestures: These Hasthas are divided into three categories, namely Samyutha, Asamyutha, and Nruthahasthas. Single or separated hand gestures are called Asamyutha Hastha. Double or combined hand gestures are called Samyutha Hastha. Decorative hand gestures are called Nrutha Hasthas. According to Nandhikeshwara, there are 28 Asamyutha Hasthas and 24 Samyutha Hasthas and 13 Nrutha Hasthas. These Hasthas have their own usages, which are very useful to express feelings and emotions. Asamyutha and Samyutha Hasthas are called expressional hand gestures. Recognizing the importance of these gestures, all the commentators of the post Natya Shastha period evolved new hand gestures like Devatha (Gods), Dashavathara (10 incarnation of Vishnu), Bhandavya (Relationships), Sankara (Complex), Nanartha (multiple meanings), Nadhi (River), Parvatha (Mountain), Navagraha (nine planets), Ragaragini[24], Nakshathra (Stars), Nayaka, Nayaki Bhava (Emotions of Hero & Heroine Chathurvarna (four caste system) Varnavishesha (colours) Vayomaana (Age) Kaalamaana (Time) Ruthumaana (seasons). Jaathi (caste) Pushpa (flower), Vedha[25], Chathuropaaya (four strategies), Panchabhootha (five elements. To learn these hand gestures one should master Hastha Karanas (action), Pranas (life force), Sancharas (Movements), Kshethra (Area) and Hastha Karmas (Duty). Bharatharnava[26] explains in detail about these gestures. Each gesture has number of usages.

Divisions of Hand gesture as per Natya Shastra: Natya Shastra also divides hand gestures into three divisions as mentioned above. They are 24 Aasamyutha Hasthas, 13 Samyutha Hasthas and 30 Nritha Hasthas. All the Gurus[27] evolved new hand gestures, experimented, propagated codified them in texts along with their usages. Among them Hastha Mukthavali of Shubhankara, Balaramaa Bharatha and Narthana Nirnaya are very important texts on hand gestures. To understand these hand gestures and their usages, it is necessary to know modes, method of practicing and placing them. Again, the Study of hand gesture is a vast and wide ranged subject as mentioned before. Only portion of a few divisions has been considered to support the views of this article.

7.2.4 Asamyutha Hasthaa (Non – combined or single hand gesture): According to Abhinayadharpana, there are 28 Asamyutha Hasthaas, namely: 1) Pathaka 2) Thripathaka 3) Ardha Pathaka 4) Kartharemukha 5) Mayura 6) Ardha Chandhra 7) Arala 8) Shukathunda 9)Mushti 10) Shikhara 11) Kapitha 12)

[24] A traditional melodic type in Hindu music, consisting of a theme that expresses an aspect of religious feeling and sets forth a tonal system (Bing – Wikipedia)
[25] The Vedas are the four ancient Indian collections of hymns (c. 2000–1100 BCE) – Bing Wikipedia
[26] A text on dance by Nandikeshwara
[27] 1. Hinduism. a preceptor giving personal religious instruction. 2. An intellectual or spiritual guide or leader.

Katakamukha,13)Suchi,14)Chandhrakala,15) Padhmakosha 16) Sarpashersha 17) Mrigashersha 18) Simhamukha 19) Langula 20)Alapadhma, 21) Chathura 22) Bhramara 23) Hamasasya2 4) Hamsapaksha 25) Sandhamsha 26) Mukula 27)Thamrachuda 28) Thrishula.

Pathaka Thripathako Ardhapathaka Kartharemukhaha || Mayurakhyo Ardhachandhra Arala Shukathundakaha || Mushtischa Shikarakascha Kapittha Katakamukhaha || Suchi Chandhrakala Padhmakosha Sarpashirasthatha || Mrughashersha Simhamukho Kangula Alapadhmaha || Chathuro Bhramaraschaiva Hamsasyo Hamsapakshakaha || Sandhamsho Mukulaschaiva Thamrachuda Thrishulakaha || Ashttavimshathi Hasthanamevam Namani Vaikramath || Abhinayadharpana

Pathaka: Bending the thumb while joining it with the index finger and stretching the remaining fingers straight by joining them is called Pathaka Hastha. The usages are: Natyarambhe varivahe vane vasthu Nishedhane || Kuchasthale Nishayancha Nadhyam Amaramandale || Thurage Khandane Vayou Shayane Gamonodhyame || Prathapecha Prasadhecha Chandhrikayam Ghanathape || Kavatapatane Saptha Vibhakthyarthe Tharangake || Vedhipravesha Bhavepi Samathve Changaragake || Athmarthe Shapathechapi Thushni Bhavasyadharshane || Ashervadha Kriyayancha Nripashrestasya Bhavane || Thadapathrecha Khetecha Dhravyadhi Sparshane Thatha || Thathra Thathrepi Vachane Sindhouthu Sukruthi Krame || Sambhodhane Purogepi Khadgha Rupasya Dharane || Thathra Mase Samvathsare Varshe Dhine Sammarjhane Thatha || Yevam Artheshu Yujyanthe Pathaka Hastha Bhavana || Abhinayadarpana

Asamyutha Hastha (Single hand gestures as in Abhinayadarpana) (Fig. 1).

Figure. 1 Usages of single hand gestures: Each of the gestures has number of usages. Here effort is made to explain usages of a few gestures, as explained by Abhinayadarpana.

Meaning:

Natyarambha: Beginning of dance, Varivahe: Cloud, Vane (forest), Vasthunishedhane (To say no), Nisha (Night), Nadhi (River), Amaramandale: (Celestials abode), Thurage (Horse), Khandane (Chapping / cutting), Vayu (Air), Shayane (Sleeping) , Gamanodhyame: (Trying to move forward), Prathapa (Valor), Prasadha - Compassion, Chandhrika (moonlight), Ghanathape (hot sun), Kavatapatane(opening and closing the door), Sapthavibhakthyarthe (denoting seven cases), Tharanga (waves), Vedhi Pravesha : (entering the street), Samathva (levelling), Angaragake: (Applying something), Athmarthe (To say I), Shapathe (Promise), Thushnebhava (Silence), Ashervadha (Blessings), Nripashreshta (Eminent King), Thadapathra (Palm leaf), Khete (Shield), Dhravyahdhispharshane (Touching oil and so on), Thathra Thathrepi Vachane (This, that, to say here, there), Sindhou (sea), Sukruthi Krame (good work), Sambhodhane (Addressing), Purogepi (Entering the city), Khadga Rupasya Dharane (Hold the sword), Mase (Month), Samvathsare (Year), Varshadhene (Rainy day), Samarajane (Sweeping)

Sarpashersha: Usages: Chandhane Bhujange Mandhe Prokshane Poshanadheshu || Dhevarshya Udhakadhaneshu Hyasthale Gajakumbhayo || Bhujasthaleshu Mallanam Yujyathe Sarpasherhakaha. Abhinayadharpana

This hand gesture is used to indicate sandal paste, snake, in slow motion, to purify, to protect.

Mrigashersha: Usages: Sthrenamarthe Kapolecha Krama Maryadhadhorapi || Bhethe Vivadhe Nepathye Avasecha Thripundake || Mukhamukhe Rangavalyam Paadhasamavahanepicha || Sarvasammelane Karye Mandhire Chathradharane || Sopane Paadhavinyase Priyahwane Thathaivacha || Sancharecha Prayujyetha Bharathagamakovidaihi || Abhinayadharpana

This gesture is used to indicate woman, cheeks, to respect, in fear, in argument, face to face, house, to hold the umbrella.

Simhamukha: Usages: Vidhrume Moukthike Chaiva Sughandhe Alakasparshane || Akarnanecha Prushathi Moksharthe Hrudhisamsthethaha || Home Shashe Gaje Dharbhachayane Padhmadhamani || Simhanane Vaidhyapakashodhane Simhavakthrakaha. Abhinayadharpana

This gesture is used to indicate coral, pearl, scent, hair lock, to hear, to show the rabbit, elephant.

7.2.4.1 Samyutha Hastha (combined or joined hand gesture): Combined hand gestures are called samyutha Hathaaa. There are 24 Samyutha Hasthas according to Abhinayadharpana. They are: Anjali, Kapotha, Karkata, Swasthika, Dola, Pushpaputa, Uthsanga, Shivalinga, Katakavardhana, Karthariswasthika, Shakata, Shanka, Chakra, Samputa, Pasha, Kilaka, Mathsya, Kurma, Varaha, Garuda, Nagabandha, Katwa, Berunda and Avahitha) and 13, according to Natya Shasthra.

Samyutha Hastha: Anjalishcha Kapothashcha Karkata Swasthikasthathaha || Dola Hastha Pushpaputa Uthsanga Shivalingakaha || Katakavardhanashchaiva Karthareswasthikasthathaha || Shakata Shankha Chakroucha Samputa

Pashakelakou || Mathsya Kurma Varahascha Garudo Nagabhandhakha || Khatva Bherundakashcha Avahitha Thathaivacha || Chathurvimshathi Sankyaka Samyuthaha Kathithaha Karaha|| – Abhinaya Dharpana.

Here effort is being made to explain usages of a few gestures, as explained in Abhinayadarpana (Fig. 2).

Figure 2. Samyutha Hastha (Combined hand gestures as in Abhinayadarpana)

Anjali Hastha: Usages: Dhevathaguru Vipranam Namaskare Anukramath || Karyashiromukhorassu Viniyojya Anjalikaraha.

If the Anjali Hasthaa is held up above the head, it means salutations to God, if held in front of the face, it means salutations to receptors, if held in front of the chest, it is to elders and spectators, if held below the chest, it means salutation to commoners. This hand gesture is used to denote cutting and to sleep also.

Kapotha: Usages: Pramana Gurusambhasha Vinayangikruthashwayam || To promise, converse with the guru, receiving with humbleness,

Uthsanga: Usage: Alinganecha Lajjayam Angadhi Pradharshane || Balanam Shikshanechaya Uthsango Yujyathe Karaha

To embrace, to shoe shyness, to show the body, to protect the child

Karkata: Usage: Samuhadharshane Thundhadharshane Shankhapurane || Anganammotane Shakhonnamane cha Niyujyathe ||

To show the crowd, the stomach, to blow the conch, for wriggling, bending the branches

Khatva: Usage: Khatva Hastho Bhavadheshaha Khatvadhishu Niyujyathe

To show the cot and Palanquin

Avahitha: Usage: Shrungaranatane Chaiva Lelakandhukadharane || Kucharthe Yujyathe soyamavahitha Karabhidhaha ||

In graceful dance, playing the ball gracefully.

7.2.4.2 Nrittha Hasthaa (Decorative hand gestures): This is a third category of hand gestures, which is mainly used in embellishing the dance as decorative element. Therefore, I have not spoken about this category, as their usages are limited in multi cultural communication.

7.2.5 Paadha Bhedha – Leg movement[28]: Mandala, Sthanaka, Bhramari and Paadhacharis are described in detail in Natyashasthra as part of the leg movements. The descriptions given in Sarangadheva's 'Sangetha Rathnakara and Natyashasthra are basically identical. But these are described in Nandhikeshwara's Abhinayadharpana in a different way. Simhabhupala's 'Lasyaranjana' divides these Charis under four heads.

They are: 1. Maargi Bhuoma Chari, which are 16 in number 2. Maargi Akasha Chari, which are 16 in number 3. Dheshiya Akasha Chari, which are 19 in number 4. Deshi Bhuoma Chaari, which are 35 in number. Apart from these Charis we have reference for Kuttana Charis in Kohala's[29] works. Bharathanatyam is practiced mostly in accordance with the description of Abhinayadharpana. Hence, these are described as in Abhinayadharpana. According to Abhinayadharpana, Paadhabhedhas are of four kinds: Mandala, Uthplavana, Bhramari, and Paadhachari.

Padabhedas according to Nandikeshwara's Abhinayadarpana: Mandalothplavanechaiva Bhramari Paadhacharika; Chathurtha Paadhabhedhasyu Thesham Lakshnamuchyathe || Abhinayadharpana

Mandala: Mandala is one of the Paadha Bhedhas according to Abhinayadharpana. Mandala means sitting or standing poses of the body. There are 10 kinds of Mandalas: Sthanakanchayathaleda Prenkhanam Prerethani; Prathyaledam Swasthikancha Motitham Samasuchika; Parshwa Suchethicha Dhasha Mandalanerithaniha || Abhinayadharpana

They are Sthanaka, Ayatha, Aleda, Prenkhana, Preritha, Prathyaleda, Swasthikha, Motitha, Samasuchi, Parshwasuchi.

- *Sthanaka:* Placing Ardhachandhra Hasthas on their respective sides of the waist and standing on the Samabhangi is Sthanaka.

[28] Natyavidhushi Prof. Jaya, Bharathanatyam Text and Digest,3rd edition , 2009 pg 120 to 123

[29] Disciple of Bharathamuni

- *Ayatha:* Standing in Chathurasra pose with a gap of two inches between the feet and bending the knees downward is called Ayatha Mandala or Aremandala or Aremandi Sthanaka.
- *Aleda:* Placing the right leg towards right at 45 degree angle by stretching it on the heel in Aremandi Sthanaka and holding the left Shikhara and the right Katakamukha in front of the chest is called Aleda Mandala.
- *Prenkhana:* Standing on a leg and placing the toes of the other leg nearer to its heel and holding Kurma hastha in front of the chest is called Prenkhana Mandala.
- *Preretha:* Stamping the floor forcefully by a leg and sitting on it with Shikara Hastha and stretching the other leg sideward along with the hand with Unmukha[30] Pathaka is called Preretha Mandala.
- *Prathyaleda:* Performing Aleda Mandala on the left side is called Prathyaleda.
- *Swasthika:* Placing the right leg in front of the left leg and standing while crossing the hands at their wrist and holding in front of the chest is called Swasthika Mandala.
- *Motitha:* Sitting in Purnamandi[31] and performing Mandiadavu[32] one after the other with stretched Pathaka hands in their respective sides is called Motitha.
- *Samasuchi:* Sitting in Purnamandi and touching the toes and the knee joint one after the other is called Samasuchi.
- *Parshwasuchi:* Sitting on toes and touching the floor only by one knee is called Parshwasuchi.

7.2.5.2 Sthanaka Mandalas: Standing Pose: There are six kinds of Sthanaka Mandalas. They are: Samapadha, Ekapadha, Nagabandha, Indhra, Garuda and Brahma Sthanaka. Samapadhancha Ekapadham Nagabhandha Thathahparam || Indhrancha Garudanchaiva Brahmasthanamithikramath || Abhinayadharpana

- *Samapadha:* Standing on samabhangi i.e., joining the legs and feet or standing erect while placing the hands on the waist is Samapadha. This Sthanaka is useful to denote gods and goddesses stance.
- *Ekapadha:* Standing on the right leg and placing the left foot on the right knee or vice versa is called Ekapadha Sthanaka. Usages: in penance and meditation.
- *Nagabhandha:* Standing and twisting on one leg around the other leg and placing one hand around the other hand is called Nagabhandha Sthanaka, which denotes the serpent pair.
- *Indhra:* Standing in Ekapadha Sthanaka and placing the Thripathaka Swastika gesture above the head is called Indhra Sthanaka.
- *Garuda:* Bending the left leg in a knelt down position and stretching the right leg backward and sitting on the left leg while stretching the hands sideward is called Garuda.

---

[30] Palm inside

[31] Sitting on the ground on toes

[32] Steps done using the knee joints

- *Bramhasthanaka:* Padhmasana posture is called Bramhasthanaka. Thus we have 10 Mandalas and six Shanakas altogether.

7.2.5.3 Bhramari: Bhramari means turning. This is one of the Padha Bhedhas according to Abhinayadharpana. They are of seven types, namely: Uthplutha, Chakra, Garuda, Ekapadha, Kunchitha, Akasha and Anga. Uthplutha Bhramari Chakra Bhramari Garudabhidha; Thathaikapadha Bhramari Kunchitha Bhramari Thatha; Akasha Anga Bhramari ||Abhinayadharpana.

- *Uthplutha Bhramari:* Standing in Sama Padha and turning the body is called Uthplutha Bhramari.
- *Chakra Bhramari:* Sliding the legs on the ground with Thripathaka Hasthas and rotating the body while sliding the legs circularly is called Chakra Bhramari.
- *Garuda Bhramari:* Placing a knee on the ground and stretching the other backward in the air or ground and turning the body with Garuda hastha is Garuda.
- *Ekapadha Bhramari:* Standing on a leg and bending the other backward and turning is called Ekapadha Brahmari.
- *Kunchitha Bhramari:* Bending the knee and turning is called Kunchitha Bhramari.
- *Akasha Bhramari:* Jumping with both legs while turning the body is Akasha Bhramari.
- *Anga Bhramari:* Placing the legs leaving a space of 2" and jumping while turning the whole body is Anga. Thus, according to Abhinayadharpana, we have seven Bhramaris

7.2.5.4 Uthplavana: Uthplavana means jumping. Uthplavana Padhabedha is one of the four Padhabhedhas explained in Abhinayadharpana. There are of five types. Alagam Kartharivashowthplavanam Motitham Thatha; Krupalagamithi Khyatham Panchadhothplavanam Bhudhaihi || Abhinayadharpana

- *Alaga:* Jumping on both the legs sideward while placing the Shikara Hasthas on the waist respectively is called Alaga.
- *Karthari:* Jumping and placing the right leg on its toes behind the left leg with Kartharemukha gesture is called Karthari Uthplavana.
- *Ashwa:* Jumping forward with a leg and placing the other leg behind it by holding Thripathaka in both hands is called Ashwothplavana.
- *Motitha:* Jumping right and left like Karthari uthplavana with Thripathaka gestures is called Motitha Uthplavana.
- *Kripalaga:* Jumping and touching the heel at the back of the waist one after the other with Ardhachandhra hands is called Kripalaga Uthplavana

7.2.5.5 Padha Chari: Chari means walking. They are of eight types, namely: Adhouthu chalanam proktham Paschachankramanam thatha saranam Veginichaiva Kuttanancha thathaparam || Luntitham Lolitham chaiva thatha Vishamasancharam Chari bhedhamithi Ashtou proktha Bharathavedhibhi || Abhinayadharpana.

- *Chalana:* Stepping forward from the place where they are standing or walking forward is known as Chalanachari.
- *Chankramana:* walking by keeping the feet in front of each other in criss-cross manner by lifting them high is Chankramana.
- *Sarana:* Moving a leg on the ground like a leech and joining the heel of the other leg with Pathaka Hasthas is Sarana.
- *Vegini:* Moving swiftly with the heel or forelegs with Alapadhma or Tripathaka Hasthas one after the other is Vegini.
- *Kuttana:* Placing the foot as though we are stamping the ground by the heel, fore-leg or sole is Kuttana.
- *Luntitha:* Standing in Swasthika Mandala and striking the floor with the toes is Luntitha.
- *Lolitha:* After doing the Kuttana on one side moving the leg which does not touch the ground slowly is Lolith.
- *Vishamsanchara:* Inter-twining the right leg with the left leg and the left leg with the right leg and walking is called Vishamasanchara.

7.2.6 Padhabhedha that is leg movement as in Natyashasthra[33]: With reference to padabhedha, the foot and leg movements are called Chari in Natyashastra. The word Chari derived from the Sanskrit word Char, which means walk or go forward. When we walk, we place one leg after the other forward, backward, sideward, up and down. These movements have been stylized, designed and adopted in the dance field from time to time. According to their feature there are named as Charis in Natyashastra. These are divided into two divisions namely Bhoo Chari means foot and leg movements performed on the ground that is earthen and Akasha Chari, means foot and leg movements performed in the air that is Arial. The above mentioned Charis are further divided into two groups namely Margi and Deshi. According to Natyashastra there are 16 Bhoo Charis and 16 Akasha Charis.

7.2.7 Dhrushtibehda – Eye movements as per Abhinayadharpana: Expressions through eyes play vital role in multicultural communications. As per Abhinayadharpana, there are eight kinds of Dhrushtibhedhas:

- *Sama*: Gazing without batting the eyelids is known as Sama dhrutshti. Usages: This is used during the beginning of dance, to indicate uncertainty, amazement and while looking at God.
- *Alokitha***:** Turning the eyes circularly is known as Alokitha Dhrushti. Usages: This is used to indicate mischief of devils, to see circular objects and around oneself.
- *Sachi***:** Looking from the edges of the eyes is known as Sachi Dhrushti. Usages: This is used to indicate suggestion, remembering, to see the objects on one side and twirling the moustache.

[33] The NatyaSastra Of Bhraramuni Trans- By aboard of Scholars – Satguru Prakashana -1986, pg 161 to171

- *Pralokitha***:** Glancing from one side to another side is known as Pralokitha. Usages: This is used to indicate seeing both sides, giving hint, dullness.
- *Nimelitha***:** Half closed eyes are known as Nimelitha. Usages: It is used to indicate sage, trance, meditation, prayer, devotion.
- *Ullokitha***:** Looking upward is called Ullokitha. Usages: This is used to indicate flag, tower, temple tower, moonlight, and to remember.
- *Anuvritha***:** Casting the glance fast up and down on either side. Usages: This is useful to indicate fury, announcement, and calling.
- *Avalokitha***:** Looking downward is known as Avalokitha Dhrushti. Usages: This is useful to indicate thinking, seeing the shadow, reading, sleeping, lying and looking at one's own body.

Dhrushti as per Natya Shastra[34]: Natya Shastra devides Dhrusthibehda into three categories;

a. Rasayuktha Nota – These glances express the sentiments or Rasas. They are eight in number. Kaantha, Haasya, Karuna, Roudra, Veera, Bhaya, Bheebhathsa, and Adhbutha.

- *Kaantha (Pleasing look):* Opening the eyes wide, so as to absorb the object aimed at, and look at it moving the eyebrows as in love and affection with a sidelong look. Usages: This glance is used in looking at a thing frequently in joy and pleasure while turning the pupils of the eyes. This is also known as 'Kataaksha'. This glance expresses erotic sentiments, joy and grace.
- *Haasya (Smiling):* Moving the eyeballs a little inward and turning them as if they express wonder. The eyelids are shut and opened slowly, moderately and quickly. Usages: This glance is used in Hypocrisy, inordinate joy.
- *Karuna (Pathetic):* The eyes are filled with tears due to mental agony and the eyelids are shut and open slowly and the glance is fixed at the tip of the nose is known as Karuna Dhrushti. Usage: This glance is used in compassion.
- *Roudra:* With knitted eyebrows and unshaken eyelids, the eyes are turned into deep red and the pupils fixed. Usage: This is used to express the ferocious sentiments.
- *Veera (Heroic):* The glance is unshaken, wide open majestic and bright. By retaining the eyeballs at the centre and the corners of the eyes should be half-closed. Usage**:** This glance is used to enact heroism.
- *Bhaya (Fear):* The eyelids are widened and raised with agitated eyebrows, while moving the eyeballs side to side very fast in fear. Usage: This glance is used to express fear.
- *Bheebhathsa (Disgust):* The eyeballs are greatly disturbed in disgust and the eyelids are moved and the corners of the eyes are slightly covered by eyelids. Usage: This glance is used to express the dejection or disgust.

[34] The NatyaSastra Of Bhraramuni Trans- By aboard of Scholars – Satguru Prakashana -1986, pg 118 to 123

- *Adbhuttha (Wonder):* The eyelashes are slightly curved at the end, and pupils are brought to sideward charmingly to make the white part of the eyes shine brightly in great wonder. Usage: This glance is used to express wonder.

b. Sthayibhaava Nota: or the glances that express the enduring states or Sthayibhaava. They are also eight in number.

- *Singdha (Affectionate):* Expressing strange desire. The eyebrows are kept straight and a side-glance is cast with calmness and sweetness.
- *Hrushta (Joyful or Merry):* The chin broadened and the eyelashes are closed a little as in winking. Looking gracefully with a smiling face.
- *Dheena (Pitiful):* The eye half shut and filled with tears and are moved slowly is known as Dheena.
- *Kruddha (Raging or angry look):* The eyelids are swollen and motionless and the eyeballs are moved a little with an expression of rage and the eyebrows are knitted.
- *Dhaptha (Haughty):* The eyes are wide open the eyelids are motionless, expressing power or haughtiness.
- *Bhaya (Fear):* The eyes are opened and closed repeatedly indicating fear and the eyeballs are made to move as if they appear to drop off from their positions.
- *Jigupsitha (disgusting):* with a pretended look the eyelids are contracted and the eyeballs are drawing in refusing to look at the object in disgust.
- *Vismitha (Wonder / Astonishment):* The eyes are wide open gazing upward and the eyelids are motionless.

c. Vyabhichaari Bhaava Nota: The glances that express the transitory states or Sanchaari Bhaavas are known as Vyabhichaari Bhaava Nota. They are 20 in number.

- *Shoonya (Vacant look):* Casting a hazy glance dimly without the knowledge of the object seen and without moving the eyes or eyeballs Usage: Worry.
- *Malina (Pale):* Shaking the eyebrows a little and trembling the eyelashes and half-closed eyes with tears with a pale look.
- *Shrantha (Tired):* The glance, which does not go too far, is moved up and the eyelids are bent down and the eyeballs appear to fall down and the eyes are narrowed.
- *Lajjitha (bashfull):* Looking down with eyelids moved up and down several times.
- *Shankitha (Apprehensive):* Looking sideward repeatedly with wavering and fixed vision and then turning to the glance around quickly.
- *Mukula (Bud):* Closing the eyelids with moving the eyeballs.
- *Ardha Mukula (Half bud):* Closing the eyelids and the eyeballs half, which are half-visible and move slowly.
- *Glaani (Languid):* The eyeballs, which are covered under the eyelids or sunken under the eyelids, moved slowly and slothfully in fatigue.

- *Jihma (Oblique or crooked):* Half Hidden look cast obliquely in which the eyeballs appear to fall down.
- *Kunchitha (curved):* The eyelashes are slightly curved and the eyeballs are sunk.
- *Vitharkitha (Deliberation or guessing):* Moving the eyelids and the eyeballs quickly.
- *Abhithaptha (Distressed):* Glancing slowly by moving the eyelids.
- *Vishanna (Dejected):* The eyelids are drawn wide apart and moved and the eyeballs are fixed.
- *Lalitha (Amorous):* Looking down from the corners of the eyes with a smiling face and moving the eyebrows deepening love.
- *Akekaara (Half Shut):* The glance in which the corners of the eyes are contracted, the eyelids are half shut and the eyeballs are repeatedly turned up while seeing another object.
- *Vikosha Full blown):* Joyful look in which the eyelids are wide open without batting the eyelashes, moving the eyeballs.
- *Vibhraantha (confused):* The glance in which the eyes are wide open and the eyeballs are moved.
- *Viplutha (disturbed):* Glancing with trembling eyelids and eyeballs.
- *Thrastha (Frightened):* The glance in which the eyes are wide open the eyeballs are tremble with fear and the eyelids are rolled.
- *Madhira (Intoxicated):* This of three kinds (1) Tharuna: Young or low Madhyama, middle or medium, Theevra: high or excessive.
- *Tharuna:* The glance in which the eyes are wide open, the look is contracted, the eyeballs are expanded. This is the first stage of intoxication.
- *Madhyama:* Bending the eyelids slightly with a trembling look, the eyeballs are turned round and brought to the middle of the eyes.
- *Theevra:* Looking down with too much of batting the eyelids or without batting with the eyeballs is slightly seen. Thus, the varieties of glance are in all, Thirty-six.

8. Architecture and Inscriptions – Secondary sources: The survey of temple architecture and various inscriptions reveals that they have used the above-mentioned traditional gestures to communicate their contemporary lifestyles through varieties of gestures. This information on gestural language serves as supportive sources.[35]

9. Findings: It is an amazing fact that varieties of gestures evolved, designed, used and codified from the 2nd century BC through texts, dance forms, sculptures, inscriptions, and paintings as a means of communication. Major findings of the research are given below.

[35] Dr Choodamani Nandagopal , Shilekale , Sundaraprakashana, 2007

- Found innumerable meaningful gestures, which are comprehensive and covers all walks of life.
- These are beyond barriers of language, culture, region, time and hence applicable universally.
- These gestures have been used by all types of medias – dance, painting, sculpting, drama for effective communications.
- Gestures have been also used in the fields such as, religion, political, social, family and in interpersonal relations for effective communication.
- The same gesture is used to convey different meaning in different context – so it is contextual.
- There is continuity in the use of gestures through the ages.
- Ancient preceptors have explored deeply and analyzed each part of the body and its movements scientifically.
- These gestures are evolved based on the emotions that are the chemistry of the body.
- Gestures play vital role in influencing the personality of the humans – both positively and negatively.
- Presently this gestural language is being practiced mainly by the art community and larger section of the society are deprived from its usages

10. Analysis: Use of Non-verbal Communication through the medium of body or gestures in multicultural society is a concept, which is based on practical orientations. The concept is deeply analysed by conducting several workshops, lecture demonstrations, intensive training courses, involving all categories of people from private sectors, educational institutions and universities over a period of two years from April 2009 to 2011 May. The following steps were taken to analyse the significance of gestural language for effective communication and its use for multicultural societies by using the collected materials, information and the findings in the below mentioned practical sessions.

10.1 Workshop on Experimentation and analysis of traditional gestures: Following four workshops were held at different locations and category of people in Karnataka, India.

Vijayapura – 4th April – 14th April 2009: It is a 10-day workshop, held at a place called Vijayapura, Rural Bangalore. 40 participants from different cultural background participated. This workshop was designed for full day 9 hours, which included five modules, which covered five major gestures. In each module, each major gesture was taught and practiced for 45 minutes. During the second part of the first module of 45 minutes, discussed on the use of practiced hand gestures in the cultural context of the participants. Similarly, other four modules were held on the remaining four major gestures in the same day. On the 10th day, participants have demonstrated their learning to the public in the closing ceremony – which received a great appreciation from the public and media.

Chinthamani – Koalr district, Karantaka from 20th to 30th May 2009: Similar workshop was conducted for 50 participants coming from varied cultural background.

K.R Puram, Rural Bangalore, Karantaka from 1st – 10th June 2009: Similar workshop was conducted for 56 participants coming from varied cultural background

State level workshop at Jain University, Bangalore, Karnataka from 23rd – 25th April 2010: A three-day workshop was conducted on Hastaabhinaya (expression through hand gestures). 110 participants across the state from different cultural background and are also practitioners were participated. This workshop was held under the aegis of Department of Performing Arts, Jain University – Bangalore. Eight post graduation students were involved as assistant resource persons to conduct this workshop. Divisions of hand gestures were taught along with shloka to eight sub-groups simultaneously. In each day, morning session was dedicated for teaching as per the source. In the afternoon session, discussions and experimentations took place in the context of different cultural background. In the concluding day, participants have demonstrated their learning in the presence of dignitaries of Bangalore and Jain Universities – who appreciated the cause of the workshop, which also received a positive response from both spectators and media. Most importantly, participants have expressed that they have benefitted immensely from this workshop, as it enhanced the existing skills and knowledge in using for the benefit of multicultural communications. Most of these participants are currently using their learning in their art schools.

10.2 Outcome of the Analysis:

- It is analyzed from the above practical sessions that these traditional gestures are useful for the contemporary world, which is mainly multicultural. It is only this gestural media though which one can communicate effectively in this diverse society.
- Acquiring these skills and knowledge need rigorous practice, especially in memorizing shlokas and remembering its execution in sequenced manner.
- Practice enhances the concentration and memory power, which is the beyond the ken of science and scientific experiments.
- Practice enhances the grace in the body and etiquettes in the behaviour of a person.
- Though it is beneficial in many ways, some participants were of the opinion that simple forms are easy to digest, since these traditional gestures require a rigorous regular practice.
- It was suggested by many participants – who are non-practioners to evolve simple patters for the benefit of larger population.
- At the same time, participants coming from different cultural background have benefitted more as they could communicate easily without language barrier.
- Finally, in the contemporary world people are traversing frequently for their livelihoods. It would be difficult to learn every language of each region or

country. In this context, the existing gestural language with necessary modifications are useful for the larger population with the back ground of varied culture.

11. Modifications: As a result of several practical approaches and its analysis demands certain modifications in the traditional gestural language to reduce the complications without compromising with its originality. It has been found that there is no need for any modification in the gestures itself as they are complete by themselves and all are useful. Therefore, modification designed only in the method of learning. Following modifications in the learning process are designed for multicultural societies and not for art professionals.

- The present practice of memorizing shlokas is not mandatory.
- Need not necessary to remember these gestures in sequence as traditional methodology demands.
- Among the innumerable usages of gestures, only relevant and required gestures may be taught in the initial modules and subsequently, depending on the needs of learner, higher but tailor made version can be designed. This method will be more accepted as it meets the needs of all groups.
- To advocate this modified version, small duration workshop, vocational courses, crash courses may be organised at suitable locations and time. People who are interested can learn acquire these skills at their leisure.
- Modifications are designed for all five major gestures indicated under section 7.2. Since these five major gestures are comprehensive in nature, modifications designed are also applicable to other existing gestures. Details on modified learning methods are given below:
    - Aangikabhinaya – there are innumerable major and sub gestures. Of them, nine head gestures, four under neck movement, few relevant and required usages of samyutha and asamyutha hasthaa (hand movements), eight types of leg movements and eight types of eye movements from Abhinayadarpana are considered and evolved a package and modified the method of learning to advocate effective communication for the benefit of multicultural society.[36]

12. Applications: After the above modifications in the method of learning, two vocational courses were organized to apply the modifications and to observe the responses and results.

Experimental Workshops on modified gestural language. First workshop was conducted at K.R Puram from 10^{th} – 21^{st} April 2011. Similar methodology, adopted in the workshop during 2009-2010 was adopted to experiment the modified method of learning the gestural languages in this workshops. 40 participants participated.

Second workshop was conducted at Vijayapura for 32 participants from 24^{th} – 30^{th} April 2011 on the same line. It was observed that the participants in both

[36] For practical application of these modified method of learning, one can contact the author

workshops were in relaxed mood and enjoyed the simplified version of learning. The participants have expressed that this simplified method is beneficial and can be easily adopted for their routine communications, especially when they have to communicate with groups of different cultural background.

13. Conclusion: The use of gestural language that is body language acquires importance and has greater value in the global multicultural environment, with demographic and cultural differences such as language, region, gender, age, religion, disability, frequent traverse, etc. Gestural language develops multicultural relationships, competence, understanding, and social harmony and removes multicultural barriers and conflicts. In this context, managing cultural diversity in the society (politically, economically, socially and culturally) demands common sign language, which is simple and user friendly than the existing form. It enables not only to interlock people of different culture or attributes working and living together but also unlock human cultural and social capital. Thus, the use of simplified gestural language plays a vital role ensuring effective multicultural communication.

Acknowledgement: My sincere thanks to: Department of Performing Arts, Jain University – Bangalore. Karnataka; Department of Performing Arts, Bangalore University. Karnataka. Natyaganga – K.R Puram Bangalore. Karnataka; Mayurikala Nikethana – Vijayapura and Chinthamani Bangalore. Karnataka; Rotary Club – Vijayapura Bangalore. Karnataka; Radhakrishan Kalanikethana, Udupi, Mangalore. Karnataka; Post Graduation – 2nd semester students (2010). Department of Performing Arts, Jain University.–Bangalore. Karnataka; Post Graduation – 4th semester students (2011). Department of Performing Arts, Bangalore University –Bangalore. Karnataka; Prof. Shanthamani ---Chief Mentor---Jain University, Bangalore. Karnataka; Dr. Choodamani Nandagopal Senior Prof. and Dean, Jain University Bangalore; Mrs. Lathamala, Senior Consultant, Rural Development Projects; International Academy for Intercultural Research – Singapore

REFERENCES

Nag P. (2007), *Cultural Heritage of India*, NATMO

Singh B.P (2009), *Indian Culture, The State, The art and Beyond*. Oxford University Press

*** (2007) *Shilekale* – Dr. Choodamani Nandagopal -Sundara Prakashana Bangalore

*** (2006) *Nrthya Lakshanam – Natyavidhushi* Prof. Jaya - Samvahana Praksshana Mysore

*** (1986) *Natyashastra – Bharathamuni*, Edited by the board of scholars published by Satguru Publication

*** (1980) *Bharathanatya Digdharshanam – Sri. Koushik*. Sanathana Kalakshethra

*** (1980) *Nruthya Kale* – Prof. U.S Krishna Rao Bangaluru Unversity Bangalore

*** (1975) *Abhinaya Dharpana – Nandikeshwara,* Edi-by Dr. Manamohan Ghosh,- Manisha Publication

*** (1970) *Dhasharupaka – Dhananjaya –* edited by K.V.Subbanna- Neenasam
*** (1966) *Lasya Ranjana – Simha Bhopala* by the board of scholars. Mysore University
*** (1957) *Bharatharnava by Nandikeshwara* - by Saraswathi Mahal Library Society, Thanjavur
www. wikipedia.org

Photo 1 Gestures sculpted in some of the dance sculptures in the temples of Karnataka
1) Nataraja In the temple of Badami India, which has 18 hands, 8th century A C.
2) Natya Saraswathi belongs to 12th century A C, Karnataka,India
3) Darpana Sundari in the Channakeshava temple, Belur,12th century A.C, India

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

IMPLICATION OF THE CREDIT CRASH FOR URBAN REGENERATION IN RIGA

IMPLICAŢIILE CRIZEI CREDITELOR ASUPRA REGENERĂRII URBANE ÎN RIGA

Guntis, ŠOLKS[1], Ádám, NÉMETH[2]

Abstract: The aim of this research is to evaluate the implication of the credit crash for urban regeneration in Riga. Examples of project development in urban brownfields and the implication of the economic downturn on them are analyzed in this study.
GDP increment rate of Latvia was the highest among the European Union member states during the rapid growth of economy. It was mostly determined by rapid development of the construction and real estate sectors. High demand for dwellings caused one of the highest rates of price rise for real estate properties in the world. As a reaction to rapid increase in demand, development of real estate projects increased as well. Significant number of them was developed in Riga - the most important economic centre in Latvia and the biggest city in the Baltic states.
Riga as a post-industrial city has significant proportion of brownfields, which are used ineffectively. The structures of these former industrial territories were formed mostly at the end of the 19th century and during the Soviet occupation period. Nowadays they are undergoing regeneration in order to construct new dwellings and commercial premises, because an advantage of these territories is their location close to the city centre.
Latvia has experienced a rapid economic downturn, which has affected all economic sectors in Latvia negatively. Banking sector has faced problems as well, resulting in unavailability of the credits. Overproduction of dwellings and decreasing purchasing ability has caused the highest rate of price decrease in the world. It has resulted in rapid decline in construction sector, and the regeneration of brownfields in Riga is affected negatively, too. Several regeneration projects are suspended, but some have not been started. Many companies have faced bankruptcy, but, despite unfavorable economic conditions, some urban regeneration projects are in progress because of the decreasing implementation costs.

Key-words: brownfields, credit crash, Riga, urban regeneration
Cuvinte cheie: terenuri abandonate, criza creditelor, Riga, regenerare rubană

[1] University of Latvia, Faculty of Geography and Earth Sciences, Riga, Latvia
[2] University of Pécs, Institute of Geography, Dept. of Human Geography and Urban Studies, Hungary

Introduction

This paper investigates urban regeneration processes in Riga (Figure 1) during two different stages of the economy – growth and decline. Regeneration of the brownfield sites is nominated as one of the key aspects of providing sustainable development of Riga in future. This is necessary in order to improve the quality of urban space in built up areas and to promote urban development in inner city areas, which were previously used, thus avoiding urban sprawl and further fragmentation of the spatial structure of the city. Several urban regeneration projects were implemented in Riga, but several ongoing activities were affected negatively by economic downturn.

Urban regeneration processes and their displays in particular cities are widely researched (Butler, 2007; Evans, Jones, 2007; Otsuka, Reeve, 2007), but there has been relatively few research done focusing on the implications of the economic crisis on urban development (Aalbers, 2009).

The case of Riga is particularly interesting because of the comparatively high number of brownfield sites in regional scale. These territories actually can be found everywhere in Riga, but major concentration of them can be observed in the built-up areas of the historical city centre and its neighbouring territories, where old industrial areas are located. Former industrial sites developed during the Soviet occupation period are located mostly in close adjacency to the railway infrastructure.

Economic restructuring and deindustrialization processes in the early 1990s caused transformation of Riga from industrial to postindustrial city, thus the number of derelict sites grew constantly (Grimski, Ferber, 2001). Economic growth determined increase of demand for qualitative premises thus stimulating urban regeneration processes as well. Most of them were implemented in the city centre, where abandoned historical industrial complexes were converted into dwellings and commercial premises. For more successful revitalization of brownfield sites assistance of the city authorities is necessary, but in the case of Riga urban regeneration processes are mainly based on the initiatives of private developers.

In order to characterize the implication of the financial crisis on current urban development in Riga, urban regeneration processes during the periods of economic growth and decline are analyzed, focusing on various aspects. Characteristic of brownfields and historical context of their formation reflects the current situation of these sites in present day Riga. Finally, conclusions about urban regeneration processes and their possible future trends are drawn.

Urban brownfields – problems and perspectives

Brownfield sites and brownfield related problems can be observed everywhere in the world, thus making this issue internationally significant. Due to a combination of economic, industrial and agricultural restructuring, speculative property development, and demographic change, every country in Europe now has a legacy of brownfield sites (Grimski, Ferber, 2001).

The loss of industries or deindustrialization marked the economic transformation from industrial to service sector (Paddison, 1993) what initially led to the abandonment of industrial territories (CABERNET, 2005) and loss of jobs what caused deterioration of social structure (Bezmez, 2008).

Figure 1. Riga on the map available at: http://www.grupa93.lv/?fl3m58i2, accessed: August 16, 2011

Emergence of various brownfield sites is one of the most observable effects of deindustrialization process and, according to CABERNET (Concerted Action on Brownfield and Economic Regeneration Network) brownfields result from changing patterns of industry and development in many regions. The loss of the industries, the resulting unemployment and the reluctance of new investors to take on the technical problems and liabilities associated with brownfield sites affect the economic prosperity of the region, particularly in urban locations. In common usage brownfields refer to previously developed or derelict land, encompassing a range of sites in terms of size and location (CABERNET, 2005).

Previously the term ”brownfield” was referred to the territories, which were classified as contaminated. In recent years the situation has changed considerably, and definition of brownfields in international planning practice has expanded to mean not only contaminated land but all “previously developed land”, whether contaminated or not (Ganser, Williams, 2007).

CABERNET has defined brownfields as sites which:

- have been affected by former uses of the site or surrounding land;
- are derelict or underused;
- are mainly in fully or partly developed urban areas;
- require intervention to bring them back to beneficial use;
- may have real or perceived contamination problems (CABERNET, 2005).

Brownfield land in cities is largely located in areas that have experienced deindustrialisation or suburbanisation. Such sites may be found in the heart of the inner city, or out along various industrial belts or dockland regions (Lorimer, 2008).

Brownfields in general are understood as a negative issue; however, revitalization and reuse of these areas also provide wide range of benefits for further urban development. Urban brownfield redevelopment is part of the urban regeneration process, what in general is based on the idea of creating desirable urban spaces (Guzey, 2009). Significant amount of brownfields are located into urban areas and urban land reuse is seen as contributing to reduce pressure on greenfield sites, thus minimizing urban sprawl, and making a positive contribution to urban regeneration by upgrading run-down areas and providing a location for housing, services and amenities (Williams, 2004).

Sustainable built environment cannot be achieved without reintegrating brownfield land into the property markets and shifting development back to the central urban locations (Grimski, Ferber, 2001). A sustainable place is one in which a balance of employment, housing, and social facilities are copresent and available to a range of socioeconomic groups. It is populated by sustainable citizens who are politically, socially, and economically active and self-reliant (McIntyre, McKee, 2008). Sustainable communities are places where people want to live and work, now and in the future. They meet the diverse needs of existing and future residents, are sensitive to their environment, and contribute to a high quality of life. They are safe and inclusive, well planned, built and run, and offer equality of opportunity and good services for all (Maliene, Malys, 2009).

Application policies, which include the use of previously developed areas for the purpose of stopping the spatial expansion of cities (Ganser, Williams, 2007), are determinative factors that prepare urban regeneration. Redevelopment of urban brownfields is widely acknowledged as one of the major tools to achieve development of compact and sustainable cities (Ganser, Williams, 2007; Lorens, 2008).

It is also possible to define on this basis a set of principles for urban development policy, which can lead to the creation of sustainable urban structures (Lorens, 2008) and the idea of compact city has become a part of sustainable city concept (Ganser, Williams, 2007). The concept of compact city means intensification of existing structures, including the reuse of decayed ones, and limitation of spatial growth of the cities. As there is still a high demand for new city spaces, there is a necessity of looking for an alternative to suburbanization processes as development of urban structure, and regenerated central urban areas can become an alternative. However, introduction of the compact city model needs a lot of efforts in terms of financing, planning and social communication (Lorens, 2008).

Brownfield redevelopment is a very important aspect of urban regeneration processes (Ganser, Williams, 2007), because it provides reuse of abandoned territories and revitalization of the contaminated areas, thus regarding to the principles of sustainable urban development (Evans, Jones, 2007). The presence of derelict land has adverse effects not only on the environment but also on the economic and social health of the city. It is further commonly understood by urban planners that future urban development has to happen on derelict land (Grimski, Ferber 2001) by means of urban regeneration.

Usually the most attractive areas for investment in urban brownfield redevelopment activities are centrally located brownfield sites as their geographical location is seen as the main advantage in order to attract potential buyers or occupiers. Investors realizing the increasing profit in central areas begin to regard those locations that they once avoided as new investment centers (He, Wu, 2007).

Further transformation processes of abandoned areas and deteriorated urban landscapes through the implementation of various redevelopment projects in order to satisfy the demands of the new service-oriented economy (Bezmez, 2008) were usually leading to the commercialization of the areas, because all development activities initiated by private developers are profit oriented. In this case the issues of urban sustainability may become less important what demonstrates the need for closer cooperation between public and private sectors.

Brownfields in Riga

In broader view, the origin of the brownfields in Riga can be dated back to the early 1990s, when the Republic of Latvia restored independence after the collapse of the Soviet Union. However, brownfield origination issues in Riga are also inwrought with the rapid industrialization processes during the second half of the 19th century, when the city became one of the most important industrial centres in the whole Russian Empire. These processes were determined by the legislation of the Russian Empire, what can be characterized as a clear example of protectionism. The import of any kind of goods was strictly limited by laws and export of industrial products was stimulated by various bonuses, so it turned out to be gainful to locate industries in the territory of the Russian Empire.

The advantage of Riga in attraction of investments mainly from abroad was well developed transport infrastructure - port facilities and railway connections. This economic growth of the city continued until the World War I, when the front-line approached the city in 1915, when almost all factories were evacuated to the inner territories of the Russian Empire (MPR, 2008).

After the end of the World War I and the following Latvian War of Independence in 1920 Riga had lost almost two thirds of its population and most of industries what resulted in many unused industrial sites, but they were soon occupied by small and medium scale manufacturing enterprises (MPR, 2008).

After the end of the World War II and following the Soviet reoccupation in 1945, massive industrialization policy was carried out. This resulted in the

establishment of huge industrial enterprises and considerable influx of immigrants from other territories of the Soviet Union, and these both processes continued until the late 1980s. The existing industrial sites were reused and adapted for modern use as well (MPR, 2008).

After the collapse of the Soviet Union and restoration of independence of Latvia, most of the industries experienced privatization, bankruptcy and closure, because the main markets in other parts and territories of the Soviet Union were lost, and re-orientation to other markets in that situation was almost impossible.

As a result of these processes most part of the former industrial and military territories became abandoned and used ineffectively for approximately next 10 to 15 years, when rapid economic growth occurred and interest for these abandoned brownfield sites emerged.

The Municipality of Riga has joined a multidisciplinary network of CABERNET, so documentation and planning issues concerning brownfield areas are based mainly on CABERNET's conceptions. Accordingly, documents of Riga City Council concerning planning issues state that territories can be classified as brownfields, if there were performed any kind of activities in the past, but at present time they are not in use or are used ineffectively (G93, 2004).

Contamination issues, respectively, are not mentioned as main features for classifying the territory as brownfield site, which can be explained in two different ways. First, it is because there are no large polluted areas in classical meaning in Riga and, secondly, brownfield regeneration issues were not topical in Riga during the 1980s, when urban regeneration related issues became topical in Western European countries and the legal frameworks used for dealing with brownfields were based mainly on contamination issues (Grimski, Ferber, 2001, Ganser, Williams, 2007). More interesting, territories in Riga, which are contaminated, are not classified as brownfield sites, if they are in active use in present time, for example, some areas in the territory of Riga port and former military airfield of Soviet army in Rumbula.

According to the results of appropriate research and estimates, there is a significant number of places which are classified as brownfield sites. Their origin and kinds vary considerably, thus brownfield sites in Riga are:

- abandoned and ineffectively used former manufacturing and warehouse areas;
- uninhabited residential buildings in poor physical condition;
- abandoned military territories;
- extensively used allotment areas;
- derelict former dump sites;
- abandoned or inefficiently used transport infrastructure areas (Trusins *et al.* 2005);
- abandoned construction sites.

Trusins *et al.* (2005) stated that location of brownfields in Riga corresponds to the main phases of evolution of the city (Figure 2) and reflects the change of its

economic development models. There are several areas where location of brownfield sites is characteristic:

- blocks of residential buildings developed at the end of the 19th and in the beginning of the 20th centuries in poor physical condition;
- old industrial plots and buildings around the central part of the city;
- railroad ring around the inner city with rundown Soviet industries and infrastructure;
- remote areas located at the borders of the city, also mainly former or present large industrial places and former dumping sites;
- former industrial areas built adjacent to water bodies in the 19th century or during the Soviet occupation period with no public access to waterfront (Trusins *et al.* 2005).

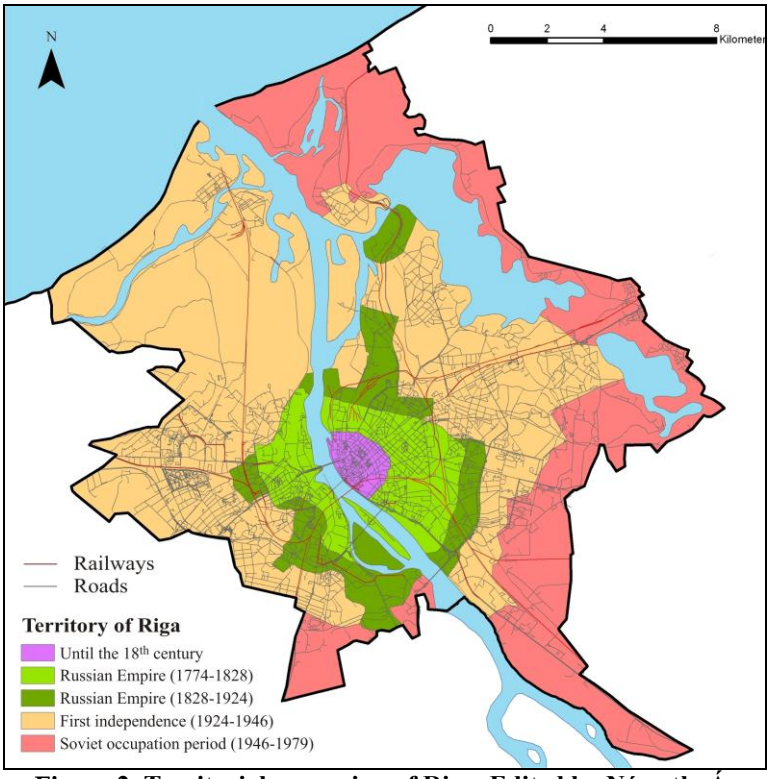

Figure 2. Territorial expansion of Riga. Edited by Németh, Á.
in virtue of the map in: *Ruskuls, G.: Rīgas Apkaimju Attīstības Projekts, Rīgas apkaimju forums, 27.11.2008*. Available at: http://www.rdpad.lv/apkaimes/apkaimes_projekta_prez_forums27118.pdf, accessed: August 16, 2011

In the context of location of the brownfields, the Old town of Riga has to be mentioned as a special case, because there are several properties; most of them are

classified as cultural heritage with high historical value, what are not in use and still remain as slums.

Therefore it can be summarized, that the brownfields in Riga are sites, which were previously in active use unlike underuse or abandonment today. The overall level of degradation of the identified territories is not high nevertheless the cumulative negative impact on living environment and urban landscape of the city is significant. These territories can be found throughout Riga and they mainly cause problems like degradation of the visual quality of urban environment, needless fragmentation of the urban structure, decrease of the land use efficiency and, in some cases, serious contamination problems (Figure 3).

Qualitative urban environment is determined as the main pylon of the future development of Riga. It is planned to stimulate the development of polycentric structure of the city, where development of strong local neighbourhood communities is planned; however, the dominance of the historical core is still set as the main goal (RD, 2005).

According to the Riga City Council (VRAA, 2007), urban regeneration, what includes brownfield redevelopment, has been stated as one of the main key objective to be implemented in order to promote complex sustainable development of Riga, and there were plans to revitalize all brownfield sites by 2018 (Lazdiņa, 2006). However, municipal legislation in Riga does not promote brownfield redevelopment processes, because the only possibilities to promote such activities are partial removal of restrictions regarding construction and tax allowances. National legislation also restricts the possibilities to support private initiatives as it is prohibited to invest public budget funds in private property what, accordingly, limits the use and development of public-private partnership. Moreover, owners of abandoned land or objects in Riga are still exempt from paying the real estate tax, what is also an obstructive factor for redevelopment activities.

Urban regeneration processes in Riga during economic growth

Riga experienced a construction boom during the rapid economic growth of Latvia (2000-2007) when real gross domestic product (GDP) increased for 6.9% - 11.9% yearly (CSBL, 2009) and the demand for new housing and commercial premises increased sharply. It can be explained with the growth of incomes and run-down existing housing stock, because during almost 10 years after the collapse of the Soviet Union only few new structures were built, mostly for personal use. This resulted in the lack of dwellings despite rapid depopulation in Latvia, especially Riga.

Riga experienced a boom of construction and considerable part of the building activities were carried out in brownfields, thus relating to urban regeneration processes. Local authorities are generally the lead agents in implementing urban regeneration programmes (Otsuka, Reeve, 2007). However, it has to be pointed out that Riga City Council mostly did not participated in these processes in partnership with private investors despite urban regeneration processes are set as important issues by local municipal authorities.

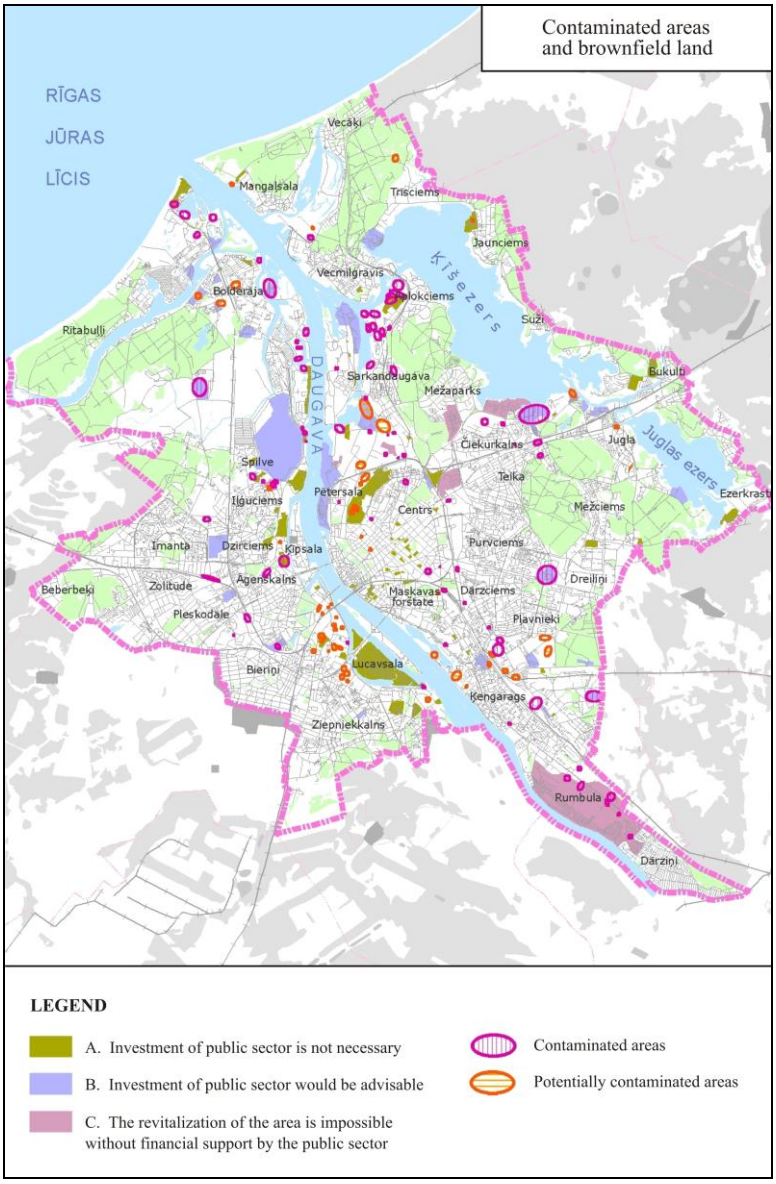

Figure 3. Brownfield location in Riga (RD PAD 2005)

Source: RD PAD (2005) *Piesārņotās vietas un degradētās teritorijas* (Riga, Rīgas domes Pilsētas attīstības departaments), available at: http://www.rdpad.lv/uploads/rpap_doc/groz_kartosh/6.2.2._piesarnjotas_un_degradetas_teritorijas.pdf, accessed: February 15, 2011.

However, two positive exceptions can be mentioned, where authorities have participated as main contributors. The first was renovation of the wooden buildings with high cultural importance near the road to the Riga international airport (Kalnciema street), when authorities covered approximately 90% of total expenses. The second project is the rehabilitation of the wooden buildings in the deprived area within the historical core (Murnieku street) with contribution of 60% of total expenses (Šolks, 2010a).

Regeneration strategies based upon physical improvement of housing alone are not enough to achieve the sustainable, long-term revitalisation of deprived areas; rather, citizens must also be transformed by means of encouraging forms of self-governance, which align citizens' self-regulating capacities to dominant norms of conduct (Flint, Rowlands, 2003). This situation is characteristic in both above mentioned cases, because local residents and owners were involved in the regeneration processes and at present time these are the most accurate territories within the local neighbourhood. Both these cases reflect the importance of participation of local residents in urban regeneration processes thus providing further sustainable development of the neighbourhood (Mathers, Parry, Jones, 2008; Blakeley, Evans, 2009).

The main argument of municipal authorities' nonparticipation is the high prospective expenses, what city council just cannot afford. As a result of this, private investors are interested in regeneration of only those areas, which are located in perspective places, mostly in the city centre and close to the waterfronts. Contaminated areas despite their advantaged locations were not interesting for them because of possible large amount of investment.

New sustainable housing can be a driver for further urban regeneration and sustainable housing is an essential ingredient of any regeneration scheme. Sustainable housing stimulates physical, economic, environmental and social improvement, and the resulting enhancements in turn stimulate new investment and new opportunities as the urban environment once again become full of life and enterprise (Edger, Taylor, 2000). This kind of housing should be well available, matching quality, economical, ecological, cozy, comfortable needs of an individual (Maliene, 2001), but new structures constructed in the city centre of Riga in revitalized territories were orientated on upper-middle class residents with relatively high incomes, thus implementing urban regeneration as gentrification (Butler, 2007).

Most popular kinds of brownfields for urban regeneration chosen by private investors were former industrial sites and abandoned residential buildings in the city centre (Barber, 2007). Both kinds of these sites have quite similar disadvantages, mostly connected with poor or run-down infrastructure and restrictions connected with the preservation of the cultural heritage. If looked from the point of view of private investors, advantage of former industrial sites is the fact, that old manufacturing complexes, despite their high cultural value, officially

are not included in the list of cultural heritage, what should be preserved (RP, 2003). This practically allows them to demolish all structures, what sometimes is really done, because of the fact, that reconstruction of abandoned industrial buildings is stated as more expensive than construction of new structures. In this case issues of conservation and maintenance of industrial heritage turned out to be a challenge for architects and urban planners, but it mostly resulted in the loss of significant part of industrial heritage what has significant effect on the historical spatial structure of Riga.

Most of the old industrial sites the origin of which dates back to the end of the 19th century were converted into dwelling houses. It was planned to attract potential residents offering them advantages of central location with various cultural objects and sufficient public transport infrastructure. These activities improved the quality of urban space in Riga city centre, but only in the local context (Šolks, 2011a). As urban regeneration projects were accomplished as individual projects, they could not provide complex urban regeneration in the whole neighbourhood, because surrounding houses and social environment remained the same with its existing problems. This situation is more characteristic to further fragmentation of the spatial structure of city what local authorities would like to avoid in the future. If the city council participated more as partner in these regeneration processes, then it would be possible to deploy this process in broader territories.

The historical part of Riga is separated from other neighbourhoods by railway loop, where former industrial sites are located. Brownfield sites outside the city centre did not attract so much attention from private investors, because these territories can be classified as suburbs despite their proximity to the historical core. Besides, there were enough vacant territories for development, where projects can be accomplished without major investment. Good examples of urban regeneration in these territories are connected with the construction of shopping malls in large former industrial areas. These projects were implemented by attracting foreign investment and tend to be some of the most successful examples of urban regeneration for active public use in Riga. The advantages of these former brownfield sites outside the city centre are location close to the main streets with high intensity traffic flow, large continuous areas for development and fewer limitations connected to architectural design of the new structures.

Despite the economic growth and construction activities urban regeneration processes were not rapid enough to achieve the goal set by local urban planners - to revitalize all brownfield sites and convert them into full value neighbourhoods by 2018 (Lazdiņa, 2006) (Figure 4-7). There are several reasons for this situation, for example, nonparticipation of city authorities in urban regeneration processes. If private investors could expect some assistance from Riga City Council, for example, in rehabilitation of contaminated soil or at least as particular tax benefits, successful cooperation as public–private partnership could be developed. Urban planners of Riga point out the necessity of participation of municipal authorities,

but city officials repute, that their possibilities to support such projects are strictly limited by the lack of finances. For the regeneration of contaminated land or former dumping sites city officials suggest to attract investments from structural funds of the European Union or Latvian Environmental Protection Fund (Lazdiņa, 2006). These previously mentioned aspects, as well as rising construction costs and overproduction of premises, decelerated urban regeneration, as well as the construction processes in Riga in general.

Figure 4. Abandoned bicycle and moped factory, partly demolished

Figure 5. Abandoned Soviet industrial complex near Brasa railway station

Figure 6. Abandoned brewery in Maskavas Forštate

Figure 7. Neglected area in Old town

Financial crisis and urban regeneration in Riga

Prices on real estate in Riga rose dramatically (average price rise was 267%) during the period of economic growth (2004-2006) and banking sector had significant role in financing most of purchases made by residents. Total mortgage debt in Latvia rose from 2% of GDP in 2000 (€141 million) to 33.75% of GDP in 2007 (€6.7 billion) (GPG, 2009). A mortgage is money lent on the security of property owned by the borrower, usually in order to enable the borrower to buy property (Aalbers, 2009), and active mortgage lending was significant precondition for rapid development of the real estate sector in Latvia (Šolks, 2010b).

In January 2007, one out of every three Latvian borrowers already encountered difficulties making their monthly mortgage repayments. The situation dramatically worsened as global inflation impacted Latvia, and the government brought in measures to reduce housing speculation (GPG, 2009). In order to purchase a property with the assistance of mortgage lending offered by various banks, buyer was obliged to cover 10% of the total price of the property instantly. This regulation was initiated to avoid problematic credits, what could emerge if buyers were overestimating their abilities to repay the loans. Other limitations were increase in Land Registry and mortgage registration fees, additional taxes on speculative real estate transactions and buyers were required to secure certification of their legal income from the State Revenue Center (GPG, 2009).

The loss of jobs and falling revenues of residents have caused rapid downturn of demand for premises and falling property prices led to substantial losses for banks and other financial institutions. In December 2008, the government nationalized Latvia's largest domestically-owned bank Parex (GPG, 2009). As a result of financial crisis mortgage lending was almost completely ceased causing substantial problems for further development.

Urban regeneration processes in Riga are interlinked with other activities in the real estate and construction sectors, so it is self evident that these processes

were affected negatively as well. New developments practically disappeared, thus marking certain stagnation in the real estate and construction sectors.

As it was mentioned before, urban regeneration processes in Riga were mainly implemented by private investors or developers without any considerable assistance from local municipal authorities. Therefore brownfield regeneration faced the same problems as other real estate projects – they were mainly suspended for indefinite period of time. Probably urban regeneration processes would have not been affected so hard, if cooperation among private investors and municipal authorities had been done.

This assumption is based on the possibility that participation of municipal authorities in urban regeneration processes would guarantee additional influx of funds for completion of the ongoing projects if necessary, thus promoting sustainable development. But in this case specific paragraphs in contracts have to be included in order to regulate contractual obligations among both partners, if private investors are unwilling to cooperate or become insolvent. Presence of municipal capital guarantees further implementation and completion of projects even when economy is hit by crisis because of availability of funds which are planned for implementation of certain activities.

This can also be illustrated with a situation when the only ongoing development activities during economic downturn in Riga were construction of multi-storey municipal housing blocks in order to provide dwellings for residents waiting in queue for municipal flat to rent.

Surprisingly, but Riga is still facing a lack of dwellings despite oversupply in the real estate sector. It is because most of the dents cannot afford to buy a dwelling in so called ”new projects” developed by private investors. Mortgage loaning is restricted as well; besides, most of the potential buyers do not qualify for demands set by creditors.

In the context of regenerated areas and new apartment blocks built there the same situation can be attributed. The dwellings were offered for sale like other newly built or refurbished premises orientated on middle and upper-middle class buyers. However, there was low demand for the properties what have not been sold before. Potential buyers waited for further decrease of the price because of the rapid decrease before, but in this case the lowest possible price could not be much lower than the existing, because these projects were implemented during the economic growth, when expenses were much higher than during the economic downturn. For example – wages of the construction workers decreased for 20.9% in the second quarter of 2009 in comparison with the same period in 2008, and prices for construction materials – for 7.6%, but overall expenses of construction decreased for 10.8% over the same period (Diena, 2009). Property developers insisted that the price for dwellings was the lowest possible as they were offered for a cost price (from €1 000 up to €1500 per m^2 depending on location).

The other aspect of urban regeneration during the credit crash is related to other particular development projects, which were not completed before the economic crisis

began. In general, only one development project in former industrial areas was completed after economy went into recession. This particular object was a shopping centre close to the city centre and waterfront, but another problem arose – it was not easy to find entrepreneurs who would wish to rent commercial premises for shops or bureaus, and there was a lot of unoccupied space for rent.

The situation concerning housing development in former brownfield sites was not surprising at all – most of the ongoing projects were suspended for indefinite period of time. There were two reasons for that – low demand for dwellings and lack of funds for construction activities as banking sector ceased mortgage lending. Most of the projects that were already started were offered for sale, but there was no interest from other investors not only because of oversupply, low demand and decreasing purchasing ability, but also because of the necessity to take on the existing obligations what concerns the crediting of the projects. The situation of these projects varied significantly, starting from sites where only demolition activities have been started to projects that were almost accomplished. There were several urban regeneration related projects, where no activities were carried out at all, but areas with the proposed projects were offered for sale as well.

However, there was an exception what was not typical for the situation and overall background of the urban regeneration processes in Riga during the economic downturn. There were two brownfield regenerations related to housing projects that were implemented during the economic crisis. Both these sites are located in the remote part of the city centre in areas close to the railroad ring where abandoned Soviet industrial sites are located. Construction activities started in the early stage of the economic downturn, converting previously used industrial buildings into dwellings. These premises can be classified as lower cost dwellings, because implementation costs had decreased significantly, what allowed to offer reasonable price (approximately €600 per m^2). Potential buyers also got additional 10% discount if they paid in cash without any mortgage loan. The most interesting fact was the high demand for these dwellings, what resulted in the price rise, but premises were almost completely sold out anyway. The advantages of these properties are the proximity to the city centre and public transport network, nearby green spaces and nice view from the top floors, but the disadvantages are incommodious planning and location near railroad where intensive cargo traffic is common. In general, this example is a clear evidence of urban regeneration that promotes sustainable development despite economic crisis.

Table 1

Number of urban regeneration projects in Riga (2011)

status	implemented	partly implemented	suspended	planned	ongoing
number	82	6	34	10	15

There were plans to stimulate construction activity that can be classified as related to urban regeneration as well. The Ministry of Economics of Latvia planned

to provide funds for heat installation of buildings in order to heighten their energy efficiency. Financial resources for this activity were provided by structural funds of the European Union and it was planned to cover 50% of the total expenses of the approved projects (MERL, 2009). The rest of necessary financial resources were expected from local residents, but another problem arose – there were problems to get necessary financial resources as crediting was strictly limited.

Heat installation of buildings included renovation of facades mainly in the apartment blocks in the outskirts of Riga, built during the Soviet occupation period, thus promoting visual quality of the urban space. Besides, heightening of energy efficiency is part of the sustainable development strategy as well. Moreover – the implementation of this activity was discussed among professionals as a good opportunity to warm up the economy, thus stimulating recovery from the financial crisis (Grīnvalds, 2009).

Conclusions

Industrialization and deindustrialization have left their marks in the urban space of Riga and, as a result of these both processes, urban brownfield issue has become topical in recent years. Derelict industrial areas constitute a significant part of urban brownfields in Riga and redevelopment of these areas would provide enough space for various business activities. Urban regeneration processes in Riga are a key issue for sustainable urban development in the future. This principle was documented in literature (Grimski, Ferber, 2001; Ganser, Williams, 2007) and, particularly, by Evans and Jones (2007), who characterize sustainable urban regeneration from various aspects.

Riga as a post-industrial city experiences several brownfield related problems, mostly fragmentation of the spatial structure, degradation of the visual quality of the urban environment and, in few cases, contamination of the soil. Riga is a member of CABERNET network, so brownfield related planning issues are based on its conceptions. Accordingly, brownfields in Riga are sites that were previously used, but at the moment they are abandoned or underused, whether contaminated or not (G93, 2004; Ganser, Williams 2007). According to Trusins *et al*. (2005) these sites are mostly former industrial territories and abandoned housing stock, as well as former military territories, allotment areas and former dumping sites.

During the rapid economic growth of Latvia the demand for dwellings and commercial premises increased sharply because of growth of incomes and lack of premises. This resulted in rapid increase of construction activities and development of the real estate sector. Significant part of development occurred in brownfield sites, thus referring to urban regeneration processes, mostly in the historical core of Riga, where abandoned industrial sites were converted into mixed-used territories, thus providing reuse of abandoned territories and development of compact spatial structure of the city.

Dwellings constructed in regenerated areas in the historical core of the city were mainly orientated to middle and upper-middle class buyers with relatively high incomes, showing signs of gentrification as part of urban regeneration processes (Butler, 2007) in Riga.

Another important issue is the participation of municipal authorities in urban regeneration processes as partners together with private developers (Otsuka, Reeve, 2007), because this kind of cooperation may stimulate regeneration of the so-called problematic brownfield sites where contamination issues are urgent, for example, the former Soviet army airfield in Rumbula. In the case of Riga the main reason for nonparticipation of city authorities is a lack of financial resources, and, as a result of this, private investors are interested to regenerate only perspective located brownfields.

Riga City Council has participated as a partner in some local urban regeneration projects in cooperation with local residents and owners. The results of these projects demonstrate that cooperation among local authorities and local residents can be very successful (Šolks, 2011b) in transforming the existing urban space and it can lead to further sustainable development (Flint, Rowlands, 2003; Blakeley, Evans, 2009).

Prices on real estate in Riga and total mortgage debt rose dramatically and early signs of repayment problems were observed in 2007. As a result of financial crisis, loss of jobs and falling revenues, demand for premises and property prices experienced rapid downturn. This resulted in substantial losses for banks that ceased mortgage lending almost completely.

As a result of the previously mentioned circumstances urban regeneration in Riga has faced the same problems as other real estate projects and they are all mainly suspended. Developers tried to sell unaccomplished projects, but there was no interest from other perspective investors, because terms of financing were not acceptable in that situation as contracts for funding were signed during economic growth when construction costs had reached their peak. During the economic crisis it was cheaper to construct a new structure than to buy an existing one. Besides, oversupply of premises and unavailability of credits served as limiting factors for any construction activities at all. This situation led to the bankruptcy of several developers and overall stagnation in construction sector.

Despite oversupply there still was a lack of dwellings in Riga because of high prices of newly constructed or renovated premises that residents could not afford to pay. Developers faced problems with the maintenance of vacant premises which caused additional expenses, because it was difficult to sublet them not only because of too high rental price, but also because of the fact that most of these premises were not finished completely, thus they could not be offered for rent without additional investments.

Despite the economic crisis and credit crash, there were few ongoing urban regeneration projects in Riga, where potential buyers are attracted due to the

reasonable price. It was possible to provide further implementation of these projects because of decreasing construction costs.

Concluding this research, some issues concerning further urban regeneration in Riga should be discussed. First – what should be the role of local municipal authorities in urban regeneration processes? Is there a necessity for cooperation among private developers and municipal authorities? If looked on examples where cooperation has been done, it can be observed, that it guarantees good results what tend to be characteristic to sustainable urban development. Besides, the presence of municipal capital in regeneration processes would guarantee completion of projects despite economic downturn or other complications and thus it can be a tool for stimulating the recovery of the economy as well. Secondly – what will be the future of the real estate sector in Riga? As a cost price of premises offered for sale right now is quite high, it is not easy to attract possible buyers, what can result in mostly uninhabited housing estates. In this case the next question appears – is there a future for urban regeneration in Riga at all? It is prospective, that after recovery and strengthening of economy urban regeneration processes will continue, but some lessons from previous experience should be regarded in order to achieve complex sustainable development of the city.

Acknowledgements

This work has been supported by the European Social Fund within the project ”Support for Doctoral Studies at University of Latvia” and by the “Hungarian Scholarship Board Office”.

REFERENCES

AALBERS, M. (2009): ‘Geographies of the financial crisis’, *Area* 41(1): 34–42.

BARBER, A. (2007): ‘Planning for Sustainable Re-urbanisation: Policy Challenges and City Centre Housing in Birmingham’, *Town Planning Review*, 78(2): 179-202.

BEZMEZ, D. (2008): ‘The Politics of Urban Waterfront Regeneration: The Case of Haliç (the Golden Horn), Istanbul’, *International Journal of Urban and Regional Research*, 32(4): 815-840.

BLAKELEY, G., EVANS, B. (2009): ‘Who Participates, How and Why in Urban Regeneration Projects? The Case of the New ‘City’ of East Manchester’, *Social Policy & Administration*, 43(1): 15–32.

BUTLER, T. (2007): ‘Re-urbanizing London Docklands: Gentrification, Suburbanization or New Urbanism?’, *International Journal of Urban and Regional Research*, 31(4): 759-781.

CABERNET (2005) Glossary of Terms. Concerted Action on Brownfield and Economic Regeneration Network (http://www.cabernet.org.uk/index.asp?c=1124). Accessed 02.08.2009.

CSBL (2009) Industry, construction, housing and services. Central Statistical Bureau of Latvia (http://www.csb.gov.lv/csp/content/?cat=472). Accessed 10.08.2009.

DIENA (2009) Gada 2. ceturksnī būvizmaksas sarukušas par 10,8%, tai skaitā, strādnieku samaksa - par 20,9%. 11.08.2009. (http://www.diena.lv/lat/business/ hotnews/gada-

2-ceturksni-buvizmaksas-sarukusas-par-10-8-tai-skaita-stradnieku-darba-samaksa-par-20-9). Accessed 14.08.2009.
EDGER, B., TAYLOR, J. (2000): 'Housing', In: Roberts, P., Sykes, H. (eds.) (2000): *Urban Regeneration: A handbook.* SAGE Publications, London: 153–175.
EVANS, J., JONEs, P. (2007): 'Rethinking sustainable urban regeneration: ambiguity, creativity, and the shared territory', *Environment and Planning*, A 40: 1416 – 1434.
FLINT, J., ROWLANDs, R. (2003): 'Commodification, normalisation and intervention: social cultural and symbolic capital in housing consumption and governance', *Journal of Housing and the Built Environment*, 18: 213–232.
G93 (2004) Degradēto teritoriju izpēte Rīgas pilsētā. SIA „Grupa 93", 66 p.
GANSER, R., WILLIAMS, K. (2007): 'Brownfield Development: Are We Using the Right Targets? Evidence from England and Germany', *European Planning Studies*, 15(5): 603-622.
GPG (2009) Hard crash for Latvia's housing market. Global Property Guide. (http://www.globalpropertyguide.com/Europe/Latvia/Price-History). Accessed 14.08.2009.
GRIMSKI, D., FERBER, U. (2001): 'Urban Brownfields in Europe', *Land Contamination and Reclamation*, 9(1): 143–148.
GRĪNVALDS, J. (2009): Ēku siltināšana - iespēja nekavējoties stimulēt ekonomiku, *Diena*, 16.03.2009. (http://www.diena.lv/lat/politics/viedokli/eku-siltinasana-iespeja-nekavejoties-stimulet-ekonomiku). Accessed 12.08.2009.
GUZEY, Ö. (2009): 'Urban regeneration and increased competitive power: Ankara in an era of globalization', *Cities*, 26: 27–37.
HE, S., WU, F. (2007): 'Socio-spatial impacts of property-led redevelopment on China's urban neighbourhoods', *Cities*, 24(3): 194–208.
LAZDIŅA, L. (2006): Degradēto teritoriju attīstība kavējas. Diena, 02.03.2006. (http://www.diena.lv/lat/arhivs/rigas-zinas/degradeto-teritoriju-attistiba-kavejas). Accessed 07.08.2009.
LORENS, P. (2008): 'Urban regeneration vs. urban sprawl – problems and prospects in the post-socialistic cities', *44th ISOCARP Congress 2008*.
LORIMER, J. (2008): 'Living roofs and brownfield wildlife: towards a fluid biogeography of UK nature conservation', *Environment and Planning*, A 40: 2042-2060.
MALIENE, V. (2001): 'Valuation of commercial premises using a multiple criteria decision making method', *Property Management*, 5(2): 87–98.
MALIENE, V., MALYS, N. (2009): 'High-quality housing – A key issue in delivering sustainable communities', *Building and Environment*, 44: 426– 430.
MATHERS, J., PARRY, J., JONES, S. (2008): 'Exploring Resident (Non-)participation in the UK. New Deal for Communities Regeneration Programme', *Urban Studies*, 45(3): 591-606.
MCINTYRE, Z., MCKEE, K. (2008): 'Governance and sustainability in Glasgow: connecting symbolic capital and housing consumption to regeneration', *Area*, 40(4): 481 – 490.
MERL (2009) Ministry of Economics of Republic of Latvia. 30.04.2009. (http://www.em.gov.lv/em/2nd/?cat=621&id=22423) Accessed 08.08.2009
MPR (2008) History of Riga. Municipal Portal of Riga (http://www.riga.lv/EN/Channels/About_Riga/History_of_Riga/default.htm) Accessed 10.08.2009

OTSUKA, N., REEVE, A. (2007): 'The contribution and potential of town centre management for regeneration. Shifting its focus from 'management' to 'regeneration', *Town Planning Review*, 78(2): 225 – 250.

PADDISON, R. (1993): 'City marketing, image resconstruction and urban regeneration', *Urban Studies*, 30(2): 339–350.

RD (2005) Rīgas ilgtermiņa attīstības stratēģija līdz 2025. gadam. Rīgas Dome, 63 pp.

RP (2003) Esošās situācijas izpēte Rīgā. SIA „Reģionālie projekti" 235 p.

ŠOLKS, G. (2011a): 'Development Perspectives of the Former Working-Class Neighbourhoods in Riga', *Human resources - the main factor of regional development*, 5: 264-271.

ŠOLKS, G. (2011b): 'Reurbanizācija un pilsētvides atjaunotne kā Grīziņkalna apkaimes attīstības perspektīva', *Latvijas Universitātes raksti, Zemes un vides zinātnes*, 762: 196-205.

ŠOLKS, G. (2010a): 'Reurbanizācijas procesi Rīgā', *Latvijas Universitātes raksti, Zemes un vides zinātnes*, 752: 156-163.

ŠOLKS, G. (2010b): 'The Implications of the Credit Boom and Bust on Development and Urban Regeneration in Riga', *Housing Finance International*, 25(2): 12-18.

TRUSINS, J. et al. (2005): *Riga City Development on the Way to Sustainability*, 8 pp.

VRAA (2007) Valsts reģionālās attīstības aģentūra (http://www.vraa.gov.lv/lv/eraf_2007_2013/riga/). Accessed 12.08.2009.

WILLIAMS, K. (2004): 'Reducing Sprawl and Delivering an Urban Renaissance in England: Are These Aims Possible Given Current Attitudes to Urban Living?', In: RICHARDSON, H.,W., BAE C.,-H., C. (eds.) (2004): *Urban Sprawl in Western Europe and the United States*. Ashgate Publishers, London: 37-54.

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

ROMANIAN TOURISTS ON BULGARIA'S BLACK SEA COAST - A TERRITORIAL ANALYSIS

TURISMUL ROMÂNESC PE COASTA MĂRII NEGRE DIN BULGARIA – ANALIZĂ TERITORIALĂ

Milen PENERLIEV [1]

Abstract: In this material, it is made a territorial analysis of the Romanian tourists visiting the Bulgarian Black Sea coast, but the trends and preferences of the Romanian tourists, too. We have also ranged municipalities according to the number of visits by foreign tourists and gave specific conclusions and recommendations.
In order to accomplish the objectives of the paper, we have read the latest trends regarding the presence of Romanian tourists on the Bulgarian Black Sea coast and used the currently available statistics from the National Statistics Institute.
There have been outlined distinct territorial imbalances in the preferences of the Romanian tourists, but still, it is obvious that they found their place among all nationalities of the tourists visiting the coast.

Key-words: the Black Sea, tourism, Romanian tourist, trend
Cuvinte cheie: Marea Neagră, turism, turist român, tendință

Objective

World tourism has increasingly developed during the recent years. The upward trend in its development has ceased only in the last couple of years due to the financial crisis. The tourism sector in Bulgaria bears the same characteristics. The littoral tourism has witnessed the greatest pace of development among all branches of the tourism sector in the country. The preferences of the Romanian tourists are also manifested towards the resorts along the Black Sea coast.

The purpose of this report is to present a territorial analysis of the Romanian tourists' preferences for holiday stay along the Bulgarian Black Sea coast. It has been reported a significant growth in their visits to the country during the recent

[1] "Konstantin Preslavsky" University of Shumen", Faculty of Natural Sciences, Shumen, Bulgaria

years. The analysis includes all Black Sea coast districts. The comparative analysis will help us outline the places, most preferred by the tourists from Romania.

Methodology and Results

It is used statistics and data from the National Statistical Institute, given by the Regional Center Varna. It encompasses all municipalities included in the Bulgaria Black Sea coast districts - Dobrich, Varna and Burgas. The latest available statistics, which refer to 2008, have been used as a base when preparing the report. Despite this, the conclusion drawn upon the data from 2008, are of even more valid for the next two years regarding the invasion of Romanian tourists in the Bulgarian sea resorts in 2009 and 2010.

The total number of foreign visitors that stayed overnight in the Bulgarian Black Sea coastline districts is 1,363,388, in 2008. Tourists from Germany hold the leading position, with 310,000 visitors (22.7 %). At the same year, Romanian tourists are on the third place in the list, right after the visitors from Russia. Romanians who stayed overnight in the Bulgarian Black Sea resorts accounted for 161,974 (11.9%). It is shown on Figure 1 that their number is almost equal to the number of Russian tourists.

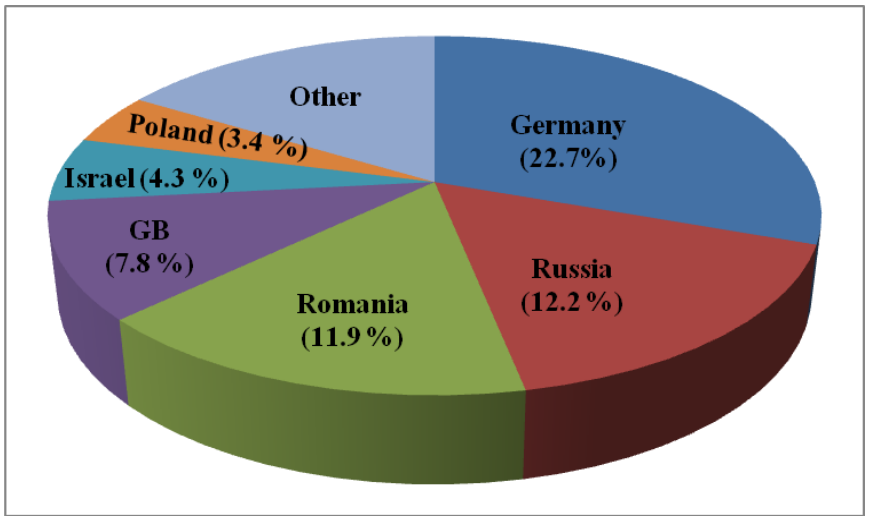

Figure 1. Number of foreign tourists who visited the Bulgarian Black Sea coast by country of origin (2008)[2]

The territorial analysis, in terms of districts distribution, shows that the Romanian tourists prefer the resorts in Varna district. 95,000 visitors have stayed overnight in this district, which accounts for 59% of the total number of Romanian guests – 162,000. Their preferences towards the other two Black Sea districts are equally distributed - Burgas (33,000 visitors) and Dobrich (33,500 tourists). The

[2] We used the latest available data from NSI (National Statistics Institute).

close distance between the resorts around Varna and the Romanian border explains why tourists from our north neighbour choose this district (Figure 2).

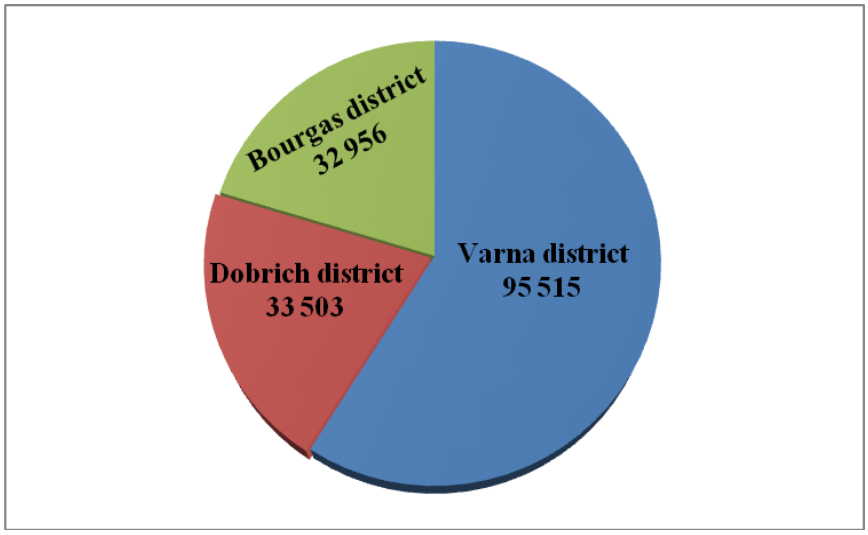

Figure 2. Distribution of the Romanian tourists by districts (Number of visitors, 2008)

The statistics about the intradistrict distribution shows the expected concentration of Romanian tourists in certain municipalities. In Varna district, nearly 100% of all visitors stayed overnight in Varna municipality (94,915 tourists). The sea resorts of Golden Sands, St. Constantine and Elena and Sunny Day, situated in close proximity to Varna, explain this trend (Fig. 3).

Nessebar is definitely the most preferred municipality in Burgas district (29,317 visitors) as it has attracted 89% of all tourists, who visited the district, and 18.1 % of all Romanian visitors staying along the Bulgarian Black Sea coast. A bit more than 2,000 Romanian tourists have chosen Sozopol for their vacation.

The most preferred holiday site in Dobrich district is the municipality of Balchik with more than 30,000 tourists, which accounts for 90% of the total number of visitors in the district and 18.6% of all Romanian guests of Bulgarian Black Sea coast. Albena - one of the most splendid and best preserved Bulgarian resorts is in this region. This fact explains the large number of Romanian tourists in Balchik municipality. The other Black Sea resorts in this part of the country remain practically unknown for Romanian guests. Only had 2,000 stayed overnight in Kavarna.

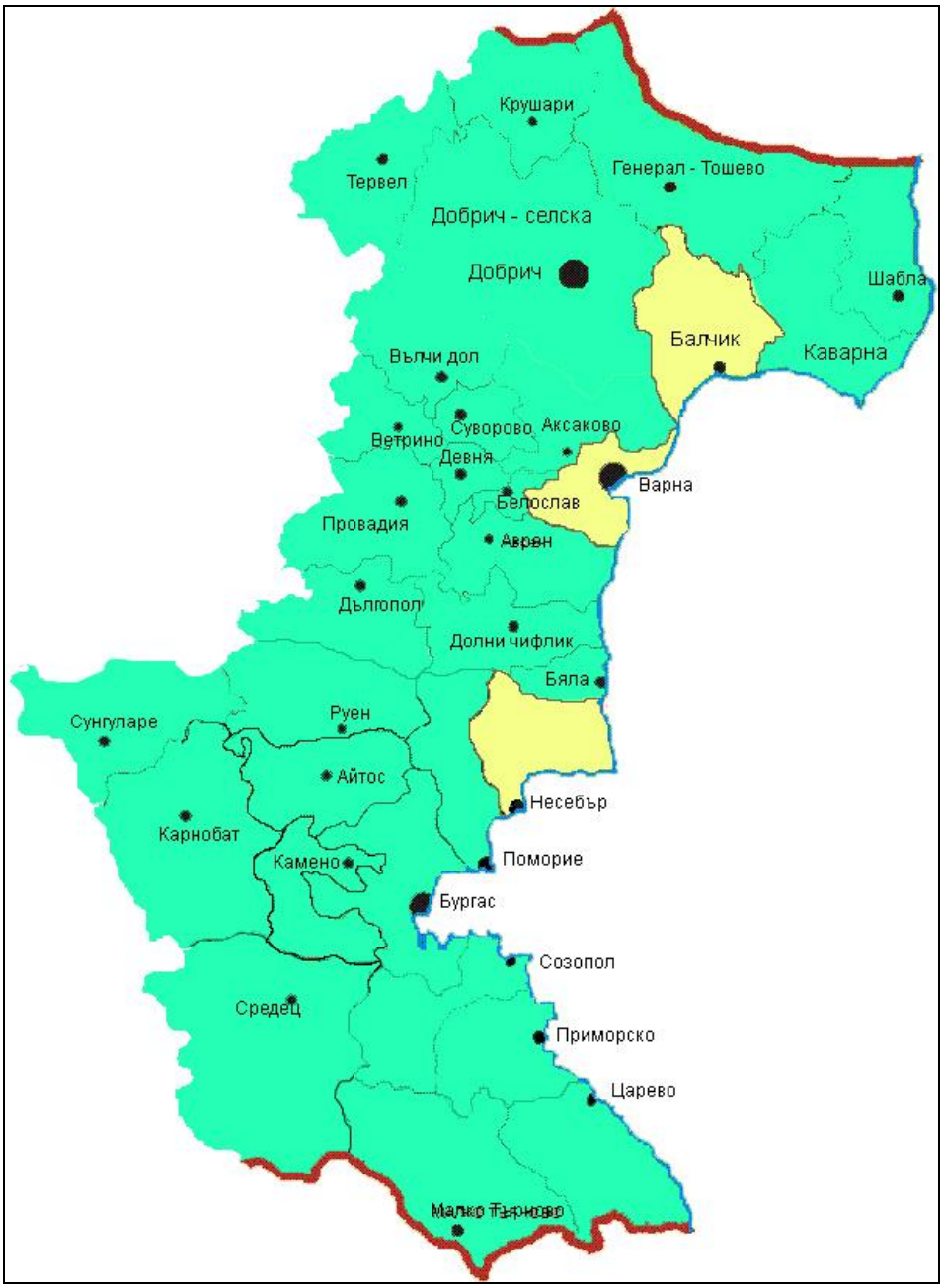

Figure 3. Most visited municipalities by the Romanian tourists

Conclusions

Following the above-presented statistical data and territorial analysis, several conclusions are to be drawn:

- Romanian guests are in the top 3 of the list of foreign tourists who visited the Bulgarian Black Sea coast in 2008;
- The majority of them preferred to stay in the resorts in the district of Varna;
- They prefer the resorts in the municipalities of Varna, Balchik and Nessebar;
- 154,000 or 95% out of all 162,000 Romanian tourists preferred the above-mentioned municipalities.

The following problems can be derived from these conclusions. Firstly, it is clear that Romanian tourists prefer to visit the Bulgarian tourist destinations with their own cars. The great number of tourists in a small number of municipalities and tourist complexes hinders parking. Bulgarian hotel chains have not planned welcoming tourists who arrive with their own transport means.

The high concentration of tourists (not only from Romania) on a small territory causes infrastructural problems. The small capacity of the road network, the drainage and sewerage system, the electricity system, health care is hampered by the increased number of tourists.

Profound analysis of the preferences of the Romanian tourist for food, culture and animation in the welcoming destinations has not been made. They have all been offered common animation program and hotel services.

The main conclusion is that the tourists from Romania prefer the Bulgarian Black Sea coast. It has been reported significant growth of visits during the last years. They have their own preferences, different from those of tourists from other countries. They are suggested to be studied and analyzed in the future in order to offer Romanian guests differentiated tourism products.

REFERENCES

DONCHEV, D, M. PENERLIEV, (2009), Geografia na turizma na Balgaria, VTU, Veliko Tarnovo

DONCHEV, D, M. PENERLIEV, (2008), Po vaprosa za turisticheskoto rajonirane na Balgaria // Problemi na geografiata, broi 2

ERMENLIEVA, N., (2010), Teritorialni disproporcii pri razvitieto na morskia turizam po Balgarskato Chernomorsko krajbrejie (Diplom thesis), Shumen University K. Preslavski, (not published)

PENERLIEV, M., (2011), Geografia na turizma, Teress project, Shumen

PENERLIEV, M., (2010), Obshtina Shabla – savremenni tendencii i razvitie, Geografia 21, br.5. Statisticheski spravochnik, NSI, 2010

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

POSSIBILITIES FOR THE DEVELOPMENT OF WINE TOURISM IN SHUMEN REGION

POSIBILITĂŢI PENTRU DEZVOLTAREA UNUI TURISM OENOLOGIC ÎN REGIUNEA SHUMEN

Daniel RUMENOV[1]

Abstract: Shumen county is a traditional region for wine industry in Bulgaria. The most popular wineries are situated in the villages of Osmar and Khan Krum. The purpose of the report is to show the possibilities of developing this kind of tourism together with the wine industry. The author also suggests an itinerary for wine tourism that could affect the development of this segment.

Key-words: tourism, wine, Shumen region
Cuvinte cheie: turism, vin, Regiunea Shumen

Introduction

Wine tourism is a form of dynamically developing tourism. The term ‘oeno-‘ or ‘wine’ tourism appears in the 1990’s, and surprisingly the creators of this fashionable branch are not the traditional European wine powers, but the countries of the New World (Markov, 2007). The combination of the wine industry and tourism is a happy whim of producers from Australia and California. The small wineries there (between 100,000 and 300,000 bottles annually) do not rely on the big trading companies but on organizing wine weekends and tours, they manage to increase their cellar door sales. Currently about 35% of the wine production of most Australian cellars has been thus realized and the annual rate from wine tourism is about 3.6 billion US dollars (Markov, 2007).

The wineries in the region of Napa Valley in California are annually visited by 18 million tourists most of which Americans. It is true that the inclusion of well-known wineries in the tourist itineraries in Europe is much older practice, but it was developed not so much as a separate business rather than as a part of a broader conception of tourism as travelling for pleasure. The ground-breaking experience of the Australian and Californian wineries proved infectious and in the late 90s

[1] Shumen Regional Historical Museum, Shumen, Bulgaria

almost all winemakers oriented themselves to this new type of tourism. Wine tours became a highly capitalized tourist product in Argentina, Chile, and South Africa as well as in the old wine powers like France, Spain, and Italy. Even Turkey, a country of no traditions in wine manufacturing, made fast progress in this field (Mileva 2004).

Surveys in Australia show that the basic motivation for participation in the vineyard and wine tours is connected with the following factors:

- Interest in wine (tasting, technology, purchase);
- Events and traditions connected with wine manufacture;
- Visiting relations;
- Desire to visit the village area including the places where wine can be tasted;
- Desire to meet the wine manufacturers;
- Desire to broaden the knowledge of wine and its production, etc.;
- Desire to meet local people, take part in the organized events connected with grapes and wine;
- Desire to visit other tourist sites (cultural) and seek new forms of tourist travelling.

In Europe, as it was mentioned above, the vineyard and wine tourism is very popular in the countries of highly developed wine culture, production and consumption like Germany and the countries of southern Europe. Recently it has also become popular in UK, the Netherlands and other countries.

Wine producers in Italy consider the vineyard and wine tourism as consequence of the following factors:

- The growing prestige of various kinds of wines, especially the high-quality ones;
- Stimulation of wine consumption;
- The increase of incomes of wine producers;
- Activities connected with preservation of the local cultural sites, national cuisine traditions and rituals, etc. (Markov, 2007, 62).

The path breaking work in wine tourism in Bulgaria was done in the 90s. Then several wineries like Damyanitsa, Lyaskovets, Osmar, Dimyat-Varna began offering organized wine-tasting sessions as well as other attractions.

Observations show that four or five years ago wine tourists in our country were predominantly foreigners, while today the ratio is 1:1, which is a clear indication of the good perspectives of this new field. Most new cellars have their own vineyards and rely on quality wines, which they sell at cellar door to restaurants and keen clients. Winery owners are well aware that wine tours are precisely one of the keys towards success and higher profits.

One interesting itinerary offered in Bulgaria was designed by the BalkaNova tourist agency and is called 'Wine, folklore, history'. The tour starts in Sofia where the guests are introduced to the best Bulgarian wines. The Rila Monastery is visited on the second day where wines from the Logodazh (Broad

Melnik vine) and Damyanitsa cellars are tasted. Trips to Melnik and Bansko and a visit to Peshtera cellar are planned for the third day. The fourth day is dedicated to Plovdiv and Asenovgrad with visits to Vimprom Asenovgrad and Todoroff cellar and tasting of Mavrud and Merlot. On the fifth day there are trips to Starosel and the ancient Thracian cult complex there, Kazanlak, the Kazanlak Thracian Tomb ant the Rose museum with an evening devoted to tasting of the local Menada varieties. The sixth day is allocated for the cellar in Elenovo and the Old Cellar in Yambol. The seventh day is spent in Nessebar with a walking tour and a trip to Via Pontiaca cellar in Pomorie. From there the trip goes on to Varna and the Archaeological museum with the unique exhibition Treasures of Bulgaria. On the eighth day the guests visit Shumen, Madara Horserider, Osmar cellar and then they continue their trip on to Veliko Turnovo and taste wines from Lyaskovets winery. The ninth day is left for the Loviko-Suhindol winery with tasting of a selection of fine Gamza wines (Fig. 1).

Figure 1. Wine itinerary

Wine tourism is a specific product. It combines travelling whose leading purpose is drinking wine, with culture, history, beautiful nature and good cuisine. All these things usually go together to provide a true wine experience. Wine has always been apprehended as related to a particular historical, cultural and gastronomic context. Wine tourism relies precisely on this feature for which reason the profile of its clientele is also specific. These are most often educated, intelligent and solvent people over there. Wine tourism belongs to the specific group of specialized types of tourism offering untraditional specific tourist products (Stoikova, 2009, p. 20).

It is defined as theme travelling (wine tours) whose purpose is visiting vine-growing regions, wineries and cellars combined with tasting of wines. However, certain authors define it as part of the village tourism, but it can also be a separate activity.

The participants in the wine tours can arbitrarily be classified as:

1/ Casual or curious tourists;

2/ Interested tourists;

3/ Initiated (devoted) tourists.

It is typical for the casual or curious tourists that they consider the wineries as attraction and the visit as a possibility for socializing. They do not have any good grounding in wine and vine-growing. The intensity of entertainment, animation, information on the wine and the region are the keys for keeping the attention of this kind of tourists.

The interested tourists have medium to high interest in wine and knowledge of vine-growing and wine manufacture. The visits to wineries are considered an attraction, but rarely a justified motive for travelling. They usually have certain experience in this: they have visited cellars, etc. It is enough for them to get information on the wines so as to excel among friends. They are usually ex curious tourists who were so impressed as to become interested.

The initiated are wine connoisseurs who often visit vine-growing regions. Their desire to visit a cellar or vine-growing region is a sufficient motivation for travelling. They have thorough grounding in wine and are interested in the manufacture and the kinds of wines. They buy wines, assess the special reserve wines of the oenotheques. The devoted tourists seek detailed information and possibilities to enrich their own knowledge.

The British, Germans and Scandinavians are among the keenest wine tour tourists. Data show that our cellars are visited by tourists from all over the world of various social status and position (Aleksieva & Stamov, 2003, 65-67).

The happy marriage between the pleasure of wine-tasting and travelling serves the interests of restaurant keepers, producers, traders, tourist agencies, hotel keepers, advertisement agents, etc. All that turns wine tourism into a prosperous branch of tourist business.

Bulgaria could turn into one of the most attractive destinations in this field not only for the good wines but also for its rich history. The memorials found in our lands connected with wine (mural paintings, bas-reliefs, ritual vessels and other archaeological monuments associated with wine from all historical eras encountered in the country.

Wine tourism in the Shumen region

Shumen region in particular can offer such monuments as well. It is located in the central part of north-eastern Bulgaria and the north-eastern tourist region. Its administrative and territorial division includes 10 municipalities and 151 towns and villages. The population of the region is 2.6% of the country's population. The territory covers 3,390.2 square km. or 3.05% of Bulgaria's territory. It is extremely

valuable strategic point in north-eastern Bulgaria. The centre of the region, the town of Shumen, is situated 100 km from the big maritime centres Varna and Burgas and at the same distance from the Danubian ports Russe and Silistra.

The following five wine cellars occupying a deserved high place in the country and world wine market located in Shumen region are: Shumen Domaine Boyar, Preslav Vinex, Osmar wine cellar in the village of Osmar, Khan Krum cellar in the village of Khan Krum and Slunchev Zamak and Slancheva Dolina cellars in the village of Dragoevo.

Shumen Domaine Boyar is located in one of the well-known white wine regions in Bulgaria. It is a successor of Shumen Vinprom created in 1948. In the late '90s, the winery underwent overhaul, expansion and modernization. The large winery is located at the foot of Shumen plateau. After the acquisition of ownership on the fifty-year-old cellar in 1997, Domaine Boyar AD invested in leading wine technologies as to provide high quality for each bottle of wine reaching the consumers. Along with the innovative approach, there is also special consideration for preservation of the winery's traditions for the following generations. Grape varieties for the well-known wines like Chardonnay, Traminer, Muscat, Sauvignon Blanc and Merlot baric are grown in some vineyards around Shumen. Baric is a wine produced in casks according to the old tradition. The company exports wine to England, Sweden, the Netherlands, Norway and the eastern markets. These days the Russian market has been particularly successful.

The cool cellar for aging wine is at the guests' disposal. There is also a special room for tasting the wines with photos of the old cellar, the vineyards and vine-growing events showing the path of wine form the grapes to the glass. Traditional Bulgarian cheeses are offered along with the selection of wines. In addition, tourists are offered photos with the old basket press and tasting lists with information on the wines (*www.infobulgaria.info*, *www.novinar.net*).

Vinex Preslav is located within the boundaries of the second Bulgarian capital Veliki Preslav (893-971). A winery, which functioned form the 7th to the 10th centuries was discovered in the outskirts of the town. Since that remote age vine-growing and wine manufacturing have been the occupations of the population from this region. It is extremely favourable for growing white grapes. The good climatic conditions and the successful technology yield the unique white wines of the Preslav region leaving unforgettable memories with both consumers and connoisseurs.

Vinex Preslav was created in 1948 under the name of State Spirit Monopoly with initial capacity of 600 tons of grapes and equipment of hand grape crushes and decanting pumps. Today the company has at its disposal modern technological equipment whose annual grape processing is 12,000 tons. The cellars have storage capacity of 15 million litres of wine. Near Veliki Preslav there is another cellar where Pino Gre, the first wine from a declared geographical regain, was created in 1979. The production of Vinex is currently exported to Russia, Estonia, Latvia, Germany, Poland, The Check Republic, Slovakia, USA, Japan, Israel and Austria.

The winery is one of the most dynamic and well-recognized wine producers (especially of white wines) and burnt wine (brandy) (*www.domaineboyar.com*).

The other winery in Shumen region which deserves special attention is Osmar in the namesake village. It is situated 17 km from Shumen and Veliki Preslav, 30 km from Targovishte and 100 km from Varna. The name of the village and wine are associated with the best Bulgarian pelin (unique wormwood wine, a beverage of forest herbs placed in aged wines). Fourteen years ago, in 1994, the traditions in pelin making were revived by the Vichevs brothers and today the winery produces its best production. In addition to pelin, Chardonnay, Cabernet Sauvignon and Merlot are also made here. Today the vineyards cover 2,000 square meters. The winery offers wonderful opportunities for wine tasting and wine tourism. It is annually visited by 6,000 Bulgarian and foreign tourists. They are offered to taste four kinds of wines, traditional Bulgarian cheeses, handmade bread in the accompaniment of Bulgarian folk music. There is also a wine shop where the guests can purchase the products of the cellar at special prices. There is also luxury accommodation offered to the guest at the Osmar residence.

The village of Osmar itself is also a tourist destination. It has been a member of BAVT (Bulgarian Association of Village Tourism) since 2004. It offers great opportunities for eco and village tourism. The famous Osmar rock monasteries are located here. In addition, esoterics organize their meetings there because of the particularly strong energy field. Osmar villagers are the only villagers in Bulgaria who have moved their trellis vines outside their yards onto the pavement so that they form a tunnel of vines along the main street. Trifon Zarezan (the Bulgarian wine holiday) is the best time to visit the village. There is an annual contest for the best pelin and wine and combined with the other attractions this would furnish the guests with unforgettable memories. Tourists can find accommodation at Sveshtarovs houses offering peace and tranquillity. An old cooperage of 70-year-old history can be seen in one of them. Some other attractions are the ride around the village in a donkey cart as well as Sts Constantine and Helena church known for its curative icons (*www.vinex.bg*).

One of the smaller cellars producing high quality wines is Khan Krum located in the namesake village a few km from Veliki Preslav. It was created in 1939 but its production today is much smaller than before. It is specialized in processing white grapes since the climatic conditions are favourable for growing white wine varieties, but it can bottle both red and white wines. Traminer form Khan Krum is a wine of recognized quality both in the Bulgarian and foreign market. It impresses with its exclusive gustatory qualities. The winery produces other quality wines as well, which are often winners of international awards: Muskat, Sauvignon Blanc and Chardonnay (*www.segabg.com*).

The last two wineries under discussion are located in Preslav village of Dragoevo. Slunchev zamak (Sunny castle) is relatively new, created in 1972 as an affiliate of Vinprom Preslav. In 2001, it was privatized and since then it produces wines of its own trade mark: Muscat, Chardonnay, Misket, Traminer, Rkatsiteli, Cabernet Sauvignon, and Ugni Blanc.

The other company which works with Slunchev zamak winery is Sluncheva Dolina OOD also located in Dragoevo. It was founded in 1998. The primary processing of the grapes is done in Slunchev zamak winery. Sluncheva dolina (Sunny valley) produces, processes, bottles and sells high-quality white and red wines. Since 2000, the company has also used the Bag-in-box type of packaging for 1 to 10 litres. The winery produces wines from the following grape varieties: Cabernet Sauvignon, Merlot, Gamza, Traminer, Riesling, Sauvignon Blanc, Ugni Blanc, etc. The grapes come exclusively from the Black Sea region. The winery sells its production through long-term contracts with twelve countries in Europe and Asia. The basic trade orientation of the company is the foreign market, which covers 95% of the total production (*www.bulgarianside.com*, *www.sunvalleywineri.com*).

The village population is exclusively Bulgarian and has preserved the traditions for growing and processing of grapes thus making it very attractive for wine tours. Some authentic Bulgarian rituals of particular interest to the foreign tourists are also preserved. More over, it has guesthouses that can accommodate the tourists.

Conclusion

Tourism provoked by wine industry is one of the fast-developing forms of specialized tourism, which has had a considerable share in the national tourist product in recent years. However, it has relatively low coverage in Shumen region. It is obvious from the fact that only 6,000 people visit Osmar cellar, which is a tiny portion of the massive stream of tourists visiting northern Black Sea coast. Guests are expected here only in summer vocation season and they usually come from this region. As a consequence, for example, the Sveshtarovs houses accept guests only form May to October. This is one drawback of the wine tourism practiced in the Shumen region. However, combined with eco and cultural tourism it could be practiced throughout the whole year. Special attention should be paid to the last itinerary. Many cultural monuments were preserved in Shumen region as a centre of the Bulgarian state in the early Middle Ages: the first capitals Pliska and Preslav, the cult settlement Madara, the Osmar rock monasteries, Shumen fortress and many others that could be used as additional attractions.

The term winescape has recently become popular. It defines a unique agricultural landscape combining three elements: grape production, activities connected with grape growing, places for wine production and storage. The preserved authentic ethnographic rituals and collections available in the discussed villages would certainly be very attractive especially to foreign visitors not only in the summer season. This combined with traditionally good wines from the region, Bulgarian cuisine, a good infrastructure (roads and accommodation) and, last but not least, the Bulgarian hospitality can make the wine tours in the region into an additional economic device for the increase of the population's welfare both in the municipality centre and the smaller town and villages discussed above.

REFERENCES

MARKOV, I. (2007). *Wine tourism and regional development. Tourism in the new millennium.* Volume 1, University Press,. South – West University of Neofit Rilskiq Blagoevgrad, Bulgaria;

STOIKOVA, Bl. (2009), *Successful Practices in Wine Tourism Following The Example of Oryahovitsa Winery in Stara Zagora Region Trakia Journal of Sciences, Vol. 7, No. 3,*

ALEKSIEVA, Y., St. STAMOV (2003) *Specializirani vidove turizum.* "Kota" – Stara Zagora

MILEVA, S. (2004) *Rekreacia chrez specializiran turizum Sofia*

www.infobulgaria.info

www.novinar.net

www.domaineboyar.com

www.vinex.bg

www.segabg.com

www.bulgarianside.com

www.sunvalleywineri.com

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

THE POTENTIAL INFLUENCE OF CLIMATIC CONDITIONS ON THE DEVELOPMENT OF WINTER TOURISM IN THE EASTERN CARPATHIANS. CASE STUDY: HARGHITA MOUNTAINS

INFLUENŢA POTENŢIALĂ A CONDIŢIILOR CLIMATICE ASUPRA DEZVOLTĂRII TURISMULUI ÎN SEZONUL DE IARNĂ ÎN CARPAŢII ORIENTALI. STUDIU DE CAZ: MUNŢII HARGHITA

Adrian TISCOVSCHI[1], Gabriela MANEA[1], Elena MATEI[1], Octavian COCOS[1]

Abstract: Due to tradition, but also to the currently available tourism infrastructure, the practice of winter sports is unequally distributed throughout the Romanian Carpathians. While certain areas, such as the Prahova Valley, receive most of the local and international tourist influx, others, such as the Harghita Mountains, are left only partially capitalized, despite their notable potential. The study's objective is to draw attention to the beneficial opportunities the development of our study area would provide to both locals and visitors. In order to do so, continuous series of meteorological data recorded over the past 49 years were analysed and interpreted, thus reaching the conclusion that the study area can broaden its present day winter sporting palette, provided that the snow layer persists from December to April.

Key-words: climate, trend, tourism development
Cuvinte cheie: climat, tendinţă, dezvoltare turistică

Introduction

The general geographic features of the Carpathian chain and the complex structure of the underlying surface are responsible for a series of local characteristics of the climate, which, to a large extent, define a multitude of complex and elementary topoclimates. The Harghita Mountains (Fig. 1) are no exception to this rule, the region abounding in suitable places for winter sports, as noted by Bogdan (2008) and Gaceu (2005).

The objective of this study is to determine whether or not the western slopes of the Eastern Carpathians are favourable from the point of view of climatic conditions for winter tourism. As the data is provided by Miercurea Ciuc and Joseni weather stations, it can be considered valid for the tourist resorts in the

[1] Geography Department, University of Bucharest, Romania

Harghita mountain region (Baile Harghita, Baile Tusnad, Baile Homorod). A series of local differences are introduced by slope aspect, altitude, landforms and vegetation, as well as by the advection of western marine air and the outbreaks of eastern and northeastern continental air masses.

The correlations between the various climatic parameters took into account the research conducted by climatologists working for the National Meteorology Administration (ANM). The analysis, which is based on the long and continuous datasets provided by 94 weather stations, in service since 1961, has highlighted a more pronounced warming during the past decades. At the same time, precipitation values are on the decrease, the trend being more obvious than in the centre of the country. Seasonally, one can notice a strong trend of precipitation increase during autumn.

Mountain regions, generally, and the Harghita Mountains, in particular, do not only feature risks associated to the long persistence of the snow layer, but also those associated to a persistence that is too short, thus limiting the winter sports season. Furthermore, it is not only the thick layers of snow (average and absolute maximum) which are considered, but also the less thick ones, that are particularly interesting in this region. Thickness increases with altitude (Baile Tusnad - 650 m alt.; Baile Homorod - 750 m alt.; Baile Harghita - 1350 m alt.), thus resulting a fairly broad spectrum of track choices, depending on the slope and the characteristics of the snow.

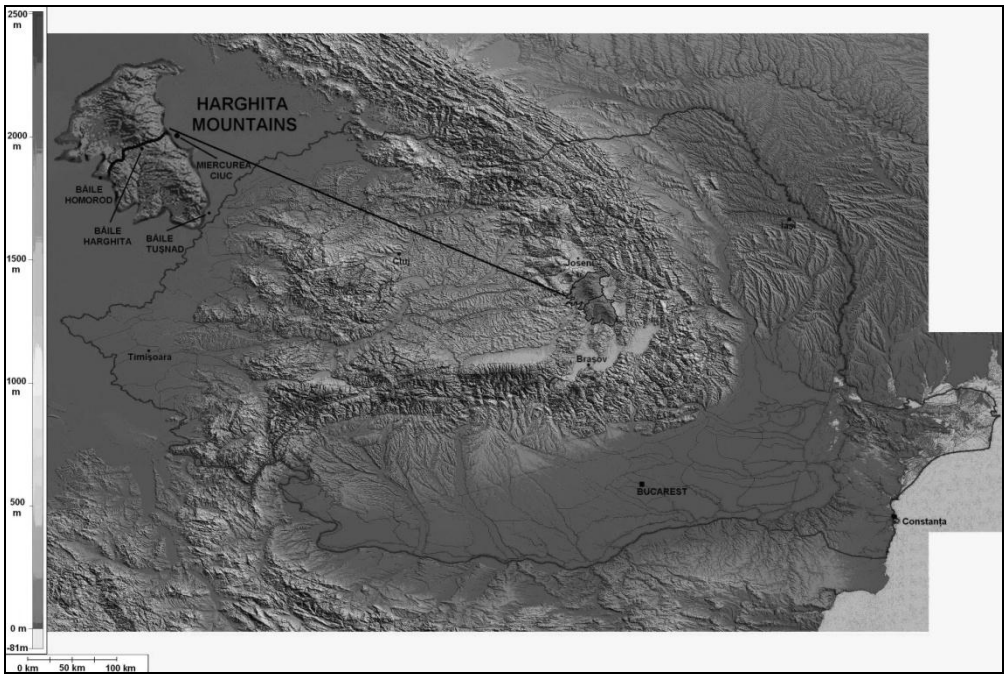

Figure 1. Location of the Harghita Mountains within Romania

Data and Methods

We used homogeneous data of average monthly temperature, snow cover and wind speed. The data series were provided by the Miercurea Ciuc weather station and supplemented by other sources (The Meteorological Yearbook, 1961-1973). In Romania, as in other regions, the most frequent inhomogeneities in meteorological data sets are found in the data recorded during the nineteenth century and the first half of the twentieth century. The average daily temperature is obtained by the arithmetic mean of air temperatures measured at 00.00, 06.00, 12.00 and 18.00 UTC. For example, the average daily temperature is obtained as follows:

$$m = \frac{t0 + t6 + t12 + t18}{4}$$

Thus, if the station Miercurea Ciuc recorded on January 15th, 1997 the following temperatures: -19.7^{0}C -15.4^{0}C -8.5^{0}C -11.2^{0}C, the average temperature that day is given by:

$$t = \frac{-19.7 + (-15.4) + (-8.5) + (-11.2)}{4} = -13.7°C$$

For the same purpose, we used the values of wind speed for several speed intervals (0-1, 2-5, 6-10, 11-15; 16-20; 21-24; 25-28; 29 -34; 35-40; > 40 m/s) - mean values for each month and each year, expressed in numbers of cases and percentages. Average monthly climate data from October to May were used to identify the general average trends of air temperature, snow and wind speed (Croitoru et al., 2009).

To quantify the range of average annual snow cover for the three resorts in the Harghita Mountains, we used a method that employs the average date of the first layer of snow and the average date of the last layer of snow. These two data set the snow interval of a region. To determine the average date of occurrence of a weather phenomenon - in this case, the first snow layer – one must fill in a table of all the dates corresponding to the first layer of snow for each year taken into account (Gaceu, 2002). Each date receives a code (the code for January 1st is 1, for January 2nd it is 2 and for December 31st - 365).

The average occurrence date of the first snow layer is obtained by summing up the codes for the entire period 1961-2000, and then dividing the result by the number of years taken into account.

The result represents the code of the average date. The same method is used to obtain the average date of the last layer of snow. Therefore, the average annual snow layer interval is obtained.

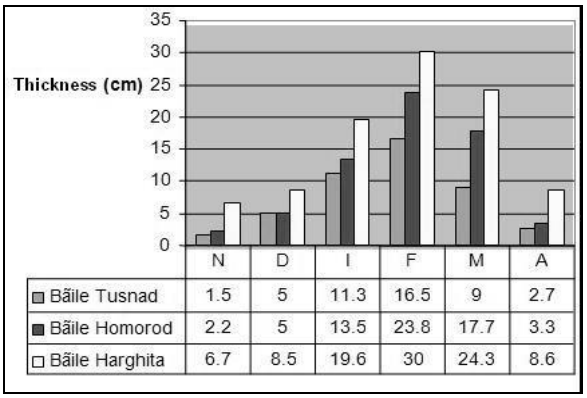

Figure 2. The average thickness of snow layer (1961 – 2000)

Results and Discussion

In the investigated area, the snow usually lasts from November until April (Baile Tusnad, Baile Homorod) and May (Baile Harghita). During the month of May, the average thickness of the layer is less than one centimetre.

Note that the dates of snow occurrence in the mountains of Harghita are offset from the dates of the first snowfalls. From December to April, the weather - typical mountain climate - will change the average thickness of the snow layer. It varies between 8 cm in December at Baile Harghita, 5 cm at Baile Homorod and Baile Tusnad and 30 cm at Baile Harghita in February (Fig. 2). The smallest values may be less than 5 cm, except for the month of February, also adding the risk that the snow is completely absent. Thus, serious problems are generated for tourism activities, especially for winter sports, if the specific infrastructure (snow canons) is not available. The analysis concerning the average thickness of the snow layer is performed in order to find suitable locations for developing the winter sports infrastructure (Voiculescu, 2007). In addition, we must also mention the fact that all slopes in the Harghita Mountains (Miklós Csipike, Tófalvi, Kosuth3, Tusnad, Homorod) are located at an altitude of less than 1500 m, in forestry, where the phenomena of snowplows do not occur (photos 1, 2).

Photo 1. Homorod ski track (February 2009)

Photo 2. Miklós ski track (February 2009)

The average dates of occurrence of the first and last snow layer set the snow range of a region; however, because of wind, radiation, water and heat factors, snow is not maintained continuously during this interval. Thus, if at Baile Harghita the average date of occurrence of the first snow layer is November 14th and that of the last is April 24th, the average annual interval falls between November 14th and April 24th. With the same method we get November 27th and April 12th for Baile Homorod and December 2nd – April 7th for Tusnad. Between these dates, the occurrence of a snow layer is possible; the average snowfall period is of 161 days at Baile Harghita, 136 at Baile Homorod and 126 at Baile Tusnad.

For Miercurea Ciuc, datasets showed no significant changes in temperature (Fig. 3). We insisted on the October – April interval, when the snow layer in the Harghita Mountains has different levels of thickness, and the monthly multi-annual evolution trends feature certain aperiodic variations of air temperature.

Wind speed is a climate parameter that has major implications for cable transport. Wind, when combined with snowfall, produces uneven accumulations and often continues the transport of the existing snow when the snowfall ends. Valleys and corridors are filled with snow, while peaks remain naked or covered only by the first layer. In Romania, during the 1961-2007 period, a decrease in average wind speed was recorded, both annually (most regions), and seasonally. The rate of decline reached different levels according to season and geographical position; higher values are recorded in the East and in mountainous areas. The decline of these values is important not only for the cable transport infrastructure (cable cars, ski lifts), but also for the calculation of specific indices, derived from the relationship between temperature, humidity and wind (the index of thermal comfort, bioclimatic index of stress, etc.).

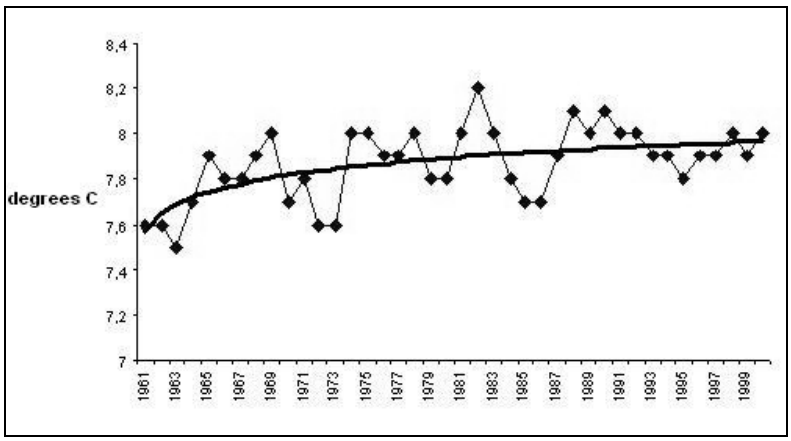

Figure 3. The evolution trend in average annual temperatures at Miercurea Ciuc (1961 – 2000)

Conclusions

Firstly, taking into account the data sets that were analysed for air temperature, the thickness of the snow layer and wind speed, we can conclude that climatic conditions are suitable for installation of new infrastructure for winter sports on the slopes of southern Harghita mountains. Secondly, it is recommended that the slopes are placed in forested areas – extremely important for strengthening the stability of the snow. Most importantly, the slopes in this area may represent a viable alternative to those in Prahova Valley (Predeal, Sinaia), which are overflowing on weekends, if we consider the price difference between the two places and the distance between them (100-150 km).

REFERENCES

AUBERT ST. (1993), *Evolution climatique et événement météorologique exceptionnel: les tempêtes de neige à Bucuresti (2-9 mars 1993)*, Publications de l'AIC - Colloque d'Aix en Provence - France, 1:379-387;

BOGDAN O. (2008), *Carpatii Meridionali. Clima, hazardele meteo-climatice şi impactul lor asupra turismului*, Editura Univ. Lucian Blaga Sibiu, p. 325;

CROITORU A., COCEAN P., SUCIU A. (2009), *Climatic Conditions and Tourism Development in Southern Carpathians. Case Study - Cindrel Mountains*, Studia Universitatis, 3:71-76;

DUMAS J.L., GENDRE C. (1996), *Geliniv pour Windows TM : une évolution majeure*, Publications de l'ANENA, 74:11-15;

GACEU O. (2005), *Fenomene climatice de risc în Muntii Bihor-Vladeasa*, Editura Universitatii din Oradea, p. 284;

GACEU O. (2002), *Elemente de climatologie practica*, Editura Universitatii din Oradea, pp. 84-86;

MILIAN N., MOTOIU M.D., Stancescu M. (2006), *Snow and avalanche monitoring pilot network in Romania. Result from a 3 winter season work*, Annals of West University Timişoara, XVI:87-91;

SCHREIBER W. (1980), *Harta riscului intervenţiilor antropice în peisajul geografic al Munţilor Harghita,* SCGGG-Geogr., 1:29-34;

VOICULESCU M. (2007), *Les avalanches de neige dans les Chic-Choc (Canada) et les Carpates Méridionales (Roumanie). Bilan des connaissances et perspectives futures*, Revista de Geomorfologie, 9:17-33.

UNIVERSITY OF CRAIOVA **Series: Geography**
UNIVERSITATEA DIN CRAIOVA **Seria: Geografie**

Vol. 14 (new series) – 2011
Vol. 14 (serie nouă) – 2011

CAPITALIZATION OF TOURISM RESOURCES IN OLTENIA (ROMANIA)

VALORIFICAREA RESURSELOR TURISTICE ÎN OLTENIA (ROMÂNIA)

Alina VLĂDUȚ [1], Sorin AVRAM [1], Liliana POPESCU [1]

Abstract: Oltenia Region has a varied natural landscape displaying all major landforms. The classical tourist offer can be thus completed by introducing the spatial evolution of the territory, by describing the mechanisms of the processes that influenced the placement and further development of different settlements or sites. In this way, tourism acquires, besides a temporal dimension, which used to be prevailing, a spatial dimension, as well, that represents the present tendency in evaluating all the activities by means of eco-compatibility. By integrating these two dimensions in the offer, there can be better evaluated the carrying capacity of the region, the tourist offer leading to the maximization of the tourist activity without surpassing the sustainability limit.

Key-words: geomorphologic patrimony, tourism offer, carrying capacity, Oltenia region.
Cuvinte cheie: patrimoniul geomorphologic, ofrta turistică, capacitatea de sustenabilitate, Regiunea Oltenia

1. Introduction

Tourism represents one of the most significant opportunities for sustainable development in Oltenia, a forcefully industrialized region during the communist period. However, present and future investors should clearly understand that they have to establish a strong link between natural potentialities and cultural and historical structures, without ignoring the ecological suitability assessment of landscape. Thus, the fundamental structures, able to support sustainable development, are the ecological structure associated to the natural resources (primary resources) and space and cultural structure (secondary resources) associated to mobility, built space and patrimony (natural and built).

The tourist attractions presently included in the current offer refer to both primary and secondary resources, but in terms of capitalization, secondary resources are better valued than the primary ones. Thus, starting from the rich cultural and historical patrimony and from the potential of the human habitats, we consider tourism operators should develop new tourism forms based on the

[1] University of Craiova, Geography Department, Romania

attractiveness of the geomorphologic resources. We do not mean primary resources are not capitalised at all, but tourism has to acquire a spatial dimension besides the temporal dimension, without ignoring the carrying capacity of the environment. The tourism potential of the geomorphologic patrimony is given by its aesthetic, scientific, cultural/historical and social/economic values (Pralong, 2005). Most of the time, the geomorphologic landscape does not have only one such value, due to its complexity. Oltenia region, located in the south-west of Romania, displays a varied and well-proportioned landscape, which increase its tourism capitalization possibilities (Fig. 1). The main landforms of the region are the plain area represented by Oltenia Plain, part of the Romanian Plain, the Getic Piedmont, the Getic Sub-Carpathians, and the mountain area represented by massifs belonging to the Parâng and the Retezat Mountain Groups.

The vertical zonation of the relief according to the lithological structure and to the features of the climatic elements imposes a regionalization of the specific geomorphologic processes. Thus, within the mountain region, the climatic and sculptural forms are modelled by the present geomorphologic processes, which induce a secondary relief. In the Sub-Carpathians, the structural and petrographic landforms are modelled by gravitational and hydric processes in an area marked by tectonic mobility, friability, and high petrographic heterogeneity. The plateau region, which is a monocline structure with fluvial-lacustrine deposits and coal intercalations, displays an alternance of interfluve surfaces and parallel North-South directed valleys. The plain unit, made up of the Danube's terraces and the piedmont plains, is an assembly with depression features and it is mainly affected by compaction and pipping; another specific element of the unit is the presence of the sand dunes, which tend to be actively modelled by wind in the context of the global climatic changes. The present natural relief modelling, under the direct influence of the external and internal agents, activating on a relief energy comprised between the extreme values of 2,519 meters (Parângul Mare Peak) and about 40 meters (The Danube Valley), as well as the man-induced modelling induced by the utilization of resources (construction rocks, salt, coal, oil, natural gases) is present within all the units and it brings to the formation of new landforms. Consequently, we consider that tourism operators should take into account primary resources, particularly the potential of the glacial and periglacial landforms, which are quite accessible in certain areas, of the karst areas that cover large surfaces of the region or of the sand dunes located near or within the Danube's floodplain. We also suggest the capitalization of the technogene relief, which is well developed within the piedmont area that does not have an increased natural or anthropogenic potential. The areas displaying the highest tourist potential in terms of both primary and secondary offer are represented by the mountain and Sub-Carpathian region, which also dispose of a better infrastructure than the lower regions, namely accommodation facilities and lines of communications. The main identified issues are about the training of tourist operators with regard to the potential of primary resources and to its integration into the classical offer and about adequate promotion activities. Thus, brochures

should include scientific information about the formation and evolution of the landforms, climate, ecological system, etc. There should be also taken into account the placard system, which proved to be extremely efficient in spots without guiding.

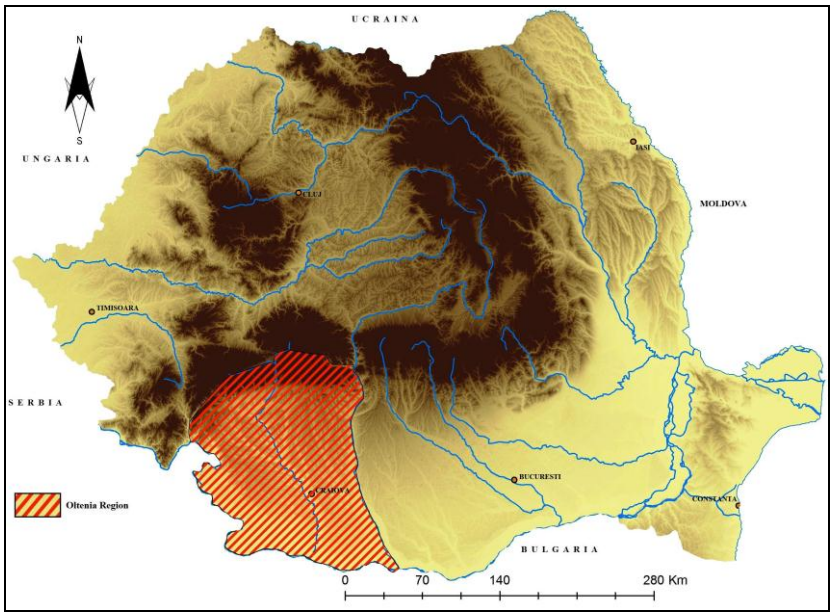

Figure 1. Geographical location of the Oltenia Region within Romania

2. Presently capitalized tourism resources

Oltenia is one of the most complex regions in Romania in terms of tourism potential, referring here to both natural resources and cultural, built patrimony, in other words, the primary and the secondary resources (Fig. 2).

2.1 Secondary resources.

By analysing the present situation of tourism in the area, we understood that using the traditional tourist attractions, which are part of the secondary resources, might represent a good starting point for introducing the geomorphologic patrimony in the offer.

Cultural - historical patrimony. According to the Govern Degree no 68/August 26, 1994, the cultural-historical patrimony includes – archaeological sites and monuments, architectural monuments and assemblies, architecture and urbanism reserves, memorial buildings and monuments, plastic art and commemorative monuments, technical monuments, historical sites, parks and gardens (Cândea, Erdeli & Peptenatu, 2003, p. 227). The region displaying the highest anthropogenic potential is represented by Subcarpathians, where there are numerous settlements famous for their monasteries, old churches, and monuments. Thus, Hurezi settlement represents the greatest assemble of medieval architecture from the former Walachia (Ielenicz & Comănescu, p. 260). Hurez monastery is a

UNESCO monument, built in 1694 by Constantin Brancoveanu, in a unique style named after the great ruler. In its proximity, there are also other old monasteries, such as Cozia, in the Olt Defile (1387, built during Mircea cel Batran reign), Arnota (1636), Dintr-un Lemn Monastery (the 16th century). Lainici Monastery is placed in the Jiu Defile, within an enlargement area and it was built in 1810. Tismana monastery is another important architectonic and cultural monument dating from the 14th century (1375-1378).

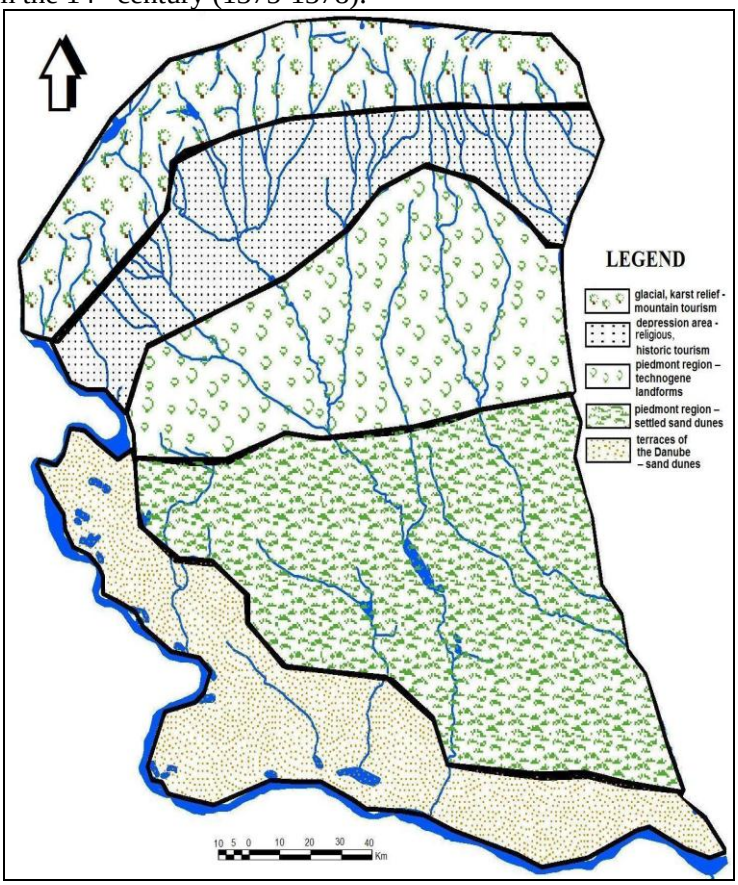

Figure 2. Tourist areas within Oltenia

Then, we mention the main cities of the region, some of them well-known for their ancient monuments that attract quite a large number of tourists. For example, in Tg. Jiu, we find some of Brancusi's most famous works – The Table of Silence, The Alley of Chairs, The Kissing Gate, The Dacian Table and The Endless Column, built by the famous sculptor between 1936 and 1938. Drobeta Turnu-Severin is well known for its Roman and medieval monuments – Traian's bridge (105, built by Apolodor of Damascus), the Roman camp and baths, the medieval fortress (the 13th century), etc. Even if Craiova has ancient roots (the Roman settlement of Pelendava), its monuments date from the 19th-20th centuries. We

mention Sf. Dumitru Church, which was first erected by the end of the 15th century, Obedeanu Monastery built in 1748-1753 (Bobarnac B., 1995, p. 57). As architectonic monuments, there stand out Băniei House erected by the Craiovesti boyars in the 15th -16th centuries and, then rebuilt by Constantin Brâncoveanu in 1699, the Art Museum (1907), which shelters some of Brancusi's works etc. There are other old, but less known religious monuments in many other towns - Slatina – Clocociov Monastery first mentioned in 1512, Râmnicu Vâlcea – Holly Paraschiva church (1554-1557). The south of the region also benefits from some ancient ruins – a Roman settlement at Hinova, a Roman Camp dating from the 4th century at Desa and another one dating from the 2nd-3rd centuries at Bistreț, all along the Danube River, but, unfortunately they are not well capitalized.

Human habitat. Romania is a country where there still are villages that preserve traditions or traditional preoccupations. Thus, Northern Oltenia preserves ethnographic and folkloric elements better than the southern part of the region. We mention Horezu, Peştişani, Glogova, Novaci, Vaideeni, Vlădeşti, Glodeni, Ponoare, etc. Oltenia is well known for pottery, each center having its own characteristics – Vlădeşti (Gorj), Şişeşti (Mehedinţi), Oboga (Olt), Horezu (Vâlcea). At Horezu for example, the ceramic objects are usually painted in blue and the most used symbol is the rooster. In fact, an old saying in the region mentions that a good potter must be agile as the rooster, skilful as the snake and patient as the fish. There are also some settlements that display an increased balneoclimateric potential - Călimănesti, Căciulata, Olăneşti, important spas, the springs of which have been used in the treatment of numerous diseases since old times. They are also known for the specific 19th century architecture. We also mention two ski resorts, one on the southern slope of the Parâng Mountains, Rânca, and the other on the northern slope of the same mountains, Parângul Mic, which are presently used mostly by tourists coming from the Oltenia region.

Economic and technological sites. Among the economic objectives, there are presently included in the tourist offer only some dams and the adjacent hydroelectric power plants – Portile de Fier I (Iron Gates) on the Danube River and Lotru Ciunget (on the Lotru Valley). However, unlike the lakes and dams in the western countries that have capitalized not only the energy of the waters, but also the tourism potential, these two sights in Oltenia did not manage to generate important tourist flows.

2.2 Primary resources.

Among the natural elements, the relief plays a vital role for tourism since it supports all tourism activities. The mountains, with numerous glacial, karst, conglomerates forms and landscapes, not to mention the peaks and ridges, has the highest potential of all the relief forms, plains and hills having generally a rather dull landscape. The landscape is a fundamental tourism necessity, because all the publicity is based on images that reflect the typical landscape of a particular area (Muntele, 2000). According to the Spatial Planning of the National Territory elaborated by the Ministry of Regional Development and Housing, the highest potential of the relief is displayed by three of the Oltenia counties – Vâlcea, Gorj,

and Mehedinţi, where there are many territorial administrative units considered to have the best natural environment, with a total of ten points out of ten for this criterion.

Among the locations the natural potential is capitalized in a certain degree, we first mention the karst areas - Polovragi and Baia de Fier areas in Gorj county (Polovragi cave, within the Olteţ basin and Muierii cave within the Galbenu Valley, the first electrified cave in Romania), Domogled-the Cerna Valley National Park, Piatra Cloşanilor, Corcoaia Gorges, Mount Oslea, Ponoarele area, Topolniţa and Epuran caves in Mehedinţi. These last two caves are among the most impressive in Romania, but they are protected by law since they were declared natural protected areas and the access of the public is very strict, requiring special approval. The Iron-Gates – the Cerna valley (Mehedinţi County) is ranked the first for the value of the tourism potential. There are 20 caves, 6 gorges, over 20 peaks, escarpments and slopes, 11 fossil points, all of them declared natural protected areas. The high mountain area is visited only occasionally by young groups, but there are possibilities for introducing certain areas with glacial and periglacial landforms in the general tourism offers taking into account some aspects related to the present access facilities – accommodation facilities at 1,500-1700 m altitude, forest or sheep roads, favourable climatic conditions in summer, etc.

3. Analysis of the natural tourism potential

After thoroughly analysing the landscape potential of the region, we arrived at the conclusion that there are three main types of landforms the capitalization of which should be taken into account – karst relief, glacial and periglacial landforms, sand dunes and the Danube's floodplain.

3.1 Karst relief

It presents a great tourism potential due to its unique mark on the landscape. Important karst areas are located in Vâlcan Mountains, Mehedinţi Mountains and Plateau, Buila Vânturariţa Massif, mainly individualized on Jurassic and Cretaceous limestones and secondary on Paleozoic crystalline limestones and dolomites. They form narrow ridges in Cerna and Mehedinţi Mountains and large summits in Buila Vânturariţa and Piule Iorgovan Massifs. The intense fragmentation and the horizontal and vertical dispersion of limestone masses imposed differences in terms of karst modelling intensity, as well as in terms of resulted karst landforms. There predominates the transition type, intensely to moderately evolved (Posea, Popescu & Ielenicz, 1974, p.387). The vertical zonation of the modelling conditions led to the development of two distinct karst landscapes – the karst landscape characteristic to the summits exceeding 2,000 m altitude, with asymmetrical and barren tops, avens, dolinas, dry valleys; the second landscape is that of the summits located below 2,000 m altitude, which reveals an intense polycyclic Pliocene-Quaternary evolution, with both surface and depth karst forms. This last type, as compared to the first one, is mainly covered by soil and vegetation.

Although it is quite necessary to protect caves and to reduce human impact to the minimum, some of the small caves should be opened for the public, having proper guiding and following very strict regulations. The shallow karst forms are the most representative for the landscape of the low and medium mountains in the north and north-western part of Oltenia. There are large karrens fields, in different stages of evolution, such as those in the Mehedinţi Mountains and Plateau (Poiana Mare, Stan Peak, Ponoare), dolinas, the most representative being Crovul Madvedului – the biggest in the country, 170 m deep and 1 km in diameter and Crovul Mare, 150 m deep and 500 m in diameter (Alexandru & al., 1981, p.55), the karstic valleys found throughout the Cerna and Cosustea hydrographic basins, karst springs (Izbucul Cernei, Izbucul Jalesului – protected area). There are also very picturesque gorges, such as Tesna, Corcoaiei, Cosustea, Sohodol and Oltet gorges, and steep escarpments formed on limestones with various levels of difficulty, sought by alpinism club members. The narrow sectors of the valleys greatly add to the tourism value of a particular location because of their spectacular aspect.

3.2 Glacial and periglacial landforms

Parâng represents the most massive mountains of the region (2,519 m maximum altitude). Consequently, glacial and periglacial landforms are well developed. According to the studies, there appear two types of glacial relief: the alpine type (sharp ridges, glacial cirques and valleys – located in the western side of the main summit) and the Carpathian type (characterized by flat and largely waved interfluves, conic peaks with small cirques, mainly located in the east). Within the higher sector of the mountains, there appear relict glacial landforms, and here we mention the associated glacial cirques: Gâlcescu, Găuri, Roşiile, Slăvei, Mohorul (Photos 1, 2) today a complex of lakes located at altitudes of more than 1,800 m. The present radial valleys the head of which is located in these cirques follow the former glacial U-shaped valleys. The striated rocks, ridges, moraines, saddles complete the image of the glacial relief of the area. There are 33 glacial lakes (13.1 ha), among which Tăul fără Fund or Roşiile has the largest surface (3.76 ha) and depth (Pişota, 1971). Gâlcescu is the most complex cirques, as there are located nine lakes (Photo 3).

Presently, crionival processes models the glacial landforms resulting a secondary relief represented by both surface and depth forms. If we take into consideration the slopes of the glacial valleys that evolved during the Holocene mainly due to periglacial processes, as denudation elements, there are periglacial ridges, such as the main summit of the Parâng, developed between the peaks Parângul Mare and Setea Mare. There are also nival karrens, nival ditches (within the interfluve Slivei-Roşiile, Roşiile I and II), 20-30 m long flat nival valleys (west of Roşiile cirque), periglacial niches, nival torrents, etc. As transportation elements, we mention rock fields, block streams, stone polygons, striated soils, small earth steps, earth hummocks, solifluxion forms, slides, etc. As accumulation elements, there were identified cryogenetic knolls resulted from the desegregation of the steep slopes under the direct action of freezing-defreezing process, nivation pro-

talus – located at the foot of the slopes; these are semicircular accumulations made up of side rocks of different dimensions.

Photo 1. Transalpine saddle and Urdele Passage (2,228 m)

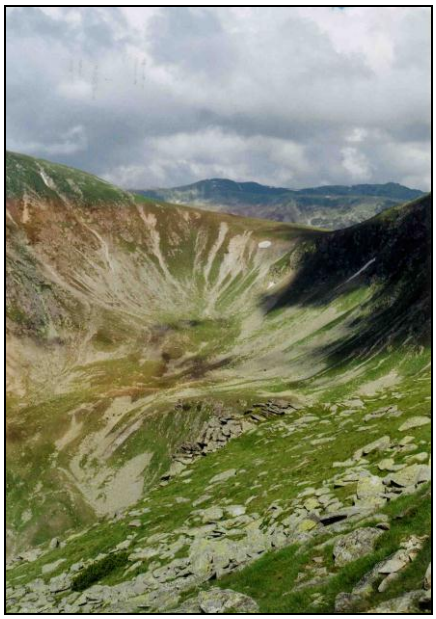

Photo 2. Mohorul glacial cirque (rock-streams, avalanche tracks, blocks field)

Photo 3. Gâlceascu and Vidal glacial lakes

3.3 Sand dunes and the Danube's floodplain.

If the aforementioned natural resources are capitalized, even at an extremely reduced scale, the south of the region, represented by the floodplain of the Danube and its sand dunes, is almost unknown even at national level. There appear two distinct sectors – a strip along the Danube River, between Ostrovu Corbului and Corabia (about 200 km long and 3 to 30 km wide) and a strip located on the left of the Jiu River, north of Craiova to its confluence with the Danube. These areas cover the floodplain and terraces of the Danube (about 250,000 ha) and they are mainly sands formed in situ, while the sands from Leu-Rotunda Plain resulted from the subjacent Levantine formations (Coteţ, 1957). The characteristic sand landforms are the longitudinal dunes, directed NW-SE (due to the predominant winds in the warm season), and other smaller dunes of the barchans type. Within the Danube Floodplain, the dunes display an irregular shape and they are not settled; as we get farther from the riverbed, on the terraces and on the left of the Jiu, the sand dunes get larger and larger, they are flatter and settled by vegetation. The length of the dunes varies between 3 and 4 km, the height between 1 and 15 m, while the width of the interdunes depressions oscillate between 20 and 800 m (Geografia României, 1983, p. 347).

Mobility of sands from southern Oltenia underwent a strong reactivation starting with the second half of the 18th century because of oak forest clearings and excessive grazing. The phenomenon increased in intensity after 1850, when the dunes moved with about 150 m/year, affecting Desa, Ciuperceni, Nedeea, Bistreţ settlements (Tufescu, 1966).

3.4 Technogene relief

Although the term of technogene relief is not frequently used in the Romanian literature in the field, Oltenia region, especially its piedmont area, was subject to an intense industrialization during the communist period. Thus, there are some large coal fields – Motru, Rovinari, where natural landforms were totally modified, resulting a secondary type of relief represented by waste damps and open pits. Surface exploitations suppose the excavation of the natural surface, namely the industrial activities transformed positive landforms into negative landforms. Consequently, they altered the natural geomorphologic system and led to the development of a new system characteristic to the coal exploitation terraces. The excavated material is mainly deposited along local valleys, which are thus filled up to the level of the interfluves, modifying the natural drainage system and alluvia carrying capacity. The second possibility is to deposit the resulted material within certain naturally concave slopes, but, in many cases, the slope stability threshold is surpassed and there occur spectacular landslides that often affect human settlements (e.g. Roşia de Amaradia – Alunu – Berbeşti coal field).

4. Results and discussions

The management, planning and development of tourism destinations is a complex action, involving more 'interested parties', numerous objectives and different timescales to be harmonized (Howie, 2003). The central and regional authorities should have a coherent policy for supporting viable tourism, and moreover, for a proper promotion of the region. It is also worth mentioning the possibilities for educational tourism, involving particularly the young generations, study trips becoming ever more popular. Lately, vacations are not only associated with fun, but also with a social achievement or an educational tool (Lohmann, 2004, p. 2). Tourism, as a form of capitalizing the natural environment and the anthropogenic patrimony, transforms the geography of numerous countries, spontaneously or following the decision of the public administration (Derruau, 1999, p. 311). The tourist attraction is generated by some natural or anthropogenic potential, with a permanent or only conjectural action. The natural tourism potential is a fundamental premise for promoting a region and for stimulating the tourists' flows. It is the fundamental factor that has led to the initiation of tourism capitalization of some components, representing the primary tourism offer from the economic point of view (Cianga, 1997, p. 25).

In order to evaluate and make an hierarchy of the territorial units, the Ministry of Regional Development and Housing, together with specialists from universities and other state institutions, used the tree method. This method is based on criteria and sub-criteria, resulting in a total of maximum 100 points, of which there were given maximum 25 points (natural environment ten points, therapeutic natural factors ten points and natural protected areas five points) for the natural tourism resources. Anthropogenic tourism resources (different historical monuments) acquired a maximum of ten of 25 points. As a conclusion, we may say that administratively speaking, landscape potential is well known, but investments

in promoting it represent the real issue. Publicity is one of the key issues in coining a new tourism destination. Proper media advertising would add to the region's positive image and perception as tourism destination.

From this point of view, Oltenia Region presents a varied tourism offer (landscape, spas, monasteries and churches, archaeological sites, piscicultural facilities, etc.). This classical tourism offer can be completed by introducing certain data about the spatial evolution of the territory, by describing the mechanisms of the processes that influenced the placement and further development of different settlements or sites. It was quite clear from the very beginning that the most increased tourism potential is hold by the mountain and sub-Carpathian regions, but the purpose of our investigation was to make a detailed analysis of the present situation, of the way tourism operators understand the value of the ecological structure and if and how they integrate it in their offer. An important starting aspect is infrastructure – accommodation facilities, access roads, shops, etc. Vâlcea County has the greatest number of accommodation units, and, of course of rooms and bed-places, followed by Gorj and Dolj, according to the data supplied by the Ministry of Regional Development and Housing. This means that the forehead mentioned traditional tourism spots benefit from the proper infrastructure, at least from the accommodation point of view.

For a better view of the situation, we applied a ten-question questionnaire to 30 pension, hotel, or motel owners from the entire analysed region (Table no. 1). About 80% of the accommodation facilities are small family pensions (eight-ten rooms, generally double or larger), most of them being located in the mountain or sub-Carpathian area, which are traditional tourism destinations in the region. Consequently, the number of tourists per year oscillates between 150 and 300, the highest number per month being registered in December – February in the mountain region (mainly in ski resorts) or during Christmas – New Year and Easter periods in the sub-Carpathian area (there are numerous monasteries). There are some pensions and hotels, where the guests' number reaches 2,000 per year (Paradis and Tara Pensions from Rânca resort, Hotel Lexi Star from Tismana), but their percentage is extremely low. In the piedmont and plain area, the number of accommodation facilities is reduced, the most important ones being at Calafat and Bechet, near the Danube River, where we cannot speak about a "proper tourism", as the guests are just in transit. Most of the tourists come only for the weekend (about 75%), predominating either families or groups of young people. The main cities supplying tourists in the area are from the region – Craiova, Slatina, Drobeta-Turnu Severin, and from Bucharest. The conclusion is that the region is not known at an international level, promotion activities being quite poor. 'Promotion is the manner in which a company seeks to improve customers' knowledge of the services it sells so that those who are make aware may be turned into actual purchasers' (Page, 2003, p. 256). Without promotion, we can hardly speak of any tourism development.

Taking into account the present economic background, owners are extremely interested in promoting new tourist activities, and we make here direct reference to

the landscape potential, but according to their answers, they make no clear difference between natural and cultural values. Asked about the information tourists require about different 'natural spots', about 40% of them referred to monasteries, churches, monuments, etc., which means they are not informed at all and offer just accommodation; however, there are also some investors who recognize the high quality of geotourism. Thus, at Rânca for example, some pension owners have understood that the glacial and periglacial landforms may represent a potential new tourist attraction and they have already bought some field cars able to reach the area, but they do not have adequate information about the processes involved in the formation and evolution of these landforms. Better-trained and informed staff of the accommodation facilities is a 'must' for quality services on one hand, and for giving the correct information required by tourists, on the other hand. It is also important that they have communication skills in order to be able to give the tourists not only correct and updated information, but also the feeling of comfort and safety.

There are some brochures and guides offered by the County Tourism Agencies, but they do not have much information about the landscape potential. The published papers about the geology and geomorphology of the area are very technical and they are not particularly useful to geotourists. Consequently, the major shortcoming, especially for casual geotourists, is the lack of populist booklets and leaflets dedicated to natural monuments together with a tourist guide to the natural parks. At the same time, placards are one of the most efficient tools in terms of conveying geomorphologic information to tourists in an adequate way. In Oltenia, the placard system is almost absent and we consider this is the best way to promote a hotspot without proper guiding. There are some relevant requirements in terms of information that have to be respected. Placards should contain basic notions regarding the exact location of the tourist spot, the geologic background and evolution, the mechanisms and processes influencing present landforms, climatic and topoclimatic features, river system, type of ecological system, general rules about environment protection, etc.

The content of a placard should depend on the site you promote. For example, in the high mountain region the accent has to be put on geologic background, climate evolution and their influence on the development of present geomorphologic processes, without neglecting ecological aspects – vegetation adaptation to the environment and specific faunistic elements. In mountain areas, it is also extremely important to emphasize the vertical zonality and thus, placards should contain information adequate to each altitudinal level. In karst areas, a short description of the processes leading to the development of surface or depth karst forms would be adequate, as well as some numerical data (e.g. the period necessary for the deposition of one centimetre of a stalagmite) in the attempt of making tourists more aware about the fragility of such areas. In the case of palaeontological sites, it is important to offer the tourist a perspective of the former environment and of the way fossils looked like. In others words, it is about conferring a scientific value to placards and, at the same time, about adapting scientific information to the

tourists' capacity of perception. This is why proper illustration should be added in order to make tourists understand the processes easily.

Thus, by overlapping the areas with increased natural potential and good present infrastructure, we consider that the best perspective for introducing the geomorphologic forms in the tourist offer is registered by the sub-Carpathian region. It is suitable most of all not for the mass tourism, but rather for the independent travels 'seeking in a destination both activities and experiences that are Rewarding, Enriching, Adventuresome, and a Learning experience – the REAL tourism' (Howie, 2003, p. 1).

5. Conclusions

The varied landforms and accessible underground features make Oltenia Region ideal for the study of the relationships between geomorphology and tourism, which is the very essence of geotourism, a form that is gaining more and more supporters from the tourists' part. Due to its scenic, scientific, or cultural value, the geomorphologic patrimony within Oltenia is an important tourism resource, poorly managed so far. The region attracts mainly the people of the five component counties, having quite a minor role in the national tourist flows, despite its great natural resources. One of the major causes is the lack of proper promotion, the scarce publicity materials such as posters, flyers, brochures, advertisements, placards, and updated tourism web sites. The knowledge and skills of the operating staff in the hospitality sector for the settlements with the highest tourism potential in the region is also a disregarded aspect. Recently, the need for qualified personnel has increased due to the high number of hotels and other accommodation establishments recently built, all of them requiring trained staff, on the one hand, and to migration, on the other hand.

However, both tourists and tourism operators should not forget the fragility of the major geographical sites such as the karst areas (The Sohodol Gorges and the numerous caves in the area – the Valcan Mountains, the karren field and the natural bridge from Ponoare – the Mehedinti Plateau). Consequently, we strongly believe that tourists should be instructed with regard to the effects their actions may provoke to the environment. In the future, there are also required some measures to restrict the timing and volume of visitor ingress.

Nevertheless, we remain confident that the geomorphologic patrimony within Oltenia is a key point for tourism development. Moreover, since the number of foreign visitors is not significant, Oltenia tourism depends heavily on the domestic demand. The tourism in the region could also benefit from the current economic crisis, when most travellers are forced to cut down the holiday costs, choosing a holiday in the home country. In this way, tourism acquires, besides a temporal dimension, which used to be prevailing, a spatial dimension, as well that represents the present tendency in evaluating all the activities by means of eco-compatibility. By integrating these two dimensions in the offer, there can be better evaluated the carrying capacity of the region, the tourism offer leading to the maximization of the tourism activity without surpassing the sustainability limit.

REFERENCES

Alexandru, M., BADEA, L., BUZA, M., DINU, M., DRUGESCU, C., SENCU, V. (1981) *Valea Cernei. Studiu de geografie*. Editura Academiei R.S.R., Bucureşti.

BOBÂRNAC, B. (1995) *Monumente şi rezervaţii ale naturii, obiective istorice şi turistice din Oltenia*, Editura Didactică şi Pedagogică, Bucureşti.

CÂNDEA, M., ERDELI, G., SIMION, T., PEPTENATU, D. (2003) *Potenţialul turistic al României şi amenajarea turistică a spaţiului,* Editura Universitară, Bucureşti.

CIANGA, N. (1997) *Turismul din Carpaţii Orientali*, Editura Presa Universitară Clujeană, Cluj-Napoca.

COTEŢ, P. (1957) *Câmpia Olteniei*, Editura Ştiinţifică, Bucureşti.

DERRUAU, M. (1999) *Geographié humaine*. Editura Armand Collin, Paris.

HOWIE, F. (2003) *Managing the Tourist Destinations*, Thomson Learning, London.

IELENICZ, M. (1999) *Dealurile şi Podişurile României*, Editura Fundaţiei „România de Mâine", Bucureşti.

IELENICZ, M., Pătru, I.G., Ghincea, M. (2003) *Subcarpaţii României*, Editura Universitară, Bucureşti.

IELENICZ, M., Comănescu, L. (2006) *România. Potenţial turistic*, Editura Universitară, Bucureşti.

LOHMANN, M. (2004) *New Demand Factors in Tourism*, European Tourism Forum, Budapest.

MUNTELE, I. (2000) *Geografia turismului*, Ed. Universităţii Alexandru Ioan Cuza, Iasi.

PAGE, S.J. (2003) *Tourism management*, Butterworth-Heineman, Oxford.

PIŞOTA, I. (1971) *Lacurile glaciare din Carpaţii Meridionali*, Editura Academiei R.S.R., Bucureşti.

POPESCU, L., NEGREANU, St., VADUVA, I. (2009) *Directions and possibilities for capitalizing the touristic potential of the relief within Oltenia, Romania,* Proceedings of the Third International Scientific Conference – FMNS2009, Blagoevgrad.

POSEA, Gr., POPESCU, N., IELENICZ, M. (1974) *Relieful României,* Editura Ştiinţifică, Bucureşti.

PRALONG, J.P. (2005) A *method for assessing tourist potential and use of geomorphological sites*, Géomorphologie relief, processus, environnement, 3/2005, URL: http://geomorphologie.revues.org/index350.html

REYNARD, E. (2003) *Géomorphosites et paysages*, Géomorphologie: relief, processus, environnement. 3/2005, URL : http://geomorphologie.revues.org/index338.html

RITCHIE, J.R.B, CROUCH, G.I. (2003) *The Competitive Destination. A sustainable tourism perspective*, Cab International, Trowbridge.

ROŞU, Al. (1967) *Subcarpaţii Olteniei între Motru şi Gilort*, Editura Academiei R.S.R., Bucureşti.

TUFESCU, V. (1966) *Modelarea naturală a reliefului şi eroziunea accelerată*, Editura Academiei R.S.R., Bucureşti.

*** (1969) *Geografia Văii Dunării Româneşti*, Editura Academiei R.S.R., Bucureşti.

*** (1983) *Geografia României, I, Geografia fizică*, Editura Academiei R.S.R., Bucureşti.

*** (1987) *Geografia României, III, Carpaţii Româneşti şi Depresiunea Transilvaniei*, Editura Academiei R.S.R., Bucureşti.

*** (2005). *Geografia României, V, Câmpia Română, Dunărea, Podişul Dobrogei, Litoralul Românesc al Mării Negre şi Platforma continentală*, Editura Academiei Române, Bucureşti.