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RESEARCH ON SUSTAINABLE DEVELOPMENT IN THE MUNICIPALITY OF PIATRA NEAMŢ FOCUSING ESPECIALLY ON PERIURBAN ZONE GÂRCINA

Thesis Summary

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Iaşi

2015

This study entitled "Research on Sustainable Development in Piatra Neamt with special focus on peripheral areas Garcina", is a detailed analysis of all the changes that took place in Piatra Neamt and Gârcina, from 1990 to present. Identifying indicators underlying the urban and rural development led to the establishment of the development level of quality of life.

PhD thesis puts into focus the role of the concept of sustainable development in achieving a balance between society, economy and environment, more than satisfactory balance in order to create a sustainable society to harness available resources so that future generations to enjoy the same skills at the same intensity as those present.

The paper deals with the seriousness and complexity of sub-urbanization concepts of sustainable development, the role of the Piatra Neamt natural area and Gârcina, geodemographical specificities, economic growth, environmental factors is essential in organizing rural-urban and spatial planning.

The approach of geographically sustainable development is a new way to present the essentials of life to shape a sustainable community logic. Chosen research area is an area with a high growth potential due to the opportunities it provides and which should be addressed at their true value, to achieve a balance between quality of life and environmental quality.

Diversified character of geographical research methodology is output methods, techniques and means of addressing the chosen theme: the interpretation of statistical data (stistico mathematical method) obtained from the Department of Statistics Neamt - Neamt DRS (population censuses in 1992, 2002, 2011 and sheets for each municipality in Neamt County), data from various institutions (APM Neamt, Neamt SGA etc.), bibliographic research method, observation method, method cartographic personal sampling data (laboratory and based on questionnaires).

In **chapter 1** are presented theoretical issues related to sustainability and sub-urbanization. The emergence of the concept of sustainable development was required by destroying the ecological balance and social-economic dysfunction manifesting high intensity. In this context, it is desired that the socio-economic activities to be carried out under the conditions of a civilized society and a modern economy, subject only to the laws of nature.

On the basis of sustainable development indicators can quantify the level of development in an area, who are carefully selected based on conditions in the field.They are developed according to the objectives of sustainable development: ecological indicators, social, economic. Over time, rural areas were not addressed in the same way as urban areas, rural analysis is often explained fragmentary and incomplete substantiated. The values it holds rural areas is overshadowed by subordination to the city, in terms of economic, social

and cultural. Peri-urban area and city are inseparable areas, Gârcina is integrated into the suburban areas Piatra Neamt is a dynamic space in which the intensity of connections to the nearby city gives adapted to urban development.

In **Chapter 2** presents the research was partially subcarpathian mountain region, which overlaps the administrative area of Piatra Neamt and Gârcina (located about 15 km from Piatra Neamt), located in the central part of the county Neamt .

Due to the geographical position of Piatra Neamt, located between peak Pietricica Cernegura and Cozla, evolution and its development is of a tentacular, links to other settlements are favorable for the development of this urban settlements.

The location of the interaction between the carpathian and subcarpathian area in the confluence of Bistrita with some of the tributaries, which forms a complex depression, is a favorability to create living spaces. The terraces of Bistrita merged with that of Cuejdiului offers the possibility of building since the meadow and reaching the slopes and interfluvial plateaus.

This complex was a permanent living space, with a long history, the oldest attestation is from the Stone Age. Evolution of Gârcina settlement system is the result of complex interactions between the natural and the social-economic, which can illustrate the continuity of habitation from ancient times.

The first evidence of prehistoric people have been discovered in the village Almas (Hill Hârcu) Eneolithic Age, Iron Age were identified Gârcina in Oprişeni hill.

Piatra Neamt municipality and Gârcina major geotectonic unit overlaps Carpathian Orogen, namely the Moldavidelor Carpathian unit, which includes the external flysch and sub-Carpathian canvas.

Study area overlaps relief units belonging to the Eastern Carpathians (Stânişoara mountains and mountains Gosmanu) and Subcarpathians Moldova (Cracău Depression-Bistrita).

Stânişoarei Mountains are well represented in the city Piatra Neamt and Gârcina, the main peak has a general NW-SE orientation and complies with the geological structure. 70% of the commune is the relief of the flysch.

The warmest month is July (Piatra Neamt recorded 19.6 ° C and 18.8 ° C Cuejdiu) and the coldest is January (Piatra Neamt recorded -2.1 ° C and -3 ° Cuejdiu C). Early autumn frosts late spring and cause damage in agriculture (spring crops, fruit trees, vines, etc.). In the period 1971-2011, June is the month which recorded the highest values of rainfall (115,5mm), but since 1981 and until 2011, replaces June to July (119,5mm).

In the months of winter season, rainfall is lowest, February recorded the lowest average amounts (in the range 1971 to 2011: Piatra Neamt 20 mm / 25.1 mm Cuejdiu).

Piatra Neamt hydrographic network consists of Bistrita River, its tributaries, plus reservoirs "BâtcaDoamnei", "Pergodur" ("Reconstructia"). Gârcina river system is made up of two streams: Cuejdiul and Almaşul.

In the analyzed soils are highlighted five classes: cernisoluri, Luvisols, Cambisols, hidrisoluri and protisoluri (young). The area is part of the "central phytogeographical region - Europe, Eastern Province - Carpathian".

In **Chapter 3** we showed socio-economic aspects of the proposed research area. The numerical evolution of the population varies between 1990-2013, the population of Piatra Neamt continually decreasing since 1995 (due to economic restructuring, population migration abroad, rising unemployment, decreasing natural balance), and in Gârcina continuously increasing since 1992 (due to migration from urban areas).

Regarding Gârcina this indicator is -0.18% during 1990-2002 and during 2002-2013 is positive (0.65%), showing the trend of concentration of population in urban areas in the countryside.

Population density in Piatra Neamt is 89.6 inhabitants / km2 (2011) compared with 2002 and 1992 when the values are higher (99.7 inhabitants / km2 respectively 101.8 inhabitants / km2). The average population density of Gârcina is 53.85 inhabitants / km2 (2011), a figure which is down from 86.21 inhabitants / km2 (1992) to 78.19 inhabitants / km2 (2010), due to departures from the area the inhabitants.

General mortality rate is calculated from 1990-2013 and has two different situations: in Piatra Neamt, the mortality rate is increasing (period 1900-2002 has lower values than the range 2003 to 2013), the lowest value was recorded in 1993 (6.17 ‰) and highest in 2013 (10.1 ‰); Gârcina in the overall death rate is decreasing (range 1900-2003 higher values than the range 2004 to 2013), the highest value was recorded in 2003 (17.29 ‰) and the lowest in 2013 (10, 5 ‰) - Fig. 30.

In the Piatra Neamt, the overall balance is positive and decreasing population in the period 1990 - 1995 (maximum value in 1990 is 16.69 ‰ and 3.88 ‰ minimum in 1995), and between 1996-2013 is negative and decreasing with one positive value (0.15 ‰ in 1999). General balance sheet generates negative value decreasing number of people with serious socio-economic structure.

In Gârcina stands opposite situation, in that general demographic balance is negative only in 1991-1992 (1990 low of -14.06 ‰), 1995, 1996 and 2004 were positive in the

previous years (2002 maxim Aging index calculated for Piatra Neamt increase of 33.53% from 1992 to 104, 64% in 2013. This highlights the special rate of growth of the elderly population, with major negative effects on the entire community, in terms of population and economy. An identical situation is encountered in Gârcina, where this index has higher values than in urban areas.

Among demographic and economic system there is a dynamic interdependence. The degree of involvement of the population in economic activities subpopulations are two types: active and inactive.

The share of active population of the total population in the city of Piatra Neamt, 1992 decreased in 2002 from 51% to 47%, which reveals that the share of inactive population increased due to aging phenomenon, the increasing number of retirees, emigration . In 2011, the working population decreases even further, reaching 41%. In Gârcina the situation is similar, decreasing the share of the working population in 2002 compared to 1992, from 41% to 33%, the majority of inactive population in 2011 increased again to 41% .

Due to existing trends in economic structure, number of employees is decreasing, the service sector is better represented.

In Piatra Neamt evolution does not significantly alter arable land by 2009 (1133 ha). In 2010 this area decreases progressively until 2013 to 782 ha.

In Gârcina arable land by 1992 is maintained constant (1019 ha). Follow involution surface until 1993 (967 ha) and a constant period. Since 2000 there is a significant increase of arable land, reaching 2008-1019 ha, followed by a sharp reduction by 2010 (805 ha). This year 2013 is approximately constant surface. Decrease in the number of students is directly proportional to the decrease of teachers, and medical personnel is evident in both localities.

In **chapter 4** are presented the issues of environmental factors: air, water, soil and some remarks about waste management. Daily maximum air pollutant emissions measured at urban background station NT1 Piatra Neamţ, in 2010-2014, show that the indicators particulate matter PM10 and PM2,5 exceeded the limit of 50 µg/m3 and 25 µg/m3. The most significant overtakings were in 2013 (25 and 26 October) to PM10 (153,61 µg/m3) and in 2011 to PM2,5 (130 µg/m3).

The quality of water is particularly influenced by human activity, pollution beeing inevitable in areas where no action is taken to improve. The quality of water Bistrita is located in grade I, overtaking is not registered to any indicator. The quality of water Cuiejdiu is placed in grade-II on indicators for oxygen (biochemical oxygen demand), nutrients (ammonia and nitrite) and Mn.

The municipality of Piatra Neamţ is supplied with water from two sources: groundwater intake front Vaduri (located about 6 km west of the city, is a source of groundwater, with a capacity of 678 l/s, being equipped with a chlorination station) and the Bâtca Doamnei accumulation (is a surface water source - dam, with an additional capacity of 308 l/s, being equipped with a modern treatment plant). The commune of Gârcina (only Gârcina village and Cuiejdi) has water supply network of the two sources.

Saving drinking water is made through 10 tanks, totaling a volume of 21300 m3 of water. The quality of drinking water is performed based on data from APASERV Neamţ. All the analyzed indicators do not exceed the maximum limits.

Assessment of soil quality is very important in many human activities (agriculture, forestry, geotechnical, environmental protection, etc.), depending on which user can establish strategies and sustainable exploitation of it.

In the municipality of Piatra Neamţ, respectively Gârcina were performed 10 soil profiles, taken from different plots of land (Fig. 122). From these profiles were collected 84 samples. Sampling was conducted on depths, depending on the thickness of horizons. The location was determined using GPS. In the laboratory, samples were subjected to a series of physical and chemical analysis: pHwater, the amount of humus, sand-dust-clay percentage, SB, AH, T, V, using standard methods.

As a result of analyses carried out, the following measures of improvement are necessary: remove excess moisture to the surface, normal fertilization of soils, works on the level curve, works to combat landslides, combat pollution by cutting waste disposal.

According to the map landslide risk undertaken by Neamţ County Council, the most affected areas in Piatra Neamţ are on the eastern and western Massif Cozla, Cârloman, Pietricica and the Doamna area (Hill Brăjineasa). In Gârcina, landslides highest risk are present in the eastern part (between the villages Gârcina and Almaş - Hill Brânzei, Runcului Forest, Mărineasa Forest, peak of Pleş) and the Gypsy valley (right tributary of the River Cuiejdi). Gârcina is a vulnerable area to nitrate pollution.

The impact of waste on the environment and human health is a major one, waste having a negative effect once that is done (in amounts increasingly more) until it is removed. The amount of waste collected in Piatra Neamţ in 2013 decreased by 32% from 2009 due to the amplification process recycling and recovery of waste. Through improper storage of waste, there is the possibility of contamination of both the population with various substances and microbiological contamination of soil and groundwater and surface waters (through solid

waste deposited on the banks of the rivers or floating on the water) and changing aesthetics of the area.

In **chapter 5**, we used the method of quantifying sustainable development index introduced by Sergio Sepúlveda (Inter-American Institute Cooperation for Agriculture - Costa Rica) according to the following dimensions: demographic, economic, educational, health, housing, utilities and networks environment. Selected time interval overlaps the years that were conducted censuses: 1992 or 2002, 2011.

According to the characteristic period index values, can be interpreted the level of development size: 0 - 0,2 – collapse, 0,2 - 0,4 critic, 0,4 - 0,6 unstable, 0,6 – 0,8 stable, 0,8 - 1 optimally. Final determination of sustainable development index (weighted average method) was achieved by providing a degree of importance (relative percentage, with values between 0 and 1, so dividing the result by 100 not be performed). Thus, I have given the demographic size 0,3, the economic size and health 0,2, for education, housing, utilities and environmental networks I have given 0,1. Thus, for 1992, the index is 0,58 (unstable), for 2002, the index is declining, the value being 0,39 (critical), then in 2011 there is a return to the stage unstable – 0,53.

For the commune of Gârcina I proceeded in the same manner. Final index shows the highest value in 1992 (0,5), when the system is characterized by an unstable state, followed by a critical state in 2002 (0,31), the lowest index values. In 2011, the system becomes unstable (0,4), showing a slight trend to the previous situation.

Sustainable development index provides information about the level of development of the analyzed area. The development of the commune Gârcina is strongly influenced by the balanced development of Piatra Neamţ, through its role as a trading center for agricultural products (rural population access to markets increases income), center for the supply of goods and services to rural areas (education, health, jobs).

Based on selected indicators (demographic, economic and environmental), the global development index highlights in 2002 the lowest level of development (critical) due to lower values of selected indicators to other years, situation valid for both municipality of Piatra Neamţ and commune of Gârcina. There is an improvement in 2011 compared to 2002, resulting in an improvement indicator values system status (but is still unstable).

In Chapter 6 I presented proposals on sustainable development in municipality of Piatra Neamt and commune of Gârcina. This area needs efficient implementation of strategies and measures that promote the area from all points of view: economic, tourism, administration etc. Being located near the city, the commune of Gârcina is part of the peripheral areas, whose

development is closely linked to the history of urban development, the two units complete each other.

The major problems facing the city Piatra Neamt and the commune of Gârcina are related to pollution Bistrița river bed, Cuejdiu, Lake Bâtca Doamnei; degradation slopes by landslides; deforestation, destruction of green spaces; urban air pollution and noise pollution due to vehicular traffic etc. In order to solve these, it must be developed an environmental infrastructure to EU standards, the level of pollution being maintained within the limits imposed. Environmental education plays a key role in preventing environmental problems because people are more informed about how they should behave with nature and furthermore, they realize the existing problems, being able to help solve them faster.

In chapter 7 are presented the final conclusions. The chosen research area is an area favorable for development because of the opportunities it provides and which should be raised at their true value, to achieve a balance between quality of life and environmental quality.

The effort to achieve sustainable development is shaped by political footprint, locally acting factors being limited by their own interests. The right to life and human society to a healthy environment, stimulates finding solutions to address existing dysfunctions, the practice of sustainable development requires more interest from local authorities.

The population is able to achieve an economic framework compatible with nature, but also to the interests of present and future generations that coexist and succeed in development, but without institutional support, legislative can't be conceived future scenarios in which the present should play an increasingly better and safer time.

Quality of environmental factors is a very important aspect of development of analyzed area, water, air and soil having suffered due to human activities, lack of education and lack of involvement in protection actions of outdoor environment. Heavy traffic and polluting companies functioning degrades air quality, illegal dumping of chemical pollutants in surface waters lead to increased pollution of watercourses Cuieji and Bistrița, and the specific geographical area is restricting the use of intense agricultural land, waste disposal chaotic causing pollution thereof.

The methodology for quantifying sustainable development index has allowed the identification of development stage of rural and urban development over the interval 1992-2011, this trend is downward in the range of 1992-2002, when the system evolves from unstable to a critical stage, recording an imbalance visible due to socio-economic implications mentioned (decrease labor, aging population, high share of the tertiary sector, etc.) and environmental pollution.

Each historical analysis in part helped estimate the final index, between 2002 - 2011, the system recording a positive trend, reaching again unstable state. Analysis of the dimension of sustainable development from the perspective of sustainable development involves assessing population structure and dynamics in direct relation to the issues of economic growth and environmental, local development requiring the existence of a local partnership, which would lead to an increase in the quality of life.