

The natural movement of the population

Case study – Craiova Municipality

¹IONUȚ-ADRIAN DRĂGULEASA
Faculty of Sciences, Geography Department
University of Craiova
Str. A. I. Cuza 1, 410087
Craiova, Dolj, ROMANIA

Abstract: - The natural movement is a component of the population dynamics and refers to changes in population numbers and structures due to births, deaths, marriages and divorces. This study presents an analysis of the evolution of natural population movement indicators over the period 2000-2020.

Key-Words: - City, geographical location, population, density, Craiova Municipality, ArcGIS 10.1.

Received: May 21, 2021. Revised: March 23, 2022. Accepted: April 25, 2022. Published: June 22, 2022.

1 Introduction

The name Craiova is mentioned in a document dated 1 July 1475, related to the nobleman Neagoe ot Craiova, and the name "city of Craiova" is mentioned in a document dated 25 July 1582 [1, cited by 2].

The Municipality of Craiova is located at the contact of the piedmont hills with the plain, on the terraces on the left side of the Jiu River, the city's hearth descends like an amphitheatre, up to the river valley [3], the location of Craiova is at the contact between two relief steps, the Getic Piedmont and the Romanian Plain, in the wide corridor of the Jiu river [4].

The urban settlement of the Municipality of Craiova extended on the terraces of the Jiu River, which is in the form of an amphitheatre downstream from the confluence with the Amaradia River (Fig. 1). The area appears as an extensive depressional corridor, located at the contact between the Oltețului Piedmont and the Bălăciței Piedmont in the north and the subunit of the Olteniei Plain - Romanașilor Plain in the south [4].



Fig. 1 Râul Amaradia
Source: download after [5]

More specifically, the components converging towards the limits of Craiova are: Tesluiului Plateau- a subdivision of Piemontului Oltețului to the NE, Piemontul Bălăciței to the NW and W, and in the south-eastern part, the Plain of Leu Rotunda - a subdivision of the Romanașilor Plain [4], (Fig. 2).

The Municipality of Craiova is considered a polarizing nucleus of the Craiova Metropolitan Area, which comprises 24 administrative and territorial units (ATUs), of which there are three urban and 21 rural units. The Craiova metropolitan area covers an area of 149,862 sq. km and has a population of over 350,000 inhabitants.

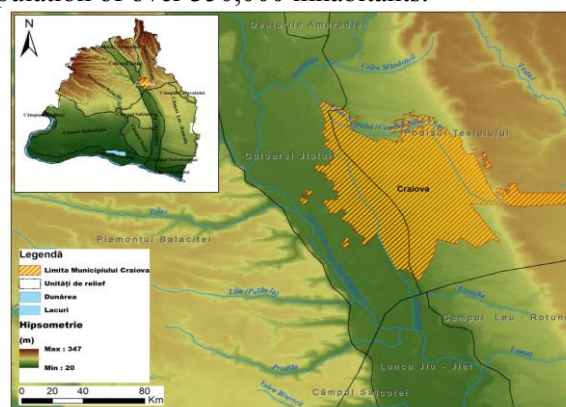


Fig. 2 Physical-geographical location of Craiova Municipality

Source: ArcGIS 10.1 data processing [23]

The urban development of the Municipality of Craiova and the peri-urban areas of Craiova was conditioned by the following factors: favorable

natural conditions, resulting from the complex natural framework (geomorphological, geological, climatic, hydrological potential), accessibility of transport infrastructure (road, rail and air).

The morphological units of the valley, the terraces and the Jiu River valley are the effect of tectonic and neotectonic movements, thus the very meandering course of the Jiu River has created a valley running over a width of 3.5-4 km, directly influencing the rate of erosion of the slopes, manifested especially between Breasta and Podari [6].

Craiova's position on the 44° parallel places it in the temperate climate zone [7], more precisely in the sub-sector with a transitional climate outside the Carpathian arc, characterized by an accentuation of the climatic continentalism, with summers dominated by clear and warm weather [8].

In addition to the influence of the continental air masses, Mediterranean and continental and tropical air masses also make their presence felt. The characteristics of the air masses and their interaction with the active surface lead to a transitional climate between lowland and low hill climates.

Geographically, the city of Craiova is located near a river, Jiul River, which never dries up and flows into the Danube, which can be used for navigation and its valley for recreation. Around the town there is a remarkable agricultural area, suitable for cereal crops (wheat, barley, oats, corn, sunflower, oilseed rape, etc.), fruit and vine growing, as well as livestock breeding, activities that show a great economic potential [6].

Ianoș [10] states that geographically, the city represents a semi-closed thermodynamic and informational system, between itself and the other systems, located at variable distances, there are numerous mass, energy and information exchange relationships.

According to Cucu [11], the city is a distinct spatial formation, characterized by a high density and a special position in the process of value exchanges, in the whole of a territory, within a certain geographical region of development or a well-defined administrative and territorial unit.

Ilinca [12] believes that the city can be defined as a spatial, economic and/or social formation that works with a multitude of factors that are in close interdependence and reciprocity, in an interaction that involves spaces of considerable size, with a special role for factors of polarization or economic gravity.

The population - from my point of view, represents the totality of inhabitants on Earth, on a

continent, in a region, in a country/locality, etc. The population is therefore a complex collectivity, rendered in the form of headcount, states or stocks of inhabitants, which can be approached transversally or longitudinally.

The geodemographics - highlights the spatial and temporal differences and causes that condition demographic facts and phenomena in a territory [9].

2 Data and Methods

The basis of this study is based on the analysis of indicators specific to the natural movement of the population within the Municipality of Craiova: population by domicile, population structure by area of residence, analysis of births and mortality, nuptials, divorce, natural growth and density.

For the realization of this study, we used statistical data at the level of administrative-territorial unit, taken from the National Institute of Statistics of Romania, the data series from the TEMPO on-line database.

In addition to quantitative secondary data from databases (INS - National Institute of Statistics), qualitative primary data (observation) were also used.

Thus, according to the author [24], the method of observation is often also indicated as a process of geographical research, when considering its action aspect. It consists of the intentional tracking and the exact, systematic recording of the various phenomena to be researched, as well as the context in which they occur.

For the location of the research area we used the development of the spatial database; was made using the ArcGIS 10.1 software tool. Legend, title, scale, north, and other necessary elements of the map were added as follows: View - Layout View - Insert: Title, Legend, Scale Bar, Text, etc. (The resulting map was exported: File - Export Map, choose the place where the format will be saved (* tiff, * jpg, * bmp, * gif, etc. - recommended * tiff.) The chosen format was jpg.

3 Results and discussions

The Municipality of Craiova, one of the largest cities in the country (seventh by number of inhabitants), with a population of over 185,000 inhabitants (excluding suburban communes) in 1973 [3], with a population by residence on 1 January 1992 - 307,077 inhabitants, 2002 - 314,918 inhabitants, 2011 - 311,909 inhabitants, 2021 - 296,359 inhabitants [date insse.ro, cited by 2].

On 1 July 2020, the population of the Municipality of Craiova (Fig. 3), was 298,488 inhabitants, of which 140,080 men (47%) and 158,408 women (53%).



Fig. 3 Population by domicile on July 1, 2020 in Craiova Municipality

Source: cited by [2]

This structural category refers to the distribution of the population by gender, resulting in two demographic components: female population and male population. The gender structure is assessed according to the share that one of the two categories has in the total population and by the ratio of masculinity (femininity), [13].

The human settlements are identified according to certain quantitative and qualitative criteria into two types of environments - rural and urban, which define rural and urban population [14].

According to the final results of the Population and Housing Census of October 2011, for the Municipality of Craiova, the dynamics of the population by residence environment is as follows (Fig. 4).

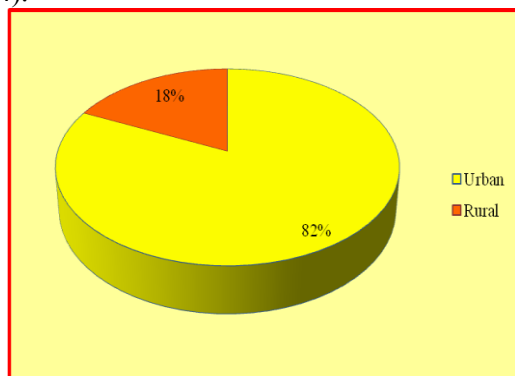


Fig. 4 Population structure by areas of residence in Craiova

Source: inse.ro data author's own processing [22]

Birth rate - is the frequency or intensity of births in a population or subpopulation; it is measured using statistical indices [13].

We distinguish between [15]:

a) Crude or overall birth rate (index), which represents the total number of live births over a period of time (year, half-year, month, etc.) in

relation to the average population of a territory or locality. Thus, the following formula is used:

$$N = \frac{Nv}{Pm} \times 1000, \text{ where:}$$

N = crude or overall birth rate (index)

Nv = total number of live births

Pm = average population (an average of the number of inhabitants for a given period).

Birth rate in Craiova (Fig. 5), registers in the period 2000-2020, a maximum of 2901 people in 2010 and a minimum of 2279 people in 2002.

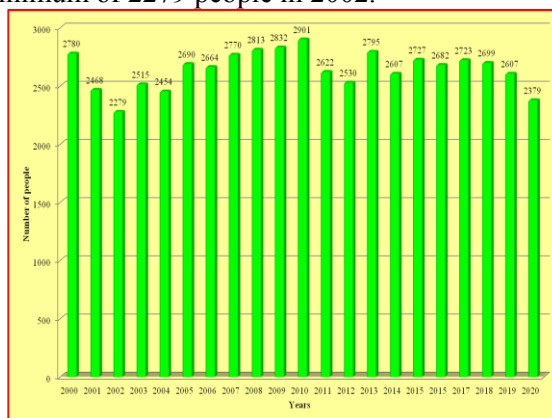


Fig. 5 Birth rate in Craiova Municipality Source: inse.ro data author's own processing [22]

b) Total birth rate (index), which is the total number of births (live and dead) in a given period of time in relation to the total population; we use the following calculation formula:

$$Nvm = \frac{Nv + Nm}{Pt} \times 1000, \text{ where:}$$

Nvm = total birth rate (index)

Nv = number of live births

Nm = number of stillborn

Pt = total population (the number representing the absolute value of a population or sub-population, determined by registration, census, special surveys or estimation in a given territory).

Mortality – it is the frequency of deaths over a given period within a population or population category; it is a determining factor, along with fertility and migration, in population structure and dynamics [16].

$$M = \frac{D}{P} \times 1000, \text{ where:}$$

M = mortality rate (index)

D = number of deceased

P = average population size

In the analyzed period 2000-2020 (Fig. 6), mortality registered a maximum of 3381 deaths in 2020, as a result of the SARS-CoV-2 virus.

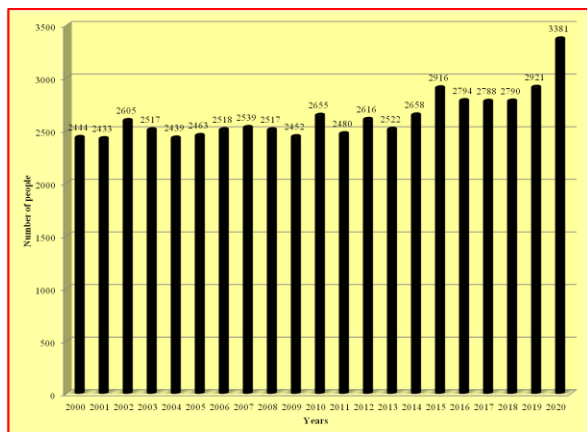


Fig. 6 Mortality in the Municipality of Craiova
 Source: insse.ro data author’s own processing [22]

Marital status - defines the number of marriages concluded or existing within a given period of time, usually a calendar year [17].

The marital status, as a demographic indicator, shows the ratio of the number of marriages to the total population at a given time [18].

In 2007 (Fig. 7), the marriage registered a maximum value of 2512 marriages and in 2020 it registered the smallest decrease of 841 marriages. The decrease is due to restrictions imposed by the authorities to prevent the spread of the SARS-CoV-2 virus.



Fig. 7 Marriage in Craiova

Source: insse.ro data author’s own processing [22]

Divorce - is the number of divorces that have occurred in a population over a period of time, usually a calendar year [17].

Analyzing (Fig. 8), it is found that in the period 2007-2010 there was the biggest difference in divorces, in the Municipality of Craiova.



Fig. 8 Divorce in the Municipality of Craiova
 Source: insse.ro data author’s own processing [22]

Natural increase (natural balance) - is the difference between the birth rate and death rate of a population as measured by the natural increase or natural growth rate [19].

It is obtained by the difference between the birth rate and the death rate:

$$S = n - m \text{ where:}$$

S = natural increase

n = birth rate

m = death rate

Density - is the value by which we assess the quantitative relationship between the population and the territory it occupies [20], it has a particular qualitative value in practical work. In the geographical practice, we distinguish first of all, the average or general density which expresses the ratio between the number of stable inhabitants in a given territorial unit, usually square kilometers or hectares. The average or overall density is obtained as follows (Table 1).

$$D = \frac{Np}{St}, \text{ where:}$$

D = density

Np = population size

St = surface area of the territory

Table 1 Calculation of the general density of Craiova Municipality

Crt. no	Population size	Surface area of the territory	Density
1.	296.743 number of persons	81,41 square kilometers	36,45 persons/square kilometers

*** Size of population by residence on 1 January 2021

Source: author’s own processing

The concept of population density can be applied to both the total population and its sub-populations, depending on the purpose. It can also

be reported both to the whole area (general density) and to categories of land use - arable land, useful agricultural area (agricultural or subsistence densities), actual built-up space, in the case of cities, etc. Agricultural (subsistence) density is calculated in a similar way to the general density, except that the population is reported per 100 hectares, equivalent to one sq. km [21].

4 Conclusion

Following the scientific and methodological research of the indicators of the natural movement of the population in the Municipality of Craiova, it can be concluded that there are oscillations in all the indicators presented.

Also, during the pandemic caused by the SARS-CoV-2 epidemiological virus, there were decreases in the number of marriages and divorces.

From my point of view, the natural movement of the population can be influenced by the following factors: the standard of living of the population, the aging of the population, low incomes and the lack of jobs in rural areas.

Population density is constantly changing due to natural factors (landforms, hydrograph, fauna, soil factor, etc.), historical (having an important role in the formation of human concentrations) and economic (represented by energy resources and the progress of innovative technology in all fields of activity).

The geographical space of Craiova Municipality is exactly, an exclusive space, of great diversity, thus realizing the most valuable and authentic function of the Earth, namely, the biotic function.

References:

- [1] Georgescu, T., Barbacioru, C., & Florea, F. (1977). *Istoria Craiovei*. Editura Scrisul Românesc, Craiova.
- [2] Drăguleasa, I.A. (2022). *Oxizii de azot (NO_x) – Monoxidul de azot (NO)*. Municipiul Craiova, Conferința Multidisciplinară Internațională „Laboratorul de Creativitate,, pp. 315-318, [<https://cadredidactice.ro/wp-content/uploads/simple-file-list/LUCR%C4%82RILE-CONFERIN%C8%9AEI-MULTIDISCIPLINARE-INTERNA%C8%9AIONALE-LABORATORUL-DE-CREATIVITATE%E2%80%9D.pdf>], accessed in 29 March 2022, ISBN 978-973-0-35995-4
- [3] Badea, L., & Ghenovici Al. (1974). *Județul Dolj*, Editura Academiei Republicii Socialiste România, București.
- [4] Lăpădat (Albă), C.D. (2019). *Municipiul Craiova. Studiu de geomorfologie urbană – teză de doctorat* (https://www.ucv.ro/pdf/invatamant/educatie/programe_doctorat/teze_doctorat/programate_2019/lapadat/rezumat_ro.pdf, <https://www.editurauniversitaria.ro/storage/publications/rasfoire/cQ9WbufPTLtBLM5fBEOJ7oJZ.pdf>), accessed in 17 January 2022
- [5] Drăguleasa, I.A. (2022). *Studiu hidrologic asupra râului Jiu pe sectorul confluență Motru-confluență Amaradia*, Editura Sitech, Craiova.
- [6] Otovescu, D., & Otovescu, C. (coord.), Popescu, L., & Pârvu, M. (2018). *Orașul Craiova – monografie: Craiova City*, Editura Beladi: Sitech, Craiova.
- [7] Marinică, I. (2006). *Fenomene climatice de risc în Oltenia*. Editura Autograf MJM, Craiova.
- [8] Ciulache, S. (2004). *Meteorologie și climatologie*. Editura Universitară, București.
- [9] Ilinca, N. (2009). *Geografia Umană. Populația și Așezările*, Ediția a III-a, revizuită și adăugită, Editura CD PRESS, București.
- [10] Ianoș, I. (1987). *Geografia orașului*, Editura Fundației Culturale „Dimitrie Bolintineanu”, București.
- [11] Cucu, V. (1970). *Orașele României*, Editura Științifică, București.
- [12] Ilinca, N. (1999). *Geografia urbană*, Editura Atlas Multimedia, București.
- [13] Iordache, C. (2009). *Geografia populației și Așezărilor Umane din România*, Editura Universitaria Craiova.
- [14] Ilinca, N. (2012). *Geografie umană: România – populație, așezări, economie*, Editura CD PRESS, București.
- [15] Vert, C-tin. (1995). *Analiza geodemografică, Manual practic*, Editura Mirton, Timișoara, p. 22-22. [<https://geografie.uvt.ro/wp-content/uploads/2015/07/Analiza-geodemografica.pdf>], accessed in 12 January 2022
- [16] Trebici, Vl., & Ghinoiu, I. (1986). *Demografie și etnografie*, Editura Științifică și Enciclopedică, București, p. 202, p. 35.
- [17] Vert, C-tin. (2001). *Geografia populației: teorie și metodologie*, Editura Mirton, Timișoara. [[https://www.studocu.com/ro/document/universitatea-din-craiova/geopolitica-si-geostrategie/geografia-populatiei-teorie-si-geopolitica-si-geostrategie](https://www.studocu.com/ro/document/universitatea-din-craiova/geopolitica-si-geostrategie/geografia-populatiei-teorie-si-geopolitica-si-geostrategie/geografia-populatiei-teorie-si-geopolitica-si-geostrategie)]

[metodologie-grigore-tudose/18397029](#)],
accessed in 14 January 2022

- [18] Ilieș, A., & Stașac, M. (2000). *Studiul geografic al populației*, Editura Universității din Oradea, Oradea.
- [19] Erdeli, G., & Dumitrache, L. (2009). *Geografia Populației Mondiale*, Ediția a IV-a, revăzută și actualizată, Editura Universitară, București.
- [20] Cucu, V. (1981). *Geografia Populației și Așezărilor Umane*, ediția a II-a revizuită, Editura Didactică și Pedagogică, București.
- [21] Muntele, I., & Ungureanu, Al. (2017). *Geografia populației*, Ediția a II-a revăzută și adăugită, Editura SEDCOM, LIBRIS, Iași. [https://www.researchgate.net/profile/Ionel-Muntele/publication/328119113_Geografia_populatiei/links/5bb89f464585159e8d878db3/Geografia-populatiei.pdf], accessed in 15 January 2022
- [22] Institutul Național de Statistică, TEMPO online: [<http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table>], accessed in 17 January 2022
- [23] <http://www.geo-spatial.org/> accessed in 5 May 2021
- [24] Armaș, I. (2006). *Teorie și metodologie geografică*, Editura Fundației România de Măine, București.

Author's contribution:

Ionuț-Adrian Drăguleasa, I made the scientific and methodological documentation of this paper.

I was responsible for the statistical part <http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table>.

I took care of the graphic design and interpretation of the statistical data.

I made it in ArcGIS 10.1. Map of the location of the study area.

I mention that there were no sources of funding for the creation of the scientific article.