Analysis of the settlement systems of the population located in the international basin of the River Guadiana

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Abstract:

The knowledge of effective and the characteristics of the population has been one of the objectives pursued by states since ancient times to today, due to military and economic interests. In this sense, this study is inserted in the studies that analyse the changes that have taken place in the settlement system of the population and its effect on the spatial organization of the urban network. The objective of this research is to study the distribution of the population of the municipalities located in the international basin of the River Guadiana.

Key-Words: River Guadiana; Population analyse; Population Structure; Population System

1 Introduction

Population density is often used as an indicator to differentiate rural from urban areas; For example, in 1961, the Organization for Economic Co-operation and Development (OECD) established the criterion of considering as a rural area any area with a population density lower than 100 hab/km^2. (López y Pérez, 2005). Which does not seem at all rigorous if we apply it to the countries, because according to this criterion Brazil (24 hab/ km^2), Sweden (24 hab/ km2), Norway (16 hab/ km^2), Canada (4 hab/ km^2), Australia (3 hab/ km^2) or the United States (35 hab/ km^2) they would be very rural.

Until the 1980s, there was a very different conception of rural life compared to the city, to the urban, with production systems and lifestyles very different from each other, due in part to the geographical-spatial isolation in which people lived of the peoples in the village. The current reality is very different, the differentiation between rural and urban environment now has nothing to do with the territorial structures of the past (Somoza, 2004).

The vision of the rural raised by Bejarano (1998), is a vision based on the idea of progress emerged in the XVIII century. Progress understood as the way of modern civilization, such as the recognition that humanity advances from the past to the future.

Other authors define the rural as a system with the same category as the urban, with a space of territorial order, which shelters a complex set of economic activities, human settlements, cultures and political process, with specificities and own logics (Echeverri, 1998; Zuluaga, 2000). The rural should be understood as a territorial issue, because land use and the activities of the resident population in the countryside are not limited to agriculture, but they are linked to several tertiary activities. Thus, rural development is considered as a spatial concept and multisectoral, (Muñoz, 2012). The proposal is to be understood as rural non-urban territory. In the current technical period, the understanding of the rural and the urban is not restricted to a city and its immediate field (Endlich, 2006).

Currently, the defenders of the new rurality emphasize that in rural areas multiple activities are being developed beyond those related to the primary sector. Fewer and fewer inhabitants of rural areas work in agriculture. Therefore, some authors such as Abramovay (2000), cited by Endlich (2006), propose that rurality is not linked to any economic sector. The important thing is the spatial and non-sectoral definition of rurality, that is, cities are not defined by industry or the field by agriculture. You cannot link rural areas to the absence of services, population and backwardness, and implementation of these represent the urbanization of the countryside (Bernardelli, 2006).

The definition of rural and urban tends to be thought from the geographical dimension of space, therefore, the classic division between rural and urban should be replaced by agricultural spaces and urban spaces (Bernardelli, 2006).

It is necessary to break the narrow economic paradigm in which the role of the rural sector has been placed, and transfer it to the context of politics and institutions (Pérez, 2001). The rural environment is then a socio-economic entity in a geographical space with four components: Territory, Population, Set of settlements and Set of public and private institutions (Muñoz, 2012).

It seems evident that, faced with so many partial and sometimes conflicting definitions, the difficulty in differentiating the rural from the urban, both quantitatively and qualitatively, is almost more intuitive than discursive.

2. Methodology

2.1. Study Area

The River Guadiana, is one of the 4 large cross-border Iberian rivers, next to the Tajo, Duero and Miño. It is, in turn, the fourth longest river in the Iberian Peninsula, with 829 km of the route between the Lagunas de Ruidera, in the spring of the Ojos del Guadiana and its mouth in Ayamonte (Spain) and Vila Real de Santo António (Portugal). (Fig 1).

Fig. 1: The international basin of the River Guadiana location map.

Source: Compiled by author from NCGI (National Centre for Geographic Information) data.

2.2. Methodology of work

The methodological approach of this research is quantitative. An analysis of spatial distribution of the population located in the international basin of the River Guadiana is performed. Starting from censual data we try to reproduce the make-up of the population system of the latest demographic census (2011).

One of the ways of presenting the results of municipal censual data is by grouping localities according to their population size. To this effect, 5 population strata were defined, thus achieving representation of all the municipalities in the international basin of the River Guadiana: under 500; 501 to 2.000; 2.001 to 5.000; 5.001 to 10.000 and over 10.000 inhabitants (Mora et al., 2015a; Mora et al., 2017a).

This paper is supplemented by the application of the database into a Geographical Information System (GIS), in order to establish both spatial and temporal dynamics and their expression in the international basin of the River Guadiana (López, Pérez, 2005;

Prieto, 2011; Mora et al., 2015b; Mora et al., 2017b).

3. Results and Discussion

3.1. Grouping of localities due to their population size

In the whole basin of the Guadiana most municipalities are small, since 59,76% of them have a population of less than 2.000 inhabitants. On the other hand, the municipalities with the most population (greater than 10.000) represent 9,46% of the total (Table1).

Table 1: Percentage of the international basin of the River Guadiana Spanish-Portuguese municipalities grouped into 5 categories (under 500; 501 to 2.000; 2.001 to 5.000; 5.001 to 10000 and over 10.000 inhabitants)

Population	Number of municipalities	%
Under 500	106	21,33%
501-2.000	191	38,43%
2.001-5.000	97	19,52%
5.001-10.000	56	11,27%
Over 10.000	47	9,46%
Total	497	100%

Source: Compiled by author from INE-ES-PT data. 2001 - 2011.

3.1.1. Grouping of localities by their population size located in Spain

Making a more detailed study of both demarcations most municipalities are in the Spanish demarcation, of the 497 municipalities whose backbone is the River Guadiana 464 are Spanish representing 93,36% of the total.

The majority of the municipalities of the Spanish side is of small size, since 63,79% (296 municipalities) of them have less than 2.000 inhabitants (Table 2).

Table 2: Percentage of the international basin of the River Guadiana Spanish municipalities grouped into 5 categories (under 500; 501 to 2.000; 2.001 to 5.000; 5.001 to 10000 and over 10.000 inhabitants)

Population	Number of municipalities	%
Under 500	106	22,84%
501-2.000	190	40,95%
2.001-5.000	91	19,61%
5.001-10.000	42	9,05%
Over 10.000	35	7,54%
Total	464	100%

Source: Compiled by author from INE-ES-PT data. 2001 - 2011.

These municipalities are concentrated mostly in the center of the basin provinces of Ciudad Real and south of Toledo, while in the eastern part of the Guadiana (province of Cuenca) localities with less than 500 inhabitants predominate. In the western side the smaller municipalities are located in the southeast of the province of Badajoz and north of Córdoba.

On the other hand, the municipalities with the most population (greater than 10.000 inhabitants) have the least representation, since they only constitute 7,54% of the total (35 municipalities). These municipalities are located at the ends of the basin, highlighting in the western part the cities of Badajoz, Merida, Don Benito and Villanueva de la Serena, while in the eastern part of Ciudad Real, Tomelloso or Daimiel.

3.1.2. Grouping of localities by their population size located in Portugal

In the Portuguese demarcation we find 33 of the 497 municipalities that includes the urban system of the River Guadiana, which comes to represent 6,64% of the total. The Portuguese localities, contrary to what happens in the Spanish demarcation, are characterized because most of the municipalities have a population that ranges between 5.001 and 10.000 inhabitants, so these municipalities constitute 42,42% of the total, followed very closely by the towns with more than 10.000 inhabitants representing 36,36% (Table 3).

Table 3: Percentage of the international basin of the River Guadiana Portuguese municipalities grouped into 5 categories (under 500; 501 to 2.000; 2.001 to 5.000; 5.001 to 10000 and over 10.000 inhabitants)

Population	Number of municipalities	%
Under 500	0	0
501-2.000	1	3,03%
2.001-5.000	6	18,18%
5.001-10.000	14	42,42%
Over 10.000	12	36,36%
Total	33	100%

Source: Compiled by author from INE-ES-PT data. 2001 - 2011.

On the opposite side we find the municipalities that have less representation in the Portuguese demarcation. On the one hand, there are those that have a population that ranges between 2.001 and 5.000 inhabitants, which constitute 18,18% of the total (6 municipalities), followed by those whose population varies between 501 and 2.000 inhabitants with a representation of the 3,03% of the total (1 municipality). Also, it should be noted that in the Portuguese demarcation there is no town with less than 500 inhabitants (Table 3), the opposite of what happens in the Spanish side where these municipalities constitute 22,84% (Table 2).

3.2. Population dimension by number of inhabitants

In the Guadiana basin live a total of 2.211.910 people, of which 1.766.580 inhabitants (79,87% of the total) reside on the Spanish side and 445.330 inhabitants (20,13% of the total) in the Portuguese side. In the basin as a whole, more than 1.2 million people (58,39%) settle in municipalities with more than 10.000 inhabitants, while only 239.624 people (10,83%) do so in localities with less than 2.000 inhabitants (Fig 2).

3.2.1. Population dimension by number of inhabitants located in Spain

In the Spanish demarcation lives 79,87% of the total population of the basin (1.766.580 inhabitants). The majority of the population is concentrated in municipalities with more than 10.000 inhabitants, since it represents 54,83% of the total (968.590 inhabitants). The three largest cities are Badajoz with 151.565 inhabitants, Ciudad Real with 74.798 and Merida with 57.797, totaling between the three 284.160 people, which corresponds to 16,09% of the population residing in the Spanish part of the Guadiana (Table 4).

Table 4: Percentage of number of inhabitants living in Spanish towns grouped into 5 categories (under 500; 501 to 2.000; 2.001 to 5.000; 5.001 to 10000 and over 10.000 inhabitants)

Town	Population	%
Under 500	29.630	1,68%
501-2.000	208.160	11,78%
2.001-5.000	278.178	15,75%
5.001-10.000	282.022	15,96%
Over 10.000	968.590	54,83%
Total	1.766.580	100%

Source: Compiled by author from INE-ES-PT data. 2001 - 2011.

Moreover, the population living in municipalities ranging between 5.001 and 10.000 inhabitants sum 282.022 people, representing 15,96% of the total. This group is followed by 278.178 inhabitants (15,75% of the total) who live in municipalities that have between 2.001 and 5.000 inhabitants, while in towns under 2.000 inhabitants there is the least numerous population group, since only they welcome 237.790 people, which represents 13,46% of the total population of the Spanish Guadiana demarcation (Table 4).

3.2.2. Population dimension by number of inhabitants located in Portugal

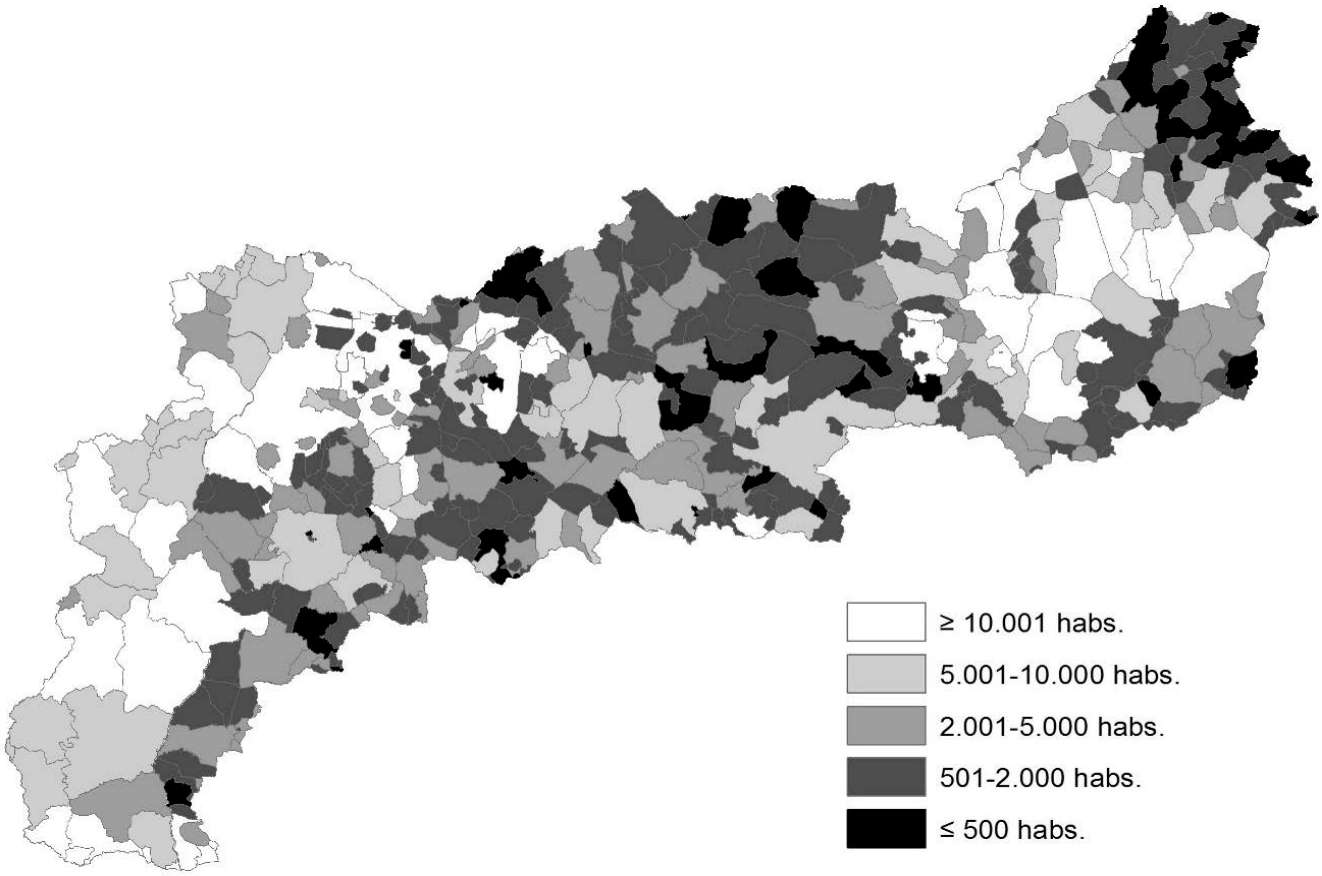
In the Portuguese demarcation it occurs exactly as in the Spanish, as we observe that 72,53% of the population (322.981 inhabitants) is concentrated in the nuclei greater than 10,000 inhabitants. The two largest cities are Évora with 56.596 and Beja with 35,854, bringing together 284.160 people, representing 36,62% of the total demarcation (Table 5).

Table 5: Percentage of inhabitants living in towns in Portugal grouped into 5 categories (under 500; 501 to 2.000; 2.001 to 5.000; 5.001 to 10000 and over 10.000 inhabitants)

Town	Population	%
Under 500	0	0
501-2.000	1.834	0,41%
2.001-5.000	20.418	4,58%
5.001-10.000	100.097	22,48%
Over 10.000	322.981	72,53%
Total	445.330	100%

Source: Compiled by author from INE-ES-PT data. 2001 - 2011.

Fig. 2: Map representing the spatial distribution of municipalities by number of inhabitants.



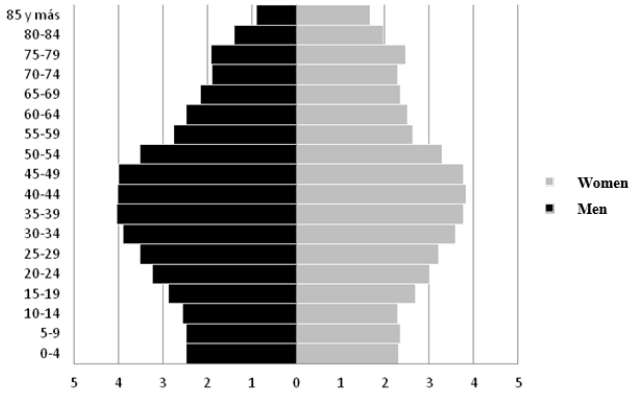
Source: Compiled by author from INE-ES-PT data, 2001-2011 and NCGI (National Centre for Geographical Information) data.

On the contrary, in localities ranging from 5.001 to 10.000 inhabitants, 100.097 people live, which represents 22,48% of the total, followed by 22,252 inhabitants (5% of the total) residing in municipalities with a population less than 5.000 inhabitants. It is necessary to emphasize that in the Portuguese side there is no locality that has less than 500 inhabitants, as it happens in the Spanish side (Table 5). However, it should be noted that the Portuguese settlement system is very different from the Spanish, because there the municipality is composed of numerous smaller local entities, called freguesias, many of which are less than 500 inhabitants.

3.3. Population structure

In the population pyramid of the Guadiana basin in 2011 it is observed that there is a predominance of the female sex (15.000 more women than men), with a masculinity ratio of 98,62% (Fig 3).

Fig. 3: Population pyramid of the international basin of the River Guadiana (2011)



Source: Compiled by author from INE-ES-PT data, 2001-2011.

However, the superiority of female staff does not occur throughout the pyramid. In the early years there are more male effective because more males than females are born (106 boys for every 100 girls) as seen in the greater length of the bottom bar of the pyramid on the side of men. From then on, the

effective gradually balance each other as they ascend in the age groups of the population pyramid. It is observed that after the age of 60, women begin to predominate in all the cohorts of the pyramid, reaching even in the last cohort (> 85) to almost double their number compared to that of men, as a consequence of the longer life expectancy female: 84 years compared to 78 for men. The greater longevity of women is due to male over-mortality due to biological, labor and social reasons (lifestyle more exposed to risk factors). (Fig 3). (INE 2011).

The population pyramid of the basin presents a clear bulbous shape, with a narrow base, indicative of fewer and fewer cohorts, due to the low birth rate and a summit with wider steps that show a large volume the adult population, due to the longer life expectancy. This allows us to affirm that we are facing an aging population, characteristic of developed societies.

In the analysis of the age groups we found a large presence of effective in the population group over 65 years and over. In this cohort, there is a clear predominance of female members (57,02% of the total population over 65 years old) compared to the male group, due to the greater longevity of the woman and the high emigration to the outside mainly male and that affected very significantly the populations of the Guadiana basin.

In this group there is an entrant or notch in the ages between 70 and 74 years (born between 1937 and 1941) that affects both sexes, although it is more perceptible in the female group: corresponds to the "unborn" during the Spanish Civil War. This fact was aggravated because the adults who had to procreate at that time were also scarce ("hollow generation" of those born in smaller numbers during the wars of the late nineteenth century and the flu epidemic of 1918).

This "hollow generation" is prolonged in the following steps (up to 55-59 years) due to the low birth rate in the postwar years due to the painful situation that followed the Civil War (international blockade of the Franco regime, economic autarky, shortage...) and foreign migration in its most intense stage (1960-1973) (INE 2001).

The bulk of the population of the Guadiana basin (66,57%) is within the adult population (15-64 years). In this group, the most significant demographic aspects would be, first, the increase in the birth rate due to the so-called baby boom of the 1960s and the beginning of the 1970s. The cohorts born between 1957 and 1966 (45-55 years) correspond to the birth boom. This phenomenon was motivated by the economic development that the country experienced since the end of the fifties until the mid-seventies.

The second demographic aspect to be considered in the adult population group is the setback that begins to suffer from the pyramid from the age cohort of 30-34 years (1977), when the length of the bars begins to decrease due to the decrease in fertility, which was a consequence of the important political, social and economic transformations that took place both in Spanish and Portuguese society as of 1975 and 1974 respectively (INE 2011).

The group of young people (0-14 years old) is very small, since it only contains 14,44% of the population of the basin, due to the continuous decrease of the aforementioned fertility, so since 1977 the young population has been reduced cohort to cohort, which has a direct consequence in the aging of the population and endangers generational replacement.

In short, the pyramid corresponding to the population of the Guadiana basin presents us with an aging population, typical of a developed society. The causes of this aging of the population must be sought in a very low birth rate and a high life expectancy. The first cause is the result of changes in mentality (secularization of society, changes in family habits, incorporation of women into the workplace, availability of contraceptive means, among others), of the economic crisis that affected the developed world since 1973 (oil crisis), cultural development (prolongation of studies) and the increase in the standard of living of the population since the mid-seventies have generated a considerable reduction in fertility.

The aging of the population, by increasing the dependency ratio, can pose problems in the medium and long term of the viability of the current social protection systems, especially with regard to pensions, as well as in the health and welfare aspects. However, this is not so much a demographic or economic problem, since if employment increases, the dependency rate can decrease with the arrival of young immigrants who contribute more income to the system, through contributions.

In the future, it is foreseeable that aging will be accentuated in the Guadiana basin, because the

population between 55 and 64 years old (10,35% of the total population) will begin to retire in the short and medium term, which will generate difficulties if the generational change or the arrival of new settlers is not guaranteed.

4. Conclusions

In the Guadiana basin live a total of 2.211.910 people distributed in 497 municipalities, of which, around 60% of them have a population of less than 2.000 inhabitants, although in these municipalities only 10,83% of the population, on the contrary, in the municipalities of more than 10,000 inhabitants live 60% of the total population. So we can conclude that the Guadiana basin has a spatial distribution of the very dispersed population in which alternate population deserts with medium and high concentrations of population in the most relevant nuclei of the territory corresponding to the county seats, capital regions and of the province.

The population pyramid of the Guadiana basin represents an aging population, typical of a developed society, due to the low birth rate and the increase in life expectancy. If current demographic trends are maintained, the current system of social protection will be jeopardized, especially with regard to pensions.

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