Shrinking Cities in Portugal – Where and Why[1]

Declínio Populacional nas Cidades de Portugal – Onde e Porquê

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Abstract/Resumo

It may seem paradoxical that in a period of rapid urban growth, some cities are shrinking; however, they are two sides of the same coin of urban change. This article identifies cities that are shrinking in Portugal. Looking at the demographic evolution from the 1991 until 2011 we identified 17 cities that are losing inhabitants, 9 of them persistently and 8 since 2001. This decline is present in the two biggest cities of Portugal, Lisbon and Oporto that present 17% and 21% decline respectively. After this first screening, we crossed the history of each city with socio-economic data (e.g. employment rate, housing characteristics, and unemployment among others) and purposed that reasons for shrinking include: suburbanization, economic transformation, satellite effect and environmental drivers. However, several cities present a mixture of reasons underlying shrinking and further work should be undertake to complement this exploratory analysis.

Na era do crescimento urbano pode parecer paradoxal que algumas cidades estejam em declínio populacional. Contudo, ambos os fenómenos são dois lados da mesma moeda. Este artigo identifica o declínio populacional nas cidades em Portugal. Observando a evolução demográfica de 1991 a 2011 verificou-se que 17 cidades estão a perder população: 9 persistentemente e 8 desde de 2001. Este grupo inclui as duas maiores cidades portuguesas: Lisboa e Porto que apresentam 17% e 21% de declínio respetivamente. Após esta primeira triagem, a história de cada cidade e dados socioeconómicos são cruzados (ex.: taxas de emprego, características da habitação, e desemprego, entre outras) permitindo propor as seguintes razões para o declínio populacional das cidades: a suburbanização, as transformações económicas, o efeito satélite e os fatores ambientais. Porém, diversas cidades apresentam uma mistura de razões que explicam o declínio da sua população. Esta análise exploratória deverá ser complementada com estudos mais aprofundados.

*Keywords***:** Shrinking cities, pull and push factors, Portugal, urban planning and economics

JEL codes: R50, R58, 020

Palavras-Chave: Declínio populacional nas cidades, fatores de atração e repulsão, Portugal, Planeamento Urbano e Economia

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1. INTRODUCTION

In 2008, the world reached an invisible but momentous milestone: for the first time in history, more than half its human population was living in urban areas (UNFPA, 2007). At the same time in a significant number of cities population declined (Oswalt and Rieniets, 2006). This might seem contradicting; however, it also shows that cities are complex systems that are still evolving. In fact, shrinkage is a process as old as growth although the former is perceived as a symptom of failed planning while the latter is a synonym of success (Turok and Mykhnenko, 2007; Haase et al., 2012; Hospers, 2013). For this reason, in a city that is shrinking, the phenomenon tend to be ignored as long as possible while trying to invert such situation (Beauregard, 2005; Panagopoulos and Barreira 2012; Hospers, 2013). However, the fact that a city is shrinking does not inevitably mean it will disappear; however, it also doesn't mean it will be back to the point of being a very populated area (Power et al., 2010; Rink et al., 2012). Literature shows that in some cases the shrinkage phenomenon lead to a decline in living conditions of those that stay while in others it introduced opportunities to change, otherwise unavailable (Oswalt, 2005; Power et al., 2010; Maes et al., 2012).

In contrast to the abundance of research about urban growth and its patterns, there is not a "theory of shrinkage" (Rink and Kabisch, 2009; Haase et al., 2012). In Europe, the debate started in Germany and has spread internationally although it remains an underrepresented topic in comparative research (Oswalt and Rieniets, 2006; Pallagst, 2005; Haase et al., 2012; Großmann et al., 2013). In Portugal, studies about this topic are scarce but increasing (Balsas, 2000; Sousa, 2010; Panagopoulos and Barreira, 2012).

Shrinkage is not found exclusively in rural areas, neighbourhoods, city size or in specialized cities (Oswalt and Rieniets, 2006; Hospers, 2013). A recent phase of shrinkage started after the end of the II world war, accelerated by the fall of the Berlin Wall and the globalization process, where in many countries, urban growth was replaced by stagnation and/or shrinking (Kabisch et al., 2006; Rieniets, 2006). Shrinkage was frequent in Europe's old industrial regions (Northern England, the Scottish Clyde side, Lorraine, the Rhine-Ruhr area), in large portions of European post-Socialist countries (Großmann et al., 2008; Kabisch, 2007) and in the "rust belt" in the US (Beauregard, 2009; Blanco et al., 2009). However, today shrinkage is registered in almost all countries and the number of shrinking cities has increased faster than the number of boomtowns (Oswalt and Rieniets, 2006; Turok and Mykhnenko, 2007). In 2006, and providing a perspective over the past 50 years, the *Atlas of Shrinking Cities* identified shrinkage in Western industrial countries, especially in the USA (59), Britain (27), Germany (26), Italy (23), and increasingly in former Warsaw Pact countries, like Russia (13), Ukraine (22), and Kazakhstan (13). Further, there have also been an above-average number of shrinking cities in South Africa (17) and Japan (12). Between 1995 and 1999, Wiechmann (2008) describes that the highest population loss was verified in northern Finland, in central and northern Sweden, and in large parts of the Central and Eastern states. According to the author considerable losses of population also took place in southern Italy, northern Spain, the central regions of France, Scotland, and in the Alentejo in Portugal. Data from Urban Audit, referred by Wiechmann (2008), highlight that out of 220 large and medium-sized European cities, 57 per cent lost population in the period from 1996 to 2001. Among them, Wiechman (2008) identifies Lisbon (Portugal capital) included in the group of cities with the highest relative loss of more than 1.75 per cent per year, from 1996 to 2001. This value is also accompanied by Oporto were population decline reached 1.37 per cent per year (Sousa, 2010; Panagopoulos and Barreira, 2012).

Demographic data shows that in the future Europe will barely participate in worldwide population growth. Some countries, such as Portugal, should even prepare for a general decrease in resident population. We hope that the present work contributes for such strategic thinking. Our goal is to provide an overview of the shrinking phenomenon in the cities of Portugal. Ultimately, we purpose a typology by identifying the process, understanding the reasons behind it and by uncovering patterns of behaviour. This work can be considered an exploratory analysis of the shrinking phenomenon in Portugal and an in-depth analysis will complement this effort. The typology sug-

gested here represented an intermediate achievement within an exploratory project[2] of one year duration that aimed at understanding the policies preferences of residents of shrinking cities towards the regeneration of shrinking cities. From the typologies that will be presented here the case studies were selected.

In the next section we provide an overview of the causes, consequences and types of shrinking. In section 3 we explain the data used and in section 4 the results obtained. In section 5 we compare our findings with previous works and provide some concluding remarks.

2. LITERATURE REVIEW – SHRINKING CITIES: CAUSES, CONSEQUENCES AND TYPES

Shrinking cities have been discussed using several approaches and definitions (Haase et al., 2012; Rink et al., 2012). In the present work we use Turok and Mykhnenko (2007) definition of shrinking cites as urban areas where a perceptible population loss occurs and, behind which a variety of entwined cause effect processes can be concealed.

Wars, natural disasters, environmental disasters, epidemics, economic, political, and social transformations have affected population settlement and demographic change everywhere (Rieniets, 2009). Although the quantity of people living in a city does not provide a full depiction, population changes is an important consequence, as well as, cause of urban conditions, especially the availability of economic opportunities (Turok and Mykhnenko, 2007; Rink and Kabisch, 2009).

2.1. Causes for population decline

One of the main reasons for population decrease is ageing which has become a process without precedents in the history of humanity (UN, 2013). This process leads to a relative reduction in the proportion of children and to an increase in the share of people in the main working ages and of older persons in the population. Global share of people aged 60 years or over increased from 9.2 % in 1990 to 11.7% in 2013 and will continue to grow reaching 21.1% by 2050 (UN, 2013). Further, the older population is itself ageing; the share of older persons aged 80 years or over within the older population was 14% in 2013 and is projected to reach 19% in 2050 (UN, 2013). Most of all, the implication of this ageing process affects all facets of human life; economically (e.g. economic growth, saving investments, pensions), socially (e.g. family composition, living arrangements, healthcare services) and, politically (e.g. voting patterns and political representation).

Further, fertility rates have diminished in practically all OECD countries to levels that are well below those needed to secure generation replacement (OECD, 2003). The world population growth rate rose rapidly in the 20th century, reaching a peak at 2% per year in 1965-1970 (UN, 2013). This peak was followed by a decline mostly as a consequence of the reduction of fertility rate in the developing regions. By 2045-2050 the expected world population growth rate is expected to drop to 0.36%. While the population of the more developed regions is rising at an annual rate of 0.28%, that of the less developed regions is increasing almost five times faster, and the least developed countries as a group are experiencing even more rapid population growth, at 2.37% per year. Such disparities, although to some extent soothed, are predicted to continue until 2050.

Changes in city populations is not simply attributable to changes in birth and death rates; migration plays an important role (Portnov et al., 2000; Turok and Mykhnenko, 2007). Migration dynamics emerge unmistakably as being closely related to the causes of both growth and shrinkage. In an increasingly competitive world, shrinking territories are those where push factors surpass pull factors. Migration can be triggered by several factors: extraordinary factors (e.g. conflicts), political transformation, economic transformation, environmental factors and competition among local governments leading to urban sprawl and suburbanization.

A political transformation is mainly linked with the post-socialist transformation in Eastern Germany and Eastern Countries (Nuissl and Rink, 2005; Bontje and Musterd, 2012). Given the income gap between Eastern and Western countries or regions, population

[2] EXPL/ATP-EUR/0464/2013 - "Policy guidelines for the regeneration in shrinking cities (2014-2015).

migrate to Western areas in search of improvements in wealth and quality of life conditions.

Economic transformations include, deindustrialization, sector decline (e.g. automotive, mining, agriculture), rapid economic breakdowns (e.g. collapse of the dot-com business), general economic cycles and macroeconomic trends, globalization, etc. Some authors consider economic transformation as the main cause of urban shrinkage (Friedrichs, 1993; Oswalt, 2005). Economic transformation alters the profile of employment, skills, education, accessibility, taxes, housing prices, etc., and affects lifestyle, standards of living, quality of life, and available urban amenities.

Environmental factors are becoming more acute due to climate change and increased health worries; hence the levels of pollution in cities, the availability of green areas and urban gardens (Kabisch and Haase, 2013) and the use of renewable energies (Hoornebeck and Schwarz, 2009) are factors that can induce migration. Weather factors by affecting urban quality of life are also important trigger factors for migration (Rappaport, 2007).

Amongst the spatial patterns of migration, suburbanization is the most debated topic and the definition of the concept is not yet consensual (Ewing et al., 2003). However, for the current work we use the definition proposed by Hesse (2006) that generally describes suburbanization as the sprawl of urban settlements, beyond the bounds of a core city and into its hinterland. Suburbanization occurred primarily in conditions of urban growth. However, partial or selective suburbanization processes can occur in conditions of shrinkage (Nuissl and Rink, 2005; Hesse, 2006; Siedentop and Fina, 2008). Suburbanization entails a specific type of out-migration which can be triggered by a variety of reasons alone or combined (Van den Berg et al., 1982). Due to local governments that compete to attract inhabitants, some neighbour municipalities of a city supply public amenities and favourable conditions for lower housing prices, thus leading to suburbanization. In other cases, due the small space available at the core city, city expands from the traditional boundaries into new sprawled areas. Besides, highway and cheap gasoline along with the middle class capacity to afford cars and single-family homes also have encouraged suburban growth (Baum-Snow, 2007; Rieniets, 2009).

2.2. Consequences for population decline

Most scholars do not a priori determine the causal and sequential relation between economic decline and demographic decline, but rather acknowledge that both types of decline are interrelated (Hoekveld, 2014). Hence, ageing previously described as a cause for population decline can be also considered a consequence (Haase et al., 2013; Hoekveld, 2014).

Currently, the characteristics of shrinkage mainly correspond to the consequences of shrinkage (Sousa, 2010). Other of the crucial aspects of shrinkage is the number of vacant dwellings and the amount of derelict land (Ahrens, 2005). This build-up environment implies the general hollowing-out of the inner city, declining target markets which erode the viability of neighbourhoods and the services within (Nevin and Lee, 2004). Further, population decline implies that many technical infrastructures will be used below capacity, malfunctions will increase and the costs of supplying drinking water, sewage disposal and other services rise (Moss, 2008; Schiller, 2007).

When features of a city became less attractive those that have the capacity to leave do so and those that stay are frequently disadvantaged population groups – the poor, the old, and foreigners – which can imply the rise of social problems in this areas (Strohmeier and Bader, 2004; Moraes, 2007). The out-migration of those in the middle-class condemns many businesses to unsustainability, joining to population also economic decline, which amplifies the territorial as well as the visual impact of shrinkage. Moreover, the declining population heterogeneity can lead to the death of social life, of public sphere, which constitutes the main source of creativity and innovation, creating a sweeping knowledge and cultural void (Borries and Böttger, 2004; Maes et al., 2012)

The generalized decay described above has an evident effect in the image of a territory (Beauregard, 2005). Borries and Böttger (2004) conclude that the above scenario might induce lack of motivation, hopelessness and sadness which can have a great impact on the mental maps or psychological conditions of residents. On the other hand, other authors show that for the ones who choose to stay, living in a shrinking city does not lead to less life satisfaction (Delken, 2008; Hollander,

2010). Hospers (2013) provides some examples of shrinking cities that while coping with it became more engaged and cohesive communities.

2.3. Typologies of shrinking cities

Shrinkage is a context-base process hence most authors propose typologies that have a national nature (Cunningham-Sabot and Fol, 2007; Martinez-Fernandez and Wu, 2007; Moraes, 2007; Beauregard, 2009). Nevertheless, attempts to propose general (Western) typologies exist (Pallagst, 2005; Wiechmann, 2008). For the time being there is no established global typology but the exercises already made are an important source of information.

Based on the causes of shrinkage, Pallagst (2005) proposed one typology divided in four motives: 1) long-term industrial transformation (e.g. from one production sector to another), 2) rapid economic breakdowns (e.g. collapse of the dot-com business), 3) environmental threats (e.g. hazards, pollution), and 4) political transformation (e.g. post-socialist systems and economic changes).

Also based in the causes of shrinkage, Wiechmann (2006) proposes four types: 1) suburbanization (e.g. hollowing out, sprawl, segregation), 2) industrial transformation (e.g. old industrial areas and Rustbelts), 3) economical, environmental and political selective collapses (e.g. oil crisis, abandonment of mining areas); and 4) political strategies (e.g. depopulation areas).

From countries away from the European and USA realities the above typologies don´t fit. Moraes (2007) describes that in Brazil the emergence of empty rural towns and decaying metropolitan areas, in opposition to swollen slums on metropolitan outskirts, are the result of an unjust territorial dynamic generated by the Brazilian land oligopoly, the government's incapacity to produce jobs, the highly speculative real estate market, the lack of housing subsidies for low income workers, and the inadequate use of land policies.

Wu et al. (2008) further increments the discussion by adding other dimensions which includes characteristics of shrinkage and information about contemporary examples such as, the Chinese county towns. The typology includes imposing circumstances (e.g. conflicts/war and depletion of resources), comparative disadvantages (lifestyle attractions and climatic conditions) and societal/global changes (e.g. absolute decline of population).

Under the European framework, more precisely for France, Cunningham-Sabot and Fol (2007) describe three types of urban shrinking areas. Large urban areas suffering from deindustrialization and, the fact of their economies were based on single industries (e.g. mining, ports). Most of the shrinking cities in France are small urban areas, located in the middle of the country (from Ardennes to the Pyrenees, passing through the Massif Central). These areas are isolated from infrastructure and urban networks. Finally, urban shrinkage is occurring within urban areas that are growing as a whole but where city centres are declining and outer suburbs are gaining population (mainly in the south of France).

Finally and most relevant to the present work is the typology of shrinking cities in Portugal proposed by Sousa, 2010. The work is based on data from 1991-2001 and cluster analysis. From the cluster analysis at the city level, Sousa (2010) purposes 3 typologies: 1) metropolitan cores and (de)industrialized areas, composed of shrinking cities where important economic transformations have occurred; 2) small interior and coastal cities where the consequences typically associated with shrinkage are more visible than population decrease itself and, 3) cities from th-e north, centre and suburban cities of Lisbon Metropolitan Area suburban where almost all the consequences are not as remarkable as in the other clusters which makes it difficult to understand the reasons behind shrinkage.

3. MATERIAL AND METHODS

The main source of statistical information used in this empirical exploratory research is the Portuguese National Institute of Statistics (Instituto Nacional de Estatística - INE). Our analysis is mostly based on data gathered during the Censuses in the last 20 years: 1991, 2001 and 2011. We examine variables and indicators over a ten to twenty years period at different geographical levels. The data source used does not provide aggregated information at the city level beyond resident population data; hence our analysis was developed using an approximation of such geographic level. In INE the city concept was defined in 2004 and

named "statistical city". Data aggregated at this level was not found for all the variables used and during the period of time analysed. Therefore we defined each city by the total number of parishes within and our first exercise was the identification of the parishes belonging to each city of Portugal. The considered number of cities was 158 which was the total number of cities in Portugal in 2011. Cities do not necessarily correspond to the complete parishes considered; however a finer definition was not possible. The error exists but its transversal to all cases and it is not detrimental for our study.

The variables used are listed in table 1. For some variables, information at the level of parish was not available and municipalities were used instead (e.g. housing prices, dependence of social security, crime indices). Qualitative data concerning each city history was also used to better understand and characterize the shrinkage process. We look at the Portuguese cities, but also at their close and extended surroundings; not only to their individual population change behaviour but also to their combined performance. The combination of these information lead to the typology suggested in the following section.

Table 1: Variables used to characterize the shrinkage process in Portugal

Variables	Information derived
Resident Population	Differentiate between cities that are growing from those that are shrinking by calculating the population growth rate.
Resident Population by age groups	Realise the proportion of inhabitants by age groups and understand how it varied along the 20 years.
Unemployment rate	Measure the evolution of unemployment during the 20 years and its influence on the decline of population.
Employment by activity sector	Track possible economic transformations.
Housing	Assess suburbanization using the quantity of built houses in the city and surrounding areas, as well as the quantity of vacant and old buildings in each city.
Housing price	Find how the price by square meter of land compares with other cities.
Dependence of social security	Check for the social fragility in each city.
Crime indices	Assess the level of insecurity.
Existence of high education institutions	Check how the lack of such institutions drives out-migration of young inhabitants.
Existence of highways	Assess the level of isolation of cities.
Purchase Power	Address differences regarding income.

4. RESULTS AND INTERPRETATION

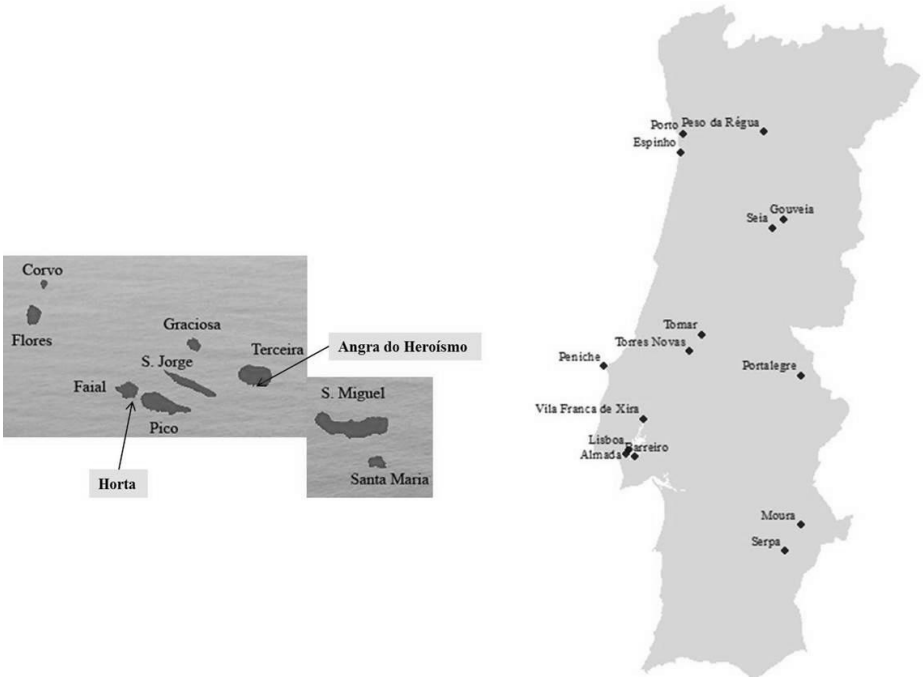
Portuguese population from 1991 until 2011 increased from 9.87 to 10.56 million inhabitants. This growth has not occurred at a constant rate and differences between the two decades are relevant. From 1991-2001 the average growth rate (0.489%) was more than the double of the one registered between 2001 and 2011 (0.197%). After 2007, Portugal has been registering a natural balance with negative values, a situation that had only occurred by the end of World War I (1918). At the same time, the strong positive net migration diminished as a consequence of the decline in migratory entrance flows and of the increase in the exit flows (Carrilho and Patrício, 2002). Since the year 2000, the ratio of aged people into total population exceeds the ratio of young population (Sousa, 2010). In 1991 the national unemployment rate was 4.1% and after 10 years the percentage was practically the same (4% in 2001); however after 6 years the value was doubled (8% in 2007), reaching 13% in 2011 (source: INE). This number was already surpassed and in 2013 the unemployment rate was 16.3% (source: INE).

Portugal has 158 cities from which 31 show decrease when comparing the population records from 1991 to 2011. However, separating the analysis in two decades, five of those cities show an increase in population between 2001-2011 (i.e. Funchal, Ponte de Sor, Elvas, Amadora, Vila Nova de Santo André). From the remaining cities, 14 display a persistent decline and 12 cities lost population from 2001 onwards. From these 26 cities we excluded 9 cities since they were designated cities after 1991. From the remaining 17 cities, 8 show a recent shrinkage and 9 a persistent one.

4.1 Population trends in shrinking cities

From the above screening we considered 17 shrinking cities (Figure 1). Angra do Heroísmo and Horta are located in the Azores archipelago. In the North we found two coastal shrinking cities, Oporto and Espinho and one in the interior (Peso da Régua). In the center of the country several cities are shrinking, in the North (Seia and Gouveia), around river Tejo (Tomar, Torres Novas, Vila Franca de Xira, Lisboa, Barreiro and Almada) and in the coastline (Peniche). Close to the border with Spain, in the Alentejo region, three cities are shrinking (Portalegre, Moura and Serpa). The southern area of Portugal, the Algarve region, includes 11 cities but none registered a population decline during the period in analysis.

Figure 1: The shrinking cities considered in this work.



The above shrinking cities vary largely in term of population size (table 2), as well as, in the amount of lost population. In 2011, Lisbon had close to 548 thousand inhabitants and lost around 116 thousand from 1991-2011. During the same period, Oporto the second biggest city in Portugal (around 238 thousand inhabitants in 2011), lost circa 65 thousand inhabitants, the most important loss in relative terms in 2011. The third biggest city, Almada with a population size around 90 thousand inhabitants lost close to 11 thousand inhabitants.

Nine cities have between 38 thousand (in Barreiro) and 10 thousand (in Peso da Régua) inhabitants. Barreiro, although ~2.5 times smaller than Almada, presents a similar population decline (~10 thousand inhabitants). Between 1991-2011, Espinho and Angra do Heroísmo population decline was around 3 thousand inhabitants in the former and 2 thousand inhabitants in the later, while all the other cities up to 10 thousand inhabitants show a decrease between 555 (Peniche) - 290 (Vila Franca de Xira).

The remaining five cities have less than 10 thousand inhabitants being Gouveia the smallest (circa 3 500 inhabitants). In this group, Gouveia is the only that show a persistent decline (~465 inhabitants) while the remaining cities (Moura, Seia, Serpa, Horta) lost inhabitants from 2001-2011. During this decade Moura presents the biggest loss (less 800 inhabitants).

The population decline presented in table 2 includes changes in birth and death rates, as well as, migratory dynamics. In most of this cases (e.g. Oporto, Lisbon, Portalegre, Torres Novas, Serpa, Gouveia) the decline is heavily influenced by the fact that the city population is aging which implies high death rates and low birth rates. However, we do not consider this phenomenon a typology of shrinkage, similarly to the followed approaches taken for instance by Haase et al. (2013) and Hoekveld

(2014). The results presented here are a stepping stone within a project targeting the development of policy guidelines for Portuguese shrinking cites. Therefore, aging of population is mainly considered a consequence of other factors that lead to shrinkage. In addition, in each of the typologies suggested there are cities with positive and negative dynamics between births and deaths.

Table 2: Shrinking cities divided by size (quantity of population)

Cities	Population in 2011	91-01 Δ pop (%)		01-11 Δ pop (%)		91-11 Δ pop (%)	
Lisbon	547 733	-98 737	-15	-16 924	-3	-115 661	-17
Oporto	237 591	-39 341	-13	-25 540	-10	-64 881	-21
Almada	89 533	-7 884	-8	-3 072	-3	-10 956	-11
Barreiro	37 729	-7042	-15	-3130	-8	-10 172	-21
Espinho	26 868	-1 214	-4	-1 512	-5	-2 726	-9
Tomar	18 209	268	1	-695	-4	-427	-2
Vila Franca de Xira	18 197	-45	0	-245	-1	-290	-2
Torres Novas	16 302	27	0	-683	-4	-656	-4
Portalegre	15 642	-328	-2	-126	-1	-454	-3
Peniche	14 749	291	2	-846	-5	-555	-4
Angra do Heroísmo	10 887	-898	-7	-1461	-12	-2369	-18
Peso da Régua	9 959	-246	-1	-72	-1	-318	-3
Moura	8 419	579	7	-803	-9	-224	-3
Seia	6 342	463	7	-586	-8	-123	-2
Serpa	6 233	156	2	-330	-5	-174	-3
Horta	6 118	76	1	-346	-5	-270	-4
Gouveia	3 472	-62	-2	-403	-10	-465	-12

4.2. Suburbanized cities in Portugal

Among the 17 shrinking cities in analysis are the country's most important cities: Lisbon and Oporto. Oporto and Lisbon are the main examples of those suffering from suburbanization.

To understand if suburbanization is occurring we gathered data concerning the municipalities. For Oporto and Lisbon cases the cities embrace the total municipality; hence we gathered data for the respective metropolitan areas (table 3). Results show that four of the shrinking cities are included in growing municipalities which suggest that a process of suburbanization is taking place. Vila Franca de Xira is the municipality with the highest growing rate while the city is shrinking (-2% in 20 years), Almada present a much higher population decline (-11%) while the municipality grew 13%. Oporto and Lisbon cities are declining while the surrounding urban areas are increasing (9 and 8% respectively). Finally, Peniche also shows signs of suburbanization since the municipality grew around 6% while the city decreased 4% in inhabitants.

Shrinking is a multi-causal process and shrinking cities in Portugal are a good example of this. The following typology designated economic transformation also includes three cities were suburbanization was suggested: Oporto, Lisbon and Peniche.

4.3. Portuguese shrinking cities where relevant economic transformations took place

To understand this process, three main sources of information were crossed. In table 4 we calculate the unemployment rate of each shrinking cities. Unemployment increases during the 20 years in analysis; which is a transversal phenomenon in Portugal. However, in some cases the value achieved in 2011 sur-

passes the one registered in the remaining years in more than the double (e.g. Espinho) or are above the national average. To better understand this decrease of economic activity we gathered information regarding the employment by sector of activity. With this data we realized that in some cases the decrease of employment is spread among the distinct sectors

Table 3: The rates of population change in cities and corresponding municipality. Oporto and Lisbon data corresponds to the Metropolitan Areas.[3]

Cities	% of Δ in population 91-2011	% of Δ in population 91-2011 in the corresponding municipality
Vila Franca de Xira	-2%	30.7%
Almada	-11%	13%
Oporto	-21%	9%
Lisbon	-17%	8%
Peniche	-4%	5.7%
Horta	-4%	-0.1%
Angra do Heroísmo	-18%	-0.4%
Torres Novas	-4%	-3.1%
Portalegre	-3%	-6.2%
Barreiro	-21%	-8%
Espinho	-9%	-10%
Serpa	-3%	-12.9%
Moura	-3%	-14.4%
Tomar	-2%	-14.4%
Seia	-2%	-19.1%
Gouveia	-12%	-20%
Peso da Régua	-3%	-20.7%

Table 4: Unemployment rate for 2011, 2001 and 1991[4]

	Unemployment rate	*1991*	*2001*	*2011*
1	Espinho	7%	7%	18%
2	Oporto	8%	13%	18%
3	Peniche	8%	10%	17%
4	Moura	12%	10%	17%
5	Barreiro	12%	10%	16%
6	Gouveia	5%	8%	14%
7	Peso da Régua	10%	9%	15%
8	Almada	9%	8%	15%
9	Serpa	13%	14%	14%
10	Portalegre	7%	6%	14%
	Portugal	**4%**	**4%**	**13%**
11	Seia	7%	8%	13%
12	Vila Franca de Xira	9%	7%	13%
13	Tomar	8%	8%	13%
14	Lisbon	7%	7%	12%
15	Angra do Heroísmo	4%	4%	10%
16	Torres Novas	6%	6%	10%
17	Horta	4%	4%	8%

[3] Lisbon Metropolitan Area includes the following municipalities: Alcochete, Almada, Amadora, Barreiro, Cascais, Lisboa, Loures, Mafra, Moita, Montijo, Odivelas, Oeiras, Palmela, Seixal, Sesimbra, Setúbal, Sintra and Vila Franca de Xira. Oporto Metropolitan Area includes the following municipalities: Arouca, Espinho, Gondomar, Maia, Matosinhos, Oliveira de Azeméis, Paredes, Porto, Póvoa de Varzim, Santa Maria da Feira, Santo Tirso, São João da Madeira, Trofa, Vale de Cambra, Valongo, Vila do Conde and Vila Nova de Gaia.

[4] Calculated using the following formula: (Unemployed inhabitants/ Economically Active inhabitants) x 100

of activity while in the cities identified in figure 2 the decrease is focused mainly in the secondary sector, specifically in the subsectors of constructions and or transformation industry (table 5). In these cases we propose that a process of economic transformation took place. The cities where this process was identified were Lisbon, Oporto, Barreiro, Almada, Espinho, Peniche, Gouveia, Seia, Moura and Portalegre.

In some other cases such as Peso da Régua, Torres Novas, Tomar, Horta and Angra do Heroísmo suburbanization and economic transformation do not explain the decline in resident population since the respective municipality is also shrinking and the increase in unemployment is spread by the different sectors of activity. In these cases we explored the pull factors of the surrounding cities and for all this cases we found features that could induce the migration of one city to another close-by. Hence these cities have been included in a typology designated Satellite cities.

Figure 2: Number of employed inhabitants (1991-2011) in the cities where economic transformation was identified.

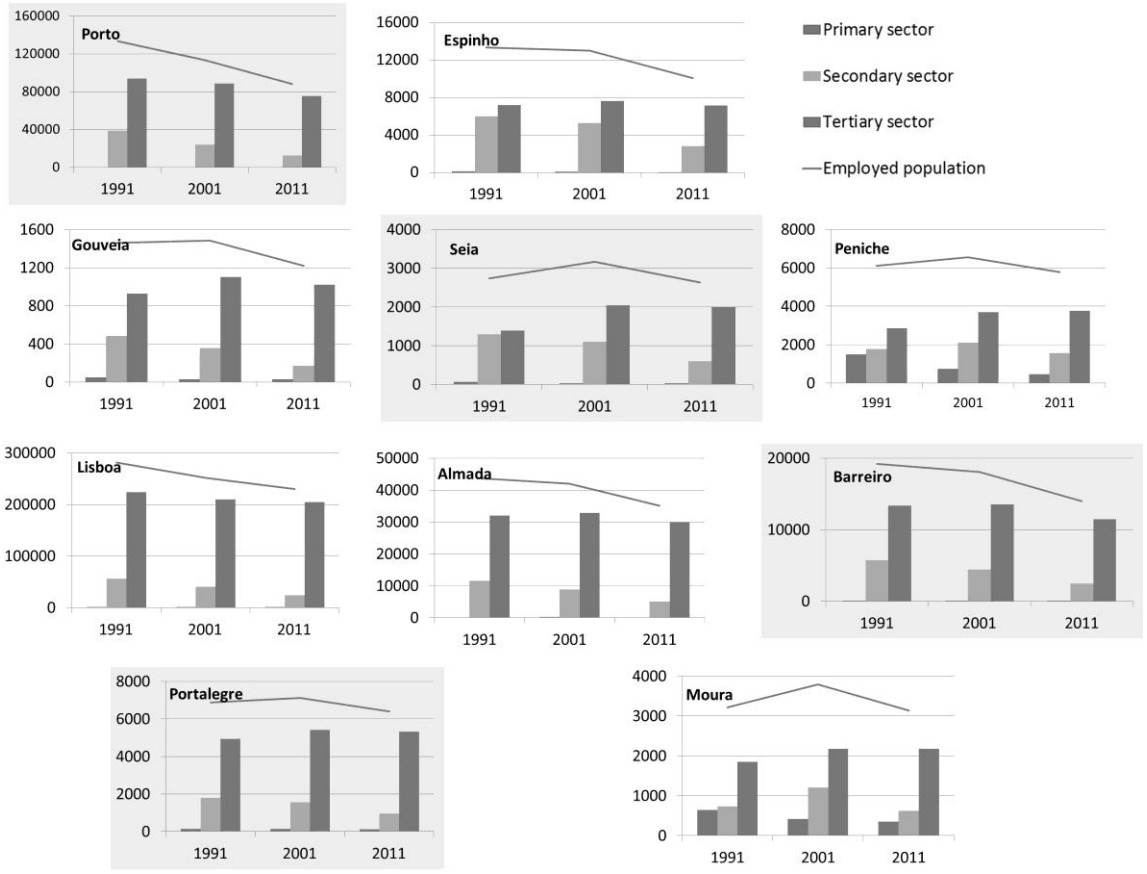


Table 5: Decline of employment from 2001 to 2011 in the most affected sectors

Cities	*Transformation industry*	*Construction sector*	*Fisheries sector*
Lisbon	44%	43%	Not relevant
Oporto	42%	45%	
Barreiro	45%	Not relevant	
Almada	49%	41%	
Espinho	46%	51%	
Peniche	Not relevant	56%	37%
Gouveia	57%	Not relevant	Not relevant
Seia	50%		
Moura	Not relevant	70%	
Portalegre	52%	Not relevant	

4.4. Satellite shrinking cities

This effect can be defined as a silent competition between urban areas close-by. In these cases the pull factors from one city surpasses those of a neighbouring one which leads to the migration of inhabitants inducing a shrinkage process in the later due to less quantity or quality of pull factors or strong push factors.

In the case of Peso da Régua, there are 4 cities growing within a distant of ~50 km or less (figure 3). Peso da Régua lost around 300 inhabitants while the unemployment rate in 2011 was 15%. Vila Real in the same period grew 33% and the unemployment rate was 11%. Hence the economic conditions are superior in this city. Further within Vila Real there is a public University while Peso da Régua does not have any institution for higher education. The combination of these characteristics are pull factors for young residents in Peso da Régua, lacking employment opportunities and or wanting to obtain higher education. The fact that from 1991 to 2011 the age group between 0-24 years was the one where the decrease was identified sustains the purposed typology (figure 4).

Figure 3: Peso da Régua and surrounding cities.

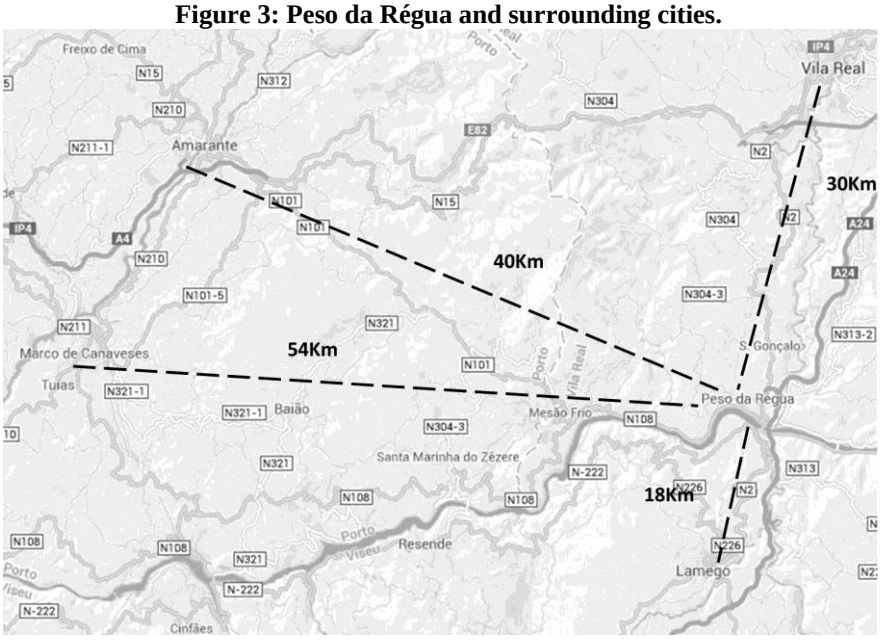
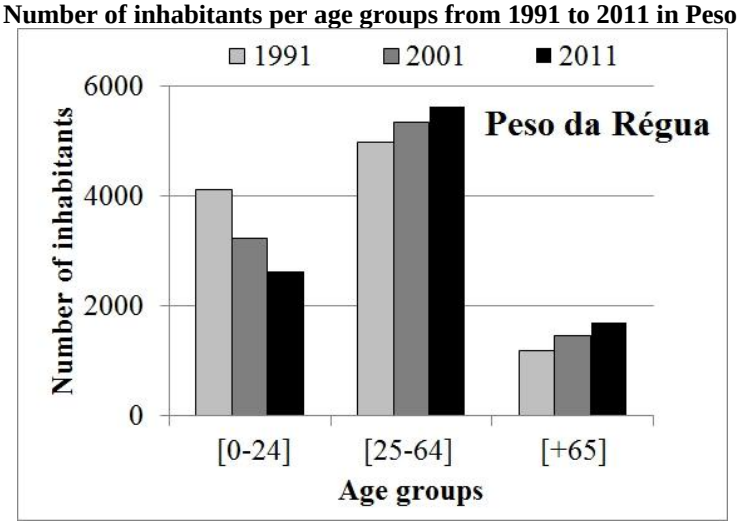


Figure 4: Number of inhabitants per age groups from 1991 to 2011 in Peso da Régua



Tomar and Torres Novas are two close-by shrinking cities (Figure 5) that show similar push factors. Nearby there are three growing cities: Fátima, Entroncamento and Ourém

(61%, 42% and 44% increased of population between 1991-2001, respectively) that act as atracting poles.

The unemployment rate (table 4) is equal to the national average in Tomar (13%) and below in the case of Torres Novas (10%). Although the values are not particularly high they are equal or above those of the nearby growing cities: Fátima (8% of unemployment), Ourém (9%) and Entroncamento (10%). Hence, inhabitants of Tomar and Torres Novas migh decide to move to nearby cities due to working opportunities. The fact that both cities present a decrease in population in the working ageing groups while the opposite is observed in all three growing cities supports the statements (figure 6).

Figure 5: Location of two shrinking cities: Tomar and Torres Novas, as well as, the nearby cities where population increase between 1991 and 2011

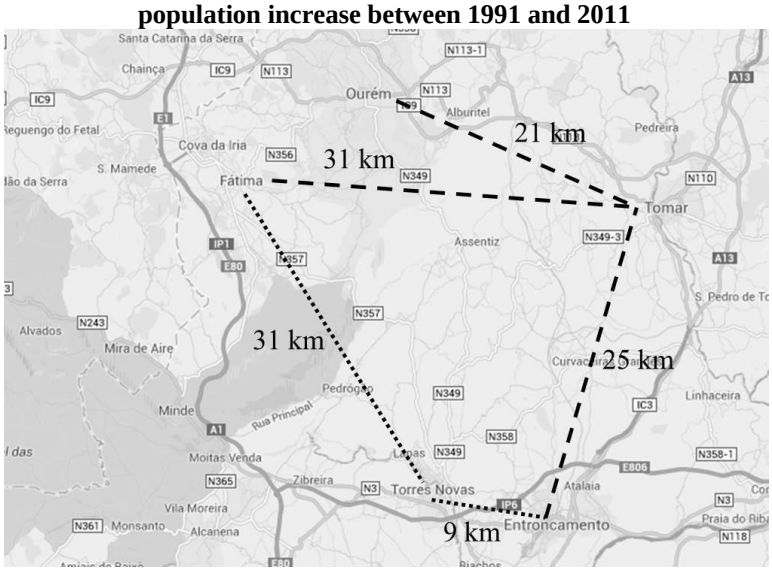
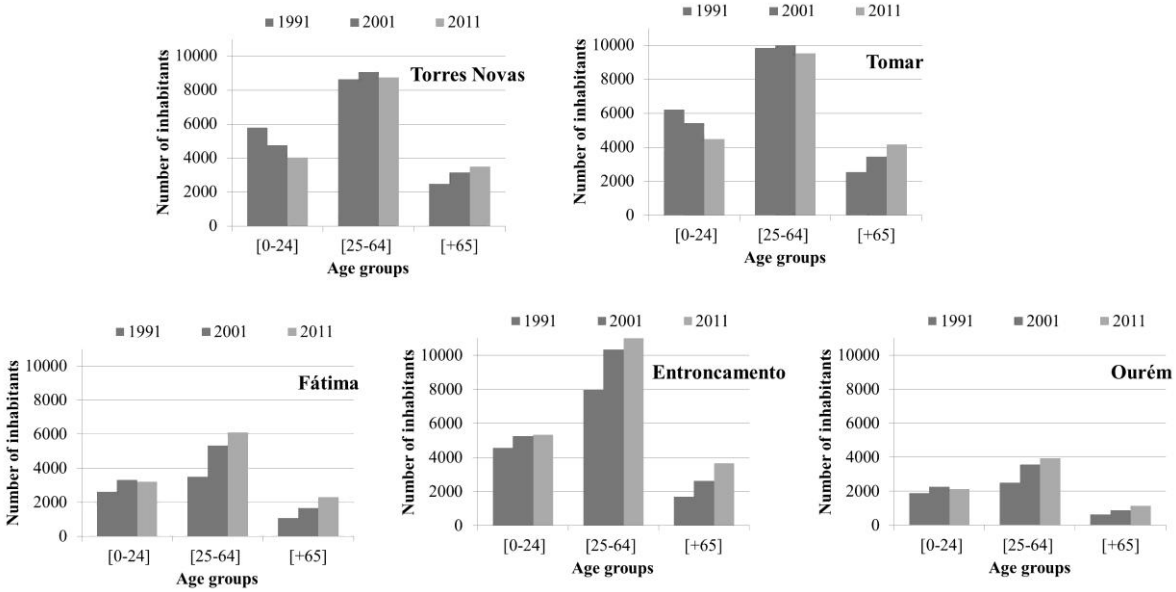


Figure 6: Number of inhabitants by age groups in the cities of Tomar, Torres Novas and nearby cities between 1991 and 2011



Another relevant feature that could promote this migratory movement is the housing prices. The data regarding the housing prices at the level of the Municipality show that the most expensive municipalities are Tomar and Torres Novas (table 6). Even those individuals working in these shrinking cities can be living on one of the growing cities and do less than one hour per day of travelling between house and work. Between the growing cities Entronca-

mento registers the lowest crime rate, as well as, the biggest purchasing power.

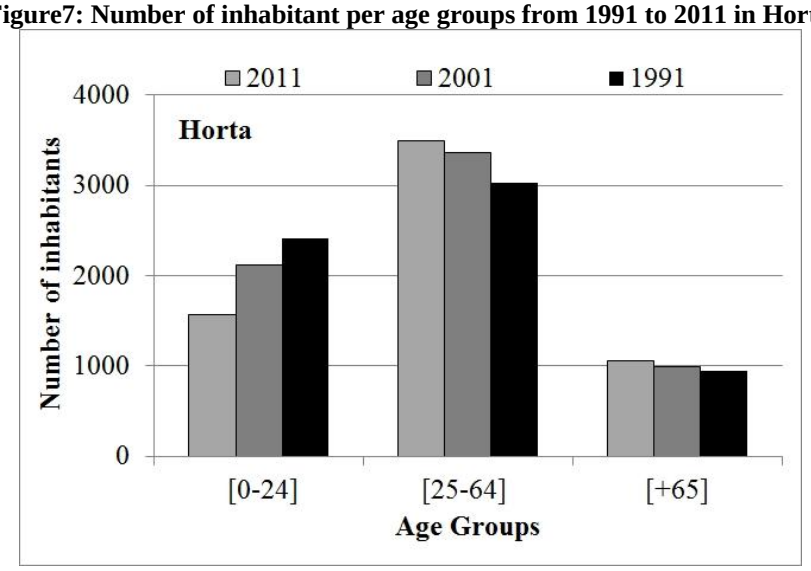
In this typology we also included two cities located in the Azores archipelago. In total the archipelago includes 6 cities; 3 in São Miguel (Ponta Delgada, Ribeira Grande and Lagoa), all of them showing an increase in population between 1991-2011, 2 in Terceira (Angra do Heroísmo shrinking and Praia da Vitória growing), 1 in Faial (Horta) that is losing population.

In the case of Horta, the city lost 300 inhabitants between 1991 and 2011. The fact that the island does not include any option for higher education can partially explain the possible migratory movement to the island of São Miguel and Terceira where the Azores University includes higher education opportunities. As in Peso da Régua, this possibility is supported by the fact that the decline is located within the younger age group (see figure 7).

Table 6: Average housing price for the Municipalities where the cities of Entroncamento Fátima, Ourém, Tomar and Torres Novas are included.

Municipalities	Average Housing price(€/m^2)
Entroncamento	846
Ourém[5]	911
Torres Novas	919
Tomar	978

Figure7: Number of inhabitant per age groups from 1991 to 2011 in Horta



For Angra do Heroísmo the reasons for decline in population are different since this city includes the campus of Azores University which makes it an important city for students. Nevertheless, the population is decreasing while the neighbouring city, Praia da Vitória, grew 4% between 2001-2001. In 2009, Praia da Vitória and Angra do Heroísmo were connected by a fast road that implied a 20 minutes distance by car between the cities. Previously the same trip was done by a national road that could imply around 40 minutes a journey. This might have been a triggering factor for the decision of inhabitants in Angra do Heroísmo to move to Praia da Vitória. In fact, this is supported by data about migratory movement. In Angra do Heroísmo the migration is negative while in Praia da Vitória it's positive. The fact that in the island there are only two municipalities allows us to use data of 2011 census regarding the individuals that have changed residency from one municipality to the other. Al-

[5] This municipality includes Fátima and Ourém cities

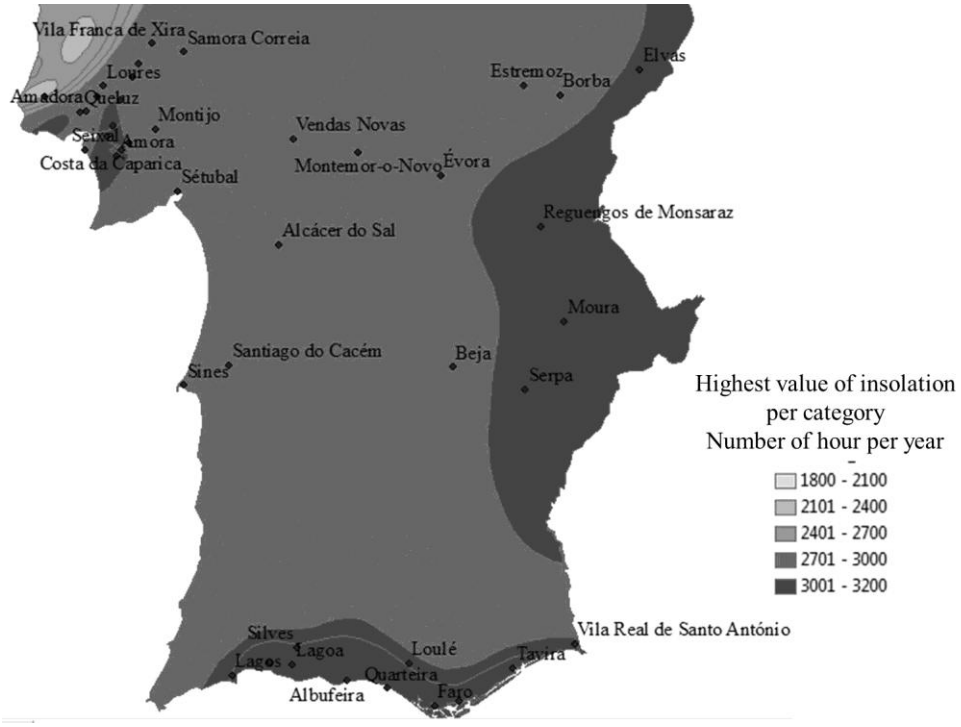
though this is a two way movement, we observed that went from Angra do Heroísmo to Praia da Vitoria is almost twice (around 800) than those that left Praia da Vitória to live in Angra do Heroísmo (around 490). Finally, in the next section we present the fourth and last typology purposed by us.

4.5. Cities with environmental drivers towards shrinkage

In Portugal the shrinking phenomenon at municipal level has been more intense in the interior of the country mainly in the Alentejo region. This fact is partially explained by the combination of environmental push factors such as the heat intensity and lack of water (Figure 8 and 9).

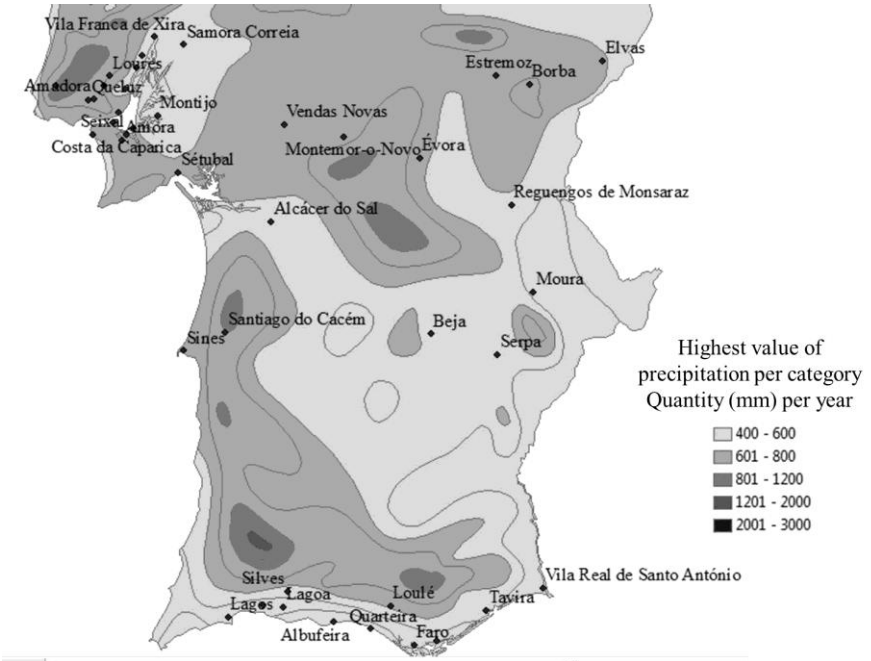
Serpa and Moura are shrinking cities located in the region with highest quantity of hours of sun per year while having the lowest precipitation levels. These two features can constitute push factors. Nevertheless, as show in figure 8 and 9 two cities where population increased are under the same conditions: Reguengos de Monsaraz and Elvas. This suggests that environmental drawbacks can be overcome by other features. In Elvas the proximity to a highway and to one important city of Spain (Badajoz) might contribute to the population growth registered. In the case of Reguengos de Monsaraz, the proximity to Évora (one of the most important cities of Alentejo), the industry of wine and tourism might also be pull factors. Moura as we mention earlier suffered a recent economic transformation and so far hasn't been able to revitalize the economic dynamic lost. In Serpa, the fact that it is located in one of the highest insolation areas in Portugal has been taken as an advantage and the instalation of the biggest sun panel park in Europe was done there. However, this per se has not been enough to prevent the decline or the effect of such strategy is yet to notice.

Figure 8: Map showing the quantity of hours per year of sun in the southern area of Portugal and the cities location.



Source: Atlas do Ambiente: http://sniamb.apambiente.pt/webatlas

Figure 9: Map showing the quantity in milimeters of rain in one year in the southern area of Portugal and the cities location .



source: Atlas do Ambiente:http://sniamb.apambiente.pt/webatlas

5. DISCUSSION AND CONCLUSIONS

From the spread distribution of the shrinking cities in Portugal we can conclude that the phenomenon is not restricted to the interior and isolated areas (i.e. the coastal pull factor). These results endorse the argument that the dichotomy coast-interior is simplistic and the population decline is a process much more complex (Haase et al., 2013).

In all shrinking cities we found that the population and economic activity had a bigger decrease from 2001 until 2011. Further, in some cities we observed an increased economic activity followed by a heavy fall from 2001 to 2011 (Seia, Gouveia, Moura, Portalegre and Peniche). This behaviour is probably linked to what was observed at the country level. From 1991-2001 there was a small increase in births, a strong increment in immigration and decline of the emigration (Carrilho and Patrício, 2002). Up to 2004, several events could have had a relevant impact on the economic performance of the country: Expo 98, the introduction of the Euro (€) in 1999, the European Capital in Oporto in 2001 and the Euro cup in 2004.

Many developed countries face declining birth rates and an ageing population, whereas immigration might not balance the losses (Großmann et al., 2013). Portugal is included in this group despite the fact the country presents a diversify situation where some areas don´t follow this overall trend (see details in Jacinto and Ramos, 2010). Therefore increasing negative natural rates were mainly considered consequences of shrinking drivers.

From 1991-2011 we identified 27 shrinking cities in Portugal that were grouped around four drivers: suburbanization, economic transformation, satellite effect and environmental factors.

Suburbanization affected the two main cities of Portugal: Lisbon and Oporto. The decline trend in both cities is visible since 1970. According to Panagopoulos and Barreira (2012) one in five buildings in Lisbon is either abandoned or in poor condition. Nevertheless, in addition to the suburbanization process we found that both cities show considerable losses in the construction and transformation sectors. Specifically in Oporto, unemployment rate is the highest of the shrinking cities and 5% above the national average. In the case of Lisbon the city registers 5% increase of unemployment from 2001 to 2011; however it's still below the national average. This might imply that Lisbon is more resilient to economic transformations than Oporto.

Within the typology of economic transformation the cases of Peniche, Barreiro and Moura stand out. Peniche has one of the highest levels of fisheries dependence of all coastal

municipalities in Portugal (Moniz et al.,2000). The activity includes not only the harvesting sector but also several related activities occurring both upstream (shipbuilding, gear manufacture) and downstream (processing, distribution and trade). With one of the nationally most important fishing ports, the city also has a significant processing industry sector (Abreu et al., 2010). At present the sector is stagnant after registering a decrease in its overall importance in recent years. Further, the current global decline of marine resources also contributed to the shrinkage phenomenon in Peniche (Moniz et al., 2000; Abreu et al., 2010).

Barreiro was one of the main industrial centers of the Iberian Peninsula which attracted steadily new inhabitants after the 60's but due the deindustrialisation process, after the 90's the city loss population, reaching in 2011 figures equal to 1970.

In the case of Moura city, the building of Alqueva Dam (between 1998-2002) probably explains the high economic activity followed by an impressive decline (in construction more than 70%) between 2001-2011. Thus, Moura is a clear case of economic transformation. However, Moura is also a city located in the most environmentally harsh region of Portugal, the Alentejo. The region is characterized by a combination of high temperatures and low rain and such setting makes it a challenging region to live in. In the era of climate and environmental changes there is need for careful consideration of such conditions (Pallagst, 2005; Rappaport, 2007). For this reason we suggested a typology focus on environmental drivers towards shrinking.

Finally, we proposed another typology that is not frequently discussed in the literature, the satellite effect. Several authors refer the fact that in some cases economic activity is increasingly concentrated in certain urban areas which damages 'ordinary' cities and towns (Hospers, 2013; Merrilees et al., 2013). Within Portugal some cities such as Entroncamento are designated sleeping cities, since most residents live their but work somewhere else, mostly in Lisbon, Tomar and Torres Novas (CME, 2009). Peso da Régua is also an interesting case because although known as the international capital of wine and vineyard and located in a beautiful landscape in the center of the Douro region, such attribute are not enough to sustain inhabitants.

Comparing our typology proposal with Sousa (2010) we found some relevant similarities which strengths both analysis done. The author identified three clusters of shrinking cities. The first comprises the cities of Almada, Vila Franca de Xira and Lisbon where predominate aged and derelict building blocks. These results are in compliance with our findings regarding the process of suburbanization occurring in these cities. The second cluster includes the cities of Elvas, Portalegre, Silves, Figueira da Foz and Gouveia. Since our dataset includes an additional decade we found that Elvas, Silves and Figueira da Foz population has increased from 2001-2011. Despite this fact, we support her findings for the cases of Portalegre and Gouveia. The third cluster comprehends the following cities: Alcobaça, Amadora, Espinho, Fiães, Lamego, Lixa, Lourosa, Mangualde, Marinha Grande, Matosinhos, Odivelas, Penafiel and Santo Tirso. From this group we just considered Espinho as a shrinking city. Lourosa and Fiães were established cities in 2001; hence not considered by us. The remaining cases show a population increase between 2001-2011.

While uncovering a pattern of behaviour in shrinking cities of Portugal we found several chain reactions that make it difficult to separate the causes from the consequences of shrinkage. Barreiro for instance is perceived as a degraded residential area with sharp deterioration of buildings and public spaces, loss of environmental quality and urban and architectural distinctiveness, social degeneration with a decrease in population heterogeneity, growing segregation – poor, inactive, illiterate or uneducated, and foreigners (namely Romany) – and (perception) of growing insecurity are worries. Hence, economic transformation might have been the cause of the above scenario; however, such factors are also push factors that can induce a shrinking process. A similar process has been described for the case of Vila Franca de Xira where a process of suburbanization is taking place but socio-economic stratification is causing difficulties to territorial cohesion and social integration (Sousa, 2010).

Despite the manner used to define shrinking and its typologies, understanding the causal processes of population decline gains more importance when devising regional or city strategies. The present work is a step towards such planning effort. Nevertheless we highlight the fact that further analysis of shrinkage in

Portugal will be beneficial to complement the typology suggested. The use of the concept of functional city instead of administrative city when identifying shrinkage and typologies might prove to provide further insights to the present discussion, thus offering future research developments.

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