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DEMOGRAPHIC DYNAMICS, ECONOMIC EXPANSION AND SETTLEMENT DISPERSION IN SOUTHERN EUROPE: CONTRASTING PATTERNS OF GROWTH AND CHANGE IN THREE METROPOLITAN REGIONS

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Abstract
Settlement densification and scattering are two processes through which cities evolved. Becoming a multidisciplinary research issue, urban sprawl is among the major concerns in developed and emerging countries for its negative impacts on socio-environmental complex systems. Sprawl varies at the regional scale, following different characteristics, dynamics, effects and consequences. Consequently, converging on a unique definition for sprawl is made even more difficult when patterns and processes of urbanization in various countries and regions are considered together. Our study aims at deriving a comprehensive interpretation of urban scattering based on a narrative analysis of recent expansion paths in three metropolitan cities of southern Europe (Barcelona, Istanbul, Naples) in terms of density traits, spatial forms, socioeconomic and environmental impacts. Compared to past urban trajectories, recent processes of urban expansion produced inherent changes in the density gradient, requiring specific actions of urban containment.
Keywords: settlement dispersion, southern Europe, urban growth, metropolitan regions

1. INTRODUCTION

An intriguing debate arose in recent times around two patterns of urbanization, density and dispersion (Bruegmann 2005; Kasanko et al. 2006; Catalàn et al. 2008; Salvati and Gargiulo Morelli 2014; Salvati et al 2018). Nevertheless, only in recent decades with rapid population growth and a more awareness on conservation of natural environments, studies on centralized and compact versus discontinuous and low-density trajectories of urban development have become a matter of intense research (Aguilar 2008; Duvernoy et al. 2018). For instance, sprawl is the typical outcome of low-density outward urban expansion (Monclùs 2000; Nel-lo 2001; Muñoz 2003; Catalàn et al. 2008). Nowadays, sprawl process concerns developed and emerging countries for its negative impact on socio-ecological systems (Bruegmann 2005).

Studying urban sprawl differs over cities since it adapts to local dynamics and structures (Bonifazi and Heins 2002). Therefore, searching for a unique definition of sprawl is more problematic when variances in urban patterns and processes in several cities (and their metropolitan areas) located in different countries are considered (Bruegmann 2005; Gargiulo Morelli and Salvati 2010). Looking out for defining sprawl exploring its spatial forms, density traits, socio-economic and environmental influences exposes intrinsic complications (Chorianopoulos et al. 2010; Salvati et al. 2013). Dispersive urban growth has brought about a change in sharpness of the density gradient line, which in the urban context moves only with an increase in population (Couch et al. 2005; Gargiulo Morelli and Salvati 2010).

2. EXPLORING URBAN TRENDS IN SOUTHERN EUROPE

Following Eurostat database, countries of the European Union comprise 511.5 million people in 2017, with an average population density of 118.3 inhabitants per km2. Due to its ageing and low fertility rates, European population will increase moderately in future depending mainly on inward migration form countries outside the continent. Within Europe, consistent migration from East to West and from rural to urban areas still seems to be the general trend (European Commission 2004). It was predicted that the European population living in urban areas will rise from 73,3% to 78% among 2005 and 2025 (United Nations 2005). Consequently, urban areas will provide accommodation for 28 million additional inhabitants over the following 20 years. Besides, changing economic functions require more peripheral areas for commercial and industrial expansion, also reinforced by the competition for capital attraction amongst cities (Gargiulo Morelli and Salvati 2010).

According to the United Nations Urbanisation Prospects, by 2030, a growing pressure for urbanisation will expected in Southern European and Northern African cities specifying the last year (2017) (Table 1). Urbanisation trends have differed significantly (Bonifazi and Heins 2002). For instance, the urbanisation rate in Southern Europe has been projected to increase to 75.2% by 2030 (from 44.2% in 1950). Particularly, projections estimate 71.6% in Greece, 76.1% in Italy, 81.6% in Portugal, 82.2% in France, and 84.5% in Spain (Barbero-Sierra et al. 2013; Salvati and Forino 2014).

TABLE 1 - URBANIZATION RATES (IN PERCENTAGE) FOR THREE CONTINENTS AND THE WORLD, 1950-2030.

Region	1950	1970	1990	2010	2030
Africa	14.7	23.1	31.8	42.7	52.9
Asia	17.4	23.4	32.3	43.0	54.1
Europe	52.4	64.6	72.1	75.1	80.5
World	29.8	36.8	43.5	51.5	60.2

Source: UN 2002.

Drivers of urban development are becoming increasingly endogenous, fed by internal redistribution, inter-urban migration and a rural exodus. Over a third of this growth will take place in the coastal regions, more specifically in the coastal cities. “Coastalisation”, as the concentration of population and economic activities in the coastal

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spaces, represents a general trend since the last two centuries of urbanisation in the Mediterranean basin (Kasanko et al. 2006; Longhi and Musolesi 2007; Turok and Mykhnenko 2007; Schneider and Woodcock 2008; Salvati and Forino 2014; Carlucci et al. 2017). As took over large hilly areas, plateaux and mountains, which characterise the inland Mediterranean area, the Mediterranean shores experienced considerable structural disabilities for urbanisation purposes due to increasing international tourism (Gargiulo Morelli and Salvati 2010; Salvati 2014a). With 150 million tourists visiting the coastal regions, people appeal to the Mediterranean Europe as tourist destination, recording an influx could double from today until 2025 (King et al. 1997; Salvati 2014b).

Whereas, more than half the world's population now lives in towns, two in every three residents in Mediterranean urban areas. In the coastal area in the Mediterranean basin, population went from 285 million in 1970 to 427 million in 2000, possibly reaching 524 million by 2025 giving to Blue Plan trend scenarios (Figure 1). Besides, urbanisation rates would change from 64.3% in 2000 to 72.4% by 2025. Furthermore, the globalising economy and the consequent restructuring of the traditional rural economies and societies of the inland areas has significantly contributed to coastal urban growth in numerous Mediterranean countries (Salvati 2014b). Trending populations and economy, coastalisation has correspondingly reinforced major works as for developing coastal plains, e.g. large-scale transport infrastructures (Kasanko et al. 2006; Salvati 2014b).

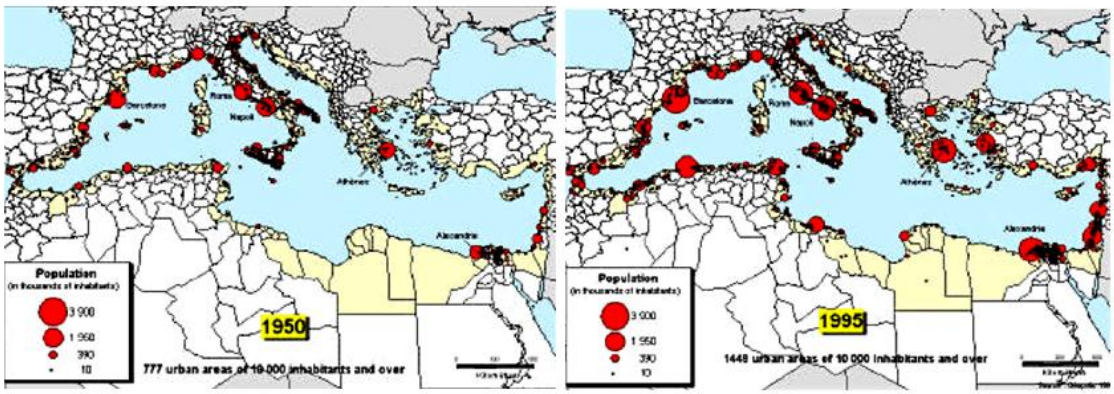

FIGURE 1 - URBAN AREAS WITH > 10,000 INHABITANTS IN THE MEDITERRANEAN COASTAL REGIONS, 1950 AND 1995.

Source: Plan Bleu-Regional Diagnostic Outlook (April 2010).

Based on these premises, the present paper intends to explore sprawl processes in specific Mediterranean contexts (Barcelona, Istanbul, Naples). Monitoring land-use/land cover changes bring up useful information for urban planners and policy makers for the management of uncontrolled urbanisation and sprawl (Alphan 2003; Anderlini 2003; Salvati, 2013). Analysing the different degrees of urban sprawl in European cities (Newman and Thornely 1996; Bonifazi and Heins 2002; Brezger 2006; Longhi and Musolesi 2007; Turok and Mykhnenko 2007; Zambon et al. 2018a), data from the European Union's Urban Audit were used. The Urban Audit presents socio-economic and environmental statistics for 258 large and medium sized cities within the European Union city and their relative "Large Urban Zone" (LUZ). As sprawl process arises beyond urban boundaries, the adoption of

different spatial urban extension should include all those areas inhabited by daily commuters. Therefore, using LUZ data rather than cities outcomes chiefly convenient for investigate dispersive dynamics. However, some caution must be used in using and interpreting this data: for instance, the administrative boundaries of LUZ don't automatically coincide with the functional and political ones (Couch et al. 2008; Gargiulo Morelli and Salvati 2010). Furthermore, such informative arrangement was mainly useful for analysing sprawl as a process which differs from urban growth, expressing how the density gradient line diverges over time. In fact, sprawl occurs when the percentage of the population living in the core city declines relative to the total population of the conurbation (Couch et al. 2005; Turok and Mykhnenko 2007). Cities can be generally classified in 4 types according to their growth and sprawl trends (e.g. Geyer and Kontuly 1993; Antrop 2004). Firstly, urban containment appeared, commonly in Northern cities of Europe which successfully combat sprawl (Colantoni et al. 2016). They are consistently growing and achieving greater compaction at the same time. Secondly, urban growing rates are combined with sprawl, mostly common trend in most European cities. Dutch cities seem to combine quite high rates of growth with strong restraints of sprawl. Thirdly, negative increasing rates accompanied by a greater compaction or negligible sprawling rates. This group is probably the smallest. And finally, a decline in population is combined with consistent sprawling rates. This is the group of cities which are experiencing the worst organisation in urban planning.

3. URBAN DIVERSITY AND THE MEDITERRANEAN REGION: THREE CASE STUDIES

Sprawl processes were studied in three Mediterranean contexts: Barcelona in Spain, Istanbul in Turkey and Naples in Italy. In the case of Barcelona, its history and geography have played a critical role in shaping the nature of urban sprawl and the challenges facing planners in containing it (Colantoni et al. 2016). The Barcelona Metropolitan region (BMR) is made up of the central city area (divided in 10 districts) and 128 municipalities, each with its own individual social, political and economic identity (Gargiulo Morelli and Salvati 2010). In addition, topography has influenced the evolution of the RMB (Nel-lo 2001). Its current landscape derived from a history composed by sequential urban layers that combine in different development patterns (Busquets 2006; Marull et al. 2009). The RMB has witnessed a dispersive expansion resembling that of North-American suburban areas in terms of low-density residential 'sprawlscapes' (Muñoz 2003); or, on the contrary, these new urban patterns are to be valued as a mere metropolitan enlargement in which sprawl remains relatively controlled (Nel-lo 2001; Catalàn et al. 2008). By contrast, some authors argued that North American and Spanish models diverge among them: (i) urban sprawl is a relatively recent phenomenon in Spanish cities (Monclùs 2000); (ii) inner areas in Mediterranean cities have retained high population densities (e.g. Martori and Suriñach 2001; Durà-Guimerà 2003; Carlucci et al. 2017); and (iii) Spanish intensity and morphology of sprawl are different from the American model. The major socioeconomic and political variations that contributed to such rapid suburbanization process were increasing per capita incomes, changes in family structures, internal migration, developments in the

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communication networks and growing levels of individual mobility, the transformation of the labour market and the increasing value of housing in the dense central areas (Marull and Mallarach 2002 2005; Dura-Guimera 2003; Domene and Saurì 2007; Catalàn et al. 2008; Zambon et al. 2018a).

In addition to the BMR, Istanbul is the second metropolitan area investigated (IMR). Istanbul is the largest Turkish city since it is also an important financial and cultural centre (Arslanli et al. 2006). The study area covers the inner city of Istanbul with five state forest industries (Bahcekoy, Catalca, Istanbul, Kanlica and Sile), 24 rural directorates of forestry, 12 private forests (PF) (approximately 546 381 hectares) and 9 islands. Istanbul is surrounded by Black Sea in the north, by the Province of Tekirdag in the west, by the Province of Kocaeli in the east and by the Province of Marmara Sea in the south. Istanbul is situated in North-western of Turkey, characterised by a dominantly smooth terrain with an average slope of 15% (Alphan 2003).

Population in Istanbul increased from 3,904,588 to 12,573,836 between 1975 and 2007, primarily due to migration (Turkish Statistic Institute 2007). The city attracted relevant migration flows during the past years as it offers many economic opportunities when compared with other Turkish cities. Istanbul has more people and industrial/commercial/activity, accounting for around 28% of Turkey's gross national product (Arslanli et al. 2006). Istanbul provides around 40% of the country's tax revenue, is home to around 38% of the country's industrial companies around 55% of the country's commercial companies and has a current population growth rate of around 3.8% year (Cetiner et al. 1994). As a result, the urban population of Istanbul is rocketing since few decades. Due to an increase of about 10,000,000 persons (Devlet Istatistik Enstitusu (DIE) 2000; Arslanli et al. 2006), areas used for settlements have expanded in extreme proportions, both as planned urbanisation and, unfortunately, illegal housing (Maktav and Erberk 2005; Aguilar 2008). Istanbul has challenged with an intensive and informal advance of residential areas since the 1950s, especially in the low-density urban fringe (Gargiulo Morelli and Salvati 2010). This kind of urbanisation is consuming massive rural land and other green areas (Maktav and Erberk 2005; Aguilar 2008). Even by optimistic estimates, at least half of the IMR 12.5 million residents live in "gecekondus", a form of "self-help housing". Consequently, informal residential areas invaded new contexts, e.g. high-quality agricultural land (Bolen et al. 2007). Furthermore, land-use/land changes, affected by human-induced activities and growth population (Wear et al. 1996; Geymen and Baz 2008), is also causing land degradation and desertification of agricultural and forest areas (Montanarella 2007; Colantoni et al. 2015). The recent master plan (2007) projected new residential areas in the peripheries (IMP 2007), but also controlling urban pressure and protecting ecologically sensitive natural lands (Göksel 1998; Coskun et al. 2006; Bolen et al. 2007).

The three-case study focused on the urban expansion of Naples which had a strong impact on the surrounding territory (Papa and Mazzeo 2014). Correspondingly in Naples, sprawl led to the conversion of agricultural land to massive impervious areas, deteriorating the environment. Urban congestion and chaos are the dominant

characteristics of the metropolitan area of Naples (MAN) are, especially in the urban outskirts (Papa et al. 2009). The neighbouring areas of Naples progressively grew into an intricate urbanization process (Coppola 1991; Coppola and Viganoni 1997). However, in these new urban areas, over-building and illegal construction coexist together with substantial attractions in relations of accessibility and productive sites (Amato 2014). Therefore, the urban conditions of the outskirts of Naples are amongst the major concerns. Numerous environmental and social difficulties emerged for which coming up with a solution represents one of the major challenges. Urban boundaries have moved together with the rapid expansion. Today Naples has reached areas well beyond its local administrative boundaries (Papa and Mazzeo 2014), resulting in the effort to govern over these residential and industrial sites (Gargiulo Morelli and Salvati 2010).

4. METHODOLOGY

The assessment of urban sprawl in the BMR was carried out through a cartographical approach (due to the lack of an administrative definition of BMR that implies the absence of official statistics for the metropolitan area) (Solans 2002). The Territorial Plan (BMTP) and data provided by Font et al. (1995, 1999) on the morphology of urban sprawl in the BMR were spatially and temporally analysed, especially with regards to 3 categories of land-use: urban, agrarian and forest. The approach provided insights into the nature of urban sprawl in this context and its impact on landscapes in the urban-rural fringe. Land-use trends were then cross-referenced with the various spatial plans that have been adopted in recent decades in the BMR. Offering insights into the relationships between processes of urban sprawl and land-use change in the rural-urban fringe provides a basis for considering the success, or otherwise, of spatial plans in containing urban sprawl and maintaining the quality of rural landscapes (Paül and Tonts 2005; Catalàn et al. 2008; Marull et al. 2009; Colantoni et al. 2016).

The assessment of urban sprawl in the IMR was carried out through the analysis of the demographic development and land-use changes (Terzi and Bolen 2009). Determining land-use changes in Istanbul, two different data sets of satellite images and maps obtained from the following sources were used. The inter-temporal dimensions of the sources vary between 1990 and 2005: Landsat GeoCover LC - 1990, 2000; and Landsat TM - 1995, 2005. The research was directed to the land-use changes in the IMR. Among the land-use changes, the size of built-up areas and its change over time is the centre of attention (Çakir et al. 2008). The pilot region selected as the concern of the study was under the pressure of rapid and unplanned population increase especially over the period of 1990 - 2005. The region demonstrates a typical example of how humans tend to settle near areas enriched with a water body and transportation network. It is obvious that such a population increase will cause drastic changes in the land-cover of the region, due to the result of migration to the area and to the availability of employment opportunities. Rapid development of tourism and urbanisation in turn increased the demand for proper infrastructure. However, sufficient infrastructure has not been realised as required. There

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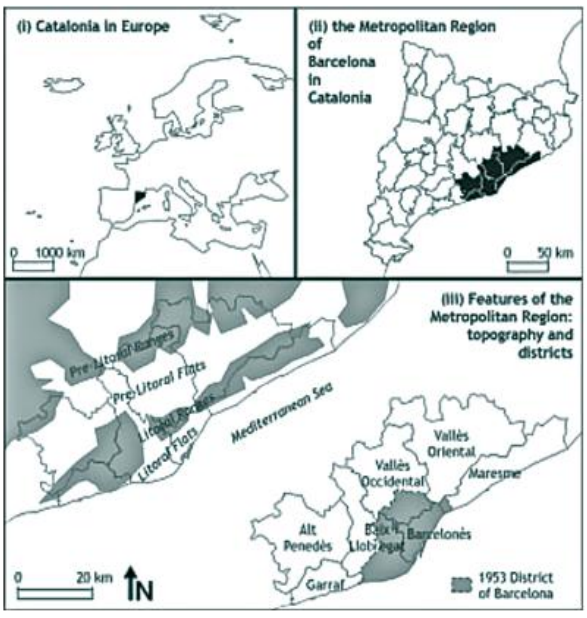
is a requirement to reach an equilibrium among economic development and increasing population in the coastal area, while conserving and maintaining its unique scenic and environmental quality.

The expansion of the Naples, which has occurred mainly in the surrounding urban rings, was testified by two indicators: (i) the diffusion over the territory of commercial and leisure activities, with direct consequences on the costs of urban mobility and the environment (Martinotti 1993; Dal Piaz 1995; Burchell et al. 2005), (ii) the distribution of population. The MRN contains several municipalities which have been divided in various concentric belts (Papa and Mazzeo 2014).

5. RESULTS

5.1. Barcelona

Population distribution in the RMB is different from others in Europe (e.g. Nel-lo 2001). The most important changes have occurred in the subcentres around the central city. After two decades (1960-1980) of strong immigration from the rural areas of south Spain, the population of Barcelona municipality grew from 1,557,863 to 1,754,900; while, for eleven municipalities around the central city the population grew much more, passing from 571,088 to 1,413,603. The absence of some planning system in these years had a special effect for the population distribution. The urban structure is irregular where population is concentrated in small areas. The outcome of such suburbanisation combines high-density areas within a large industrial area.



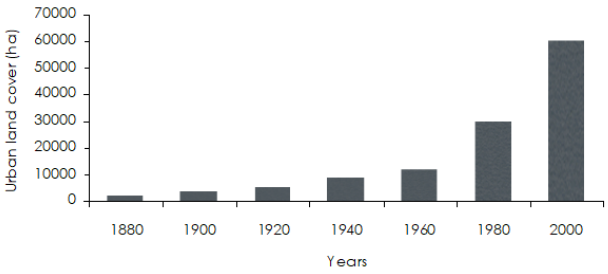


FIGURE 2 - (LEFT) LOCATION MAP AND MAIN FEATURES OF THE BMR (Source: Departament de Geografia Fìsica i Anàlisi Geogràfica Regional, Universitat de Barcelona, Catalonia, Spain);
(UPPER RIGHT); EVOLUTION OF BUILT-UP LAND-USE IN THE BMR, 1880 – 2000 (Source: Català et al. 2007); (lower right) a digital picture of inner Barcelona from Google Earth imagery (2016).

Since the 1950s, the BMR has experienced an accelerated process of land occupation (Figure 3). Between 1950 and 1975, entire new neighbourhoods were built at the edge of traditional cities to accommodate the increasing population migrating from rural areas to the city in a process like that of Italy. From 1975 onwards, migration flows tended to stabilise, but the residential dispersion continued and even increased. Between the 1975 and 1986 and coinciding with a period of economic recession in Spain, urban growth remained fairly-low. Land occupation receded, but residential decentralisation was sustained through infilling processes of former urban "islands". Many of the second homes built during the previous period became main residences consolidating thus the dispersed urban model. In 1986, the economy began to recover together a new wave of land occupation for urban purposes in the metropolitan peripheries that took off during the 1990s. The evolution of the average density per territorial unit illustrated the existence of the suburbanisation course and the population shift towards the BMR periphery (Figure 3).

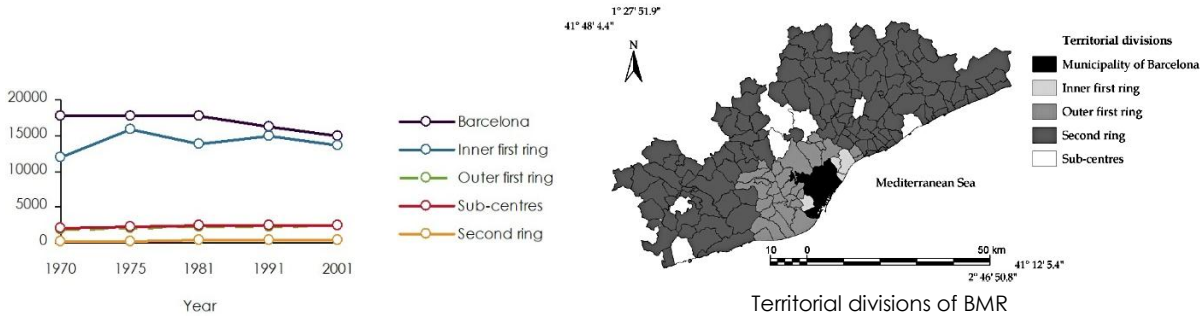


FIGURE 3 - EVOLUTION OF POPULATION DENSITIES IN THE DIFFERENT TERRITORIAL DIVISIONS OF BMR

TABLE 2 - LAND-USE (%) IN THE BMR FOR 1994 E 2001.

DISTRICT	1994				2001			
	FOREST	CROPLAND	URBAN	OTHER	FOREST	CROPLAND	URBAN	OTHER
Alt Penedès	39.31	52.11	8.36	0.22	47.20	39.57	7.19	6.05
Baix Llobregat	46.85	23.52	29.19	0.44	39.94	11.18	45.73	3.15
Barcelonès	11.75	4.47	83.5	0.28	17.13	2.40	79.20	1.27
Garraf	65.94	23.53	10.28	0.25	57.03	11.36	17.76	13.85
Maresme	52.54	26.63	20.32	0.52	56.21	12.51	25.39	5.88
Vallès Occidental	55.27	19.66	24.85	0.22	58.27	9.4	31.51	0.83
Vallès Oriental	67.56	19.06	12.89	0.49	67.37	13.15	15.61	3.86
Total region	52.67	26.42	20.54	0.37	53.74	16.36	25.59	4.31

Source: Elaborated from Estadìstiques agràries i pesqueres de Catalunya. Departament d'Agricultura, Ramaderia i Pesca.

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A general survey of land-use for the BMR for 1994 and 2001 is given back in Table 2. Several key trends become apparent. First, the total area of cropland has declined significantly during this period, while the area of urban land has gradually increased. Forest land has remained relatively stable across the region. However, trends are not uniform across the metropolitan region. Indeed, urban expansion appears to be more rapid in some districts (e.g. Garraf and Baix Llobregat) than others. Similarly, forestry areas have clearly expanded in districts like Alt Penedès but not in some of the others. Also, urban land hasn't increased uniformly amongst the districts.

The largest increases are particularly observed in the sub-centres and in the municipalities of the external part of the first metropolitan ring which appears to confirm the assertion about the importance of the existing urban fabric in the sprawl processes of Southern European cities. In the BMR, between 1994 and 2000, crop land recorded the largest decrease, confirming its role as repository for urban growth. Relatively large and flat areas and proximity to urban settings explained its proclivity to fall under the advance of urbanisation. Shrub land and other non-urban land cover fall, whereas forest land exposed the lowest decrease between 1994 and 2001. The first periphery registered the highest non-urban decrease, with an inner part having already a low non-urban area, and an outer part suffering important losses. In contrast, the second periphery experienced the lowest non-urban decrease because of its high initial non-urban area and its meagre urban potential. The wide-ranging trend for the whole BMR pointed out an outward expansion with the most rapid growth occurring on the fringe. However, this development has not spread outward in simple concentric rings: between 1956 and 1972, it was discontinuous with the most evident pattern being the formation of separated islands or patches of urban development in the fringe areas. Urban sprawl in Barcelona seems to have adopted leapfrog development and conversion of second houses into main ones as the principle modalities of manifestation.

Only in the successive period (1973-2002), urban expansion concentrated along major roads in the areas between the urban centre of Barcelona and some urban islands on the fringe. Much of the new development on the fringe of Barcelona consists of low-density detached housing. 40% of new houses in the central areas of the BMR were detached family houses, while in the small towns and villages of the rural-urban fringe, 70% of new houses were detached (Muñoz 2003). Such proliferation of detached housing contributed to drive urban sprawl as favoured housing type for many residents. Furthermore, non-urban land prices are relatively low, making housing more affordable.

In addition to the dispersive residential phenomenon, the construction of second homes in Barcelona was emblematic. In the 1960s and 1970s, several people living in Barcelona purchased second homes in the rural-urban fringe, often in hilly or mountainous areas. Indeed, the Litoral and Pre-litoral ranges were occupied by hundreds of small plots, most of which were simply a result of the subdivision of an unproductive farm. While, many of these new settlements were only occupied during holidays or weekends (or even permanently

unoccupied); by the 1990s, they had become an important part of the expansion of the metropolitan region as people began to convert them to permanent homes. These new types of settlements, called "urbanitzacions" in Catalan, are now more than 800 in the BMR occupying a total of 22,000 hectares, which constitutes approximately 40% of the 50,000 hectares of designated urban land in the region. Morphologically, these areas seem 'islands', due to their only one access route, and embody a form of 'leapfrog' development, quite different from a contiguous form of urban expansion.

Together with residential expansion, also the relocation of industrial activities occurred in peripherical areas. Several industries shifted from the central areas of Barcelona to the outer well-connected areas of the metropolitan region, particularly in the Baix Llobregat and Vallès districts. Two of the most important land-uses along the main transport routes in these areas are logistics and freight activities, both of which require large amounts of space. In the Alt Penedès district, relatively low land prices contributed to the most recent wave of industrial occupation. Even an increase in retailing activities and shopping centres sprung up in areas that offer cheap land with easy access to transport networks. The first of these major shopping centres was the Baricentro in 1980, constructed at the junction of the Mediterranean and the Barcelona-Sabadell Highways. More recently, large shopping centres were constructed on other major transport routes (e.g. the Maresme Highway and L'Ametlla Highway).

Environmentally, sprawl contributed to a significant decrease of agrarian land in the fringe. Between 1972 and 1999, cropland fell from 80,000 to 50,000 hectares (- 36%), especially around central Barcelona and in Maresme, Vallès Occidental and Baix Llobregat districts, with average reductions of between 75 and 100%. The most rapid decrease occurred between 1982 and 1989 (- 20%), and between 1989 and 1999 (- 12%). In 1999, cropland in most municipalities near Barcelona represented less than 10% of total land-use while, in some fringe and flat areas, cropland still uses more than 50% of the total. Agrarian land-use change has been coupled by significant changes in forest land. Data from the National Forestry Inventory indicated that forest use in provincial Barcelona increased from 362,000 in the mid-1960s to 424,186 hectares in the mid-1980s. Between 1994 and 2001, the growth was only 1% according to data from the Department of Agriculture. Forest cover in the lower lying areas has remained relatively stable thank to natural parks and other protected spaces in mountainous areas. In mountainous areas, farming tended to be marginal, shifting towards an afforestation. Preserving and enhancing Barcelona's natural environment through natural parks, forestry has not diminished.

In the BMR, the current urban saturation of the metropolitan inner core limits future urban growth (e.g. Gargiulo Morelli and Salvati 2010). Subcentres and municipalities located in the outer part of the first periphery have taken over the urban expansion. Subcentres have a significant historical background and considerable high urban densities; while, the other municipalities offer affordable housing prices and more modest densities. Both attract

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people searching for their first home or for better standards of life that have left the most compact and central part of the BMR (Busquets 2006).

Municipalities of the first periphery have the benefits of their centrality and proximity to Barcelona, enjoying the greatest urban potential and experiencing the highest relative urban gains. Changing development model towards urban sprawl is tangible in the BMR, mainly in its peripheries (Catalàn et al. 2008). Wide-ranging land occupation, high agricultural and forest and the decrease in urban densities expecting for further development are some signs of the current urban transformation (e.g. Gargiulo Morelli and Salvati 2010; Serra et al. 2014).

5.2. Istanbul

The demographics of Istanbul changed considerably between 1927 and 2000 (Table 3). The population of Istanbul has grown 12.4 times of its initial population by increasing to 10,018,735 in 2000 and consequently the number of persons per square kilometre of the region significantly increased, reaching values of 1,7000 in the year 2000. During 1990-2000 periods, for instance, the annual population growth rate of Istanbul was 33.1 per cent. Until 1980, this rate in the countryside was higher than that of the city due to the higher migration to the rural areas in Istanbul. In 2000, however, the share of population living in Istanbul was 90.7 per cent. The rapid change in the proportions of the populations of city and village occurred in the '80s due to the new arrangement in administrational division structure of the Province of Istanbul.

TABLE 3 - DEMOGRAPHIC CHANGE IN ISTANBUL METROPOLITAN REGION.

Years	Urban	Rural	Total	Urban (%)	Rural (%)
1927	704,825	102,038	806,863	87.35	12.65
1940	815,638	175,599	991,237	82.28	17.72
1960	1,506,040	376,052	1,882,092	80.02	19.98
1980	2,909,455	1,832,435	4,741,890	61.36	38.64
2000	9,086,599	933,136	10,018,735	90.69	9.31

Source: State Institute of Statistics of Turkey.

In the last 80 years, Turkey has faced rapid changes in its spatial organisations given the changes in agriculture and industry. Besides Istanbul, changes are well observed on every corner of the country's agricultural landscape and mainly in several urban spaces like Ankara, Izmir, Iskendrun and Adana.

With rapid economic development, the standard of living has considerably improved over the last decades besides environmental degradation. A direct relationship has been observed between land-use changes detected via satellite images and socio-economic improvement of the region.

According to the outcomes obtained from the classified images dated 1990 and 2005, the distribution of the built-up areas was 11 and 16%, while croplands accounted to 27 and 23% of the total area. Forest areas covered 25% of the total area in 1990 and 2005, indicating that such areas were under strict control and were conserved. In the change detection analysis, a comparatively more significant variation in land cover has occurred between years 1990 - 2005. Values of the urban expansions for the period of 1990 -2000 and 1995 - 2005 were calculated as 10,821 and 16,727 hectares. Between years 1990-2000, the urban expansion rate reached 18% although, during the 1995-2005, it was 24%. These increments mainly occurred in the areas, near the highway, airport and the coastline. Another significant change was the continuous decline in croplands. Particularly, the decline of croplands mainly occurred far from the centre of the districts prior to 2000 and 2005. They decreased from 144,775 to 144,230 ha during the periods of 1990 - 2000 and 139,392 to 126,339 ha during the period of 1995 - 2005. The overwhelming influx of internal migrants from mainly eastern part of the country informally or/and illegally occupied the land at the outskirts of several major cities. With its uncontrolled population dynamics, Istanbul has later turned out to be one of the well-known primate and largest cities in the world.

By analysing demographic change and transformation of land-use patterns, intensive migration and natural population growth in Istanbul caused continuous urban expansion. Also, a decrease or total loss of forests and agriculture fields went off a rapid increase of building activities, determinable through the analysis of GeoCover satellite images. Industrialised areas, which did not exist in 1984, have been extended due to planned building, highway and sea connections in the district (Terzi and Bolen 2009). Neighbourhoods were intensively (or more slowly) developing In the following periods.

Neighbourhoods with transition characteristics turned into compact areas due to population density increase. Low-density dispersion affected spatial development in the IMR, turning into a compact shape due to growing density and\or evolving new subcentres. The past master plans proposed new housing development areas in the periphery, nonetheless sprawl has promoted and stimulated compact neighbourhoods in the following period. The 10% of total population lived in 35% of total urban areas with gross density of 423 person/ha in 2005; while, 21% of population lived in more than half of urban area with gross density of 45 person/ha. By analysing its development patterns, the IMR has expanded since 1975, following a compactness in the following period. A neighbourhood that once sprawled has later turned into compact due to rising density and\or emerging new subcentres near to it. Urban decentralisation, determined by market forces and Master Plans, were unavoidable, especially under the settings of rapid urban population growth.

5.3. Naples

The 142 Municipalities of the MRN can be divided in 6 concentric belts (Figure 4). Results exposed how population trends varied over time in these belts, following census data taken over the period beginning in 1861 to 2009 (Figure 5). Population loss has spread in its surrounding municipalities, especially in areas of the first

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and second belt. On the percentage of total population in each belt, Naples grew until 1921 (approximately 45% of the total population was living in the city), while the percentage of residents in the external municipalities decreased. Since 1921, demographic trend has been reversed and, in 2009, Naples residents are about 24% of the total population of the MRN, a similar percentage to the population of the first belt (23%). Even the areas of the second, third and fourth belt have had increasing rates, and have reached values of 15 to 17% in 2009. A consistent population growth between 1936 and 1981 occurred where inhabitants nearly doubled in that period, passing from approximately 2,178,000 to 3,700,000. In the following years (from 1981 to 2009), the rate of population growth has clearly decreased. Since 1961, Naples has progressively lost population while the areas of the first to fourth belt have seen a continuous increasing trend.

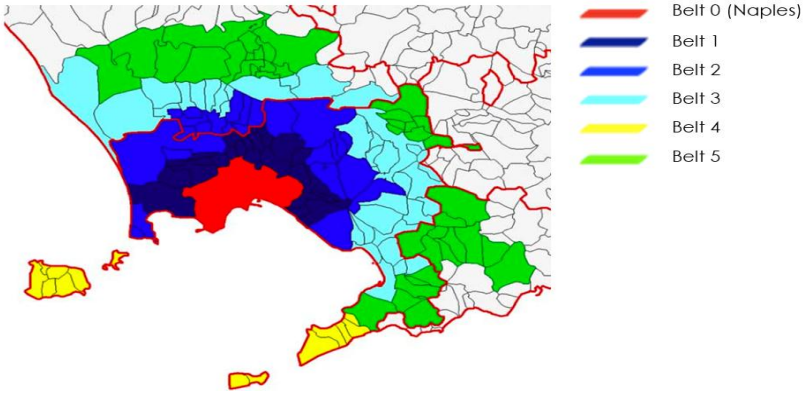
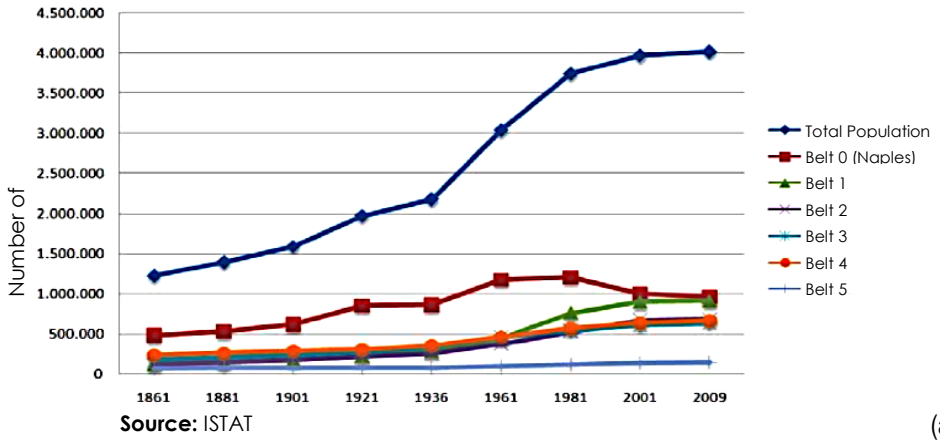


FIGURE 4 - MUNICIPALITIES OF THE METROPOLITAN AREA OF NAPLES DIVIDED IN 6 CONCENTRIC BELTS.



Source: ISTAT

(a)

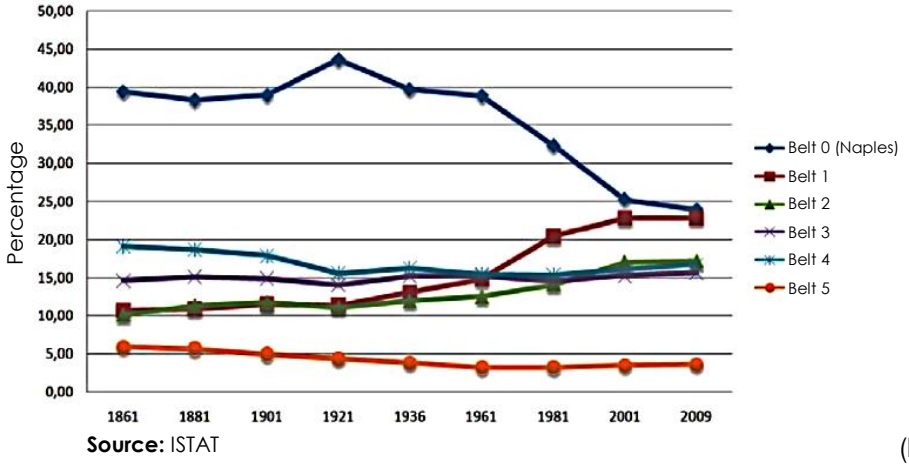


FIGURE 5 - POPULATION TREND FOR THE METROPOLITAN AREA OF NAPLES (A) AND POPULATION PERCENTAGE TREND FOR THE METROPOLITAN AREA OF NAPLES (B).

The analysis brings out an interesting result: Naples is having difficulty in retaining population due to the deterioration of its urban environment and to the constant high costs for housing in the area. Consequently, flows of internal migration have occurred in the MRN, resulting in a decrease of population density throughout the entire region with a growing decentralisation urban use.

6. DISCUSSIONS

Urban growth can be defined as a complex and dynamic process related to landscape transformation driving forces with different nature (e.g. political and environmental) that affect city and recently also its metropolitan area, at several spatio-temporal scales (Jomaa et al. 2008; Jaret et al. 2009; Akin et al. 2014). Change recognition of land cover and land-use is an overbearing contribution for planning, monitoring, management and studying urbanization and landscape dynamics, environmental impacts, natural hazards and other risks (European Commission 1998; Sommer et al. 1998; Serra et al. 2003; Sanli et al. 2008; Schneider and Woodcock 2008; Travisi et al. 2010; Salvati, 2013). New urban features determined new deals counting unplanned population growth, decreased forested areas, increasing pollution, land fragmentation and erosion (Kucukmehmetoglu and Geymen 2009; Ayazli et al. 2015). In the three studies cities, dispersive urban growth threatens the most vital natural areas and fragile ecosystems, especially geologically risky areas (Ayazli et al. 2015).

6.1. Barcelona

With regards to the population development of the BMR, distribution and growth has been unequal since the 1960s. Between the 1960s and 1980s, a period of intense migration flows from rural to urban areas, the central metropolitan zone witnessed an increase of approximately 200,000 people (from 1,557,863 to 1,754,900), while

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in the surrounding areas the increase was much more significant (from 571,088 to 1,413,603). In fact, urban development markedly increased in the surrounding areas of the central city, given birth to several Subcentres (urban islands), some of which were the result of illegal building activities. Towards the end of the 1970s, population growth and migration flows in the BMR had stabilised. Nevertheless, residential dispersion continued, especially over areas in between former urban islands and along major transport infrastructure works. This has probably been the consequence of growing costs of the compact city, the urban land market and the congestion of the urban centre (Burchell et al. 2005; Busquets 2006). Above all, the gradual saturation of the metropolitan inner core together with the low densities and housing prices of the periphery acted as push factors to the sprawl process that was gaining strength by the 1980s. Furthermore, public investment for infrastructure development contributed to the conversion of second homes (located in the urban fringe where land was cheapest) to main ones, again nurturing the residential dispersion of those years (Cuadrado-Ciuraneta et al. 2017). Through stagnant population for the whole BMR since the early 1980s (Catalan et al. 2008), other factors interplayed towards the peripheral outer fringe, such as urban land market and further urban costs e.g. congestion (Garcia and Riera 2003).

Because of the history of urbanisation of the second half of the 20th century, the BMR's landscape is the result of the overlapping of successive urban layers (Marull et al. 2009). Findings evidenced that major land-use changes between 1994-2001 have occurred for cropland (a decrease from 26.42% to 16.36%) and urban land (an increase from 20.54% to 25.59%). The largest increase in urban land has occurred in Subcentres and municipalities of the external part of the city, mostly at the expense of agricultural land.

The observed overall trend of urban land-use change testifies an outward expansion of the metropolitan area. Discontinuous urban growth and ribbon development are the dominant spatial patterns of the sprawl process in the BMR (Paül and Tonts 2005; Catalàn et al. 2008). The relating causes are the rising level of car ownership, the relocation of industrial and retailing activities to the urban fringe, infrastructure development and the conversion of second homes (located in the metropolitan periphery) to main ones in the 1990s (Cuadrado-Ciuraneta et al. 2017). Therefore, agricultural land has mainly decreased in the fringe around the central area of Barcelona). To sum up, fringe land urbanization, loss of agricultural land in the periphery and decreasing urban densities of the inner core of the BMR are all signs of an evident switch to sprawl patterns of development.

6.2. Istanbul

The second case-study is dedicated to the assessment of dynamics of the sprawl process in the IMR (Terzi and Bolen 2009). With intense population growth in capital of Turkey since the 1980s, an intense period of urbanisation has begun. In Istanbul, residential areas have extended by around thousand hectares per year, at the disadvantage of semi-natural vegetations, forests and rural crops (Kaya and Curan 2006; Kucukmehmetoglu and Geymen 2009). Above all, built-up areas were mostly the consequence of illegal and spontaneous housing

activities ("gecekondus"), that consumed most of the agricultural land of surrounding urban areas. Such phenomenon was further scaled-up by infrastructure development, that allowed easier access to the city where most people work. By the end of the 1980s, Istanbul started to decline because of the formation of various subcentres in the urban fringe. Furthermore, multi-centre development had been encouraged by the Master Plan of 1980. Urban expansion was later fuelled also by economic growth of the city and the appearance of new commercial activities.

With regards to population growth, data suggest that between 1927 and 2000 the total inhabitants of the IMR have increased more than 12.4 times. Therefore, population density in the area is high. Land-use changes were detected through satellite remote sensing techniques for the period 1990-2005. The analysis focused on the evolution of built-up areas within and around the central city. The data collected exhibited an increase of 5% of built-up areas (from 11 to 16%), a decrease 4% of agricultural land (from 27 to 23%) and a rather constant trend for forest areas (from 28.4 to 27.5%). For the last ten years (1995-2005), urbanisation rates were calculated to be around 24%, mainly next to highways (the E-5 and Transit European Motorway), coastline and the airport.

Assessing urban sprawl in the IMR, due to the impressive population increase of the last 30 years combined with strong economic development and the arrival of new commercial activities, areas used for settlement expanded (mostly following illegal housing) consuming agricultural and forested land (Çakir et al. 2008; Terzi and Bolen 2009; Salvati and Gargiulo Morelli 2014; Salvati et al 2018). So, uncontrolled planning has resulted in the extension of urbanisation and loss of agricultural land (Alphan 2003).

Based on demographic and land-use changes data, a sprawl index was calculated for each neighbourhood for the period 1975-2005. Residential areas with low values of the index indicated an intense sprawl process, while high values referred to compacting neighbourhoods. Finally, results mapped to give a clear view on the urban dynamics of the IMR. The outcomes obtained evidenced a peculiar pattern of development. The intense urban expansion of the 1980s towards the peripheries of the central city was contrasted by an opposite trend in the following period. In other words, most of the neighbourhoods of the urban fringe that were once sprawling are now compacting. This was the consequence of a growing population, market forces, Master Plans and the emergence of new subcentres. In conclusion, an urban decentralisation process was at work in the IMR. Even if compact developments are following the sprawl process of the 1980s, the IMR still presents the typical characteristics of urban sprawl; however, it is premature to speak of urban growth rather than sprawl in the IMR.

Findings underlined the importance of understanding urban changes as a precondition for the design of measures of sprawl. The analysis benefits the assessment of the impacts of spatial variables, e.g. density, distance to centres and strength of centres, on urban form and how they are determined by sprawl dynamic forces. Urban sprawl should be comprehended as phenomenon and even be measured for the future development planning in the IMR (Terzi and Bolen 2009; Kucukmehmetoglu and Geymen 2009). Monitoring

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land-use/land changes aims at providing useful information for urban planners and policy makers for the management of uncontrolled urbanisation and sprawl (Anderlini 2003; Karaman 2008; Salvati, 2013).

6.3. Naples

The third narrative case-study in the Metropolitan Region of Naples (MRN) focused on sprawl process. Due to the lack of a robust planning system, the mentality of "dispensation" of the population and the permissive building code, several cities (especially Naples) have chaotic, inefficient and unsustainable patterns of urbanisation (Papa and Mazzeo 2014; Pili et al. 2017). Even along the administrative limits of the city, the disordered urban continuum can be observed, which leaves no space for different identities in which an unclear built environment is composed of several objects thrown together (Amato 2016). The periphery of Naples is not an indistinguishable area; however, it can be divided into four typologies: the ancient rural centres; the suburbs of quality districts where the bourgeoisie emigrated from the urban centre; zoning area of public housing; and then recently built-up areas of public housing but completely degraded (Amato 2008).

Today, from North to East the region is characterised by an undifferentiated, homogeneous and over-urbanised space (Gargiulo Morelli and Salvati 2010). The conversion of agricultural land to vast areas of impervious surface has been a common reality for the MRN since the 1950s. But to be sure that such phenomenon is related to urban sprawl and not urban growth, demographic data and population distribution over land was analysed. Between 1936-1981, total population in the MRN almost doubled (from 2,178,00 to 3,700,000). Since 1981 rates of population growth have significantly decreased while the central area of Naples began to lose population since 1961. The population growth of the central city (Naples) grew until 1921, reaching 45% of the total inhabitants of the MRN. The total population is almost equally distributed over all the territory of the MRN: 24% in the central city, 23% in the first ring belt and 15 to 17% in the remaining ones. To put it briefly, residential densities in the inner core of the MRN have significantly decreased, and the total population fallouts almost equally dispersed over the entire region.

7. CONCLUSIONS

As revealed in our study, a comparative analysis of land-use and urbanization patterns and processes may shed light on (more or less) intense urban transformations leading to important changes in metropolitan structures and socioeconomic configurations. An integrated framework, linking quantitative analysis with a narrative approach may better evidence complexity in land-use transformations and suggest specific solutions for sustainable land management linking social cohesion, environmental sustainability and local competitiveness (Zambon et al. 2018).

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