

Multi-nuclear growth patterns in a rapidly changing Turkish city: a fringe-belt perspective

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Abstract. *The fringe-belt concept provides a basis for connecting urban growth patterns to internal processes of urban transformation. However, multi-nuclear growth patterns and the associated fringe belts require greater attention. The development of fringe belts in Turkish cities is discussed with particular reference to the city of Mersin. Especial attention is given to the development of an outer fringe belt which forms an 'umbrella' over the multi-nuclear pattern of the metropolitan area.*

Keywords: urban growth, multi-nuclear, fringe belt, Mersin

The concept of the urban fringe belt is 'arguably the most important single contribution to urban morphology to arise out of the morphogenetic tradition' (Whitehand, 1987, p. 76). The recognition of fringe belts provides a basis for articulating the growth phases of cities (Whitehand and Morton, 2003). Such belts offer a historico-geographical means of connecting the patterns of urban growth at a city-wide scale to internal processes of physical change.

The growth of Turkish cities was not as great as that of the cities of Europe and the United States during much of the industrial age. However, İstanbul as capital of the Ottoman Empire, and port cities such as İzmir, Mersin, Samsun and Trabzon have experienced periods of rapid growth since the beginning of the twentieth century. In this paper, fringe-belt development is examined in cities that have grown by the coalescence of a number of settlements. The principal focus of attention is the city of Mersin, Turkey.

Fringe belts and urban growth cycles

The fringe-belt concept was formulated by Louis (1936) in Berlin. He identified different

residential zones that were separated from one another by belt-like relatively open spaces. The concept was developed by M. R. G. Conzen in his plan analyses of English towns and cities (Conzen, 1960, 1962, 1969). He defined a fringe belt as 'a belt-like zone originating from the temporarily stationary or very slowly advancing fringe of a town and composed of a characteristic mixture of land-use units seeking peripheral location' (Conzen, 1969, p. 125).

After Conzen's refinement, the fringe-belt concept became a means of explaining the complexity of urban development (Whitehand, 1987, p. 77). Such belts aided comprehensive assessments of the growth phases of cities and the physical forms associated with each of these phases (Whitehand and Morton, 2003). They are mostly unplanned entities arising from the decisions of property owners and developers. Each belt is formed of a variety of mainly extensive land uses and separates residential growth zones associated with different historical periods (Whitehand, 2001, p. 108). A striking aspect of the development of fringe belts is their continued existence long after they cease to be at the urban fringe.

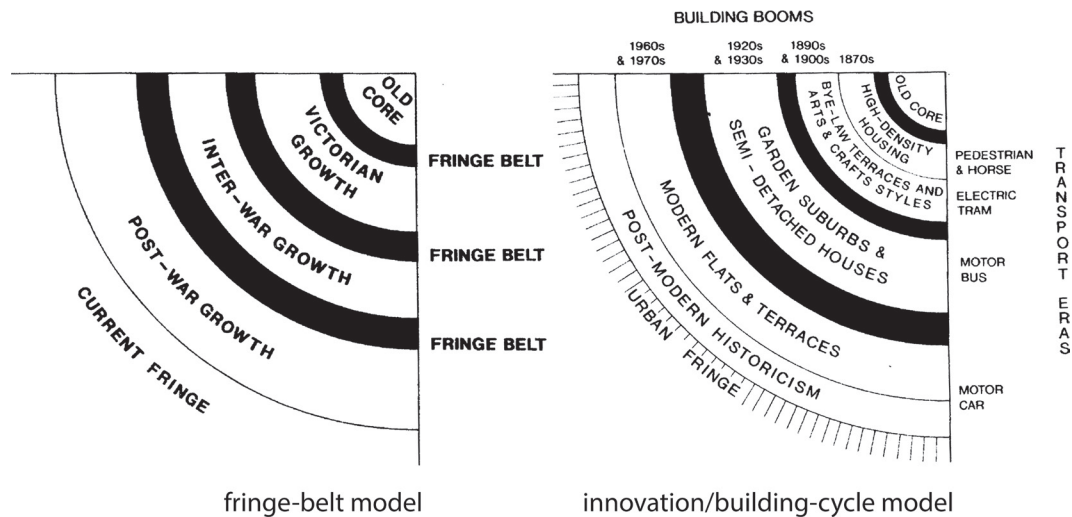


Figure 1. Conzen's fringe-belt model and Whitehand's innovation/building cycle model (Source: Whitehand, 1994, pp. 11–12).

Elaboration of fringe-belt studies by Whitehand (1972a, 1972b, 1974, 1987) underlined aspects of the rationale of fringe-belt formation and perpetuation. He did this in terms of bid-rent theory. Focusing on a major component of fringe belts, namely institutions, he considered the relative bid rents of institutions and house-builders over time, including over the course of housebuilding booms and slumps. In particular he emphasized the increasing investment by institutions in their sites as they became embedded in the built-up area, thereby reducing the probability of these sites being acquired by house builders and redeveloped for housing.

A further elaboration of this perspective was Whitehand's innovation/building cycle model. In this he related each housebuilding boom, which is associated with the creation of characteristic forms in the urban landscape, to innovations in transportation and housebuilding technologies (Whitehand, 1994, p. 11) (Figure 1).

Inter-relations of fringe belts

These models depend on the recognition of concentric fringe belts. Conzen identified these fringe belts in his initial fringe-belt study – an inner fringe belt (IFB), a middle

fringe belt (MFB) and an outer fringe belt (OFB). Whitehand (1967) distinguished between the formation and modification processes to which fringe belts are subjected. During the fringe-belt formation process, land at the edge of the built-up area is taken up by non-residential uses. These uses have lower building densities and a coarser-grained spatial structure than housing areas (Conzen, 1981, p. 119). They are characterized by large ownership units and a high proportion of open space (Whitehand and Morton, 2004). Once established and surrounded by urban expansion, they are likely to undergo considerable pressure for modification (Whitehand, 1974, p. 41). In the course of time there may be 'survival of original use in original form', 'intensification of original use', 'land-use change' and 'absorption' (Barke, 1982, 1990). 'Fringe-belt translation' occurs through the transfer of a land-use use from an older fringe belt to a younger one (Conzen, 1969, p. 126).

Since fringe belts are in large part products of centrifugal forces, they have been interpreted as the corollary of the central business district (CBD), which is the product of centripetal forces (Whitehand, 1967, p. 223). M. P. Conzen (2009, p. 47) drew attention to the fact that 'IFBs are inherently more complex than MFBs and OFBs because of their long

gestation and vulnerability'. MFBs and OFBs tend to have coarser-grained structures than IFBs, with more open ground, vegetation and a sparser network of roads.

The characteristics of fringe belts reflect their age, size, location, process of growth and cultural context (Conzen, 2009). The IFBs of European cities tend to be associated with city walls. Unless they have scarcely grown since medieval times, they are almost all 'closed fringe belts' in that they are completely encased by subsequent residential accretions (Conzen, 1962, p. 406). In British cities, spacious land uses frequently acquired sites at the edge of the built-up area during the first 2 decades of the twentieth century, associated with a protracted hiatus in housebuilding, before, during and after the First World War. In some cases they have survived to form a partial green belt within the city (Whitehand and Morton, 2003).

M. P. Conzen (2009, p. 48) points out that fringe belts are less readily identifiable in American than in European cities owing to their fewer historical impediments to urban development and land-market differences. He described Chicago's outward growth as an 'undisciplined spatial expansion'. According to Whitehand and Morton (2003, p. 820), the high incidence of car ownership already in the 1920s and the relative absence of significant spatial constraints reduced the distinctiveness of fringe belts and concentric growth phases in American cities. In Chinese cities, city walls are major influences on fringe-belt formation. As in so many cities, in Pingyao religious and quasi-religious uses have been associated with the creation of fringe belts (Conzen *et al.*, 2012). The Ming city wall in Nanjing, created in the last one-third of the fourteenth century, was a major influence on the consolidation of a massive fringe belt in the late-nineteenth and early-twentieth centuries (Whitehand and Gu, 2015). Fringe-belt expansion and transformation took place during the second half of the twentieth century with the advent of *danweis* in the extramural.

Among numerous cases of fringe-belt research in various contexts, the investigations

of Tyneside and Birmingham are noteworthy for their explications of the interrelationships between different fringe belts, and between the central city and sub-centres. In both cases, fringe belts of distal settlements have become parts of the fringe belts of the central city, after the incorporation of neighbouring settlements into the greater urban areas.

In Tyneside several separate nuclei merged into a single conurbation in the inter-war and post-war periods as a result of expansion of their built-up areas (Whitehand, 1967). The multi-nuclei settlement pattern became increasingly influenced by the role of the central city – in this case Newcastle. This type of development raises questions about whether the fringe belts of a local centre are parts of the primary city (Conzen, 2009, p. 46). Birmingham incorporated several neighbouring settlements during its outward growth (Whitehand and Morton, 2006, p. 2052). Although these settlements, such as Selly Oak and Harborne, had formed their own Edwardian fringe belts, they became parts of Birmingham's Edwardian fringe belt as a result of the incorporation of settlements by residential expansion within Greater Birmingham's urban area (Whitehand and Morton, 2003, p. 823) (Figure 2).

Fringe-belt development in multi-nuclear urban areas has not been studied in detail in developing countries. In this paper the dynamic nature of urban growth in rapidly developing cities is examined with reference to fringe-belt formation in a multi-nuclear metropolitan area. In particular, consideration is given to the extent to which the fringe-belt model, which was formulated initially for an essentially single-centre urban area, is appropriate in a very rapidly growing multi-nuclear metropolitan area. The investigation is carried out in the city of Mersin, Turkey. The development of the IFB of this city was examined in detail in a recent study (Ünlü, 2013). However the relationship between fringe belts was not discussed in detail. This is rectified here through an analysis of Mersin's fringe-belt formation. This is done first at a city-wide scale and then within the particular district of Pozcu.

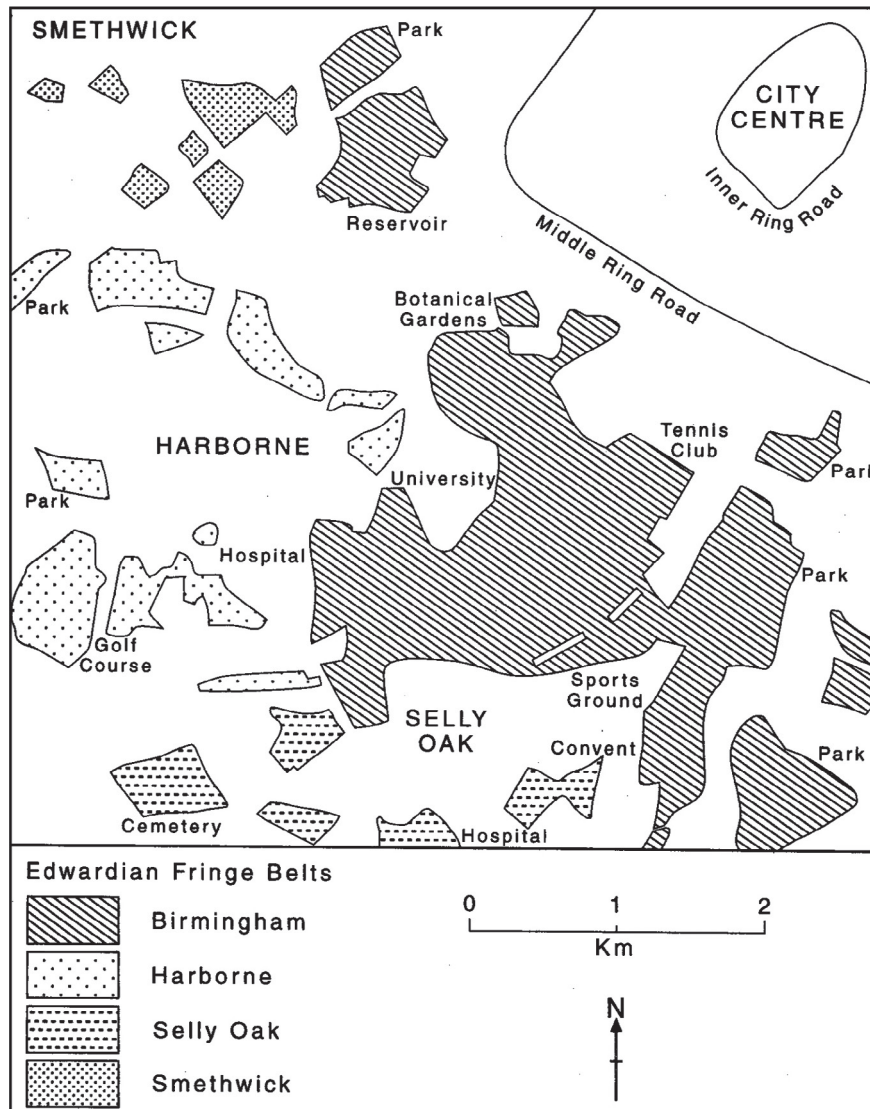


Figure 2. Edwardian fringe belts of Birmingham and surrounding settlements (Source: Whitehand, 1996, p. 229).

The growth of Mersin and the inter-relations of fringe belts

The urban growth of Turkish cities has been examined in a series of studies. Aru (1998) explains the historical development of the cores of Turkish cities during three major periods – Roman, Byzantine, and Seljuk. In a recent study of Ankara, Günay (2005) explored urban growth, including consideration of an urban ecology model. In an examination of peripheral suburbs he concludes that the core of the city has a weaker effect on the development of such areas. Tekeli

(2011, p. 98) refers to developments in the periphery of cities as a pattern of ‘fragmented sprawl’. However, these studies lack in-depth historico-geographical investigations of the shaping of the urban landscape.

Kubat (2010) showed that there has been almost no investigation into the development of the urban form of Turkish cities from a fringe-belt perspective, though more recently a study has been undertaken by Hazar and Kubat (2015) on the fringe belts of İstanbul in comparison with those of Barcelona. In an earlier study of Mersin, Ünlü (2013) focused on morphological processes within its IFB.

He depicted this fringe belt as having developed in three distinct functional sections. A railway station and associated warehouses initiated fringe-belt formation in the eastern part of the city. With the advent of the modern port in the 1950s, large amounts of storage and industry accompanied fringe-belt expansion in this area, where there has been a merging of the inner, middle and outer fringe belts. In the northern section of the IFB, the initial industrial uses later merged with institutional uses of the MFB. Cultural and educational uses occupied the western section of the IFB.

The starting point for the present study is the beginning of the nineteenth century, when the Ottoman Empire began a modernization process that has continued through to the present. In earlier periods, Turkish cities were mostly confined within city walls, like the medieval cities of Europe. However, being a relatively young city, founded at the beginning of the nineteenth century, Mersin lacks a city wall in its historical development.

Sources

This study is based largely on maps and aerial photographs of various dates. The first map covering the built-up area of Mersin was prepared in 1910 at a scale of 1:5000. It shows the street plan of the city. It provides information on important buildings and is a basis for locating fringe-belt land uses. The second map, prepared by the British army in 1942, again at a scale of 1:5000, depicts the street plan. It provides the names of key institutions, which were parts of the inner and middle fringe belts. However, plot boundaries are not included. The first detailed map, showing streets, building block-plans and building heights (number of storeys) was produced by the Ministry of Public Works and Settlement in 1956, but again plot boundaries were not included. Similar detailed maps were produced in 1976 and at the beginning of the 2000s. These maps contain selective information about land and building utilization and plot boundaries. Used in combination with

one another, the aerial photographs taken in 1948, 1955, 1972, 1992 and 2012, and land-use maps of 1985, 1990, 2001 and 2006 make it possible to reconstruct the development of the city's urban form, including the formation and modification of fringe belts over much of the post-war period.

Mersin

During the nineteenth century, the Ottoman Empire implemented institutional and economic reforms, for which the Western world was conceived as an appropriate model. The port cities underwent significant changes and in almost all of them new types of land use began to emerge. For example, banks, insurance companies, hotels, and institutional and government buildings were constructed (Tekeli, 1998).

Between the foundation of the Turkish Republic in 1923 and the Second World War, the main aim of the new regime was to create a modern way of life and improve sanitary conditions. Government buildings and other major buildings were constructed in each city, especially in Ankara, the new capital of the Republic (Keskinok, 2010). The advent of new land uses resulted in expansion of the IFB which became largely surrounded by garden suburbs (Bilgin, 1998, p. 260; Tekeli, 1998, p. 11).

In the 1920s and 1930s, during the Ottoman and Republican modernization periods, the city of Mersin, which in the early-nineteenth century had consisted of little more than 'a few huts on the shore' (Beaufort, 1817), was gaining importance associated with direct economic relations with major industrial countries. The built-up area of the city expanded rapidly. Its historical city centre was developed around Uray Street, the main connection between the customs pier and the railway station. Many new land uses occupied this street (Selvi Ünlü, 2009). Mersin was becoming a significant commercial centre in the region, and government house, the prison, warehouses, factories, and the railway station formed the first components of the IFB.



Figure 3. The western section of the IFB enveloped by the emerging Çamlıbel district c. 1945.

In the absence of a fixation line, the IFB was formed in three distinct parts. Each section had its own functional character (Ünlü, 2013). The arrival of a railway station and industrial, warehouse and religious premises facilitated IFB formation in this period, especially to the east. The advent of the People's House (the cultural centre of the new Republican regime), the Governor's Mansion, and new public parks contributed to expansion of its western section, which later was enveloped by the residential accretions of the Çamlıbel district (Figure 3). Çamlıbel was particularly an environment for the newly emerging bourgeoisie in the city. The dominant building type was the single-family detached house, each of which was named after its owners, who were the most prominent businessmen in the city. As in the British case (Whitehand and Carr, 2003, p. 1), it was a change from streetscapes

of continuous façades to more open landscapes, in which the houses were placed in large plots and separated from the road and from each other by gardens. Hemmed in by these accretions and becoming increasingly consolidated, the IFB may be referred to as an 'early Republican belt' – a name also applicable to similar IFBs in a great many Turkish cities.

The MFB was in its formation phase in Mersin during the 1950s: a notable feature was institutional 'campuses' in peripheral locations. A number of these were local branches of governmental organizations. In this process, agricultural land was acquired for the establishment of decentralized local directorates of the central government. In addition, military quarters and large-scale sports areas were located in the MFB. A ring road was constructed and acted as a fixation line.

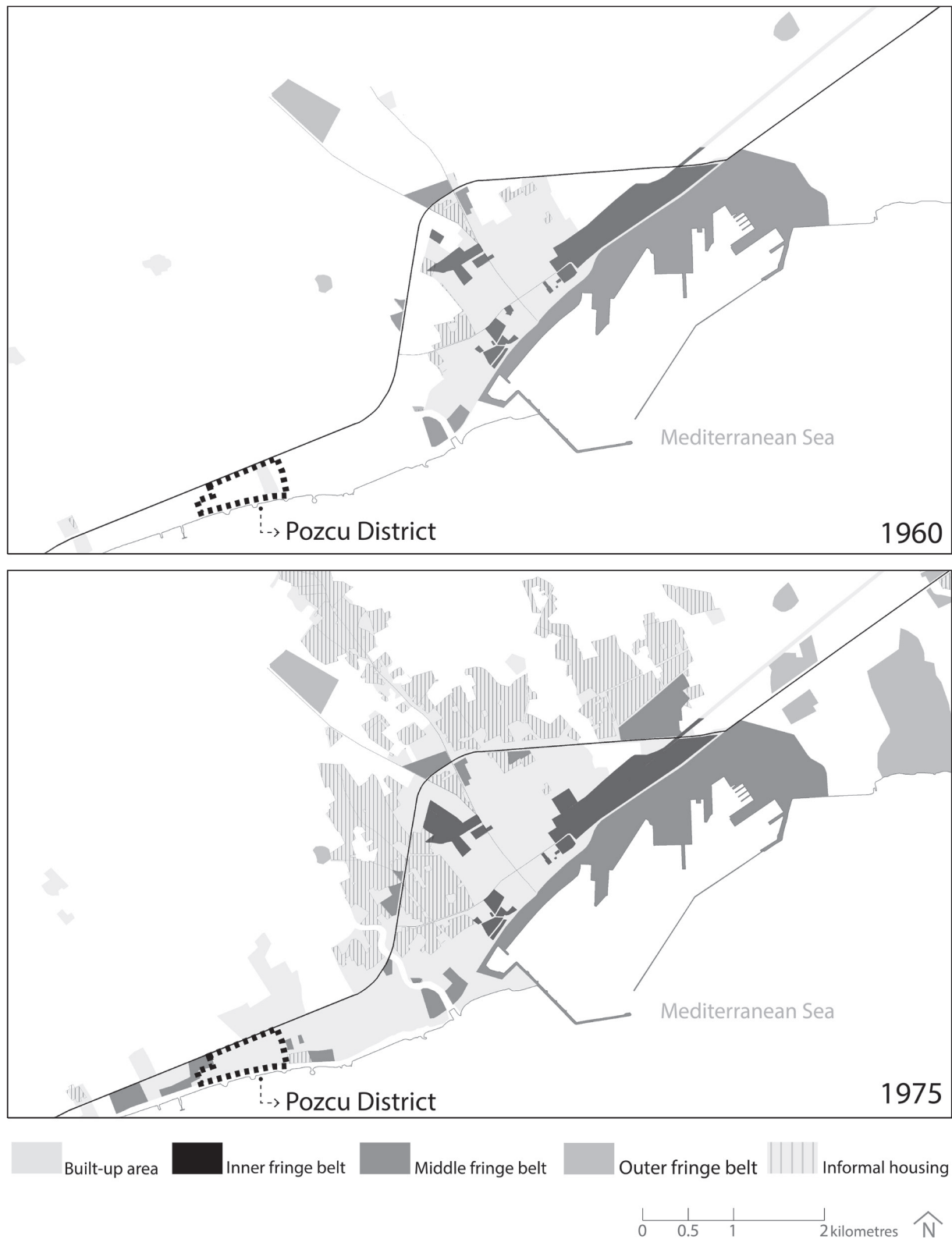


Figure 4. Pozcu and informal housing areas within the greater region of Mersin.

After the 1950s, a vigorous outward expansion was characterized by leapfrogging of the MFB by housing provided by co-operative organizations and low-density housing on cheap peripheral agricultural land (Altaban, 1996, p. 9). During this period, informal housing emerged in response to the housing needs of immigrants from the countryside. Increasing car ownership in the 1980s facilitated housing dispersal, and the development of mass housing areas was encouraged by new legislation (Tekeli, 1998, p. 22).

Two types of residential environment were associated with this leapfrogging of the MFB. The first was informal housing areas attached to the MFB. The second was the low-density residential development of Pozcu, which had been agricultural land containing many citrus trees (Pozcu, 1947). This land was divided into small plots and sold to create a new residential quarter, distant from the built-up area. It became an area of single-family detached houses in large gardens, far from the city (Figure 4).

Especially after the 1960s, the MFB was in a consolidation phase along the ring road. New fringe-belt uses appeared in close vicinity to Pozcu. These uses are historically part of the MFB at a city-wide scale, but they were also the morphological units of a fringe belt around Pozcu (Figure 4)

During the 1980s, Mersin developed a dispersed OFB within surrounding agricultural land. Ring roads and a highway began to act as a fixation line. The OFB included a university campus, sports grounds, hospital campuses, public parks, industrial areas, and new administrative units (Figure 5).

Fringe-belt processes in sub-centres: the case of Pozcu

Initially the core of Pozcu was developed with several residential blocks of single-family houses. Fringe-belt uses emerged in this vicinity during the rapid development of the 1960s and 1970s. During this fringe-belt formation phase Pozcu was physically limited by the sea to the south and the first of Mersin's

ring roads to the north. Many institutional, especially educational, uses developed to the east and west. These included primary and secondary schools and local directorates of ministries (Figure 6).

New school areas and a new mosque were located in the eastern part of Pozcu's fringe belt at the beginning of the 1990s. In the western part a military zone was part of a fringe-belt extension westward. In this period, reclamation of land from the sea for a public park and a road alongside the southern boundary of Pozcu became a part of its fringe belt. Part of the fringe belt was occupied by informal settlements (Figure 6).

The fringe belt of Pozcu has undergone significant modification processes and large-scale development in the last 2 decades. Cultural institutions, such as the military museum and the archaeological museum, were located in the west, replacing informal settlements. A mosque area was enlarged on an adjacent plot. The agricultural and vacant land to the north was occupied by the largest shopping centre of the city and department stores (Figure 6).

Thus Pozcu has become a significant sub-centre with its own fringe belt. Its locational advantage made it attractive to large-scale investment. For the middle and upper classes attracted to it, it became more accessible than the city centre.

As Pozcu was absorbed by the development of Mersin to the west, its fringe belt became embedded within the larger built-up area but retained its location and character. Within the framework of core-periphery relations the fringe belt was formed and modified under the effect of centrifugal forces relative to the CBD. But it also formed part of the MFB at a city-wide scale.

Discussion: an umbrella belt?

The findings of this study reveal that it is possible from a fringe-belt perspective to recognize the development of a settlement pattern in a rapidly changing city at two scales. First, the development of fringe belts at a city-wide scale involves differentiation of land-use units,

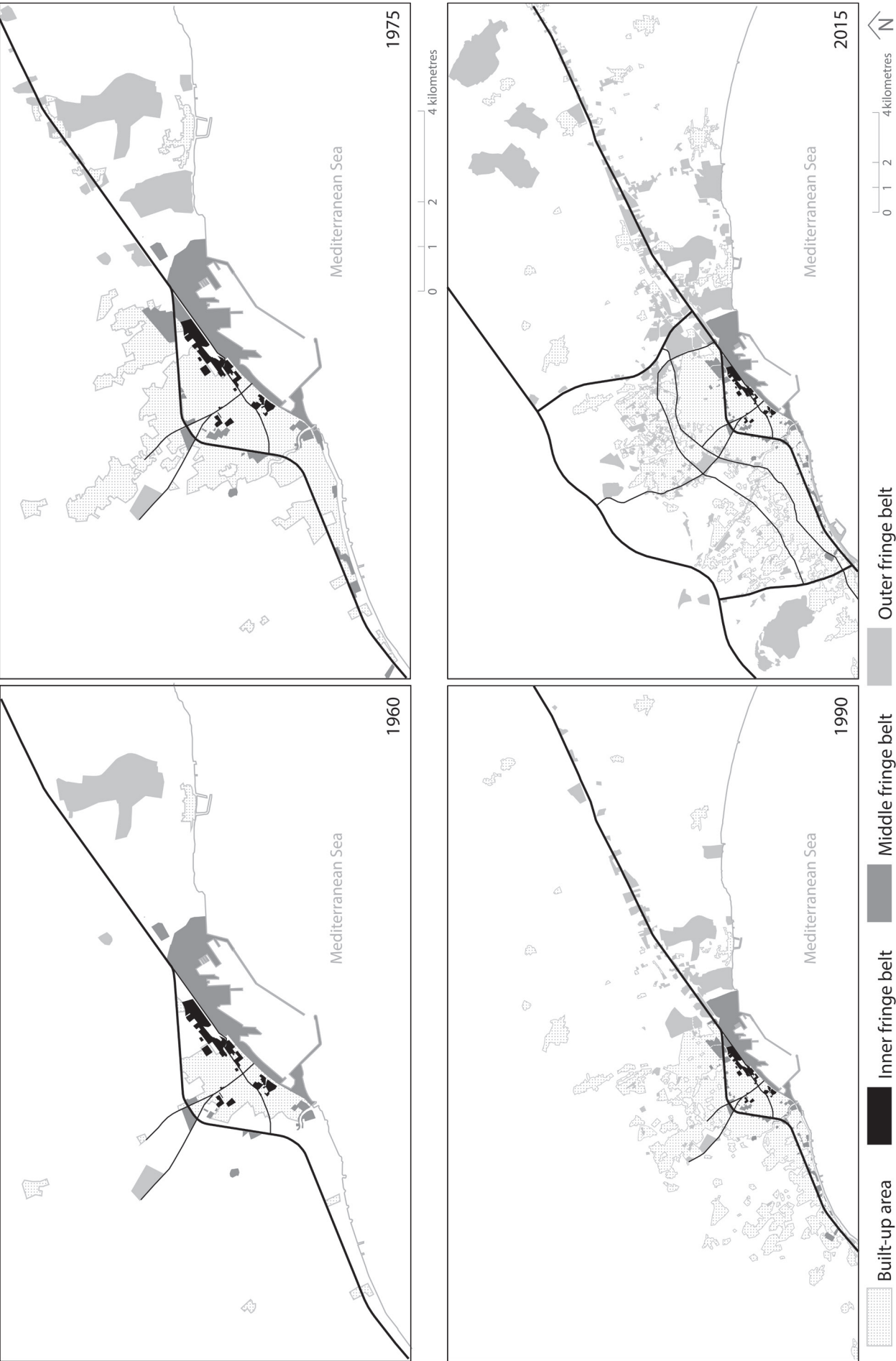


Figure 5. Development of Mersin’s fringe belts.

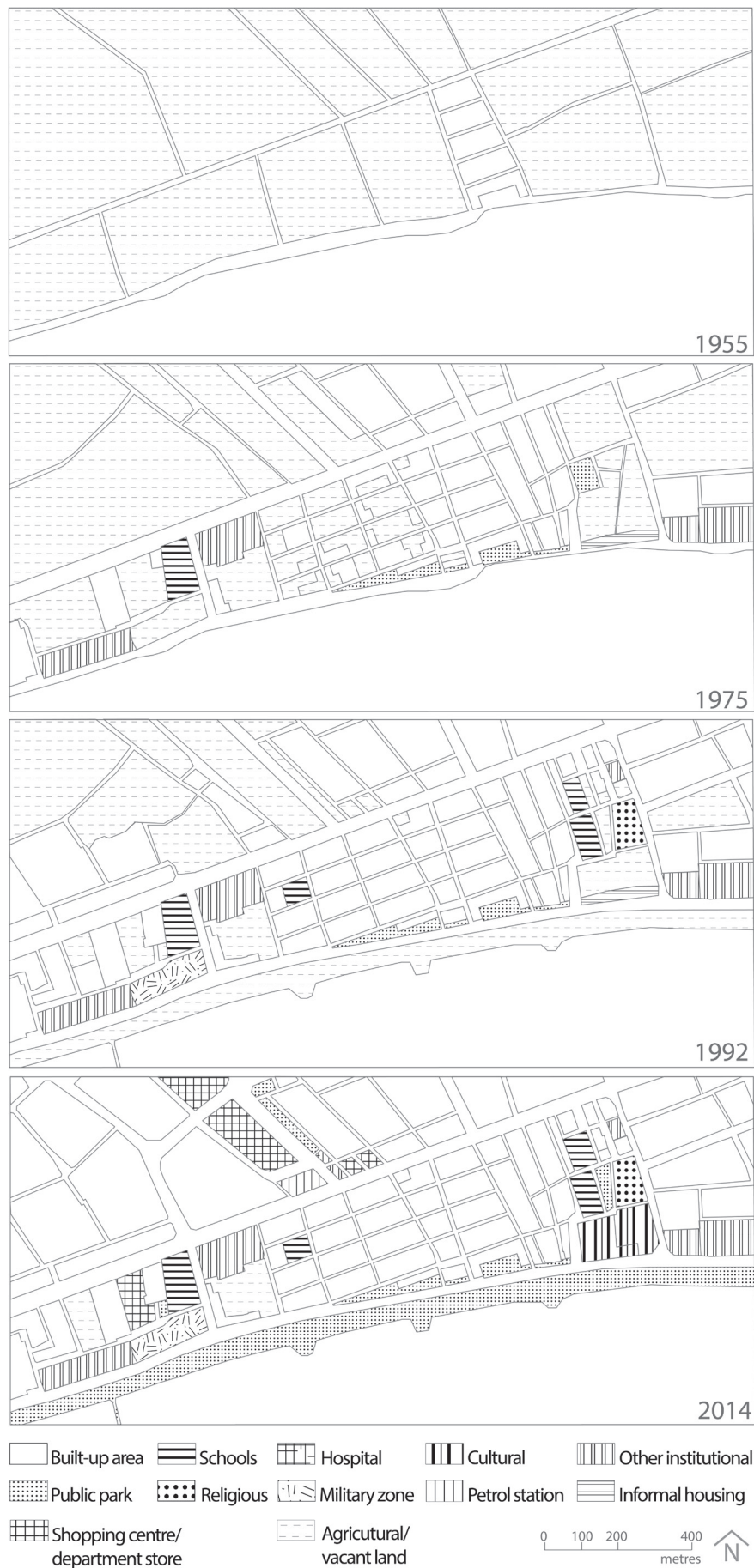


Figure 6. Fringe-belt development in the Pozcu district.

the effects of fixation lines and the relation of informal housing to fringe belts. Secondly, fringe-belt development in sub-centres takes place within a framework of core-periphery relations.

City-wide scale

Development of different land-use units in different parts of fringe belts is associated with the growth pattern of cities (Whitehand, 1967). In Mersin, industrial uses and warehouses occupied large areas in the eastern part of the city. They have been associated with the port area and the railway station since the end of the nineteenth century. With the advent

of the modern port in the 1950s, large areas of storage and industrial zones were accompanied by fringe-belt expansion in this area associated with the introduction of an oil refinery, and a free trade zone. Here there is a large area in which the inner, middle and outer fringe belts have merged. To the north, the initial industrial uses of the IFB later merged with institutional uses of the MFB. Cultural and educational uses formed the western section of the IFB. A similar development characterized MFB and OFB formation in later periods, with the occurrence of institutional campuses (including a university campus), and sports grounds.

As discussed by Ünlü (2013), one of the main reasons for the IFB in Mersin being

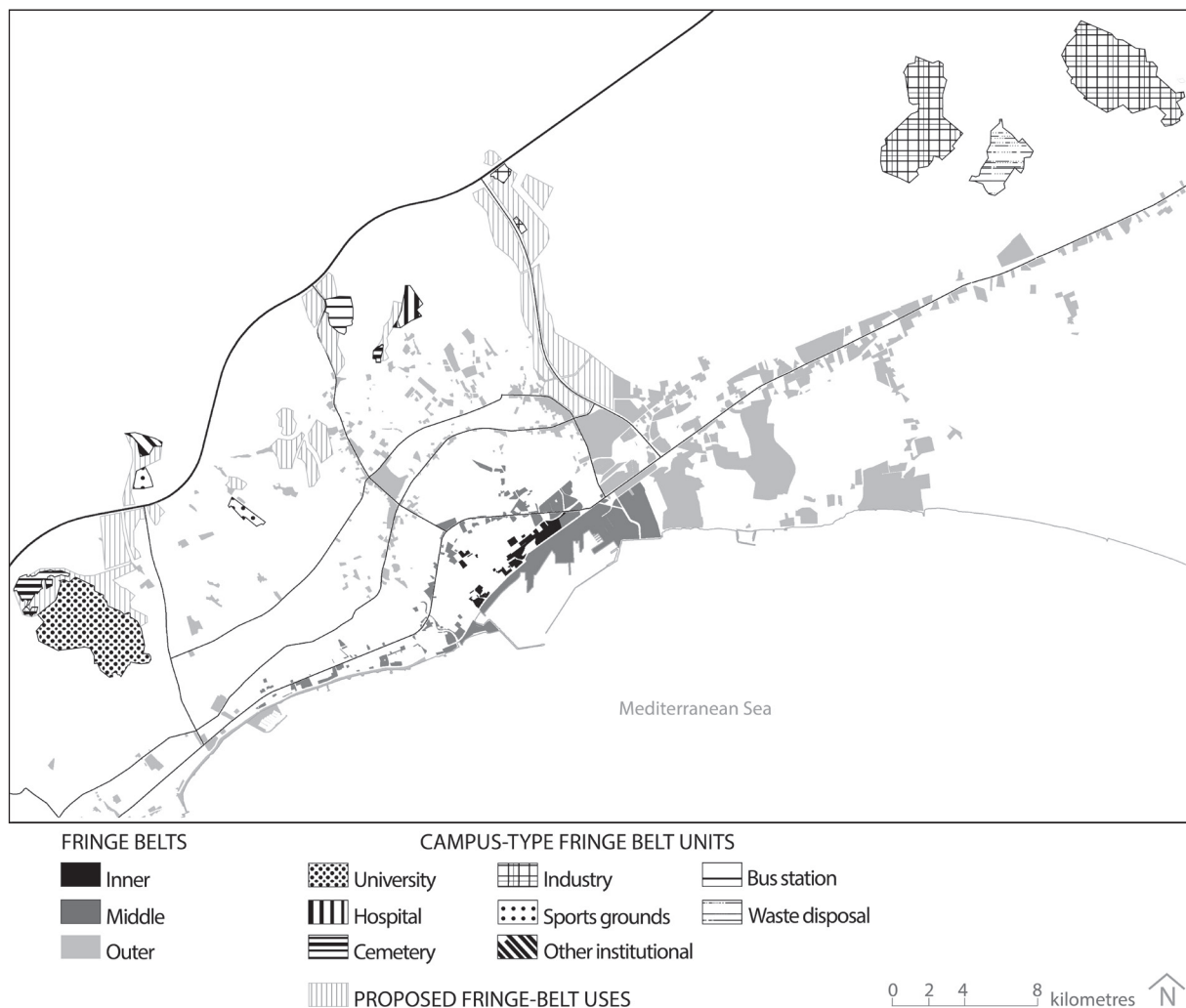


Figure 7. Large-scale campus-type fringe-belt uses within the greater region of Mersin.

discontinuous was the absence of a city wall acting as a fixation line. However, the first ring road, surrounding the city centre, acted as a fixation line for the MFB, which contained *inter alia* many institutions. OFB sites are more scattered throughout the surrounding areas, and lack a significant fixation line. However, a university campus, large-scale sports areas, transportation facilities, industrial areas, warehouses, and a solid waste storage area developed in close geographical relation to the highway to the north that connected Mersin to Adana, the main city of the Çukurova region. It is also noteworthy that the approved development plan of Mersin anticipates the development of fringe-belt uses in relation to this highway (Figure 7).

Discussion of fringe-belt development at a city-wide scale also requires consideration of the relation of fringe belts to informal housing areas. Whitehand and Gu (2015) point out that informal housing emerged in Nanjing in the form of shanties, fairly close to the city walls, as a physical expression of an influx of immigrants from the countryside that exceeded the number of new dwellings being constructed. Vilagrasa (1990, p. 309) explains the development of informal housing in the peripheral land of Lleida in terms of the housing shortage created by the arrival of rural immigrants. Although Vilagrasa did not discuss informal housing in relation to fringe belts, M. P. Conzen (2009) notes that Al-Ashab (1974) records it as part of Baghdad's MFB.

Ünlü (2013) also drew attention to informal housing areas created by immigrants from the countryside. They were located in the vicinity of the MFB and the OFB in Mersin, where cheap agricultural land was available to be subdivided and sold to immigrants.

Core-periphery relations

Residential expansion to the west along the seashore led to the development of Pozcu. However, it had never been a settlement functioning separately from Mersin. Therefore, it is not directly comparable to the large-scale,

multi-nuclear developments of Birmingham and Tyneside. In both these cases, several neighbouring settlements formed their own fringe belts, which later were incorporated into the fringe belts of greater urban areas after the expansion of the main cities into surrounding areas. Pozcu developed as a result of the influence of a strong urban core nearby. In the initial stage of fringe-belt formation, government decisions to develop institutional uses at a city-wide scale were conducive of fringe-belt development to the east and west of Pozcu, where publicly-owned land attracted fringe-belt uses. Later, they formed parts of a fringe belt to the west and east. Two distinct parts were joined by a recreational zone occupying land to the south reclaimed from the sea as part of a larger metropolitan-scale development.

The main factor contributing to the development of a fringe belt around Pozcu was the driving force of local and central government bodies seeking convenient large sites for public services. Most fringe-belt uses developed by local and central government bodies were located on publicly-owned land, which reduced the pressure for redevelopment of their sites for other purposes, such as commercial land use and housing. The considerable investment of some fringe-belt land uses in their existing sites was also a factor in their resistance to redevelopment and their propensity to expand on to adjacent sites, as shown by Whitehand and Morton (2003).

In the western part of Pozcu's fringe belt, plots were consolidated during the outward growth of Mersin, and remained intact in their original form. In the eastern part two processes were noteworthy. The first was intensification of the original land use, especially in Muğdat Mosque, which was initially a small mosque with its shrine at the site. Later it became the largest mosque in the city, after expanding towards adjoining sites. The second was the emergence of new fringe-belt uses as agricultural and vacant land was occupied by museums.

The agricultural and vacant land in private ownership to the north was used for housing

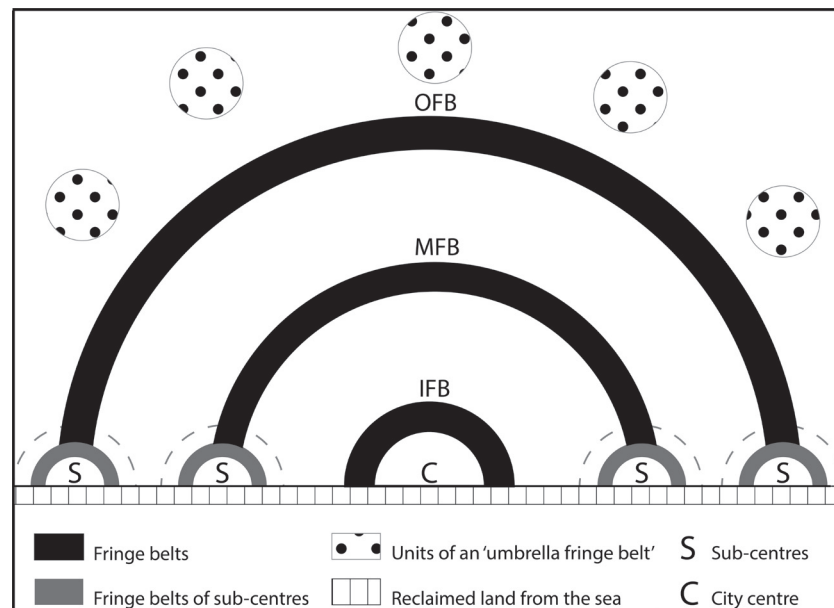


Figure 8. City centre, sub-centres and their fringe belts, and units of an 'umbrella fringe belt'.

development during the 1970s, and shopping centres and department stores during the 2000s. The sizes of the plots and their increased accessibility along the main public transport route were attractive to such large-scale investments.

When fringe-belt development is considered at both a city-wide scale and in sub-centres, it is evident that although the OFB has a fragmented structure its development along the highway is related to the development of the form of the city as a whole. Since Mersin has been growing to the west with new residential developments, through creating sub-centres such as Pozcu, and to the east with the advent of new industrial sites, fringe-belt development began to take on a linear form of development, mirroring that of the city as a whole. This type of fringe-belt development is arguably acting as an 'umbrella' over the historico-geographical development of the city at a metropolitan scale (Figure 8). There is also a linear type of development along the seafront fringe belt on reclaimed land that connects the IFB of the city centre to the fringe belts of sub-centres (Figure 8).

Conclusion

This paper provides a tentative conceptual framework for comprehending a multi-nuclear settlement pattern. Posing the question of whether Conzen's fringe-belt model is generalizable to metropolitan developments, it contributes to that fringe-belt model and the innovation/building cycle model of Whitehand. It confirms that a fringe-belt model purely based on a strong central core leaves unexplained significant aspects of the form of a metropolitan area such as Mersin.

In Mersin, although the IFB and the MFB are largely dependent on the strong influences of a central core, some MFB uses began to be located around sub-centres in the region and eventually formed the fringe belts of those sub-centres. They later developed a degree of autonomy, even though becoming absorbed by the outward growth of the centre. The OFB in some respects acted as an 'umbrella' over the multi-nuclear settlement pattern of the region. The coastline binds the sub-centres and their fringe belts to each other.

Further investigation is needed to ascertain whether an 'umbrella fringe-belt' development is evident in other cities, and the extent

to which this is dependent on cultural context. In both Conzen's fringe-belt model and Whitehand's innovation/building cycle model, emphasis is placed on the strong influence of a central core. More investigation is required of multi-nuclear metropolitan regions and the complex inter-relations of cores and fringe belts that they present.

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