

Environment and Planning B: Planning and Design

# **Sense of place in the changing process of house form: Case studies from Ankara, Turkey**

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## **Abstract**

This paper aims to investigate the impact of typomorphological changes of residential environments on residents' sense of place' (SoP). Seven housing developments representing different types introduced in Ankara, Turkey since the late 19<sup>th</sup> century are selected as case studies. Their morphological characters at the building, street and neighbourhood scales are examined, and typological transformations among the cases in terms of the degrees of continuity are identified. The paper proposes a conceptual model consisting of ten indicators to assess SoP at the building, street and neighbourhood scales of the residents of the seven cases. The scores of SoP are generated through structured interviews with the residents and analysed in SPSS. The results show that SoP is negatively affected by typomorphological changes over time, particularly when mutational changes occur. Continuity in typomorphological transformation helps to maintain SoP at a desirable level. Furthermore, physical changes at the street and neighbourhood scales have larger impact on SoP than that at the building scale. The research thus suggests that planning and design should be responsive to traditional types in residential development, particularly at the street and neighbourhood scales to maintain residents' SoP.

## **Key words**

Typomorphological transformation, house type, spatial analysis, sense of place, Turkey

## Introduction

House is a material expression of human life styles and patterns. House forms have been evolving over time for human survival and their constant pursuit of better quality of life (Ng *et al.*, 2005). Modernist movement begins an era of standardisation and mass production of housing, which are believed to be responsible for placelessness (Relph, 1976). Forces of globalisation at present contribute to the problem, and international architecture is accused for its incompatibility with the local cultures (Krier, 1979). Many cities are suffering from a typological crisis and a loss of sense of place (SoP).

Literature reveals that traditionally, spatial changes often occurred in a piecemeal manner to gradually adapt to the changing life styles. Morphologists describe the gradual change of urban forms as typological process, which is cumulative and continuous (Caniggia & Maffei, 1979). Many scholars believe that continuity in urban form and typological processes help to sustain SoP and benefit people's satisfaction with life (Chen & Thwaites, 2013; Rapoport, 1977; Lynch, 1960). They claim that it would be more beneficial to the local culture if traditional types were adopted in contemporary development. However, no research hitherto has empirically examined the impact of continuity or mutations of urban form on SoP over time. Moreover, which aspects exactly of traditional types that benefit the culture, in particular, residents' SoP need to be understood so tradition is not just to be replicated as images. As such, this study aims to combine typomorphological analysis of residential environments and SoP assessment to identify the morphological characteristics and their impact on SoP over time. The study asks two questions:

1. Can continuity in the transformation of house form help maintain or build SoP?
2. How SoP was affected by spatial changes at different scales, in particular, the building, street and neighbourhood scales?

The research is conducted with case studies from Ankara, Turkey, because the city has a long cultural tradition, and experienced dramatic changes since 1923 when it became the capital of the Republic of Turkey. The argument for continuity as a way to solve the problem of placelessness is particularly relevant to such a city where abundant historical remains embed residents' collective memory.

The following paragraphs firstly give a brief overview of the concept of SoP, followed by the introduction of the dual methodology: typomorphological analysis and SoP assessment. It then briefly describes the historical development of houses in Ankara, and the rationale for case selection. A typomorphological analysis and the SoP scores of the cases at the building, street and neighbourhood scales are presented subsequently. The discussion focuses on the dynamic relationship between typomorphological transformation and SoP.

This is followed by the summary of the findings, the research limitations and recommendations for further work.

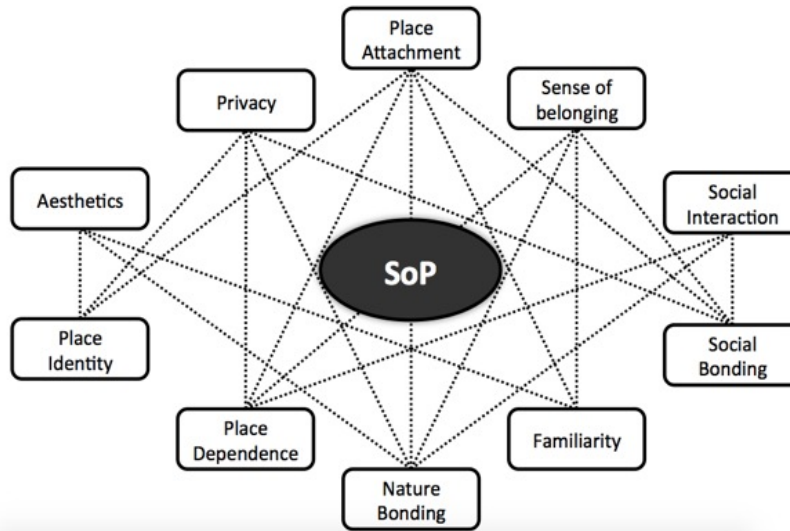
## **Sense of place**

### *Concept*

The term 'sense' refers to emotional perception of human being, and the term 'place' combines physical environment and human attitudes toward it (Shamai *et al.*, 2012). As such, the term 'sense of place' includes both objective and subjective aspects and is closely related to people's satisfaction for a space with regard to its ability to fit human needs. 'Place and sense of place do not lend themselves to scientific analysis...they are inextricably bound up with all hopes, frustrations, and confusions of life.' (Relph, 1976, p.i). SoP, therefore, 'resists a simple definition' (Shamai & Ilatov, 2005, p. 467).

Scholars including Relph (1976), Tuan (1977; 1974) and Norberg-Schulz (1979) focused on the phenomenology of SoP which was primarily associated with human perception, attitude, psychology and emotions towards a space. Tuan (1974, p. 93) defines SoP from a geographical perspective as people's 'affective ties with material environment' and emphasises the role of physical environment as an emotion carrier. Many researchers employed Tuan's definition of SoP in their investigations of the reasons for physical and emotional displacement (e.g. Williams, 2009). SoP is considered to be vital for human wellbeing (Lang, 1987; Lewis, 1979), because of its significant impact on people's feeling, thinking and understanding (Larson *et al.*, 2013). It is widely acknowledged that SoP is multifaceted and affected by complex social, cultural and physical factors (Hay, 1998; Hernandez *et al.*, 2007; Lewicka, 2010; Shamai *et al.*, 2012; Stedman, 2003). Among a variety of such factors, the most acknowledged ones are personal characteristics, ethnic and religious background, the length of residence, level of education, income, marital status, age, gender, ownership status, and quality and age of the dwelling (e.g. (Shamai *et al.*, 2012; Shamai and Ilatov, 2005; Smith 2011). Because of the indefinite meaning and interdisciplinary nature of the concept (Zia *et al.*, 2014), it is a complex task to identify with precision what really generates a genuine SoP (Shamai, 1991; Paradis, 2000).

Nevertheless, scholars attempt to explain the concept of SoP in association with other place-related ideas. The authors have identified ten most commonly discussed ideas in literature, for instance, place attachment by Low & Altman (1992); place identity by Proshansky *et al.* (1983); place dependence by Stokols & Shumaker (1981); privacy, sense of belonging and social interaction by Kyle (2007); cultural bonding/familiarity by CEM (2010); and nature bonding by Wolf (2010). This research adopts them as indicators of SoP (Figure 1). They are interrelated to one another and some are used interchangeably. There is no consensus on any hierarchical relationships among them.



**Figure 1.** Sense of place indicators (by the authors).

### *Physical environment and sense of place*

Although the SoP literature often emphasises the phenomenological construct of the concept, physical environment is fundamentally important. Steele (1981, p. 11-12) claims that SoP ‘...is the pattern of reactions that a setting stimulates for a person. These reactions are a product of both features of the setting and aspects the person brings to it.’ Hummon (1992, p.262) echoes this view and states that ‘SoP is inevitably dual in nature, involving both an interpretive perspective on the environment and an emotional reaction to the environment’. In this regard, SoP develops based on the action-reaction relation between the physical setting and human perception, which satisfies the human need of being reacted, not ignored, and feeling alive and important.

Apparently, ‘interaction’ is the key word in the investigation of the spatial characteristics and their potential contributions to SoP. Literature has mentioned quite a few spatial characteristics that are relevant to either human psychological wellbeing or SoP, for example, connectivity and access patterns (Biddulph, 2007; Wilkerson *et al.*, 2012); street form (Mayo, 1979), public-private area relations (Biddulph, 2007); building arrangement and spatial configuration (Saraf & Ahlen, 2010; George & Campbell, 2000); density (Bramley *et al.*, 2009; Lopez, 2010; Gen & Pendola, 2008); scale and proportions (Lopez, 2010; Schneekloth & Frank, 1994); streetscapes, building heights and façade compositions (Gen & Pendola, 2008); street width, building attachment and size (Perkins *et al.*, 1990). These elements are also important for typomorphological analysis, which aims to identify the changes undergone in the built environment over time.

## **Methodology**

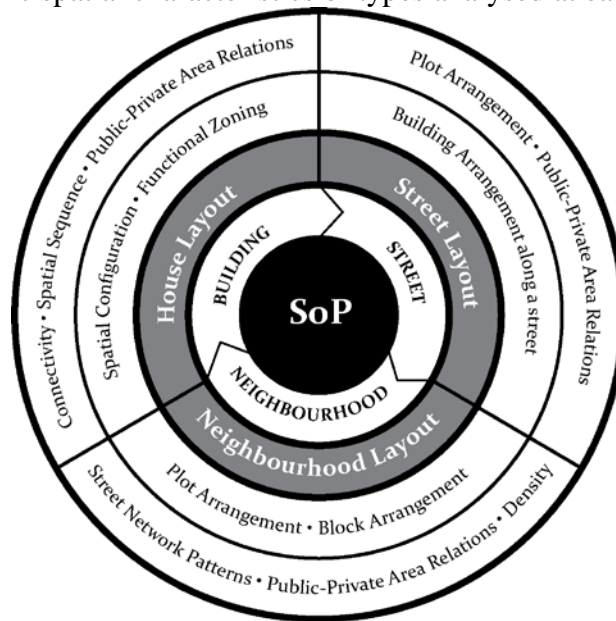
This study adopts a dual methodology combining the typomorphological analysis and the SoP assessment. The former analyses spatial characteristics of the physical environment with types defined according to their public-private area relations, spatial sequence, density and spatial configuration at the building, street and neighbourhood scales (Figure 2). The spatial analysis identifies different degrees of continuity in the transformation, namely continuous, partially continuous and mutational transformations among the cases at the three scales. With regard to SoP assessment, structured interviews are conducted to gather residents' opinions related to the ten indicators at the three scales to construct a full picture of SoP. The impacts of the observed continuity and discontinuity of the spatial characteristics are revealed through the variation of the SoP scores. The dual methodology will not only reveal the impact of typomorphological changes of the residential environment on SoP, but also clarify what physical characteristics at which scale are mostly relevant to SoP.

### *Typomorphological analysis*

Typomorphology 'interprets the built landscape in relation to location, time and scale in order to understand the production and transformation process of urban form and guide quality design practice' (Chen & Thwaites, 2013, p. 57). Typomorphological analysis starts with the identification of spatial types at a location. Particular attention is paid to types emerged at different stages of the urban development within a given context. 'Location' is significant in typomorphological analysis, because forms at the same location are often shaped by similar external factors and reflect similar socio-economic and cultural values of the residents. Therefore the cases selected from Ankara are located as close as possible to one another to minimise the potential impact of socio-economic and cultural differences of the residents on SoP.

Time is vital in typomorphological analysis because the robustness of types or patterns can be tested over time, and the process of adaptation facilitated by inhabitants themselves can be explored and valued (Chen & Thwaites, 2013). The research firstly identifies the morphological periods in Turkey in which different internal and external factors affect urban forms. Thereafter, house types from each morphological period of urban development are reviewed, and the relevant cases are selected. The selection deliberately covers cases showing different degrees of typological changes, which are classified as continuity, partial continuity and mutation. Continuity cases refer to the cases continuously developed from earlier types. Partial continuity (or partial mutation) refers to partial changes of typologies with some retained characteristics of the previous types. Mutation refers to a complete change from previous types.

‘Types should always be identified and analysed in articulated scales’ (Chen & Thwaites, 2013, p. 59), because urban form needs to be understood as a whole. Urban transformation often starts with changes in buildings. Further changes then occur in the positioning of buildings to the street, which affects the street patterns, which in turn change the neighbourhood patterns. Therefore, detailed examination of spatial characteristics of the case studies in this research is carried out at the building, street and neighbourhood scales. Figure 2 shows specific spatial characteristics of types analysed at each scale.



**Figure 2.** Spatial characteristics concerned in the typomorphological analysis at the three scales (Gokce & Chen, 2016, p. 68).

### *Sense of place assessment*

Interview is an effective way to gather subjective data. The ten SoP indicators are discussed through structured interviews with the residents of the chosen cases, and the results are statistically analysed through the SPSS software. The research discusses SoP with the residents at the building, street and neighbourhood scales to respond to the typomorphological analysis described above.

The interview questions are split into three sections. Section I is about the socio-demographic information of the interviewees such as the size of the household, ownership status and the length of residence. The data collected from this section is used to test the impact of demographic variables on SoP. Section II asks about residents’ overall view on each of the indicators regardless of scales. The results from this section can be used to

validate the results generated from Section III, which also focuses on the ten indicators but with detailed questions per indicator at the three scales. Section III consists of 155 questions in total which are adapted and developed from existing questionnaires in literature, namely NAS (Neighbourhood attachment Scale) and PREQIs (Perceived Residential Environment Quality Indicators) introduced by Bonaiuto *et al.* (2003).

The participants were asked to rate their views using 7-point Likert scale (Johns, 2010) for each question, which was then aggregated to assess ten indicators individually at the three scales. The overall SoP was calculated through the mean value of the scores of the ten indicators at each scale. Any rating beyond 6 was considered to be *very high*; between 5 and 6 *high*; between 4 and 5 *moderate*; and less than 4 was deemed to be *low*.

## **Case study**

### *Housing development in Ankara and case selection*

Ankara, located in the northwest of central Anatolia, has a long history dated back to the prehistoric times (Cansever & Yener, 1966). Its urban form has been influenced by the terrain, water sources and local climate. The current residential environment was dated to the late Ottoman Empire period (1890s to 1923). Since the establishment of the Turkish Republic and Ankara became the capital, the city has experienced dramatic changes. Four morphological periods of the city's development can be identified: the period of 1923-1950 (the early Republican Period); 1950-1980 (modernisation period); 1980-2000 (liberalisation period), and post-2000s. A few new house types were introduced in those periods.

In the early 19<sup>th</sup> century, the dominant house type was the traditional Turkish house (Case I and Case II), which had already developed for hundreds of years following the spatial demand of the nomadic lifestyle of Turkish people before they settled in Anatolia. However, since the 1840s, changes in house types occurred along with economic and social changes in Turkey (Sey, 1998a). For example, close relations with Europe at the time brought new house types to Turkey such as single-family houses, terrace houses and row houses (Sey, 1998b). These new types spread out in major cities like Istanbul and Ankara first before appeared in other cities of the country (Sey, 1998a).

Following the First World War, there was a significant housing shortage in the early Republican period (1923-50) (Sey, 1998b). Slums began to appear and housing cooperatives were just established. Low-density garden houses originated from England were introduced as an ideal house type (Sey, 1998a). Small-scale housing investment was made to accommodate public servants, military officials and the new government employees (Erturk & Ozen, 1987). But the housing shortage was not much improved due to economic constraints at the time.

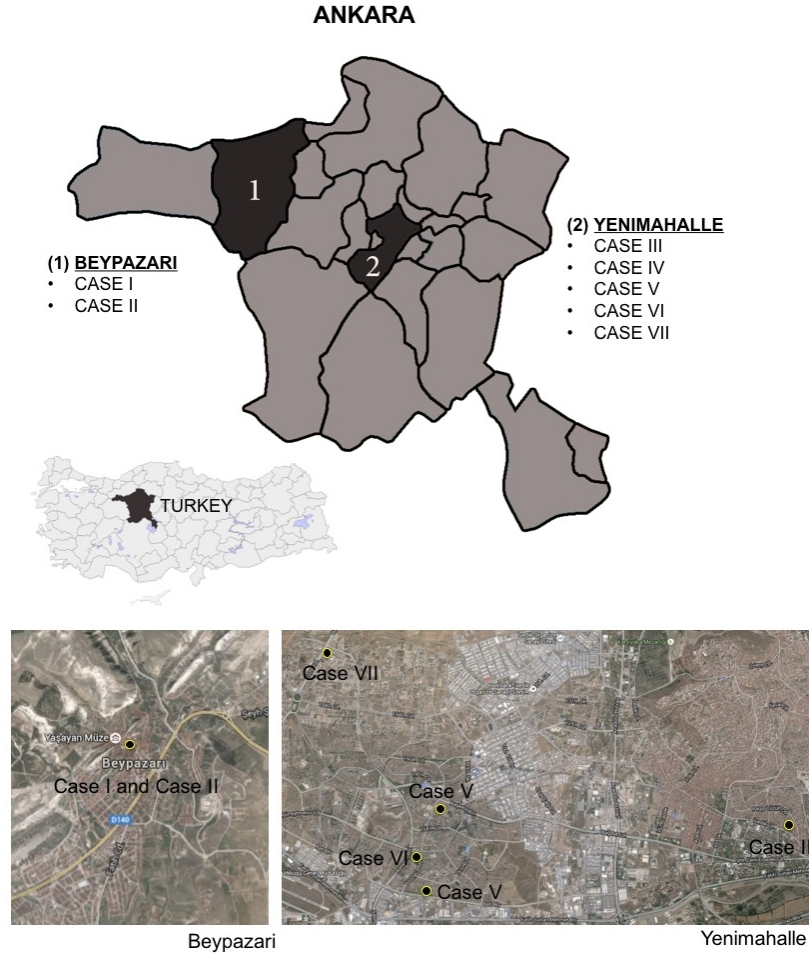


The years following the 1950s saw a dramatic increase of population in Ankara (Keles *et al.*, 2009). With changes in regulations, three- to five-floor apartment buildings (Case III) were allowed in different regions of Ankara (Altaban, 1998). Garden houses from the previous period were largely replaced. Ankara was named ‘the city of apartment blocks’ in the 1960s (Altaban, 1998) which changed the city’s traditional image (Oktay, 2004). There were also attempts from housing cooperatives and municipalities to provide affordable housing for low-income groups and slum dwellers. But these attempts were not successful (Batuman, 2006).

In the 1970s and 1980s, only the houses for mid- and high-income groups were constructed by private developers who dominated the housing market at the time (Burkay, 2006). The urban poor remained in slums which spread continuously in many areas of the city (Erman, 2001). Without adequate government support, the houses constructed by housing cooperatives were also occupied by mid- and high- income groups (Sey, 1998a). One of the examples is ‘Batikent’ in Ankara (Case IV, V and VI) (Coban, 2012; Batuman, 2006).

Not until the 2000s, affordable housing was constructed at a large scale in Ankara to replace slums and squatter houses (Burkay, 2006). Housing cooperatives were not active in later years (Coban, 2012). High-rise apartment buildings built by private developers became the urban norm in the contemporary period. The layouts of these new apartment buildings were inspired by international models and completely different from the previous house types of Turkey. Due to the tension among different social groups, the high-rise apartments were mostly gated (Case VII) (Coban, 2012).

Therefore, Case I and II are selected in this research as the examples of the traditional house types dated back to the late 19<sup>th</sup> century and early 20<sup>th</sup> century. They offer slightly different layouts but their associated streets and neighbourhoods share similar spatial characteristics. Case III is an example of the low-rise apartment block type introduced in the 1950s. This example presents a transition from the old to the new life style as a result of population growth at the time. Case IV, V and VI are three examples of house types adopted by the housing cooperatives in the 1980s and 1990s. Case IV consists of single-family houses, and Case V and VI are medium-rise apartment buildings. The three cases have clear boundaries although not strictly gated. Case VII is an example of the contemporary house type, a gated community consisting of two high-rise apartment blocks. This case was built in 2007 and chosen as the latest example in order to allow the residents a few years to develop a SoP by the time of this research. The seven cases are located at two boroughs of the city of Ankara: the first two from Beypazari and the rest from Yenimahalle (Figure 3).



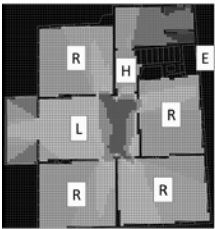
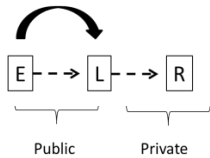
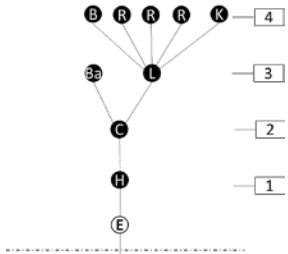
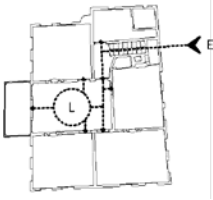
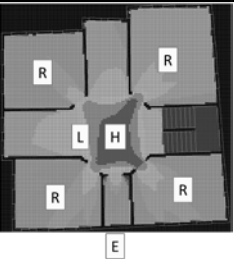
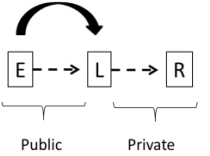
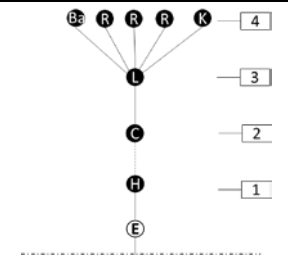
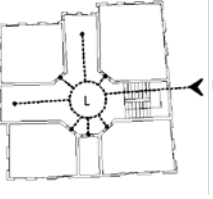
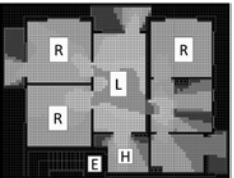
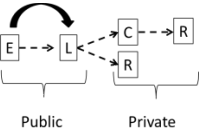
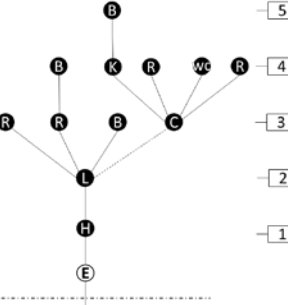
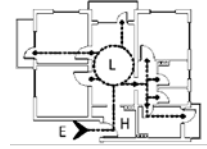
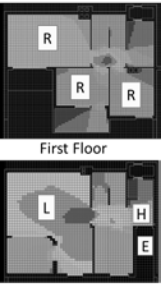
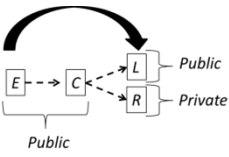
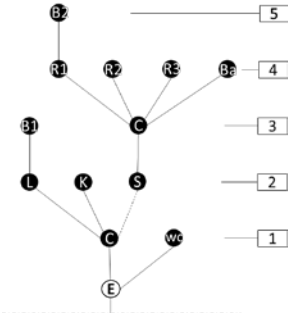
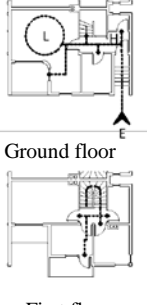
**Figure 3.** Case location map (Adapted from [www.turizmajani.com](http://www.turizmajani.com) and [www.mgm.gov.tr](http://www.mgm.gov.tr)).

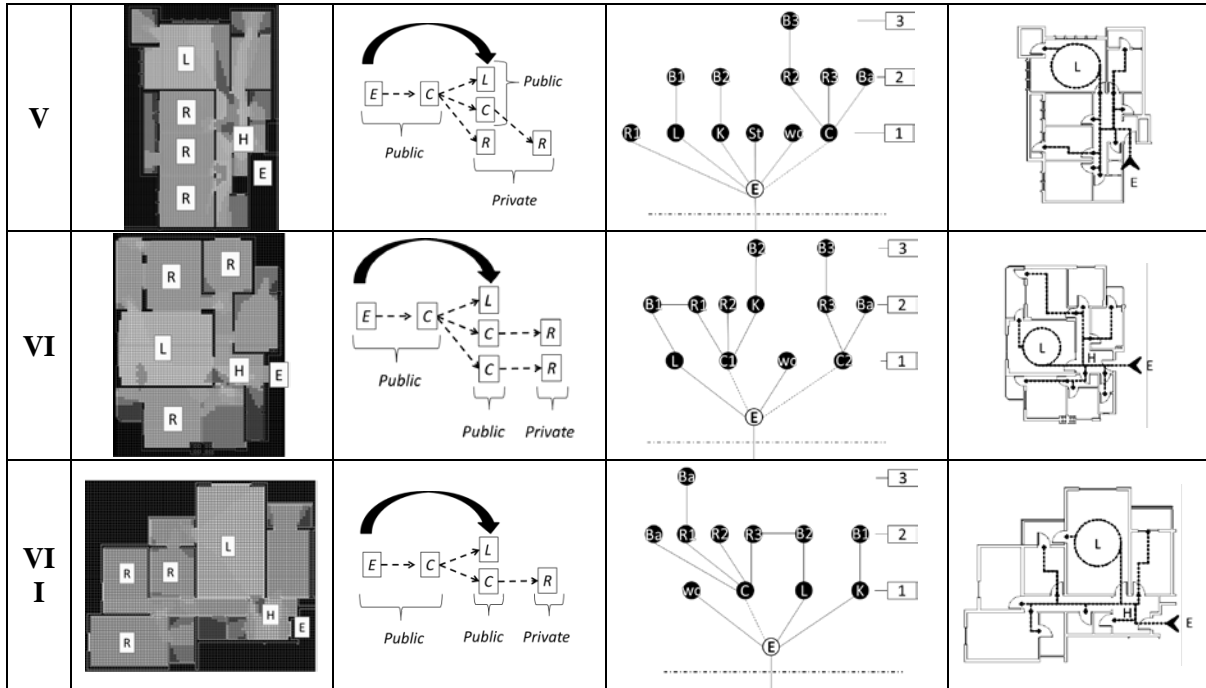
### *Typomorphological analysis*

At the building scale, the spatial configurations of the house layouts are examined with regard to connectivity, spatial sequence, public-private area relations, functional zoning, access patterns and compactness (Table 1). It is observed that the most connected and integrated area of the houses is the living space in earlier cases (Case I, II and III); the layouts of later cases are more circulation-oriented. In terms of spatial sequence, the entrance directly leads to the living area in Case I, II and III, while circulation spaces are introduced in the other cases. Moreover, in Case I and II, there is a direct transition from public (shared spaces in the house) to the private areas (individual spaces, bedrooms etc.) and the access to the living room is linear. There is no functional zoning since the rooms of Case I and II have no specified functions. In comparison, the transitions between the public and private zones are partly mixed in Cases III, V, VI, and strictly separated in Cases IV

and VII. The contemporary cases (V, VI, and VII) with their tree-like access patterns are less compact compared to traditional cases.

**Table 1 Building scale analysis**

Case	Connectivity <sup>1,2</sup>	Spatial sequence <sup>2</sup> Functional Zoning	Access Patterns <sup>2,3</sup>	Compactness
I				
II				
III				
IV				



<sup>1</sup> The gradient from dark to light represents the most connected to the more segregated spaces (Hillier, 2007).

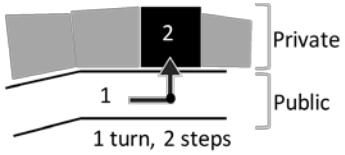

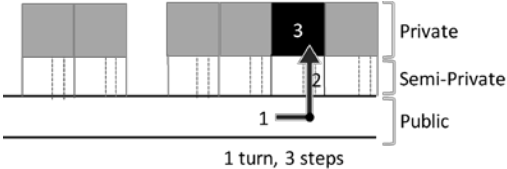

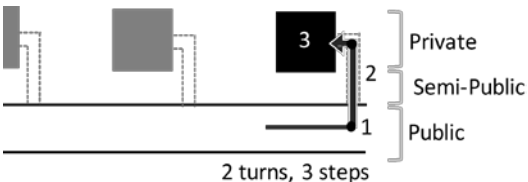

<sup>2</sup> E: Entrance, H:Hall, L:Living Room, R: Room, C: Circulation, Ba:Bathroom, B:Balcony, K: Kitchen

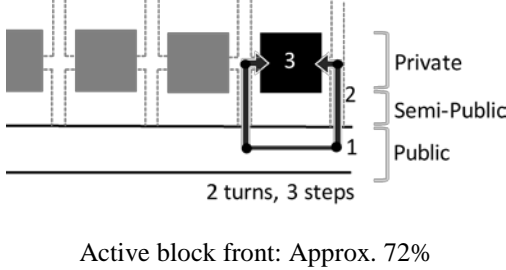

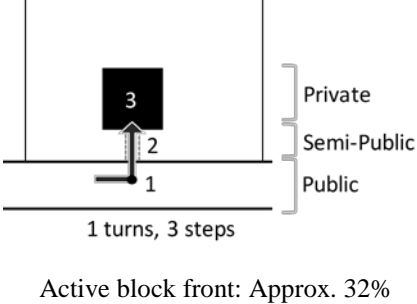

<sup>3</sup> Justified permeability graph shows the access pattern from the entrance, and the numbers on the right indicate the depth of the layouts.

At the street scale, the analysis focuses on the arrangement of the buildings and plots along a street; the access patterns from the nearest public street to the private entrances; the building height to street width ratio and the coverage of active block front (Table 2). The traditional houses (Case I and II) are adjacent to one another, creating a continuous street façade without intervals and setbacks, while Case III and IV have front gardens as buffer zones between the public and private spaces. These buildings are also linearly arranged along the streets. Buildings of the later cases, Case V, VI (multi-storey) and VII (high-rise) are free standing away from the streets. Houses of the early cases are directly accessed from the public streets, while Case V, VI and VII are accessed from semi-public pathways.

**Table 2 Street scale analysis**

Case	Building Arrangement/Access Patterns/Public-Private Area Hierarchy/Active Block Front	Street View/Building Entrances	H/W ratio Building Height


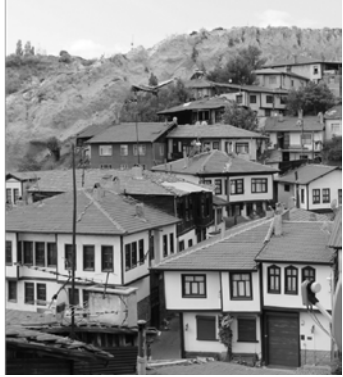


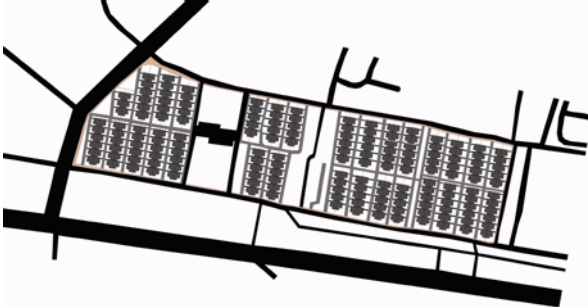

<p><b>I -II</b></p>	 <p>Private Public</p> <p>1 1 turn, 2 steps</p> <p>Active block front: Approx. 100%</p>		<p>Low-rise buildings 1-2-3 floor single family houses</p> <p><math>W=H/2, H/3</math></p>
<p><b>III</b></p>	 <p>Private Semi-Public Public</p> <p>1 2 3</p> <p>2 turns, 3 steps</p> <p>Active block front: Approx. 72%</p>		<p>Mid-rise buildings 3-floor multi-family apartment blocks</p> <p><math>W=2H</math></p>
<p><b>IV</b></p>	 <p>Private Semi-Private Public</p> <p>1 2 3</p> <p>1 turn, 3 steps</p> <p>Active block front: Approx. 83%</p>		<p>Low-rise buildings 2-3 floor single family terrace housing</p> <p><math>W=2H</math></p>
<p><b>V</b></p>	 <p>Private Semi-Public Public</p> <p>1 2 3</p> <p>2 turns, 3 steps</p> <p>Active block front: Approx. 50%</p>		<p>Mid-rise buildings 5-floor multi-family apartment blocks</p> <p><math>W=H</math></p>



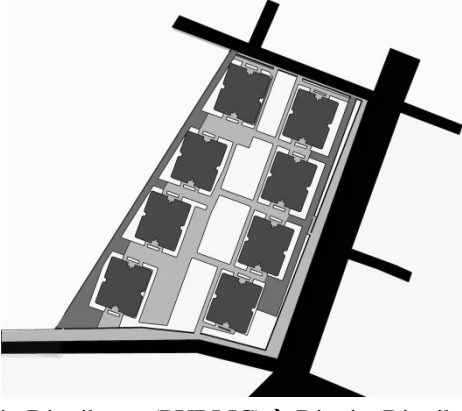

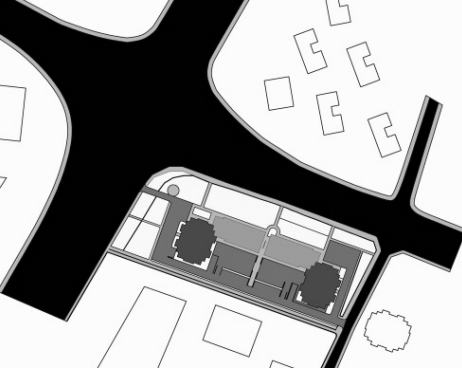

<p><b>VI</b></p>	 <p>Active block front: Approx. 72%</p>		<p>Mid-rise buildings 5-floor multi-family apartment blocks W=H</p>
<p><b>VII</b></p>	 <p>Active block front: Approx. 32%</p>		<p>High-rise buildings 12-floor multi-family apartment blocks W=2H</p>

At the neighbourhood scale, the immediate surroundings of the houses are examined in terms of block arrangement, street network patterns, public-private area relations, density and land coverage (Table 3). In Case I and II, houses are built by the street lines. The block patterns are irregular with polygonal blocks varying in sizes. In Case III, the blocks are mainly regular, and the lengths of the blocks are almost identical. While there are approximately six plots or house units in one block in Case I and II, it is around 20 plots per block in Case III. In Case IV, the single family houses are arranged in a grid pattern with 10 to 12 plots per block. Case V, VI and VII have five, eight and two freestanding apartment buildings respectively in a block. The street widths also differ. While streets are as narrow as 2 to 3m in traditional neighbourhoods, the streets of the contemporary case are over 60m wide. Public and private areas are clearly defined in traditional cases and ambiguous in later cases with large semi-private or semi-public transitional spaces between buildings and the streets. Density (number of house units per area) increases from the traditional cases to the contemporary ones. However, the land coverage (building footprint area/site area) is lower in the later cases than that of the traditional cases.

**Table 3 Neighbourhood Scale Analysis**

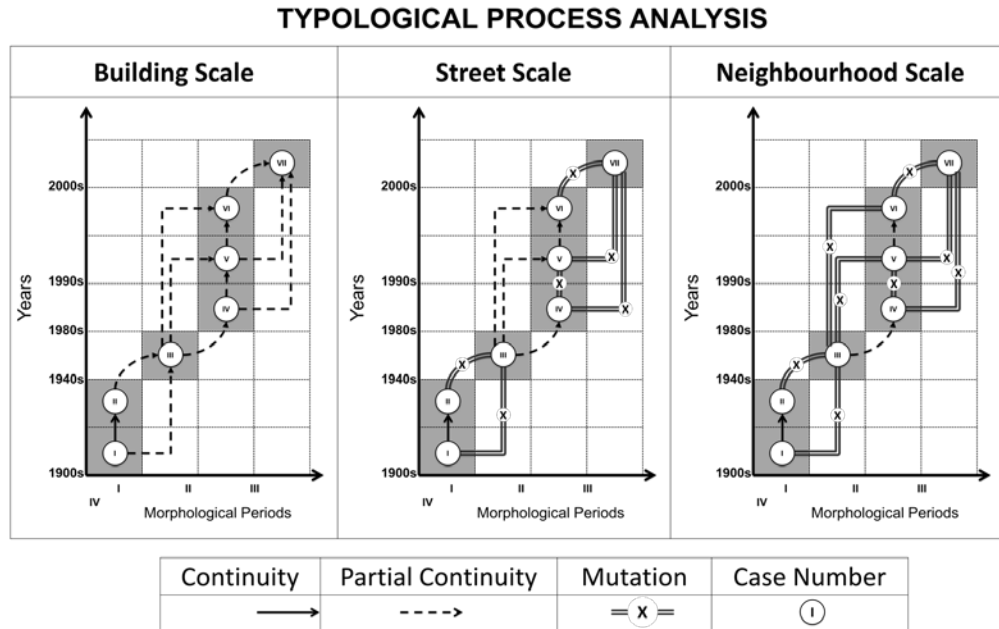
Case	Building Arrangement/ Street Network/Spatial Hierarchy	Land Coverage (%)
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<p><b>I-II</b></p>	 <p>Main Distributor (PUBLIC)→District Distributor (PUBLIC)→Building Entrance (Private)</p>	 <p>60%</p>
<p><b>III</b></p>	 <p>Main Distributor (PUBLIC)→District Distributor (PUBLIC)→Local Distributor (SEMI-PUBLIC)→Plot Entrance (SEMI-PRIVATE)→Building Entrance (Private)</p>	 <p>50%</p>
<p><b>IV</b></p>	 <p>Main Distributor (PUBLIC)→District Distributor (PUBLIC)→Local Distributor (SEMI-PRIVATE)→Plot Entrance (SEMI-PRIVATE)→Building Entrance (Private)</p>	 <p>47%</p>

<p>V</p>	 <p>Main Distributor (PUBLIC)→ Main Distributor (PUBLIC)→Local Distributor (SEMI-PRIVATE)→Pedestrian Pathway (SEMI-PRIVATE)→Building Entrance (Private)</p>	 <p>27%</p>
<p>VI</p>	 <p>Main Distributor (PUBLIC)→ District Distributor (PUBLIC)→Local Distributor (SEMI-PRIVATE)→Pedestrian Pathway (SEMI-PRIVATE)→Building Entrance(Private)</p>	 <p>32%</p>
<p>VII</p>	 <p>Main Distributor (PUBLIC)→Pedestrian Pathway (SEMI-PRIVATE)→Building Entrance (Private)</p>	 <p>23%</p>



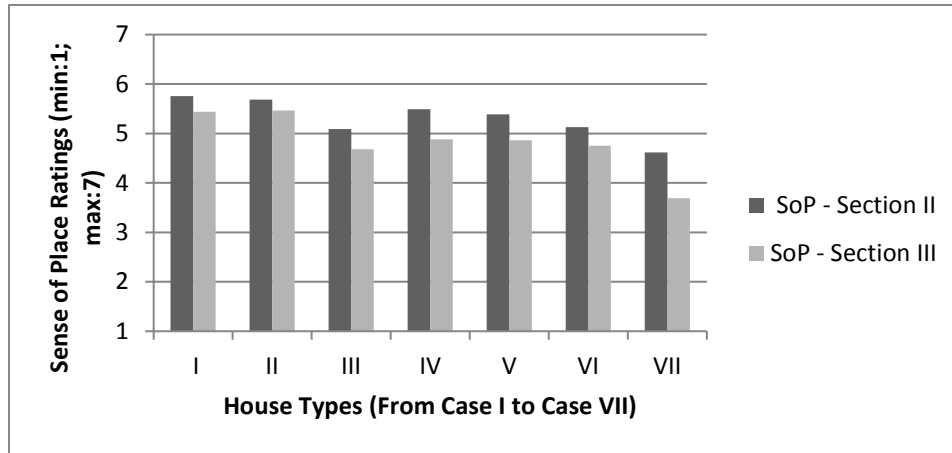
Based on the typomorphological analysis, the degrees of transformation over time at different scales can be identified. Continuous, partial continuous and mutational transformation among these cases at the three scales are summarised in Figure 4.



**Figure 4.** Typological process of the seven cases at the three scales (by the authors)

### *Sense of place assessment*

Overall 140 residents (20 per case) were interviewed for the assessment of SoP at the three scales. The scores related to the indicators at the three scales in Section III have showed good internal consistency according to both Cronbach Alfa reliability test (The lowest  $r_{\text{Building Scale}}=.718$ ;  $r_{\text{Street Scale}}=.645$ ;  $r_{\text{neighbourhood Scale}}=.766$ ) and the comparison with the results of Section II regarding the overall scores against the indicators (Figure 5). Generally, the scores in Section III were slightly lower than those in Section II. It was understandable that the participants' score to each indicator overall was higher than the synthesized score from detailed questions of each indicator. The latter naturally encouraged the participants to think about problems of their home environment. Nevertheless, the consistency between the results of the two sections has validated the results concluded from Section III.



**Figure 5.** Sense of place scores from Section II and III are mainly consistent (by the authors)

The research has adopted two strategies to minimise the impact of socio-economic and demographic variables on SoP. First of all, the seven cases are all middle class houses located in close vicinity where possible in the city. This was to ensure that the houses are affected by similar external factors and the residents have similar socio-economic status. In the interview, consensus was sought among members of the household on the answers to the questions. This to some extent eliminated the impact of personal status such as age, gender, level of education and profession on SoP.

Nevertheless, the research still statistically tested the impacts of the demographic data, including the household size, length of residence, ownership status and hometown through SPSS. As mentioned in the methodology section, such data was gathered in Section I of the structured interview. A sample of the statistical analysis of them is shown in Table 4.

**Table 4.** A sample of the demographic data.

	Household size		Length of residence (Neighbourhood)		Length of residence (Home)		Owner (O) / Tenant (T)	
	Mean	SD	Median	SD	Median	SD	O/T	SD
<b>I</b>	2.8	1.19	(>15 years)	.000	(>15 years)	.000	19O, 1T	0.22
<b>II</b>	2.8	1.13	(>15 years)	.571	(>15 years)	.688	15O, 5T	0.44
<b>III</b>	3.9	1.50	(>15 years)	.820	(5 to 15 years)	.858	7O, 13T	0.48
<b>IV</b>	3.2	1.11	(>15 years)	.598	(>15 years)	.732	13O, 7T	0.48
<b>V</b>	3.7	1.03	(>15 years)	.523	(>15 years)	.670	18O, 2T	0.30
<b>VI</b>	3.6	0.88	(>15 years)	.410	(>15 years)	.598	16O, 4T	0.41
<b>VII</b>	3.4	0.99	(5 to 15 years)	.670	(5 to 15 years)	.510	16O, 4T	0.41

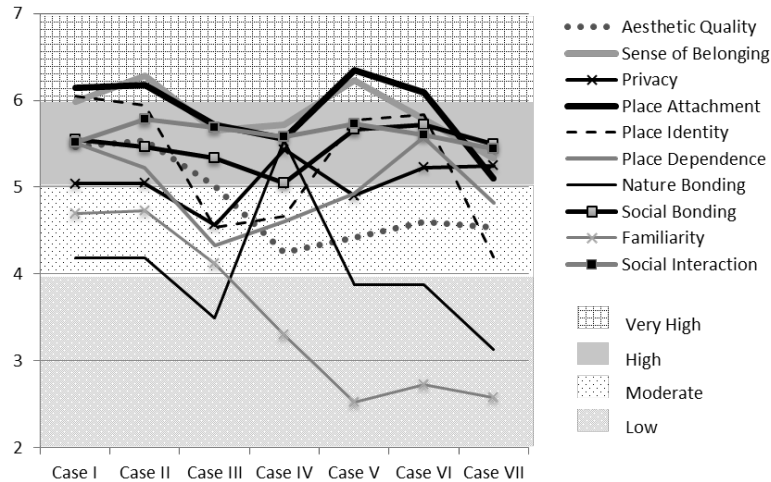
The effects of the demographic variables on SoP scores were tested in SPSS at two levels: The impact of a particular variable and the impact of the interaction between a variable and spatial typologies. Insignificant impact was represented by  $p\text{-value} > .05$  (Field, 2009). The analysis showed that the impacts of most of the demographic factors on SoP were insignificant compared to those of the spatial typologies (only the impact of *the length of residence in the city* was more apparent with the  $p\text{-value}$  of .019 at the street scale). Moreover, the interaction between the majority of the demographic variables and the spatial typologies also had **insignificant** impact on SoP, except the interaction between spatial typologies and *education level* ( $p\text{-value} = .009$ ), *profession* ( $p\text{-value} = .032$ ), *length of residence in the district* ( $p\text{-value} = .037$ ) and *length of residence in the city* ( $p\text{-value} = .002$ ) at the street scale; as well as, at the neighbourhood scale, the interaction between *education level* ( $p\text{-value} = .028$ ) and spatial typologies. However, from a comparative point of view, the calculated effect sizes showed that those aforementioned impacts on SoP were **much less** than that of spatial typologies. Therefore, the statistics support that the impact of the demographic variables has been appropriately managed in the research.

## Results

The scores against the ten indicators were compared through cases respectively at the building, street and neighbourhood scales. Then, the overall SoP scores were calculated from the mean values of the scores of ten indicators at each scale. Accordingly, the scores have been interpreted along with the typological processes and mutations identified in the typomorphological analysis.

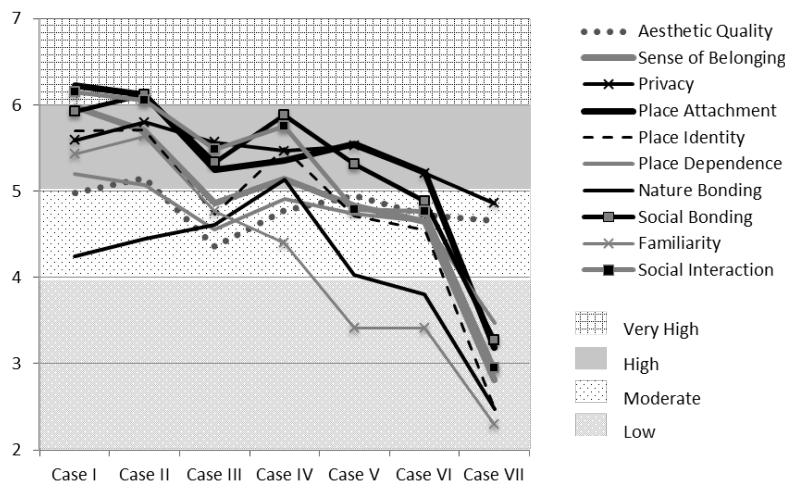
### *Sense of place at each scale*

At the building scale, there was no significant difference in the social interaction scores, which ranges between 5.43 and 5.78 among the cases ( $p\text{-value} = .432$ ). However, the scores of the other nine indicators were significantly different in all cases ( $p\text{-value} < .05$ ) as shown in Figure 6. The scores for most of the indicators showed a slight downward trend over time despite the fluctuations. Privacy, rated 5.04 for Case I, was the only indicator showing a slight improvement of 4% in Case VII. From the earliest case to the most contemporary one, the most dramatic changes were observed on familiarity and place identity with the decline rates of 45% (from 4.7 to 2.57) and 30% (from 6.05 to 4.2) respectively. Overall, all residents have reported at least *moderate* level of satisfaction with most of the indicators. Only nature bonding and familiarity indicators were fallen to *low* range while sense of belonging and place attachment scores were rated *very high* over time.



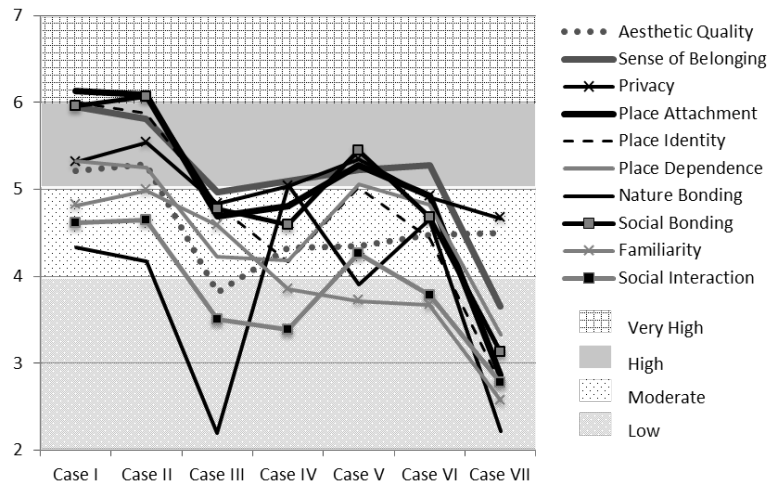
**Figure 6.** Sense of place assessment at the building scale (by the authors)

At the street scale, the scores of all indicators showed a clear decline from Case I to Case VII ( $p$ -values $<.05$ ) (Figure 7). Nevertheless, scores in most of the cases were above 4 except in Case VII of which all the indicators, except aesthetic and privacy, hit the bottom. Besides, the least decrease of only 6% (from 4.98 to 4.65) was observed in aesthetic quality followed by privacy (12% from 5.58 to 4.86). Nature bonding at the street level saw a gradual improvement from Case I to Case IV. Then it declined and hit the bottom in Case VII. The most drastic decline of over 50% was experienced in social interaction from *very high* ( $>6$ ) in Case I to *low* ( $<3$ ) in Case VII. Overall, the scores were at the *moderate* level in the first four cases but they could not be sustained in later cases.



**Figure 7.** Sense of place assessment at the street scale (by the authors)

At the neighbourhood scale, there were significant differences in the scores of all the SoP indicators amongst the seven house types ( $p$ -values $<.05$ ). Similar to the results at the street scale, the overall trend was downward for most of the indicators, despite some fluctuations (Figure 8). The scores were markedly stable and comparatively higher in the first two cases. The most dramatic decline was observed in the scores of Case III and VII. The scores of privacy were relatively stable and decreased by around 12% (from 5.3 in Case I to 4.6 in Case VII). The most dramatic fall was seen in place attachment from *very high* ( $6.13 > 6$ ) in Case I to *very low* ( $2.86 < 4$ ) in Case VII. Place identity and social bonding have also declined by approximately 50%. Social interaction hit the *lowest* level ( $2.7 < 4$ ) in Case VII, and was at the *moderate* level ( $4.6 < 5$ ) in Case I. Sense of belonging and place dependence were scored *high* in the traditional cases, and dropped substantially and *low* in the latest case. In contrast, aesthetic quality stayed relatively stable between Case III and VII at the *moderate* level, although the decline was noticeable in the first three cases. Overall, only in the traditional cases, scores for all indicators were above four, which was the threshold of satisfaction. This could not be sustained in later cases, except privacy and aesthetic quality.



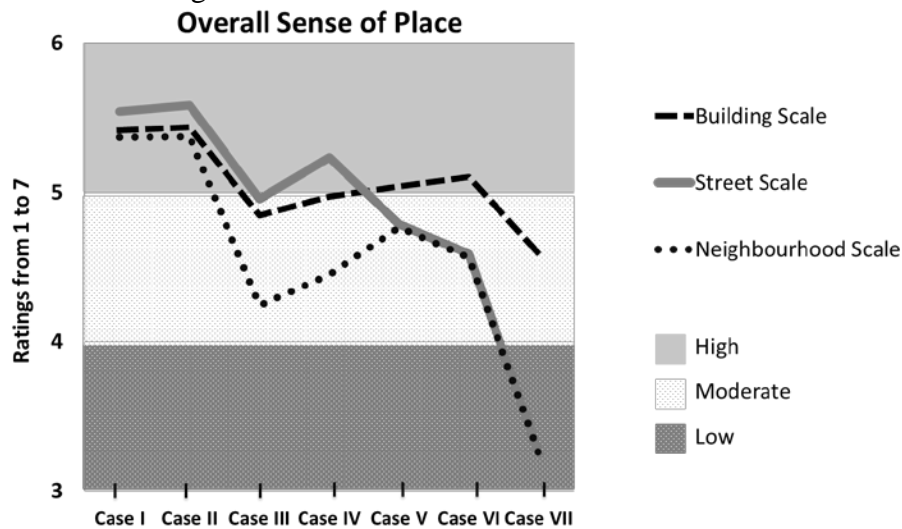
**Figure 8.** Sense of place assessment at the neighbourhood scale (by the authors)

### *Overall sense of place assessment*

The mean scores of all SoP indicators were calculated and compared at the three scales (Figure 9). SoP scores at all scales were the highest in Case I and II, both at around 5.5. Then the scores dropped greatly in Case III and increased slightly in Case IV. The

improvement continued at the building and neighbourhood scales in Case V. However, there was a sudden decline in SoP score at the street scale. Though the improvement was still noted at the building scale in Case VI, SoP scores at the street and neighbourhood scales were comparatively low in Case VI and VII.

The overall SoP at all scales showed a downward trend but with different degrees of decline. The most dramatic drop was at the street and neighbourhood scales by around 50%, while the decline at the building scale was 18%. Moreover, only at the building scale, SoP scores were at least at the *moderate* level with the lowest score in Case VII (4.58). In comparison, SoP scores in later cases were relatively *low* at the street and neighbourhood scales. It was also observed that SoP scores were higher at the street scale than those at the building and neighbourhood scales in Case I, II, III and IV. Case V, VI and VII achieved better SoP at the building scale.



**Figure 9.** Comparison of the overall SoP scores at the three scales (by the authors)

## Discussion

### *Typological process and the overall sense of place*

The study has found that SoP is largely affected by the changes of spatial typologies at the three scales over time with the effect sizes at all scales  $>0.138$ , which is the benchmark according to Cohen (1988). The impact of building scale changes (.260) is less influential compared to those of the changes at the street scale (.746) and neighbourhood scale (.717). In addition, SoP and the changes of spatial typologies over time are negatively correlated.

Statistically, there is a medium relation at the building scale ( $r_{\text{Building Scale}} = -.385$ ), and a large relation at the street ( $r_{\text{Street Scale}} = -.756$ ) and neighbourhood scales ( $r_{\text{Neighbourhood Scale}} = -.668$ ) [Small = .10, Medium = .20, Large = .50, Very large = .70] (Cohen, 1988).

At the building scale, partial continuity or change is observed among all cases except from Case I to Case II. SoP scores drop from Case II to Case III and from Case VI to Case VII, and show slight improvement from Case III to Case VI. This suggests that the house layouts are mostly appropriate for the changing life styles of the residents. Since all SoP scores are in a close range, it is not evident that continuity has helped maintain SoP at this scale.

At the street scale, drops in SoP scores from Case II to Case III, and from Case IV to Case VII coincide with the observed typological mutations. Generally, the street spaces in later cases are not well-defined and the public-private transition is less clear. The SoP score of Case IV is slightly improved compared to that of Case III. This reflects the partial continuity of typological characteristics between the two cases. It is observed that the spaces between buildings in Case IV are pedestrianised and well-landscaped with vegetation. Case IV also has a higher ratio of active front compared to Case III and all later cases, which helps SoP at the street scale.

Mutations are discovered among all cases at the neighbourhood scale except partial continuity observed from Case III to Case IV and from Case V to Case VI. These mostly correlate with the drops and the increases in the SoP scores. However, it is observed that mutational change occurs from Case IV to Case V, but the respective SoP scores improve. It suggests that certain changes in typomorphological characteristics may be positive to SoP. Compared to earlier and later cases, Case IV, V and VI are neither located in open sites nor gated. Clear boundaries visually separate these houses from the surroundings but one can still access the houses easily. This setting is proved to be positive to SoP, because perhaps visual boundaries are needed for the middle class residents to establish a sense of safety and community.

In summary, continuity in transformation may not be clearly beneficial at the building scale, because people are able to customise the interiors of their houses to meet their needs. Mutational changes do damage residents' SoP at the street and neighbourhood scales despite one exception at the neighbourhood scale. Therefore, the authors claim that in general it is at the large scales where typomorphological continuity between the traditional and contemporary residential environments benefits SoP. Nevertheless, the residential environment at all scales are all important and perceived by the residents as a whole, so that dissatisfaction at one scale results in low SoP overall (Figure 5).

### *Typomorphological characteristics and the sense of place indicators*

While the research results partially support the argument for continuity in literature (except at the building scale), it also identifies the negative impact of some particular physical characteristics on specific indicators of SoP, which enriches the existing literature. At the building scale, the scores of the cases for each SoP indicator are in a close range and the residents are mostly satisfied. Scores against privacy have even improved in later cases as the buildings getting taller and distanced from one another. However, natural bonding and familiarity need some attention in Case III, V, VI and VII, because private gardens exist in traditional cases and Case IV (single-family houses), whilst other cases only have balconies which are not so effective in facilitating nature bonding. It is inevitable that as the population grows and urbanisation intensifies, private gardens are less likely to be provided for individual households. Therefore, it is important to develop high quality communal gardens.

At the street scale, scores against privacy and aesthetics do not vary greatly among cases. This suggests that residents are satisfied with the aesthetic quality of all house types. Scores for all other indicators drop greatly in later cases, particularly from Case VI to Case VII. It is clear that the most recent case has the least percentage of active front, the tallest buildings and unclear boundaries of public private spaces. Hard-paved car parks surround the building make the communal space on the ground floor not attractive to users. The single entrance to the buildings and the basement parking have minimised the residents' opportunity to interact with their neighbours. In comparison, the immediate areas outside the buildings of other cases are pedestrianised or offer on-road parking. There are more openings to the streets which create more opportunities for social interaction (Table 2).

Similarly, at the neighbourhood scale, scores against privacy and aesthetic quality are comparatively stable among the cases. Scores for nature bonding has the greatest variation among the cases, with Case III and VII the lowest. By contrast, the higher scored ones have either private gardens (Case IV) or are well-landscaped (Case VI). Traditional neighbourhoods also have little vegetation while the latest case has large car parks on the ground. Scores for place attachment, place identity, social bonding, sense of belonging and place dependency drop greatly, especially from Case VI to Case VII. With regard to the physical characteristics, houses of Case VI have better defined public and private spaces, appropriate building height to street width ratio and good landscape. Furthermore, it is worth noting that high land coverage and/or density do not necessarily encourage social interaction as shown in Case III, IV and VII. This contradicts with some claims in the literature arguing for high density environment to enable social interaction (Putnam, 2000).



Scores against each indicator of SoP allow us to understand the physical characteristics that may contribute to certain aspects of SoP. Therefore, design and planning of residential environments in the future could learn the lessons.

## **Conclusion**

This study has bridged the concepts of SoP and typomorphological analysis to investigate the interplay between SoP and the typomorphological transformation of residential environment in the Turkish context.

The study has firstly developed a conceptual framework for the assessment of SoP and then applied it to the case studies that represent the changing process of residential environments. The study has identified the dynamic link between SoP and the three degrees of spatial transformation, namely continuity, partial continuity and mutation. In relation to the first research question, it has empirically proved that in general typological continuity can help maintain/rebuild SoP at the street and neighbourhood scales. Furthermore, the study identified that the perception of SoP is different at different scales. In relation to the second research question, the assessment is useful in clarifying what spatial characteristics should be retained and what dimensions of SoP should be paid more attention in new housing developments. Therefore, it urges a positive response to the spatial relations of urban form, particularly at the street and neighbourhood scales, which would give the residents a better chance to establish SoP in the new environment.

The research is against the advocacy for the replication of traditional images in new development, because the empirical evidence shows that aesthetics was not necessarily negatively affected by mutations of the physical environment. The study emphasises the importance of quality public or communal spaces to facilitate social interaction. It suggests that clear definition of the public and private spaces near the houses is necessary. Well-designed green space is beneficial. The mix of car-accessed and pedestrian spaces with priority giving to the latter is positive for place dependence and social interaction, which is in turn useful for developing stronger social bonds. The entrance points to apartment buildings and their relationship with the streets also affect the level of social interaction. These are the physical aspects on which contemporary residential developments could learn from the traditional types.

The limitation of the research perhaps lies in the conceptual framework of ten SoP indicators. One may ask to what degree each indicator contributes to SoP and whether there are other factors affecting SoP. This research does not intend to compare the impact of changes in physical environment to that of changes in socio-economic status of the residents which may be explored in future research. The question of ‘what creates SoP’ remains. The paper only focuses on physical environment without bias against other

factors. Another limitation of the study is that the socio-economic and demographic variables might still have affected the results to a certain degree, despite the aforementioned measures in the research design. In addition, the limitation might be related to the ways through which typological process and different degrees of transformation were identified. The decision made for a case with regard to continuity and mutation in its transformation has no clear cut. It was made based on the researchers' judgment. A different researcher might consider the partial continuity as continuity. Nevertheless, these limitations do not invalidate the results, because the research focuses on the interrelationship from a comparative perspective.

Further research with a bigger sample size regarding both interviews and house types, or in a different context can be explored to provide a fuller picture of how typomorphological transformation affect SoP and socio-cultural sustainability. The methodology developed in this research may be useful in promoting understanding of traditional physical characteristics for other contexts to benefit residents' SoP. This is a vital issue in the field of urban morphology, which attempts to help current interventions in cities result in a more sustainable future. Further study could explore the links between design qualities and different aspects of SoP in more detail.

## **Acknowledgements**

The authors thank the two anonymous reviewers for their constructive comments on the revision of the paper.

## **Declaration of conflicting interests**

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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