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Typological diversity and morphological continuity in the modern residential fabric: *The case of Ankara, Turkey*

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ABSTRACT

Each city has a unique fabric corresponding to the dominant modes of production, legal control, and guidance systems in which it operates. Any periodic alteration in the settled mode of housing supply, in this sense, potentially results in an intrinsic change in 'typological diversity' and 'spatial continuity' within the collective fabric. If not coordinated by design and development control, the emergent variation in the housing typology may result in spatial fragmentation through the collective urban fabric. To test that point, the paper aims to reveal the subtle relationship between the two phenomena on a morphological basis. Through rapidly changing socio-economic dynamics in the last century, the cities of Turkey are subject to different housing production forms, therefore, offering a relevant context to examine the issue.

Along with a planning system without effective development control tools to ensure spatial coherence responding to the dynamic nature of the housing sector, the residential fabric of Ankara comprises all the dominant housing typologies that emerged within different periods in Turkey. Accordingly, following a historical review of the housing supply forms in Turkey, the paper maps the emerging patterns of modern housing typologies through successive development zones of the city. It examines their internal typomorphological characteristics via a series of transects. Utilizing the GIS-based coherency analysis, the level of morphological continuity on each transect is calculated. Consequently, in light of the findings of the analysis, a critical perspective on housing production and development control creating different forms of spatial fragmentation through typological variation is suggested.

1. Introduction

Each city reproduces its characteristic form and fabric based on the particular mode of production of the built environment. Such a basis is highly conditioned by the national (or regional) legal planning frameworks and design control mechanisms (Booth, 1996). All the developmental dynamics play a role in the internal variations within the city fabrics. In this context, typological diversity reproduces itself in parallel with the changing lifestyles, expectancies, and property relations depending on society's cultural and economic structure (Davis, 1999). On the other hand, *continuity* is inversely proportional to the level of 'phase difference' created by the changes in time. The shorter the period the socio-economic transformation manifests through sharp breaks, the more the diversity pattern in the fabric visibly reveals emerging discontinuity in space.

Housing, which is the dominant program within the overall building stock, forms the districts that largely determine the primary morphological character of the city. Then the periodically changing form of housing typically characterizes the city's identity.

According to Soja (1985: 109), capitalist spatiality characterizes itself as a distinct homogenization, fragmentation, and hierarchy. The standardization engendered by industrial production techniques produces identical but disintegrated formal and spatial patterns in specific periods. Market mechanisms usually consolidate the existing (uneven)

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socio-spatial hierarchies through relative locational and infrastructural advantages and constraints. This situation expresses itself much more clearly in developing countries where planning cannot be institutionalized effectively. In the context of the modern housing sector, the experience of Turkey suggests an exemplary case producing certain ruptures and continuities within the collective form of cities (Bilgin, 2004; Doğru, 2021, p. 76).

Ankara, the capital of Turkey, has been the subject of various forms of housing production since its establishment; therefore, it offers a very relevant context for the discussion about the standard quality in housing morphology being transformed throughout the country's history. The city, which evolved through reactive planning procedures and informal processes under the conditions of rapid urban growth, has produced different building typologies periodically in a few decades. At this point, the century-old modern planning history of the city reveals a rich typological palate.

The issue of how the typological diversity produced at the building level evolves in parallel with the production of coherent and integrated urban form as the primary factor for sustainable living environments and one of the main issues of contemporary urbanism (Alexander et al., 1987). In this context, the article critically analyses the housing development in Ankara, which has been produced with different plan approaches and housing typologies in the last seventy years. The typomorphological mapping of the modern residential fabric of the city aims to expose the fundamental quality indicators of *typological diversity* and *morphological continuity* in relation to each other. The mapping study employs the method of cross-sectional maps called 'the transect' (Duany, 2002), aiming to characterize spatial coherence through varied typological patterns from the core to the periphery. To that end, a GIS-based coherency analysis is applied to each transect of the districts representing different morphological periods of the city.

The maps cover the consecutive fringe belts originally conceptualized as a unit of analysis by Conzen (1960, 1962) and Whitehand (1967, 1988). The fringe belts given in the case of the research have been developed from the 1950s onward around the core fabric of the city. The study aims to explore the dominant (modern) building types produced in many cities of Turkish cities in each period and the corresponding urban fabrics that typically emerged.

The typological mapping conducted at the street block or ensemble level specifies the distribution of the residential types throughout the city's development zones. Then, the pattern of typological diversity in the urban fabric could be made visible along with its internal transitions. In this way, the transects could provide an evaluative basis on how these typological variations suggested morphological continuity for coherency or discontinuity that would create spatial fragmentation. Eventually, the collective form transformed in the city's planning history is assessed for the alternative development and design control approaches.

2. Theoretical background

2.1. The relationship between building typology and urban form on the basis of change and continuity

The early pioneering examples such as Ildefons Cerdà's Barcelona (1859) and Hendrik Petrus Berlage's Amsterdam (1915) show that housing is considered the principal constituent of the city, a generator of life patterns, and so, an integral part of conceiving cities in the history of modern urbanism. However, in the first half of the last century, the modernist residential types, creating relatively closed and homogenous communities (in the form of ensembles) distinct from the existing city fabric, became common practice in many European cities. (Krier, 1979, pp. 74–85; Mumford, 2009, pp. 2–99). This emerging situation has been one of the primary motivations for a group of Italian scholars and architects, who would later be known as the Italian School of Typomorphology (Moudon, 1987, pp. 1964–2008, pp. 35–66; 1994: 290-5), behind their emphasis on the continuity and the integrity of the building fabric inherent in traditional urbanism (Moneo, 1978, p. 35; Forty, 2000, pp. 304–311, pp. 307-9). They argue that the Modern Movement, in combination with speculative reconstruction in the post-war period, ruptured this continuity and integration, which can only be recuperated with a careful reading and understanding of the historical city (Petruccioli, 1998, pp. 57–60). To this end, pioneered by Saverio Muratori in the 1950s, the school aims at integration between typology, the systematic categorization and conceptualization of building types, and the field of urban morphology that examines the compositional and configurational relationships between different elements of urban form (i.e., plot, street-block, and building). Based on the typological thinking initially developed by Muratori (1959), Caniggia and Maffei (1979) further developed the conceptualization of 'typological processes' and the relationship between urban form and transforming building typologies. Cannigia and Maffei (1979: 47), who define the homogeneous group form created by similar building types in a particular historical period as 'urban tissue' (*tessuto urbano*), are the representatives of the paradigm that conceives the city as a kind of organism. From this perspective, the development of the urban form is handled with a process that keeps change and continuity together and adapts the existing typology to the future. That approach implicitly considers keeping the continuity of the building typology as the product of the local cultural context, the primary task of urban planning and design (Cataldi et al., 2002, p. 4).

According to Aldo Rossi (1966), who emphasized typological continuity and permanence with a structuralist perspective, the primary permanence elements that resist time are monuments and urban precincts, especially the residential fabric. Rossi (1966) sees 'typological innovation' as a phenomenon outside of architectural design due to the complex relationship of building typology with the city and society. It is the characteristic features of typology itself that enable the development of an architectural design (ibid., 171).

Scheer (2010: 3) posits the concept of typology on an evolutionary basis regarding urban morphology. To her, building type is subject to constant variation due to technological, cultural, and economic factors such as construction, transportation and communication techniques, social rights and roles, welfare level, and property relations. For example, 'insula', which emerged with the innovations in construction technology in the Roman period, corresponds to a kind of apartment type produced with economic necessities in the modern age (ibid., 36–40).

As initially introduced by Conzen (1960), cities are composed of 'morphological periods' characterized by distinctive forms of streets, plots, and buildings as a response to the emerging requirements in the urban pattern (pp. 6–7). This is what Caniggia and Maffei (2001) called *phase; the* time interval for the progressive variations in existing buildings is recognizable (pp. 55–56). Following Caniggia and Maffei (2001: 54), Petruccioli (2007) discusses the 'typological process' (*processo tipologico*) 'as the fundamental mechanism of evolution from one type to another that defines a certain morphological period. Accordingly, any departure in the rule system that ensures continuity of the dominant types demarks on the duration of each period (p. 39). To Whitehand et al. (2014), the typological process takes place either by introducing new types of form components (i.e., buildings and streets) or via the adaptation of the existing forms through successive modifications in form. Then an enduring adaptation would lead to the emergence of transmutation between the different periods (pp. 513–514). In this regard, adaptive processes could ensure subtle typological transformation in a specific context. Accordingly, the coherence of an urban form highly depends on the consistent application of certain building typologies in an evolutionary framework (Scheer, 2010, p. 48). Relying on the accumulated knowledge in urban typomorphology, Kropf (1996) addressed building typology as a component of urban tissue together and in relation to plots, streets, and plots to identify the historical character of human settlements.

With their comprehensive research, Kirschenmann and Muschalek (1980) examined the housing areas developed in different European cities throughout the second half of the last century as a certain morphological period. They showed how diverse housing patterns can be designed with similar building types. In this way, it is emphasized that even standardized modern building typologies could create a rich palette of spatial syntax through compositional variations by design.

Explaining the relationship between building typology and urban form through hypothetical models called 'speculations', Martin and March (1972) discussed the possibility of fundamental variations in urban form produced by different building types over the performative evaluation of space. They suggested a universal typology over three types: *pavilion/tower*, *street/slab*, and *court*. Then, Sherwood (1978) elaborates on building typology, specifically modern housing. In this context, he presented the *detached/semi-detached, terraced/row housing, block, slab,* and *tower* as the primary 'prototypes'. In parallel lines of thought, Leupen and Mooij (2022) emphasized the value of formal typology in investigating housing design. They extended Sherwood's formal typology via a series of categories, such as spatial organization and form of the dwelling, building configuration, access condition, and tectonics. They figure out the configurational capacity of different types (i.e., *clustered low-rise, row, mat, urban villa, infill, slab, block, tower*) within themselves and at the level of the urban ensemble (i.e., *villa park, ribbon, perimeter, semi-open and open block, parallel rows, free-standing objects, free composition,* and *superblock*). Pont and Haupt (2010), who developed a morphological matrix ('spacematrix') based on the indicators of density, analyzed more than a hundred Dutch residential fabrics and revealed a typology (i.e., *point/nucleated), peripheral*, *strip*) very similar to that of Martin and March (1972) on an empirical basis. Elevational and combinatoric variations of these three types presented in the analysis essentially represent the possibility of typological hybridity in housing (i.e., a block fabric consisting of a point block and strips).

In urban design, the 'form-based coding' approach, which systematically questions the relationship between building typology and urban form, is an ongoing search for reproducing the essential morphological qualities of traditional fabrics (i.e., integrity, diversity, and density). Accordingly, the primary motivation of the design practice is to imitate the rich typological spectrum changing from the center to the periphery as a lost characteristic of the cities to a great extent after modern urbanism.

'The transect', in this regard, is used as a typomorphological framework to specify the design codes, ensuring the smooth variation in building typology from the center to the periphery. One could consider the mapping method introduced by Duany (2002) as a design control model and a tool for morphological research, as well.

Accordingly, the standards of different (traditional) building forms in the determined sections of the city are formulated as formal design codes. Aiming at a resolution that can provide diversity even in the street block, the 'typological coding' establishes a close relationship between the building and the fabric (Parolek et al., 2008, pp. 64–79). Then, a legible morphological continuity in a larger context could be ensured while creating distinctive sections through unique typological settings.

Despite giving no direct reference to the idea of 'the transect', necessarily, contemporary urban design practice is used to search for a typological diversity in urban form, especially in planned residential districts. From this point of view, Urhahn and Bobić (1994) proposed a multi-scaled typological framework from the unit to city/region based on coherency and diversity (pp. 12–14). From an urbanist perspective, Sanders (2013) also dealt with the issue of morphological continuity by introducing the concept of 'consonance' in the urban form. Accordingly, Sanders and Baker (2016) emphasized the need for an urban design approach that provides typological continuities to ensure coherency between what exists and what is newly proposed. However, there hasn't been any development of a typological urban design approach that includes innovative 'adaptation' strategies at the fabric level. Scheer (2010) points out the need to manage typological transformation shaped evolutionarily by socioeconomic and cultural processes as the essential function of urban planning and design practice (pp. 71–72). Accordingly, instead of a universal (standard) 'transect'' introduced for different urban contexts, a local perspective that would reveal the unique typomorphological features of each context could be considered critical to strengthening the relationship between typology and urban form. Such a view requires a flexible typological framework enabling internal variations to adapt to the changing conditions and morphological continuities in a given context (ibid. 68, 74).

The concept of 'transitional morphologies' that has emerged in the recent urban morphology literature potentially responds to the dialectical relationship between typomorphological diversity and continuity. Inspired by the transitional biological forms studied in paleontology, the concept implies the intermediary typologies recognized between the different (urban) morphological periods. With a comparative analysis, Trisciuoglio et al. (2021) argue that urban fabrics tend to transform relatively at slow paces in parallel with the breaks in socio-economic conditions, compared to the relatively fast-changing building typologies. Such an asynchronous pattern of transformation creates some transitional forms in the city. Then, they address the need for design codes to guide such an adaptive process responding to its evolutionary (incremental) nature for sustainability. Such a view indicates the critical role of building typology to ensure continuity in diversity throughout the larger urban setting (pp. 11–12).

Doubtlessly, a prospective design perspective on the issue necessitates a robust analytical outlook on a typomorphological basis. For particular cases, there have been already few studies emerged in that vein. While Sun and Bao (2020) explore the phenomenon in housing typology in the context of Nanjing as a case of traditional Chinese urbanism, Gür and Dülgeroğlu (2019) provide a comprehensive review of changing urban housing typologies in 20th-century Istanbul, thus, suggest a relevant basis to leverage the conception of transitional morphologies within Turkish context. In this context, one of the most systemic analytical approaches is provided by Gökçe and Chen (2019). Plotting the individual formal features of each morphological period at the building, street, and neighborhood scale in the case of Ankara, Turkey, the authors provide an objective framework to reveal the subtle relationship between building typology and the layout characteristics of a particular type within a given period.

2.2. *Typological diversity in the context of housing supply models: the case of Turkey*

The city form is an outcome of a particular mode of production characterized by the class structure of the society, property relations, and the technological infrastructure in a state of flux. Its developmental transformation is highly conditioned by the preferences of the main economic actors (i.e., landowners, developers, and the public) and the state in the capitalist mode of production (Sawyers, 1975). Therefore, it is possible to identify different periods of urbanization concerning the changing pattern of social mobility and the main policy orientation subject to transformation accordingly. In this sense, modern urbanism in Turkey does not suggest an exception (Tekeli, 1998; Bilgin, 1998; Şengül, 2001, pp. 61–94). It has continued its historical transformation within the (re)structuring processes characterized by different modes of production (of space) and capital accumulation regimes (Balaban, 2011; Eraydın, 1988). According to Tekeli (1982), land ownership and value exchange, urbanization speed, changing entrepreneurial characteristics and construction technology, and the state's regulatory role are the main factors determining the production modes in housing (p. 61). However, the financial factors that fall under the scope of monetary policy, such as the creation of accessible credit resources, taxation, and the determination of interest rates, are the economic factors that condition the housing market and the forms of supply (Balamir, 1981, p. 33). Then, the institutional and political economy periodization already made by

Tekeli (1982, 2009), Sey (1998), and Bilgin (1996) for the development of the housing sector in Turkey provide a relevant basis that could be re-examined in terms of residential morphology of the Turkish cities.

In this framework, during the 1930s and 1940s, in which the rate of urbanization was relatively low, the dominant mode of production was individual houses with gardens and the building cooperatives established by the central governments in Turkey (Özüekren, 1996, pp. 356-58). Within the forty years after the late-1940s, housing production

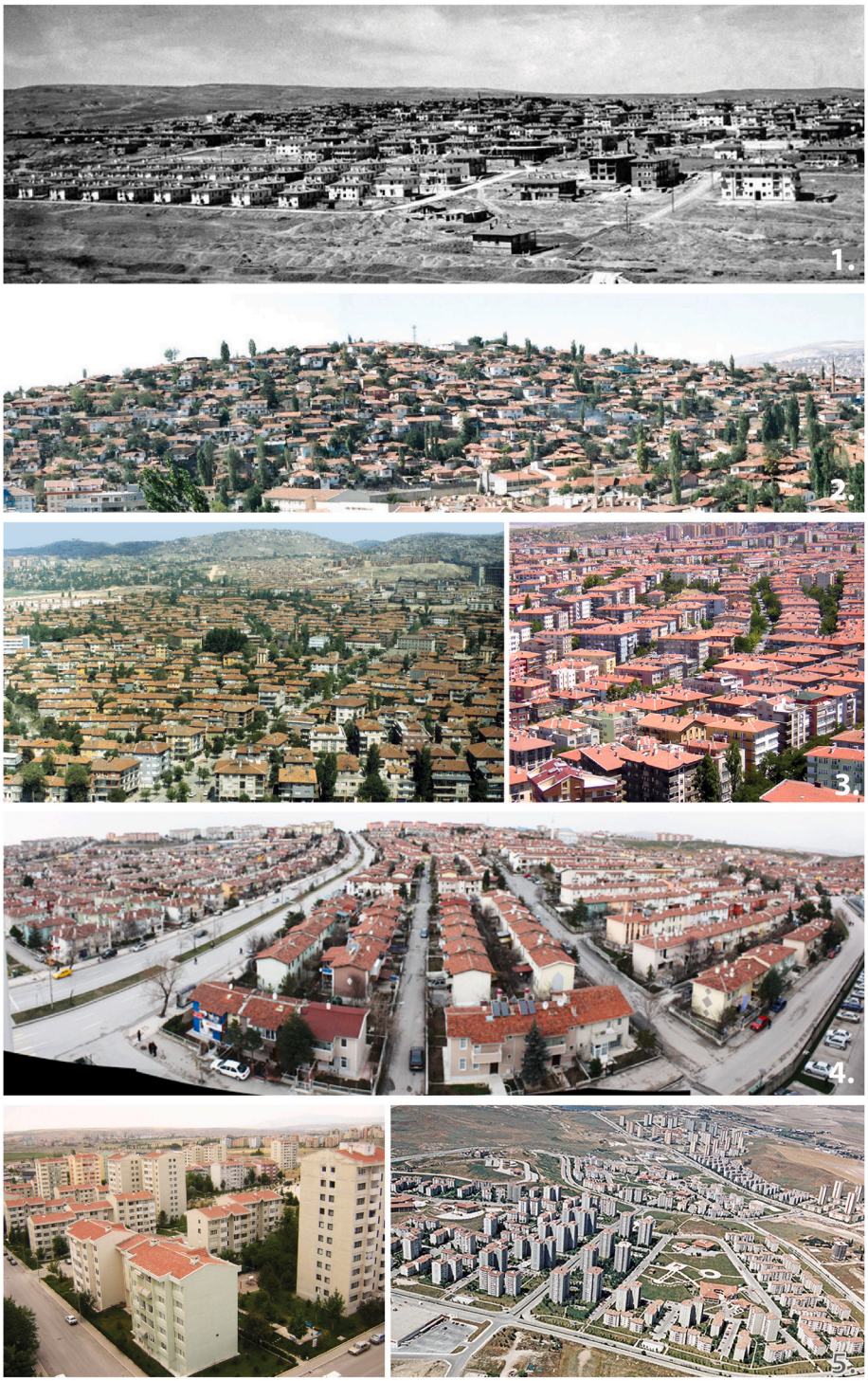

Fig. 1. Bahcelievler, Ankara, designed by H. Jansen based on garden-city principles in 1936, as one of the earliest examples of planned housing cooperatives in Turkey. **[1.]** (Source: URL-1) *Gecekondus* (squatter's houses) that was built up on the hillsides informally from the late-1940 in Ankara. **[2.]** (Source: B. Günay's personal archive, 1990). Early housing developments based on individual apartment blocks: new developments in the inner urban fringe (left) and the core fabric transformed through the unification of the small plots for the construction of new apartments (right) **[3.]** (Source: B. Günay's personal archive, 1990; O. Çalışkan's personal archive, 2004). Cooperative housing estates developed after the 'Batıkent Master Plan' enacted in 1979. **[4.]** (Source: O. Çalışkan's personal archive, 2008). The first phases of the mass housing development in Eryaman, Ankara: The cooperatives led by the Mass Housing Administration of the state replaced the previous low-rise mid-density housing typology with the open-plan type of mid to high-rise modern housing in the early 1980s **[5.]** (Source: O. Çalışkan's personal archive, 2004; URL-2).

was characterized by the individual apartments built by small property developers and the squatter's houses built informally by the rural immigrants under the low regulatory capacity of the state (Balamir, 1996, p. 339; Tekeli, 2009, pp. 244-47). (Fig. 1.1)

As a matter of fact, individual housing production could not respond to the increasing housing demand, especially in the cities that experienced the process of industrialization and rapid population growth through rapid migration. In an emerging condition where the state and private capital fronting industrial investments could not meet the increasing need for housing through the reproduction of labor, the squatter's houses, whose number reached 750.000 in Ankara in 1965, accommodated 23% of the total population of the city as of 1980 (Eraydın, 1998: 149; Pulatx, 1992: 219 cited in Doğru, 2021, p. 97). (Fig. 1.2)

The so-called Slum (*Gecekondu*) Law (No. 775) enacted in 1966 to control the informal urban development would be the first legal basis for the transformation of slum areas that constituted 55% of the total housing stock of Ankara as of the 1970s (Balamir, 1975, p. 309). Nevertheless, the *reclamation, cleanup,* and *prevention* policies determined by the law did not have a chance to be implemented systematically (Keleş, 2015, p. 542). On the contrary, with the help of legal zoning amnesties, redevelopment processes paved the way for radical urban transformation during the next forty years.

The Condominium Property Ownership Law (No. 634), enacted only one year before the Law of Slum (No. 775) (ibid.: 466), would respond to the increasing housing demand of the middle class in the face of rising land prices in cities. While the law grants individuals the right to own units within apartment blocks, it would also provide the legal basis for a new housing production process carried out by the small entrepreneur (contractor) who undertakes all the construction stages (i.e., providing the land, preparing the project, running the construction and marketing the house) (Tekeli, 1996, p. 92). In such a mode of production, which is called 'build and sell' (*yap-sat*) in Turkish, contractors earn the surplus (differential rent) by sharing a certain percentage of the dwelling units produced in agreement with the landowners, with their limited capital accumulation. Having turned them into one of the influential groups in local politics, the mode of production led by the contractors had been the leading factor of unprecedented pressure on the 'development rights' within the settled areas of many Turkish cities (Balamir, 1996, pp. 339–341; Batuman, 2012, p. 586). Especially during the 1980s, contractors could start more than one construction in the same period by reducing the capital costs thanks to the deposits collected from the future owners of the apartments. Then, the construction activity became widespread with a speculative speed (Balamir, 1981, pp. 24–25). The process corresponds to the uncontrolled growth of Turkish cities based on both the intensification of the core and its contiguous extension to the periphery (Bilsel, 1977).

The so-called 'rehabilitation plans' were made to transform many informal neighborhoods into apartment blocks during the 1980s. Eventually, apartments being built through the reproduction of a few typical ground plans obtained by the contractors led to the development of a large tract of urban fabrics that did not provide any typological variation (Bilgin, 1996, p. 483) (Fig. 1.3).

By the 1980s, Turkey's common perception of housing started transforming from a non-productive sector against the industry to a profitable investment sector within the national economy (Balaban, 2011). Accordingly, in the second half of the 1970s, relatively large capital groups turned to the real estate market due to the inflationary policies of the country (Tekeli, 1982, p. 75). The state was playing a leading role in this transformation thanks to the fund created by the Mass Housing Law that came into force in 1981. In 1984, Mass Housing and Public Partnership Administration (*TOKİ* in Turkish) was founded and started to produce mass housing on publicly owned lands outside the city in the form of 'satellite cities'. The new institution reorganized the increasing demand through cooperative housing unions and construction companies investing in housing projects (Özuekren, 1996: 363; Doğru, 2021, pp. 30, 85). Thanks to the allocation of 84% of the loans provided by TOKİ to cooperatives between 1984 and 1999, non-profit housing production reached up to 35% of the national housing production in that period (TOKİ, 1999: 8, cited in Doğru, 2021, p. 119). This situation gave cooperative housing a recognizably widespread texture in many cities, including Ankara.

The scale of housing production increased compared to the previous period with the building cooperatives, composed of several individual initiatives. (Tekeli, 1982, p. 69). Cooperative unions, which organized members for the credit purchase, obtain development plans and housing projects through construction companies, while the local government, which provides urban land and infrastructure, has the authority to approve the plan and supervise the construction (ibid., 81). Nonetheless, the institutional competence of integrated design guidance and control systems would never be established as opposed to the emerging fragmented pattern of development within the larger context.

In this period, while the individual apartment blocks on separate parcels were reproduced in the core of the city, in the new peripheral development areas, relatively more integrated urban parts, which are mostly composed of variations of slabs and tower blocks, were built up through cooperatives (Özuekren, 1996: 359; Bilgin, 1996, p. 485). As a pioneering example, 'Ankara Batıkent Project', for which the land expropriation was completed in 1978, hosted 55.000 residences on 1034 ha following a master plan that coordinated 33 cooperative developments within the whole new town (Eryıldız, 1995, p. 20; URL-6) (Fig. 1.4).

The state that was more active in the housing sector in the 1980s aimed to lead the housing market by bringing alternative standards to the cooperatives in mass housing applications, specifically for the middle-income group, via the new settlements initiated by the Mass Housing Administration. The Ankara-Eryaman and Istanbul-Halkalı, mass housing projects guided the applications in this direction for a total capacity of 80.000 residences (Sey, 1998, p. 298). These practices reveal the typological characteristics of the last century's international-style, first-generation modern mass housing practices (Bilgin, 1998, p. 488) (Fig. 1.5).

In the 1980s, large entrepreneurial developers, who had become the leading actors in the housing market, started to take place in the sector independently by producing closed housing estates appealing to the emerging upper-middle come group (Sey, 1998, pp. 297-98). The housing production at the hand of private developers introduced the standard construction techniques based on the tunnel formwork system technology. Accordingly, the new industrial construction technology was to support to ensure a large scale of development (Tekeli, 1982, p. 77). Mass housing companies, which also cover the cost of urban infrastructure by owning agricultural land outside the city, were obtaining the surplus value in exchange after the development. In this context, the economic efficiency of the investment depended on the production of a large number of houses in an area to be developed. Then the tendency of large entrepreneurs to invest in the urban periphery to minimize their land costs led to the emergence of a highly dispersed settlement pattern at the metropolitan scale (ibid., 78) (Fig. 2.1).

By the end of the 1990s, the current level of institutionalization was considered insufficient by the state for the development of a relatively autonomous housing sector. Then, in 2003, TOKİ was equipped with the authority to develop housing projects on the lands owned by the state together with private construction companies (Balaban, 2012, pp. 30–33). Thus, TOKİ has become the most potent supplier in the sector (Doğru, 2021, p. 92). The central administration, which became the dominant actor in housing, thus became the determining factor in the dominant housing typology of the period. TOKİ (URL-7), whose share in the total housing stock was 1 million units as of 2021, developed many housing estates lacking identity through the standard housing typology (Keskinok, 2019, p. 64). Then the state acted as the main factor in reproducing typological uniformity in every city in Turkey (Fig. 2.2).

Parallel to this, housing production for the upper-middle and upper-

Fig. 2. The periphery of Ankara as a typical development pattern seen in many Turkish metropolitan cities in the 1990s: The mixed-typology of the housing estates developed by private developers for the emerging upper-middle income group. **[1.]** (Source: O. Çalışkan's personal archive, 2004). The typical social housing estates developed by Mass Housing Development Administration for middle-income groups in different cities in Turkey throughout the 2000s. **[2.]** (Source: URL-3). Speculative developments of high-income group residences that characterize a new form of gated communities in Ankara and other Turkish cities' planned extensions. **[3.]** (Source: URL-4 and URL-5).

income groups has continued to grow in the last twenty years, mainly as the major economic activity of the private sector. This process, which paves the way for speculative developments congruously with the mainstream planning approach of local governments that encourages urban sprawl, has characterized the periphery of many Turkish cities. The new developments, which led to the emergence of 'gated communities' in the form of high-rise residential towers with commercial podiums built on large urban blocks, have turned into a widespread prototype without any urban design control and guidance (Fig. 2.3).

Within this historical context, the collective fabric of many cities in Turkey has composed of various typological sections that need to be revealed from a typomorphological perspective to ensure morphological continuity and spatial integration for an open and coherent urban form. Then the proposed analysis below aims to support the emerging literature on the issue of typological processes and morphological development control in planning (Gu et al., 2019; Lovra, 2016; Whitehand et al., 2014).

3. Method: *typomorphological Mapping and the Transect and coherency analysis*

To examine typomorphological diversity and continuity on a factual basis, the authors map the modern core area of Ankara and its (western) extension, the city's main development area. The mapping study aims to reveal the residential fabric's typological pattern, which characterizes the city's foremost part. To this end, the dominant types of housing that emerged in the historical process briefly given above has been specified in the first place. At that point, a two-layered typology is adopted to classify residential building types. On the first layer, *linear block*, *point block* (tower), *podium block* (tower with a podium), and *single (detached/semi-detached/row) house* have been specified as the four basic formal types. On the second layer, the initial formal typology is further elaborated with the distinction of three context-specific subtypes: (i) apartment block as a subtype of point block; (ii) squatter; and (iii) rural house, as subtypes of single house, each representing a particular dominant type in the urban development history of both Ankara and Turkey (Fig. 3). These specialized types generate characteristic urban fabrics that can be easily distinguished in the city.

In our analysis, four basic house types and three sub-types are subject to mapping. The initial mapping of the planned housing development carried out by the workshop organized by the Ankara Chamber of Architects between October 5 and December 16, 2019, provided a basis for the further updated mapping presented below. Following the field trip to western Ankara, the participants mapped out specified typologies at urban block and ensemble levels. The study covers the city's six principal development zones (districts), comprising all the housing types identified above. Following the typological mapping for all selected districts, figure-ground maps have been produced in the form of 'the

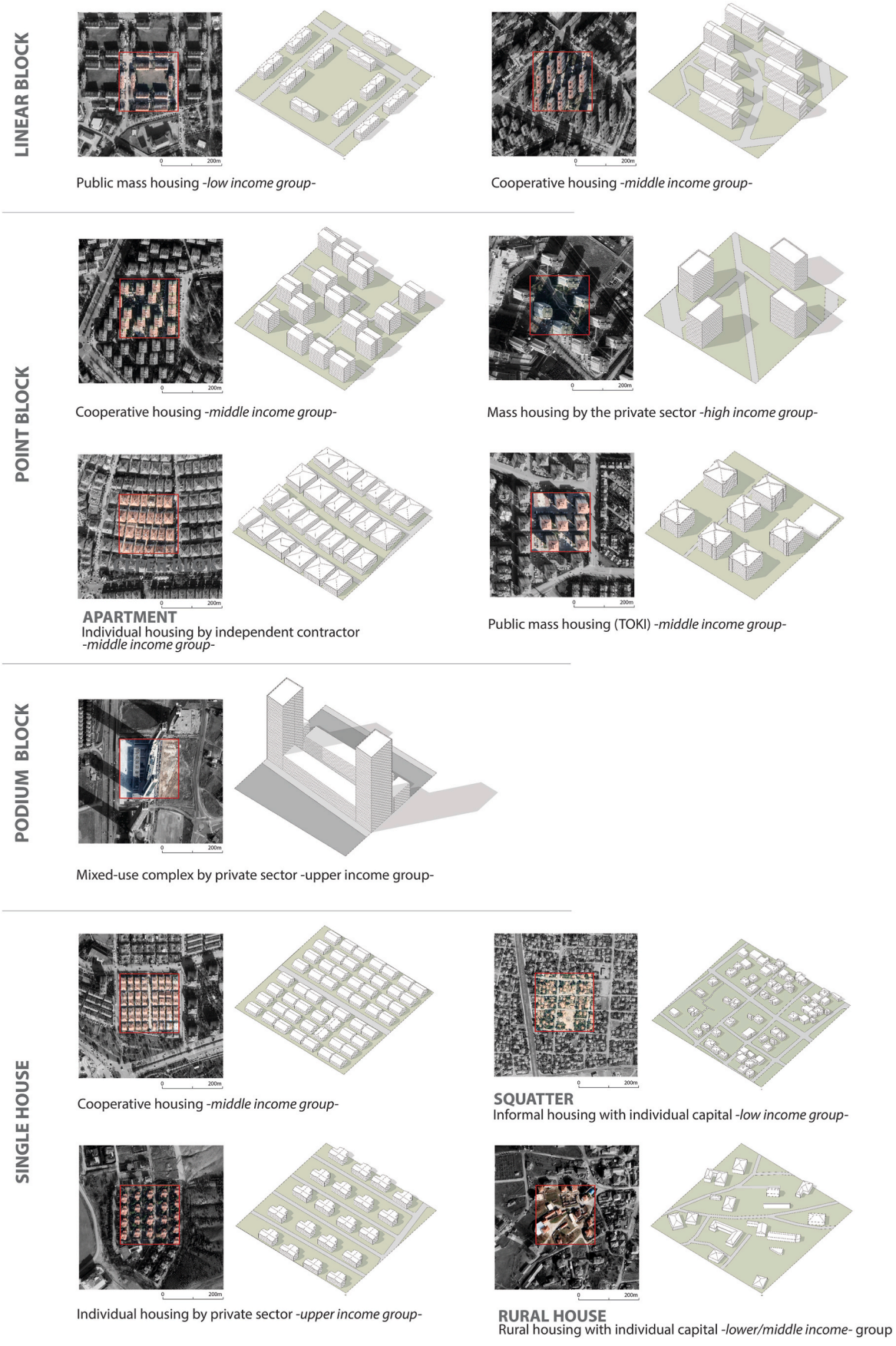

Fig. 3. Classification of the dominant housing types provided by different modes of housing supply periodically in Turkey in the context of Ankara.

transects'. Accordingly, the transects of each district, which are 1.2 km × 4.8 km in size, aim to represent the changing typomorphological character of the tissue from center to periphery. Though the figure-ground maps show all the buildings in the given fabric, the typological mapping includes only the housing units. That means public and commercial buildings are excluded from mapping. At that point, no distinction has been made between residential and mixed-use buildings mainly represented by podium blocks (having commercial facilities supplement the dominant housing program of the building).

In this framework, the Yenimahalle-Batikent-Eryaman and Sincan axis (266 km^2), called the 'western corridor', and the Çayyolu and İncek settlements known as the 'southwestern corridor' of Ankara (244 km^2) are involved in the analysis (Fig. 4).

MapHub, an open-source interface for creating and sharing interactive maps, was used for typomorphological analysis. Accordingly, the maps of the six districts have been drawn with basic graphic elements (i.e., bookmark, line, polygon) using the online satellite image as a base. The complete map drawn on the interactive interface was then transferred to the GIS's computational environment after the necessary updates.

While the typomorphological structure of the six districts is examined in the context of the area as a whole, in the next stage, the unique pattern of morphological (dis)continuities is exposed through 'the transects' that characterize each selected section from the center to the periphery. The sections (1.5 × 5 km in size) aim to illustrate the fabrics, each produced within a particular production regime in a specific

Fig. 4. The six planned residential districts in western Ankara.

period.

To reveal the relationship between typological variation and morphological continuation (or fragmentation) within the specified fabrics, the coherency analysis initially introduced by Çalışkan and Mashhoodi (2017) is applied to the transects. The framework quantifies the number or total area of a particular morphological element (buildings in the case of this study) in the "adjacency" of each location within a neighborhood. Subsequently, it assesses whether or not there is a statistically meaningful pattern across all the locations. This study assesses spatial patterns using the global Moran's I index (Moran, 1948, as cited in Getis, 2010), as formulated in equation (1).

$$I = N \sum_{i=1}^{N} \sum_{j=2}^{N} SW_{i,j}(x_i - \overline{X})(x_j - \overline{X}) \Big/ \left(S_0 \sum_{i=1}^{N} (x_i - \overline{X})^2\right) \qquad \text{(Equation 1)}$$

Where x_i is the footprint area of a building i and $\overline{X}$ is the average building footprint area in a neighborhood. N is the total number of buildings, and $SW_{i,j}$ is the inverse Euclidean distance between the buildings i and j, i.e. spatial weight. S_0 is the sum of spatial weights as defined between all buildings:

$$S_0 = \sum_{i=1}^{N} \sum_{j=2}^{N} SW_{i,j} \qquad \text{(Equation 2)}$$

The positive values of global Moran's I indicate spatial clustering of

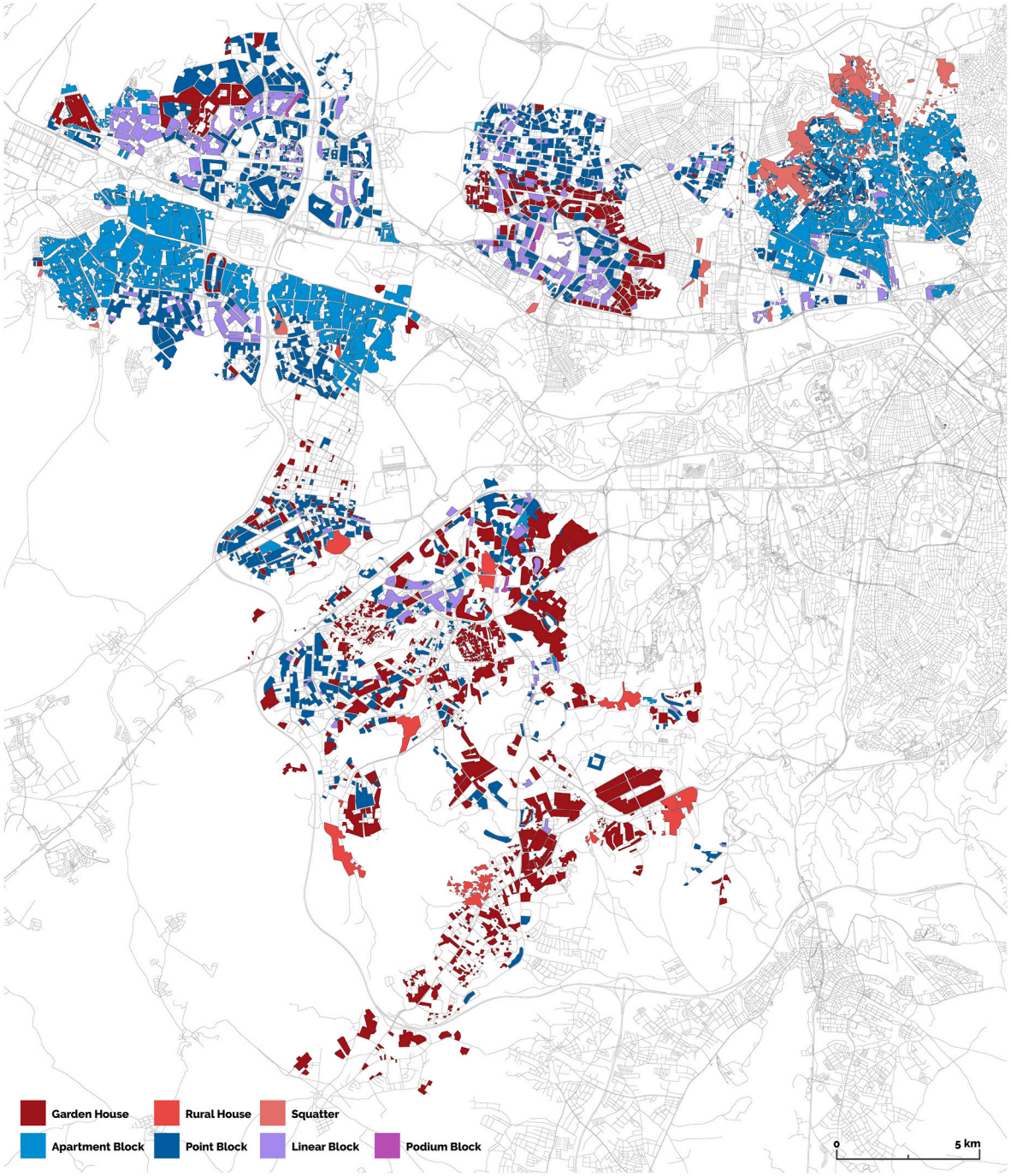

Fig. 5. The typological pattern of the residential fabric mapped out within the six zones in western Ankara.

buildings, negative values show the dispersed spatial distribution of buildings, and non-significant values (expectedly closer to zero) show random spatial distributions. To assess the statistical significance of the global Morans' I value, its z-score produced (equation (3)):

$$Z_I = (I - E[I]) \Big/ \sqrt{V[I]} \quad \text{(Equation 3)}$$

where:

$$E[I] = -1/(N-1) \quad \text{(Equation 4)}$$

$$V[I] = E[I^2] - E[I]^2 \quad \text{(Equation 5)}$$

To assess coherency in different adjacencies, 20 Morans' I indices from radius 100 m–2000 m with 100 m intervals are produced for each transect.

Consequently, a robust method to examine the typomorphological continuity and a critical view of the spatial quality of Ankara's modern housing development would be proposed.

4. Findings: *The relationship between the diversity in housing typology and morphological continuity in the fabric*

Ankara, which has hosted all the different forms of housing in its urban history, can be considered a good sampling case reflecting the Turkish experience in the context of modern housing development. In this context, the main purpose of the analysis is to reveal the morphological continuity and coherency patterns created by the said typological diversity delineated by each development zone in the urban fabric.

4.1. The typological pattern of the residential fabric in western ankara

The internal differentiation of the typology mapped out in the study area, which extends 25 km from the center, could also represent the city's housing development history. In the map, each subtype is highlighted with a different shade of color, indicating the corresponding formal type (Fig. 5).

The building pattern for the whole area shows that a relatively more concentrated fabric reproduced in the core has been gradually lost from the center to the southwestern periphery as the major development zone of the city (Çalışkan, 2009a, 2009b, pp. 213–223). The scattered/sporadic structure of the Çayyolu-İncek region, which developed mainly with the lead of the real estate sector from the mid-1990s onwards, essentially signifies a much different period from the previous urban formations led by planning.

However, the map shows a relatively legible characteristic area formation at the district level in Ankara. The city has a variety of living fabrics through diverse typomorphological characteristics zones concerning the scale of production and the level of demand for each housing typology in each period. However, sustainability-wise, this typological richness could be questioned regarding the morphological integration it suggests for a coherent social life and an affordable infrastructure and service provision in the city.

When focused on the singular districts in the whole area, it is seen that each zone exemplifies a unique typological pattern depending on its planning and development history. Accordingly, in Yenimahalle, which continued its development as a core area from the early-1950s along with the transformation process until the mid-2000s, the apartment

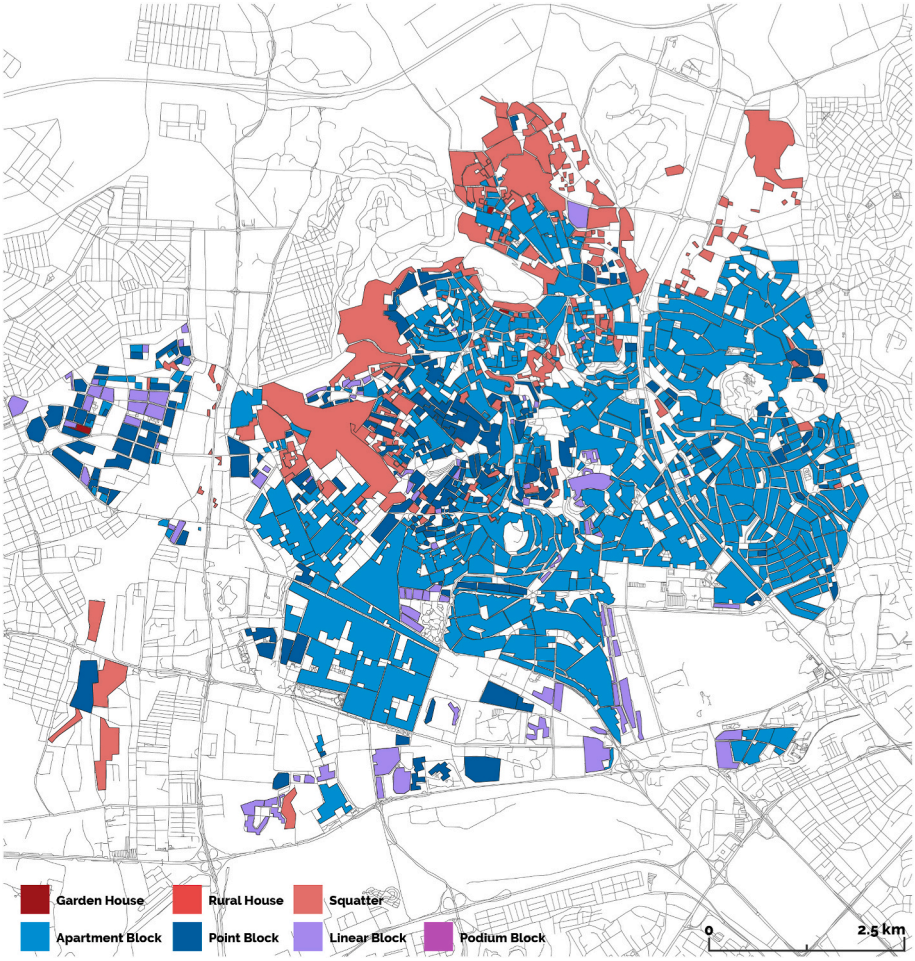

Fig. 6. Yenimahalle as an example of the *core fabric typology* in the cities of Turkey.

block is the type that dominates the whole texture (Fig. 6)

The long-term application of the housing supply by individual contractors since the second master plan of the city (1957) has resulted in a widespread application of the same building typology and the extensive coverage of apartment blocks. It is also seen that the informal neighborhoods (*gecekondus*), whose formation started in the same period on the periphery of the district since the 1950s, have been transformed into the modern estate's point block typology by the urban transformation projects implemented after the early-2000s. Squatters no longer characterize the urban fringe of Ankara, except for a few geographically marginal areas.

Batıkent, the second district in our mapping, was planned as a new town envisaged with Ankara 1990 Master Plan (1975) (Günay, 2005, p. 106). The settlement with a distinctive typological pattern reveals a fragmented texture composed of linear and point blocks divided by a continuous strip of single-family houses, creating a character area in itself (Fig. 7).

Though the settlement has been developed partially by various housing cooperatives, such a legible typological pattern was provided by the development plan of the district dated 1979. The point is that the development plans in Turkey do not specify the building typology per se, but the building rights allocated via coverage and floor area ratio (FAR) within each urban block. This indicates the intrinsic capacity of the plans to ensure a legible typological pattern only by a few morphological parameters.

However, this point is not valid for the Eryaman district, another planned development in the outer periphery of the city. Here, the point block, which is the dominant housing typology of the area, does not exhibit a cohesive pattern, except for the typology of single-family housing and peripheral blocks (of the slum prevention zone) that indicate a partially integrated cluster (Fig. 8).

The main reason is that although it provided continuity and integration between open and built-up areas throughout the new settlement (Keskinok, 2005, p. 143), the district's development plan did not specify the building types in each sector included in the plan area. The point is that though the 'neighborhood unit' concept was already adopted in the planning practice in the 1980s, the 'character areas' concept was not yet considered within Turkey's planning profession.

As the fourth zone in our analysis, the Sincan-Etimesgut district is another outer-periphery development area of the city. The core fabric of the district was almost entirely developed by the redevelopment plans since the late-1990s based on the transformation of the low-rise informal housing stock into the mid-rise (5 to 7-story) apartment blocks. The point block typology at the site's southern edge corresponds to the high-rise residential developments composed of super-blocks with the active involvement of contractors or construction companies with relatively

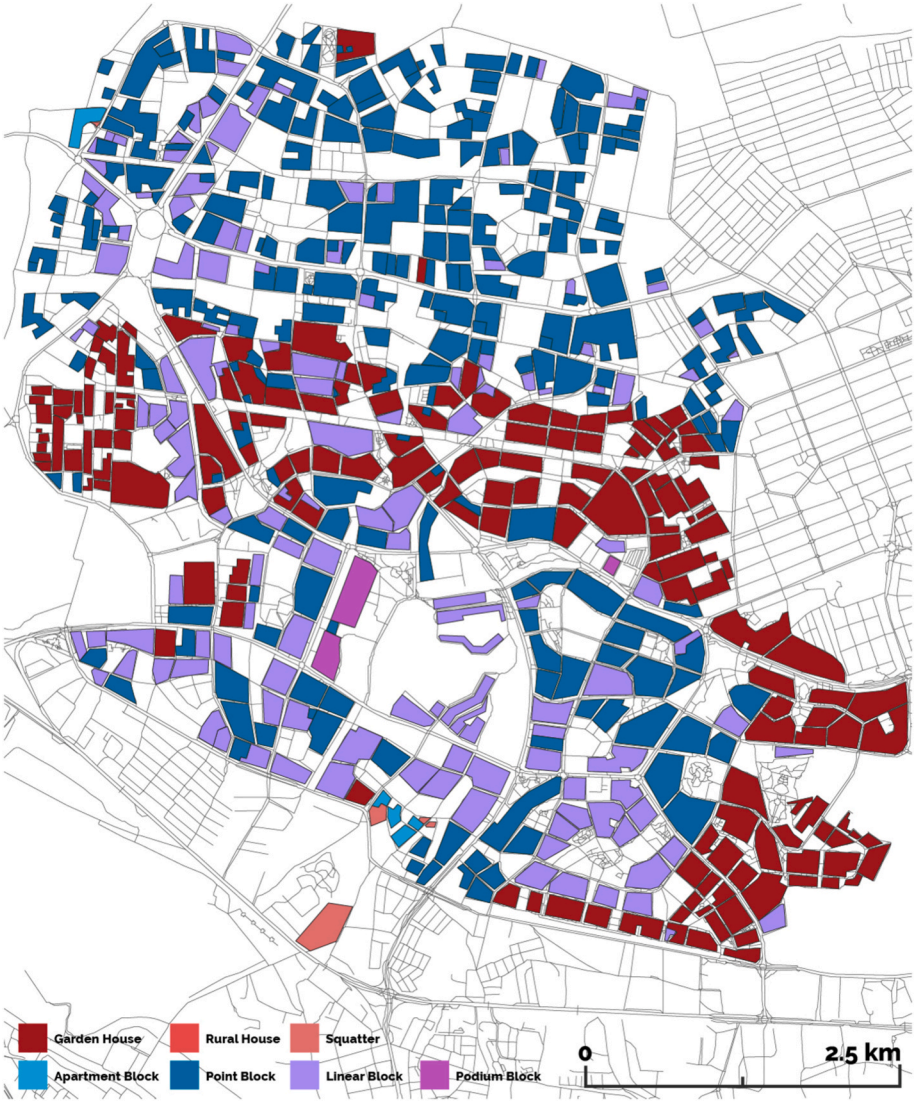

Fig. 7. Batıkent district as an example of the *planned residential fabric* typology in the inner-fringe.

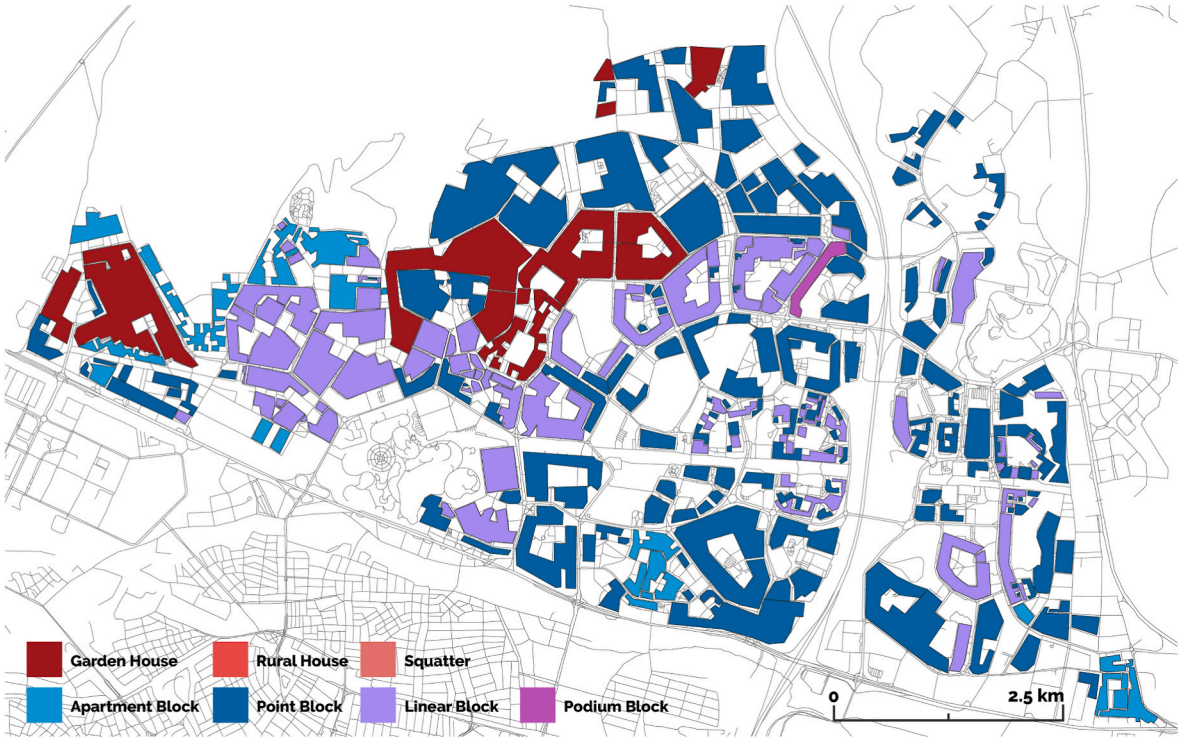

Fig. 8. Eryaman district as an example of *the planned residential fabric* in the outer fringe.

large capital in housing production within the last two decades. (Fig. 9).

The last development area within the mapping study is the Çayyolu-İncek region, which continues its development on an area of approximately 50 km^2 of urban land rendering the most fragmented morphology in the city. (Fig. 10). The district emerged as a cooperative housing area alternative to Batıkent in the early-1980s. It was initially planned as a mass housing area following the development plan approved in 1986 (Aras, 2008, pp. 65–68). Though the overall district was envisioned as a planned development corridor along a public transit by the '2015 Ankara Structural Plan' in 1986 (Günay, 2005, p. 108), the partial plan revisions made after 2000 led the area to be open for speculative housing developments in a fragmented fashion (Aras, 2008, p. 49–50). Thanks to the planning approach that prevailed in the next period, the district has been shaped entirely by the preferences of the upper and middle-upper income groups, in line with the partial zoning demands of the real estate sector. The ongoing process still produces a

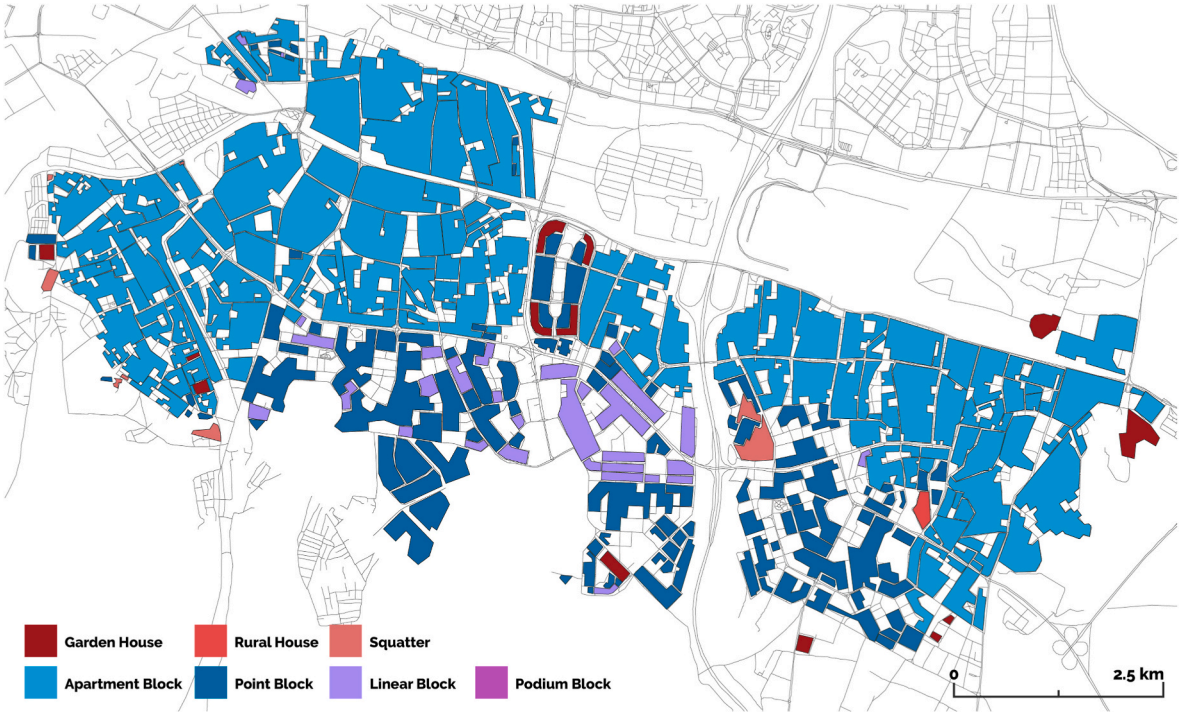

Fig. 9. The Sincan-Etimesgut district as *a planned housing development pattern* in the outer fringe.

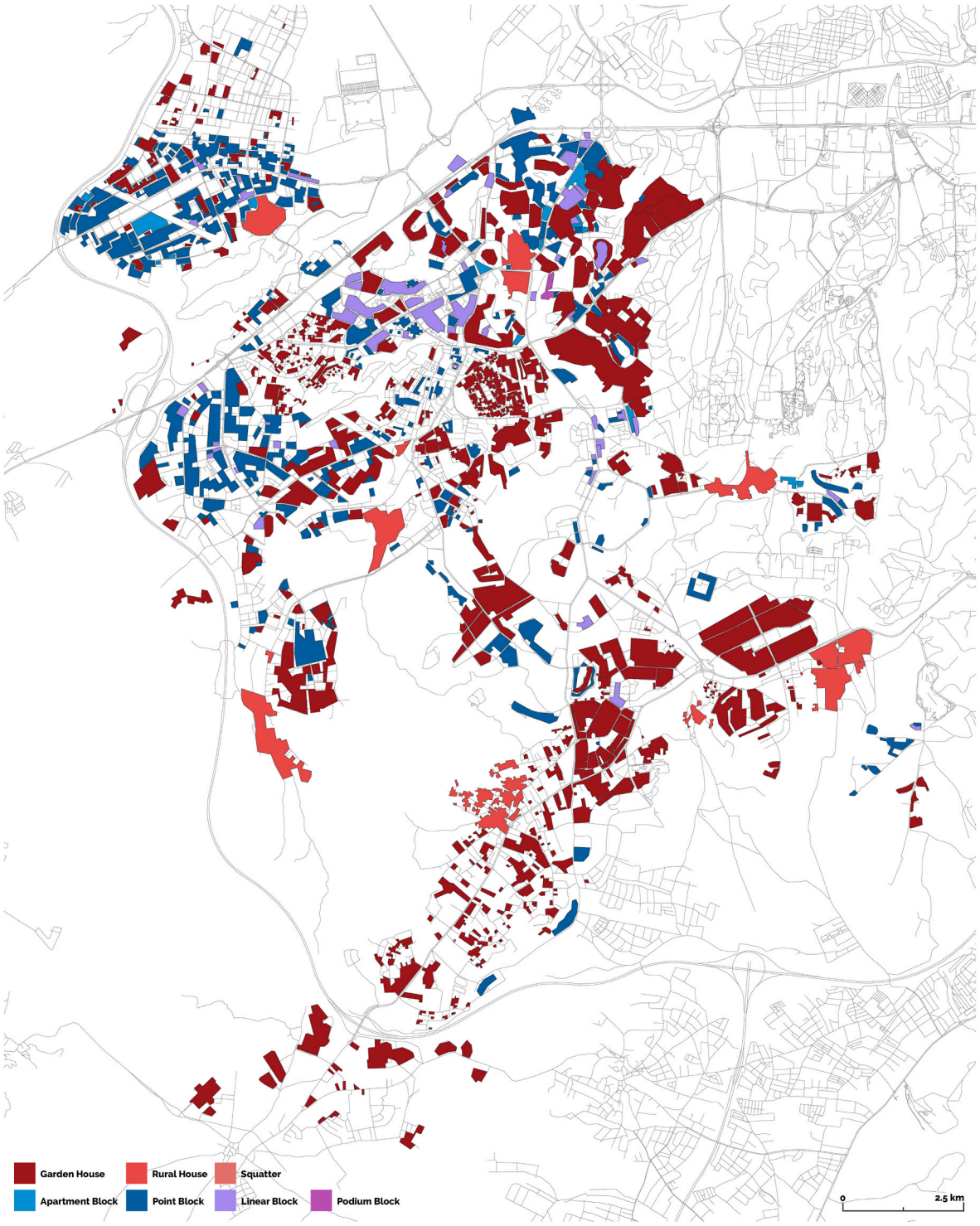

Fig. 10. Çayyolu-İncek district as *a mixed (planned and speculative) housing development pattern* in the outer fringe.

loose urban fabric mostly comprised of point blocks and detached single-family houses as gated communities.

As seen in the southeastern region of the district, the inherited fabric of the villages is gradually transformed into apartment blocks. It brings about a very hybrid condition between the urban and the rural.

The overall morphology we have presented above confirms the necessity for a strategic view of the macro urban formation of Ankara, as discussed elsewhere by Günay (2005: 117). However, one could argue that to ensure a cohesive living environment for different communities (income groups), we should have a mezzo-scale strategy to generate integrative and transitional typologies in and between the urban districts. This requires a responsive mapping technique exposing the intrinsic characteristics of the typical building fabrics of each development zone. To that end, we employ 'the transect' to reveal the morphological (dis)continuity of the districts' fabrics more precisely by a focused analysis (Fig. 11).

Then, the figure-ground maps enable us to analyze spatial coherence for each transect. Therefore, it could be possible to see the relative performance of the fabrics on morphological continuity defined by a particular building typology (Fig. 12).

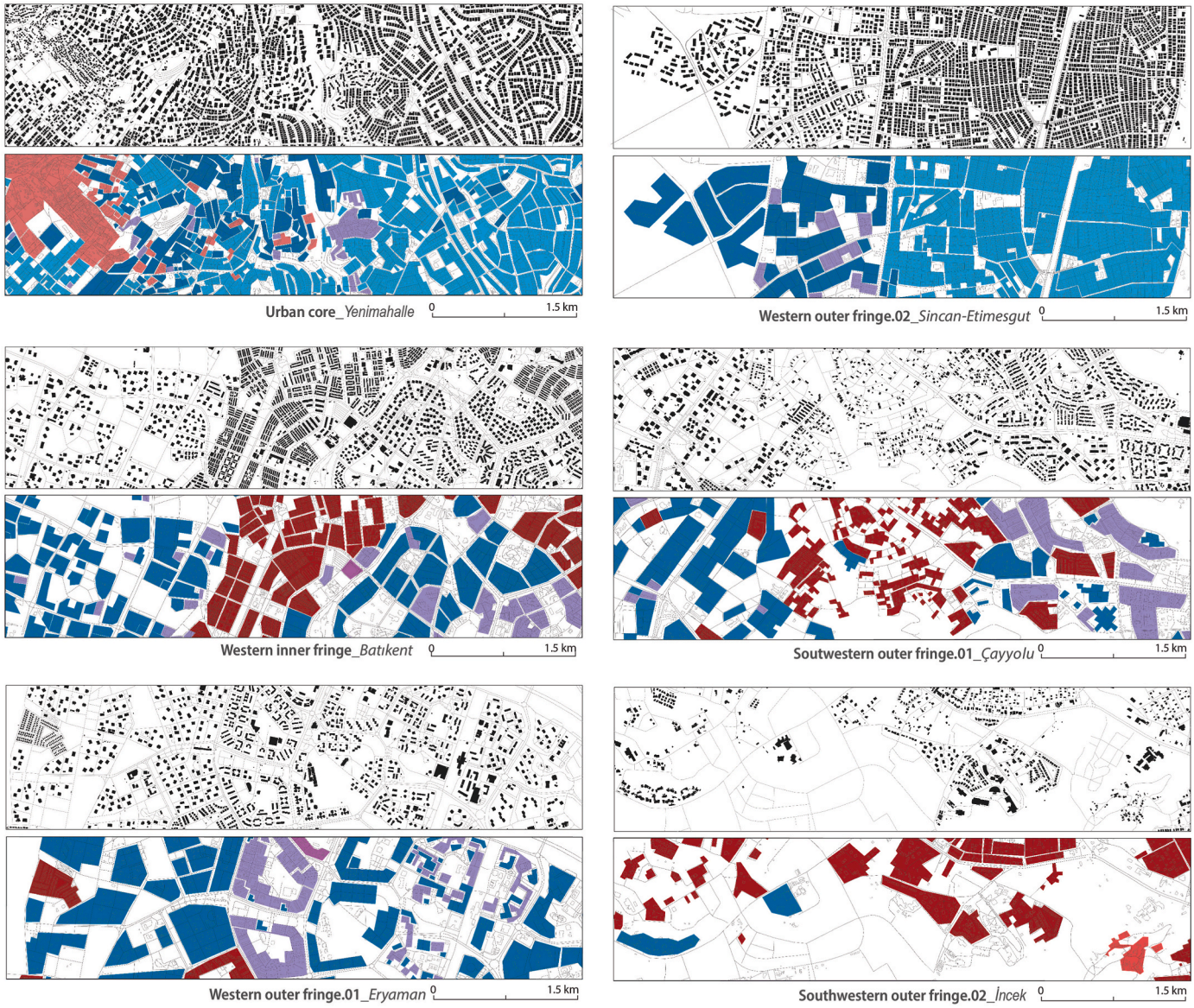

Fig. 11. 'The transects' of the planned developments in western Ankara regarding the housing typologies.

As seen in Fig. 12, the study of spatial autocorrelation (Morans' I) with different radii reveals that in four of the districts (Sincan-Etimesgut, Yenimahale, Cayyolu, and Eryaman), buildings are coherently placed together in spatial clusters, indicated by significant positive autocorrelation Z-score. Two different properties differentiate the coherency of buildings' distribution in these neighborhoods. The first property regards the intensity of building clusters in the districts. In Sincan-Etimesgut and Yenimahale, buildings are clustered in more dense spatial patterns than in Cayyolu and Eryaman. This is indicated by larger Moran's I Z-score values or the higher coherency of buildings. The second property regards the variation of coherency across the levels of scales. In Yenimahale and Cayyolu, the spatial patterns of buildings become more clustered from the lowest radius of analysis (100m) to a mid-range radius (800–1000m). However, the intensity of clustering drops after those radii. In other words, one can expect a more coherent placement of buildings when looking up to 1 km around a building. Above that radius, however, the pattern becomes less coherent. Put differently, when one zooms out to view Yenimahale and Cayyolu as a whole, the pattern is less coherent compared to zooming in on a smaller part of the neighborhoods. This differs from the case of Sincan-Etimesgut and Eryaman, where patterns of buildings remain more coherent across different scales. In other words, one can expect a roughly coherent increase of buildings around a building when incrementally zooming out in Sincan-Etimesgut and Eryaman. In the case of two neighborhoods, the buildings' spatial patterns approach 'randomness', indicating close-to-zero and insignificant Moran's I Z-score. This is particularly visible in the case of Incek, where the buildings are placed with almost no coherent spatial pattern except for the lowest levels of scale at a radius of 200–400 m. In the case of Batıkent, significant spatial patterns are indicated by building clusters in the lower scales. However, given the diversity of the local patterns, there is no coherent spatial structure at the highest scale levels (Fig. 12).

The apartments located on their plots with relatively short set-back distances create a continuous street wall with near frontal facades and support the formation of a more coherent street pattern than in other types. As seen in the Sincan-Etimesgut district, even a clear-cut typological difference does not interrupt the continuity of the streets already formed by the neighboring apartment blocks.

However, the 'open fabric' characteristics based on street formation suggested by the dense fabric of apartment blocks are not observed later within the other typologies. As seen in Batıkent, which reveals the minimum coherency in the analysis, the formation of closed housing

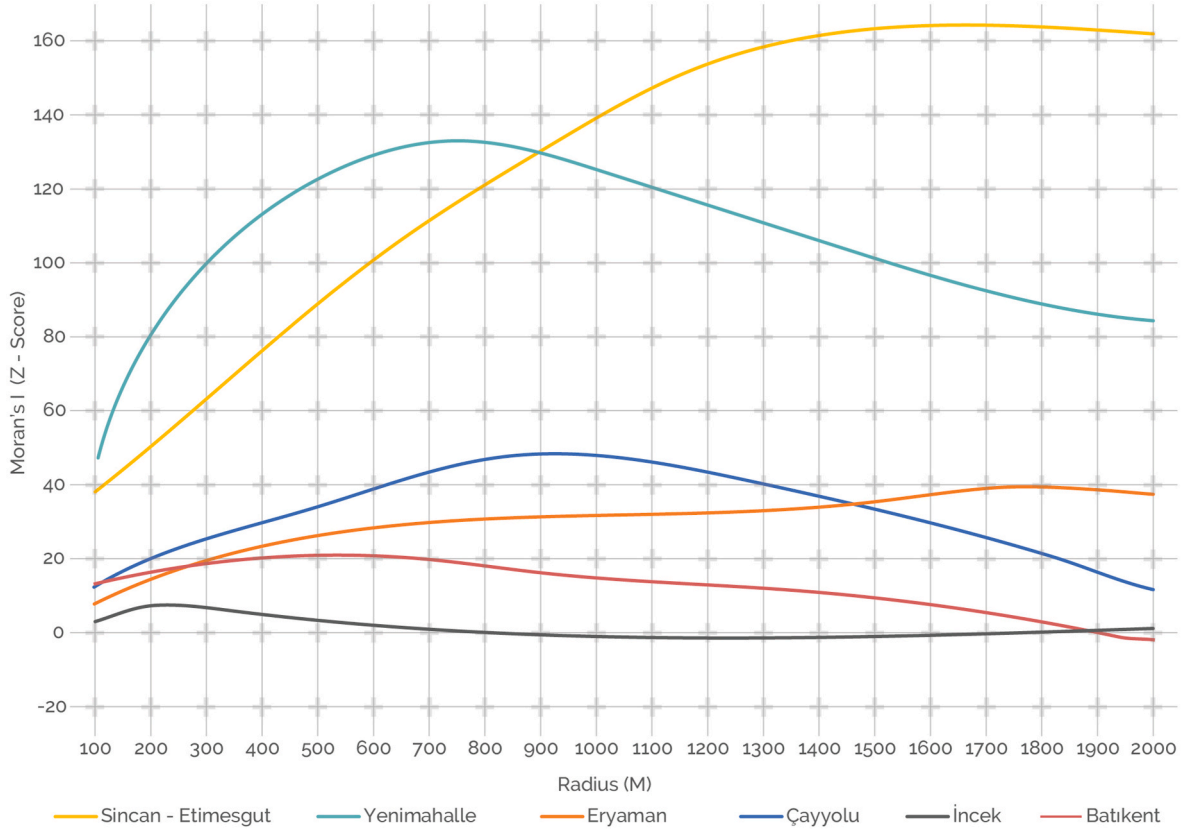

Fig. 12. The Moran's I index indicating the spatial coherence of 'the transects' of the planned developments in western Ankara.

estates and private housing clusters has become a norm in the new developments. Though the building type changes at a certain distance from the transect's center, its principal organization within superblocks remains the same throughout the whole urban extension of Batıkent.

A characteristic change in pattern formation observed in Batıkent and partially Eryaman, the first mass-housing districts of the city, is remarkable. This is mainly due to the organization of land production led by the housing cooperatives at that period. As indicated in the cooperative union's (*Kent-Koop*) report titled 'Implementation Principles' (1979), *"the families living in Batıkent should self-organize themselves and start to create their own environment they will live in the future"* (Eryıldız, 1995, p. 20). Such a principle, in practice, let each housing cooperative selecting its building type without any guiding principle on the larger urban context. As seen in the figure-ground maps, such a process eliminated the chance to create a spatially coherent urban form with some central common areas and a controlled, typological relationship between the individual estates (Keskinok, 2005, pp. 138–139). In the Eryaman district, on the other hand, while the initial development stages involved relatively integrated common spaces within the large ensembles, the decrease in the scale of housing production (by relatively smaller construction firms), afterward broke the spatial integration to be ensured by those shared spaces as interface.

The amalgamation of small parcels and the application of large-scale modern housing developments is a common trend in rapidly developing urban contexts. That engenders morphological fragmentation and eliminates the sense of place within the fabric (Gu, 2014, pp. 167-69). Such a situation is also observed in the city form of Ankara, especially in the case of İncek. This area has been subject to speculative development for the last twenty years. Accordingly, multi-story point blocks locate right next to the detached single houses, while the rural settlements in the same context are trying to maintain their existence with extremely weak connections to the new developments.

5. Discussion

Regarding the districts we examined via the six transects above, it is possible to argue that the typomorphological characteristics of Ankara's urban periphery have profound similarities with the modern housing development pattern of many cities in Turkey. This is basically because the settled spatial planning perspective falls short of generating spatial and structural continuities at the larger scale and remains insufficient to produce distinctively coherent character areas in pieces. Therefore, a kind of urban form comprising fragments of textures disconnected from each other becomes a prevailing typology. This indicates the lack of the necessary tools of 'design control and management' within Turkish planning practice to generate livable urban forms (Çalışkan, 2009a, 2009b).

The analysis shows that the typological richness produced by different modes of housing provision is far from the capacity to deliver an integrated spatial form in the collective urban fabric. Rather, the typological variation is reproduced through morphological fragmentation. In other words, development and design control in the Turkish planning system falls short of ensuring both typological diversity and morphological continuity. In most cases, the building typologies' continuous change in scale and layout characteristics cannot be controlled and coordinated effectively. This point is clearly seen in Yenimahelle, and Sincan-Etimesgut districts which are dominantly defined by apartment blocks. Both districts' fabrics were reproduced incrementally at the level of individual plots (without a design control at the block or ensemble level), yet revealed the top two morphological quality values of spatial coherence.

Mostly counted as an indicator of sprawl, discontinuous (or the so-called 'leapfrog') urban development pattern is proven to be a factor of unsustainability in different respects. It mainly favors the production of parcels situated discretely over vacant lands on the urban fringe (Torrens & Alberti, 2000). Then, the scattered characteristics of the

urban form manifest themselves in a variety of long-term problems, such as high capital expenditures of public services and infrastructure inefficiency (Harvey & Clark, 1965), loss of agricultural and natural land (OFT, 2022), and increased commuting distances and higher transportation costs (Ewing, 1997; Jun & Hur, 2001). In addition to the functional consequences, dispersal and piecemeal development are considered factors that disrupt social coherency construction within emerging built environments. To Raman (2010), the social environment is highly conditioned by the density and layout characteristics of the housing environments. He indicates that the spatial distance between

Fig. 13. Aerial view of the planned housing developments through different districts in Ankara: The fragmentary formation of the fabric with a series of in-between vacant portions of land results in fragmentation of the public space and agricultural areas in the periphery. (Günhan's personal archive, 2023).

the residential fabrics influences visibility, spatial linkages, therefore, the amount of social activity and interaction (p. 77). In this regard, wasting space in a living fabric does not support the required quality and attractiveness of livable neighborhoods (Crookston et al., 1996, p. 137). Fragmentation in the spatial pattern of urban form, therefore, results in the disintegration of communities, loss of a sense of belonging, and, thus, a decline in social capital in the long run (Jenks & Burgess, 2000). Such a condition is realized in urban contexts, as in the case of the rapidly developed peripheries of the cities in developing countries like Egypt and Turkey (Acioly Jr., 2000; Çalışkan, 2009). Due to the lack of effective development and design control, many planned developments in Ankara are characterized by the dispersion of vacant lands remaining in-between, idle, or temporarily utilized within the new residential fabrics. Such morphology ends up with the segregation of the housing ensembles without any active public interfaces required for vital community life (Fig. 13).

Development and design control play a pivotal role in ensuring urban coherence in practice, by regulating and guiding the physical (trans) formation of urban areas. Historically, the control function of planning is motivated by a desire to have a harmonious physical order, social cohesion, and public health, as well as resolving conflicts in developmental tendencies (Booth, 1996, pp. 3–5). The development control ordinances, which promote orderly growth and prevent haphazard urban sprawl, involve zoning regulations, building codes, and design guidelines, are operational to shape the urban landscape and maintain aesthetic and functional coherence (Punter & Carmona, 1997, pp. 27–29; Birch and Wachter, 2008). The control regulations over the various discrete implementations include imposing height limits, land use restrictions, and architectural standards to ensure design quality and cohesive urban environments in the larger context (Hall, 1996, p. 2).

Observed fragmentation in planned urban extensions in Ankara, in this regard, is considered a systemic problem exceeding a single period and becoming a settled drawback. Turkish planning practice, which tends to manage the changing housing supply modes in urban land, keeps operating in the same fashion primarily based on functional zoning and building control via a limited set of parameters (i.e., FAR, coverage, and height) expressed as 'development right'. In that condition, spatial planning cannot adequately guide the housing market to produce both diverse and cohesive living environments. Then, the urban land is shaped by discrete developments in line with the (primarily speculative) economic preferences of the real estate market. Moreover, one of the critical dimensions of the emerging typological pattern is that modern housing development is not guided strategically to ensure a responsive relationship with the settled rural communities at the city's edge. The enduring condition is not likely to be altered since the mainstream developmental processes critically lack the quality indicators responding to the livability demands of the local communities in Turkey (Büyükcivelek et al., 2022).

Such a typical deficiency experienced in Turkey does not suggest an exception in the international context. Inadequacy in development control by planning is actually a common problem in many rapidly developing urban contexts. Lee (2017) argued that the urbanization in Chinese cities starting from the 1980s–driven by market speculation, generated its own types and urban fabric that were drastically different from their precedents, resulting in fragmented enclaves and discontinuity in the city. Chen and Thwaites (2016) also addressed the unprecedented pace and scale of development as the reason why the periphery of Chinese cities is primarily characterized by a fragmented pattern of housing estates, mostly in the form of superblocks and gated communities (pp. 40–44). Tsukamoto et al. (2008) explained the fragmentation in Tokyo's core fabric through large-scale redevelopment projects juxtaposing skyscrapers with low-rise residential buildings since the early-2000s. Proposing a definitional framework to define housing typologies of cities in developing countries, Manahasa et al. (2022) exhibit the diversity of housing patterns in Tirana. Then, they argued that socioeconomic-political periods have a significant role in the formation of housing types. This is even more obvious in the context of developing counties through informal legality statuses that engender a heterogeneous built environment in comparison to their developed counterparts. A similar perspective was suggested by Remali et al. (2016) by exploring typological discontinuities and gaps in housing development in the Gulf region. Hamouche (2004) identifies the dynamics of globalization (i.e., investments of large multinational companies in the real estate sector) as the fundamental factors of such rapid morphological change in the region. Those would be considered a very contextual exemplification of typological ruptures and morphological dissolution within developing urban contexts.

At that point, one could question the relevance of design control by planning to ensure urban coherency since there are various settlements revealing high morphological coherence without any systemic control mechanisms involved but through some local building codes. As an outcome of self-organized processes, traditional (unplanned) settlements intrinsically generate spatial coherence through strong links between the form components -i.e., buildings, plots, streets- (Salingaros, 2000, pp. 291, 295). Nevertheless, for the planned urban developments in which the morphological relationships are constructed by masterplans, unlike the emergent fabrics, a regulatory framework and control tools (i.e., design codes and guidelines) are the unique instruments to ensure coherence in the built environment. As discussed by Tsegaye (2017) in the actual case of Addis Ababa, Ethiopia, the lack of design control in development precincts ends up with fragmentation lacking necessary spatial qualities such as the relationship between buildings and open spaces, enclosure for social interaction and the distinction between public and private domain. (p. 41). Alternatively, Punter (2003) exemplified Vancouver, Canada, as an ideal case in which the controlled development processes had generated a series of coherent but distinct inner-city neighborhoods, which, in turn, merged one with another with fewer vacant areas remaining (pp. 361-64). Likewise, Trache (2001) claims the use of place-responsive development and design policies to enhance urban coherence in the case of a French regulatory framework implemented in an industrial town with successful results in practice. As discussed by Scheer (2023: 68) in the Northern American context, in the cities where the unit of space production is a plot or urban block in the absence of urban design of a larger scale, the only way to provide urban coherence is plan regulations (codes and zoning). Therefore, the urban contexts where the regulatory frameworks fall short of managing rapid and speculative property development, like in Turkey, tend to generate fragmentation in urban tissue.

For those typical contexts, the typomorphological approach, which deals with the built environment based on typological change and continuity as a social and economic process (Moudon, 1994), can provide a relevant basis for development control in planning. Then, it is possible to utilize 'the transect', which we used analytically in the research, as a development control tool as introduced by (Duany and Talen 2002; Talen, 2002). In addition, 'morphological regions' and 'character areas', which have been discussed in urban morphology literature for the last decades, could be considered operational to relate the idea of typology with urban design and planning, which, in turn, would condition an increase in the quality of the residential fabrics (Gu, 2014; Gu et al., 2019; Hall, 1997, 2008; Kropf, 1996).

6. Conclusion

Discussing the intrinsic pace of change in conditions of modernity, Giddens (1990) underlines the embedded discontinuities and drastic ruptures in the transformation of modern societies. Then, he exempts cities from this phenomenon, considering that they *have a specious continuity with pre-existing social orders*. (p. 6). Nevertheless, one could claim the state of discontinuity even for contemporary cities within the very condition of late modernity that reveal itself with a sharp increase in speed in all aspects of social life (Virilio, 1986). The dissolution of

many modern metropolises that are rapidly growing through the open rural periphery makes it hard to discuss the 'form' of the city in a traditional sense (De Geyter, 2002). In the context of Ankara, the capital of an emerging economy, such a condition is recognized as a strategic policy direction tolerated and encouraged by local governments through speculative housing developments. Consequently, the settled continuities in space within the city's core area are not reproduced by the (late) modern phases of development.

Nevertheless, the conception of urban form as a holistic artifact planned centrally, combining all the constituent elements in a single image, is not a valid and legitimate paradigm within contemporary urbanism. The contemporary city is considered a juxtaposition (and superimposition) of different spatial patterns and systems embracing both competition and contradictions as well as cooperation and congruence in itself (Campbell, 2018; Marshall, 2009). That essentially corresponds to Rowe and Koetter's (1978) well-known metaphor, 'the city as a collage' rather than the expression of a single mastermind. At this point, the primary quality sought in the city fabric (re)generated through complex processes involving uncertainties and contingencies is not 'harmony' in the sense of perceptual integrity but 'coherence' regarding morphological integrity (Salingaros, 2000). The basic element that provides morphological coherence is the close relationship between fabric elements and fields and the regular diversity within itself (Çalışkan & Mashhoodi, 2017). In this regard, one could argue that typological diversity is indispensable in developing a coherent urban fabric. However, as Lovra (2016: 204) points out, juxtaposing different urban typologies in the fabric does not necessarily provide a sufficient condition for coherency. At this point, the spatial relationship between different typological regions gains importance.

In this sense, the current research provides a methodical framework to reveal the intrinsic relationship between typological variation and morphological continuation in the urban fabric. Following the description of a formal housing typology from the historical reading of the production modes in housing, the authors transformed the typological viewpoint into a morphological perspective by regional and transect-based mapping. Then, each transect is analyzed against its performance of morphological coherency. In this way, the subtle association between typology and morphology could be exposed on an objective basis. Thus, the proposed framework could relate socioeconomic, typo-morphological, and computational perspectives.

In this regard, Ankara exemplifies the phenomenon, 'the discontinuities of modernity' in Gidden's (1990) terms. As discussed by Bilgin (1996) elsewhere as a typical condition of modern architecture and planning in Turkey, each new building typology was perceived and presented as a new invention each time, leaving no traces to the next period (p. 490). In this case, the evolutionary continuity of urbanism is interrupted. As Gu (2014) analytically revealed, juxtaposing typological zones with completely different massing in scale is one of the primary factors that cause fragmentation in the urban landscape. As depicted in the analysis, such a situation is observed in Ankara's urban form as a typical case in many Turkish cities.

Enabling a higher social encounter and contact level, the open city form with high spatial connectivity and continuity is considered a prerequisite for a vital urban life. The close coexistence of different housing typologies conditioning social mix in a given context could enhance such a condition. Therefore, one could also argue that typological disparities that may result in spatial fragmentation were not only a matter of architectural style but also a phenomenon that would hinder the social reproduction of urban life. For effective management of change, spatial planning needs a robust institutional framework that would enable strong coordination between the key actors of the housing sector (i.e., developers, housing associations, and cooperatives) and user groups (i.e., local people and initiatives) involved in each period of production. In this way, a constant increase in spatial quality through changing modes of housing supply would be ensured, and the typological knowledge created within a certain period would be transferred to the next phase in continuity.

At this point, the recent history of modern housing in Turkey suggests a peculiar case. The housing sector reveals a very adaptive capacity to respond to the changing factors of production, such as new construction technologies, increasing demand for dwellings, or the emerging finance for development. Whenever the economic capacity of the existing actors of the housing supply reached its limit, a new mode of provision emerged over a few decades in Turkey (Tekeli, 2009, p. 253). This is a source of typological diversity within the residential fabrics in many Turkish cities. However, such institutional flexibility could not provide an operational basis for a kind of 'learning process' to ensure adaptive improvement of the previous building and fabric typologies evolutionarily.

According to G. Caniggia, *"design must be carried out by a continuous comparison of what already exists with what we are doing, therefore by continuous 'interpretation'"* (Caniggia & Maffei, 1979, p. 27). This view requires a responsive design control associating the singular design action that produces the particular with intrinsic references of the ordinary and making it an integral part of the collective fabric. Considering the 'discontinuous diversity' we revealed in the Ankara case, the need for a close relationship between urban policy, spatial planning, and design becomes more indispensable than before. It is believed that the applied framework of the current research could provide an operational ground to monitor the relative performance of the planned districts of the cities (regarding the typological richness and morphological continuity) for a proper design policy in planning.

Finally, using the term, 'morphological continuity' represented by the figure-ground maps within the study, one could claim rather limited implication of the notion of morphology. Urban morphology as *"the study of the physical (or built) fabric of urban form, and the processes shaping it"* (Urban Morphology Research Group, 1990) *"is not merely two-dimensional in scope"* (Smailes, 1955, p. 101; cited in Chapman, 2006, p. 24). In this context, displaying just the plan form of buildings, figure-ground maps purposefully exclude most levels of information and critically reveal the spatial structure conditioned by building footprints within urban fabrics (Hebbert, 2016, pp. 723, 725). Therefore, without ignoring the importance of the other factors involved (i.e., ownership, function, agency, and mobilities) and acknowledging the fact that morphological studies *involve buildings, plots, street blocks, and the street patterns that make up the structure of towns* (Larkham, 2005), the authors state that the figure-ground maps suggest a valid and relevant medium to discuss morphological coherence. Then, in the same line as Hebbert (2016, p. 725), the authors also argue that *"no graphic better expresses a city's morphology than its figure-ground plan"*. However, the authors believe that the critical relationship between building typology and spatial coherence would be further elaborated based on another dimension of coherence, which is expressed as 'visual compatibility' of the buildings perceived and measured on the street level (Ewing & Clemente, 2013, pp. 27–29), as well.

Author statement

We state that during the preparation of this work, the authors used ChatGPT in order to make some initial review of the corresponding literature on the specific issue.

After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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