

Suburbanisation in Turkey: Towards Antifragile Planning

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Abstract: This study examines the socio-spatial fragilities arising from suburbanisation driven by globalisation and population growth in the context of suburban areas in Turkey. It defines the limitations of traditional planning as outdated narratives and asks the following question: How can antifragile planning be integrated into the suburban futures of cities as a new narrative? Methodologically, this study is conceived as a theoretical and conceptual contribution rather than an empirical data analysis. It conducts a critical literature review and comparison to assess the limitations of existing planning paradigms. The paper examines how the concept of antifragility developed by Nassim Nicholas Taleb and Terje Aven offers a transformative planning approach that not only resists shocks but also turns uncertainties into opportunities. The findings suggest that such narratives can reduce inequalities, strengthen communities and contribute to suburban environments that are more just, innovative and equitable in the face of urban uncertainties.

1. Introduction¹

Suburbanisation expanded significantly throughout the 20th century. However, contemporary globalisation and rapid population growth have reshaped its current dynamics. Consequently, it has become essential to study suburbs as constantly evolving phenomena. Maginn and Anacker (2022) also emphasise that, due to their own dynamics and diversity, suburbs have become complex

¹ A previous version of this article was presented as an abstract at the AESOP 2025 conference. The current manuscript represents an expanded and comprehensive revision of that work.

settlements requiring separate study. Indeed drawing on their historical development, suburbs can be one of the key components of 21st century urban growth (Angel et al., 2012). Some studies, such as the Atlas of urban expansion (Angel et al., 2012), show that urban areas have expanded from fully developed perimeters to the boundaries where urban and rural uses intertwine (Harris & Lehrer, 2018).

Keil (2017) defines suburbs as structures bring new perspectives to urban conditions. These areas, which bring together different dimensions (sociology, planning, environment and governance) are not static but are in a state of constant transformation. Although these dynamic processes generate challenges, suburbs play significant roles in contemporary urban society by providing spaces for both disorder and possibility (Keil, 2017). In addition, the emergence of suburbs is not limited to personal choices. It is also closely linked to ideological approaches, public policies and global economic forces (De Vidovich, 2019).

An examination of the suburbanisation process in Turkey will make a significant contribution to international urban studies. As a country in a transitional phase between the planning paradigms of the Global North and the urban growth dynamics of the Global South, Turkey reflects a unique synthesis of rapid, neoliberal-driven metropolitan expansion and deep socio-spatial polarisation. Whilst eastern literature frequently focuses on market-driven or welfare state-oriented suburban models, the Turkish context exemplifies how high-density, rent-seeking urban policies and the spread of gated communities can actively generate new forms of socio-spatial and institutional fragility. Consequently, examining the future of Turkey's suburbs offers valuable insights into how a delicate balance can be achieved between developing suburban growth and long-term antifragile development.

This article takes the position that suburbs generally go beyond the dictionary meanings of the term's "suburb" and "non-suburb" in order to accept them as dynamic and multifaceted settlement structures (Forsyth, 2012; Airgood-Obrycki, 2019).

The socio-spatial and socio-economic polarisation and spatial inequalities that have emerged with continuous growth of suburbs are important problems. Consequently, the transformation of suburbs from homogeneous forms into complex areas characterised by growing inequality has led to the emergence of social and spatial fragilities. Moreover, the construction of suburbs based on traditional approaches, together with changes in urban futures, is expected to exacerbate environmental, social and economic fragilities due to uncertainties, unpredictability and risks related to climate, finance and health. These fragilities, as defined by Moroni and Chiffi (2021), combined with the reality that cities' futures are uncertain and their complexities are not to be recognized by traditional planning

paradigms, then it is relatively safe to suggest that suburbs should be examined in this context and have become highly critical concepts.

Therefore, the problem that this study tries to point out is that the old narratives do not provide adequate long-term solutions for the suburbs, they do not embrace the uncertainties that cities face, they do not have the capacity to internalise that cities are complex phenomena, and they do not have the capacity to understand the nature of the suburbs themselves. Accordingly, the study examines the limitations of existing planning paradigms and suburban planning processes, emphasising the need for sustainable and even equitable solutions and “transformative” new narratives, embracing the uncertainty of the future of cities. However, it has been demonstrated that traditional planning paradigms, which rely heavily on deterministic assumptions and static master plans, are fundamentally inadequate for managing the non-linear complexities and unpredictability of modern urban expansion.

Recognising this structural limitation, contemporary urban theory has increasingly turned to seeking new paradigms that go beyond simply resilience. Thus, it argues that “antifragility planning”, which aims to reduce socio-spatial fragility, strengthen communities and emerge stronger from unexpected challenges or risks in a more innovative framework for urban futures, is an important and innovative approach that should be integrated into urban futures and suburbanisation processes. The emergence of this approach is, of course, directly related to the concepts of fragility and antifragility put forward by Nassim Nicholas Taleb (2012) and Terje Aven (2015). These concepts emphasise that it is not only sufficient to build resilience against shocks, but also to aim for empowerment through uncertainty and complexity.

Therefore, the study methodologically examines old narratives and fragilities that have emerged in suburbanisation processes and includes theoretical discussions and literature comparisons that include new narratives in addition based on the research question of how can antifragile planning approach serve as a transformative narrative for reframing and addressing the multi-layered socio-spatial fragilities of contemporary suburbanisation in Turkey? As a result, they can build their capacities in the face of current fragility or uncertainties and unpredictability, especially in suburbanisation in Turkey. For future research, this study can also lead to the development of new approaches towards thinking and action practices that embrace uncertainty and complexity in creating an innovative, just, equitable urban future from an antifragile perspective.

This study is organised as follows: Section 1 serves as an introduction to the article. Section 2 establishes the conceptual and theoretical framework by reviewing global urbanisation and suburbanisation trends, examining the discourse on fragility and antifragility in urban planning and outlining the limitations of traditional planning narratives in addressing future uncertainties. Section

3 applies these concepts to the Turkish context; through a critical synthesis of existing empirical studies and the literature, it assesses the socio-spatial, environmental and institutional fragilities arising from suburbanisation in Istanbul, Ankara and Izmir. Section 4 presents a critical discussion of the failure of traditional planning narratives and outlines the path towards just, innovative and equitable suburban futures through antifragility planning principles. Finally, Section 5 concludes the article with a summary of the key findings, the study's limitations and recommendations for future research.

2. Methodology

This study is not an empirical study based on quantitative data. Consequently, it is structured as a normative and theoretical intervention in urban planning. It has not measured socio-spatial fragilities through original field surveys, interviews or spatial analyses. Instead, this research utilises a qualitative and critical synthesis of the literature on suburbanisation in Turkey and existing empirical case studies. The methodological framework of this article is based on critical theory and conceptual modelling, adopting the concepts of fragility, risk and antifragility from Taleb (2012) and Aven (2015) as an analytical lens to re-evaluate traditional planning paradigms.

The research design proceeds in three successive stages. Firstly, a theoretical scoping process was conducted to identify the conceptual and spatial dimensions of urban fragility, robustness, resilience and antifragility, as well as the condition of optionality, within the planning literature (see Section 3.1 and Section 3.2). Secondly, a critical synthesis of the planning history and secondary empirical data pertaining to Turkey's three major metropolitan areas (Istanbul, Ankara and Izmir) was carried out. This stage systematically identifies the documented patterns of socio-spatial segregation, environmental pressures and institutional conflicts. Thirdly, these findings have been synthesised and brought together to form a systemic conceptual model (which is detailed in the subsequent sections). This conceptual framework operationalises how static, traditional planning narratives interact with external factors to exacerbate suburban fragilities, thereby establishing the normative rationale for an institutional paradigm shift towards flexible, antifragility planning practices.

3. Conceptual framework and theoretical background

3.1. Urbanisation and suburbanisation in a global perspective

Concepts of urbanisation and suburbanisation, while keeping their original meanings, cannot be considered independently of each other after a certain point due to urbanisation playing an active role in triggering growth. For example, Keil (2017) defines suburbanisation as a multifaceted differentiation of urbanisation. One of the first definition which has its historical roots in the Latin word “*sub-urbium*”, was made by Harlan Paul Douglass (1925). He has defined these areas located within the metropolitan area and its own suburban identity. He has also pointed that they are communities from which the city centre can be conveniently, quickly and low-costly reached. Harris and Larkham (1999) explained the concept of suburbia through five common characteristics (environmental location, housing character, low density and community identities) while and Ethington (2007) expanded the definition of suburbia by including social segregation and cultural formations (as cited in De Vidovich, 2019).

Historically, pre-industrial suburbs were marginalised areas by poor inhabited. Following the Industrial Revolution, upper classes seeking proximity to nature, turned to low-density, car-oriented “garden city” models (Dunham-Jones and Williamson 2008; cited in De Vidovich, 2019; see Figure 1). Although the US-originated, detached-house suburban lifestyle spread in late 20th century (Gans, 1967; cited in De Vidovich, 2019), these areas gradually lost their homogeneity of white and upper-middle class residents, taking on heterogeneous structure comprising diverse ethnic groups (Teaford, 2008; cited in Forsyth, 2012). This transformation has also been observed in Europe. For example, in Finland the “*lähiö*” suburbs, which developed as part of the post-World War II national reconstruction, have faced problems (socio-economic decline and income inequality) over time (Stjernberg, 2019). However, suburban development in Europe has not historically been driven entirely by market. It has been shaped by post-World War II welfare state policies and regulated planning. This institutional difference has given rise to an extremely diverse range of spatial typologies across the continent, defying simple generalisations. For example, Germany’s *Zwischenstadt* and Italy’s *città diffusa* models represent de-centralised, multi-centred regional patterns. Whereas Finland have produced the *lähiö* model, which was deliberately designed as high-density social housing during national reconstruction period.

This situation, which provides input into and the changing perception of the suburbs over time, was also noted by Davis (1955). This convergence at the periphery is structurally defined as urban sprawl (a phenomenon characterised by low density, car dependency and fragmented development). In contemporary planning discourse, urban sprawl is regarded as a fundamental cause of spatial fragility, with the analytical focus having shifted from mere physical expansion to long-term structural

unsustainability. However, urbanisation here is not merely physical expansion but also the changing perception of suburbs over time and should be examined through a multidimensional approach. In the context of suburbanisation, not only the location of suburbs but also their relationship with city and their socio-economic structures are taken into account, highlighting the necessity of addressing suburbanisation and its role in the city. With this multidimensional approach, it is argued that suburbanisation also plays role in the economic growth process (Hamel & Keil, 2016). This is because, in this process, land use for work and housing has spread from city centre to the periphery (Nicolaidis & Weise, 2006; cited in Forsyth, 2012).



Figure 1 | Suburban Examples in Global. German Suburb (a), Canadian Suburb (b), American Suburb (c), Finnish Suburb (d). Sources: Kickuth (2021), De Vidovich (2018), Stjernberg (2019)

Unlike in the US, suburban poverty and spatial disadvantages are more prominent in Europe and Australia (Maher, 1994; Harris, 2010; cited in Forsyth, 2012); this situation leads to each region developing its own distinctive patterns of suburbanisation, as seen in the examples of Germany and Italy (Sieverts, 2003; Indovina et al., 1990; cited in De Vidovich, 2019).

According to De Vidovich (2019), the 21st century (which urbanisation processes are shaped by dynamics of suburbanisation) is now referred to as the century of the suburbs. Consequently, suburbanisation goes beyond physical growth. it is a socio-economic and cultural transformation characterised by inequalities and governance challenges (Keil, 2017). For this reason, due to the fragilities it presents, it must be at the centre of new urban governance policies. Indeed, whilst these fragilities are defined on a global scale, they are local, complex and region-specific (see Section 3.3, and Section 4).

3.2. *Fragility and antifragility in urban planning discourse*

The concept of “antifragility” was introduced by Nassim Nicholas Taleb in 2012. Taleb (2012) aimed to develop this concept as form that goes beyond concepts such as fragility, robustness and resilience, which we are very familiar with, by considering it as “the opposite of fragility”. Therefore, before defining the concept of Antifragility in detail, the concept of fragility should be fully explained. According to Chiffi and Curci (2020), fragility is a dynamic situation that can be easily damaged even by non-violent factors and can increase or decrease over time or emerge spontaneously. As mentioned in the definition, this concept, which can be handled multidimensionally, can be handled as fragile objects, fragile communities, fragile individuals and fragile cities, etc. Therefore, beyond being able to remain resilient in the face of factors such as sudden events (shocks), violence or stress, Antifragility involves developing by learning from the situation, getting stronger from difficulties, adapting better to the situation and even evolving (Taleb, 2012; Chiffi & Curci, 2020). Here, future uncertainties and unexpected events are the benefit of antifragility. Therefore, the things that are antifragile should also be flexible, dynamic, have a high adaptation capacity and have a holistic structure that learns (Taleb, 2012). At this point, especially the terms flexibility and adaptation and the concept of resilience come to the agenda and are compared with the concept of resilience with similar approaches. In this context, in the face of any uncertainty, risk or stress factor, resilience refers to the ability to return to its former state in a short time by first experiencing a performance decline and preserving the structure and function (“bouncing back” in the literature) (Hillson, 2023), while Antifragility emphasises becoming stronger by maximising performance when exposed to this stress. On the other hand, while the concept of resilience focuses on strengthening existing structures and minimising risk, antifragility is based on restructuring and evolving (quantum change) by learning from risks (Taleb, 2012; Hillson, 2023). Finally, Blečić and Cecchini (2020) stated that resilience should be understood as a boundary condition of antifragility and also added the condition of optionality. In support of this comparison, the related concepts shown by Hillson (2023) in his analysis of comparisons are indicated in the table (Figure 2).

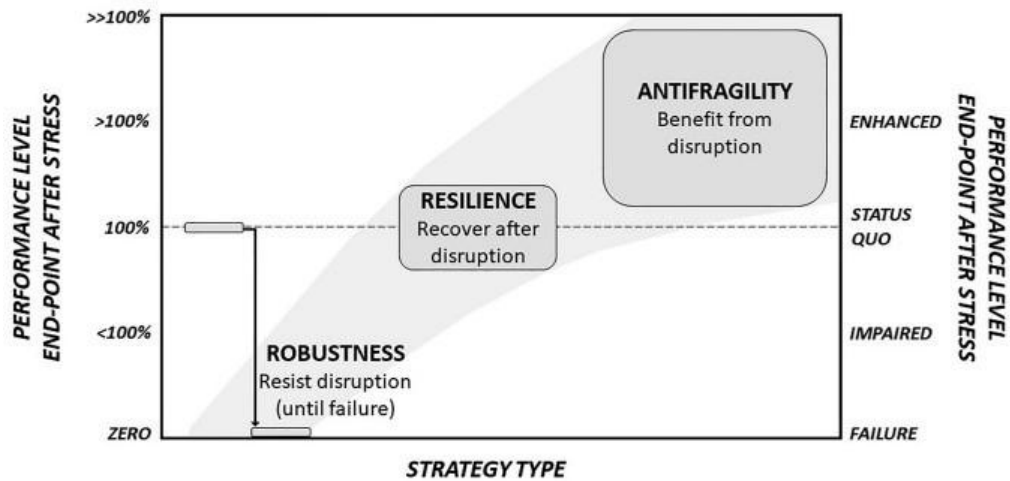


Figure 2 | Comparison of Concepts. Source: Hillson (2023)

The future of cities is faced with uncertainties such as pandemics, natural disasters, climate change, wars, etc. These unknown uncertainties cannot be solved with the traditional planning approaches that continue to exist today (Hillson, 2023). At this point, the concept of antifragility is a transformative and innovative step with its adoption as an approach in the field of urban planning for the unpredictable future of cities. In this context, the Antifragile Planning approach proposes to utilise these conditions to produce optionality, flexibility and innovative solutions instead of trying to exclude uncertainty and complexity from planning by turning the crisis into an opportunity. This approach is based on some basic principles and one of the most fundamental principles is the *via negativa* approach (Chiffi & Curci, 2020). According to this principle, approaches that lead to fragility (plans based on precise forecasts, micromanagement, over) specialisation and high pressure for optimisation - should be avoided (Taleb, 2012; Blečić & Cecchini, 2020).

Antifragility is multidimensional, therefore, antifragility planning must integrate physical and social dimensions (communities, governance, cultural diversity, and socio-economic structures). Cities must be able to evolve and strengthen themselves using political, social, and technical measures to be better prepared for globally uncertain and complex futures.

3.3. Framing suburban fragility: the limits of planning narratives coping with future uncertainties

3.3.1. The multifaceted landscape of fragility in the suburbs

Fragilities in suburban areas can reach complex dimensions that undermine their long-term stability and well-being. At social level, suburbs appear to be homogeneous, but in fact they exhibit significant

social segregation (see Section 3.1). The thoughts and complaints of inhabitants living in fragile neighbourhoods are often not heard -or not wanted to be heard-, which leads to a decline of trust in institutions. Consequently, they look for basic services outside their own neighbourhoods (Llana, 2025). The exaggeration of media narratives, especially crime news, damages the reputation of neighbourhoods. It also creates a “reputation gap”. This perception problem not only prevents investment from flowing into these neighbourhoods or urban areas but also reduces social capital, deepening social fragility. In this context, socio-spatial fragility is often manifested in the proliferation of gated communities and private complex, which structurally institutionalise urban segregation and undermine broader social cohesion.

Moreover, the demographic structure of the suburbs has diversified with significant increases in the number of immigrant, elderly and low-income families. However, these fragile groups have significant difficulties accessing basic services in low-density, car-dependent outer suburbs. The “invisible geography of fragility” makes the situation worse because the problems of these populations are less visible and therefore less discussed (Lewis-McCoy, 2023).

Many European cities experienced rapid suburbanization after World War II. Immigrants and low-income households concentrating in neighbourhoods originally built for public housing. Over time, these suburbs faced limited access to jobs, education, and healthcare then social isolation and barriers to cultural integration. Gentrification in city centre and changes in the housing market pushed fragile groups further to the periphery. Multiple layers of administrative fragility, such as fragmented local governance and inadequate coordination of social service, further exacerbate these conditions. These interrelated spatial, social, and economic weaknesses continue to cause socio-spatial segregation and inequality in European suburbs today, undermining urban cohesion.

As noted in Section 2.1, this situation points to the existence of different local fragilities in different contexts. US suburbs also provide remarkable examples of socio-spatial fragility. since 2008, there has been a greater proportion of the low-income population living in US suburbs than in city centres, and this “hidden poverty” is masked within blocks of apartments. This low-density, car-dependent geography becomes a financial burden and a significant barrier to disadvantaged groups’ access to work, healthcare and education due to limited transport options. Exclusionary mechanisms within the planning framework (such as zoning and housing policies) are deepening inequalities and micro-segregation within the suburbs by adapting to new demographic realities (Kneebone & Garr, 2010; Lewis-McCoy, 2023).

Spatial fragilities are caused by the high maintenance costs of extensive infrastructure (roads, pavements, pipes etc.) resulting from the dispersed (or fragmented) and car-oriented development model of suburbs (Kruse & Sugrue, 2006). This situation places a significant financial burden on

municipal budgets. In fact, in most contexts, this has been addressed as an “over infrastructure” issue. The traditional post-World War II suburban development model has been described as a “Ponzi scheme” that requires continuous new growth to sustain the existing expensive infrastructure and generate revenue (Marohn, 2013). This model, which “sacrifices flexibility for growth”, has created a long-term financial burden that has brought municipalities’ ability to finance basic services to a standstill. Moreover, municipal mergers (or, in some contexts, splits) driven by the desire to control land use, along with discriminatory zoning practices, have served as the primary mechanism for racial (particularly in the US context) and economic exclusion (Wyndham-Douds, 2023). These spatial strategies deepen existing inequalities, create new fragilities for marginalised groups, and lead to a segregated structure in the suburbs. At the same time, environmental fragility is accelerating fundamentally due to uncontrolled urban sprawl. This is leading to the irreversible loss of agricultural land and natural ecological buffer zones on the city’s critical periphery. Therefore, the misconception that suburbs are naturally developing communities is demolished and it becomes clearer how intentional political and legal structures shape these unequal spaces.

3.3.2. The Role and Limitations of Traditional Planning Narratives in the Formation of Fragilities

The fragility of today’s suburbs is no accident; it stems from traditional narratives in planning and the limitations of the paradigms they have shaped. The narrative of the suburbs as a utopian ideal focused on purity and cleanliness, and pushed the single-families to the suburbs (Loh & Love, 2023). Within this framework, the historical narrative of the suburbs, presented as a utopian ideal has masked the structural socio-spatial contradictions of peripheral growth; it has brought about a transformation from the initial promise of purity to the reality of profound fragility in the present day (Keil, 2017). This state-sponsored narrative promoted homogeneity and car dependency, setting the groundwork for future suburban fragility.

The main reason why traditional planning fails in the light of these fragilities is hidden in the limitations of the dominant paradigms. The rational-comprehensive model, which is widespread in urban planning, assumes a linear and logical path from problem definition to solution based on the prediction, stability and risk reduction assumptions (Altshuler, 1965). Criticisms of the rational-comprehensive planning approach and its inadequacy in managing urban complexity have been discussed across a wide range of works, from Batty’s (2007) *Cities and Complexity* to his subsequent studies on unpredictability (Batty, 2020). However, the application of the concept of antifragility to spatial fragilities in a suburban context remains a critical gap in the literature that has not yet been

sufficiently explored. However, this model fundamentally conflicts with the dynamic and non-linear nature of urban systems, struggles to measure social and environmental values, and is inadequate for extraordinary problems (Altshuler, 1965). By emphasising functional efficiency and rigid zoning plans, modernist planning has created significant fragilities such as a lack of public space, car dependency, and social isolation. This seemingly rational approach has been driven by an underlying meta-narrative and has directly contributed to exacerbating these suburban fragilities by disregarding human comfort.

The American development model was a large-scale “experiment” characterised by rapid sprawl and automobile-oriented development, sacrificing flexibility for growth (Kruse & Sugrue, 2006). The “Ponzi scheme”-like financial burden created by this model shows that traditional planning is locked into an unsustainable growth cycle, creating a latent economic fragility that threatens long-term stability (Marohn, 2013).

3.3.3. Limitations of planning in the face of old narratives and uncertainties

Old narratives do not offer an approach to dealing with uncertainty and complexity. Therefore, this situation is inherent in planning's dependence on static narratives. Cities and neighbourhoods are dynamic, non-linear and complex systems in which small changes can have large and unpredictable effects. Urban transformations do not arise from central coordination, but from contextual changes and uncoordinated local actions. Traditional planning, based on the assumption of designing an “optimal plan” and controlling urban development towards a “predefined future”, operates under an illusion of control that is incompatible with the uncertainty and self-organising nature of complex systems (Rauws, 2017; Moroni & Cozzolino, 2019; Moroni et al., 2020). Issues such as persistent inequality, poverty, and unsustainable development, including suburban fragility, categorise as “wicked problems” as defined by Rittel and Webber (1973). In fact, it must be recognised that such problems are complex, have no single correct solution, and cannot be addressed with traditional, linear planning approaches. The characteristics of these wicked problems directly contradict the assumptions of the rational-comprehensive planning model. The linear and deterministic mindset of traditional planning is fundamentally inadequate for addressing the intertwined, contradictory, and constantly changing nature of suburban fragilities.

The historical roots of urban planning (see Table 1), from ancient civilisations to modern times, are based on fixed plans, grid layouts, and a top-down design tradition. This has created a dependence on “rational decision-making” and master plans as templates for development (Altshuler, 1965). This

liberal paradigm has become established by resisting paradigm shifts despite rapidly changing social realities (Chandy, 2023). Although driven by a desire for order and control, this rigidity becomes a significant source of fragility in the face of uncertainty. Planning is generally slow to adapt and fails to cope with the emerging complexities and uncertainties of contemporary suburban life. Master plans remaining more of a performative act than an effective tool for uncertainty management. Such inflexible planning approaches create a false sense of safety about apparently resolved issues, mask the reality that urban development is actually progressing in a fragmented and uncontrolled way, and further deepen fragilities.

Table 1 | Old planning narratives and their contributions to suburban fragility

<i>Old Narratives / Traditional Planning Paradigms</i>	<i>Main Assumptions / Principles</i>	<i>Background to Failure to Cope</i>	<i>Ignored Urban System / Problem Characteristics</i>
Rational-Comprehensive Planning Model	Prediction, stability, control, linear problem solving, objective evaluation, optimal plans.	Assumes full knowledge of future and outcomes, struggles with non-quantifiable social/environmental values, inadequate for non-sequential problems, actually satisfactory solutions.	Dynamic, nonlinear, emergent behavior, self-organization, multiple interdependent factors, Complex and structural problems
Modernist Urban Planning Approach / Principles	Functional efficiency, spatial order, strict zoning, uniformity, scientific approach	Car dependency creates lack of public space/diversity, promotes social isolation, ignores the human experience beyond efficiency, leads to unsustainable infrastructure burden.	Intimacy at a human scale, community building, diverse needs of populations, long-term financial sustainability.
Master Planning (as a fixed template)	A comprehensive inflexible vision, a desire for top-down control, detailed future design	Lack of flexibility, high cost, low application adaptability, alienates communities, cannot adapt to changing conditions, often more promotional than practical.	Unexpected events, community involvement, constant transformation, wicked problems
Conventional Suburban Narratives	Homogeneity, problem-free, utopian ideal, “White space”	Masks increasing diversity and poverty, prevents recognition of vulnerabilities, prevents effective intervention; perpetuates sociological amnesia	Increasing diversity, concentrated poverty, complex social dynamics, evolving spatial inequalities.

It has been illustrated how suburban development was characterised by state-sponsored “utopian” narratives, creating a perception of cities as “worn out” and reinforcing the homogeneous and car-dependent nature of suburbs. The failure of the rational-comprehensive planning model and modernist

principles to recognise cities as complex adaptive systems has led planning to operate under an illusion of control, creating major spatial and financial fragilities such as the financial unsustainability of suburban sprawl and Ponzi scheme-like growth model (Marohn, 2013). Furthermore, it is explained in detail how mechanisms such as master plans and zoning plans, prepared with a predictive and top-down approach, contribute to spatial inequality and segregation. In this context, the need for new narratives and antifragility approach comes to the fore. The characterisation of suburban fragilities as wicked problems clearly shows that traditional, linear planning approaches are inadequate for tackling such complex and constantly evolving challenges. In light of these findings, an urgent paradigm shift in planning is essential. This change requires the embracing of adaptive strategies, the acceptance of the inherent complexity of urban systems, and the active inclusion of various new approaches and narratives to build more equitable and just suburban futures (see Section 5). Only in this way can suburbs cope more effectively with future uncertainties and offer their residents real well-being and stability.

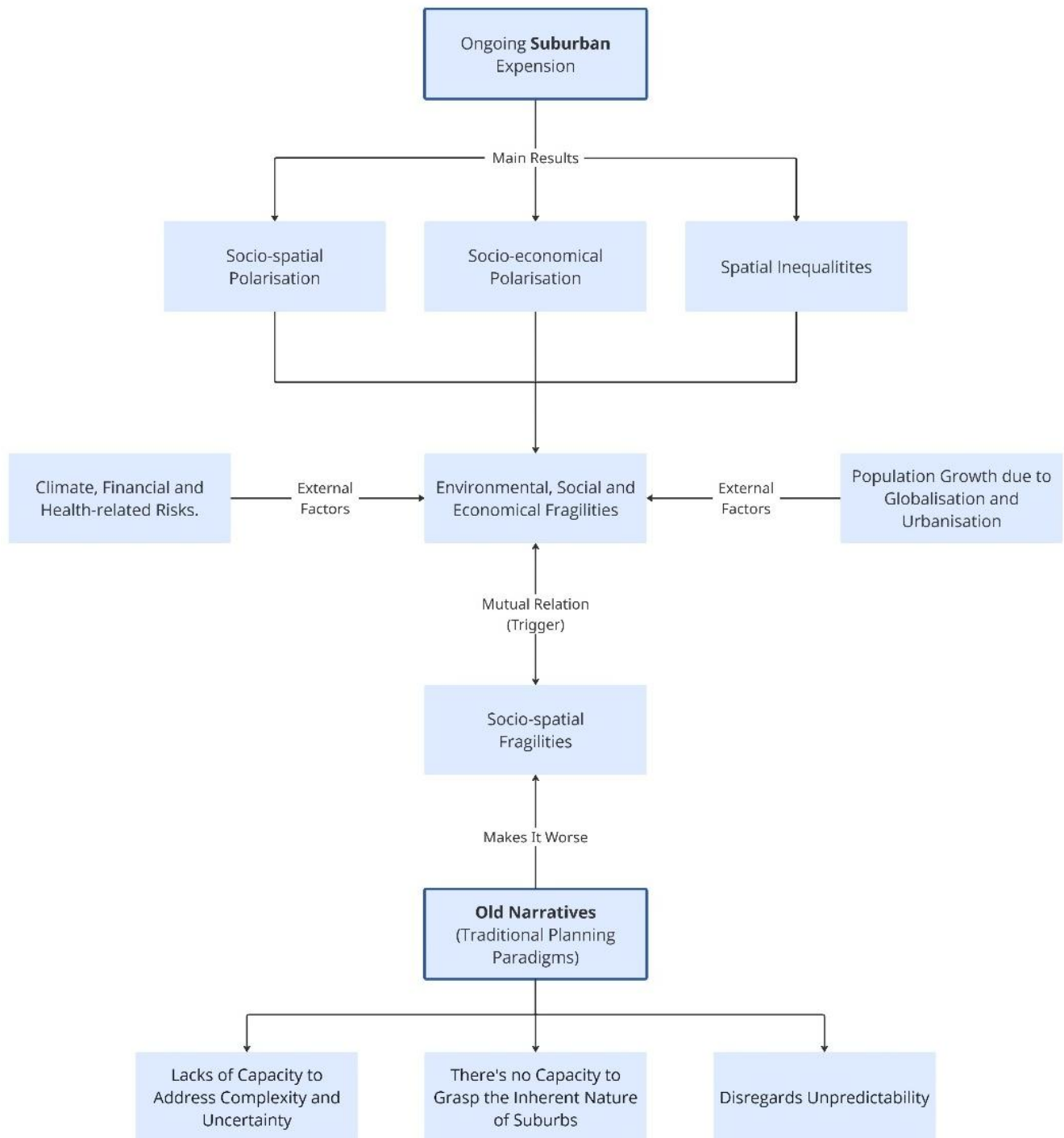


Figure 3 | Conceptual model of suburban fragility and the limits of traditional planning

4. Suburbanisation in Turkey

In Turkey, suburbanisation emerged in the 20th century alongside urban sprawl, but in a different form. It has become a phenomenon shaped by numerous factors, including globalisation, population

growth, housing density, the spatial distribution of industrial and service activities, and central government policies, and has created a unique set of urban fragilities in the country's largest metropolitan areas (Istanbul, Ankara, Izmir). This systemic pattern, in which local fragilities are exacerbated by overarching global and traditional planning pressures, is structurally illustrated in the conceptual model (Figure 3). Rather than attempting to present a separate and comparative empirical analysis for each metropolitan area, these three cities have been assessed collectively in this study to provide thematic and demonstrative evidence of the multi-layered urban fragilities conceptualised within this study.

To contextualise these fragilities, it is necessary to outline the broad contours of spatial planning in Turkey. Historically state-centred and, in recent years, increasingly rent-oriented, Turkey's planning framework has been reshaped by neoliberal urban policies since the 1980s. Rather than implementing flexible or adaptive master plans, the institutional structure is highly fragmented yet relies on a centralised authority. Top-down institutions, led by *TOKİ* (Mass Housing Administration in Turkey), possess legal planning powers that frequently bypass local authorities and civil participation, directly directing housing supply in peripheral areas. Furthermore, the system operates under a reactive governance model periodically disrupted by comprehensive building permit reforms (building amnesties) that legalise unauthorised sprawl and structural risks. This institutional environment actively prioritises short term property capital over long-term spatial stability; this naturally generates systematic socio-spatial and ecological fragilities in metropolitan peripheries.

Suburbs, which emerged as agricultural areas on outskirts of cities, have developed into complex structures through transport networks. In many cases, these areas, which remain functionally connected to the city centre despite their administrative independence. They have spread to other cities driven by industrial and commercial growth, as well as to metropolises such as Istanbul, Ankara and Izmir (see Figure 4) (Çetin, 2012).

In this process, especially the upper middle class's desire to “distinguish and position” themselves in more sparse residential areas was effective; the first planned suburban initiatives in Istanbul and Ankara became evident in the form of settlement in detached houses with gardens as an indicator of the search for a more “civilised” living environment and status symbol (Datta & Yucel Young, 2007; Kanat, 2017). In summary, suburbanisation in Turkey is a dynamic process that has emerged as a result of the complex interaction of various factors such as industry, transportation, migration and lifestyle preferences, bringing along administrative problems, infrastructure deficiencies and socio-spatial segregation.

Beyond migration and rapid urbanisation, these three cities have developed into metropolises through their own dynamics. From the early stages of industrialisation, Istanbul (pioneering suburbanisation

driven by the upper-middle class's search for villas in the Bosphorus and the Princes' Islands) has, particularly since the 1980s (Onur, 2020), become a city where the most prominent examples of gated communities are found. Overcrowding in city centres, fear of crime and safety concerns arising from urban poverty have driven the upper and middle classes to seek spatial protection. Influenced by global consumer culture, these groups turned to developments such as *Beykoz Konakları*, built even in forested areas on the outskirts like *Beykoz* and *Büyükdere*, aiming to display their status through a closed, protected and "purified" lifestyle (Kurtuluş, 2011).



Figure 4 | Suburban Examples in Turkey. “*Beykoz Konakları*” in İstanbul (a), “*Erdemkent*” in Ankara (b), “*Villakent*” in İzmir (c). (Sources: Map data 2026 Google).

This process deepened socio-spatial segregation and turned suburbs into privileged settlements catering to upper income groups (Pérouse & Danış, 2005). In Ankara, on the other hand, the process of suburbanisation gained momentum at a later period, especially with the rapid population growth and planned housing projects of the middle class that started with it becoming the capital city. This led Ankara suburbs to exhibit a more organised development compared to Istanbul. In İzmir, suburbanisation has been differentiated through the city's identity as a port city and its close relationship with industrial zones; settlements concentrated around industrial and commercial activities have formed a unique suburbanisation pattern in interaction with the geographical structure of the city. Studies examining the motivations for suburban living in İzmir (Doğmuşöz, 2024) indicate that in addition to the desire for a house with a garden and discomfort with the crowds in the city centre, the more affordable price of suburban housing is also an important reason for preference. *Villakent* neighbourhood is considered as an example of these motivations (Doğmuşöz, 2024). The different experiences in these three cities reveal that the suburbanisation phenomenon in Turkey is not homogenous, but rather a multifaceted process shaped by local dynamics, planning practices and socio-economic stratification (Erkan, 2010). Therefore, it should be emphasised that suburban studies are not only about where people live, but also about how and why they live and the resulting problems of social and spatial justice.

This suburbanisation process, which includes complexity and multi-dimension situations, creates urban fragilities. As Curci and Chiffi (2024) highlighted, this fragility can easily be negatively affected by uncertainties, making suburbs as fragile areas open to degradation in the face of stresses, uncertainties, etc. It is crucial to understand that suburban life is shaped not only by individual preferences but also by factors such as structural inequalities, planning failures and safety issues. This is because understanding these factors are critical to understanding these fragilities. During this process, fragilities are also deepening due to inadequate planning paradigms.

(i) Socio-spatial segregation and inequality. Suburbanisation leads to a sharp class segregation and polarisation in urban space, deepening inequalities in access to urban resources, services and opportunities for different segments of society (Pérouse & Danış, 2005). This situation leads to a weakening of social solidarity, and even increase in social tensions, making the socio-spatial structure more fragile to uncertainties. External economic changes or social crises may further strain these segregated structures. The primary causes of this phenomenon include the differentiation in income distribution, neoliberal housing policies fuelling this differentiation (Pérouse & Danış, 2005), the upper-class identity's progression on the axis of western lifestyle and the desire to show this in space, the marketing of the search for security and status as a consumption element. Driving factors such as insecurity, crowding and quality of life concerns in urban centres direct these classes to suburban areas, which they perceive as safe and pure.

(ii) Social distance and isolation. The physical and social closure of gated communities to the outside world creates a serious social distance between those who live inside and those who remain outside. Public life is replaced by isolated islands. This isolation weakens the urban community as a whole and creates a systemic fragility by reducing the capacity for solidarity and common response to unexpected social challenges or crises. The isolation of individuals can also increase mental fragilities. Fundamentally, this social isolation is triggered by security issue, fear of “the other”, the desire to live in a homogeneous community, and individual motivations such as escaping the chaos and crowds of city centres trigger this social isolation.

(iii) The shrinking of public space. Gated communities cause the urban public space to shrink by enclosing public spaces (streets, parks, etc.) behind walls. This situation brings urban injustice and social exclusion and eliminates the socialisation and control mechanisms offered by public life. This shrinking public space reduces social cohesion and resilience, making the urban system fragile. This spatial reduction is primarily driven by individuals' efforts to meet their safety needs on their own, the marketing of space as a consumption object and some approaches of local governments in urban planning processes. This may occur when zoning plans, especially in the peripheries of the city, define areas favourable to such large-scale housing projects with closed and private use, allowing parcel

mergers and high precedent increases. In addition, the flexibility of these projects in terms of public space standards (green space, road width, etc.) or the inability of existing planning principles to adequately adapt to these new construction dynamics also play a role. Furthermore, indirectly allowing or encouraging the private sector to provide basic infrastructure and security services that should be provided by the public sector is also a factor affecting the quality and accessibility of public space.

(iv) Environmental and infrastructural fragilities. Unplanned or contextually inadequate suburban developments lead to the uncontrolled consumption of natural areas (agricultural land, forests). Furthermore, they cause the degradation of ecological stability and the loss of biodiversity. This situation reduces the resilience of the environmental system to natural shocks (climate change, drought, extreme weather events), making the urban system more fragile. Inadequate drainage systems and low-quality building stock increase fragility to natural disasters (Doğmuşöz, 2024). When these infrastructural weaknesses come together and are affected by external pressures, they accelerate the demolition of the system, i.e. loss of function. These critical vulnerabilities are driven by the pressure of rapid urbanisation, spatial planning practices that are out of context and short-term, rent-oriented construction, lack of regulation and, in some cases, illegal construction are some of the reasons. Urbanisation that leaves infrastructure investments behind and insufficient consideration of natural risks are also important among the main reasons.

(v) Governance and planning paradigm fragilities. As Curci and Chiffi (2024) point out, the uncertain future of cities and suburbs, and the failure of the traditional planning paradigm to recognise that they are complex phenomena, leads to a lack of adequate long-term solutions to suburban problems. The inability of old narratives and planning processes to assimilate the dynamics of the suburbs themselves and the uncertainties facing cities makes the planning system itself “fragile”, because it cannot adapt to or learn from the unexpected. This prevents the urban system from developing a self-strengthening (antifragile) structure. Ultimately, the primary root of this fragility lies in one-dimensional planning perspectives based on static assumptions. That’s why there is a need for new “antifragility” or “transformative” narratives capable of understanding the dynamic and evolving nature of cities and suburbs and embracing these uncertainties.

As elaborated above, the fragility of suburbs in Turkey does not only consist of physical deficiencies or infrastructural inadequacies. On the contrary, it has a multi-layered structure arising from socio-economic divisions, administrative inadequacies, declining quality of public space, and planning approaches that fail to adapt to changing conditions. As Curci and Chiffi (2024) emphasise, these fragilities make suburbs, and urban systems in general, fragile to negative consequences in the face of internal and external shocks, uncertainties and stressors, threatening the holistic health and

sustainability of the urban structure. For this reason, understanding and managing the complex of problems brought about by suburbanisation requires multidimensional and holistic approaches and new narrative.

5. Discussion

5.1. The Failure of old narratives and necessity of antifragility

Considering that the suburbanisation process in Turkey has revealed multi-layered fragilities such as socio-spatial segregation, isolated gated communities, and environmental degradation (see Section 4), these findings clearly demonstrate the inadequacy of traditional planning narratives. The inherent mechanism of this fragility (where global pressures meet the limits of local planning) is precisely mapped out in the conceptual model (as seen in Figure 3). According to these old narratives, in traditional planning, suburbs were seen as “land to be bought” or “areas used to channel migration pressure” and were therefore driven by population growth, infrastructure investments and economic focal points (Çetin, 2012; Datta & Yücel Young, 2007). For suburbs in Turkey, these fragilities are fuelled by constantly changing conditions, uncertain economic fluctuations, inadequate planning etc. The pervasive nature of these fragilities in Ankara, Istanbul, and Izmir, as evidenced by the expansion of gated communities and systemic infrastructure lacks, suggests that the planning system itself operates under a false illusion of control. This illusion, based on the assumptions of the rational-comprehensive model (predictability, linearity, stability), consistently fails to view urban environments as complex, non-linear adaptive systems. This mismatch has led to the formation of inherently fragile suburban structures that cannot absorb unexpected socio-economic or environmental shocks without systemic failure.

In this context that uncertainty and shock waves pose significant risks to the traditional planning approach. Adopted as a new discourse, “antifragile planning” aims to overcome unpredictable uncertainties through processes of “learning, experiencing and redefining” rather than through pre-determined risk scenarios (Blečić & Cecchini, 2020). This approach advocates a planning model that (i) learns from uncertainty, (ii) knows what not to do (*via negativa*), and (iii) incorporates a transformative, multidimensional perspective. In the face of the “unknown unknowns” that the suburbs may face in the future, it proposes not an emergency response and resilience paradigm, but to develop new functions at the moment of shock. For example, in Izmir, the demands for teleworking

triggered by COVID-19 have inspired the rapid transformation of green spaces in the suburbs (Doğmuşöz, 2024). On the other hand, as detailed in Section 2.3, static planning practices based on the assumptions of the rational-comprehensive model (e.g., uniform parcelling, infrastructure limitations, unrealistic master plans on paper) rely on definitive predictions and disregard participatory planning approaches; such practices should be abandoned in accordance with the principle of *via negativa*. These new narratives overcome the static and centralised character of planning and adopt a dynamic planning approach based on flexible learning cycles that turn uncertainties into opportunities (or, in economic terms, turn crises into opportunities).

5.2. *Towards just, innovative and equitable suburbs*

The fragilities identified in the suburbs in Turkey are fuelled by multi-layered elements such as socio-spatial segregation, social isolation, shrinking public space, environmental/infrastructural inadequacy and traditional planning paradigm deficiencies (Çetin, 2012; Pérouse & Danış, 2005; Curci & Chiffi, 2024). Therefore, future suburban fragility with an antifragile planning approach reveals a vision of “learning from shocks, developing new functions and emerging stronger” (Taleb, 2012; Hillson, 2023) in moments of uncertainty. As a result of rapid population growth and the resulting pressure on the city centre, the infrastructure planning of suburban areas has often been addressed through large-scale, one-off projects. This situation has resulted in the adoption of traditional planning paradigms in suburban areas, leading to top-down planning without participation, inefficient land use, inflexible urban design interventions, and hence socio-spatial segregation and unfair urban areas. In particular, the example of Turkey highlights that the prevalence of gated communities, which have privatised security and public space, therefore deepening socio-spatial segregation and further more eroding the foundations of civic trust and social capital necessary within the larger metropolitan structure, is the ultimate expression of this fragility.

Overcoming these mechanisms of spatial exclusion requires a shift from a selectionist, top-down approach to a governance that actively develops the fundamental antifragility qualities of optionality and redundancy, by decentralising decision-making processes and empowering local, diverse stakeholders in planning processes. However, overcoming the deep isolation and socio-spatial segregation of gated communities goes beyond merely increasing civil society participation or localised civic involvement. These divisions are structurally produced by macro-level neoliberal housing policies and systemic housing affordability crises in Turkey. Therefore, a resilience-oriented planning framework must critically address these inclusive housing provision systems rather than

relying on localized participatory mechanisms alone in order to develop truly inclusive suburban environments (Pérouse & Daniş, 2005; Kurtuluş, 2011; Onur, 2020). However, the heterogeneous character of suburban areas with the presence of different ethnic and income groups can be supported by interventions such as social centres that can support a culture of solidarity and provide sociological resilience. This both produces an antidote against isolation and unites the community as social capital in times of unexpected crisis (Chiffi & Curci, 2020).

On the other hand, in antifragile approaches that address fragilities from a spatial perspective, physical infrastructure inadequacies, inaccessibility in transportation, single-functional uses etc. also increase spatial fragility (Doğmuşöz, 2024; Erkan, 2010). To counter the spatial fragility resulting from inflexible infrastructure and car-dependent single-functional uses, antifragile planning must prioritize modularity and multi-functionality in design. Modularity ensures that the failure of one component (e.g., a specific transit line or a single-use zone) does not cascade into systemic failure, while multi-functionality allows spaces, such as green areas, to swiftly accommodate unforeseen functions, as demonstrated by the remote working trend in Izmir during the pandemic. In this case, while reconstructing the suburbs in Turkey from both spatial and social perspectives, antifragile planning approaches that transform uncertainties into learning opportunities instead of suppressing them, that centre participation, have optionality, adopt modular approaches, nurture socio-cultural solidarity and create opportunities for dynamic infrastructure solutions should be considered.

6. Conclusion

In conclusion, suburban areas in Turkey generate multi-layered fragilities within historical, socio-economic and environmental contexts. Therefore, the implementation of antifragility planning approaches in these environments requires a comprehensive re-structuring process that includes not only spatial but also ethical, political and cultural dimensions. This analysis shows that traditional planning tools are fundamentally inadequate in meeting the transforming and uncertain needs of these areas. At this point, the antifragile planning approach, with its new narratives, emerges as a powerful and transformative approach that can definitely shape the future of urban planning. This is because the antifragility approach fundamentally aims to transform systems not only to demonstrate resilience but also to embrace uncertainty, evolve and innovate in the face of stress, shock and chaos. Given the multi-layered fragility of Turkey's suburban areas, the planning paradigm must be restructured with this transformative and antifragility perspective. Consequently, for Turkish cities to achieve a more just, sustainable, and equitable urban future, adopting antifragility planning is becoming a necessary

transformational discipline in the face of uncertain urbanisation processes. This study opens the necessary discussions on antifragility planning approaches and provide a theoretical framework it should be acknowledge that it functions primarily as a conceptual and normative intervention based on a critical synthesis of secondary literature. At the and the main limitation of this research is the empirical testing. To build upon these foundational discussions, future research should operationalise this conceptual model through quantitative spatial analyses and case studies especially in Turkish suburbs. The aim should be measuring the practical effectiveness of anti-fragility planning tools in real world scenarios.

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CRedit authorship contribution statement

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No data was used in this article.

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