Open House International

Exploring housing renewal through residential satisfaction: insights from the Istanbul case

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Received 19 June 2023
Revised 1 October 2023
22 February 2025
16 May 2025
Accepted 26 August 2025

Abstract

Purpose – This paper aims to reveal to what extent, and through which factors, housing renewals and the year of building construction affect residential satisfaction.

Design/methodology/approach – Residents' subjective evaluations and satisfaction concerning their dwellings and residential environments are examined, with a specific reference to housing renewal implementations and the year of construction. The study is based on a survey conducted through social media using an online questionnaire, targeting residents of Istanbul's housing areas undergoing rapid urban transformation through single-building renewals.

Findings – The results indicate that residents living in buildings constructed more than 30 years ago have negative evaluations regarding the structural quality and earthquake resiliency of their dwellings. However, despite high levels of residential satisfaction in newer buildings, evaluations of functional and facade properties remain negative. These results indicate that the residential buildings built in the last 10 years and within the national renewal program are far from meeting the residents' expectations regarding the interior quality of the dwellings.

Originality/value – This paper discusses the housing renewal issue from the residents' perspective. The findings reveal suggestions for the implementation of housing renewals in order to increase residential satisfaction.

Keywords Residential satisfaction, Housing renewal, Earthquake preparedness, Istanbul

Paper type Research article

1. Introduction

Housing is more than a basic shelter; it is a multidimensional concept central to individuals' lives. As a fundamental human right, access to housing is shaped by national policies and influenced by global and local dynamics. These policies aim to ensure affordability and increasingly address the renewal of physically outdated housing stock, which often falls below its use and exchange value. Renewal practices, defined within housing policy frameworks, have become key tools to improve housing supply. The need for housing renewal and renewal policies varies based on countries' housing systems and local dynamics, and it is a topic that is debated in the field of housing practices as well as in the literature in terms of housing renewal practice procedures and results (Carmon, 1999; Kleinhans, 2004; Turkington and Watson; Alves, 2017; Turk, 2021; Nachmany and Hananel, 2022; Nachmany and Hananel, 2023). Eventually, houses produced within the housing system affect individuals in terms of their lifestyles, living environments and conditions. In other words, houses and residential environments produced and renewed within the guidance of national housing policies and affected by global and local dynamics become important determinants of individual processes and societies' quality of life.

In Türkiye, beyond broader housing debates, the challenge of producing earthquake-safe and resilient residential environments remains critical. Following the devastating Maraş earthquakes on February 6, 2023, this issue returned to the national agenda. The urgency of

Open House International
© Emerald Publishing Limited
e-ISSN: 2633-9838
p-ISSN: 0168-2601
DOI 10.1108/OHI-06-2023-0152

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renewing existing housing stock was quickly reflected in national and local policies, accompanied by growing public demand for the renewal of residential buildings. Under these circumstances, urban transformation in Türkiye is a rapidly progressing process, primarily targeting residential areas under the justification of providing a safe housing stock against earthquake risk. A significant portion of the renewal demands is carried out through single-building renewals. However, this process is criticized for prioritizing economic concerns over earthquake risk in location selection, leading to fragmented implementations that deviate from a holistic urban planning approach, and for limiting the renewal process to merely improving the physical quality of the existing building stock (Eren Özkan and Özçevik, 2015; Güzey, 2016; Güney, 2022; Kuyucu, 2022). Moreover, research-based knowledge production on changes in neighbourhood and housing quality, as well as whether user needs are met, remains limited. The urgency and necessity of creating earthquake-resistant residential environments once again highlight the importance of discussing the issue from a broader perspective, including different dimensions such as users' perspectives concerning neighbourhood and housing features. This article seeks to address this gap by producing evidence-based insights from the perspective of users, aiming to contribute to the discussion on single-building renewal processes.

In this context, this study examines housing conditions in neighbourhoods undergoing rapid transformation, focusing on residents' perspectives within a residential satisfaction framework. Accordingly, residents' subjective evaluations and satisfaction with their dwellings and neighbourhoods are analysed, with specific reference to residential buildings' construction years and renewal processes. This study assumes that residents living in buildings constructed in different time periods and undergoing different renewal processes will have differing levels of satisfaction with their neighbourhood and housing conditions. The paper aims to determine to what extent, and through which factors, building construction years and housing renewals affect residential satisfaction at different scales. To achieve this aim, an online survey was conducted via social media platforms with the residents living in the Bakırköy and Kadıköy districts in Istanbul. These districts face earthquake risk due to deteriorated housing stock and are undergoing rapid urban transformation via single-building renewals. Within the survey, residents' subjective evaluations of their dwellings and neighbourhoods, including assessments of structural resilience against earthquakes, were collected. In this context, the article first addresses the concept of housing renewal within the framework of earthquake preparedness and explains how housing renewal, particularly single-building-scale renewals, is being implemented in Türkiye. While discussing housing renewal in Türkiye within the context of legislation, the article presents evaluations regarding the processes involved, outlines the overall framework of housing renewal and identifies its key problematics. Subsequently, the core of the research framework is explained in the following section by introducing the concept of residential satisfaction and defining the indicators based on the key factors that influence residential satisfaction. In the following section, the study's original research methodology, research area and sample characteristics are described, along with the indicators of residential satisfaction that guide this research. The research findings, presented under the results section, are discussed in the discussion section, and the article is concluded with the conclusion section.

With the aim of determining the factors through which housing renewals affect residential satisfaction, this study adopts an exploratory approach, focusing on the relationship between single-building renewal practices and residential satisfaction, rather than analysing housing renewal within a comprehensive model that considers the diverse dynamics and complexities of urban renewal in Istanbul. In this regard, it presents an evaluation of housing renewal processes within the context of earthquake preparedness from a user perspective and identifies the housing and neighbourhood-related factors that may influence user satisfaction in this process.

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2. Renewal for earthquake preparedness and Türkiye case

Urban renewal policies have evolved in response to national ideologies and shifting urban challenges. Carmon (1999) identifies three phases: slum clearance and physical improvement (1930–1960), socially oriented approaches (1960–1980) and a focus on economic development post-1980, largely driven by public-private partnerships. More recently, urban renewal is increasingly framed as a solution to the housing crisis, where the private sector takes a leading role while the state regulates and provides incentives (Nachmany and Hananel, 2022). Despite broader goals such as sustainability, housing quality and poverty reduction (Kleinhans, 2004; Hao and Wang, 2023), renewal efforts often prioritize physical upgrading through demolition and reconstruction.

In earthquake-prone contexts, renewal is closely tied to risk mitigation. Across countries, strategies include legal frameworks, financial incentives and integration with national and local plans (Cheng and Chang, 2018; Zhang *et al.*, 2022; Rapaport *et al.*, 2024). For instance, Japan's post-1995 law mandates retrofitting of pre-1981 buildings, gradually increasing the role of local governments (Zhang *et al.*, 2022). Countries like China and Italy combine seismic retrofitting with energy efficiency goals; the former provides strong state funding, while the latter relies on tax incentives and a risk classification system (Cosenza *et al.*, 2018). In Romania (Georgescu *et al.*, 2018) and New Zealand (Egbelakin *et al.*, 2013; Aigwi *et al.*, 2020), property owners are responsible for retrofitting, whereas in Iran and Taiwan, public policies support retrofitting or rebuilding, especially in high-risk zones (Cheng and Chang, 2018; Lin *et al.*, 2024).

Although addressing the housing deficit and economic concerns are relevant in Türkiye, the primary objective is to reduce seismic risk. National legislation enables renewal at the single-building scale, often through demolition and reconstruction, reflecting a model in which physical safety outweighs social or environmental considerations. A similar example is Israel's TAMA 38 program, implemented between 2005 and 2022 as the national master plan to improve earthquake resilience in housing. Within the program, the state acted as a regulator and facilitator, while homeowners and private developers were the main actors (Nachmany and Hananel, 2023; Hananel and Shamai, 2024). TAMA 38, which used to enable housing renewal on a building scale, over time became the primary instrument guiding renewal implementations in Israel (Margalit and Mualam, 2020; Hananel and Shamai, 2024). The program is evaluated as successful in terms of upgrading the physical features of housing and increasing the housing stock, while it was also criticized for creating deficiencies in public infrastructure due to population growth it facilitated. Economically, homeowners gained from rising housing and rental values, while the housing sector revived. More importantly, the program was criticized for focusing on areas with economic potential rather than high seismic risk (Nachmany and Hananel, 2023; Hananel and Shamai, 2024). In 2022, TAMA 38 was replaced by a new approach focusing on housing complexes and local planning in high-risk, low-cost areas (Hananel and Shamai, 2024).

Fragmented projects, considered as fourth-generation urban renewal, carried out without upper-scale plans are often driven by economic dynamics and market priorities rather than mitigation of seismic risk (Güzey, 2016; Margalit and Mualam, 2020; Kuyucu, 2022; Nachmany and Hananel, 2022). As an earthquake-prone country, Türkiye considers urban renewal an essential part of earthquake preparedness, and it has been implemented through building- and site-scale projects, resulting in economic, social and spatial transformations in cities. Moreover, in Türkiye, urban renewal, and particularly housing renewal, has become an important component of the housing production and supply. Since 2002, the construction and real estate sectors have played a key role in shaping macroeconomic policies prioritizing the economic growth in Türkiye (Balaban, 2012; Kuyucu, 2022). During this period, foreign investment was introduced to economic system, real estate companies increase, and the middle class grew through financial tools such as low interest rates. Owner-occupied housing was encouraged and supported during this period, like it was in previous periods as well (Sarı, 2022). In the following period, the economic growth driven by macroeconomic policy transformation slowed down due to various global and local crises; in response, especially

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after 2012, institutional and legal regulations were introduced to support the construction and real estate sectors and counteract the decline in economic activity (Kuyucu, 2022). While some of these were realized in the form of large-scale transportation and infrastructure projects on the outskirts of the cities (Kısar Koramaz *et al.*, 2018; Enlil and Dinçer, 2022; Kuyucu, 2022), in other instances, there were projects where redevelopment and regeneration were encouraged in the built environment and urban centres (Güzey, 2016).

In terms of the housing process in Türkiye, the 1999 Gölcük earthquake has crucial importance and can be defined as a turning point in the earthquake preparedness efforts and housing policy of Türkiye. The 1999 earthquake, which affected the Marmara Region and caused a devastating destruction, especially in the northwest provinces of Marmara, led to the recognition that Türkiye's existing housing stock is insecure against earthquakes and needs to be renewed. Following the 1999 earthquake, the renewal of the existing housing stock gained importance as a housing production mode and was introduced as the new model of housing production (Tekeli, 2010; Aksu Çam, 2021). In this period, new legal regulations were made, and authorized institutions were established to ensure and encourage the renewal of the existing housing stock.

In 2011, the Van earthquake, which affected eastern Anatolia, was another turning point that accelerated and strengthened the legal regulations for the renewal of the existing housing stock (Eren Özkan and Özçevik, 2015; Kısar Koramaz *et al.*, 2018). The Law on Transformation of Areas under Disaster Risk (Law no. 6306/16.5.2012), enacted in 2012, is one of the main legal regulations that has been, and still is, effective in the renewal of the built environment. Law no. 6306, which defines renewal of the existing housing stock under earthquake risk as one of its main purposes, encourages and regulates the production of housing through renewal. The law enables the renewal of the existing housing stock in danger of an earthquake risk at different scales and through different risk statuses. Among them is the risky building status, which refers to buildings with serious structural problems, and are at risk of collapsing during an earthquake. The law enables renewals at a single-building scale through a single-building scale. Risky building status is determined through technical analysis at the request of property owners. Once designated as risky, the building must be demolished and rebuilt on the same plot within existing urban plans. Property owners are responsible for demolition, reconstruction and associated costs. Law No. 6306 supports this renewal with tax incentives and rent allowances. Property owners must select a constructor, negotiate payment terms and approve architectural plans. Since its approval, residential buildings in Türkiye have been renewed on a single-building scale under the law.

In Türkiye, Law no. 6306, which provides the opportunity for housing renewals, is a tool for both the aim of facilitating the construction sector, promoting housing ownership and producing economically and structurally strengthened houses by renewing the existing housing stock. From another perspective, it is seen that this law also serves macroeconomic policies by keeping the construction and real estate sectors alive. However, this tool is devoid of the guidance of plans and programs on the upper scale and is implemented in line with the priorities of the property owners and the private sector. This ongoing process makes it harder to monitor and control the short-term and long-term effects of single-building housing renewals. As a direct positive outcome, single-building renewals provide an enhancement of the buildings' construction quality. As indirect outcomes, housing renewals cause an increase in property and rent values and affect the physical environmental conditions and social structure of the neighbourhoods, leading to long-term transformation of the residential environments (Kısar Koramaz *et al.*, 2018; Aksu Çam, 2020; Turk, 2021). In addition to the aforementioned effects, renewals implemented within Law no. 6306 are criticized for not prioritizing the riskiest areas in the face of earthquake destruction. Instead, economic priorities are more prominent factors, with the dynamics of the market economy serving as the main facilitators of the renewal processes (Eren Özkan and Özçevik, 2015; Güney, 2022). Furthermore, it is noted that residents' sense of belonging to their dwellings and trust issues with neighbours and constructors might lead to reluctance in single-building renewals (Markoç, 2020; Güney,

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2022). These critical views mainly concern the leading cases in Istanbul, such as Kadıköy (Markoç, 2020) and Bakırköy (Kısar Koramaz *et al.*, 2018), from which this research has chosen its case areas.

As a result, urban renewal practices have evolved and been implemented through various models that address different challenges, ranging from slum clearance to promoting social and economic development and implementing sustainability principles. As the specific conditions of each country shape the rationale for urban renewal, earthquake preparedness holds a key place, particularly in Türkiye, where it plays a significant role in guiding housing renewal policies.

3. Residential satisfaction

Residential satisfaction refers to an individual's overall level of satisfaction with their dwelling and residential environment. Residential satisfaction occurs as a result of individuals' evaluations and assessments of the objective conditions of the dwelling and residential environment in which they live. It is a multidimensional and interactive process that occurs at different levels of the residential environment and covers a variety of domains referring to different attributes of the residential environment (Campbell *et al.*, 1976; Marans, 2015; Fernández-Portero *et al.*, 2017; Aragonés *et al.*, 2017). Marans and Rodgers (1975) conceptualize residential satisfaction as a hierarchical process operating at various dimensions – mainly the dwelling, neighbourhood and community. In their conceptualization, residential satisfaction is defined as the result of individuals' perceptions and evaluations of the objective conditions of the dwelling and the residential environment. In this process, individual characteristics such as the demographic and socio-economic attributes, previous experiences, needs and expectations of the individual also influence residential satisfaction (Marans and Rodgers, 1975; Marans, 2012, 2015).

In another study, Emami and Sadeghlou (2021) analysed the literature on residential satisfaction in terms of its conceptualization, measurement and wide range of indicators, highlighting its multidimensional nature. They grouped these indicators into four categories: urban policy and planning, including factors like location, tenure, infrastructure, transportation, management and maintenance; design-related aspects, such as dwelling characteristics, housing typology and safety; social milieu, including social networks and sense of identity; and finally, individual-level factors like socio-economic and demographic characteristics (Emami and Sadeghlou, 2021).

Canter and Rees (1982) define domains concerning the residential environment in three groups: home, neighbourhood and neighbours. The dwelling, where individuals spend their entire lives, is among the fundamental determinants of residential satisfaction. The dwelling, which is influenced by socio-economic and cultural dynamics, is important in individuals' lives by providing for their basic psychological needs and contributing to the constitution of individuals' identities. It is acknowledged that dwellings' structural characteristics and interior conditions have a crucial effect on residential satisfaction (Ng *et al.*, 2005; Phillips *et al.*, 2005; Fernández-Portero *et al.*, 2017). The neighbourhood, which is the fundamental environmental unit that surrounds the dwelling and meets the basic needs of individuals, is also a determinant of residential satisfaction. The physical environmental characteristics, quality of the amenities and maintenance are among the characteristics of the neighbourhood that affect residential satisfaction (Aragonés *et al.*, 2017). Neighbours as the third category refer to the social environment and comprise the characteristics of social relations and bonds among the residents of a neighbourhood. It is emphasized that dwelling and residential environment features alone are not sufficient to ensure residential satisfaction, but the social environment and relations among the neighbours are also important components of residential satisfaction (Ng *et al.*, 2005; Hipp, 2010; Du *et al.*, 2020).

Residential satisfaction is among the crucial determinants of quality of life and well-being. On the other hand, residential satisfaction is also considered as a predictor of residents' behaviours regarding their residential environments. Satisfaction with the dwelling and the

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residential environment can affect individuals' decisions to move from their residential environment and from this perspective, residential satisfaction may be considered as a predictor of residential mobility. On the other hand, an individual's satisfaction with the dwelling may affect decisions to make changes regarding their housing, such as readjustment of the residential conditions through renovations (Weidemann and Anderson, 1985; Adriaanse, 2007; Aragonés *et al.*, 2017). Understanding residents' satisfaction with different features of the dwelling and residential environment contributes to addressing the conditions that need to be improved and upgraded both at the dwelling and residential environment levels. From this perspective, residential satisfaction studies have the potential to contribute to shaping housing policies and implementations and to address the conditions needed to be upgraded at varying levels in residential environments and dwellings (Adriaanse, 2007; Permentier *et al.*, 2011; Aragonés *et al.*, 2017).

4. Methodology

As mentioned before, the paper aims to determine to what extent and through which factors building construction years and housing renewals affect residential satisfaction at different scales. The hypothesis guiding the research is that residents living in buildings constructed in different time periods and undergoing different renewal processes will have varying subjective evaluations and levels of satisfaction with their neighbourhood and housing conditions.

The research is based on a survey conducted through social media platforms using an online questionnaire, targeting residents of two districts in Istanbul. These districts, Bakırköy and Kadıköy, are undergoing rapid transformation through single-building renewals, which gained legal definition under Law No. 6306 (Pektetik, 2021). The survey was conducted between December 2020 and March 2021. Due to COVID-19 conditions, the survey was announced via social media and delivered to participants residing in the case areas through an online questionnaire. As a first step, the neighbourhood-based social media groups, which are created and run by local residents of the neighbourhoods located in the case areas, were identified. The research and the questionnaires were announced in 15 neighbourhood groups, which were active on the Facebook platform. Among these 15 groups, 9 represented residents of neighbourhoods located in Bakırköy, while 6 represented those in Kadıköy. The questionnaires were completed by volunteer group members. The responses were analysed based on residential addresses, excluding those from outside the case areas. A total of 98 questionnaires were accepted, forming the sample size for this research. The limited sample size constitutes the main constraint of this research. Additionally, a representative sample could not be formed under COVID-19 conditions. Instead, respondents' residency location was used as a quota, and a self-selection sampling strategy based on voluntariness was adopted. Due to the sample being formed under these conditions, this study does not intend to represent the case areas; rather, an exploratory research approach is adopted within the framework of the research aim, making inferences about the relationship between subjective evaluations, satisfaction levels, building age and the renewal process.

The questionnaire comprises questions on residents' subjective evaluations and satisfaction regarding their dwellings and neighbourhoods. It covers assessments of structural resilience, functional features, safety and neighbourhood characteristics. As the first step of the data analysis, the data were categorized according to the construction year of the buildings in which the respondents resided, and the sample was analysed based on this categorization. Subsequently, principal component analysis (PCA) was conducted to establish residential satisfaction indicators, followed by one-way ANOVA and Tukey tests to identify the differences across building periods. In the following sections, the case areas, sample characteristics and residential satisfaction indicators are explained, respectively.

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4.1 Case areas

The case areas are the Bakırköy and Kadıköy districts, which are under earthquake risk due to the physically deteriorated housing stock and where single-building renewal projects are taking place. The reasons for selecting these districts as the case areas are as follows:

(1) Both districts comprise neighbourhoods' urbanization process was regulated by master plans during the Republican period and went through similar urbanization processes. Residents' socio-economic status and length of residency are similar, and the quality of urban life is among the highest in Istanbul (Şeker *et al*., 2022). Housing prices and land values are also relatively high compared to other districts (Koramaz and Dokmeci, 2012).

(2) Both districts are planned residential areas with housing stocks from different periods. They are vulnerable to earthquake risk due to their old housing stock and coastal location on the Marmara Sea (IMM, 2020; IRAP, 2021).

(3) The case areas are facing a rapid transformation through single housing renewal projects, especially following the approval of Law no. 6306 (Kısar Koramaz *et al*., 2018; Koylan, 2018; Berkmen and Turgut, 2019).

Although both districts share similarities as case areas, they differ significantly in their housing renewal processes. In Kadıköy, the master plan allows for increased building height and dwelling units, leading to higher population density and a more significant transformation of the built environment. This regulation also encourages housing renewals for property owners (Koylan, 2018). In contrast, Bakırköy's master plan does not permit changes in building height and number of dwelling units, preventing a radical population growth and environmental transformation. Moreover, these restrictions make housing renewals under Law No. 6306 challenging for property owners in Bakırköy, particularly regarding payment conditions (Kısar Koramaz *et al*., 2018).

4.2 Sample characteristics

The total sample consists of 98 respondents, with women (63%) and married individuals (52%) being the majority. Respondents are balanced across age groups (25–55 years), and 48% have a university degree. The majority are employees (53%), with retirees constituting 27%. As it was aimed to reveal residents' subjective evaluations and satisfaction in relation to the construction year of the residential buildings, the first step was to make a categorization based on respondents' residential buildings' construction periods. The three categories are "Residential buildings constructed before 1984", "Residential buildings constructed between 1985 and 2011" and "Residential buildings constructed after 2012". Construction period categorization was based on key legal regulations regarding the planning and renewal in Türkiye. The first group, constituting 41% of the sample, is labelled as buildings constructed before 1984. This group consists of buildings over 35 years old, vulnerable to earthquakes due to their age and built before the 1985 Planning Law (no. 3194). The second group comprises residential buildings constructed between 1985 and 2011 and constitutes 33% of the sample. The breaking points for this group were the enactment of the Planning Law – Law no. 3194 approved in 1985 and Law no. 6306 approved in 2012. The last group constitutes 27% of the sample and consists of buildings constructed after 2012, following the approval of Law no. 6306, which regulates the renewal of residential buildings. As the distribution of the residential building groups to districts is analysed, it is seen that the majority of the buildings constructed before 1984 are located in Bakırköy, and the majority of the buildings constructed after 2012 are located in Kadıköy.

Assessment of socio-economic characteristics by building construction periods reveals distinct patterns. In post-2012 buildings, the majority are younger respondents (25–34 years: 31%), highly educated (82% university graduates) and employees (58%). In buildings constructed between 1985 and 2011, respondents aged 25–44, university graduates and

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employees are more frequent (25%, 59% and 56%, respectively). In contrast, in pre-1984 buildings, respondents aged between 35 and 64 and retired individuals have higher frequencies. Ownership status assessment indicates that the majority of the respondents (73%) are homeowners, with the highest rate (85%) among pre-1984 buildings. Conversely, the majority in post-2012 buildings (31%) are tenants. Residency length in the neighbourhood and in the dwelling is relatively high among respondents living in pre-1984 buildings. It is notable that for respondents living in post-2012 buildings, the percentage of respondents living in the same neighbourhood and dwelling for less than 5 years has high values (54%; 73%) (Table 1).

In terms of building and dwelling characteristics, most buildings have 5–7 floors (53%) and the dwelling numbers vary between 9 and 14 (37%) and 15–20 (20%). Post-2012 buildings tend to have more floors (35% have 8–10 floors). In the buildings constructed between 1985 and 2011, 5–7 floors constitute the majority (63%). Conversely, the number of floors of pre-1984 buildings is relatively low. The number of dwellings is higher in post-2012 buildings compared to the other two construction period groups. The dwelling sizes vary across the sample. It is striking that dwellings in post-2012 buildings are often smaller (46% are ≤90 m2), while the size of dwellings in the buildings constructed between 1985 and 2011 is larger. In the pre-1984 buildings, the dwellings between 90 and 100 m2 stand out with a rate of 45%. In terms of room numbers, the majority of the sample consists of 2 + 1 and 3 + 1 room typologies. Pre-1984 and post-2012 buildings are dominated by 2 + 1 dwellings, followed by 3 + 1 dwellings. For the buildings constructed between 1985 and 2011, 3 + 1 dwellings constitute the majority, and then the rate of 4 + 1 dwellings is higher compared to the other groups and the sample. The number of dwellings with balconies is high, but 35% of post-2012 buildings lack balconies (Table 2).

4.3 Indicators

As mentioned in the literature section, residential satisfaction is measured within a multidimensional framework encompassing the dwelling, neighbourhood and community levels, addressing various qualities across these dimensions. Since housing renewal policies in

Table 1. Ownership status and length of residency – frequency distributions

		Residents living in buildings constructed:							
		after 2012		between 2011 and 1985		before 1984		Total	
		n	%	*n*	%	*n*	%	*N*	%
Ownership	Owner	17	*65*	21	*66*	34	*85*	72	*73*
	Tenant	8	*31*	9	*28*	4	*10*	21	*21*
	Other	1	*4*	2	*6*	2	*5*	5	*5*
	Total	26	*100*	32	*100*	40	*100*	98	*100*
Length of residency in neighbourhood	< 5 years	14	*54*	9	*28*	6	*15*	29	*30*
	5–10 years	1	*4*	5	*16*	9	*23*	15	*15*
	11–14 years	0	*0*	2	*6*	1	*3*	3	*3*
	15 >	11	*42*	16	*50*	24	*60*	51	*52*
	Total	26	*100*	32	*100*	40	*100*	98	*100*
Length of residency in dwelling	< 5 years	19	*73*	9	*28*	4	*10*	32	*33*
	5–10 years	2	*8*	7	*22*	11	*28*	20	*20*
	11–20 years	0	*0*	7	*22*	9	*23*	16	*16*
	21–35 years	2	*8*	8	*25*	6	*15*	16	*16*
	36 >	3	*12*	1	*3*	10	*25*	14	*14*
	Total	26	*100*	32	*100*	40	*100*	98	*100*

Source(s): Authors' own creation

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Table 2. Residential building and dwelling characteristics - frequency distributions

		Respondents living in buildings constructed: after 2012		between 2011–1985		before 1984		Total	
		n	%	*n*	%	*n*	%	*N*	%
Number of floors in residential building	1–4 floors	3	*12*	3	*9*	14	*35*	20	*20*
	5–7 floors	7	*27*	20	*63*	25	*63*	52	*53*
	8–10 floors	9	*35*	4	*13*	0	*0*	13	*13*
	11 >	7	*27*	5	*16*	1	*3*	13	*13*
	Total	26	*100*	32	*100*	40	*100*	98	*100*
Number of dwellings in residential building	2–8 units	3	*12*	3	*9*	8	*20*	14	*14*
	9–14 units	7	*27*	14	*44*	15	*38*	36	*37*
	15–20 units	5	*19*	6	*19*	9	*23*	20	*20*
	21–28 units	4	*15*	4	*13*	6	*15*	14	*14*
	29 >	7	*27*	5	*16*	2	*5*	14	*14*
	Total	26	*100*	32	*100*	40	*100*	98	*100*
Dwelling size	< 90 m2	12	*46*	3	*9*	9	*23*	24	*24*
	91–100 m2	7	*27*	5	*16*	18	*45*	30	*31*
	101–120 m2	5	*19*	8	*25*	10	*25*	23	*23*
	121–150 m2	1	*4*	9	*28*	3	*8*	13	*13*
	151 >	1	*4*	7	*22*	0	*0*	8	*8*
	Total	26	*100*	32	*100*	40	*100*	98	*100*
Number of rooms in dwelling	2 + 1 rooms	14	*54*	5	*16*	23	*58*	42	*43*
	3 + 1 rooms	10	*38*	20	*63*	17	*43*	47	*48*
	4 + 1 rooms	2	*8*	7	*22*	0	*0*	9	*9*
	Total	26	*100*	32	*100*	40	*100*	98	*100*
Number of balconies in dwelling	No balcony or French balcony	9	*35*	3	*9*	4	*10*	16	*16*
	1 balcony	13	*50*	13	*41*	19	*48*	45	*46*
	2 balconies	3	*12*	11	*34*	14	*35*	28	*29*
	3 or more	1	*4*	5	*16*	3	*8*	9	*9*
	Total	26	*100*	32	*100*	40	*100*	98	*100*

Source(s): Authors' own creation

earthquake-prone areas vary across countries, residential satisfaction – measured at these multiple levels – can serve as a valuable outcome for evaluating their effectiveness. As the scope of the paper addresses how buildings constructed in different time periods and undergoing different renewal processes will have differing levels of satisfaction, the indicators used in this paper are limited to subjective evaluation and satisfaction scales at the dwelling and neighbourhood dimensions. This investigation corresponds to the determinants of residential satisfaction from the literature, such as housing typology and safety (Emami and Sadeghlou, 2021); dwellings' structural and functional characteristics and interior conditions (Ng *et al.*, 2005; Phillips *et al.*, 2005; Fernández-Portero *et al.*, 2017); quality of the amenities; maintenance (Aragonés *et al.*, 2017) and social environment in the neighbourhood environment (Ng *et al.*, 2005; Hipp, 2010; Du *et al.*, 2020). The indicators used in this study were established through two separate PCAs (using the varimax rotation method), conducted in SPSS (version 27).

4.3.1 Indicators of residents' subjective evaluations of dwelling and neighbourhood. At this phase, 23 variables concerning residents' subjective evaluations regarding dwelling and neighbourhood were submitted to PCA. Through the analysis, six components, explaining 68.82% of the variance (Kaiser–Meyer–Olkin Value: 0.807), emerged. The first component is labelled "F1.1. Evaluations regarding functional features of dwelling", indicates residents' subjective evaluations for the functionality of the dwelling and is composed of eight variables

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that measure residents' subjective evaluations for the architectural layout and size of the dwelling and evaluations for the functionality of the rooms in the dwelling. The second component is labelled as "F1.2. Evaluations regarding structural features of dwelling and earthquake resistance" and is composed of six variables. Among these variables, four of them measure residents' evaluations of infrastructural facilities in the building such as water, heat, noise insulations and accessibility in the building. The other two variables measure residents' feelings of safety and earthquake risk. "F1.5. Evaluations regarding dwelling facade and its functional contribution" is another component, consisting of three variables that measure dwelling and building attributes related to facade characteristics, such as evaluations of balconies, the exterior view from the interior and the amount of sunlight received. Two variables measuring residents' feelings of belonging were grouped in the analysis and this component is labelled "F1.4. Attachment to dwelling". Through the PCA, two components emerged, which refer to residents' subjective evaluations for attributes at the neighbourhood dimension. "F1.3. Evaluations regarding perception of safety and environmental quality in the neighbourhood" and "F1.6. Evaluations regarding social environment in the neighbourhood" are composed of variables measuring residents' evaluations for neighbourhood safety and environmental quality and social environment attributes (Table 3).

Table 3. Residents' subjective evaluations of dwelling and neighbourhood indicators - principal component analysis

Components	Variables
F1.1. Evaluations regarding functional features of dwelling *Eigenvalue: 7.426*	*My dwelling is size is adequate* *Number of bedrooms is adequate* *Placing furniture is easy* *Architectural layout of dwelling is functional* *Bedrooms are functional* *Living room is functional* *Kitchen is functional* *Bathrooms are functional*
F1.2. Evaluations regarding structural features of dwelling and earthquake resistance *Eigenvalue: 2.438*	*Water insulation is convenient* *Heat insulation is convenient* *Noise insulation is convenient* *I'm safe in this dwelling* *My dwelling is safe against earthquake risk* *Building is accessible*
F1.3. Evaluations regarding perception of safety and environmental quality in the neighbourhood *Eigenvalue: 1.823*	*This neighbourhood is safe* *This neighbourhood looks nice*
F1.4. Attachment to dwelling *Eigenvalue: 1.713*	*I call my dwelling "home"* *I feel I belong to this dwelling*
F1.5. Evaluations regarding dwelling facade and its functional contribution *Eigenvalue: 1.354*	*My dwelling gets adequate amount of sunlight* *My dwelling has a pleasant view* *Balconies are functional*
F1.6. Evaluations regarding social environment in the neighbourhood *Eigenvalue: 1.076*	*I trust my neighbours* *My neighbours have similar lifestyles to me*

Note(s): Kaiser–Meyer–Olkin measure of sampling adequacy: 0.807 and Bartlett's test of sphericity sig.: 0.000
*Each variable comprises an evaluation by the respondent made on a Likert scale where 1 is "completely disagree" and 5 is "completely agree"

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4.3.2 Indicators of residents' satisfaction with dwelling and neighbourhood. For the establishment of satisfaction indicators, seven variables were submitted to PCA. Through the analysis, three components, explaining 71.06% of the variance (Kaiser–Meyer–Olkin value: 0.924), emerged. The first component is labelled as "F2.1. Satisfaction with the dwelling" and is composed of three variables that measure satisfaction with different aspects of the dwelling. Two other variables concerning overall satisfaction with the neighbourhood and its social environment emerged as another component and are labelled "F2.2. Satisfaction with the neighbourhood." Another component, "F2.3. Satisfaction with the residential building garden," is based on a single variable reflecting residents' satisfaction with the garden (Table 4).

Table 4. Residents' satisfaction with the dwelling and neighbourhood - principal component analysis

Components	Variables
F2.1. Satisfaction with the dwelling *Eigenvalue: 2.877*	*I'm satisfied with the interior of my dwelling* *I'm happy to live in this dwelling* *I'm satisfied with the exterior of the building* *I'm satisfied with the level of privacy inside the dwelling*
F2.2. Satisfaction with the neighbourhood *Eigenvalue: 1.173*	*I'm satisfied with the attitude of people living in this neighbourhood* *I'm happy to live in this neighbourhood*
F2.3. Satisfaction with the residential building garden *Eigenvalue: 0.924*	*I'm satisfied with the building garden*

Note(s): Kaiser–Meyer–Olkin measure of sampling adequacy: 0.6920 and Bartlett's test of sphericity sig.: 0.000
*Each variable comprises an evaluation by the respondent made on a Likert scale where 1 is "completely dissatisfied" and 5 is "completely satisfied"

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5. Results

Since the research hypothesis suggests that residents living in buildings constructed in different periods and undergoing different renewal processes will have varying subjective evaluations and levels of satisfaction with their neighbourhood and housing conditions, one-way ANOVA and Tukey tests are conducted using the indicators derived from PCA, based on building construction period groups. The ANOVA test determines whether each indicator differs significantly across construction period groups and the Tukey test identifies which groups differ. This analysis presents findings that reveal through which characteristics of the dwelling and residential environment, and to what extent, the building construction period and the renewal process influence residential satisfaction.

A comparison of F-values obtained from the ANOVA analysis of the subjective evaluation indicators notes that "F1.2. Evaluations regarding structural features of dwelling and earthquake resistance" is the most effective discriminator between construction period groups (F: 11.371; *p*: 0.000). Tukey test results indicate that evaluations of structural features and earthquake resistance of dwellings have the lowest scores for pre-1984 buildings and significantly differ from the other groups. The group of residents living in the oldest buildings, which were constructed before 1984, has the lowest subjective evaluations regarding structural features and earthquake resistance of their dwellings, with a mean value of "−0.50" (Table 5).

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Table 5. Residents' evaluations and satisfactions regarding dwelling and neighbourhood - ANOVA and Tukey test results

Indicators	Residents living in buildings constructed: after 2012 $n = 26$	between 2011 and 1985 $n = 32$	before 1984 $n = 40$	Total $n = 98$	F	sig
F1.1. Evaluations regarding functional features of dwelling	−0.10	0.56**	−0.38	0.00	9.645	0.000
F1.2. Evaluations regarding structural features of dwelling and earthquake resistance	0.53	0.20	−0.50**	0.00	11.371	0.000
F1.3. Evaluations regarding perception of safety and environmental quality in neighbourhood	0.45	0.20	−0.45**	0.00	8.529	0.000
F1.4. Attachment to dwelling	0.20	−0.13	−0.02	0.00	0.789	0.457
F1.5. Evaluations regarding dwelling facade and its functional contribution	−0.44■	−0.07	0.35■	0.00	5.580	0.005
F1.6. Evaluations regarding social environment in neighbourhood	−0.43●	−0.09	0.35●	0.00	5.430	0.006
F2.1. Satisfaction with the dwelling	0.51	0.35	−0.59**	0.00	13.770	0.000
F2.2. Satisfaction with the neighbourhood	0.22	−0.19	0.01	0.00	1.007	0.370
F2.3. Satisfaction with the residential building garden	−0.20	−0.02	0.14	0.00	0.768	0.467

Note(s): *Sign indicates groups significantly differing from each other; ** sign indicates the group differing from the rest of the groups (95% confidence interval; sig<0.05)

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"F1.1. Evaluations regarding functional features of dwelling" and "F1.5. Evaluations regarding dwelling facade and its functional contribution" are the other two indicators for dwelling, and they both significantly differ among construction period groups. "F1.1. Evaluations regarding functional features of dwelling" as an indicator for subjective evaluation of dwelling features is an effective discriminator with an F-value of 9.645 (p: 0.000). Subjective evaluations of functional features of dwellings have the highest mean score (0.56) for residents living in buildings constructed between 1985 and 2011, and this group significantly differs from the other two building groups. For another indicator, "F1.5. Evaluations regarding dwelling facade and its functional contribution," there is a significant difference between buildings constructed before 1984 and buildings constructed after 2012. Residents living in post-2012 buildings evaluate their dwellings significantly lower than those in the pre-1984 buildings (mean score: –0.44). Residents of the pre-1984 buildings have the highest mean score (0.35) for this indicator and significantly differ from the residents living in the post-2012 buildings. According to the analysis results, "F1.4. Attachment to dwelling" does not significantly differ among the groups (F: 0.789; sig.: 0.457).

ANOVA results indicate that the two subjective evaluation indicators regarding the neighbourhood environment significantly differ among building construction period groups. For the "F1.3. Evaluations regarding perception of safety and environmental quality in the neighbourhood" indicator, the F-value is 8.529 and pre-1984 buildings group significantly differs from the other two groups. Residents living in pre-1984 buildings have negative evaluations of the environmental quality and safety of the neighbourhood, and this group significantly differs from the other two groups with a mean value of −0.45. "F1.6. Evaluations regarding social environment in the neighbourhood" is an indicator at the neighbourhood scale that reflects residents' perceptions of the social environment. For this indicator, the subjective evaluations of residents living in pre-1984 buildings significantly differ from those living in

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post-2012 buildings, reporting more positive evaluations (mean score: 0.35) (F-value: 5.43; sig.: 0.006).

Among the 3 satisfaction indicators, "F2.1. Satisfaction with the dwelling" significantly differs among the construction period groups with an F-value of 13.770 (sig.: 0.000). Tukey results indicate that the pre-1984 buildings group significantly differs from the other two groups and has the lowest satisfaction scores with a mean value of −0.59. In other words, residents living in buildings constructed before 1984 are the least satisfied group with their dwelling, compared to the residents living in residential buildings constructed in the following periods. On the other hand, results indicate that the other two satisfaction indicators, regarding satisfaction with residential building gardens and satisfaction with neighbourhood environment, do not significantly differ among the groups of housing construction periods (Table 5).

The results indicate that, except for the attachment to dwelling indicator, user evaluations regarding the structural and functional features of the dwelling and physical and social features of the neighbourhood differentiate according to the residential building construction period. When examining satisfaction indicators, it is observed that the residential building construction period particularly differentiates satisfaction at the dwelling scale. The discussion section elaborates on which of these indicators differ, in what direction and how these differences relate to housing renewal processes, opening them up for further discussion.

6. Discussion

The results indicate that residents' evaluations regarding the structural features of the dwelling and earthquake resistance of the buildings are the prominent distinguishing factors among the building construction period groups. Residents of buildings constructed before 1984 evaluate their structural features and earthquake resistance negatively, citing common safety concerns and structural issues. This result indicates that in Istanbul, where the earthquake threat is a prominent risk, strengthening the resiliency of residential buildings through housing renewals is an important concern of the residents.

Residents of buildings constructed after 2012, when Law No. 6306 guiding single-building renewals came into force, evaluate the functional features of their dwellings negatively. In addition to the decrease in the size of the dwellings and the decrease in the number of rooms in dwellings in post-2012, the interior conditions are also less functional in terms of responding to residents' needs and expectations. This finding indicates that housing renewals have the potential to trigger the transformation of the dwellings' interior conditions and affect residents' evaluations in a negative direction. The amount of sunlight in the dwelling, the exterior view experienced from the dwelling and the functionality of the balconies are negatively evaluated by residents of post-2012 buildings. Furthermore, in this group, the number of floors and the total number of dwellings in the building are relatively high, while the number of balconies is low, and even some buildings do not have any balconies. These findings are thought-provoking, as the quality of the interiors resulting from single-building renewals often falls short of residents' expectations. These results indicate the deficiency of the single-building renewals in terms of architectural quality, as they are carried out only with the aim of an improvement in structural quality and an increase in the number of dwellings driven by economic priorities. The findings regarding the factors affecting residential satisfaction, such as dwelling characteristics, interior conditions and structural features and safety (Ng *et al.*, 2005; Phillips *et al.*, 2005; Fernández-Portero *et al.*, 2017; Emami and Sadeghlou, 2021), highlight the importance of considering each of these features in renewal implementations in order to meet the residents' expectations and needs. Despite their negative dwelling evaluations, residents of post-2012 buildings report higher residential satisfaction than those in older buildings. These results emphasize the importance of building age, structural quality and earthquake resilience and their potential impact on residential satisfaction in earthquake-prone Istanbul.

At the neighbourhood scale, residents of buildings built before 1984 also evaluate the safety and environmental quality of their neighbourhood negatively, in line with their negative

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evaluations of dwelling structure. This finding can be interpreted as indicating that subjective evaluations of the dwelling and neighbourhood are interrelated in an interactional relationship, which is also emphasized in the literature as an explanation of the multidimensional nature of residential satisfaction (Aragonés *et al.*, 2017; Fernández-Portero *et al.*, 2017). On the other hand, it is noteworthy that among the residents living in the pre-1984 buildings, evaluations related to the social environment in their neighbourhoods are positive and especially higher than those who live in the post-2012 buildings. Middle-aged and older residents, owner-occupiers and residents living in the same neighbourhood for more than 15 years constitute the majority of those living in the pre-1984 buildings. Positive evaluations regarding the social environment among residents living in buildings with structural deficiencies and renewal expectations for structural improvement are important findings in terms of careful consideration of the social sustainability dimension within renewal programs. It is also worth noting that the social environment in the neighbourhood is evaluated negatively by residents of post-2012 buildings, where higher proportions of younger people, tenants and those living in the neighbourhood for under 5 years are found. This finding indicates that housing renewals have the potential to transform the social environment in the neighbourhood as well. The results indicate that the attachment to dwelling does not differ by building construction period. This finding suggests the need for more comprehensive research on the factors influencing place attachment, which is shaped not only by physical context but also by individual processes and cultural and social factors (Scannell and Gifford, 2014).

7. Conclusion

Housing renewal, a critical aspect of global housing policy, is also a prominent issue in Türkiye, a country with extensive seismic hazard zones that has been subjected to the destructive consequences of earthquakes multiple times. Within the earthquake preparedness efforts, Law no. 6306, a specific tool enabling property owners to renew their houses on a single-building scale, has positively impacted several related issues, such as facilitating the construction sector and contributing to the continuity of the owner-occupied housing system in Türkiye. However, single-building renewals have also been criticized for prioritizing economic expectations in location choice rather than strengthening resiliency against earthquake risk (Eren Özkan and Özçevik, 2015; Güney, 2022). Another question regarding housing renewals is to understand the transformations they cause at the neighbourhood and dwelling scales and the extent to which they meet residents' expectations in different aspects. The answers to these issues will provide the insights that will contribute to Türkiye's housing renewal program, as well as provide an example of comprehending the stimulating dynamics and consequences of housing renewal in earthquake-prone residential environments. Within this context, this paper aims to examine dwelling and neighbourhood conditions from the residents' perspectives, with a specific focus on housing renewals.

The findings in this paper suggest that examining residential satisfaction in housing production and renewal within a temporal framework based on construction periods can offer an analytical approach for a comprehensive review of housing policies. Thus, residents' evaluations of dwelling structural and functional features as well as neighbourhood physical and social attributes vary by construction periods. In other words, homes built or renewed in different periods offer varying dwelling conditions that meet residents' expectations to different extents. Among these, residents' evaluations of building safety against earthquakes and dwelling structural conditions are prominent factors in earthquake-prone neighbourhoods such as those in this study's case areas. However, the results also highlight that single-building renewals do not totally provide residents' positive evaluations, especially in terms of dwellings' functionality and interior conditions. In general, the findings demonstrate that housing renewal programs reshape residential environments and dwellings, which in turn are likely to influence residents' lifestyles by altering the conditions of everyday life. This broader impact highlights the significance of national-scale housing renewal programs for household

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life at the micro scale. This emphasis reflects the original contribution of this paper, which investigates renewal at the dwelling scale and evaluates it from the residents' perspective. The research methodology and findings of this paper offer insights for other earthquake-prone countries facing the challenge of housing renewal for earthquake preparedness.

Currently, in Türkiye, the renewal demands of the residents, which are stuck between earthquake risk perception and economic concerns, operate in line with the decisions and capabilities of the households. However, the results of the study highlight the importance of implementing housing renewal programs that are not limited to structural renewal but consider the housing problem in all dimensions and aim to ensure residential satisfaction. Then, it is clear that architectural and technical guidance is needed to address the deficiencies in housing renewal implementations that negatively affect residents' satisfaction. Therefore, at the micro scale, professional architectural and technical support should be complementary to the housing renewal programs in order to guide residents' choices and produce residential environments that satisfy residents' needs.

The primary limitation of this study is the limited sample size and the inability to create a representative sample due to the COVID-19 conditions. In light of this limitation, this study does not aim to represent Istanbul or the case areas. Instead, an exploratory research approach is adopted, drawing inferences about the relationship between residential satisfaction indicators and housing renewal. In the future, conducting similar research on a larger sample with variation in terms of neighbourhoods' spatial attributes and renewal processes might contribute to housing renewal practices and academic research. The approach proposed in this study can also be linked to other prominent topics of renewal research and debate, such as neighbourhood spatial characteristics and identity, transformation of the neighbourhood social structure, gentrification and affordability, and these topics offer opportunities for future research. Finally, in the future, comprehensive assessments that consider not just user evaluations but also spatial, social and economic features at the building and neighbourhood scales can be conducted. Prospective research that explores the associations between subjective and objective indicators, in a holistic understanding that guides housing renewal policies and projects, should be conducted.

Acknowledgments

This paper is based on the survey data from the MSc thesis titled "User evaluations regarding housing satisfaction and housing renewals: Bakırköy and Kadıköy Cases" (by Umutcan Pektetik, supervised by Elif Kısar Koramaz), and the research project "Planning strategies and actions to address the impact of single-building housing renewal on urban environmental quality of life" (Project ID: 45659, Project Code: SDA-2024–45659, funded by the Scientific Research Projects Office of Istanbul Technical University).

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