



Management and maintenance of multi-family buildings in Croatia: perspective of co-owners' representatives

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Received: 12 May 2022 / Accepted: 17 May 2023 / Published online: 21 June 2023
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Abstract

The paper deals with maintenance and management problems in multi-family buildings in Zagreb and other Croatian cities from the perspective of co-owners' representatives. After 1990, when there was intensive privatization of housing, the responsibility for the maintenance of the housing stock shifted to private owners and management companies. Apartment owners have been given the obligation to maintain multi-family buildings and have faced problems and challenges in maintaining and managing common property. The empirical research was conducted on a convenience sample of co-owners' representatives ($N=353$) using the survey method. The results are analysed according to three construction periods of multi-family buildings: built before 1945, during the socialist period (from 1945 to 1990) and the post-socialist period (after 1991). The results show that in all three construction periods there are certain bigger or smaller shortcomings regarding the building quality, and then the maintenance. The paper concludes that insufficient financial and organisational resources, insufficient engagement of managers, inadequate collaboration between representatives and managers, and weak energy renovation of multi-family buildings are some of the most important problems faced by co-owners' representatives.

Keywords Multi-family buildings' maintenance and management · Co-owners' representatives · Three construction periods · Energy renovation · Croatia

1 Introduction

In the Croatian tradition of studying the quality of life and housing, special emphasis was placed on the specificities of collective housing estates created in the socialist period (from 1945 to 1990), and then in the post-socialist system of construction of new housing settlements and locations (after 1991). During the socialist period, housing policy, including the production and allocation of housing estates and housing stock in Croatia, was strongly under state control. Planned and mass construction of collective estates, in which tenants were handed the tenancy rights instead of ownership, sought to meet the housing needs of a large number of people who migrated to the cities in the process of intensive

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industrialization and mass urbanization. The two necessities (industrial growth and housing provision) were considered to be key development priorities in the former system (Bežovan, 1993; Mandič, 2010; Sendi & Kerbler, 2021).

However, this model of solving the housing issue was not entirely satisfactory, both in terms of the technical quality of construction (e.g. fast and mass construction with often poor quality materials and technical solutions and high massive buildings with a large number of entrances), and in terms of the social consequences it produced. Due to the inability to build a sufficient number of apartments, not everyone who paid contributions at the level of their work organizations became adequately housed, so such a socialist model created social inequalities (Bežovan, 2004), and also generated a housing crisis that, in a way, persists even today.

With the transition from the socialist to the free-market economy system, the state lost its controlling and active role in the housing sector, but housing problems became even more complex. Therefore, it is important to emphasize that the socialist legacy was a kind of common denominator, but after independence, each of post-socialist countries chose their own path of development and a different housing policy. Hence, new measures were implemented especially in the reform of new housing institutions, and new subsidy programs and rent reforms (Tsenkova, 2013). The 'trial and error' approach to different subsidy schemes has been plagued by populist policies and an inability to establish sound and transparent fiscal policies. It can be said that the previous shortage of housing has been replaced by a shortage of affordable housing (Hegedüs & Struyk, 2006; Tsenkova & Polanska, 2014). Further, the new social-housing programmes started very slowly, and the conditions for expanding the social rented stock through new construction remained at a minimum. Budget sources were problematic, while the development of social housing and its financing has been a low political priority (Mandič, 2018). Housing policy in Croatia share similar and inadequate frame. In this context, the important field of housing policy such as the management and maintenance of multi-family buildings, which is the main research subject of this paper, remained insufficiently regulated also. It is especially important to point out that the obligations of tenants towards the maintenance of joint ownership in buildings were left during socialism to the control of the state and the local level of government. Therefore, with the transition to a market oriented economy, this sector of activity, although passing into the hands of owners, remained undefined and weakly active.

In this paper we analyse the current state, problems and possible solutions for future management and renewal of multi-family buildings. Since in Croatia there has not been any similar research yet, which would provide an insight into a wider context of building maintenance and management from the perspective of co-owners' representatives, this study is an initial step in this direction. We surveyed the attitudes of co-owners' representatives about the issues characteristic of multi-family buildings, regarding technical maintenance and management of buildings, and their cooperation and satisfaction with building managers.

1.1 Theoretical and contextual background

At the beginning of the 1990s massive privatization of public housing was carried out, which has, as a political and social intervention, strongly shaped the problem of housing in Croatia to this day. With the privatization of the housing stock in the process of repurchase, the so-called *give-away privatization* (Kovacs & Herfert, 2012; Lux & Sunega, 2014; Stephens et al., 2015), the public type of housing has almost disappeared. Former holders of

tenancy rights acquired the ownership of dwellings at prices far below their actual value (Bežovan, 1993; Spevec & Klempić Bogadi, 2009) as a Right-to-Buy scheme (Murie et al., 2005). As in other Central and Southeast European countries (CSEE), the goal of the housing privatisation was to accelerate the process of transition to free-market economy and to mitigate its negative social effects (Lowe & Tsenkova, 2003; Nedučin et al., 2019; Pojani & Baar, 2016; Sendi, 1995; Tsenkova & Polanska, 2014) and economic instability of the majority of population. Hence, according to the 2011 census, 89% of apartments in Croatia were privately owned or co-owned (Croatian Bureau of Statistics, 2017). Compared to the data from 2001, there was a 6% increase in private ownership, which is not surprising given that the private ownership remains the most widely socially and institutionally promoted form of housing status. Thus, Croatia has become one of the post-socialist countries with the largest share of private ownership of apartments or a super-ownership country (Lowe, 2017).

However, housing privatization caused many other consequences besides economic ones, especially social and those related to the quality of life and housing (Svirčić Gotovac, 2020). While the privatization provided residents with the benefits of ownership, it also placed them in a position of having to carry out maintenance and management functions that a substantial portion of households, especially low-income homeowners, could not afford to perform, relying traditionally on the state to perform these tasks (Pojani & Baar, 2016; Stephens et al., 2015). In addition, from a public budget perspective, privatization laws relieved the state of the financial responsibility to carry out housing maintenance tasks (Clapham, 1995). Relevant here, an important change was the shift of responsibility for the maintenance and management of the housing stock from the state to the citizens, now private homeowners. This introduced a distinction between private ownership of an apartment and co-ownership of common parts of the building (e.g., façade, roof or elevators). The concept of co-ownership, by defining the rights and obligations of co-owners in the building maintenance and management, was supposed to be impetus to the households to commence with a (pro)active care of their newly privatised dwellings (Gruis, et al., 2009; Mandić & Filipović Hrast, 2018; Soaita, 2012). Valid Act on Ownership and Other Real Rights states that co-ownership agreement contains the name of co-owner authorised to represent co-owners in matters involving the manager or third persons, and the limits of his/her powers (Act on Ownership and Other Real Rights, 2015, Article 375). According to this provision, co-owners choose a representative from among themselves, i.e. a person in charge of coordinating the activities of managing and maintaining a multi-family building between key actors in the housing sphere—co-owners, the management company, city and state. However, this segment of housing stock management will in practice prove to be very complex and burdened by problems, from a vague legal and organizational framework to the financial, social and human issues (Gruis et al., 2009; Hegedüs & Teller, 2006).

Therefore, before presenting the results, we will present some of the most important determinants of the state of the housing stock according to three construction periods: *before 1945*, *socialist (from 1945 to 1990)* and *post-socialist (after 1991)*. Starting from the assumption that the construction period of the building correlates with other important determinants of its maintenance and management (primarily, its physical, technical and organizational conditions), the analysis of data by these dimensions can be very informative. The first period of construction is particularly interesting in light of the recent earthquakes that hit Zagreb and Petrinja at the end of 2020, which caused significant damage to residential buildings in the centre of Zagreb—primarily those older, built before 1945—and, consequently, the need for more intensive engagement of representatives in the renovation and reconstruction process (Svirčić Gotovac et al., 2021). The other, socialist period

(from 1945 to 1990) is relevant because of a high representation of these buildings in the total housing stock and their importance in potential renovation models (Dekker et al., 2005; Hess et al., 2018), and for exploring whether multi-family buildings are still desirable for living as they were in socialism. At that time they were attractive for middle-class people and young families with children, and unlike in the West, they were hardly affected by social erosion or the invasion of immigrants and low-income groups (Musterd & Van Kempen, 2009; Rowlands et al., 2009). In the third, post-socialist construction period private and market-oriented residential construction generally delivered improved technical standards and better residential quality, however empirical evidence in some cases show major defects in newer buildings (Nedučín et al., 2019; Svirčić Gotovac, 2015). It is also known in the literature that the market-based system is not necessarily delivering adequate housing of better quality to people that cannot afford it, so housing shortages, overcrowding and substandard conditions define the housing experiences of the poor and disadvantaged in post-socialist cities (Tsenkova & Polanska, 2014). Therefore, similarities and differences in views and attitudes of co-owners' representatives from buildings of different ages and quality of construction can further illuminate comparative advantages and pitfalls of the maintenance and management across these three generations of housing stock.

1.2 Basic determinants of the housing stock in Croatia

The share of multi-family buildings in the housing stock in Croatia is 33%. According to the year of construction, 12% of the total stock of multi-family buildings at the national level was built by 1945, 62% during the socialist period (until 1990), and 26% in the post-socialist period (after 1990) (Ministarstvo prostornog uređenja, graditeljstva i državne imovine, 2021). As in other parts of Europe, large and modern housing estates built in Croatia after the Second World War mostly have distinct and standard features: they consist of a complex of buildings with apartments that are (a) different in shape, (b) built as planned and massive in the local context, (c) located in tall buildings (vertical skyscrapers), (d) tall enough (usually five or more floors) that an elevator is required by law (Dekker et al., 2005; Wassenberg, 2018). For the sake of comparison, the share of inhabitants living in estates like these ranges from less than 5% in Athens to more than 80% in Bucharest, with generally higher shares in Eastern Europe than in other parts of Europe (Hess et al., 2018). Therefore, collective housing estates are still a significant part of the housing market in Eastern and Central European cities (Grossman et al., 2017; Hegedüs & Tosics, 1998; Kahrik & Tammaru, 2010; Van Kempen et al., 2005), as they cover about 40% of the total housing stock on average. With its 33% of multi-family buildings, Croatia is slightly below that average.

According to technical characteristics (e.g. prefabricated, high and massive buildings) and considering the poor maintenance, it is estimated that the service life of buildings built in socialism is about 50 years (Nedučín et al., 2019; Vezilić et al., 2014). Therefore, the service life of buildings built by mid-1970s has already expired or is about to. At the same time, a significant part of the problems in the housing maintenance and management was inherited from the period of socialism. For example, in previous sociological research of large residential estates (Rogić, 1990; Seferagić, 1988), apart from the general criticism of housing in collective estates that were of poor quality (e.g., prefabricated and tall buildings, small and inadequate flats, poor layout, unmaintained facades and roofs etc.), the non-existent concern for the renovation of the housing stock is also highlighted, as a problem that existed at that time, and only deepened over time. The maintenance of

the housing stock was poor, and its renovation or subsequent development of new estates did not exist as a form of intervention, so the low use value became even lower over time (Seferagić, 1988; Mišetić et al., 2004). Inadequate investments in the housing management, caused by neglecting its economic significance and resultant low rent and utility fees, led to further degradation of the housing stock (Hegedüs & Teller, 2012). Furthermore, residents of lower social status mostly remain living in older socialist estates either because of residential inertia or because of a lack of financial means to leave (Černič-Mali 2005; Nedučin, et al., 2019), while younger families from middle and upper social class prefer newer housing (Svirčić Gotovac, 2015). Should they prevail, these trends of social segregation could push parts of the multi-family housing stock (deeper) into the poverty trap and, consequently, further endanger sustainability of housing management. Due to negative feedback loop, the first to be affected are the buildings in the worst condition that have the least amount of renovation funds available, because a higher proportion of middle-class households have left, leaving room for the inflow of low-income households (Nedučin et al., 2019; Pojani & Baar, 2016), which is also a possibility for Croatian estates if they are not renovated fast enough.

Since technical standards related to energy consumption in buildings were not applied before 1981, buildings built earlier, 58% of them, belong to the category with the worst energy characteristics. Hence, the Ministry of Physical Planning, Construction and State Assets estimates that many multi-family buildings are at risk of energy poverty, especially in deprived areas or low-developed regions. Also, it is believed that most buildings built before 1964 do not have sufficient earthquake resistance, since the Ordinance on Temporary Technical Regulations for Construction in Seismic Areas was adopted only after the major earthquake in Skopje in North Macedonia in 1963 (Ministarstvo prostornog uređenja, graditeljstva i državne imovine, 2021). For example, the historic centre of Zagreb, where the majority of the oldest (from the period before 1945) buildings are located, suffered the greatest damage due to minimal earthquake resistance and poor quality of construction, as well as decades-long lack of housing maintenance. This made the centre even more vulnerable because it consists of a building stock over a hundred years old (built mostly in the late 19th and early twentieth centuries) whose structural durability is severely antiquated. There are also residential buildings that are worn out because building materials have lost their properties, they have been unmaintained and repeatedly reconstructed for decades so, in some instances, the reconstructions have compromised their very statics (Atalić et al., 2021). It is also a common case for all the three construction periods that the 'do-it-yourself' interventions in buildings are undertaken by the owners, who then damage the visual identity or otherwise harm the buildings (statically or in the sense of energy efficiency) (Mandič & Filipovič Hrast, 2018).

In today's post-socialist period, the issue of housing is almost entirely left to the market, and its quality is dictated mainly by the efforts of private investors to maximize profits (Tsenkova, 2001). In this context, as a rule, those housing programs, such as Socially Focused Housing that in the former system sought to ensure a sufficient number and quality of apartments and market regulation, does not exist (Bobovec & Mlinar, 2013). In the post-socialist period private investors build individual residential buildings without the construction of complete residential estates, often on inadequate plots and in densely built-up areas. The issue of housing is addressed only partially, which benefits small investors and most often results in residential construction of minimum technical standards and a high price (Jukić et al., 2011). The findings of the study on the quality of life in new residential settlements and locations in the Zagreb settlement network from 2015 (Svirčić Gotovac, 2015) are illustrative, showing that one-third of respondents were at best "neither

satisfied nor dissatisfied” with the quality of construction works in their (at the time) ten-year-old apartments and buildings. Residents mostly criticized the newly constructed facilities, citing objections such as water leaks from ceilings or balconies, inadequate sound and hydro insulation, broken pipes, poor facades, poorly executed finishes, etc. As long as investments in technical conditions (e.g., renovation of facades and roofs) in both older and newer buildings are often insufficient, a significant number of such buildings will not comply with the energy efficiency standards of the European Union (Nedučín et al., 2019). This is especially important in the context of the fact that residential buildings, which make up 70% of the total building stock of the Republic of Croatia, are the largest individual energy consumers (Vezilić et al., 2014), which additionally calls into question the contemporary mass energy renovation of residential buildings. Based on findings valid across CSEE region, the general conclusion that could hold true for Croatia as well is that the deterioration process in considerable parts of urban multi-family housing stock built before 1991 has reached a “critical stage” (Gruis et al., 2009, p. 6; Vezilić, et al., 2014), and that the need for repairment is urgent.

1.3 Maintenance and building management problems

The above-mentioned housing problems were accompanied by economic, demographic and social changes caused by the economic and political transition. Owners who acquired ownership of the apartment in the process of privatization were often unable to finance regular maintenance, let alone engage in extraordinary costs and improvements of co-ownership in buildings. This is similar to other post-socialist countries where, after the privatization process in the 1990s, new homeowners often do not have enough money to maintain and renovate their properties (Cirman et al., 2013; Dimitrovska Andrews & Sendi, 2001; Kovacs & Herfert, 2012; Murie et al., 2005). With the exception of East Germany, the lack of finance for the complex regeneration of housing estates in Eastern European cities is still a central problem that affects the residential satisfaction they provide (Herkfert et al., 2013). According to this phenomenon, called the *poor homeowner phenomenon* (Hegedüs & Teller, 2006), homeowners in Central and Southeast European countries face more serious challenges in maintaining and managing their property than in Western European countries (Mandič, 2010). Thus, for example, the so-called common reserve fund, which consists of common financial resources at the level of building, is often paid only at a minimum, which makes major investments and renovations of buildings impossible. Introduced in 1997, the common reserve fund is “a purpose-linked common property of all co-owners of the property, intended to cover the costs of maintenance and improvement of the property and to repay loans to cover these costs” (Act on Ownership and Other Real Rights, 2015, Article 90). According to the law, co-owners are obliged to make payments into the common reserve, but in practice, it often happens that the payments are not made regularly or are not made by all co-owners. In this case, the manager has the right to request the compulsory collection of the reserve by the court.

The maintenance and management of multi-family buildings are further hampered by the lack of adequate legal and procedural solutions that would make the responsibilities of the owners, but also of all other actors of the housing sphere more clearly defined. Specifically, in the Croatian legislative framework, two legal acts, the *Act on Ownership and Other Real Rights* and the *Regulation on Building Maintenance*, have regulated housing policy since the beginning of the 1990s with no significant updates or new legislative solutions that would regulate this area more efficiently. In a way, the state left the housing

policy aside, waiting for the so-called European sources to help renovate the aging housing stock. For example, after joining the EU in 2013, Croatia has definitely developed slowly regarding energy renovation compared to other post-socialist countries that accessed the EU membership some ten years earlier and had a longer access to EU funds. Croatia had the right to use funds from two EU funded programs for public subsidizing of retro-fitting of multi-family buildings when the Croatian Government brought energy renovation programs in 2014. The aim of the programs was to reduce energy consumption in buildings at the national level and to reduce CO₂ emissions, particularly in mixed-use buildings. Among these programs is the Programme of energy renovation of multi-family buildings within the EU Operation Programme Competitiveness and Cohesion (Fond za zaštitu okoliša i energetska učinkovitost, 2022). In the period between 2014 and 2020 a series of projects of energy renovation was carried out, with a registered rate of renovation of the building stock amounting to 0.7% or 1.35 million m² per year.¹ Based on that, two calls with subsidies for apartment owners for energy renovation were implemented, in 2016 and 2022. Both were filled up in record time, fulfilling only a small part of owners' demands for the renovation of older buildings. The other program is the Programme of Measures for the reconstruction of earthquake-damaged buildings in the City of Zagreb, Krapina-Zagorje County, Zagreb County, Sisak-Moslavina County and Karlovac County. Although the first version of this program was adopted in 2020, it is fair to say that the overall and systematic post-earthquake renovation has not even started yet.

As will be presented below, the above identified issues of building maintenance and management are also reflected in the views and attitudes of the surveyed representatives of co-owners of multi-family buildings in Croatia.

2 Methodology

Data collection was conducted using an online survey questionnaire, prepared in the *Limesurvey* system. The questionnaire was prepared based on a review of relevant literature and media reports on the issue of maintenance and management of multi-family buildings. The questionnaire featured both closed and open-ended questions, as well as Likert-type rating questions with scales ranging from three to five points, depending on a specific variable (more details on each analysed measure is provided in the Results section). For the purposes of this paper, the following issues were analysed: satisfaction of the representatives of co-owners with the building, technical maintenance of the building, including its energy renovation, cooperation of the representatives of the co-owners with the managers, and the organizational framework within which they act. The study was carried out on a convenience sample of representatives of co-owners of multi-family buildings in Croatia. Due to the fact that companies (public and private) that manage multi-family buildings did not want to forward the survey on representatives of co-owners because of the General Data Protection Regulation, we decided to collect data through social networks. Thus, the participants accessed the online questionnaire via a link distributed in the closed *Facebook* group "Representatives of co-owners" that assembles representatives of co-owners

¹ In the period till 2030 the goal is to increase the renovation rate to 3%, which is why the Long-term Strategy for National Building Stock Renovation by 2050 was prepared. Renovation programs are envisioned also by the Integrated National Energy and Climate Plan 2021-2030 (Fond za zaštitu okoliša i energetska učinkovitost, 2022).

Table 1 City and period of construction of the building

City	Period of construction of the building			Total (%)
	Before 1945	1945–1990	After 1991	
Osijek	0	5	1	6 (1.7)
Rijeka	9	14	3	26 (7.4)
Split	1	9	1	11 (3.1)
Zagreb	52	107	63	222 (62.9)
Other	3	63	22	88 (24.9)
Total (%)	65 (18.4)	198 (56.1)	90 (25.5)	353 (100)

in Croatia, mostly from Zagreb.² Eight days before the posting of the link, a notice with the description of the research, the announcement of its start and the invitation to the representatives of co-owners to participate was posted on the web portal and in the *Facebook* group “Representatives of co-owners”. The survey was anonymous, and data collection was carried out between 4th of November and 30th of December 2021.

A total of 475 participants filled out the questionnaire. After the exclusion of partially completed questionnaires, a final sample of 353 participants was formed ($M_{age}=50.1$, $SD_{age}=11.4$; 52% women). The median length of residency of participants in the building was 17 years ($IQR=26$). The detailed structure of the sample by city and period of building construction is presented in Table 1. The largest number of participants, 222 (63%), are representatives of buildings located in Zagreb. According to the construction period, the largest number of buildings in the sample was built in the socialist period (56%), followed by buildings built after 1991 (26%) and buildings from the period before 1945 (18%).

As mentioned previously, since this is the first time that a survey is carried out among the population of co-owners’ representatives, the paper primarily shows descriptive analyses and analyses of statistical significance of particular correlations, in order to acquire a thorough insight into the examined population.

3 Results

Depending on the completion rate of the questionnaires, some analyses were carried out on a sample smaller than the total, and in these cases, the size (n) of the considered subsample is indicated. As descriptive indicators of symmetric distributions measured on interval or ratio scales, arithmetic mean (M) and standard deviation (SD) are presented; for asymmetric distributions or variables measured on rank scales, median (Mdn) and interquartile range (IQR) are presented. As a criterion of asymmetry of distributions, the ratio of the skewness and the corresponding standard error greater than 3 was used (Field, 2009). Due to uneven subsample sizes and the consequent violation of prerequisites for the parametric statistical analyses, statistical tests of differences across three construction periods (before 1945, between 1945 and 1990, and after 1991) were performed by non-parametric statistical procedures (omnibus and post-hoc X^2 tests, omnibus *Mann–Whitney* tests and post-hoc

² The *Facebook* group was founded and administered with the support of zgradonačelnik.hr (<https://www.zgradonačelnik.hr/>), an informative and advisory internet portal specializing in the issues of housing and construction, as well as a partner in the implementation of this phase of research.

Table 2 Change in building satisfaction in the last five years, *f* (%)

Change in satisfaction	Total sample <i>N</i> =353	Period of construction of the building		
		Before 1945 <i>n</i> =65	1945–1990 <i>n</i> =198	After 1991 <i>n</i> =90
Decreased	90 (25.5)	26 (40.0)	35 (17.7)	29 (32.2)
Remained the same	160 (45.3)	25 (38.5)	91 (46.0)	44 (48.9)
Increased	103 (29.2)	14 (21.5)	72 (36.4)	17 (18.9)

Kruskal–Wallis tests). Post-hoc comparisons between particular construction periods were performed with Bonferroni corrected *p-value* $p=0.05/3=0.017$, in order to protect against Type I error. The article presents the results of only those tests that are relevant for its understanding.

3.1 Satisfaction with the technical condition of the building

Representatives of co-owners assessed their overall satisfaction with the building as slightly higher than the “medium”, with an arithmetic mean of 3.2 ($SD=0.8$), on a scale of 1—very low to 5—very high. Representatives of buildings constructed after 1991 estimated their general satisfaction with the building ($M=3.5$, $SD=0.8$) as significantly higher both in comparison to the representatives of buildings constructed before 1945 ($M=2.9$, $SD=0.9$), $U=1906.0$, $z=4.0$, $p<0.001$, and in comparison to the representatives of buildings from the socialist period ($M=3.2$, $SD=0.7$), $U=6534.0$, $z=4.0$, $p<0.001$; there was no significant difference between the two last categories, $U=5719.0$, $z=1.5$, $p>0.05$. Looking at the direction of the change in satisfaction with the building in the past five years, it remained the same for most of co-owners’ representatives (45%; Table 2). The percentage of those whose satisfaction increased (29%) was slightly higher than the percentage of participants whose satisfaction decreased (26%).

While representatives of co-owners in the oldest and newest buildings predominantly stated that their satisfaction with the building either did not change or has decreased, representatives in buildings built in the socialist period stated significantly more often that their satisfaction with the building increased, $X^2(4)=20.7$, $p<0.001$. On average, participants rated the quality of building construction as “pretty good”, with an arithmetic mean of 3.4 ($SD=0.8$), on a scale of 1—very bad to 5—excellent. The lowest average building quality score was determined, as expected, for the category of the oldest buildings, those built before 1945 ($M=3.2$, $SD=0.8$); at the same time, this value was significantly lower than that in the category of buildings built between 1945 and 1991 ($M=3.6$, $SD=0.8$), $U=4631.5$, $z=3.7$, $p<0.001$, but not than the value observed in the category of buildings constructed after 1991 ($M=3.4$, $SD=0.9$), $U=2426.5$, $z=2.0$, $p=0.05$. Also, no significant difference was found between the categories of socialist and post-socialist buildings, $U=8003.5$, $z=1.5$, $p>0.05$.

According to that, participants were presented with 19 possible problems or shortcomings in terms of building construction and maintenance and given the opportunity to select the three most prominent ones in the building they represent (Table 3, panel A). Thus, the largest percentage of representatives of co-owners stated that they have problems with the facade (40%), and with the roof and roof structure (33%), which is also expected because

Table 3 Most pronounced building quality/maintenance problems (%). Source: Authors

Problem/deficiency	Panel A. Most pronounced building quality/maintenance problems				Panel B. Urgent, necessary or extraordinary costs at building level over the past 5 years			
	Total sample				Total sample			
	Period of construction of the building		After 1991		Period of construction of the building		After 1991	
	Before 1945	1945–1990	After 1991		Before 1945	1945–1990	After 1991	
	<i>n</i> = 65	<i>n</i> = 198	<i>n</i> = 90	<i>N</i> = 353	<i>n</i> = 55	<i>n</i> = 158	<i>n</i> = 64	
Poor quality building materials	7.4	6.1	11.1	–	–	–	–	
Roof and roofing construction	33.4	33.8	23.3	52.0	54.5	55.1	42.2	
Façade	40.2	36.9	34.4	22.4	23.6	21.5	23.4	
Outer joinery	16.1	18.2	16.7	10.8	9.1	12.7	7.8	
Water supply system	19.8	22.7	17.8	29.2	34.5	29.1	25.0	
Water distribution and meters	19.5	25.8	6.7	–	–	–	–	
Sewage system	15.0	15.2	16.7	38.3	30.9	42.4	34.4	
Rainfall drainage system	11.3	6.1	20.0	17.3	21.8	13.3	23.4	
Heating installations	4.2	6.6	2.2	10.1	1.8	15.2	4.7	
Gas installations	0	0	0	7.9	18.2	7.6	0	
Replacing atmospheric boilers with condensation boilers	9.6	8.1	15.6	7.9	21.8	4.4	4.7	
Elevator	7.4	9.1	6.7	22.7	9.1	26.6	25.0	
Electrical installations	2.0	2.0	1.1	13.7	18.2	12.0	14.1	
Chimney	9.1	10.1	3.3	17.0	41.8	12.0	7.8	
Ventilation system	2.0	1.5	4.4	1.4	0	1.3	3.1	
Waste and waste disposal	15.6	13.6	22.2	–	–	–	–	
Stairway appearance and condition	11.9	13.6	6.7	–	–	–	–	
Entrance	6.8	4.0	12.2	39.4	21.8	39.2	54.7	
Vandalism	9.3	13.1	2.2	–	–	–	–	
Something else	3.7	4.6	8.9	6.9	7.3	3.8	14.1	
No special problems/deficiencies	9.1	9.1	10.0	15.0*	5.2*	12.7*	26.4*	

*The share of participants who stated that they have not had any urgent, necessary or extraordinary costs at building level over the past five years

these are the parts of the buildings that have been least invested in and neglected in the long term. However, this is very surprising for newer buildings that are 10 or 20 years old. In the third place, the representatives pointed out problems with water distribution (20%) because in the two older periods of construction there are often no separate water meters. Instead, they are at the level of the building, which often creates problems with maintenance but also with paying for water consumption. Only 9% of participants stated that they do not have any problems or deficiencies in their building regarding the construction and maintenance of the building.

Mentioned problems with the facade and with the roof and roofing were the most frequent in all three age categories of buildings. Thus, 58% of participants from buildings built before 1945 stated that one of the most pronounced problems in terms of the quality of construction and maintenance of the building is the facade, and 46% reported also the roof; these percentages in the category of buildings built between 1945 and 1990 amounted to 37% and 34%, and in the category of the newest buildings—34% and 23%. Onwards, in both categories of buildings built before 1991, problems related to the distribution of water and water meters occupied the third place on the list of the most pronounced problems (18% in the category of oldest buildings and 26% in the category of buildings from the socialist period). This is often a consequence of the joint calculation of water costs at the level of the building. In the category of buildings built after 1991, the third most pronounced problem was waste and its removal (22%), which is one of the main problems in the large cities of Croatia, especially in the capital city of Zagreb.

Considering the above determined need for improvements of the outer envelopes of buildings (facades and roofs), which gains additional importance both in the context of post-earthquake and energy renovation of buildings, we were interested in whether the frequency of these two problems changes with regard to the construction period. For both problems, the frequency of their mention was significantly higher in the category of the oldest buildings than in the category of the newest buildings [$X^2(1)=7.6$, for the roof; $X^2(1)=7.7$, for the facade; both $p=0.006$]. The category of the oldest buildings also differed significantly from the category of those built in the socialist period according to the frequency of problems related to the facade, $X^2(1)=8.5$, $p=0.004$.

The vast majority (277 or 85% of $n=326$) of participants stated that they had incurred extraordinary maintenance costs at the building level in the past five years, in addition to regular costs. Analysed by the construction period, the incidence of extraordinary costs increased statistically significantly between the category of newest buildings (76%, $n=87$) and the category of socialist buildings (87%, $n=181$), $X^2(1)=6.9$, $p=0.009$, but not between categories of socialist and oldest buildings (95%, $n=58$), $X^2(1)=1.9$, $p>0.05$. Of the 277 participants who had incurred some extraordinary costs at the building level in the last five years, 52% of them stated the costs related to the roof and roof structure (Table 3). About 40% of participants also stated costs related to the entrance or stairway doors (video surveillance system, intercom, etc.), or the sewerage system. About 30% of the participants had costs for the water supply system and about 20% costs for the elevator or facade. Accordingly, we were interested in whether the three age categories of buildings differed according to the frequency of costs related to the outer envelope of the building (roof and facade), however, this was not the case [$X^2(2)=3.2$, for the roof; $X^2(2)=0.2$, for the facade; both $p>0.05$]. Furthermore, 59% ($n=325$) of co-owners' representatives claim that they are planning extraordinary expenses in the next five years, in addition to regular ones. These costs are usually planned for the facade renovation (25% of responses); roof repair or replacement (including chimney repair; 17%); stairway renovation (including

common parts such as facades, entrance terraces and stairs, cellars, sheds, etc.; 11%); and installation or repair of elevators (10%).

The frequency of planned extraordinary costs for the purpose of restoring or improving the facade increased statistically significantly between the category of the newest buildings (21% of $n=43$) and the category of socialist buildings (50% of $n=110$), $X^2(1)=9.6$, $p=0.002$, but not between the categories of socialist and oldest buildings (58% of $n=40$), $X^2(1)=0.4$, $p>0.05$. The frequency of plans for the renovation of the roof and roof structure did not differ significantly between the three categories of buildings, $X^2(2)=3.8$, $p>0.05$. In accordance with these results is the finding that only 9% (28 out of $n=315$) of co-owners' representatives stated that their buildings were energy renovated (out of this number, 18 carried out the energy renovation with the support obtained from the Ministry of Physical Planning, Construction and State Property in 2016, and the remaining 10 independently). This is in line with the mentioned data of the Environmental Protection and Energy Efficiency Fund to which less than 1% of buildings managed to submit applications for the 2016 call for subsidized energy renovation from the EU Operation Programme Competitiveness and Cohesion (Fond za zaštitu okoliša i energetska učinkovitost, 2022). A further 4% (11 out of $n=315$) of participants stated that they had started the process of energy renovation in their buildings. Of the remaining 276 participants, whose buildings were not energy renovated, 46% stated that they were not planning any kind of energy renovation of the building, either independently or with the support of the Ministry. The frequency of plans for the energy renovation of buildings, with or without the support of the Ministry, was the highest in the category of buildings from the socialist period (66% of $n=146$), and, as expected, the lowest in the category of newest buildings (33% of $n=81$), $X^2(1)=21.7$, $p<0.001$. The frequency of these plans in the category of buildings constructed before 1945 was 53% ($n=49$) and did not differ significantly from the two remaining age categories of buildings.

3.2 Financial aspects of management and maintenance of multi-family buildings

The common parts of a building are financed through the financing of the common reserve fund, which is a legal obligation of co-owners. The distribution of above minimum amounts of contributions to the reserve funds was extremely positively asymmetric, with a median of 0.53 euro/m² ($IQR=0.34$). Considering the construction periods, the value of contributions to the common reserve funds increased with the age of the building: the average value recorded in the category of the newest buildings ($Mdn=3.0$, $IQR=1.0$) was significantly lower than the value in the category of buildings from the socialist period ($Mdn=4.0$, $IQR=2.0$), $U=2075.5$, $z=6.3$, $p<0.001$; this, again, was significantly lower than the average amount of reserve contributions paid by co-owners in the oldest buildings ($Mdn=6.0$, $IQR=6.0$), $U=1877.0$, $z=4.5$, $p<0.001$. In the oldest buildings, there is a permanent need for renovation or at least constant repair. About three quarters (78%, $n=324$) of co-owners' representatives stated that co-owners in their buildings pay a monthly contribution to the common reserve fund that is higher than the required minimum. Therefore, the sample showed a relatively large number of apartment owners who are aware of the need for the maintenance of buildings, and have agreed to raise the amount of common reserve, which can be done by taking out bank loans for certain investments. Considering the construction periods, the frequency of contributions being higher than the minimum was above 70% in each of the three age categories of buildings and they did not differ significantly in this respect, $X^2(2)=1.7$, $p>0.05$. About half of co-owners' representatives (52%, $n=325$)

said that the common reserve contributions in their building were increased in the last five years. The percentage of those who increased the contribution was significantly higher in the category of oldest buildings (66%, $n=58$) than in the category of post-socialist buildings (40%, $n=86$), $X^2(1)=8.3$, $p=0.004$; between these two, and not significantly different from them, is the category of socialist buildings, with a frequency of increasing the contribution of 53% ($n=181$). However, the urgency of significant investments in older buildings is further accentuated by recent earthquakes in the Zagreb and Petrinja regions. Thus, out of 38 participants from this category of buildings, 20 of them cited “earthquake” and restoration of the damage caused by it as (one of) the reasons for the increase in the reserve contributions. For comparison, in the two remaining building categories, the earthquake was mentioned only once as the reason for the increase in the reserve.

3.3 Cooperation with building managers and the organisational framework

The multi-family building management in Croatia is almost equally divided between public (city) and private management companies, as private and smaller companies are increasingly present, taking over the work of previous monopolies in this domain. Thus, slightly more than half of co-owners’ representatives (53%, $n=303$) cooperate with a private management company, while the remaining 47% of representatives have contracts with public managers. Representatives from post-socialist buildings more often cooperate with private managers (79%), than with public ones (21%). This is a significantly higher percentage than in the category of oldest buildings (where the ratio of private managers is 40%), $X^2(1)=19.27$, $p<0.001$, as well as in the category of socialist buildings (with 45% of private managers), $X^2(1)=25.43$, $p<0.001$. There was no significant difference between these two remaining categories, $X^2(1)=0.15$, $p>0.05$.

The average score of satisfaction with cooperation with management companies was also slightly above the “mean” value, $M=3.2$ ($SD=1.1$) on a scale from 1 – very low to 5 – very high. The degree of satisfaction with cooperation with the manager observed in the category of post-socialist buildings ($M=3.5$, $SD=1.1$) was significantly higher both in comparison to the category of buildings built before 1945 ($M=2.9$, $SD=1.1$), $U=1521.0$, $z=3.0$, $p<0.01$, and in comparison to the category of buildings from the socialist period ($M=3.1$, $SD=1.0$), $U=5607.5$, $z=2.6$, $p<0.01$, while there was no significant difference between these two last categories, $U=3846.0$, $z=1.4$, $p>0.05$. Representatives’ assessments of their satisfaction with managers also differed depending on whether they cooperate with a public or private company. Thus, the average level of satisfaction with public management companies ($M=2.7$; $SD=1.0$) was significantly lower than the average level of satisfaction with private companies ($M=3.6$; $SD=1.0$), $U=6298.5$, $z=7.0$, $p<0.001$. Additionally, according to their satisfaction with a particular type of company, representatives of co-owners choose more often those of the private type because they are probably more efficient and easier to cooperate with.

When problems that exist in their cooperation were singled out in more detail, participants were offered 11 options, among which they could choose those that described possible problems they had in cooperation with the manager. Most of them (36%, $n=303$) responded that they do not have significant problems in their cooperation (Table 4). In doing so, this answer was statistically significantly more frequent in the category of the newest buildings (46%, $n=83$), compared to the category of the oldest buildings (23%,

$n = 52$), $X^2(1) = 6.1$, $p = 0.01$; the category of socialist buildings (36%, $n = 168$) did not differ significantly from the two previous categories.

The remaining participants listed the following as the most common specific problems they have in cooperation with the manager: *Non-informing of co-owners' representatives about the projects and tenders announced for co-financing* (34%), *Slow response or ignoring the requests of co-owners' representatives for the implementation of works* (32%), *Preference of individual contractors regardless of price/quality* (26%), and *Insufficient offer of contractors* (21%) (Table 4). Some of selected answers for a third of representative point to absent or very weak cooperation when there are specific problems such as certain works or applications for the necessary tenders. Considering the construction periods of the building, a statistically significant difference was found for the problem of *insufficient engagement of the manager in the renovation of the building after the earthquake*. This answer, again as expected, was chosen significantly more often by representatives of co-owners in the oldest buildings than by representatives of co-owners in the two remaining categories of buildings, $X^2(2) = 43.0$, $p < 0.001$. This is not surprising, because due to the earthquake, in older buildings there was significantly more interest in the renovation of buildings, and it concerns extremely existential reasons. In this case cooperation with managers is necessary and often cannot wait, in contrast to the buildings in the other two construction periods.

4 Discussion and conclusion

Croatia is going through numerous problems, just like other CSEE countries that have a similar structure of 'super-owner occupied nations' (Lowe, 2017). This has also caused real estate management problems. The collapse of the Eastern European model of housing and transitional housing reforms have brought inauguration of the importance of the market. Common to all these models is reduction of state powers and means for action (Lowe, 2017; Tsenkova, 2013). Housing policy was neglected also in the socialist period, and after the 1990s there was no significant progress towards solving the problem of building maintenance, with everything being left to the market and financial capacities of tenants. For example, legal permission to keep common reserve funds (common funds at the level of particular building) at a minimum enables low-income households to spend small amounts on maintenance of their multi-apartment buildings, making this tolerant legal opportunity insufficient for providing adequate maintenance. Therefore, many housing policy measures that would stimulate maintenance of buildings built prior to 1945, and then of those built later in the socialist period, remain unsolved on the long term.

It can be argued that real estate owners are not a 'better-off' part of the population' (Mandič, 2017), since the common interests regarding common property (the entrance, stairways, roof, etc.) are inadequately managed and neglected by them (Rabenhorst & Ignatova, 2009). Also the problems of infrastructure maintenance (water, electricity, gas, common heating) stand out as a priority, especially if they have not been previously maintained and adequately modernized, so that many buildings built earlier and during the post-socialist period nowadays have very high energy costs (Hegedüs & Teller, 2006; Tosics & Hegedüs, 2017; Vezilić et al., 2014). Almost no steps have been made regarding energy saving. Although Croatia, like other CSEE countries, relies on EU funds, the improvement of the housing stock is not within the scope of its interest more significantly, just like in most CSEE countries (Tosics & Hegedüs, 2017). Moreover, there is also a problem of protection of individual owners and private property, often being above common interest or

Table 4 The most pronounced problems in collaboration with the manager (%). Source: Authors

Problem	Total sample N = 303	Period of construction of the building		
		Before 1945 N = 52	1945–1990 N = 168	After 1991 N = 83
Poor communication with co-owners' representative	17.5	25.0	16.7	14.5
Slow response or ignoring the requests of co-owners' representatives for the implementation of works	32.0	36.5	35.7	21.7
Preference of individual contractors regardless of price/quality	26.1	34.6	26.2	20.5
Insufficient expertise of the staff employed (e.g. insufficient knowledge of laws and regulations)	18.2	17.3	19.6	15.7
Disregard for the execution of the annual management plan	15.8	21.2	14.3	15.7
Insufficient offer of contractors	21.1	25.0	18.5	24.1
Insufficient control over spending building common reserve funds	12.5	13.5	11.9	13.3
Irregular informing of co-owners on spent common reserve funds	9.9	7.7	12.5	6.0
Non-informing of co-owners' representatives about the projects and tenders announced for co-financing	33.7	46.2	31.5	30.1
Insufficient engagement in the renovation of the building after the earthquake	15.2	44.2	11.3	4.8
There are no pronounced problems in collaboration with the building manager	36.3	23.1	35.7	45.8

even jeopardizing the interests of common property (Tocisc & Hegedus, 2017). Although change of the legal framework should result in certain investments, many owners are not motivated to invest in their real estates especially given that they are not aware of potential value of their immoveables (Gruis et al., 2009). In that sense, there is a lack of an adequate legal framework that would clearly define rights and obligations of owners (Gruis et al., 2009; Rabenhorst & Ignatova, 2009), both in CSEE countries and in the Croatian housing sector. This is also connected with a phenomenon called the *poor homeowner phenomenon* (Hegedüs & Teller, 2006), when homeowners in Central and Southeast European countries face more serious challenges in maintaining and managing their property (Mandič, 2010), which also keeps the state of stagnation constant.

Although a wider generalization of the presented results is partly limited with regard to the convenience sample of participants (most of whom are from the city of Zagreb), the current study provided important insights into the issue of maintenance and management of multi-family buildings. First of all, it turned out that the co-owners' representatives were mostly satisfied with the buildings built during the socialist and post-socialist periods, and this satisfaction was relatively stable. This can be explained by the fact that buildings built between 1945 and 1990 still meet the basic housing criteria of their tenants. Such a conclusion can be connected to existing findings from CSEE countries where there is general satisfaction and habituation to life in socialist estates (Grosmann et al., 2017; Kovacs & Herfert, 2012; Tsenkova, 2013). These estates are inhabited by a large number of tenants that have shared a similar residential environment for decades, and from this fact comes certain acceptance, although the legacy of fast building of socialist and monotonous buildings was of medium quality. Today this stock is apparently outdated and in need of repairment.

Such a pattern contrasts with the implicit assumption that building satisfaction should decline more markedly in buildings from the socialist period, compared to those from post-socialism. Such a decrease in the satisfaction of tenants of newer buildings could be further reinforced by construction defects that occur in the new residential construction (e.g. facade cracks, bursting of pipes, water leakage, poor quality construction works, etc.). Results often show that buildings constructed more recently in CSEE countries are not necessarily better in terms of quality (Tocisc & Hegedüs, 2017; Tsenkova & Polanska, 2014). The strong dissatisfaction with newer apartments can be explained by the way they were built, which also includes fast and scattered urbanism (Jukić et al., 2011) and dense commercial or developer residential construction (Stanilov, 2007). Post-socialist housing is often too dense, with inadequate infrastructural equipment, which is compensated by the already existing infrastructure belonging to neighbouring older housing estates (Svirčić Gotovac, 2015). Such problems could create unexpected housing costs for new homeowners, both financially and in terms of certain residential dissatisfaction. Also, considering the commercial and higher prices of newer apartments, the expectations of such tenants regarding the quality of construction must have been higher.

The satisfaction of co-owners' representatives with the oldest buildings, built before 1945, was generally the lowest, while at the same time featuring the most pronounced decline in satisfaction over the last five years. Such assessments were triggered by the recent earthquakes in the cities of Zagreb and Petrinja, which, owing it to their poor earthquake resistance, aggravated many of the problems these buildings had in the past due to the lower quality of construction, and non-maintenance. The oldest buildings require the greatest investments, which is visible in the presented increase of common reserve at the level of those buildings. It is therefore hard to expect that renovation shall happen soon on most buildings, because they are often inhabited by the older population that will not be able to invest or take out loans without the help of city institutions. It can thus be expected

for the Zagreb city centre, where buildings are most severely damaged, to be further derelict and to stagnate regarding the renovation of multi-family buildings (Svirčić Gotovac et al., 2021).

As with the general building satisfaction, participants assessed the quality of building construction as “pretty good”. The highest level of satisfaction with the quality of construction was observed in the category of buildings from the socialist period. Thus, according to this indicator as well, buildings constructed between 1945 and 1990 prove to be reliable and adequate in housing terms. Such data are comparable with data from other post-socialist countries where tenants mostly show satisfaction with living in apartments from the socialist period. Still, it needs to be regarded that Croatia has had an already thirty-year long transitional phase in which, as the most recent member of the EU, it lagged behind with investments in so-called energy renovation of its housing stock, primarily facades and roofs, which are also the greatest problems that representatives are facing. Therefore, there is still an ongoing neglect and almost negligible investment in the socialist housing stock. As a consequence, it experiences dissipation of the population’s social structure and population ageing, because younger families with children, and the upper-middle class are less and less prone to buying apartments in older housing estates, and more inclined towards investing in the newer housing stock. In this sense the obtained results are similar to other post-socialist countries (Tsenkova, 2013; Tsenkova & Polanska, 2014). In addition to all said, Croatia is probably the only remaining post-socialist country that does not have a housing act, while the current Act on Ownership and Other Real Rights requires amendments, necessary for providing a stronger regulation and activation of the housing policy sector. The legal framework is the basis that enables protection of co-owners’ rights and more efficient solving of financial and organizational problems (Mandič & Filipovič Hrast, 2018).

One of the problems that we encountered in the research is weak management of common parts of multi-family buildings (Rabenhorst & Ignatova, 2009). It is visible in the satisfaction with cooperation with the management company, which was reported as “mediocre”. Public management companies often lack professional competences and initiative to represent co-owners in the right way (Gruis et al., 2009; Mandič & Filipovič Hrast, 2018). Co-owners, on the other side, do not have enough control over managers, so that common parts of buildings most often remain neglected. At the same time, this suggests a lack of cooperation in implementing changes. Also, many ‘do-it-yourself’ interventions damage the visual image or otherwise harm the buildings (statically or in the sense of energy efficiency) (Mandič & Filipovič Hrast, 2018). Older buildings are technically very weak and require massive comprehensive repairs, while buildings from the socialist period require repairs related to various types of energy loss and improvements (isolation, facades, roofs, windows etc.). At the same time, the largest number of participants stated that “there are no pronounced problems in cooperation with the manager”. In both indicators (the level of satisfaction and the lack of pronounced problems in cooperation), co-owners’ representatives from buildings built after 1991 were at the forefront—reporting the fewest problems. An explanation for such assessments within the category of newest buildings can be their generally better physical condition, and therefore their easier maintenance.

Finally, it can be concluded that in performing their duties, co-owners’ representatives are faced with various challenges and often lack support. Insufficient financial resources, insufficient involvement of building managers, and the existing organisational and legislative framework in Croatia—are just some of the problems that co-owners’ representatives face. The research pointed to the need of comprehensive maintenance of the multi-family stock, because otherwise they suffer from serious technical deficiencies. Energy renovation

as an opportunity for renovating real estates is still not taken seriously enough, neither by state institutions, nor real estate owners. According to current data, financial resources from EU funds are not enough for all who want to renovate their real estates, which is accompanied by a lack of interest among co-owners for greater investments in building maintenance. The obtained results served to point to the condition of real estates built in different periods, and to outline in which aspects the commons parts of buildings are neglected. In that sense, the attitudes of co-owners' representatives represent an important information on the type and urgency of works that should be implemented on buildings immediately, distinguishing them from lower-level works (Gruis et al., 2009).

Thus, these briefly sketched, but very concrete measures at several levels (co-owners, representatives, managers, city and state) are necessary for further improvements in the complex domain of housing policy. These data can contribute to facilitation and acceleration of the process of maintaining and improving of the housing stock and to instigate stronger engagement of all parties involved. The final result could be the renovation of a larger number of older buildings, but also easier maintenance of newer ones. Also, the obvious conclusion is that targeted policies are necessary, because co-owners still have a 'tenant mentality', along with the creation of a 'new management culture' in multi-family buildings. Research suggest a possible conflict of interest between co-owners and management companies, who, due to their ignorance, neglect or non-professionalism, do not necessarily work in the interest of real estate owners (Mandič & Filipovič Hrast, 2018).

Furthermore, future research should be directed towards verifying current findings in the samples of co-owners themselves, as well as on expanding analyses by taking into account additional determinants of multi-family building management, such as its social components and features of cooperation between representatives and co-owners. Considering that this is the first survey of this type, conducted on a convenient sample, the following research should involve representative samples of different Croatian cities and housing estates, so that it could provide insight into wider social, financial and legislative aspects of that cooperation in every particular city.

Funding This work was supported by the Croatian Science Foundation (HRZZ) under Grant [IPS-2020-01-7036] within the framework of the Slovenian-Croatian bilateral project entitled *Quality of Living in the Housing Estates of the Socialist and Post-socialist Era: a Comparative Analysis between Slovenia and Croatia*.

Declarations

Conflict of interest The authors report there are no competing interests to declare.

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