

Identifying Design Trends in Mass Housing Development

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Abstract

Mass housing development is a global phenomenon that provides a subtle indicator towards population, urbanization, and economic growth. It centred itself in high volumes production with effective costing and construction techniques, promoting adequate living within standardized conditions. However, the current situation witnessed issues regarding mass housing quality and performance, which urged a reassessment of its model, regulatory framework, environmental conditions, and urban impact. Note that these contexts emphasize the design obsolescence risk gap caused by the deficiency of the modernist ideal. As such, this study provides insight into the emerging patterns and trends in the mass housing development literature that advocate its future design. Data were collected by using thematic review (TR) analysis on 30 articles published in SCOPUS and WoS databases from 2018 to 2023. The findings demonstrate five design trend themes: Contemporary Lifestyle Program, Dynamic Permeable Territory, Systemic Adequacy, Regional Energy Efficiency, and User Experience Design. These trends contribute significantly to the need for socio-spatial integration within mass housing design and its impact on urban territories, which helps improve environmental performance and innovate technological change beyond the existing IHS method. Consequently, the result also suggests that future studies in mass housing design should be able to redefine new habitational frameworks promoting contemporary needs and lifestyles that are substantially neglected today.

Keywords: Mass Housing Design, Contemporary Lifestyle, Sustainable Model, Housing Adequacy

Introduction

The current stage of mass housing development is debatable. On the one hand, it tackles the acute housing shortage; on the other, it has been criticized for its negative social, economic, and environmental impact (Zolfaghari et al., 2023). The primary factor for the rise of mass housing correlates to the need for urban housing, characterized by large-scale housing

projects aiming to produce multi-story and multi-block designs due to the shortage of urban land resources (Gür & Yüksel, 2019). As urban condition is concerned, scholarly discussion rendered mass housing into multi term context, including social housing (Chippagiri et al., 2021), mass-industrialized low-income housing (Habid et al., 2019), affordable housing (Olanrewaju & Tan, 2018), incremental housing (O'Brien et al., 2020), post-war mass housing (Kaasalainen & Huuhka, 2020), public housing (Fakere & Duke-Henshaw, 2019), and large housing estate (Antypenko & Benkó, 2022). In these cases, it is essential to note that the mass housing model is not a singular subject. It entails a combination of units, blocks, and neighbourhood enclaves in which several housing types co-exist, hence demonstrating the complexity of impacts towards sustainable living (Gür & Yüksel, 2019).

Since the 1920s, the intersection of the modern movement and the housing question has influenced how mass housing is developed. Its ideology is rooted in the utopian pursuit of modernist ideals centred within the family home. In this context, the edifice was viewed as the hub of a utopian desire that could be potentially used for educating the mass (Kallis, 2020). This phenomenon enlightened the modernist architects to focus on the 'minimum dwelling' program of affordable, hygienic, and scientific design that could be produced in a mass scale of industrial prefabrication (Antypenko & Benkó, 2022). In addition, it also seeks a broader program of social change between lower- and middle-class society (Kallis, 2020). From the perspective of the socialist block, the development of mass housing was shaped by the Soviet political agenda emphasizing collectivism, hence rejecting the class and social hierarchy (Manahasa et al., 2022., Drémaité, 2022). However, as early as the 1970s, the limitation of this approach was recognized whereby facilities, neighbourhoods and settlements did not function as planned (Milovanović et al., 2023) due to the quality problems of existing housing stock (Asan & Özsoy, 2018). According to Zolfaghari et al (2023), the mass housing from the '60s to the 80s, after decades of continuous use and inadequate maintenance, revealed inadaptable responses of its interior conditions to the current needs of the occupants, shows high energy consumption and CO2 emission and high maintenance costs.

Furthermore, centralized mass housing consistently failed to reach low-income households while demotivating individual entrepreneurship (Bunster & Bustamante, 2019). This is evident in the context of peripheral mass housing complexes that act as the urban expansion catalyst and a spatial fix tool for marginal groups of slum dwellers and urban poor, which had resulted in the increasing of their distance towards employment opportunities, creating social isolation, imposing unaffordable housing provision, and generating incompatible style of living (Borsuk & Eroglu, 2020). On the other hand, it inflicts a high concentration of poverty and crime (Jegade et al., 2018), increasing social polarization, low energy efficiency and inequality in cities (Milovanović et al., 2022), and resulting in complex ownership situations and ongoing destruction (Shevchenko, 2022).

In extending the standardized and functionalist mass housing approaches, there is an alternative attitude towards housing customization to empower the inhabitants' needs and desires. The Open Form concept in late 1950 by Oskar Hansen was presented at the CIAM congress in Otterlo to evoke the creative role of the individual as the co-author of the space (Eloy & Vermaas, 2022). This was followed by Hundertwasser's Manifesto Against Rationalism in Architecture in 1958, which offered a radical extreme solution of Open Form through wall modification. Subsequently, Fumihiko Maki 1964 published his theory of Collective Form, emphasizing multi-facet design for individual and public environments via a bottom-up planning approach (Eloy & Vermaas, 2022). However, one of the most important concepts

was outlined by John Habraken in 1972 through the 'Open-Building' approach (Lily, 2021; Eloy & Vermaas, 2022). In this concept, the powers of dwellers were recognized by the duality components of 'support' infrastructure and 'detachable units' that correspond to participatory design by inhabitants. This structure was later used to develop Incremental Design housing or progressive housing that enhanced adaptability through a self-built approach controlled within the base unit parameter set by the architects (Lily, 2021). Note that this conception indicates a strong trajectory of architectural agency through 'form', which coincides with two contexts: (1) Herman Hertzberger's polyvalence concept that accentuates form's ability to incite interpretation by formal, spatial, and relational activity – which also relates to Habraken's idea, and (2) the critics by Dutch Structuralist movement concerning on the logic of functionalism that had a corrosive effect on the society by imposing uniformity (Lily, 2021). This phenomenon allowed for user-centric approaches in mass housing, ensuring stronger coherence between household needs and the characteristics of their residential environment (Bunster & Bustamante, 2019).

The fallacy of affordability and the cookie-cutter solution embedded within the current state of mass housing development are undeniable and led to negative stigma (Powell, 2021., Jegede et al., 2018). However, in developing countries, its significant impact in forming urban morphology of the suburban metropolises and facilitating housing shortage for the urban residents (Talebian & Özmen, 2019) indicates a strong motivation for further adaptation and innovation. Therefore, taking this dialectic phenomenon as the point of departure, this study intends to explore the future design of mass housing development by posing the following research question:

RQ1: What are the current design trends on the mass housing development found in the literature from 2018 to 2023?

Method

The term thematic review (TR) through ATLAS.ti 23 software was introduced by Zairul (2020); (2021); (2023); Zairul & Zaremohzzabieh (2023) as the method that applies the thematic analysis procedure in a literature review. According to Clarke and Braun (2013), thematic analysis is a pattern identification process leading to specific themes over comprehensive reading on the subject. In brief, a TR as a literature review involves identifying, analyzing, and synthesizing themes. Meanwhile, according to Zairul et al (2023), the use of ATLAS.ti software allows for high accuracy and efficient analysis of data to strengthen themes exploration. In this context, the software is useful in managing literature and references, defining research topics and questions, demonstrating theoretical frameworks, integrating research material, describing factual qualities, and building analytical interest. These attributes of ATLAS.ti ensured that the thematic analysis process was conducted consistently and thoroughly.

The following step explains the pattern identification and categories construct to understand the current design trend of the mass housing development. In this setting, the interpreted findings highlight the recommendation of future research in the mass housing subject through design endeavour. The selection of literature was performed based on several selection criteria: 1) Publication from 2018 – 2023, 2) Portray to at least the keyword(s) mass housing, design, and development, 3) Focusing on the design trend of the mass housing development. Note that the intention to avoid any specific country of study preferences was made to help define a holistic overview of the worldwide phenomena in the mass housing context.

Table.1

Search strings from Scopus and WoS

SCOPUS	TITLE-ABS-KEY ("mass housing") AND TITLE-ABS-KEY (design AND development)) AND PUBYEAR > 2017 AND PUBYEAR < 2024 AND (LIMIT-TO (LANGUAGE , "english")) AND (LIMIT-TO (SRCTYPE , "j"))	37 results
WoS	"Mass Housing" (All Fields) and Design AND Development (All Fields) and Article (Document Types)	32 results

Source: Author

The literature search was performed in the SCOPUS and WoS databases. The preliminary search produced 37 articles from SCOPUS and 32 WoS articles. However, 39 articles were removed due to unrelated topics or not showing any discussion on mass housing. Also, there were cases whereby articles were found to be incomplete, inaccessible, had disconnected links, overlapped, or revealed incomplete metadata. Thus, the final paper reviewed was rationalized to only 30 articles (Figure 1). Filtered articles were uploaded in the ATLAS.ti 23 as primary documents, which later divided into (1) author, (2) issue number, (3) periodical, (4) publisher, (5) volume and (6) year of publication. These distributions allow all articles to be analyzed based on the year of publication, hence correlating the pattern of discussion according to the year. Therefore, the total number of articles concluded as the final documents in the ATLAS.ti 23 was 30 documents. Note that only English language papers were selected. Results were separated into two parts consisting of quantitative and qualitative findings.

A few steps were to be applied in conducting TR analysis (Figure 2). The first step required a clearly defined research question, which act as the basis of the reviewed process while ensuring focus and relevancy on the discussed topic. The next step is to identify research studies and the sources, which involves keyword-based searching, including through electronic databases, reference lists, and hand-searching significant publications, organizations, and conferences. After identifying relevant articles, inclusion and exclusion criteria were used to filter for the most significant studies for the review. In this step, the TR process required extensive readings on a specific subject to develop themes and was further expedited by ATLAS.ti software as well as including general bibliometric information. Subsequently, the documents were filtered further in Mendeley to tally their metadata according to the APA format, particularly on the authors' names, including the first and the last names. Publication dates were also verified to avoid errors in the Mendeley library, and the abstracts were captured to grasp the article's essence.

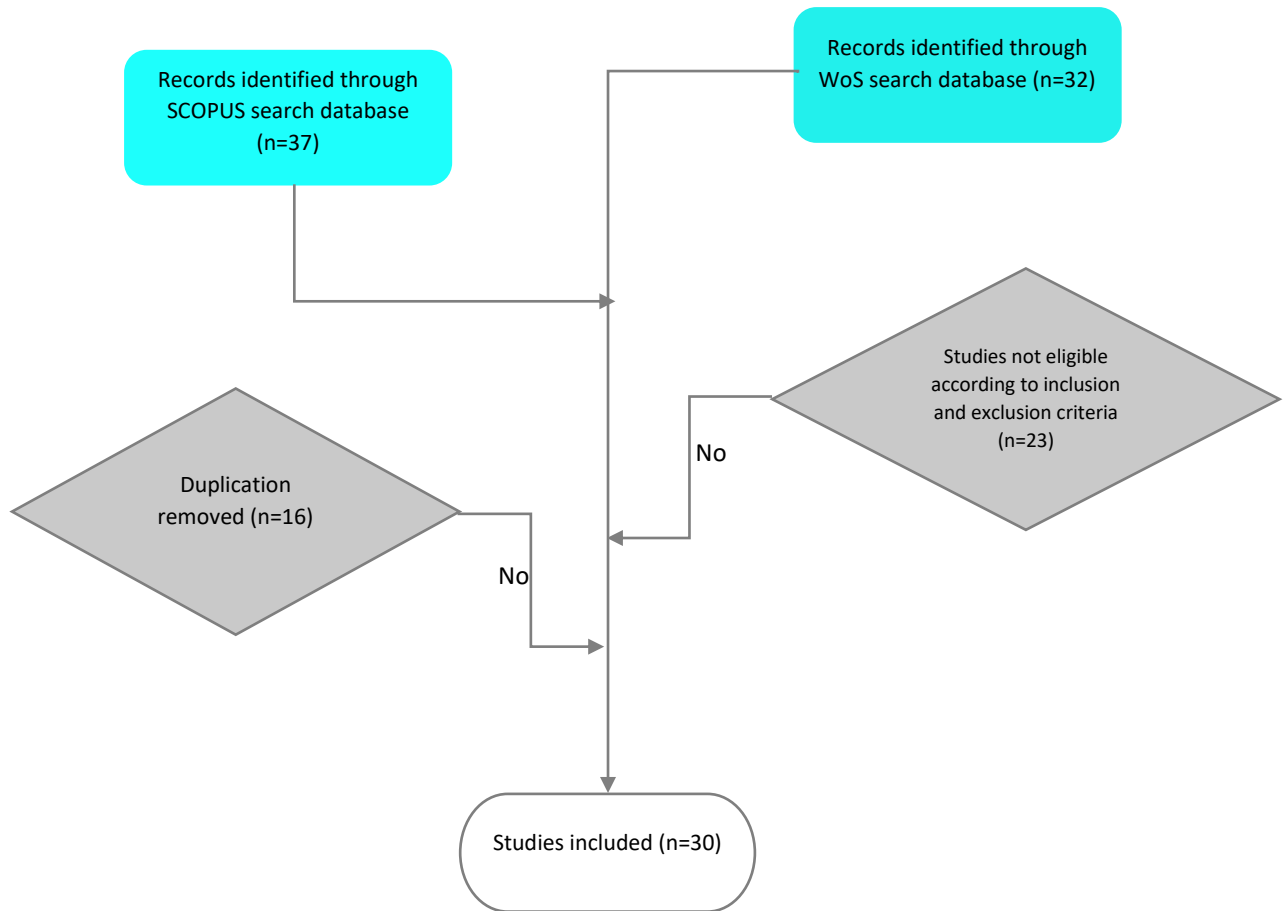


Figure.1 Inclusion and Exclusion criteria in the thematic review
 Source: Author

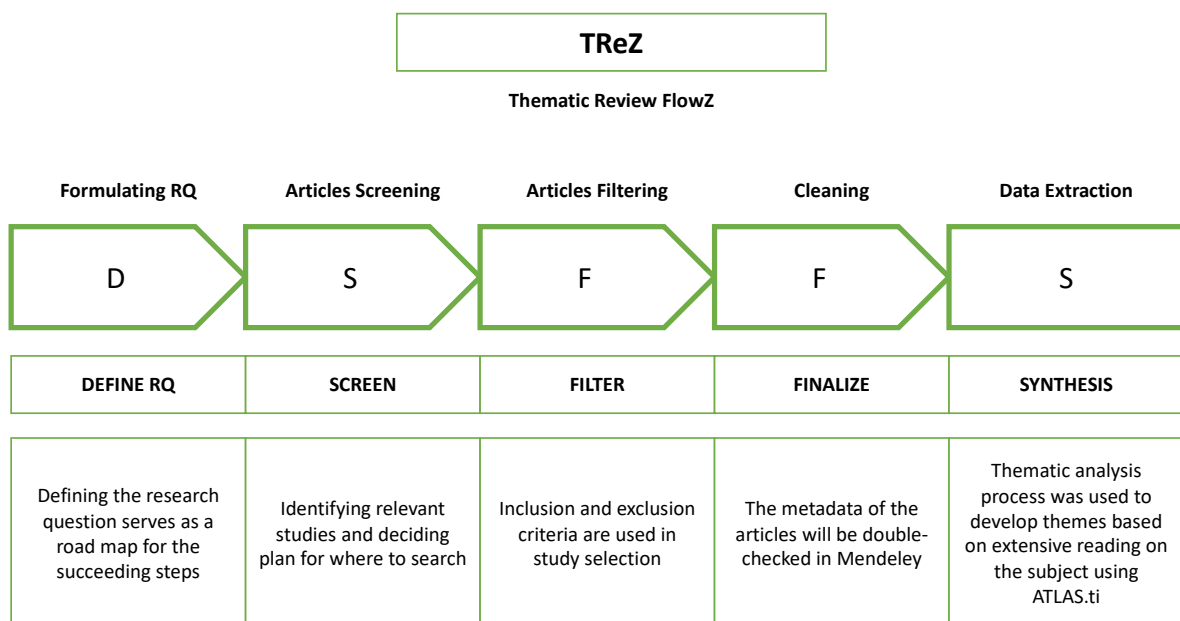


Figure.2 Thematic Review Flow, TReZ
 Source: Zairul et al. (2023)

Result And Discussion

The findings are structured in two parts involving quantitative and qualitative analysis. The former emphasizes geographical and publication distribution concerning countries of study and the subject of discussion. Subsequently, a descriptive analysis of the observed themes related to the Research Question (RQ) is discussed in the latter section.

Quantitative Results

In this section, data generated from ATLAS.ti 23 is mapped in Microsoft Excel to identify the geographical dispersal of this study (Figure 3). From the record, Turkey contributed to the most studies on mass housing development. These studies are based on five (5) topical contexts ranging from the issues of displacement within peripheral mass housing development as discussed by Borsuk and Eroglu (2020), environmental improvement in urban housing through courtyard integration by Ayçam et al (2020), mass customization issue as in the article by Garip et al (2021), TOKI's performance through transaction cost discussed by Tatlı et al (2022) and the stakeholder satisfaction in determine design quality mentioned by Eryürük et al. (2022).

Subsequently, Germany highlighted four (4) studies encompassing the discussion about modern materials and structures by Pastukh et al (2022) in comparison to the Russia Federation context, optimization of heating, cooling, and lighting energy performance by Košir et al (2018), on the application of modular cross-laminated timber construction for temporary and seismic condition by Bhandari et al (2023), and rehabilitation towards social equality as discussed by (Milovanović et al., 2022). Note that the rehabilitation issues relate to the case studies found in other countries, including Serbia and North Macedonia (Milovanović et al., 2022). In the case of modular cross-laminated timber, this study was also conducted in the United Kingdom, Austria, and Sweden (Bhandari et al., 2023). In addition, heating, cooling, and lighting optimization were also discussed in the case of Iceland, Greece, and the United Arab Emirates (Košir et al., 2018).

Iran and India outlined three (3) studies, respectively. In Iran, studies show an inclination towards housing's interior rehabilitation examined by Zolfaghari et al (2023), assessment of social sustainability indicators as demonstrated by Karji et al (2019) and an analysis of the notion of becoming in the context of Mortafa housing as explored by Talebian and Özmen (2019). Meanwhile, in India, the focus is given on the application of sustainable prefabricated wall technology based on the article by Chippagiri et al (2021), followed by Shetty and Dash (2018) on the demonstration of prefab construction technology and finally on the impact of natural ventilation towards life cycle energy and life cycle cost as discussed by (Sharma and Sharma, 2022). On the other hand, China and Serbia make up two (2) studies each. In China, Ceshmehzangi (2018) emphasizes the impact of urban design controls on contemporary urban housing. Also, Zhai and Tong (2022) reflect on the morphological evidence of the changing boundaries in the Lilong settlement. In the context of Serbia, the mass housing studies were depicted through the reprogramming and rehabilitation of the Mass Housing Neighbourhood (MHN) by Milovanović et al. in 2023 and 2022.

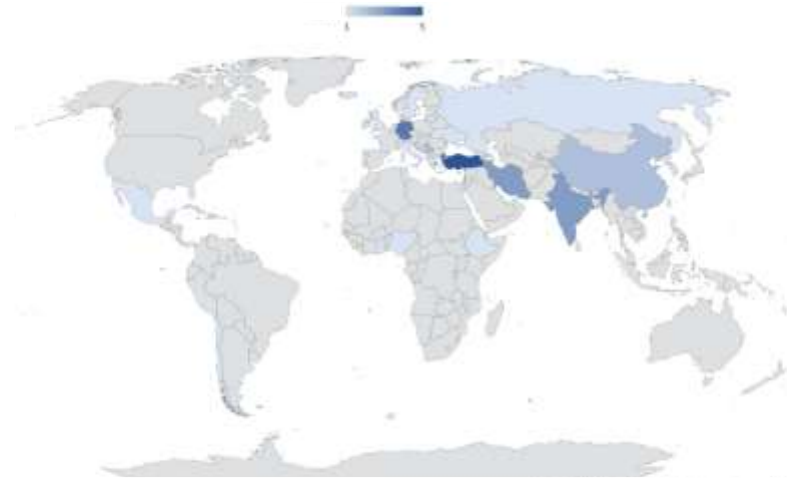


Figure.3 Geographical Dispersion according to country

Source: Author

The rest of the countries relate to only one study each. In Italy, the focus is given to the theoretical aspect related to the minimum dwelling concept in Garbatella model housing by Kallis (2020), which also relates to the social concept as discussed by Rakonjac et al (2022) in the effect of lighting for open spaces activities in Croatia and identity crisis in North Cyprus as argued by (Sokienah, 2021). In terms of urban issues, Manahasa et al (2022) explained the heterogeneous context in housing typologies in Albania, followed by Antypenko and Benkó (2022) on functional diversification of large housing estate in Hungary, and Jegede et al (2018) on the practised of housing defensible space in Nigeria. Furthermore, in the aspect of project performance, in the case of Ghana, Kwofie et al (2022) examined communication performance in repetitive attributes projects. At the same time, Shevchenko (2022) explained Ukraine's mass housing development in the 20th century, which may correspond to the findings by Daget and Zhang (2020) in Ethiopia on the decision-making model for the industrialized housing system (IHS). There is also a study on the environmental impact, specifically in the case of Mexico, which relates to the passive design strategies in building envelopes, as experimented by (Reyes-Barajas et al., 2020). Moreover, in the context of personalization, a discussion by Drémaité (2022) on Co-operative housing in Lithuania could be the basis for developing a predictive personalization model in Chile, as explored by (Bunster and Bustamante, 2019).

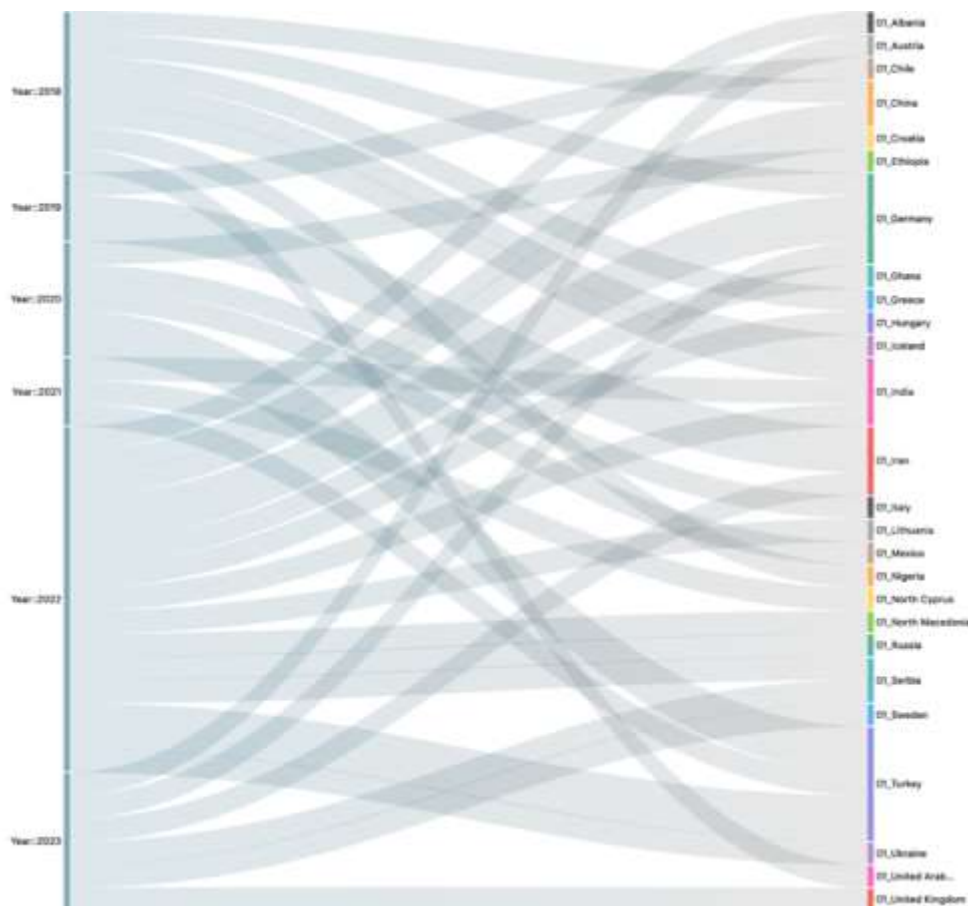


Figure.4 Country dispersion according to year

Source: Author

In addition, data in Figure 4 explored the relation between years of studies and countries. 2022 contributed to the most studies on 15 findings, with significant evidence highlighted in Germany and Turkey. Subsequently, 2018 outlined seven (7) studies, six (6) studies in the quarter of 2023, and five (5) studies documented in 2020, with the majority captured through Turkey's cases. The minor data were tabulated in 2019 and 2021, demonstrating three (3) studies respectively and led by Iran's domination. Furthermore, Table 2 demonstrates the relationship between the authors and the finding themes that shall be explained further in the qualitative section.

Qualitative Results

The qualitative component of this paper intends to evaluate the emerging themes related to the research questions. Concerning the future trends of mass housing in the articles published from 2018 to 2023, five (5) prominent themes could be considered, as listed in Figure 5. The themes are (1) Contemporary Lifestyle Program, (2) Dynamic Permeable Territory, (3) Systemic Adequacy, (4) Regional Energy Efficiency, and (5) User Experience Design.

Table.2

Author vs theme generated

	THEME 1 Contemporary Lifestyle Program	THEME 2 Dynamic Permeable Territory	THEME 3 Systemic Adequacy	THEME 4 Regional Energy Efficiency	THEME 5 User Experience Design
Manahasa et al. (2022)	~	/	~	~	~
Daget and Zhang (2020)	~	/	~	~	~
Sokienah (2021)	~	/	~	~	~
Zolfaghari et al. (2023)	/	~	~	~	~
Garip et al. (2021)	~	~	~	~	/
Bunster and Bustamante (2019)	~	~	~	~	/
Jegede et al. (2018)	~	/	~	~	~
Pastukh et al. (2022)	~	~	~	/	~
Chippagiri et al. (2021)	~	~	~	/	~
Borsuk and Eroglu (2020)	~	/	~	~	~
Cheshmehzangi (2018)	~	/	~	~	~
Košir et al. (2018)	~	~	~	~	/
Antypenko and Benkő (2022)	~	/	~	~	~
Tati et al. (2022)	~	~	/	~	~
Eryürük et al. (2022)	~	~	~	~	/
Shetty and Dash (2018)	~	~	/	~	~
Sharma and Sharma (2022)	~	~	~	/	~
Kallis (2020)	/	~	~	~	~
Rakonjac et al. (2022)	/	~	~	~	~
Milovanović et al. (2023)	/	~	~	~	~
Karji et al. (2019)	/	~	~	~	~
Drémaité (2022)	~	~	~	~	/
Bhandari et al. (2023)	~	~	/	~	~
Zhai and Tong (2022)	~	/	~	~	~
Milovanović et al. (2022)	/	~	~	~	~
Reyes-Barajas et al. (2020)	~	~	~	/	~
Shevchenko (2022)	/	~	~	~	~
Ayçam et al. (2020)	~	~	~	/	~
Kwofie et al. (2022)	~	~	/	~	~
Talebian and Özmen (2019)	/	~	~	~	~

Source: Author

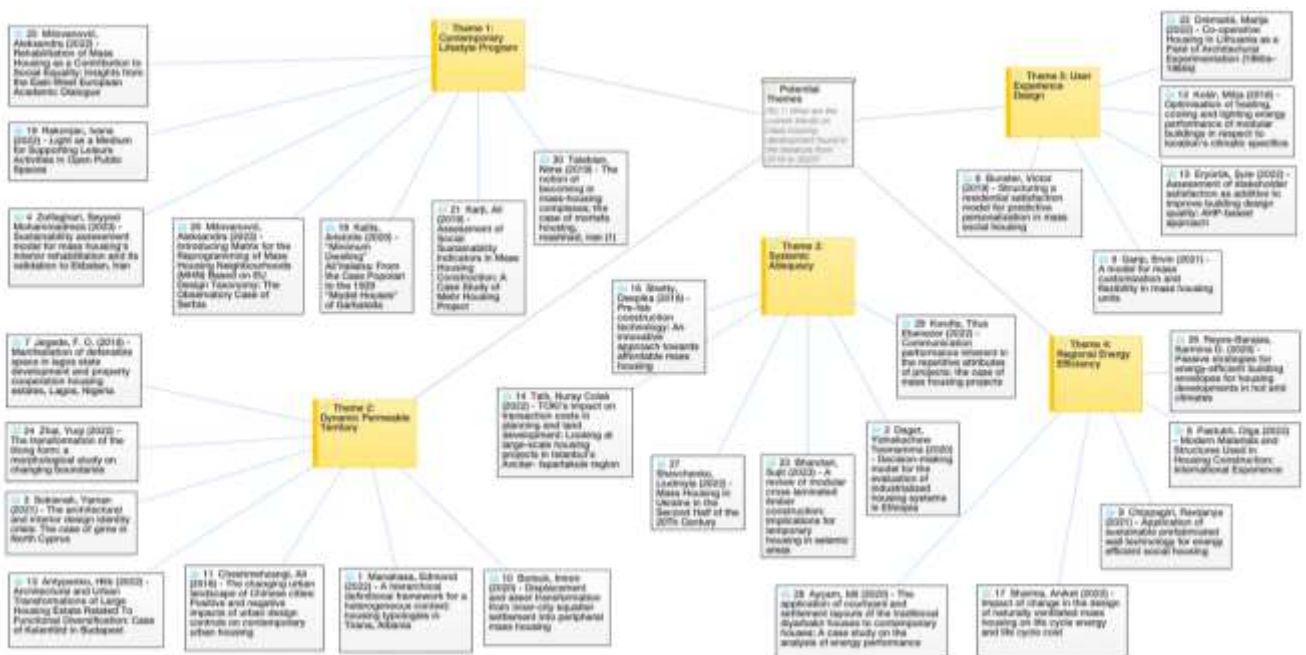


Figure.5 Overall network to answer RQ

Source: Author

Theme 1: Contemporary Lifestyle Program

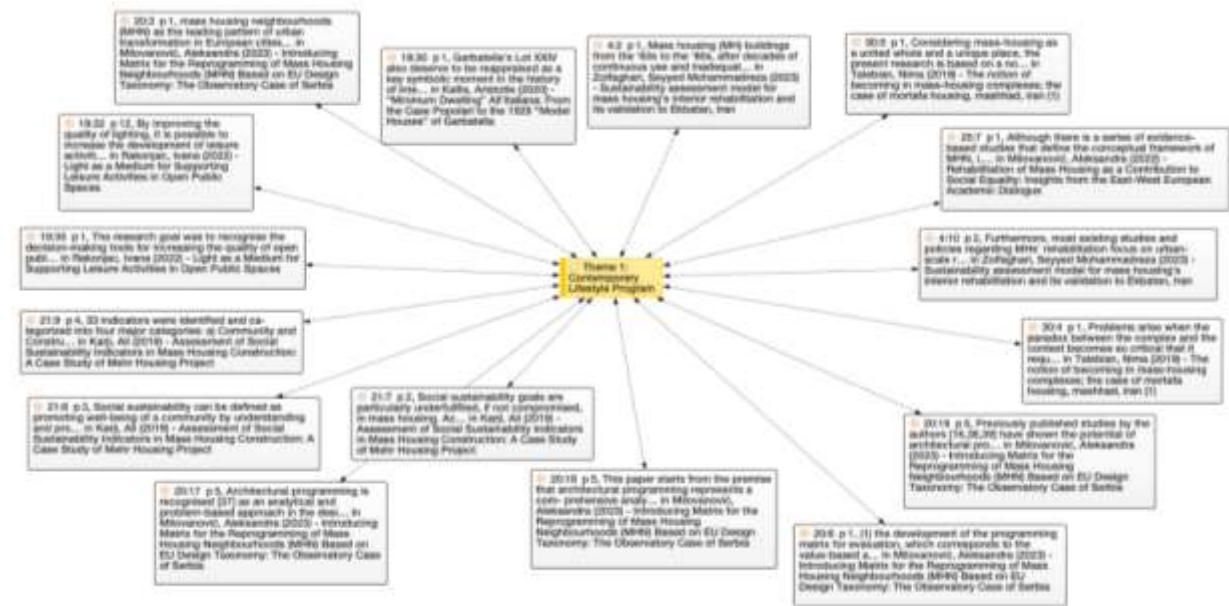


Figure.6 Theme 1 – Contemporary Lifestyle Program

Source: Author

The fact that mass housing is a product of post-World War development underpinning by utopian modernism had resulted in a scalable model of modern “minimum dwelling” (Existenzminimum). Based on the study by Kallis (2020), this conception emphasized rational design based on functionality and was implemented worldwide to overcome the housing crisis. However, in the recent discourse, the context of abandoned Garbatella’s Lot XXIV experiment in Rome developed by the Institute of Public Housing (Istituto per le Case Popolari, ICP) is re-evaluating as providing juxtaposition for an alternative – a “third-way” vision of architectural design – for urban social housing that is more rooted to the natural and cultural environment as opposed to the international register of modern housing solutions brought by CIAM (Kallis, 2020). According to Talebian and Özmen (2019), this reassessment of nature and cultural performance is now relevant due to problems centred on considering places as fixed entities and neglecting the becoming notion of mass housing complexes. Bearing in mind that place is not a static product but an ongoing dynamic process in the state of constant becoming, the context of Mostafa housing in Mashhad, Iran, demonstrates a critical paradox between complex and the context, which led to various action of urban intervention, gentrification, re functioning or demolition. Subsequently, in the case of Mehr housing in Iran, Karji et al (2019) agreed that social sustainability is underqualified since existing mass housing perpetually contributed to adverse social outcomes such as social inequality and disadvantaged neighbourhoods. Social sustainability can be defined as promoting the well-being of a community by understanding and providing their social needs and preserving their cultural and spiritual values, thus potentially contributing to the improved lifestyle of occupants (Karji et al., 2019).

Critics made by Rakonjac et al (2022) on the lighting design in existing mass housing settlements in Croatia revealed a lifestyle paradox between modernist and contemporary living. In this study, the perception of modernist design had incurred living rigidity due to the predetermined solution of utopian ideals and mass culture. By imposing a constraint on recreational dimension only in day-time activities, modernist living narrowed nightlife to

small gathering and movement orientation, hence the minimal lighting design that neglects green area infrastructure. On the contrary, contemporary living, which is based on cosmopolitan life of individual 'free will', shows a preferred lifestyle centred on non-regulated consumption of time and spontaneous activities. Shifting lifestyle through improving the quality of lighting in residential areas led to the possible development of leisure activities in accordance with contemporary urban living (Rakonjac et al., 2022). The study by Milovanović et al (2023) and (2022) describes that this transition could relate to the value of architectural programs, recognized as an analytical and problem-based approach in the design process that is developed through specific contextual circumstances of exponential urban development and urbanity growth which involved changing patterns of everyday life, industrialization, mass construction, and standardization. This model is widely applied in the case of reprogramming evaluation for Mass Housing Neighbourhood (MHN) in Serbia, North Macedonia, and Germany (Milovanović et al., 2023., Milovanović et al., 2022). In fact, this scenario coincides with the rehabilitation process of mass housing's interior, such as in the case of Ekbatan Mass Housing in Iran, as explained by (Zolfaghari et al., 2023). This phenomenon is crucial based on the National Human Activity Pattern Survey, which shows that more than 87% of a person's lifespan in modern society is spent indoors, and the number increased due to the recent Covid-19 Pandemic lockdowns. Moreover, interior spaces affect multiple criteria of sustainability aspects, including energy consumption, CO2 emissions, and waste generation in buildings as well as their inhabitants' psychology, behaviour, well-being, and productivity.

Theme 2: Dynamic Permeable Territory

Although mass housing is defined through repetitive and standardized notions, Manahasa et al (2022) confirmed that it may be subjugated through a heterogenous context that is formed by the territorial interrelation of typological schemes and morphological patterns. In the case of Tirana, the assimilation concerning mass housing typologies with a political period, particularly the Soviet Neoclassicist and legality statuses, highlight socioeconomic and cultural parameters within mass culture. These factors potentially formalized mass housing form, aesthetics, envelopes, and spatial attributes, justifying the polarity between the notion of homogeneity and heterogeneity (Manahasa et al., 2022). Indeed, the study by Sokienah (2021) revealed that this notion stirred an identity crisis in mass housing which emphasize a globalized image over local character due to the influence of economic and political globalization.

The symbiotic relationship between mass housing and urban context caused a domino effect. In the study of China's urbanization by Cheshmehzangi (2018), the increase in floor area ratios in Chinese urban housing intensified its compactness and density, harming life satisfaction, well-being, and energy consumption. In this situation, Cheshmehzangi (2018) proposed that the best feasible housing might be manifested through

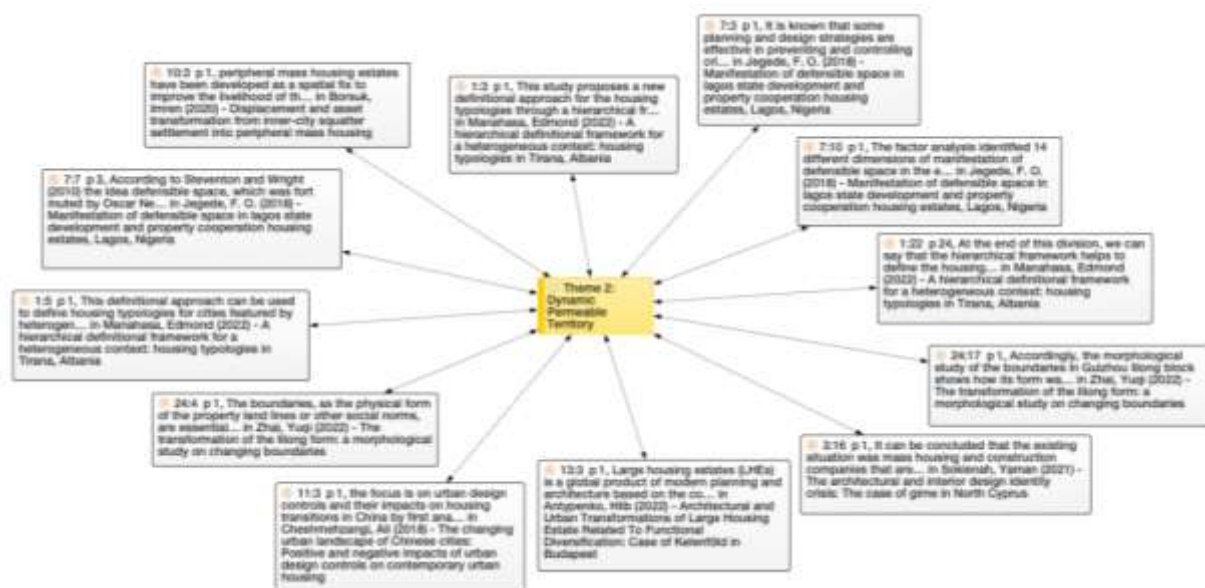


Figure.7 Theme 2 – Dynamic Permeable Territory

Source: Author

The mid-rise solution of a small linear block model. This is to allow territorial permeability of social and environmental conditions, as opposed to the existing massive block housing development. A similar scheme is introduced by Antypenko and Benkő (2022) in Budapest, where the focus is given to the notion of a mixed development of a small residential block. This strategy critiques the 'functional city concept' of large housing estates (LHS) in Hungary, which are gradually transformed from predefined facilities distribution into functional diversification following rising consumption demand. The proposals advocate the fundamental idea of changing private and public space boundaries by manipulating solid and void. This duality stands the test of time based on the case of Lilong form transformation from 1845 to 2016, described by (Zhai and Tong, 2022). In this context, the author approved that the boundaries reflect the evolution of social changes by demonstrating morphological adaptation to the imposed regulations and changing communities.

The dynamism of territories in mass housing could generate positive and negative assets. In the case of defensible space, as discussed by Jjegede et al (2018), effective design strategies and planning are potentially led towards neighbourhood security, providing positive value in return. On the contrary, the study by Borsuk and Eroglu (2020) discovered that peripheral mass housing in Turkey demonstrates the growth of market-based processes and financial assets at the expense of intangible assets of household relations and social capital. This has caused the urban poor to be more vulnerable to displacement pressure due to the new territorial context limiting their livelihood and oppressed livability (Borsuk & Eroglu, 2020).

Theme 3: Systemic Adequacy

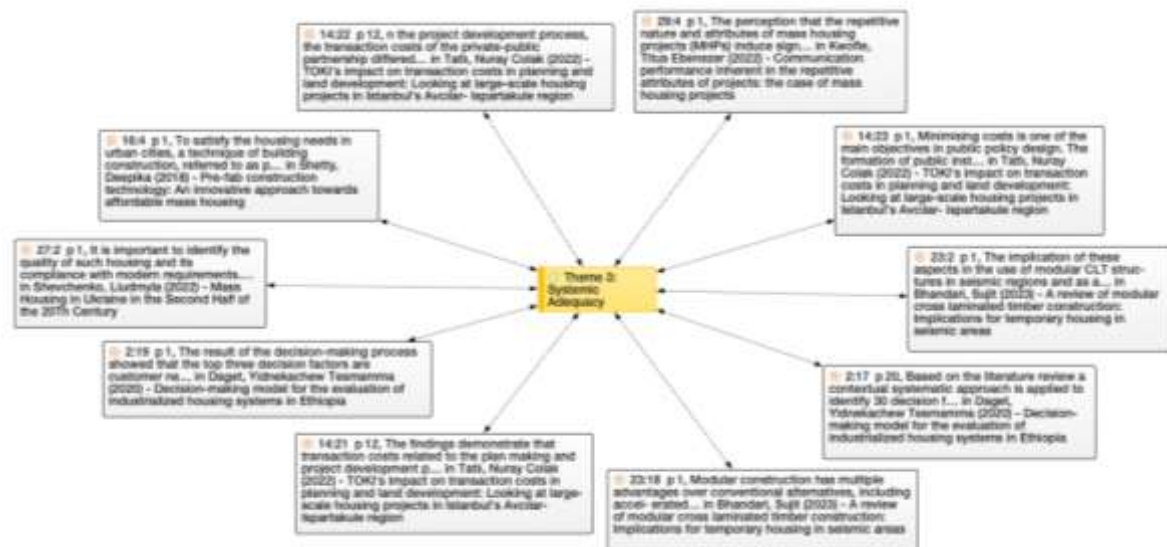


Figure.8 Theme 3 – Systemic Adequacy

Source: Author

For a century, mass housing development experienced revolutionized constructional methods due to the practice of fast-track production and the increased demand for housing supply. The study by Daget and Zhang (2020); Shetty and Dash (2018) confirmed that prefabrication being part of the industrialized housing system (IHS), had stood as the most reliable method, hence transforming itself into a 'type' referred to as 'prefab architecture'. In the current state of its implementation, the focus is given to providing adequate and affordable models with excellent quality architecture that promotes economic and material efficiency, safety measures and limiting environmental impacts (Daget & Zhang, 2020; Shetty & Dash, 2018). Note that while this transition is an enhanced model of its early production, its implementation, particularly in developing countries, is subjected to the specific IHS decision factors ranging from the construction industry, customer need, the supply chain, infrastructure, the environment, and finally socio-political context (Daget & Zhang, 2020). In the case of Ethiopia, the focus is given to the top-three decision factors whereby precast concrete beams, slab blocks, and agro stone panels are identified as suitable housing systems (Daget & Zhang, 2020).

Moreover, the study by Bhandari et al (2023) revealed a new emerging study related to modular cross-laminated timber (CLT). This material and technique provided benefits for temporary and rapid mass housing in seismic regions through accelerated build schedules, greater certainty on build costs, times, and quality, and less waste during construction. However, due to the limited concentration of CLT manufacturers and supply chains, only the European region shows its vast implementation with other continents in minimal numbers and none in Asia and South America (Bhandari et al., 2023).

Despite constructional trends, the current mass housing development demonstrates adequacy in project management through the project implementation process and policy regulatory system. In this context, the study by Tatli et al (2022) indicated that the current scenario is inclined towards a centralized managerial agency as a successful regulator for the mass housing project. This is further enhanced by the integration of effective communication through repetitive attributes of mass housing, as discussed by (Kwofie et al., 2022). In

addition, Shevchenko (2022) agreed that both aspects are equally important due to the poor quality of existing mass housing resulting from inefficient managerial conduct and complex ownership situations in adapting to current needs and regulations. In the case of TOKI (the Mass Housing Administration - Toplu Konut İdaresi in Turkish), explained by Tatlı et al (2022), its policy control on mass housing project draws a direct effect on the private-public partnership (PPP) and the private developer particularly in regulating hidden transaction cost. Although it gives more advantages to PPP, the more extended period of the land development process pushes higher transaction costs hence overall housing price, leaving more benefits for private land deals (Tatlı et al., 2022). Meanwhile, communication among project teams (PT) based on mass housing development's repetitive attributes must be controlled within an aligned managerial system using specific sharing behaviour (Kwofie et al., 2022). This could improve development performance and ensure suitable quality housing for sale.

Theme 4: Regional Energy Efficiency

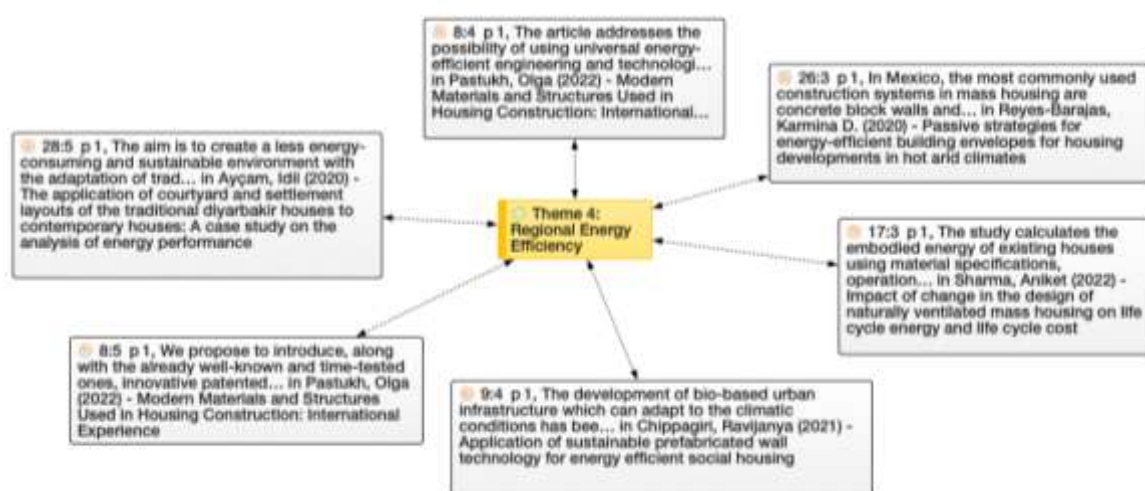


Figure.9 Theme 4 – Regional Energy Efficiency

Source: Author

Climatic concerns had called for energy efficiency in the construction industry, particularly the mass housing sector. In the recent trends demonstrated in five studies conducted by Pastukh et al (2022); Chippagiri et al (2021); Sharma and Sharma (2022); Reyes-Barajas et al (2020); Ayçam et al (2020), all the researchers agreed that energy consumption of the mass housing is controlled through applied modern materials, prefabricated housing components, construction method and technological system of building envelopes and regional adaptive design. Note that these attributes measured life-cycle cost to life-cycle energy consumption, particularly in heating and cooling, thermal transmittance value (U-value), surface and operative temperature concerning comfort value and spatial design energy performance. (Pastukh et al., 2022., Chippagiri et al., 2021., Sharma & Sharma, 2022., Reyes-Barajas et al., 2020., Ayçam et al., 2020). In the study of housing construction in the Russian Federation and Germany by Pastukh et al (2022), emphasis is given to the application of energy-efficient solution through modern innovative technologies and materials which is developed following International European LEED and BREEAM and Russian GREEN ZOOM standards. Modern materials, including precast reinforced concrete panels, ventilated façade technology, double-shell construction, renewable raw materials, and non-ventilated roof, allow rapid construction, enhanced retrofitting strategies for long-term development and increased

energy efficiency. Besides, they also help to improve aesthetics and comfort (Pastukh et al., 2022).

Moreover, Chippagiri et al (2021) explained that the need to establish affordable mass housing at 8000 units per day in India led to the development of prefabricated housing solutions using agro-industrial by-products and materials. Through comparative simulation, this method is more adaptive to the high tropical climatic condition, which reduces peak cooling load by six times, making structures energy efficient. Note that this result is in line with the thermal behaviour study and energy performance of mass housing in the hot arid climate of Mexico. According to Reyes-Barajas et al (2020), implementing bioclimatic adaptation techniques through thermal insulation and opaque ventilated facades helps improve thermal comfort. Hence most preferred by the locals.

Conversely, analysis of the life cycle cost and life cycle material of the mass housing prototype model in Himachal Pradesh, India, shows a significant relation concerning embodied and operational energy to the house design attributes. In this case, Sharma & Sharma (2022) revealed that building with compact shapes consumed less energy due to the lesser exposed area, justifying that total energy consumption is proportioned to the compactness ratio. Whereas lighting load is affected by Window Wall Ratio (WWR), suggesting higher WWR resulted in better daylighting, with increased heat gain, heat loss and unwanted glare. Furthermore, adapting the bioclimatic design of traditional houses to contemporary development helps to create a less energy-consuming and sustainable environment. This is due to the unique spatial attributes of the courtyard structure form that allows for passive cooling and shading, which caused temperature differences between indoor and outdoor environments (Ayçam et al., 2020).

Theme 5: User Experience Design

Observing users' satisfaction with mass housing is challenging. According to Bunster and Bustamante (2019), despite having standardized quality, mass housing demonstrates prevalent modification, signifying mismatches between the attributes of housing provision and the requirement of the dwellers. While it could be subjected to multiple reasons, the modification often demonstrates constant response over household needs neglected by its original state, suggesting the occupants live with minimum performance standards (Bunster & Bustamante, 2019). This dilemma is a recurring phenomenon, which is responsible for a new creation of mass housing typology at specific intervals, such as in the case of 1962's 'Co-operative Housing' in Lithuania. In this context, Drémaité (2022) posits a hypothetical stance that the development of this typology stimulates architectural experimentation that confronts the archetype of the Soviet apartment and the shortage of its production. In principle, as the co-operative concept allows residents to contribute their funds to building their homes, it permits commoners to gain access to material wealth in the form of better housing, hence inculcating Soviet's middle-class group. One crucial change that co-operative housing offered was the possibility of better-to-do citizens securing quality living (Drémaité, 2022). In current trends, this situation propagates to user experience as a critical dimension of mass personalization. In this process, mass housing is approached as a dynamic product-service ecosystem corresponding to changing occupancy patterns at different stages of the housing's life cycles (Bunster & Bustamante, 2019).

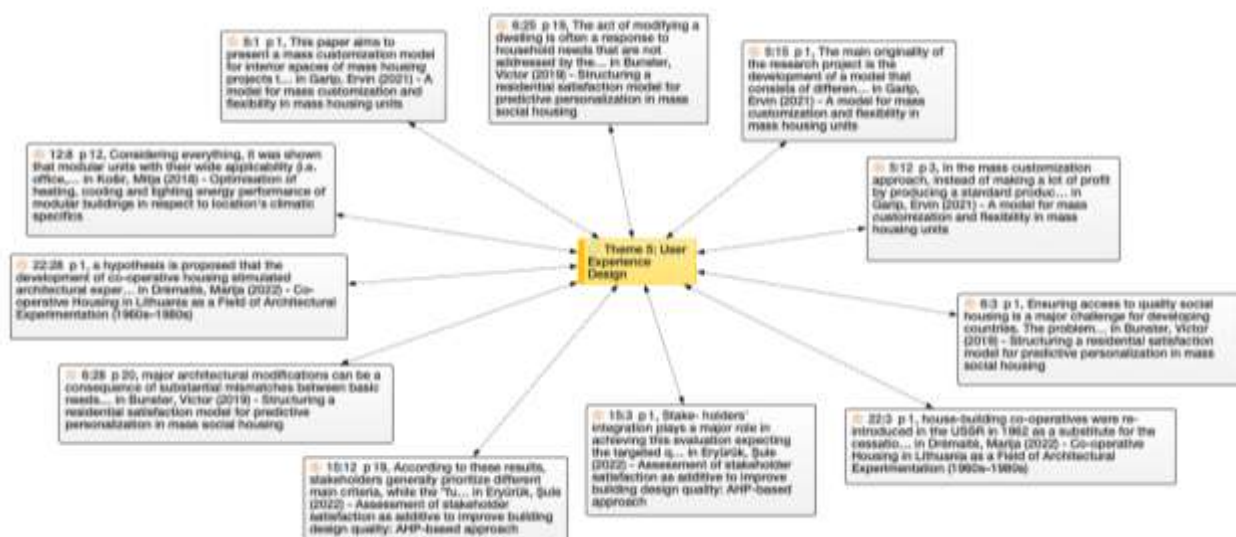


Figure.10 Theme 5 – User Experience Design

Source: Author

Personalized mass housing requires unique customization tools. In the study by Garip et al (2021), the tools manifested specific models according to the different spatial configurations generated by the design variable, hence differentiating solutions based on users' needs and preferences. In this case, mass customization centred on manipulating possibilities created by information systems such as computer-enabled design and automated manufacturing (Bunster & Bustamante, 2019), to produce a specifically tailored design as opposed to the mass production of repetitive cost-cutting product (Garip et al., 2021). Indeed, the potential in tailoring to preferences represents mass personalization, hence the users' experience design. According to Eryürük et al (2022), it is evident that the validity of this innovational process relied on stakeholders' satisfaction to uphold a certain quality and standard, in which functionality signifies the highest rank of importance in the production of mass housing. Indeed, the process of personalization-customization could be further extended into the environmental dimension as per Košir et al (2018) in their proposed (bio)climatic conditioned customization that is deemed potential to enhance environmental comfort in the prefabrication of modular units.

Analysis on opportunities, challenges, and recommendation for future development of the mass housing

The shift of the modernist society to the contemporary way of life hallmarks the progress of the mass housing development. The study by Rakonjac et al. (2022) explains the effect of 'free choice' in lifestyle resulting in new contents and activities had caused the rhythmic change of life that conflicts with the modernist ideal (Milovanović et al., 2023). This phenomenon is remarkably peculiar as the change is not centred on functionality or practicality but is prone to fluidity and indefinity. In the context of modernist architecture characterized by deterministic function (Manahasa et al., 2022), rational design (Kallis, 2020), segregated urban planning (Cheshmehzangi, 2018), monofunctional pattern with the tendency for superblock (Milovanović et al., 2023), and independent from historical references (Antypenko & Benkő, 2022), there is a synergetic value that prompts to this transition. According to Milovanović et al (2023), examining the fundamental nature of the design problem occurring

in mass housing production reveals the critical need towards human approaches involving social and cultural values.

For this reason, the human dimension is now moving from a human-centred to a life-centred perspective, becoming more significant in the post-COVID era. Thus, housing should consider inhabitants' background and culture in promoting a new lifestyle where 'sustainability matches style'. Bearing in mind the lack of studies on the physiological factors, the impact of the ageing society, disabilities, and decreasing trend of household sizes on the mass housing schemes. In line with this phenomenon, one way to measure is through architectural programming based on values consisting of environment, human, social, systemic, temporal, economic and aesthetic aspects (Milovanović et al., 2023).

While quantity and supply are the antecedents of mass housing, the recent trend shows substantial effort to improve its environment's design quality. The relationship between the typological aspect and territorial setting discussed in the mass housing and urban issues outlined dichotomy of values concerning homogenous and heterogenous urban context (Manahasa et al., 2022), impact of modern and traditional culture (Sokienah, 2021; Ayçam et al., 2020), multifunctional over monofunctional (Antypenko & Benkó, 2022), public and private relation with the subset of open and close market (Zhai & Tong, 2022), risk and safety (Jegade et al., 2018), and transition over stagnation (Cheshmehzangi, 2018; Borsuk & Eroglu, 2020). These values indispensably led to the notion of designing for the circular economy, which supports (1) the cultural approach by maintaining, re-use, renovating and retrofitting existing housing blocks; (2) the functional approach through adaptive design concerning changing needs, user lifestyle and behaviour; (3) the technical approach by implementing easy replacement and direct use; and (4) the material approach which highlights recycling and upcycling design principles and utilization of sustainable materials (Milovanović et al., 2023). Approaches 1 and 2 concerning rehabilitation and adaptation are dominant challenges that require substantial analysis, while 3 and 4 relate to the ongoing exploration affecting systemic adequacy and energy efficiency.

Affordability has long been the tenet of mass housing development. In the current decade, it is evident that this principle tends to highlight the collision of climatic targets with social cohesion, renovation of existing housing with diversified use and ownership and meeting energy performing requirement while balancing minimum energy efficiency standards (Milovanović et al., 2023). In this case, climatic resilience could only be afforded through efficient systemic and energy solutions. Daget and Zhang (2020) stated that the rationale decision made in the selection of innovative IHS technology led to achieving affordability and quality by means of sustainable clean material and improved environmental comfort (Chippagiri et al., 2021., Pastukh et al., 2022). This decision might be better implemented through direct control of managerial agencies on specific mass housing projects (Tatlı et al., 2022) by taking advantage of its repetitive characteristics as compartmental solutions in handling information sharing and construction methods (Kwofie et al., 2022). In addition, the use of IHS technology in the form of prefabricated modular must also take into consideration the capabilities and nature of developing countries (Bhandari et al., 2023; Manahasa et al., 2022; Pastukh et al., 2022). Findings show that most mass housing projects are currently developed within this block of nations where the mixture of heterogeneous contexts is probably contrasting to the homogenous conduct of the "Western world" (Manahasa et al., 2022). In this case, it is interestingly evident that localized prefabricated system achieved affordability through enhanced cost efficiency demonstrated by local production and assembling while manifesting excellent adaptive energy performance based on geographical

context (Shetty & Dash, 2018., Sharma & Sharma, 2022., Chippagiri et al., 2021; Reyes-Barajas et al., 2020).

Furthermore, there is a strong impetus on the user experience design in mass housing development, particularly in the era of post-COVID (Milovanović et al., 2023). Underpinning by the need to achieve psychological satisfaction, this propagation led towards adaptability and personalization through technological advancement articulated by mass customization data and manifested via a mass personalization model produced through a mass production process (Bunster & Bustamante, 2019., Garip et al., 2021). This unique phenomenon emphasizes individuality within commonality, as outlined by contemporary living. However, the fact that this process is based on expectations prior to implementation, it is critical for developers to comply with such expectational standards to avoid further unsatisfactory conditions (Bunster & Bustamante, 2019). In addition, introducing bioclimatic conditioned customization (Košir et al., 2018) must be further investigated to integrate energy driven according to users' needs and demands. Should this exploration succeed, it will be an excellent investment towards a future sustainable model for mass housing development.

Conclusion

This study posits the thematic directions of mass housing development through current design trends and scenarios discussed from 2018 to 2023. Despite showcasing numerous issues, the study manages to shed the potentiality of this archetype through its philosophical underpinning, which demonstrates a clear transition from the modernist approach into contemporary living. These findings help investors, developers, and policymakers explore the fresh demands of the new generations. Subsequently, this study also acknowledged the influence of modernist strategies in developing sociological characters for the mass housing inhabitants. It points out neglected aspects and its notion of becoming based on several modernist models that shaped globalized societies. The correlation between sustainable urban planning and the typological study stated by these existing models provides innovative inputs for designers and planners to encapsulate sociological paradigms for urban residents, particularly in the recent post-pandemic period. Moreover, this study also emphasizes the users-designers relationship within the mass housing development, which could entail better adaptation and higher post-occupancy satisfaction. In this relation, users benefit the most as they are given the flexibility to continuously modify their living environment according to the current demand and desire, hence allowing the growing household trend.

Affordability concerns have driven this study to highlight the need for an inclusive managerial strategy to ensure excellent mass housing quality. This strategy creates a double-edged advantage not only regarding project management but also in the constructional process, specifically on prefabrication modular units, which at some point are still considered as a second-class solution for housing. Most importantly, this study underlines the criticality of energy efficiency to overcome climatic challenges. By taking advantage of the disparity moved and substantial impact of developing countries in making the mass housing market, energy efficiency could be further explored through the lens of localized bioproduct and prefabrication in building sustainable and resilient contexts.

As such, the themes encapsulated by the notion of the contemporary lifestyle program, the dynamic territorial permeability, the systemic adequacy, the regional energy efficiency, and the user experience design monopolized design trends of the mass housing development captured in the literature within 2018 to 2023. In this context, they emphasize making housing affordable in urban growth to provide support towards a sustainable and resilient society.

This tendency aligns with the United Nations Sustainable Development Goal 11 on ensuring sustainable cities and communities whereby adequacy, safety, sustainability, and affordability become the main priority to improve living conditions, particularly in developing countries due to urbanization, rising populations and increasing migration.

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