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Analysing Key Spatial Design Parameters for Millennial Living Across Global Contexts

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Abstract - This research paper explores the spatial design parameters critical for accommodating the lifestyles and preferences of millennials in global urban environments. Millennials, characterized by their unique social behaviors, technological adeptness, and value for community, demand living spaces that reflect their dynamic and flexible lifestyles. This study investigates key design elements such as adaptability, communal integration, visual connectivity, and spatial diversity. By analysing contemporary architectural practices and case studies from diverse global contexts, the paper provides insights into creating residential environments that enhance social interaction, adaptability, and a sense of belonging for millennial residents.

Key Words: millennial; shared living; flexible design; adaptable design; community engagement; spatial parameter; urban dwelling; social sustainability; participatory design; millennial living; spatial privacy

1. INTRODUCTION

To understand the importance of generational differences, we first need to define the term "generation". A generation is a group, which can be identified by year of birth, age, location, and significant events that create their personality (Guha, 2010; Smola & Sutton, 2002). Major life events such as wars, technological advancements, or major economic transitions moulds the personality, values, and expectations of a generation (Hauw & Vos, 2010). Over the past eighty years, four main generations have dominated the world: Baby Boomers, Generation X, Millennials, and Generation Z (Kaifi, Nafei, Khanfar, & Kaifi, 2012).

BABY BOOMERS	GENERATION X	MILLENNIALS	GENERATION Z
1946 - 1964	**1965 - 1979**	**1980 - 2000**	**2000 - Present**
The generation who grew up in the post-World War II era, marked by economic expansion and major social changes such as the Cold War and civil rights movements, valuing hard work and traditional structures.	The generation who witnessed the shift from industrial to digital economies, shaped by the end of the Cold War and the rise of personal computing, known for their independence and emphasis on work-life balance.	The generation reaching adulthood in the early 21st century. Also known as Generation Y, they have been shaped by the technology revolution that saw computers and the internet become central to work and life.	The digital natives who have grown up with social media and global connectivity, shaped by climate change awareness and the COVID-19 pandemic, known for their pragmatism, and social consciousness.

Table -1: Different generational cohort

2. RESEARCH METHODOLOGY

The methodology involves utilizing literature and evaluation research methods in achieving objectives identified earlier.

1. Literature study on millennials and their characteristics from global contexts.
2. Qualitative analysis of different key factors in millennial living.
3. Case study analysis of millennial living from diverse global contexts.
4. Comparative analysis of determinants and their influence in case studies.
5. Derivation of spatial design parameter for millennial living as research findings.
6. Conclusion.

3. DEFINITION OF MILLENNIALS

Millennials, also known as Generation Y (Gen Y), represent the demographic cohort following Generation X and preceding Generation Z. The term "millennial" was coined by Neil Howe and William Strauss in their book “Generations: The History of America’s Future, 1584 to 2069” (Howe and Strauss, 1991). Born between 1980 and 2000, millennials have come of age during a period marked by rapid technological advancements, globalization, and significant political changes. This generation is the first to grow up as digital natives, having access to vast amounts of information with the press of a button or the swipe of a screen (Kaifi et al., 2012). However, millennials also reached adulthood in the shadow of the global economic crisis, which has shaped their behaviors and experiences in unique ways. This generation exhibits different life choices and preferences compared to their predecessors, significantly influencing how they live their lives. The distinct set of circumstances under which millennials have grown up sets them apart from previous generations, influencing their approach to work, social interactions, and living arrangements. Today, millennials constitute a substantial demographic in urban populations worldwide, playing a crucial role in shaping the future of urban living.

4. CHARACTERISTICS OF MILLENNIALS

As generations evolve, so do the defining characteristics of those born within specific time periods. Each generation is marked by distinct traits shaped by the significant events and conditions experienced during their formative years. According to generational experts Neil Howe and William Strauss, generations can be understood as "people moving through time" (Howe & Strauss, 1991). The defining characteristics of each cohort are influenced by pivotal events they encounter as they progress through life. These events can be either subjective, affecting individuals personally, or collective, impacting society as a whole.

The characteristics of millennials may vary by region and by individual, but based on their age and collective variety of social and economic condition, they may experience the same history and the mindset. So based on this certain common characteristics about millennials could be explained, which includes ambition, confidence, outspokenness, liberalism, self-centeredness, diversity, education, collaboration, trend-orientation, easy-going nature, curiosity, enthusiasm for social media, pursuit of work-life balance, demanding nature, non-conformity, high expectations, consumerism, sense of civic duty, esteem for work, moderate tolerance, competitiveness, strong social identity, social responsibility, technological savvy, optimism, reality orientation, and openness to change (Guha, 2010; Kowske, Rasch, & Wiley, 2010), (Kaifi et al., 2012) (Deal, Altman, & Rogelberg, 2010) (Kowske et al., 2010).

5. MILLENNIAL LIVING

Millennials are known for their distinctive lifestyle choices, including a preference for flexible living arrangements, a strong sense of community, seamless integration of technology and spatial diversity into daily life (Bowes.J. et al. 2018). As architects and urban planners strive to meet the evolving needs of this demographic, understanding the spatial design parameters that resonate with millennials becomes crucial, which defines the following key considerations,

1. The importance of communal integration with a strong hierarchy of sharing and spatial privacy to foster a sustainable social interaction and a sense of community.
2. The need for adaptable and flexible living spaces that can evolve with residents' changing life circumstances.
3. The role of participatory design approach in enhancing these social dynamics, as essential components of millennial living environments.

5.1 HIERARCHY OF SPATIAL SHARING

The general idea of community living being the reduction of private areas in the profit of the community is contradictory to the conception of living being the highest form of privacy (Schmid, 2019). Hence, significant attention must be devoted to delineating the boundaries between private and communal spaces.

As psychologist, Schmid said “a system of shared spaces with different functions, varied infrastructure, and a diverse user group ensures a balance between appropriation and utilization" (Schmid, 2019). Consequently, the diversity of communal areas becomes paramount. Embracing this diversity is crucial for orchestrating a seamless transition from communal to private spaces, underlining the importance of the concept of sharing spheres in this context.

5.1.1 Sharing sphere concept

The sharing sphere contains four distinct spheres each characterized by varying degrees of privacy. The bedroom is the most intimate and the outdoor spaces are the most open. Before designing a communal space, it is important to define in which sphere it belongs. Their place in the transition needs to be established wisely for the space to play the expected role. The symbol of the sphere also shows that each of the common areas has to be considered with equal importance to result in a smooth and natural transition from public openness to private intimacy (Ahn, et al., 2018).

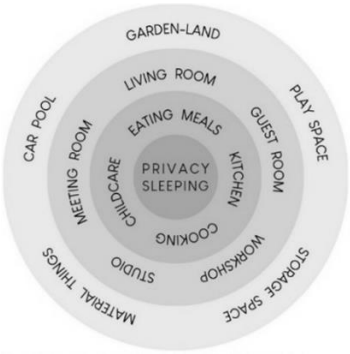

Fig -1: Sharing sphere concept (Ahn, et al. 2018)

5.2 TRANSITION OF SPATIAL PRIVACY

Here's the six transitional spaces concept that have been theorized by the English architect Serge Chermanyeff to explain the spatial privacy transition from public to private (Alexander & Chermanyeff, 1971),

5.2.1 Urban public

Urban public spaces represent areas accessible to all, often seamlessly extending from the street without barriers. Here, buildings engage with the street, adopting either an open or closed stance. Transitional spaces within this category encompass visually and physically open environments like courtyards and lobbies, facilitating interaction and connection between the built environment and the surrounding urban fabric.

5.2.2 Urban semi-public

In the urban semi-public realm, accessibility is granted beyond an initial sensory or physical threshold. However, this space is accessible only to a limited segment of the general public. The threshold may denote access to public functions exclusive to members or areas visually disconnected from the main street, such as secluded gardens or secluded entrance halls.

5.2.3 Group public

Within the group public domain, entry is restricted solely to community members, rendering it physically closed to outsiders. However, it typically maintains visual openness to entice community members. This area often serves as the initial point where residents begin to establish a sense of belonging. Examples of such spaces include open communal areas like common rooms, expansive corridors, and stairwells.

5.2.4 Group private

Slightly asjacent to the communal core are shared spaces for a smaller group gathering where the individual freedom and communal freedom overlap (Pereyra & Rapponen, 2019). These areas encompass more intimate settings such as guest rooms, workshops, or laundromats. Additionally, certain less connected corridors may also be categorized as group private spaces.

5.2.5 Family private

Reserved for family members or closely knit clusters, the family private space accommodates a limited number of individuals, typically not exceeding five. This transitional zone comprises a family apartment or an intimate shared outdoor area, fostering a sense of familial closeness and exclusivity.

5.2.6 Individual private

The private room is the most private interior space the domain of freedom with the most distance from any societal rules (Nierhaus & Nierhaus 2014). This sanctum characterized by a significant threshold, is typically secluded from external influences. Bedrooms or single-person units exemplify this category of transitional space, serving as havens of personal retreat and reflection.

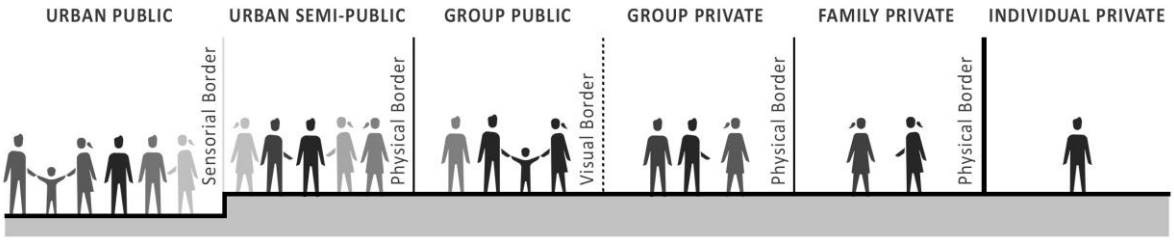

Fig -2: The six transitional steps of spatial privacy (Alexander Chermanyeff, 1971)

5.3 ADAPTABLE & FLEXIBLE DWELLING

Adaptable & Flexible dwelling is an approach to design with user at the centre of the design process and considers the need for change and adaptability over the course of lifetime; social and technological change and user input through the ability to increase or decrease unit size as a family unit grows or shrinks.

Schneider and Till (2005) argues that adaptable housing design should offer opportunities to the occupants instead of dictating ways of living, which resonates with millennial's traits (Schneider & Till, 2005). Schneider and Till believe that these opportunities can be offered in three ways;

1. Ability to customise homes,
2. Potential to adapt prior to occupation and
3. Potential to make changes post occupation.

Habraken (1999) sees dwellings as a relationship between people and environment and with his concept, also referred to as the Open Building approach; he looks into ways of creating social harmony (Habraken, 1999). He identifies three conditions for creating successful communities with social cohesion.

1. Firstly, as little as possible should be decided on what households will be housed in advance.
2. Secondly, the environment of the occupant should be capable of renewal as the residents want to possess and shape it as the way they like.
3. Finally, formation of a community takes time and people should be given the opportunities to form communities instead of being forced.

In addition, adaptable dwellings are built and maintained through the concerted efforts of many parties to structure the interfaces of parts and of decision makers in ways that improve the responsiveness to end users (Habraken, 1999). This leads towards increased customization for not only the dweller, but also the community social needs.

5.4 PARTICIPATORY DESIGN FRAMEWORK

The notion of 'Design Participation', which entails active involvement of users in the design process, gained momentum following the 'Design Participation' international conference in 1991. The discourse emerging from this conference emphasized a community-oriented approach to design, where solutions are co-created by a diverse group of collaborators including stakeholders, designers, and end users (Herman Hertzberger, 1991).

This new way to design proved to be an ideal model for housing development where communities could have the opportunity to directly identify, influence and implement design strategies that meet their specific housing and community needs.
Jon Broome (2005) also argues that users should be involved in the housing process for creating socially sustainable dwellings (Jon Broome, 2005). By adapting to demographic change and user involvement and empowerment, it would be an ideal model for millennial development, where communities could have the opportunity to directly identify, influence and implement design strategies that meet their specific housing and community needs.

However, in practice, the concept of 'tokenism' has become prevalent, wherein stakeholders and end users are often marginalized in the decision-making process. This trend reflects a disproportionate distribution of decision-making power, with professionals often sidelining end user input, relegating it to a mere token gesture of community involvement.

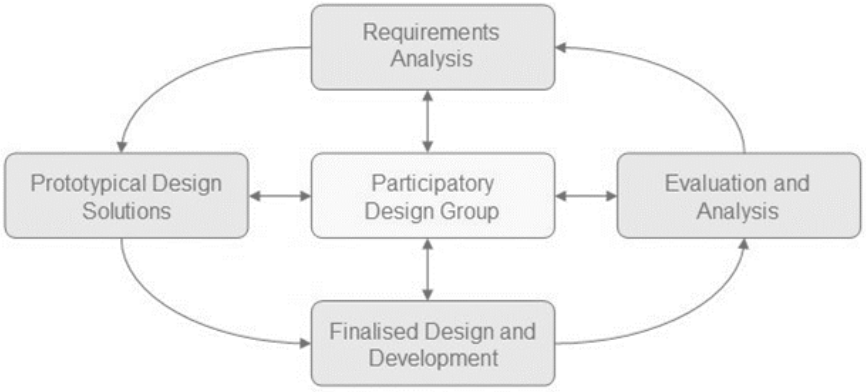

Fig -3: The participatory design process

6. MILLENNIAL LIVING CASE STUDY 1: VINDMØLLEBAKKEN, NORWAY

Vindmøllebakken residential complex located at Stanvanger, Norway was designed by Architect Helen & Hard. It is situated on the plot of their former office building. This project consists of 40 co-living units, 4 townhouses, and 8 rental apartment units, all clustered around a single courtyard, the core of the plot, accommodating 120 residents in an area of 6400sq.m.

Vindmøllebakken is a model of socially sustainable community dwelling, balancing individual and communal benefits through a collective design approach. At its heart is a double-height, amphitheater-style courtyard, designed to encourage resident interaction. Additionally, a rooftop community greenhouse fosters intergenerational collaboration, allowing residents to grow their own food. The complex's diverse mix of residents across different generations significantly enhances its social sustainability.

6.1 CONCEPT

The core concept of this project is “Gaining by Sharing” which is achieved through its user diversity (i.e.) the building is home for residents of different generations, it is all about sharing between generations, as everyone is complimentary. The success of this project is summarized in three categories.

1. Firstly, the user integrated development process that enables residents to contribute to the design of their future living environment.
2. Secondly, a flexible design strategy that provides the possibility of changing the design until the last phases of the project based on users’ demands.
3. Thirdly the consideration of shared spaces for the community for empowering social interaction among residents and increasing the quality of their lives.

6.2 USER INTEGRATED DEVELEOPMENT

One of the core design principles at Vindmøllebakken is the active participation of future residents in the design process of their homes and neighbourhood (Pagh et al., 2018, p.132). To initiate this "bottom-up shared living project," architects Helen and Hard sought to gather interested individuals through online advertisements and newsletters.

Once a diverse group of interested participants was assembled, they were involved in all project phases, from pre-planning to the operational use of land. This involvement was facilitated through an algorithmic analysis that focused on three major aspects: flat unit layout configuration, unit dimension preferences, and unit location allocation. The

algorithm was designed to balance these factors, ensuring that the final output met the varied needs and preferences of the future residents.

The participatory process at Vindmøllebakken spanned approximately two years. The architects employed a flexible design strategy, allowing for continuous adaptation to users' needs and feedback throughout the project's development stages. This approach ensured that the final design closely aligned with the community's desires and requirements.

6.3 FLEXIBLE DESIGN STRATEGY

Designing all the units and shared spaces to accommodate both individual and communal interests presented a significant challenge for the architects. This process was time-consuming and required numerous modifications throughout the design stages. To address this issue, the architects of Vindmøllebakken adopted a flexible and open plan layout for arranging the units adjacent to each other. This approach allowed for adaptability and revisions until the project's final phases.

The architects could easily adjust the internal layouts of the units to meet the owners' needs at every step of the design. They were even able to alter the scale of the units, making them larger or smaller based on user feedback, using the same algorithmic cohorts employed for the participatory approach.

This innovative algorithmic generation approach enabled the designers to manage the entire design process while accelerating the incorporation of user feedback into the project. However, the flexibility post-construction was mainly limited to changes in the shared spaces' programs. This method ensured that the final design was highly responsive to the evolving needs and preferences of the future residents.

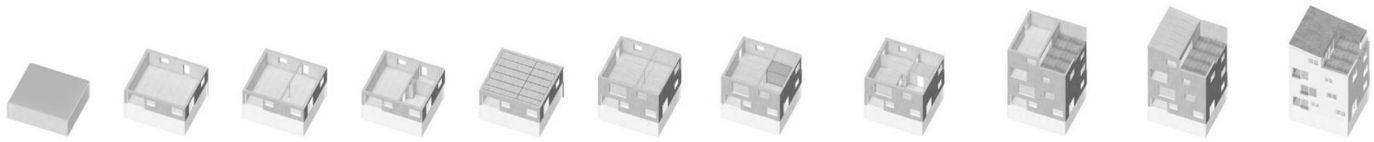

Fig -4: Flexible layout configuration of Vindmøllebakken

6.4 SHARED SPACE WITHIN COMMUNITY

The third principle that makes Vindmøllebakken a successful model of housing is its emphasis on shared spaces within the community. Designed around the concept of shared living, the project features minimally sized, fully equipped private units for households, complemented by extensive communal areas. These shared spaces are intended to enhance facilities and strengthen the social infrastructure among residents through the sharing of time, spaces, and resources.

Each household is allocated 12.6 square meters of shared space, resulting in a total of 500 square meters dedicated to community use. These communal areas, centrally located within the project, include a communal kitchen, garden, dining room, guest rooms, workshops, and a laundry room. Additionally, the rooftop houses a greenhouse and a library, further fostering a sense of community and collaboration among the residents. This strategic integration of shared spaces ensures that the community can thrive both socially and functionally.

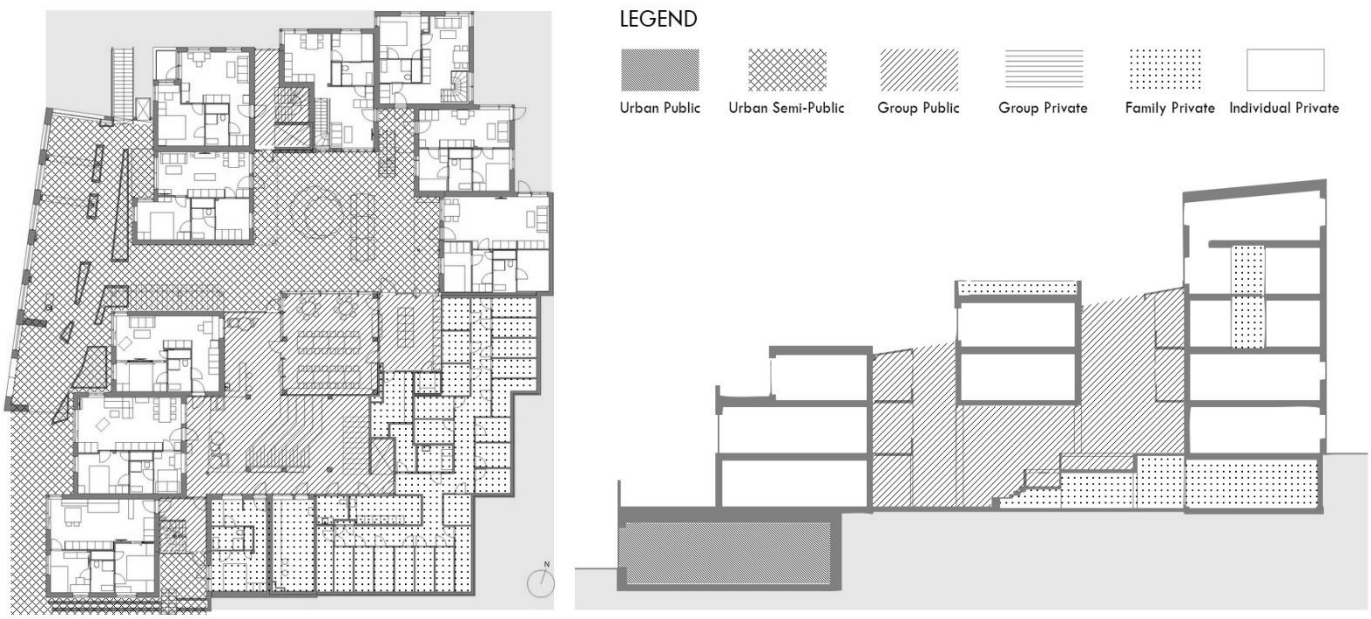

Fig -5: Spatial sharing in ground floor Plan (left) & Section (right)

7. MILLENNIAL LIVING CASE STUDY 2: ÜBERBAUUNG HELLMUTSTRASSE, SWITZERLAND

Überbauung Hellmutstrasse scheme, designed by ADP Architecture and planning, is an urban communal living project located in Zurich, Switzerland, that exemplifies how thoughtful design can create a harmonious living environment that prioritizes flexibility, community, and connectivity. This project transcends the traditional notion of housing, emerging as a vibrant and interconnected community where residents can thrive by integrating adaptable living spaces with communal areas and central circulation, the project sets a new standard for sustainable and community focused urban living.

7.1 CONCEPT

Überbauung Hellmutstrasse represents a pivotal endeavor in crafting adaptable and sustainable dwelling, seamlessly intertwining functionality with community involvement. The project's success can be attributed to three main factors which includes,

1. The flexible design approach that can adapt to the changing needs and preferences of its residents (Steven Groák, 1992).
2. The spatial arrangement, which is meticulously planned to enhance functionality, aesthetics, and community interaction.
3. The effective central circulation that plays a crucial role in enhancing connectivity and accessibility throughout the development.

7.2 USER ADAPTABLE DESIGN

This project’s adaptability isn't merely a result of fixed beams and columns with generic spaces in between; rather, it stems from the creation of modular units that can be flexibly combined in different configurations. Non-load-bearing walls and partitions can be effortlessly relocated or removed, empowering residents to reshape their environments without major structural alterations. Additionally, the open-plan layout for living, dining, and kitchen areas offers a versatile space that can be tailored to accommodate fluid user’s requirements, reflecting the dynamic preferences of its inhabitants (Steven Groák, 1992).

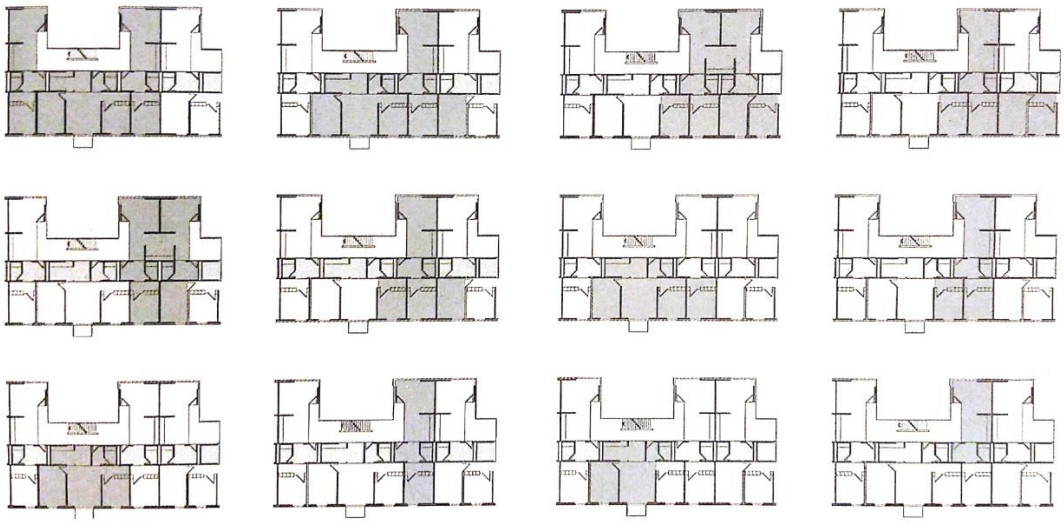

Fig -6: Different adaptable layouts of Überbauung Hellmutstrasse

7.3 SPATIAL CONFIGURATION

The design is horizontally divided into three zones. The first zone, spanning 5.1m wide, comprises rooms separated by loadbearing walls. While these rooms share similar sizes, they lack predefined functions, allowing for adaptability to various social uses such as bedrooms, living areas, dining spaces, or workstations. While the sizes of individual rooms remain fixed, the flexible configurations enabled by non-loadbearing partitions can alter the overall apartment size.

The second zone, measuring 2.2m wide, serves as a service area housing bathrooms, kitchens, and storage spaces. Although less flexible in terms of function, variations in the way these spaces connect to the rest of the apartment are possible.

The third zone, spanning 7.5m wide, is characterized by minimal use of loadbearing walls, offering versatility in function. Here, spaces can transform into kitchens, living areas, or studios equipped with all necessary amenities. Positioned at the heart of this zone is the building's main circulation core, surrounded by entrances to different apartments. The undefined nature of the circulation core allows for greater freedom in connecting private units to shared circulation spaces, promoting interaction and community engagement (Tummers, 2015).

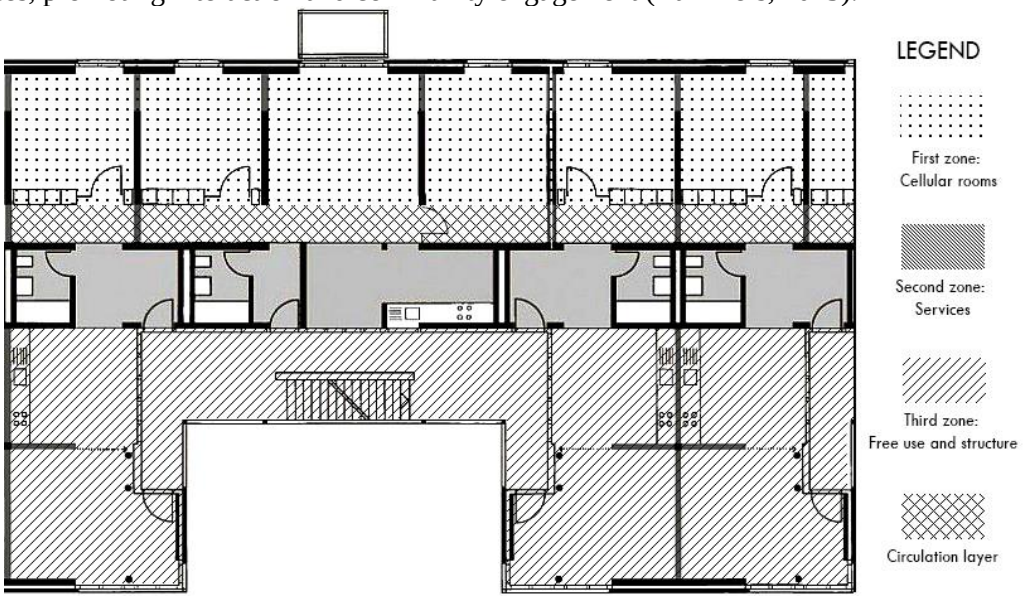

Fig -7: Ground floor spatial configuration of Überbauung Hellmutstrasse

7.4 THE COMMUNAL CIRCULATION

The central circulation space, featuring balconies, emerges as a pivotal design element fostering communal living. These balconies spaces are wide enough to allow for different uses. They become an extension of each apartment, creating transitional zones from the public street to the private apartments as well as contributing to the sense of community

(Leupen, Heijne & van Zwol, 2005). Functioning as vertical connection spaces encircling the central courtyard, they maintain visual continuity across different levels. However, the scheme's flexibility is primarily limited to the arrangement of floor plans, allowing for expansion or contraction of apartments within this parameter.

8. MILLENNIAL LIVING CASE STUDY 3: NEXT 21, JAPAN

The NEXT 21 project, spearheaded by Osaka Gas Company in Osaka, Japan, serves as an experimental venture in urban collective housing. While the initial blueprint originates from Osaka Gas, the eighteen individual units within the building are designed by thirteen distinct architects. The project partially adopts Habraken's Open House concept by segregating the main structure from the infill walls (Habraken, 1999). However, it deviates from the support and infill theory as the design does not fully incorporate separate planning for mechanical systems and their integration with individual units. Despite this, the design envisages subsystems that can be independently adjusted, even though the construction of the building occurred holistically.

8.1 CONCEPT

NEXT 21 ensures that the development can evolve with the needs of its residents while maintaining a strong sense of community and connection to its surrounding by majorly focusing on the following aspects.

1. The adaptable design strategy that follows leupen's frame and generic space theory (Leupen, 2006).
2. Coordination between house and street zone to create a seamless connection between private and public spaces, fostering a sense of community.
3. The nature of the collective space that promotes inclusivity, convenience and opportunity for social interaction
4. Visual connectivity that enhances both the aesthetic appeal and the functional experience of the development.

8.2 LEUPEN'S FRAME & GENERIC SPACE THEORY BASED RESPONSIVE DESIGN

The primary design approach in NEXT 21 aims to establish a versatile structural framework capable of accommodating changes in both external walls and internal layouts independently (Brouwer & Kearney, 2011). Rather than relying on load-bearing walls, the design employs an in-situ concrete beam and column structure arranged in a grid formation, affording flexibility in spatial configurations. From the third floor upwards, the structure comprises six individual single-span towers positioned on a 7.2 x 7.2-meter grid, with intervening "street zones" measuring 3.6 meters in width. By decoupling the external and internal walls from the structural framework, each residence enjoys the freedom to tailor their apartment layout according to their preferences. Additionally, the modular façade system is designed to adapt seamlessly to various internal configurations while maintaining a cohesive aesthetic appearance from the exterior (Leupen, 2004).

8.3 THE HOUSE & STREET ZONE COORDINATION

Private and public spaces are arranged in accordance with the structural grid. The spaces are divided into several zones including house, street and common areas. Aforementioned 7.2 x 7.2m structural towers making the house zones and the street zones are structurally separate. Within the house zones, floor slabs are structurally detached from the core, facilitating vertical expansion possibilities. In contrast, the street zones primarily serve as circulation pathways connecting apartments and green spaces, with occasional usage as seating areas.

The non-structural nature of the street zones allows for vertical spatial alterations. Specifically, the third and fifth floors feature duplex apartments that integrate with upper-level spaces, enabling vertical expansion by adapting the street zone's floor slab, which remains structurally detached from the central core. Although the division between changeable street zones and permanent house zones conforms to a fixed grid system, it imposes limitations. Nonetheless, adhering to Leupen's principle, a certain degree of permanence is essential to afford flexibility through change (Leupen, 2006).

Fig -8: Fourth floor spatial layout of NEXT 21

8.4 NATURE OF THE COLLECTIVE SPACE

A "3-dimensional street" has been conceived as an organic extension connecting to the Ecological Garden, serving as an essential shared area facilitating interaction among residents of the community. Each resident can relish the ambiance of a traditional street while preserving privacy within their unique lifestyles.

8.5 VISUAL CONNECTIVITY

The corridors are intentionally left open rather than enclosed, fostering visual connectivity between various levels for the residents. As the level ascends, the width of these pathways varies, enhancing vistas across different levels of the structure. Moreover, internal balconies and terraces overlooking communal spaces ensure residents have sightlines and opportunities to engage with one another, fostering a strong sense of community.

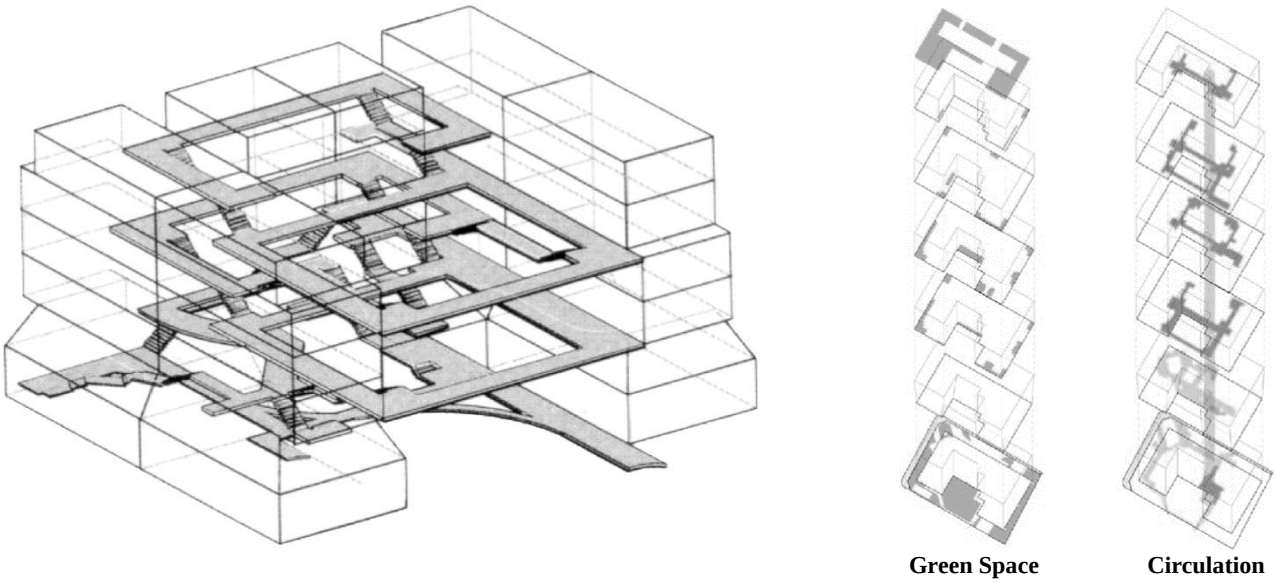

Fig -8: Circulation as collective space (left) & green space interweaving with circulation (right)

9. INFERENCE FROM CASE STUDIES

	DETERMINANTS AND DESCRIPTION	INFLUENCE IN CASE STUDIES

S. NO		VINDMØLLEBAKKEN, NORWAY	ÜBERBAUUNG HELLMUTSTRASSE, SWITZERLAND	NEXT 21, JAPAN
9.1	**SPATIAL FLEXIBILITY:** For millennial living, incorporating flexibility within common areas is essential for fostering a sense of belonging among residents. By designing common spaces without visual barriers and adopting an open-plan layout, residents can easily discover and utilize areas that suit their comfort levels and social preferences **(Kendall, 1995)**. Architecturally, a user flexible design results in a longer-lasting building usage and gives the residents possibility to explore the same space new every time **(Steven Groák, 1992)**.	**MEDIUM**	**HIGH**	**HIGH**
9.2	**VISUAL CONNECTIVITY:** To encourage interaction, maintaining a strong visual connection between both outdoor and indoor common areas is crucial. When residents can see activities happening, they are more likely to feel invited to join in. Furthermore, visual connectivity makes it easier for residents to transition from their private rooms to communal spaces, fostering a sense of community. Additionally, ensuring that common areas are visually or physically linked to circulation paths increases the likelihood that passing residents will be drawn into these communal spaces, thereby enhancing social engagement and interaction.	**HIGH**	**LOW**	**HIGH**
9.3	**PROPORTION OF COMMON AREAS:** In any building, achieving the right proportions is essential, particularly in areas designed to foster social interaction, such as common and congregation spaces. If these areas are too small, they may not accommodate enough people comfortably, leading to underutilization. Conversely, if the spaces are too large, they can feel impersonal and intimidating, deterring residents from using them.	**HIGH**	**LOW**	**MEDIUM**
9.4	**PUBLIC, COMMON AND PRIVATE THRESHOLD:** The thresholds between different transitional spaces are crucial for defining boundaries and managing access. These thresholds can be designed to be sensorial, physical, or visual, ensuring that only authorized individuals can pass through **(SPACE10, 2018)**. One effective approach to implementing this strategy is by varying ceiling heights to create an intuitive boundary between different types of common or semi-private spaces. This subtle architectural cue helps residents understand the transition between areas without the need for obvious barriers. However, in certain cases, physical	**HIGH**	**MEDIUM**	**MEDIUM**

	boundaries remain necessary to enhance the security and privacy of residents.			
9.5	**SPATIAL DIVERSITY OF COMMON AND PRIVATE:** Diversity at every level within a community is highly advantageous, particularly for achieving social sustainability. Within private spaces, diversity contributes to the formation of a broader and more inclusive community, which is essential for developing "weak ties". In common areas, this diversity allows residents the freedom to choose their interaction spaces, complementing the flexible design of these communal zones.	**MEDIUM**	**MEDIUM**	**MEDIUM**
9.6	**COMMON AS A CORE:** Concentrating all common areas in a single location or ensuring they are closely connected significantly enhances their usage potential. The more frequently residents pass through these shared spaces, the greater the likelihood of spontaneous interactions and community building. In a multi-story building, the ground floor is especially important as it often serves as the main hub for communal activities and social engagement. However, it is equally important to incorporate common spaces on other floors, situated near residential units. This proximity encourages residents to engage with each other frequently, fostering a sense of community outside their private space.	**HIGH**	**HIGH**	**HIGH**
9.7	**SYNERGY OF PRIVATE, COMMON AND PUBLIC:** In publicly accessible developments, it is crucial to strike the right balance between public, common, and private spaces. Common areas should be designed to be inviting and appealing to residents, while still maintaining the sanctity and privacy of individual. To achieve this, it is advisable to cluster private areas in one section and common areas in another, ensuring clear delineation between the two **(SPACE10, 2018a)**. For millennial living, an ideal ratio between private, common, and public spaces is 2:2:1. The layout should facilitate a seamless transition from private to public areas, enhancing both privacy and community interaction.	**HIGH**	**MEDIUM**	**HIGH**
9.8	**DIVERSITY OF HOUSEHOLDS:** The design should accommodate a diverse array of household types, from individual students and single adults to multi-generational families. This diversity should be reflected in a broad age range of residents, encompassing young adults, middle-aged individuals, and seniors **(McCamant, Durrett & Hertzman, 2003)**. Additionally, the development should embrace and celebrate a variety of cultural and demographic backgrounds, ensuring an inclusive community where people from all walks of life can coexist and thrive.	**HIGH**	**LOW**	**LOW**
9.9	**DYNAMICS OF COLLECTIVE SPACE:**	**HIGH**	**MEDIUM**	**MEDIUM**

	The communal spaces should be thoughtfully designed to maximize their utility by arranging private residences around a central shared area **(Tummers, 2015)**. This configuration helps to clearly define and emphasize the communal core. Within this central space, various zones should be created to cater to different activities and accommodate groups of varying sizes. These distinct areas are essential for supporting a range of functions, from intimate gatherings to larger community events, ensuring that the communal space is versatile and inclusive for all residents.			
9.10	**SENSE OF SECURITY:** Security plays a vital role in millennial living, contributing significantly to residents' comfort levels and sense of belonging. This importance is particularly emphasized due to the limited and balanced boundaries between private, public, and common areas within modern living spaces.	**HIGH**	**HIGH**	**HIGH**

Table -2: Case study inference

10. RESEARCH FINDINGS: SPATIAL DESIGN PARAMETERS FOR MILLENNIAL LIVING

Here are the research findings detailing 18 spatial design parameters for millennial living. These parameters have been identified and analyzed to address the unique lifestyle preferences, communal engagement, and spatial diversity that define the millennial generation. By focusing on these design elements, we aim to create living spaces that not only meet but enhance the living experiences of millennials in urban environments.

10.1 Finding 1: VISUAL LINKAGE

The visual or physical connection between the circulations and the common core is crucial for giving residents the feeling of being in the common room right at their doorstep. It enhances the sense of belonging. Such a connection also brings spontaneity in the interaction residents could have there.

10.2 Finding 2: CONCENTRATION OF SHARED SPACES

The concentration of shared spaces significantly enhances spontaneous social interactions by bringing residents together in a centralized location. This centralization acts as a social hub, easily identifiable by the residents, fostering a sense of community and belonging. Strategically placing the common core near the entrance further increases the likelihood of spontaneous interactions, as residents naturally converge in these areas upon entering the building. This design choice promotes a vibrant and dynamic communal atmosphere, encouraging frequent and casual social engagement among residents.

10.3 SPATIAL ADAPTABILITY

- **10.3.1 Finding 3: Private unit adaptability**
  The ability to highly personalize living spaces is crucial in helping residents quickly feel at home. Modularity within units allows for flexible and adaptable environments that can easily accommodate changes in residents' living situations over time. This adaptability not only enhances the overall living experience but also fosters long lasting usage of spaces, enhancing overall sustainable capabilities.

- **10.3.2 Finding 4: Open communal spaces**
  The open plan layout encourages freedom of movement, facilitating spontaneous interactions among residents. By eliminating physical borders, the design creates an environment where residents feel interconnected and part

of a cohesive community. This softened border not only enhances accessibility but also encourages residents to engage with one another freely, contributing to a vibrant and welcoming atmosphere.

10.4 PUBLIC, COMMON AND PRIVATE THRESHOLD

- **10.4.1 Finding 5: Openness of public space**
  The openness of public spaces may evoke feelings of insecurity among residents. Poorly managed public openness can negatively impact residents' overall sense of well-being and safety. Additionally, clear delineation between public and common spaces is crucial to prevent ambiguity and ensure residents' privacy and security. This clarity helps mitigate any perception of all floors being accessible to non-residents, promoting a sense of exclusivity and safety within the community.

- **10.4.2 Finding 6: Design of neutral zone**
  Neutral zone / Buffer zones play a critical role, particularly between communal areas and individual private spaces. Their design should prioritize aspects of security and intimacy to ensure residents' comfort and well-being. As the size of the community increases, the significance of these buffer zones becomes even more pronounced. They serve as essential transitional areas, helping residents navigate the shift from public communal spaces to their private domains.

- **10.4.3 Finding 7: Spatial variation**
  Varying the proportions of spaces, such as ceiling height, between public, common, and private areas, enhances the perception of privacy and openness within a living environment. These physical variations serve as sensory cues, delineating soft borders and defining the transition between different zones. This subtle manipulation of spatial proportions not only enhances the overall ambiance but also helps establish a visual and tactile distinction between various areas, contributing to a more nuanced and cohesive spatial experience for residents.

10.5 SPATIAL DIVERSITY OF COMMON AND PRIVATE

- **10.5.1 Finding 8: Diversity of private units**
  The diversity of dwelling units within a project has a profound impact on the composition of the community it houses. By offering a range of dwelling types, the community becomes more inclusive and diverse, fostering connections among residents with varied socioeconomic, cultural, and political backgrounds. This diversity enriches the community fabric, allowing residents to form relationships beyond their immediate social circles and develop what sociologists term "weak ties" connections.

- **10.5.2 Finding 9: Diversity of shared space**
  A wide range of shared spaces within a community significantly contributes to social integration and fosters diverse interactions among residents. With numerous options available, residents can gravitate towards the social areas that best suit their preferences and comfort levels. This diversity not only promotes inclusivity but also strengthens residents' sense of belonging by offering spaces where they can truly identify and connect with others.

10.6 DYNAMICS OF COMMUNAL SPACE

- **10.6.1 Finding 10: Nature of outdoor space**
  The design considerations for outdoor spaces should mirror those of indoor areas. Properly proportioned outdoor spaces can accommodate a variety of social activities and gatherings for all residents. Additionally, arranging housing units around a central courtyard fosters spontaneity in outdoor interactions and encourages community engagement. Ensuring a seamless connection between indoor and outdoor common areas is essential for facilitating socialization and integration among residents.

- **10.6.2 Finding 11: Common room aspects**
  The common room serves as the heart of the community, and its size should be tailored to accommodate the number of residents gathering in the space. This ensures comfort and safety within the community. A wide-open common space with multiple zones and socializing settings offers various opportunities for interaction. Such versatility enhances the overall functionality of the space, catering to diverse preferences and promoting meaningful connections among residents.

- **10.6.3 Finding 12: Communal laundromat**
  The laundromat inherently serves as a natural social space due to its utilitarian function, bringing residents together out of necessity. By thoughtfully considering its location and size, the laundromat can be transformed into a versatile area where various social activities take place alongside laundering. Positioning it near the common core amplifies its potential as a social hub, encouraging residents to gather and interact, thus fostering a stronger sense of community. This strategic placement not only maximizes the laundromat's functionality but also enhances its role as a key communal space within the building.

- **10.6.4 Finding 13: Communal workspace**
  A diverse workplace fosters an environment conducive to knowledge sharing, allowing individuals from various backgrounds to exchange ideas and expertise. This setting serves as an additional socializing space where different generations within the community can connect and collaborate on common projects. By bringing together people with varying perspectives and experiences, the workplace not only enhances professional growth but also strengthens intergenerational bonds, contributing to a more cohesive and dynamic community.

10.7 Finding 14: NATURE OF ACCESS SPACES

Access spaces, such as hallways and corridors, are perfect for fostering spontaneous interactions among residents. Introducing natural light into these typically dark areas transforms them into inviting social spaces, where residents can enjoy views of greenery or the central common area. The design and layout of these access spaces should be carefully considered, with proportions and arrangements that encourage residents to pause and converse without obstructing the flow of others passing through. Such spontaneous interactions are essential in building a sense of community and belonging, as they provide frequent and casual opportunities for residents to connect and engage with one another.

10.8 SYNERGY OF PUBLIC, PRIVATE AND COMMON

- **10.8.1 Finding 15: Communal congregation**
  Public gatherings provide opportunities for the entire neighborhood and residents to come together, expanding their social networks. By facilitating interactions among a diverse group of people, public congregations help to integrate residents into the larger neighborhood, creating a more cohesive and supportive environment. Moreover, the facilities and spaces used for these gatherings benefit everyone in the neighborhood, enhancing the overall quality of life and giving the community a shared sense of purpose and identity.

- **10.8.2 Finding 16: Priority of private space**
  Private units serve as essential retreats from communal living, providing residents with a personal sanctuary. These spaces require as much thoughtful design and attention as common areas, ensuring they fulfill all necessary living functions that are not catered to in shared environments. Contrary to the assumption that smaller rooms might encourage more interaction, it is the comfort and functionality of private units that are crucial. When residents feel at ease and content in their personal spaces, they are more likely to foster a sense of belonging and actively participate in the community.

10.9 PRIVATE TO PUBLIC

- **10.9.1 Finding 17: Hierarchy of sharing**
  The relationship between private and common spaces is paramount in community-oriented design. Establishing a clear hierarchy of sharing levels within both private and collective areas is essential to foster meaningful connections. This hierarchy dictates how spaces are utilized and shared among residents, ensuring a seamless transition from private to public. This structured approach to spatial relationships is the cornerstone of creating a cohesive and connected community.

- **10.9.2 Finding 18: Sense of Security**
  Prioritizing security measures is crucial for achieving a harmonious balance between privacy and social connectivity. When individuals are confident in the security of their surroundings, they are more likely to engage in social interactions and build connections within the community. This sense of safety enables residents to freely utilize shared spaces and participate in communal activities, knowing that their privacy is respected and protected.

Limitations of the study

1. The key limitation of the study is user's real-time feedback and live evaluation of the above parameters could not be considered since all the case studies were evaluated with secondary data from the literature.
2. The integration of smart technologies and sustainable practices is a fundamental aspect of millennial living, contributing to the creation of efficient, eco-friendly, and interconnected environments that resonate with millennials' tech-savvy and environmentally conscious nature. However, these elements are not within the scope of this research paper, as they do not pertain to the spatial design focus of this study.

10. CONCLUSION

The exploration of spatial design parameters for global millennial living reveals the necessity of adaptable, communal, and technologically integrated living spaces that align with the values and lifestyles of this dynamic generation. Millennials, with their emphasis on flexibility, community engagement, and digital connectivity, require residential environments that not only accommodate these preferences but also enhance their daily living experiences.

This research underscores the importance of tailored spatial design parameters to effectively accommodate the unique needs and preferences of the millennial generation in global urban environments. By focusing on visual connections, common core concentrations, flexible spaces, and a well-balanced hierarchy between public, common, and private areas, architects can create residential spaces that resonate deeply with millennial values and lifestyles.

By drawing on contemporary architectural practices and analyzing case studies from various global urban contexts, this paper aims to provide a comprehensive framework for architects and urban planners to create vibrant, inclusive, and adaptable living environments for millennials. By addressing the nuanced needs for flexibility, community, and security, these design strategies can help forge strong, cohesive communities that enhance the quality of life for millennial residents globally.

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