

Impact of Physical Environmental Factors on Mental Wellbeing of Condominium Dwellers

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ABSTRACT

This paper attempts to reveal the outcomes of the empirical research investigating how the physical environments of the residential high-rises, known as condominiums, including the urban and community contexts, impact mental wellbeing of the dwellers since the emergence of condominiums in Bangkok's real estate market has continued to proliferate. The principal objectives of the research are to determine the assumption that the high-density urban environment and unique structure of condominiums are the significant determinants affecting occupants' mental status. Based on the quantitative research approach, the two-stage stratified sampling technique and a cross-sectional survey were performed to engage 1,206 participants from eighteen high-rise condominiums in Bangkok. The interdisciplinary research instruments applied in this study are a Physical-Environmental (PE) Assessment for evaluating the physical environment and surroundings of the condominiums and a Personal and Psychological (PP) Questionnaire for collecting respondents' attributes and their psychological status quo: safety concerns, privacy satisfaction, and a sense of community at the time of their dwelling in condominiums. At the analytical stage, three inferential statistics, Pearson product-moment correlations, independent sample t-test, and one-way analysis of variance, were applied at the p -value ≤ 0.05 . The results endorsed three urban factors: geographical zoning, land use zoning, and density of population as significant dominants of safety concerns, including the sense of community of condominiums' dwellers, whereas community and architectural factors appeared to have distinctive effects on all three psychological variables.

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INTRODUCTION

The rapid growth and primate characteristic of Bangkok, Thailand's capital city, has urged demand for vertical living for decades. As the nation's business hub, Bangkok attracts expatriates and migrants worldwide. This metropolis now houses over ten million population and provides all amenities for its civilians, much more advanced than any other region of the country. The value of land in Bangkok has been steadily rising till it has become a dilemma for low/middle-income people to own property. The traditional low-rise houses in the central business districts (CBDs) are being transformed into high-rise residential buildings known as "condominiums" or "condos" (Rujibhong, 2017).

Since the Condominium Act was enacted in 1979, private-owned residential high-rises have played an essential role in Bangkok's property market. These condominiums have emerged as the preferred choice of accommodation amongst young professionals, owing to their embodiment of a trendy urban lifestyle and the provision of essential living services (Poonsawat et al., 2022). Despite dwelling on the top floor of a luxury condo, living in one of the most densely populated cities (approximately 3,797/km²) like Bangkok has never been easy (Digital Government Development Agency, 2021). In exchange for better economic opportunities, Bangkokians succumb to the competitive way of life, traffic congestion, chaotic rush hour, expensive cost of living, pollution, and crimes. These difficulties cause stress, exhaustion, and individuality due to discouragement of

social interaction and loitering around neighbourhoods. In the interest of saving commuting time and promoting a symbiotic bond between population density, compact urban form, and public transportation usage, transit-oriented development (TOD) has persistently continued Bangkok's condominium development trajectory. As a consequence, a significant number of condominiums have emerged in prime locations strategically situated along the two public transportation systems: the "Bangkok Mass Transit System (BTS)" and the newly developed "Metropolitan Rapid Transit (MRT)" (Klinchuanchun, 2022; Thansettakij, 2023) (Figure 1).

As mentioned earlier, Figure 1 illustrates Bangkok's centralised development pattern dominated by intrinsic factors: population density, public transportation development courses, and land overprice. Another dominant fabricating of the monocentric condominium development is urban planning regulations. The two bulk-control indicators, Floor Area Ratio (FAR) and Open Space Ratio (OPR) allow taller condominiums to be built in Bangkok's central area—commercial zone and medium to high-density residential zones—more than others.

Living in residential high-rises in metropolitan areas can be two sides of the same coin. On the one hand, it offers occupants on the high floor a splendid city view, increased privacy, and less traffic noise pollution, yet certain limits of its physical environment tag along on the other hand (Gifford, 2007; Rujibhong, 2019).

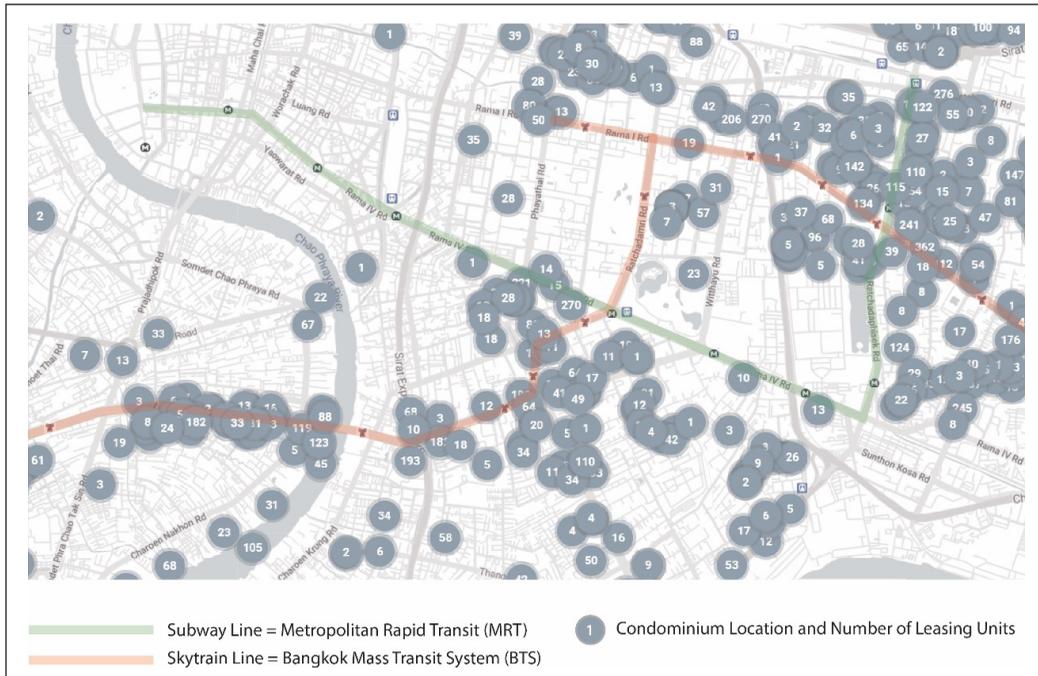


Figure 1. The map illustrating the densification of condominiums oriented by MRT and BTS lines in Bangkok's CBD

Besides urban's chaotic surroundings, residential high-rises' unique structure could be advantages and disadvantages for human wellbeing. As commonly known, the core of a multistorey building (e.g., central core, split core, and atrium core) is an essential architectural element of load-bearing. It integrates functions and service needs, for instance, elevator banks, mechanical facilities, plumbing, smoke shafts and fire-fighting stairs for the occupants (Ibrahim, 2007; Rujibhong, 2019; Szolomicki & Golasz-Szolomicka, 2019). Such vertical structures considerably cause difficulties in emergency evacuation and often exacerbate smoke and flame spreading all over the building during fire incidents. Since the Great Fire of Rome in AD 64, when the Insula apartment was first built, until the

Grenfell Tower fire incident in 2017, fire emergency has been the most concerning issue amongst high-rise residents.

It seems paradoxical that these residential buildings provide high privacy for their residents by separating each living unit with shared "walls, ceilings, and floors with neighbours adjacent above and below" (Kennedy et al., 2015; Rujibhong, 2017). Despite the tightened proximity, such visual blockage successfully forms the perception of privacy amongst occupants and completely tears them apart. Without defensible territory and semi-public areas (i.e., a single house's front yard), condominium inhabitants sometimes maintain their security and privacy by living anonymously and avoiding hanging around the corridor and common areas. This level

of anonymity, enhanced by the architecture of the tall building, dissuades people from their community spirit. When humans do not interact, developing a sense of community is impossible (Kloos et al., 2012; Rujibhong, 2017). As indicated in previous studies, a social withdrawal existed among apartment and multifamily residential buildings' inhabitants. Besides architectural features, another presumptive cause of a lack of a sense of community is the density of the population. The argument around this issue is that density oppositely relates to the sense of belonging and supportive behaviour toward neighbours (Ng, 2009).

The ramifications of living in high-rise housing in urban contexts, particularly in Bangkok, have not been extensively studied in terms of their impact on the mental wellbeing of residents. While condominiums are popular in Bangkok, their ability to meet psychological needs has been debated. Limited quantitative research exists on the influence of physical conditions in Bangkok's condominiums on occupants' mental wellbeing. This article addresses this research gap by providing statistical evidence to comprehensively understand the correlation between condominium physical conditions and residents' mental wellbeing (Rujibhong et al., 2016).

Concerning the issues of urban Bangkok and the physical environments mentioned above, the pursuits of this article are (1) to elaborate on how the physical environment of condominiums and urban communities impacts the mental wellbeing of the dwellers and (2) to highlight the statistical significant

factors by their effect size and statistical power as well as to answer the following research questions (RQ):

RQ1: Which physical environmental factors related to condominiums significantly influence the mental wellbeing of inhabitants?

RQ2: To what extent do individual physical environmental factors influence the mental wellbeing of inhabitants differently?

LITERATURE REVIEW

In order to quantitatively obtain answers to the research questions mentioned above, it is necessary to comprehend and identify essential bodies of knowledge that will facilitate the extraction of measurable factors and variables. The following knowledge sets encompass the physical environmental factors associated with condominiums, as well as the quantifiable aspects of the mental wellbeing experienced by condominium inhabitants.

The Physical Environmental Factors Related to Condominiums

Within the scope of this research, the term "physical environmental factors" pertains to the tangible components and constructed surroundings of the condominium building and its immediate vicinity. Although condominiums possess unique architectural characteristics, it is essential to consider them as a new type of housing and compare them with the global housing concept. Thus, it becomes crucial to rely on characterising condominiums as a type of house.

Referring to the United Nations' right to adequate housing, it is established that "adequate housing" must satisfy seven criteria: security of tenure, availability of services, affordability, habitability, accessibility, location, and cultural adequacy. This definition expands the scope of this research to encompass an examination of the urban context of the district and community in which each condominium is situated (United Nations, 2022).

In the field of urban sociology, dating back to 1905, the influential work of Georg Simmel, a sociologist and philosopher, explored the profound impact of the urban context on individuals. Simmel argued that the unique urban environment acts as an external factor that gradually shapes the internal adaptations of its residents. More specifically, urban living exposes people to increased and prolonged stimulation, affecting them deeply. At the same time, the prevalence of intellectualism, which emphasises traits like punctuality, calculability, and strict social norms, separates individuals from their inherent human nature. The rapid and constant influx of stimuli within urban surroundings could make individuals indifferent or unimpressed, regarding perceived differences amongst things as meaningless (Simmel, 1950; Takooshian, 2005).

However, Park and Burgess (1972) provided alternative perspectives on the social dynamics and psychological effects of urban living. Park argued for a more nuanced understanding of urban life, emphasising the potential for social cooperation, cultural

diversity, and community formation in cities (Park & Burgess, 1972). Wirth, on the other hand, examined the effects of urbanisation on the individual, stressing the role of anonymity and the formation of subcultures within urban settings. He highlighted three urban characteristics: "(1) large numbers of people, (2) high population density, and (3) heterogeneity of population, as the city life's socio-psychological determinants" (Wirth, 1938). Later, in 1970, the sociologist Stanley Milgram confirmed these factors by publishing the statistical findings of his experimental research. He agreed with Wirth that the population density could constitute "a continuous set of encounters with overload and resultant adaptations" (Bibi, 2022, p. 12). He also criticised that the city dwellers, so-called "urbanites," limited themselves from altruistic behaviour. The lack of willingness to trust and assist strangers among urbanites was related to their perceived physical and emotional vulnerability stimulated by urban crime statistics. The heterogeneity of the city that produced a greater tolerance for behaviour and codes of ethics encouraging people to withhold aid for fear of antagonising strangers or crossing an inappropriate and difficult-to-define line was another reason (Barrett & Horne, 2022; Milgram, 1970).

Later, a group of built environment researchers underscored the significance of social and physical environments in shaping individuals' perceptions and experiences of inclusive wellbeing. The authors highlighted the pivotal role of density and deprivation as crucial parameters that provided valuable

insights and evidence into the fundamental connection between the urban environment and its impacts on health and wellbeing. By examining the interplay between these factors, their work sheds light on the complex relationship between the urban environment and its influence on individuals' overall wellbeing (Rajendran et al., 2009).

Meanwhile, Thailand's Department of Public Works and Town and Country Planning is vital in defining district characteristics and implementing land use zoning regulations. These regulations, guided by the Town Planning Act, cover open space, transportation, public infrastructure plans, and policies controlling the height of residential buildings, including condominiums. This framework establishes property rights and ensures that the surroundings of each condominium align with the designated land use zoning (Panjaburee & Boonvas, 2016). For example, condominiums in the red zone, representing commercial areas, are typically surrounded by commercial buildings, chaotic activities, and a higher population density than condominiums in the yellow zone, which denotes low-density residential areas (Figure 4.).

When transitioning from the urban context to condominium arcades, the management of the territory and access control within vertical communities has been a topic of debate through the last decades. It has been argued that the proliferation of gated community developments reflects shifts in societal values influenced by globalisation (Low, 2001). The term "gated community"

has been defined in various studies as a residential area with walls or fences that restrict public access. These communities are characterised by legal agreements that establish a set of rules and responsibilities for residents regarding the management of the community. The advantages of gated communities, as described in some studies, include implementing a managerial approach by real estate developers to clearly define property boundaries and provide safety and security for residents. Additionally, gated communities foster a sense of community amongst residents. However, some scholars view gated communities as visual representations of fear created through the presence of gates, solid walls, and security personnel (Atkinson & Blandy, 2005; Barrantes, 2021; Li, 2013; Rujibhong, 2017). Furthermore, evidence reveals that among high-income residents, people living in the gated compounds had a weaker sense of community than the non-gated ones but were indifferent to the low-income group (Wilson-Doenges, 2000).

One of the most widely recognised and influential concepts in architectural design for multifamily residential complexes is "Defensible Space," developed by Oscar Newman, an American architect and city planner. Defensible Space focuses on the relationship between architectural features and residents' perceived safety and security. This concept is composed of four key components: (1) territoriality: This component emphasises the creation of clearly defined spaces that establish a sense of ownership and control within the

residential complex; (2) surveillance: The Surveillance component aims to design the environment in a way that promotes natural surveillance, allowing residents to observe and monitor their surroundings during regular daily activities, (3) image: The Image component focuses on designing the physical environment to convey a sense of security and safety, both visually and psychologically, to the residents, (4) milieu and juxtaposition: This component considers the influence of the surrounding context and adjacent elements on the safety and security of the residential complex and its inhabitants.

By incorporating these four components into the architectural design, the defensible space concept seeks to create multifamily residential complexes that enhance residents' perceived safety, security, and overall wellbeing (Newman, 1972). The concept of defensible space views outsiders as potential offenders, whereas Jacobs (1961) and Hillier (1999) perceived strangers as potential guardians. Jacobs advocated against segregating spaces into single-purpose areas and instead promoted diverse land usage, including residential, commercial, entertainment, and institutional functions, to attract a constant flow of people throughout the day (Hillier, 1999). Hillier further argued that street accessibility enhances natural surveillance as the presence of strangers serves as a "natural police mechanism" (Reynald & Elffers, 2009).

Previous studies have also addressed the arguments concerning the socio-psychological impacts of the unique

physical environment within condominiums. Condominiums are widely recognised for their distinctive architectural features, including an internal core serving as shared access to each floor, along with shared walls and floors that separate individual living units. These physical attributes have been described as creating a "sealed cell" environment, which can contribute to a reduced sense of neighbour recognition and community compared to other housing types. Furthermore, researchers have identified specific fears experienced by residents of high-rise buildings, such as concerns related to strangers and criminal activities, apprehension regarding elevator malfunctions, and the fear of falling from higher floors (Abramova et al., 2021; Gifford, 2007; Gifford et al., 2011; Jephcott & Robinson, 1971; Li, 2013).

The Mental Wellbeing Factors Related to Condominium Dwellers

The notion of "home" extends beyond mere ownership of physical assets. It entails a dynamic interweaving of living experiences, age, and generational aspects that contribute to a sense of safety, security, and identity (Dupuis & Thorns, 1998). Within the realm of understanding the concept of home, various interpretations exist. However, for this study, the psychological perspective holds particular relevance, as it is intricately linked to mental wellbeing.

Fundamentally, a house serves as a source of physical security and wellbeing for its occupants. Beyond its primary function, the physical attributes of a house play a

crucial role in fulfilling the psychological need for privacy and enabling control over environmental comfort. Additionally, the more complex human needs, such as social recognition and empowerment, can be addressed through the transition from the interior to the outer realms of an individual's home, expanding the sphere of influence and engagement (Després, 1991; Dupuis & Thorns, 1998; Maslow, 1958).

Empirical research studies on developing a sense of home and attachment to living spaces refer to the concept of psychological home. Psychological home is a dynamic process where individuals modify and maintain their environment to reflect their sense of self. It is driven by the need to establish a personal connection between oneself and a physical location (Sigmon et al., 2002). The psychological home encompasses cognitive, affective, and behavioural components, involving attributions about people, emotions associated with establishing a home, and actions to make a place feel homelike. Creating a psychological home provides a refuge that offers security, safety, and protection from external stresses, reducing anxiety and aiding in coping with change.

By applying the principles of psychological home, Cicognani et al. (2014) identified through regression analysis that the perceived quality of the relationship with the house, which represents the privacy and unique expression of individuals' selves, and the sense of belonging to the territorial community significantly influenced the life satisfaction of elderly individuals

(Cicognani et al., 2014). Meanwhile, another quantitative study also found that psychological home predicted life satisfaction even after accounting for contextual variables, for example, age, type of dwelling, number of people in the household, and years in residence (Bužgová et al., 2023). Factors such as dwelling type, social interaction, and length of time in a home contributed to higher subjective wellbeing levels, as revealed through regression analysis (Crum & Ferrari, 2019).

The results of the previous research have yielded compelling evidence highlighting the interplay between feelings of safety, privacy, and a sense of community within the overarching framework of the psychological home. However, a discernible research gap persists regarding each constituent pillar's independent and interdependent functioning. Therefore, this study aims to address this gap by focusing on the discrete examination of each significant psycho-factor as the fundamental unit of measurement. In the meantime, the study seeks to unravel the nuanced impact of the condominium environment on each psycho-factor, thus contributing to the advancement of scholarly understanding in this domain.

Safety Concerns Associated with Condominiums

The feeling of safety is the most psycho-fundamental for humans, yet the dimensions of safety are complicated. Feeling safe involves (1) psychological safety and (2) actual safety. At a particular time, a person might feel safe and secure, though they are

not in reality. More than that, the degree of “safety needs” and “reaction to threats” of an individual relies on each person’s cognitive bias and heuristics (DeMartino & Stacey, 1958; Schneier, 2010). Environmental psychology researchers often have to deal with perceived psychological safety and security, not the actual ones.

Following the 9/11 attacks, a reporting initiative, Connecting Research in Security to Practice (CRISP), identified three broad categories of threats associated with living in high-rise housing. These categories include (1) crime, encompassing offences such as homicide, robbery, unauthorised access, and property damage; (2) behavioural disorder, involving issues like drug abuse, domestic violence, and suicide risks; and (3) emergency, covering natural or human-caused emergencies such as fires, terrorist attacks, elevator malfunctions, and electricity blackouts (Challinger, 2008).

Several concerns have been raised regarding the safety of residents in high-rise buildings, particularly related to the height of such structures. Research conducted in Hong Kong and Singapore highlighted that a small percentage of individuals living in tall buildings expressed unease about building height, leading to their reluctance to occupy higher floors (Yuen et al., 2006). Stefanucci and Proffitt, who explored the perception of vertical distances, discovered that people tend to overestimate distances when looking downward from elevated positions, particularly compared to upward from ground level (Stefanucci & Proffitt, 2009). Moreover, this overestimation

correlated with individuals’ self-reported fear of heights (Abramova et al., 2021; Ng, 2017).

This study also utilised these conceptual frameworks of the threats of tall buildings, including the potential condominium features, for example, the height of condominiums, and applied them to assess and measure the safety concerns related to these contemporary threats in subsequent investigations. In subsequent investigations, this study also applied these conceptual frameworks to evaluate and measure the safety concerns associated with these modern threats.

Privacy Satisfaction Associated with Condominiums

Perceived privacy is somehow related to a person’s vulnerability to hazards. The World Health Organization (2011) once stated that suitable housing should ensure personal and household privacy and allow occupants to live without fear of intrusion with safe entry and exit (World Health Organization, 2011). The absence of privacy can make a person insecure, leading to asocial behaviours, for example, fear of crime, causing social withdrawal and lowering the value of properties (De Macedo et al., 2022; Newell, 1994).

Since the 1970s, psychologists have considered privacy as a process of boundary control that a person allocates with his/her in-contact(s). This psychological regulation controls the situation, players, and the degree of interaction. Theoretically, the control of boundaries associates “both restricting and

seeking interaction to achieve the desired degree of access to the self or one's group by others, at a particular time and a given set of circumstances," which could fail or achieve their preferences. Later, in 2005, a psychologist, Margulis (2003), summarised that privacy represents control over the transaction between a person and others. The ultimate goal is to enhance autonomy and (or) minimise vulnerability (Margulis, 2005; Pedersen, 1979; Pedersen, 1999).

In a mixed-method study conducted by a group of researchers on residents living in multi-story apartments in the tropical climate of Brisbane, key findings revealed that residents value flexibility and choice when managing privacy and comfort throughout the day. The discussion also highlighted the significant design interrelationships among various comfort and privacy factors in the design of liveable apartment spaces (Kennedy et al., 2015).

This study further developed the indicator for measuring occupants' privacy satisfaction related to everyday life in condominiums based on the most salient four aspects of privacy proposed by Burgoon et al. (1989): psychological, informational, physical, and social/interactional privacy. It is also an essential state of mind, accelerating humans' contemplation and self-discovery (Burgoon et al., 1989).

Sense of Community Associated with Condominiums

A person can expand an abstract boundary of home beyond the dwelling unit to the larger scale of community, city, or country

via social recognition, modification, and selection. Besides the satisfaction of privacy, social empowerment is also the key to reinforcing the sense of belonging to a home environment. As highlighted in previous studies, community participation is essential to social beings like humans, particularly for urban people who live in a heterogeneous society. Social participation can lessen alienated feelings and help people to become identified. The vital psychological process motivating people's enthusiasm to have such participate is the sense of community (Appleyard, 1979; Rujibhong, 2017; Wang & Li, 2023).

Proposed by McMillan and Chavis in 1986, the "Sense of Community Index (SCI-1)" comprised 12 questions categorised by four principles of the sense of community: (1) membership, (2) reciprocal influence, (3) reinforcement (integration and fulfilment of needs), and (4) shared emotional connection (Bess et al., 2002; McMillan & Chavis, 1986). Later, in 2008, Chavis et al. further developed the SCI-2, which comprised 24 questions yet relied on the same four principles. The SCI-2 has become the most applicable and validated index measuring the sense of community since its broad scope can be associated with presumptive relationships across different types of demographics (Chavis, Lee, & Acosta, 2008; Chipuer & Pretty, 1999; Richard et al., 2023).

In a quantitative study on the communal attributes of condominiums and their influence on social interactions amongst apartment dwellers in Colombo, Bandara

et al. (2020) discovered a significant correlation between the usage of communal facilities such as swimming pools and gym areas and the occurrence of social interactions. The research findings indicated a high utilisation of these spaces in all three condominiums, and a parallel increase in social interactions was observed. This finding supports the idea that when the utilisation of communal spaces is maximised, there is a corresponding increase in the potential for social interactions. Based on the architectural context of three condominiums in Colombo, the researchers defined the communal attributes as the different recreation facilities: function room, kids' area, gym and swimming pool, and landscape area (Bandara et al., 2020).

This study adopts the concept of grouping architectural features into communal characteristics within the condominium. Also, it integrates the use of the SCI-2 to measure the sense of community amongst condominium residents. The study also elaborates on the modified survey assessing the residents' sense of community about the communal characteristics of the building, which are expected to support the mental wellbeing of the residents.

MATERIALS AND METHODS

Based on a thorough review of pertinent literature and the previously stated research inquiries, the research hypothesis (H_1) can be articulated as follows:

“Urban (IV1), community (IV2), and architectural (IV3) factors exert significant influence on safety

concern (DV1), privacy satisfaction (DV2), and sense of community (DV3).”

The construct diagram in Figure 2 proposes two sets of variables emphasised in this study and the presumptive effect that each physical environmental factor (IV1/IV2/IV3) influences each psychological status of this sample group (DV1, DV2, DV3) distinctively and significantly. It further leads to the research instruments and methods.

Independent Variables Set (IV) consists of:

IV1 Urban Factors are variables involving urban characteristics: (1) *district population density* (ratio scale: person/m²), (2) *land-use zoning* (nominal scale: medium/high-density residential zone, commercial zone), and (3) *geographical zoning* (nominal scale: Northern/Central/Southern/Eastern/Northwestern/Southwestern Bangkok).

IV2 Community Factors are variables involving community characteristics: (1) *community types* (nominal scale: gated/non-gated community) and (2) *socioeconomic status of the community* (nominal scale: low-medium-high price in THB/m²)

IV3 Architectural Factors are variables involving characteristics of the residential buildings: (1) *building types* (nominal scale: atrium/single/doubled-loaded corridor), (2) *defensible setting* (interval scale: ranking score 1 to 5, evaluating access control,

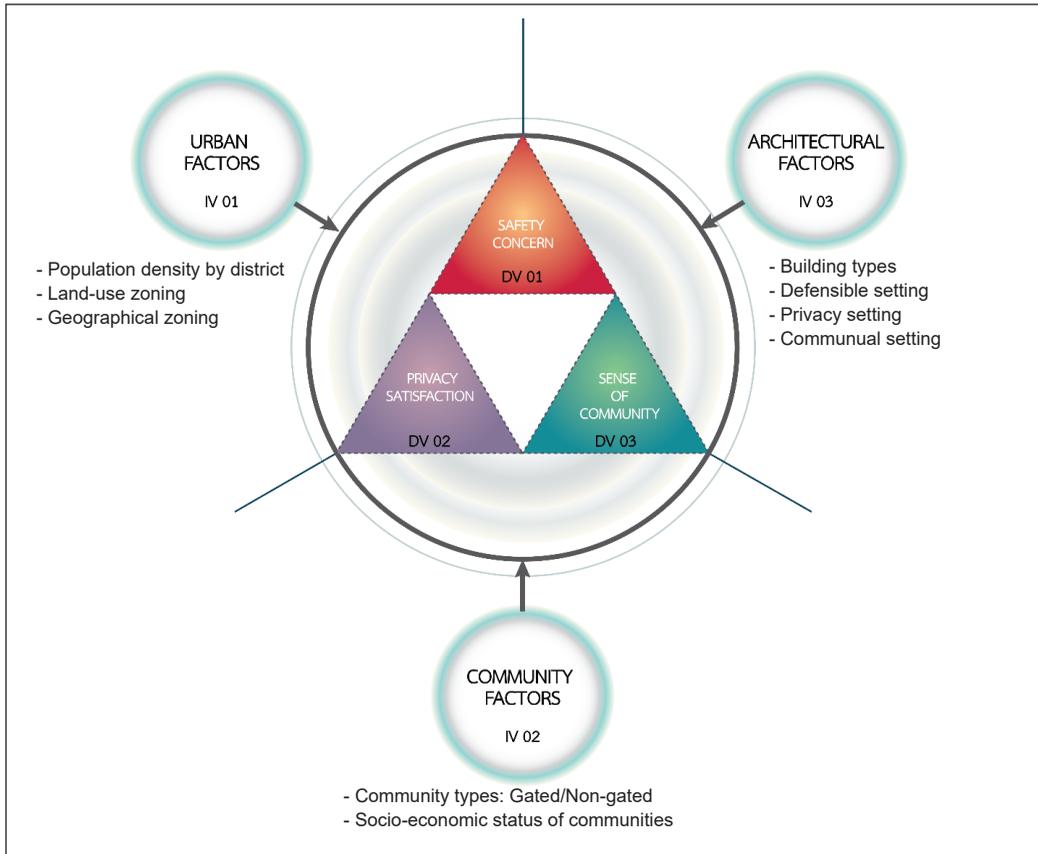


Figure 2. Research variables and constructs

surveillance, territoriality, and milieu and juxtaposition of condominiums), (3) *privacy setting* (interval scale: ranking score 1 to 5, evaluating number of units per floor, type of typical floor plan, and number of unit's members), and (4) *communal setting* (interval scale: ranking score 1 to 5, evaluating a variety of common and recreational areas and visual exposure/ease of accessibility).

Dependent Variables (DV) Set consists of:

DV1 Safety Concern is a self-reported psychological measure reflecting the

degree of anxiety regarding potential harm from three types of threats in condominiums: (1) *degree of concern about crime*, (2) *degree of concern about behavioural disorder*, and (3) *degree of concern about emergencies* (all categories measured in Likert Scale 1 to 5).

DV2 Privacy Satisfaction is a variable that signifies the extent to which residents feel satisfied with their ability to control and manage their privacy in various situations within condominiums. It contains four dimensions of privacy: (1) *level of psychological privacy*

satisfaction, (2) level of informational privacy satisfaction, (3) level of physical privacy satisfaction, and (4) level of social/ interactional privacy satisfaction (all categories measured in Likert Scale 1 to 5).

DV3 Sense of Community measures the strength of the bond between residents and their condominium community. It encompasses four aspects: (1) *feeling of membership*, (2) *feeling of reciprocal influence*, (3) *feeling of reinforcement* (integration and fulfilment of needs), and (4) *feeling of shared emotional connection* (all categories measured in Likert Scale 1 to 5).

Research Methodology

As stated earlier, this study aimed to determine and statistically confirm the significant effects of physical environmental factors on the mental wellbeing of condominium dwellers. The cross-sectional survey was planned to collect data to test the above hypotheses.

Research Population and Setting

The population of this study addressed more than 350,000 dwellers of condominiums located in the Bangkok Metropolitan area. The sample size was estimated using Taro Yamane's sample size table for a number of the population more than 100,000. The desired sample size was between 1,111 and 1,222 participants (with a $\pm 3.0\%$ margin of error, a 95% confidence interval plus 10% compensation for non-response). Upon concluding the survey, it was determined

that the sample size amounted to 1,206 participants. Table 1 provides a breakdown of the number of respondents from each condominium.

The Bangkok Metropolitan area was clustered into six different zones according to the criteria of the City Planning Department (CPD) to ensure that the samples represented the entire population throughout the city. Of each zone, three condominiums were purposively defined to represent the low-selling price condominiums, middle-selling price condominiums, and the high-selling price condominiums consecutively. The total number of selected residential high-rises then became eighteen.

Research Instruments

Since the goals are to evaluate the physical existence of eighteen condominiums and to collect the residents' data, two research instruments were initiated and designed to fit several units of measurement and the manners of both categorical and numerical data, as described below.

Physical-Environmental (PE) Assessment.

The PE assessment evaluated the physical environment of the selective condominiums, including their surroundings, as framed in the scope of the study. The tool implementation was during the non-participant observation by the researcher. In fulfilling the PE assessment criterion, some indicators need answers from the secondary data, for example, the population density of each district and the typical floor plan of the condominiums.

Personal and Psychological (PP) Questionnaire. The PP questionnaire was to collect personal information from the samples. The questionnaire allowed respondents to self-report their personal background information and the status of three psychological variables: (1) safety concern, (2) privacy satisfaction, and (3) sense of community while residing in condominiums in the Likert Scale 1 to 5.

Sampling Technique

This research applied the two-stage stratified sampling technique to recruit respondents living in Bangkok's condominiums (Figure 3).

Stratum 1: Stratified by Geographical Regions. Ensuring the samples represent the population -condominium dwellers of 350,000 units located in Bangkok- this study divided the city into six geographical zones regarding the City Planning Department (CPD). The breakdown of engaged respondents from each zone is as follows: (1) Northern Bangkok (215 respondents), (2) Central Bangkok (200 respondents), (3) Southern Bangkok (195 respondents), (4) Eastern Bangkok (178 respondents), (5) Northwestern Bangkok (Northern Thonburi) (207 respondents), and (6) Southwestern Bangkok (Southern Thonburi) (211 respondents).

Stage 1: Economic Classifications and Inclusive Criteria. Purposively, the participating condominiums of each zone represented the three different selling price levels, according to the condominium price

index defined by the Real Estate Information Center (REIC), as follows.

1. Low-selling price: less than 50,000 Baht/m²
2. Middle-selling price: 50,000 - 79,999 Baht/m²
3. High-selling price: greater than or equal to 80,000 Baht/m²

By the legal definition of high-rise condominiums applied in this research, the participating condominiums must (1) be residential high-rise buildings higher than 23 m, (2) be operated and occupied for more than five years, and (3) formally grant authorisation to the research team to administer the survey on their property.

Stage 2: Simple Random Sampling.

In the final stage, the random lottery technique was applied. The survey involved 1,206 respondents living in eighteen condominiums who willingly consented to answer the PP questionnaire (Figure 3).

RESULTS

Prior to the full-scale field survey, the Index of Item Objective Congruence (IOC) was performed to confirm the content validity of the research tools: (1) Physical-Environmental (PE) assessment and (2) Personal and Psychological (PP) questionnaire. Regarding the IOC evaluators' recommendations, the PP questionnaire was improved and trialled in a pilot study. Both tools, the PP questionnaire and the PE assessment, were randomly administered at the condominium coded SB03. The result derived from the SB03 condominium

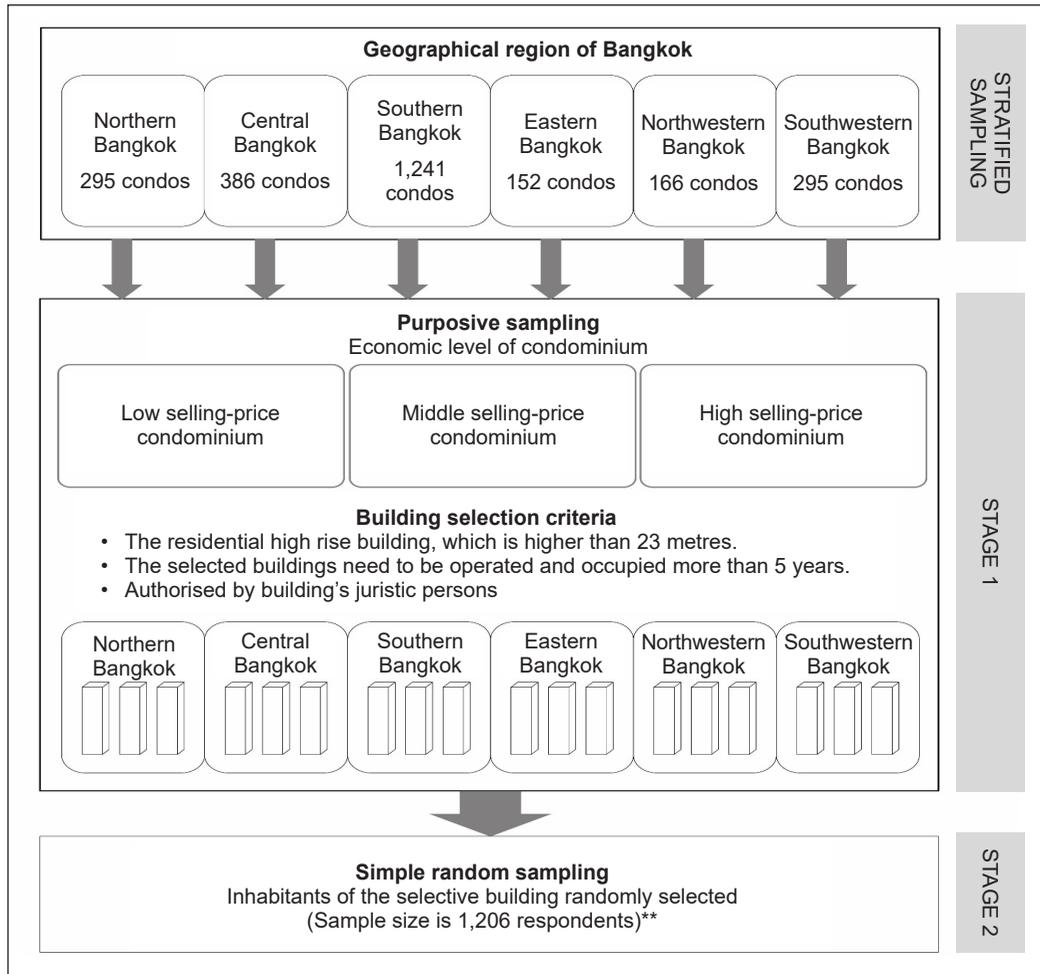


Figure 3. Two-stage stratified sampling technique applied in research

(n = 65) was examined for the survey's validation, reliability, and uni-dimensional qualification. The calculated Cronbach's Alpha coefficient value confirmed a high internal consistency of the overall PP questionnaire at 0.905.

Demographic Data

The survey results indicated that the proportion of females (683 respondents = 56.6%) was higher than males (523 respondents = 43.4 %). The age of the

sampling group average was 32.8 years old. Most samples were in middle adulthood (35–60 years old) and early adulthood (25–34 years old) (32.0%), respectively. Regardless of outliers, the samples were in the middle-level income. The mean, mode, and median household income (per month) were 56,949 THB (appx. 2,186 Euro), 50,000 THB, and 50,000 THB (appx. 1,280 Euro) per month consecutively. Meanwhile, 555 respondents (46%) owned the dwelling units (Rujibhong, 2017).

Results of Physical Environmental Assessment (PE)

About the assessment, participated buildings were systemised in code: the first three letters represent the geographical zone (Figure 4), and the last two digits represent the economic level of the condominium (Table 1).

The figure below illustrates the locations of condominiums engaged in the survey. As mentioned earlier, the Floor Area Ratio

(FAR) and Open Space Ratio (OPR) have influenced a conglomeration of high-rise condominiums to be built in commercial zones and medium to high-density residential zones than others (Figure 4).

The data about the urban attributes of each condominium was elaborated in the following columns: geographical zoning, zoning code, land use code, and population density by district (Table 1). The community factors of each condominium were recorded

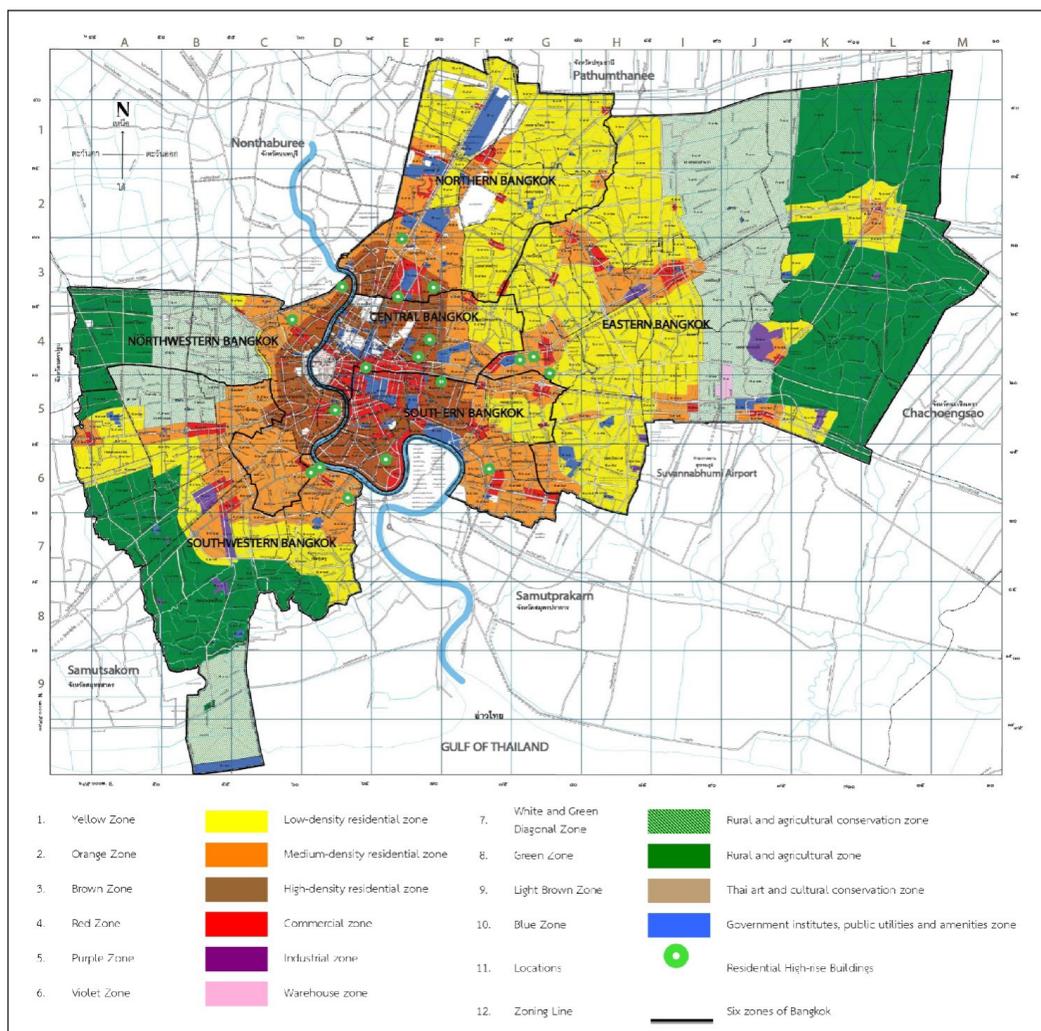


Figure 4. The map illustrating the locations of 18 condominiums and land-use zoning in Bangkok

in the columns: level of condominium, economic code, and community type. The architectural characteristics classified into three variable sets: the defensible score, privacy satisfaction score, and communal score were recorded.

Based on the data (Table 1), the condominiums CB01-03 are situated in the distinctive context of commercial zones (CMC) and high-density residential areas (HDR). These condominiums are also located in the most densely populated areas of Bangkok. In contrast, the condominiums NB01-03, situated in the northern region of Bangkok, are in the least densely populated area of Bangkok's inner city (MDR).

Regarding community factors, the data shows that most middle-priced condominiums were designed with a more open concept by adopting a semi-gated community approach.

Defensible Setting Score

The non-participant observation and PE assessment summary showed that the high-priced condominiums (NB, SB and NWB, Econ Code 03) earned the highest defensible setting score, scaling from 1 to 5. Meanwhile, the low-priced condominiums (NB, CB, and EB Econ Code 01) received the lowest scores. Comparatively, the high-priced condominiums' protective territoriality and surveillance system were superior to the low-priced ones. Besides, the low-priced condominiums had problems with multiple entrance controls and locations that were forlorn or far from public transportation (Figure 5).

Privacy Setting Score

The comparison of condominiums' economic levels showed that the average privacy setting score of all three levels was indifferent. Notably, the high-priced condominiums earned better scores on privacy features than others (Figure 6).

The PE assessment evaluated the privacy setting score by considering the type of building's core structure (atrium/single-loaded/double-loaded corridor) and floor density (number of living units per floor) as physical features that effectively provide more privacy for occupants. Before applying the inferential statistic, the privacy setting score of each building was merged with the score of density per unit measured by the PP questionnaire.

Communal Setting Score

The graph below illustrates that the middle-priced condominiums, on average, received higher communal setting scores than others. The critical indicators considered in this category were various recreational facilities, and the layout of the master plan (sociopetal/socio-fugal design) assumed to invigorate occupants and entail a high perception of the communal atmosphere (Figure 7).

Results of Personal Psychological Questionnaire (PE)

The Exploratory Factor Analysis (EFA) indicated that all questions (Likert Scale 1 to 5) derived from the PP questionnaire were adequately factorable (all factor loadings ≥ 0.60). Considering the safety concerns score, the three most concerning issues

Table 1
Results of physical environmental (PE) assessment

Geographical Zoning	Zoning Code	Level of Property	Econ. Code	Condo Code	Land use	<i>n</i>	Population by District person/km ²	Community Type	Defensible Score (1 to 5)	Privacy Score (1 to 5)	Communal Score (1 to 5)
Northern Bangkok	NB	Low	01	NB01	MDR	70	4,847	Semi-gated	2.40	3.50	4.50
		Middle	02	NB02	HDR	77	4,847	Semi-gated	3.80	3.50	4.00
		High	03	NB03	HDR	68	4,847	Gated	4.60	3.50	2.00
Central Bangkok	CB	Low	01	CB01	HDR	70	15,078	Semi-gated	2.40	3.00	2.00
		Middle	02	CB02	HDR	71	15,078	Gated	3.60	3.50	4.00
		High	03	CB03	CMC	59	10,328	Gated	4.00	4.00	1.50
Southern Bangkok	SB	Low	01	SB01	HDR	62	4,814	Gated	3.20	3.50	2.00
		Middle	02	SB02	HDR	68	6,702	Semi-gated	2.80	4.00	4.50
		High	03	SB03	HDR	65	6,592	Gated	4.60	4.00	2.00
Eastern Bangkok	EB	Low	01	EB01	MDR	60	5,227	Gated	2.60	4.50	2.50
		Middle	02	EB02	MDR	70	5,227	Semi-gated	4.00	3.50	3.00
		High	03	EB03	MDR	48	5,227	Semi-gated	4.20	3.50	2.00
Northwestern Bangkok	NWB	Low	01	NWB01	MDR	71	8,405	Gated	3.80	2.50	3.00
		Middle	02	NWB02	MDR	70	8,405	Semi-gated	4.00	2.00	5.00
		High	03	NWB03	HDR	66	12,361	Semi-gated	4.40	3.50	2.00
Southwestern Bangkok	SWB	Low	01	SWB01	MDR	71	5,332	Semi-gated	3.00	3.00	1.50
		Middle	02	SWB02	MDR	69	5,332	Gated	4.20	3.50	3.00
		High	03	SWB03	MDR	71	5,332	Gated	4.40	3.50	5.00

Note. MDR = Medium-Density Residential Zone.
HDR = High-Density Residential Zone
CMC = Commercial Zone

The Impact of Physical Environment on Mental Wellbeing

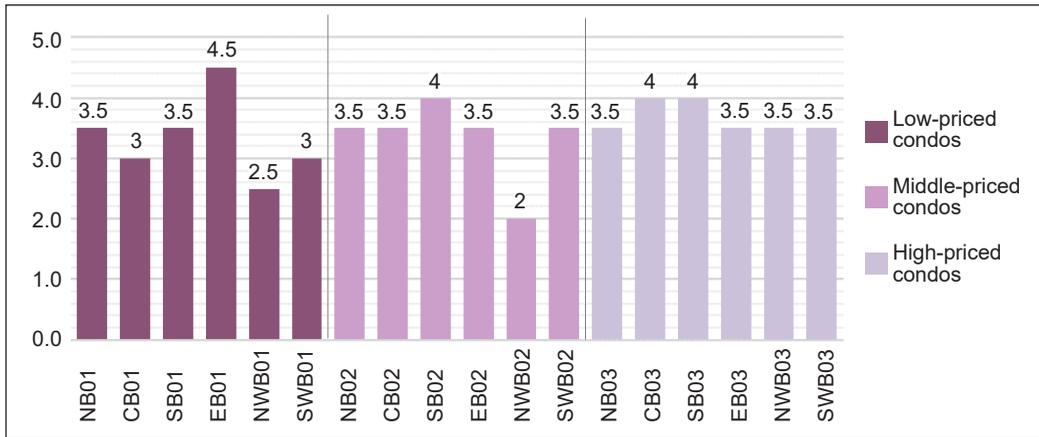


Figure 6. Comparative privacy setting score of condominiums by economic level (scale 1 to 5)

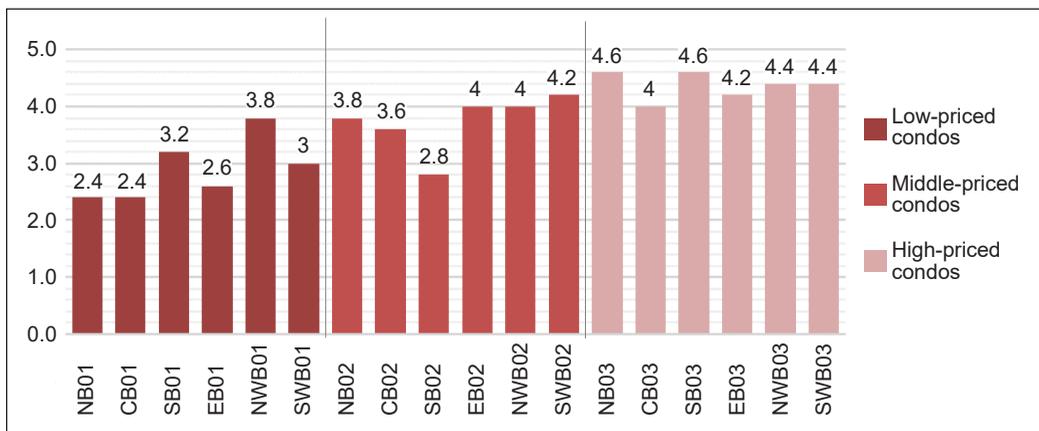


Figure 5. A comparative defensible setting score of condominiums by economic level (scale 1 to 5)

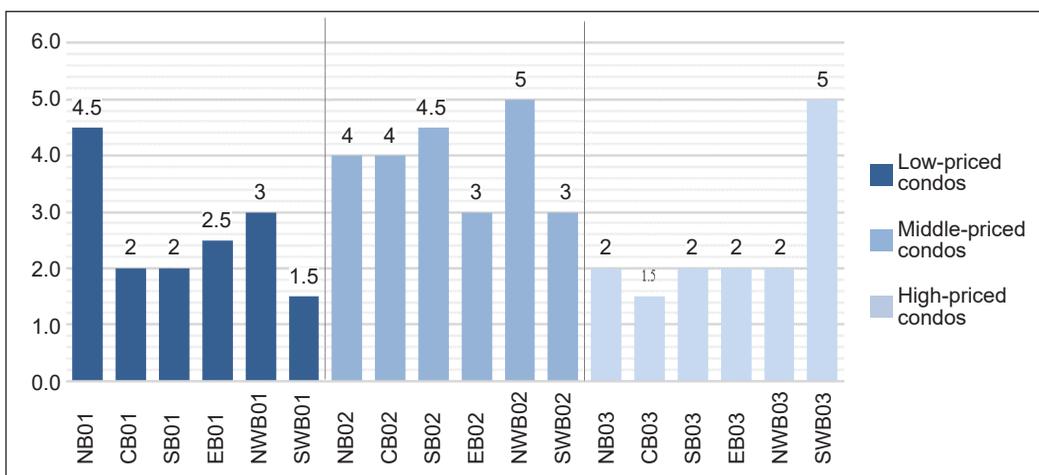


Figure 7. A comparative communal setting score of condominiums by economic level (scale 1 to 5)

amongst the respondents are the emergency concern (Q7 = elevator malfunction, and Q8 = failed emergency evacuation) and crime concern (Q3 strangers in the building) (Table 2). The results also illustrated that the samples were most satisfied with their physical privacy (Q13 = personal and daily routines and Q14 = relaxed and loose in the unit) while dwelling in their units, followed by informational privacy (Q11 = private conversation) (Table 2). The samples also reported their strong sense of membership (Q17 = feeling like a member of the condominium) and emotional connection with their condominium communities (Q24 = feeling bound with the condominium, and Q23 = feeling angry if someone criticises/defames the condominium) consecutively (Table 2).

Results of Statistical Analysis

The various inferential statistic approaches applied during the analytical stage, for example, the Independent Sample t-test, Pearson product-moment Correlations (PPMC), one-way Analysis of Variance (one-way ANOVA), and the statistical power (Cohen's magnitude of effect size), answer the main research questions, which physical environmental factors significantly affect the mental wellbeing of condominiums' inhabitants and how different those effects are (Rujibhong, 2017).

Regarding the PPMC analysis results, significant relationships existed between independent (numerical) and dependent variables. Considerably, Pearson's r revealed small negative correlations

($r = -.207$) between the density of the population and the sense of community, feeling of membership ($r = -.168$), influence ($r = -.154$), reinforcement ($r = -.165$) and 4) shared emotional connection ($r = -.205$) significantly at $p < 0.01$ (Rujibhong, 2017) (See Table 3).

It also indicated small positive correlations between the privacy setting score of condominiums and the average privacy satisfaction score ($r = .09$), particularly the physical privacy ($r = .1$), significantly at $p < 0.01$ (Table 3). Other significant trivial correlations also exist, for example, weak negative correlations between the defensible setting score and safety concern and the sense of community scores, as well as weak positive correlations between the communal setting score and sense of community scores (Table 3).

The one-way ANOVA was applied to compare the effect of the categorical variables, such as land use and geographical zoning of the city.

The analysis accepted the alternative hypothesis (H_a), assuming considerable differences between the safety concern score and the sense of community score amongst the residents of different land-use zones ($p < .001$). However, a significant effect was not found on the privacy satisfaction score. The Post Hoc confirmed the more robust sense of community among medium-density residential area respondents than in other zones (Rujibhong, 2017).

Meanwhile, the one-way ANOVA results revealed the influence of geographical zoning on a safety concern, including behavioural

disorder score and emergency concern ($p < .05$). Post hoc comparison showed that the safety concern of the respondents from the city's western side was greater than the eastern side. Besides, significant differences in the privacy satisfaction score

were detected, including informational and physical privacy satisfaction ($p < .05$). The Post hoc indicated greater privacy satisfaction amongst the respondents living in Northern Bangkok than those living on the city's south side.

Table 2
Summary of the PP questionnaire's scores (Likert scale 1 to 5)

(n = 1,206)	Question Items	Mean	S.D.	Factor Loading
SAFETY CONCERN SCORE		2.638	0.978	$\alpha = 0.905$
Q1	Crime in parking space	2.295	1.22	0.724
Q2	Lack of CCTV	2.707	1.292	0.732
Q3	Strangers in the condominium might be criminals	2.876	1.257	0.794
Q4	Someone jumps off the high floor	2.389	1.232	0.71
Q5	Drug-abusing people living in the condominium	2.594	1.261	0.781
Q6	Unhygienic condition of sharing facilities	2.513	1.218	0.725
Q7	Elevator's malfunction	2.879	1.279	0.723
Q8	Failed rescue operation/evacuation in case of emergency	2.849	1.325	0.717
PRIVACY SATISFACTION SCORE		4.011	0.765	$\alpha = 0.894$
Q9	Freely express emotions in the living unit	3.977	1.074	0.756
Q10	Being able to work on a concentration-required task in the living unit	4.014	1.022	0.793
Q11	Having a private conversation in the living unit	4.054	1.03	0.844
Q12	Receiving classified documents via the condominium's mailbox	3.871	1.035	0.688
Q13	Personal activities and daily routine	4.232	0.918	0.711
Q14	Being relaxed and loose in the living unit	4.265	0.9	0.735
Q15	Hanging out with family/friend (s) in the condominium's common areas	3.689	1.084	0.5
Q16	Inviting friend(s)/guest(s) to visit the living unit	3.982	1.058	0.644
SENSE OF COMMUNITY SCORE		3.324	0.734	$\alpha = 0.885$
Q17	Feeling like a member of the condominium	3.623	0.896	0.549
Q18	Condominium residents can recognise each other	3.242	1.043	0.661
Q19	Requests and complaints are always responded	3.175	0.972	0.682
Q20	Neighbours' opinions are beneficial	3.258	0.987	0.777
Q21	Happy to participate in events hosted by condominium members	3.175	1.014	0.81
Q22	Neighbours are kind and helpful	3.298	0.992	0.783
Q23	Feeling angry if someone criticises or defames a condominium	3.302	0.992	0.694
Q24	Feeling bound and happy to live in the condominium as long as possible	3.522	1.02	0.573

Table 3
Pearson product-moment correlations (PPMC) of independent variables and dependent variables

VARIABLES	AVERAGE SAFETY CONCERN	Crime	Behavioural Disorder	Emergency	AVERAGE PRIVACY SATISFACTION	Psycho-privacy	Info-privacy	Physical-privacy	Social-privacy	AVERAGE SENSE OF COMMUNITY	Membership	Influence	Reinforcement	Emotional Connection
1 Density of Population (by district)	.057*	.04	.068*	.03	0.00	.04	-.03	-.03	0.00	-.207*	-.168**	-.154**	-.165**	-.205**
2 Defensible setting score	-.070*	-.086**	-.03	-.066*	.05	.04	.03	.05	.04	-.070*	-.092**	-.03	-.079**	-.04
3 Privacy setting score	-.072*	-.04	-.084**	-.071*	.090**	.095**	.075**	.100**	.03	-.03	.01	.00	-.062*	-.05
4 Communal setting score	.01	.03	.03	-.04	-.05	-.084**	-.05	-.04	0.00	.061*	.05	.03	.05	.080**

Note. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

.01 < |r| < .1 “Very small or weak correlation.”

.1 < |r| < .3 “Small or weak correlation”

.3 < |r| < .5 “Medium or moderate correlation”

.5 < |r| “Large or strong correlation.”

- Negative relationship

+ Positive relationship

A significant variance in the sense of community amongst Bangkok geographical zones was revealed, including the feelings of membership, influence, reinforcement, and emotional connection ($p < .001$). The Post hoc tests indicated that the respondents residing in Central Bangkok expressed the lowest sense of community than others (Table 4).

Considering the economic level of the community, significant differences in the economic status of condominiums on safety concerns ($p < .001$), such as crime, behavioural disorder, and emergency concerns, were discovered. The variances in privacy satisfaction, including the feelings of membership and reinforcement, were also found ($p < .005$). The Post hoc test reported a greater safety score among low-priced condominium residents than others (Table 4).

As mentioned earlier, there were two community types amongst the eighteen condominiums: gated and semi-gated communities. According to an independent sample t-test, respondents from gated and semi-gated neighbourhoods reported significantly different degrees of safety concern and sense of community. The respondents in gated condominiums were more concerned about crime and emergencies than those in semi-gated condominiums ($p < .004$). Furthermore, respondents living in semi-gated condominiums expressed a significantly higher sense of community than those living in gated condominiums, as well as significantly higher mean scores of memberships, reinforcement, and emotional

senses of community, respectively. Meanwhile, the privacy satisfaction score of these two groups of respondents was insignificant (Table 4).

DISCUSSION

The statistical findings of this study provide robust responses to the research questions and support the acceptance of the alternative hypothesis (H_1). Specifically, the results indicate that physical environmental factors, including urban, community, and architectural factors, exerted discernible effects on the mental well-being of condominium dwellers in terms of safety concerns, privacy satisfaction, and sense of community. These effects were observed to manifest in unique and distinct ways, further highlighting the significance of the physical environment in shaping the psychological experiences of residents (Figure 8).

Regarding architectural factors, specific unique attributes of the condominium, such as building height, were found to have an insignificant statistical effect. This finding aligns with previous research criticising the overestimated concern regarding building height (Stefanucci & Proffitt, 2009). As a result, the variable related to building height was excluded from the analysis.

The Impact of Urban Factors on the Mental Wellbeing of the Condominium Dwellers

Various urban factors, including geographical zoning, land use zoning, and population density, significantly influenced the respondents' safety

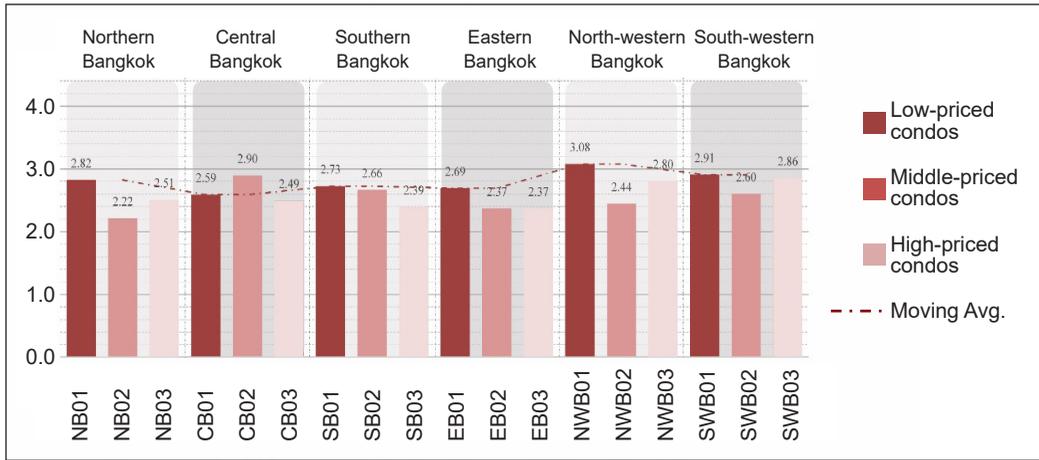
Table 4
Summary of statistical analyses of differences between groups by categorical predictors

Independent Variables	Land Use Zoning		Geographical Zoning		Economic Level		Type of Community
	One-way ANOVA		One-way ANOVA		One-way ANOVA		
Avg. SAFETY CONCERN	F(2,1203) = 10.197***	F(5,1200) = 3.899***	F(2,1203) = 9.736***	t = 2.248*			
Crime Concern	F(2,1203) = 11.271***	F(5,1200) = 1.859	F(2,1203) = 12.738***	t = 2.201*			
Behavioural Disorder Concern	F(2,1203) = 7.661***	F(5,1200) = 5.566***	F(2,1203) = 5.292**	t = 1.056			
Emergency Concern	F(2,1203) = 4.534*	F(5,1200) = 2.794*	F(2,1203) = 10.307***	t = 2.902**			
Avg. PRIVACY SATISFACTION	F(2,1203) = 2.044	F(5,1200) = 2.324*	F(2,1203) = 1.801	t = .809			
Psycho. Privacy Satisfaction	F(2,1203) = 2.276	F(5,1200) = .789	F(2,1203) = 4.572*	t = .944			
Info. Privacy Satisfaction	F(2,1203) = .804	F(5,1200) = 2.542*	F(2,1203) = .211	t = 1.191			
Physical Privacy Satisfaction	F(2,1203) = 1.964	F(5,1200) = .012*	F(2,1203) = 1.563	t = .900			
Social Privacy Satisfaction	F(2,1203) = 1.421	F(5,1200) = 2.16	F(2,1203) = 1.134	t = -.305			
Avg. SENSE OF COMMUNITY	F(2,1203) = 10.621***	F(5,1200) = 11.295***	F(2,1203) = 2.737	t = -3.337***			
Membership	F(2,1203) = 6.379***	F(5,1200) = 8.326***	F(2,1203) = 3.742*	t = -3.627***			
Influence	F(2,1203) = 8.072***	F(5,1200) = 7.216***	F(2,1203) = 1.636	t = -1.698			
Reinforcement	F(2,1203) = 9.441***	F(5,1200) = 7.848***	F(2,1203) = 4.755**	t = -2.533*			
Emotional Connection	F(2,1203) = 7.134***	F(5,1200) = 10.857*	F(2,1203) = .500	t = -3.35***			

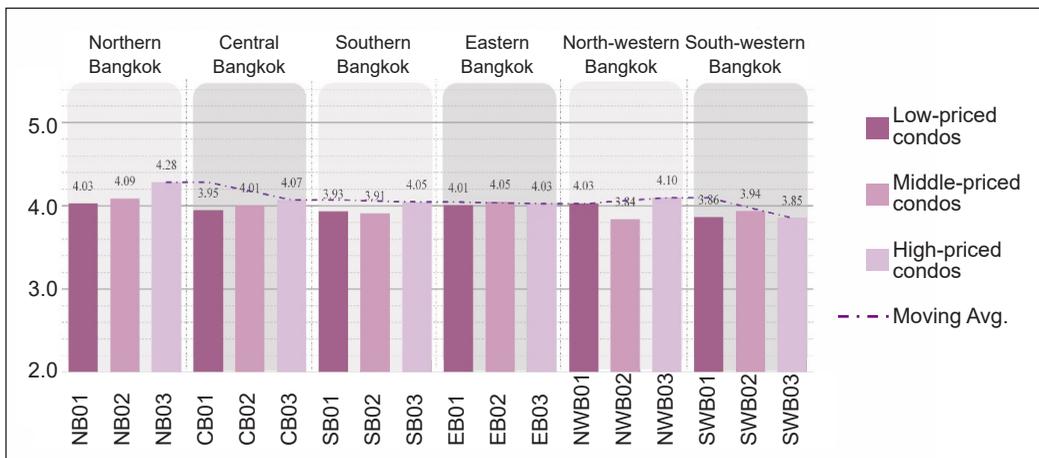
Note. *p ≤ .05, **p ≤ .01, ***p ≤ .001

The dataset was proved to conform to an assumption of a normal distribution considering the skewness and kurtosis between ±2.

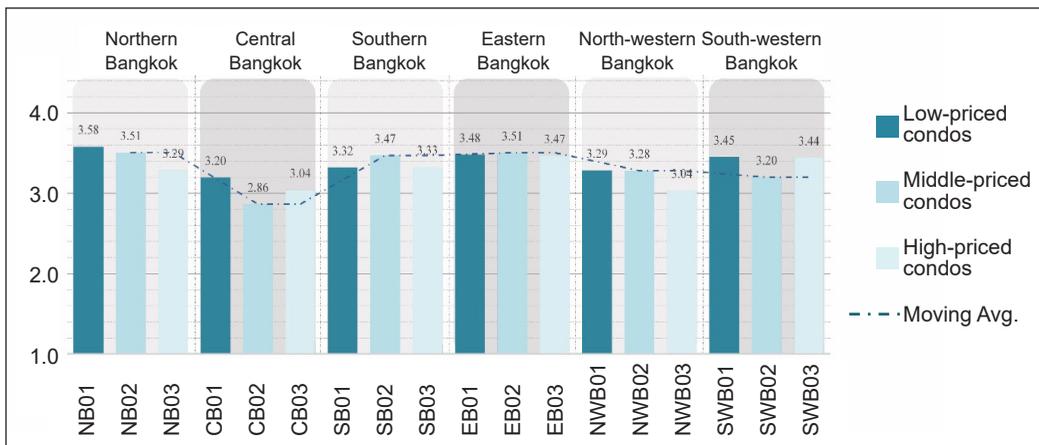
The Impact of Physical Environment on Mental Wellbeing



(a)



(b)



(c)

Figure 8. Comparative three psychological scores of eighteen condominiums: (a) safety concern; (b) privacy satisfaction; and (c) sense of community

concerns. Notably, individuals residing on the western side of the Chao Phraya River (Zone 5: Northwestern Bangkok and Zone 6: Southwestern Bangkok) exhibited considerably more pronounced concerns regarding the behavioural disorder and emergency evacuation compared to those residing on the eastern side of the river (Zone 1 to 4). This finding underscores the spatial variation in safety concerns within different zones, highlighting the significance of geographical location in shaping perceptions of safety amongst condominium residents (Rujibhong, 2017) (Figure 8).

Historically referred to as “Thonburi,” the western side of Bangkok has exhibited a consistent vulnerability to seasonal flooding. Moreover, due to its proximity to the industrial district in Samutsakorn and Samutprakarn provinces, the area has become an appealing destination for migrant labourers from neighbouring countries, including Cambodia, Myanmar, and Laos (Office of Foreign Workers Administration, 2016). Additionally, there has been an observable presence of outlaw motorcycle gangs and drug dealers in this particular area. These contextual factors contribute to the distinctive characteristics and dynamics of the western side of Bangkok (Rujibhong, 2017).

The Impact of Community Factors on the Mental Wellbeing of the Condominium Dwellers

The community and architectural factors that affected the respondents’ safety

concerns were the community’s economic levels. The degree of concern about safety amongst the respondents living in the low-priced condominiums was more significant than in the middle and high-priced condominiums. Based on the result of the PE assessment, the low-priced buildings could not maintain their physical environment as well as the middle and high-priced condominiums and earned a defensible score less than others.

The types of community also influenced the variation of safety concerns amongst the condominiums’ residents. The findings revealed that the gated characteristic of condominiums became problematic since it excluded dwellers from the outside, increased fear, and discriminated against insiders from outsiders, as seen from the more significant concern about crime amongst the gated condominiums’ residents than others.

The Impact of Architectural Factors on the Mental Wellbeing of the Condominium Dwellers

The condominiums’ privacy attributes, (1) a smaller number of living units on each floor and (2) the number of dwellers per unit, were essential capacities that supported the privacy satisfaction of the residents. Besides, the building configurations that positively correlated with the residents’ psychological and physical privacy were courtyard and single-loaded corridor arrangements rather than the double-loaded corridor.

In the sense of community, the negative relationship between the density of the

population and the respondents' feeling of membership, reinforcement, influence, and emotional connection was significantly revealed. This interpretation is consonant with several pieces of research that pointed out heterogeneity and density of population as the misery of urban life causing the overloading of people's cognitive function, which leads to social withdrawal and less interest in their community (Milgram, 1970; Rajendran et al., 2009).

The analysis of variance revealed a stronger sense of community amongst respondents living in medium-density residential neighbourhoods than those who lived in high-density residential areas. Moreover, the participants living in Central Bangkok expressed the slightest sense of community more than in other zones. The research findings are valuable for housing developers, as they demonstrate the benefits of operating residential high-rises in Central Bangkok, the country's business hub. Such developments provide residents convenient access to amenities, infrastructure, and economic opportunities. However, the findings also shed light on the challenges posed by the area's high cost of living, pollution, and rush-hour traffic. The double-time population density in Central Bangkok, combined with demanding routines and environmental factors, contributes to residents' fatigue and reduced inclination to engage with the community.

For the community factors, the results confirmed a more robust sense of community among semi-gated compounds' residents than the gated ones. This research

statistically endorses the argument of the adverse effects of the gated community on condominium residents in Bangkok that living in such an environment considerably deterred people from connecting with neighbours, participating in social events and feeling bound with their community. The analysis also suggested that the defensible setting of condominiums negatively affected the residents' sense of community.

CONCLUSION

In conclusion, this study emphasises the importance of understanding the mental well-being of diverse residents in high-rise condominiums, considering the challenges of urban complexities, community diversity, and architectural constraints. As observed from the sampling group, the insights from Bangkok's urban psychology provide valuable information for housing developers. Despite the vast diversity of Bangkok's metropolis, neighbourhoods exhibit shared mental perspectives. Every community has distinct needs, concerns, pleasures, and ties to their living environments, all of which demand a thorough understanding. A foundation rooted in environmental psychology is essential to enhance high-rise housing projects in specific areas of Bangkok. Given the high population density, heterogeneity, and competitive lifestyles in Central Bangkok, it is recommended that future development plans for residential high-rises be either slowed down or reevaluated. Such considerations are vital to prevent threats to residents' sense of community and public mindfulness.

As previously discussed, the Floor Area Ratio (FAR) is a key metric the City Planning Department uses to control urban density. It represents the ratio of a building's total floor area to its plot size. It is suggested to ease regulations and increase the FAR specifically for residential buildings to promote high-rise housing development in medium-density zones rather than in Central Bangkok. Conversely, the FAR for new condominiums in commercial areas should be more restricted.

In addition to the urban factors mentioned earlier, the psychological wellbeing of condominium inhabitants was influenced by community characteristics. The research indicates that residents of semi-gated condominiums had a stronger sense of community. Interestingly, their concerns regarding emergency evacuation were lower than those living in fully gated condominiums. The perceived exclusivity, especially in upscale condominiums, can be counterproductive to fostering community spirit amongst residents. Designers and housing developers should eschew overly segregated designs. Instead, they should promote connectedness between residents and their surroundings by incorporating shared public spaces or transparent enclosures complemented by natural or green barriers.

Recommendations

From an architectural standpoint, creating a safe and secure condominium environment demands a thoughtful integration of spatial design and management strategies. It ensures

that the living space exhibits its protective capacity and remains evident to its residents. Within the scope of this study, four primary components of a building's defensible features are highlighted: (1) access control, (2) surveillance, (3) territoriality, and (4) milieu and juxtaposition. These components are crucial in bolstering the perception of security amongst high-rise residents, especially in addressing concerns related to safety and crime.

Beyond the district's population density addressed earlier, this study also examines the impacts of residential density, specifically the number of units per floor and individuals within each unit. The data suggests that high floor density can compromise residents' psychological privacy and heighten concerns about behavioural disruptions. Conversely, high unit density tends to diminish residents' satisfaction with both psychological and physical privacy. Limiting these two density types mitigates potential stress among high-rise dwellers. Implementing the high-rise housing standards set by the National Housing Authority (NHA), such as specifying a minimum area per occupant, in upcoming residential high-rise public and private projects is deemed beneficial. Furthermore, managing privacy in living units housing more than two occupants becomes increasingly complex, especially among non-family members. Thus, in addition to the usual in-unit divisions, offering shared multi-functional areas, like co-working spaces, libraries, and common living or meeting rooms, can assist residents

in adjusting their personal and group privacy levels to meet their needs.

Given the verified impact of communal attributes on the sense of community, it becomes imperative to value diverse recreational facilities as fundamental amenities for condominium residents. According to the NHA's housing standards, regulations mandate a minimum area ratio for retail and green spaces in community areas, but these are only enforced in public housing projects. Expanding these recreational and communal area ratios and applying them universally to all new residential high-rise developments, whether by public or private entities, is recommended to address this disparity. In addition to the ratio of recreational and communal areas, the accessibility and visibility of these facilities are viewed as key communal factors that foster a sense of community and social interaction among residents. Condominium developers are also encouraged to incorporate sociopetal space planning in these areas. This specific spatial design promotes enhanced visual continuity and richer communal experiences among residents and bolsters natural surveillance, thereby augmenting feelings of safety.

The research was conducted during the pre-coronavirus pandemic era, where respondents primarily expressed concerns about safety and security stemming from human-induced threats, such as building malfunctions and crimes. Interestingly, the unhygienic condition of buildings ranked fifth in their concerns, a factor that would likely rank higher today. The

pandemic and subsequent shifts in daily living have prompted urban dwellers, including condominium residents, to alter their behaviours and routines significantly. Future studies should emphasise the hygiene standards in multifamily residences to mitigate the spread of infectious diseases and develop more sustainable condominiums. It includes introducing new design methodologies and implementing adaptive solutions for existing structures.

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