



# Flexible Living Space Organization for High-Rise Apartments in Ho Chi Minh City

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**Abstract.** The process of urbanisation is taking place strongly, creating pressure on the environment, resources, and ecosystems. Global climate change has led to serious consequences for human life. In 1980, the term “sustainability” appeared as an important attribute required for development in all fields. Sustainable development has become the guideline for all architectural activities in the 21st century in architecture and construction, as mentioned in the Beijing Charter 1999 Pham (2015). Integrating flexible adaptability in the built environment can contribute to sustainable development both socially, economically, and environmentally Nakib (2009). In Ho Chi Minh City (HCMC) in particular and large cities in general, the design of high-rise residential buildings still has many shortcomings, such as scalability and low ability to transform functional space. Flexible design for the organisation of apartment space is essential to meet the fluctuations of interior space due to factors such as climate, culture, society, economy, and technology Vu (2016). This study proposes flexible organisation and transformation solutions for living space in high-rise apartments in HCMC based on the inheritance of existing features combined with flexible housing design strategies. The results are meaningful for meeting the requirements of changing functions due to the diversity of current and future user needs.

**Keywords:** High-rise apartments · Flexible architecture · Adaptable architecture

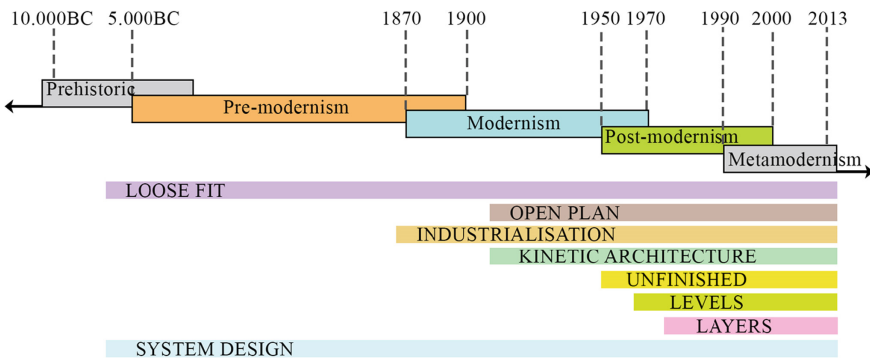
## 1 Introduction

Overall, high-rise residential buildings in HCMC have undergone six development stages from 1999 to the present. In the HCMC market, high-rise residential buildings are classified based on income, including unrated apartments and elementary, intermediate, high-end, and super-premium apartments [10]. According to current standards, Circular 31/2016/TT-BXD guides the division of high-rise residential buildings into three classes [6]. Circular 14/2008/TT-BXD, high-rise residential buildings are classified into four classes [5]. Through apartment samples (Table 1) to assess the current state of flexibility in the organisation of living space, it can be seen that flexibility mainly manifests on the level of rooms. On the unit and floor levels, the walls between rooms and the proportion of unit types on the apartment floor are still fixed and cannot be converted or expanded.

**Table 1.** Name of typical apartment samples for classes (*Source* authors)

No	Name	Location	Class
1	Zentower	Dist. 12	Elementary
2	Thanh Loc	Dist. 12	
3	Binh Trung Dong	Dist. 2	
4	D1 Mension	Dist. 1	Intermediate
5	Era town	Dist. 7	
6	Sai Gon Riverside Complex	Dist. 7	
7	The MARQ	Dist. 1	High-end
8	Serenity Sky Villa	Dist. 3	
9	D'Edge	Dist. 2	

In the world, flexible architecture has appeared, developed, and transformed from the prehistoric architecture period to the 21st-century architecture period. Overall, flexible architecture can be relatively classified into eight strands of thought (Fig. 1). Objects influenced by the strands of thought related to adaptability include space, building components and structures [11]. In Vietnam, versatility is already present in traditional residential architecture and has the potential to grow in contemporary architecture [1, 8]. Theoretically, the flexibility in spatial organisation and the ability to respond to the local environment of street houses are studied and applied to a new type of housing—high-rise apartment buildings [3]; the floorplan can be flexibly expanded by using sector margins [2].



**Fig. 1.** The eight strands of thought related to adaptability (*Source* [11])

## **2 Features of Apartment Units in HCMC and Proposal Flexible Unit Models**

### **2.1 Features of Apartment Units in HCMC**

The apartments in the classification from elementary to high-end follow the general rule of change that in the same class, when unit scale increases, the number of bedrooms, bathrooms, and auxiliary rooms increases. The area of the master bedrooms, private bathrooms, and group of living room and dining rooms also increased. Specifically, the change in spatial composition of a typical intermediate apartment unit is detailed in Table 2.

### **2.2 Proposal Flexible Apartment Unit Models**

Based on Circular 31/2016/TT-BXD stipulating the classification and recognition of apartment classes [6], TCXDVN 323–2004 on high-rise housing—Design standards [4], characteristics of intermediate apartments in the market and the rule of changing the spatial composition as above, the model of intermediate apartments with the proposal area and spatial composition is illustrated in Table 3.

## **3 Flexible Housing Design Strategies**

Based on a synthesis of theories and practical experiences, a building with a flexible spatial organisation will have some of the 12 characteristics and be achieved by three design strategies. Three strategies include (i) modularity; (ii) loose fit; (iii) spatial planning. Twelve characteristics include (1) reversible; (2) functional separation; (3) open space; (4) support space; (5) oversize space; (6) multifunctional spaces; (7) space to grow into; (8) typology patterns; (9) spatial variety and standardisation; (10) switchable among typology patterns; (11) standard grid; (12) simple plan.

## **4 Proposal Solutions to Flexibly Organise and Transform Apartment Unit Models**

The apartment unit model selected to build flexible space organisation solutions belongs to the intermediate class representing all 3 apartment unit classes in the market. Each class includes three types of sizes from 2 to 4 bedrooms. The proposed flexible living space organisation solution is implemented on three levels of spatial, including flexible organisation of unit areas on typical floors, flexible organisation of units on unit areas, and flexible organisation of rooms on units (Fig. 2).

**Table 2.** The change in spatial composition of a unit in intermediate apartments in HCMC (Source authors)

Spatial compositions	Characteristics of spatial compositions in unit					
	2 bedrooms unit		3 bedrooms unit		4 bedrooms unit	
Number of rooms	9		11		14	
Living room	×	Medium	×	Medium	×	Large
Dining room	×	4 seats	×	6 seats	×	8 seats
Kitchen	×	Wet kitchen	×	Wet kitchen	×	Wet kitchen Dry kitchen
Logia	×	Single-function	×	Single-function	×	Single-function
Unit lobby	×	Install cabinets	×	Install cabinets	×	Install cabinets
Bathroom 1C (common)	×	Standard size	×	Standard size	×	Standard size
Bedroom 1C (using common bathroom)	×	Small	×	Small	×	Small
Master bedroom 2R (using private bathroom)	×	Medium	×	Medium	×	Large Add a large dressing room
Bathroom 2R (private)	×	Large Add a bathtub	×	Large Add a lavabo	×	Standard size
Bedroom 3C (using common bathroom)			×	Small	×	Small
Drying yard			×	Single-function	×	Combine with area for housekeeper
Master bedroom 4R (phòng vệ sinh riêng)					×	Extremely—Large

(continued)

#### 4.1 Flexible Organisation Solution for Unit Areas on the Apartment Floor

A unit area is defined as the space where a unit is located. There are three types of unit area sizes, including small unit area (contains up to 2 bedrooms unit), medium unit area (contains up to 3 bedrooms unit) and large unit area (contains up to 4 bedrooms

**Table 2.** (continued)

Spatial compositions	Characteristics of spatial compositions in unit					
	2 bedrooms unit		3 bedrooms unit		4 bedrooms unit	
						Add a large dressing room
Bathroom 3R (private)					×	Add a lavabo Add a bathtub
Area for housekeeper (toilet + bed)					×	Combine with drying yard
Elevator lobby					×	Combine with unit lobby

*Note:* ×—Yes

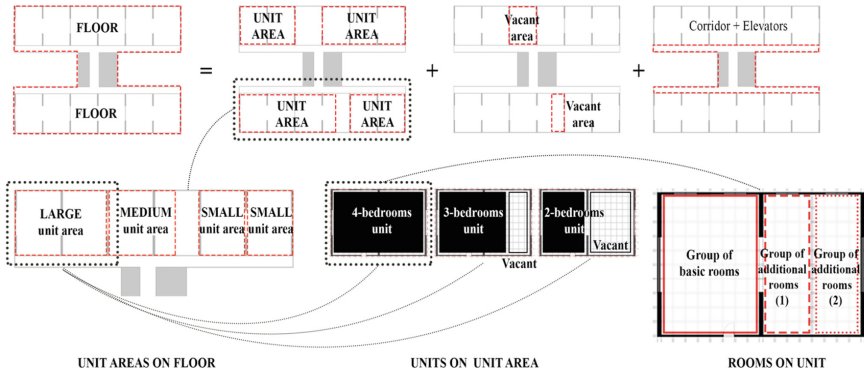
**Table 3.** Proposing spatial compositions inside intermediate apartment units (Source authors)

Characteristics	Characteristics of spatial compositions in units		
	2 bedrooms unit	3 bedrooms unit	4 bedrooms unit
Spatial compositions	<ul style="list-style-type: none"> <li>● K-B-A</li> <li>● BC</li> <li>● T</li> <li>● G</li> <li>● N1(C)</li> <li>● V1(C)</li> <li>● N2(R)</li> <li>● V2(R)</li> </ul>	<ul style="list-style-type: none"> <li>● <b>K-B-A (increase area)</b></li> <li>● BC</li> <li>● T</li> <li>● G</li> <li>● N1(C)</li> <li>● V1(C)</li> <li>● N2(R)</li> <li>● V2(R)</li> <li>● N3(C)</li> </ul>	<ul style="list-style-type: none"> <li>● <b>K-B-A (increase area)</b></li> <li>● BC</li> <li>● T</li> <li>● G</li> <li>● N1(C)</li> <li>● V1(C)</li> <li>● N2(R)</li> <li>● V2(R)</li> <li>● N3(C)</li> <li>● <u>N4(R)</u></li> <li>● <u>V3(R)</u></li> </ul>
Area	70m <sup>2</sup>	100-105m <sup>2</sup>	130-140m <sup>2</sup>

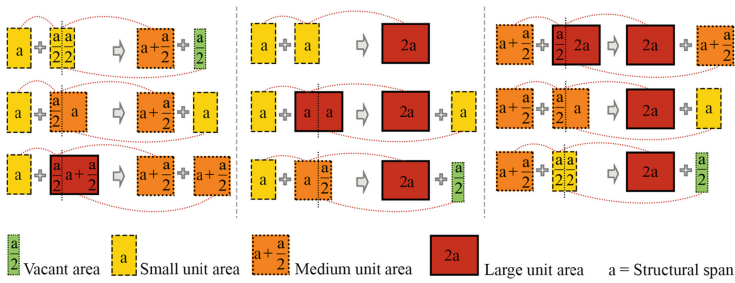
*Note:* K—Living room; B—Kitchen; A—Dinning room; BC—Loggia; T—Lobby; G—Drying yard; N1(C)—Bedroom no.1, using common bathroom; V1(C)—Bathroom no.1, common use; N3(R)—Bedroom no.3, using private bathroom; V3(R)—Bathroom no.3, private use; GN—room for housekeeper; Kh—Store

unit). The flexible organisation of unit area types on a typical apartment floor is applied according to a general principle shown in Fig. 3.

On a typical floor plan, there are many different types of unit areas arrangement. Each type of unit area arrangement can transform by separating and combining unit areas. The initial unit areas organisation model with the ratio of certain unit area types can be determined by market research results. If needs change over time, the unit can be

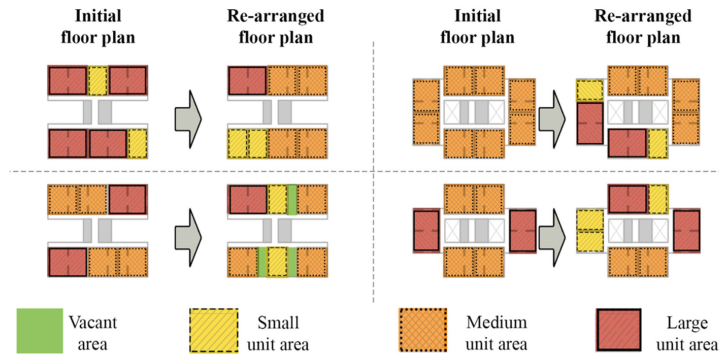


**Fig. 2.** The spatial hierarchy diagram in the HCMC high-rise apartment model (*Source* authors)



**Fig. 3.** Principle of separation and combination of unit area types in HCMC high-rise apartment model (*Source* authors)

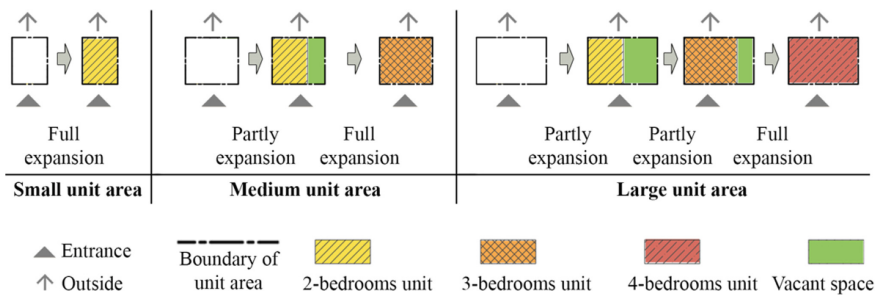
expanded within the initial unit area (if the owner owns the medium and large unit area type) from the beginning). The initial unit areas can be merged with the adjacent unit areas to form a new larger unit area (Fig. 4).



**Fig. 4.** Some initial models of unit areas organisation and the results of transformation (*Source* authors)

## 4.2 Flexible Organisation Solution for Unit Models in the Unit Areas

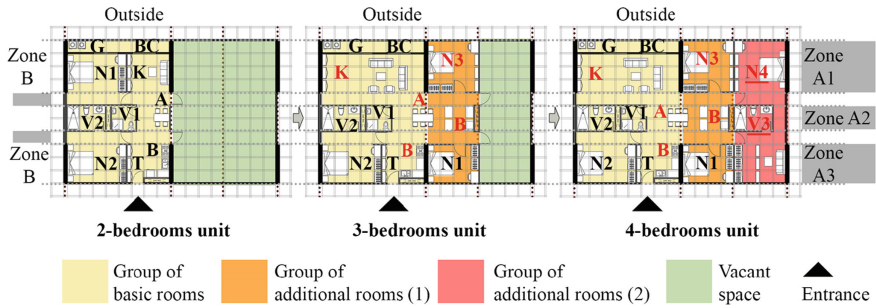
As the demographics change in the direction of increase, the size of units needs to change towards the increase. To flexibly meet future housing needs, the design solution should have a variety of unit sizes; At the same time, the apartments need to be designed for expansion when required. The most basic condition for scaling the units is that units need to be installed in a large or medium unit area to have vacant space for expansion. There are three types of unit sizes proposed to meet the changing demographics, including the 2-bedroom unit, 3-bedroom unit and 4-bedroom unit. Over time, the scenarios of variation among unit sizes in the unit areas should be anticipated and prepared (Fig. 5). In particular, it is necessary to identify the principles and directions of spatial development in the future to limit the impact of the post-expanded unit on the initial unit. Before the unit areas are filled with units, the vacant space can be exploited for many purposes, such as business, production, office, and garden, providing residents with more choices associated with practical needs.



**Fig. 5.** The variation of unit sizes on unit areas in the intermediate apartment model (Source authors)

## 4.3 Flexible Organisation Solution for Rooms Inside Unit Model

The spatial compositions in units are divided into groups of basic and additional rooms to build periodically according to the stages of unit size development. The group of basic rooms forms a 2-bedroom unit; the groups of additional rooms combined with the group of basic rooms form a 3–4 bedrooms unit with 1–2 additional bedrooms (Fig. 6). In the unit configuration, the groups of basic and additional rooms are arranged in two types of the zone including the traffic zone (Zone B) and the usable zone (Zone A) (Fig. 6). The level of flexibility is enhanced thanks to this traffic zone. Zone B links between groups of rooms and is an extension of other adjacent rooms such as the living room, kitchen, and dining room. According to the level of flexibility and priority, zone A can be divided into the sub-rooms group, the technical rooms group, and the priority-rooms group.



**Fig. 6.** The variation of spatial compositions and configurations in a unit (*Source* authors)

## 5 Conclusion

Flexible living space organisation for high-rise apartments is a potential approach to address the needs of transforming living space due to a multitude of unforeseen causes. The solutions are researched and proposed based on the principle of inheriting the existing characteristics of HCMC high-rise apartments and following current standards. The solutions are systemised according to the spatial hierarchy from the general to the details to be convenient for application in design development.

**Acknowledgements.** We acknowledge Ho Chi Minh City University of Technology (HCMUT), VNU-HCM for supporting this study.

## References

- Hien NV (2022) Flexible living space organization for high-rise apartments in Ho Chi Minh City. Architecture master thesis, University of Architecture Ho Chi Minh City, Ho Chi Minh City
- Kim M, Yoon C (2021) A case study of the extension of floorplan flexibility using sector margins. *J Asian Arch Build Eng.* <https://doi.org/10.1080/13467581.20201800472>
- Le THN, Nguyen VH (2022) Adapting Vietnam's urban street house to highrise apartments: Leveraging spatial flexibility and environmental responsiveness. *FuturArc, Housing Asia, The voice of Green Architecture in Asia—Pacific, 1Q, vol 76*
- MOC (2004) TCXDVN 323-2004 Highrise housing—Design standard, Ha Noi
- MOC (2008) Circular 14/2008/TT-BXD Guide to apartment classification, Ha Noi
- MOC (2016) Circular 31/2016/TT-BXD Regulations on classification and recognition of apartment building classes. Ha Noi
- Nakib F (2009) Theoretical and practical approaches to adaptability and sustainable architecture. Conference: 3rd Ain Shams International Conference on Environmental Engineering (ASCEE-3), Cairo
- Nguyen NSH (2016) Features of exploiting traditional culture in residential architecture in large cities in Vietnam. Architecture philosophy thesis, University of Architecture Ho Chi Minh City, Ho Chi Minh City
- Pham DN (2015) Sustainable and green architecture development in Viet Nam, Tri thuc, Ha Noi



10. Phan HQ (2021) The transformation of functional system in high-rise apartment Ho Chi Minh City, Architecture master thesis, University of Architecture Ho Chi Minh City, Ho Chi Minh City
11. Schmidt R III, Austin S (2016) *Adaptable Architecture: Theory and practice*. Routledge, New York
12. Vu HC (2016) Apartment unit spatial organization—Flexible design and long-term vision, Ho Chi Minh City Department of Planning and Architecture, Ho Chi Minh City