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WHAT MAKES THE MORE HABITABLE HIGH-RISE, HIGH-DENSITY RESIDENTIAL ENVIRONMENT IN THE FUTURE OF HONG KONG?

By
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Submitted in partial fulfillment of the requirements for the degree of Bachelor of Science (Honours) in Architectural Studies

College of Science and Engineering
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March 2014
ABSTRACT

With the ever-rising number of population and the ever-increasing urban density since the urbanization in the 1960’s, the Hong Kong government has been putting effort on enlarging the buildable land mass and maximizing the capacity and efficiency of the existing urban context. The striking amendments in building regulations in 1966 marked the milestone of the change in the majority of building forms and later, the urban form of Hong Kong. Since then, the urban form of Hong Kong started to evolve from single towers to towers sitting on the podiums.

Since the birth of a pioneer residential project from the amendments in late 1960’s, the podiums have been accommodating shops, facilities and transportations that support urban dwellers who lived above and in the surrounding area. However, as the type evolves over decades, it might have failed in coping with the ever-changing urban fabric and creating growing chasm with dweller’s life styles in both physical and social aspects, hence, failed to bring the initial concepts to reality. The podiums have progressively worsened the already-high density as well as the living quality. Negative critiques of this urban form are in increasing number. Thus, this study revises the existing form in the city so as to explore the possible design solutions to the existing and foreseeable problems.

Spatial and formal analysis and on-site data collection are adopted to figure out the relationship between podium designs and pedestrian footprints in and around the urban area. Also, through a series of sectional studies, failure in creating sense of neighborhood because of the site-less generic design is also found. From the findings, next, new design solutions will be suggested to provide insights and ideas on the more habitable form of future high-rise, high-density composite residential environment in both physical and social perspectives. This study will also provide architects and urban designers with design concepts of accommodating continuous changes in urban contexts and dweller’s life styles.
ACKNOWLEDGEMENTS

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I am also thankful to my fellow peers for the valuable discussions and suggestions that foster and broaden the content of this project. Also, thanks go to my family and my best friends as well for their unlimited love, support and patience. And finally, to my religion, that has always been strengthens me and guides me through difficult times.
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1. INTRODUCTION

1.1 Background

Hong Kong is a packed city. This small spot on the map has a land area in total of 1104 square kilometer. However, due to the unique and hilly topography with rugged mountains in most of the vicinity, only 33.4% of the land is developed (Planning Department, 2012). In order to house over 7 millions of population, the precious land resources must be utilized efficiently and effectively. Vertical city has been our option ever since urbanization in the early 1960's. Together with the influx of population from the Mainland of China after Second World War, there were the needs seeking for new city planning strategies in order to house the sudden increase of citizens. Therefore, building regulations was amended in 1966 and it has striking influences on the later urban form of Hong Kong. Under the amendments, composite residential buildings are allowed to have 100% site coverage at podium level up to a height of 15 meters for non-domestic part of a composite building. After three decades of evolutions, the podium-tower form of residential towers started to fail in coping with the ever-changing and ever-increasing urban density. It has been changing from the efficient building form to the unwelcoming massive blocks. Problems like hindering pedestrian movement, lacking sense of neighborhood and such are starting to reveal and unveil as well.

1.2 Definitions of Concepts

1.2.1 Habitable

The properties of the habitability of a residential environment refers to ‘be an enclosure, serving as a refuge from the outside world; provides space dimensioned according to the needs of whoever inhabits it; is attentive to the arrangement of the space; expresses the identity of the neighborhood and whoever inhabits it’ (Bollnow, 2008).

1.2.2 High-rise, high-density
High-rise, high-density environment is characterized by mega-scale podium with almost 100% site coverage plus tower buildings with small intervals (Wei, 2009). Also, this kind of environment should have favorable urban location conditions and diverse urban cultural functions to efficiently and compactly enhance urban dwellers' spatial accessibility (Lee, 2011).

1.2.3 Residential Environment
Residential environment is that part of the built environment which refers to the immediate neighborhood and affects the daily life of residents (World Health Organization, 2007) in which neighborhood is a combination of physical and spatial features to be associated with amenities and daily life paths that tightly bounded with routine, offering important source of identity and security (Forrest, La Grange and Yip, 2002).

1.3 Objective
The main objective of this research is to study and revise the existing podium-tower form of residential development in Hong Kong, so as to propose a more habitable and holistic residential environment based on the current design and under the framework of Building Regulations. This research will also seek:

- to analyze formal aspect and its usages in elevated landscape with the environment of high-rise and high-density in Hong Kong
- to observe dwellers' activities and movements in the residential area with podium space
- to recognize dwellers' perception of public and private space in the residential complex
- to propose a design idea to promote the more habitable forms in the podium-tower environment in Hong Kong

1.4 Significance and Scope of Study
This study focuses on the weakness of podium-tower form of residential buildings in today's urban fabric and its effect and influence on residents and pedestrians through the perspective of habitability. It aims to evaluate and explore the more habitable options of this building form through amendments and modifications of the existing ones under the building regulation framework.

This study concentrates on a network of large-scale residential development projects in Hong Kong. They are worth studying as they are all inter-connected to each other by their podiums built in different decades. By examining the network, the level of impact on contextual, social and physical aspects can be compared and discussed, giving knowledge base for the redesign of the building forms.

The study will begin from a theoretical review of social interactions, urban connectivity and pedestrian walkability particularly in the podium-tower residential environment. The significance and weaknesses of this urban form are then identified and a theoretical framework is formulated with the literature review. Through the case studies of six residential projects in Tuen Mun, a new town in Hong Kong, the elements of the more habitable residential environment are identified from different perspectives. In comparing the different projects, they will be able to serve as a foundation for dialogue towards the better urban forms with podiums in future development projects, particularly on residential basis.

The study will also attempt to explore more habitable residential building forms and make suggestions and alterations to the existing projects. The purpose is to relief the compactness and densely built environment in the current urban context and conditions, and hence improve and enhance the living environment for residents and citizens.

1.5 Introduction of Chapters
1.5.1 Chapter 2: Literature Review
For this chapter, it is hope to strengthen the rationale of the research by doing literature review. This part will not cover every single publication but the most helpful and important ones that comments and the useful materials that could be drawn from each of them.

1.5.2 Chapter 3: Methodology
Research question will be introduced in the beginning of the chapter and followed by the introduction of methods for studying different hypothesis. The background of the studying site will also be covered such as the selection of site, the historical, social and topological background, the future trend of development of the area and etc.

1.5.3 Chapter 4: Findings and Analysis
Collected data is presented and analyzed and the underlying causes of today’s problems in the urban fabric will be found. Discussion of the results will be focused on different perspectives so as to offer clues and guidelines for new design ideas.

1.5.4 Chapter 5: Design Ideas
Based on the literature reviewed and the collected data and analysis of this research, design approach will be concluded in this chapter. It is an exploration of ideas on how we could tackle the existing problems in the near future. Design rationale and design strategies are set up. They will be applied on the studying site of this research, so as to demonstrate how those ideas could work in the urban fabric as a whole.

1.5.5 Chapter 6: Conclusion
This chapter concludes the result and the outcome of this research. Also, limitations of design solutions and how this research could benefit the current study in similar topics will also be illustrated.
2. LITERATURE REVIEW

In the past few decades, there were numerous studies that focused on various aspects of residential designs: Podium and Mega-structure (Lau, 2005; Dong, 2009; Paau, 2009; Wei, 2009; Xue, Zhai, Roberts, 2010; Law, 2011; Barrie, 2011), neighborhood and social interaction (Riger, 1981; Forrest, La Grange and Yip, 2002; Huang, 2006; Cho, 2011; Hui, Yu, 2013), high-rise, high-density living and design (Seik, 2001; Wang, Lau, 2002; Chan, Wong, 2002; Ng, 2005; Yuen, Yeh, Earl, Kwee, 2006; Wong, 2010; Wong, 2011), urban renewal (Lerup, 2000; Koolhaas, 2002; Chan, 2007; Lee, Chan, 2008; Ho, Yau, Ervi, 2012) and pedestrian footprint and mobility (Roymeyer, Ülo n Enzo, 2006; Parvin, Arlen, Jofè, 2008; Guo, 2013). However, none of these studies had collaborated the existing drawbacks of this form from different aspects and, to provide insights for future development of podium-tower type of residential environment. For this study, knowledge from different researchers with the similar aspects is drawn and studied. Although some of the literature run counter to the hypothesis, part of the literature is useful as it shares similar thoughts and support the arguments of this research.

2.1 Scope of Literature Review

One of the major issues on podium design in the international literatures has been the effect of it on the existing urban fabric, which in turn leads to discussions in land-use planning, walkability and connectivity, social influences to dwellers and so on. There are a few topics of literature that contributed to this study, namely:

- Podium and mega-structure
- High-rise, high-density residential living and design
- Pedestrian footprint and mobility
- Neighborhood and social interactions
- Urban renewal

2.1.1 Podium and Mega-structure
For most of the literatures, it seems that podium-tower residential design receives more criticisms than positive comments so far. In Xue and Roberts’ research on the west Kowloon development (Kowloon Station development) in 2010, they raised the points that not only do the massive podium blocks isolate itself from the neighboring environment but also the whole urban fabric. As the podium blocks cover 100% of the site, when a few podiums join together, the streets between are so narrow and they are just like being privatized by the podiums. Also, together with the nature of being self-sustained, there are very few reasons for people to communicate with the remaining urban fabric, as it seems to have no flavoring factors to attract them to do so. For another literature, both Dong (2009) and Barrie (2011) presented the importance of the streets. Although the streets are no longer pleasant to walk due to poor air quality and severe traffic, there are still a number of uniqueness that streets possess but not the podium. Both the authors also claimed that the podium withdraws the street life. However, there is no actual ideas or solutions in bringing back the essence of streets has given in the literatures.

2.1.2 High-rise, high-density Residential Design

Hong Kong has been a vertical city since the 1970’s. Yet, podium-tower design only started getting common in the late 1980’s. In Chan, Tang and Wong’s research on private housing development in 2002, it points out that almost 100% of the private residential development focuses more on maximizing the profits they can make rather than creating better living environment for residents. Living units and space with low-commercial values such as communal space are particularly tiny in the towers. Also, since the composite residential buildings are allowed to have 100% coverage for the non-domestic part, developments usually develop the podium blocks into large-scale, high-ended looking shopping malls which house a lot of different brands of shops and restaurants so as to attract tourists and shoppers from different districts to come. On the other hand, Wang and Lau also presented their views on urban living environment in 2002. They showed that over 80% of residents enjoy living in high-rise building only if the height can separate them from the street
crowds. The residents also indicate that the privacy, quietness and security are the major concerns of their living environment. From these literatures, it basically unveils some of the issues of the podium-tower building types and reveals different expectations in the residential environment from different stakeholders. Two questions can be raised from these literatures: How we could balance different expectations from different parties and how we could harmonize the both expectations in the future designs?

2.1.3 Pedestrian Footprint and Mobility
There are numerous literatures presented the idea that the urban setting has significant effect on pedestrian route choices. In Guo’s research on route choice in 2013, it showed that Hong Kong pedestrians will not be satisfied with the walking environment when they cannot find diverse experience, such as spatial, visual and social experience, along the route. The research also pointed out that pedestrians in Hong Kong tend not to have alternative routes in going to the same destinations because they found that there are not many differences between different routes. In another research in 2008, Parvin, Arlen and Jofe’s study has also proved that visual experience is one of the main factors that would affect the movement of pedestrian in vertical built from. In multi-level building, enough penetration must be provided so that visual connections between spaces can drive people to different spots. Together with some critiques from section 2.1.1, is there any way that we could balance the diversity of podium level and street level and increase the visibility between different spaces on different level so as to promote pedestrian movement along the urban fabric?

2.1.4 Neighborhood and Social Interactions
The physical characteristic of a neighborhood such as the built form could affect patterns of local social interactions. But what is a neighborhood? Or what constitutes a neighborhood? In Forrest, La Grange and Yip’s research on high-rise neighborhood in 2002, they suggested that neighborhood is not about the buildings
themselves but how they interact with residents. The spatial layout of a place should also be able to create different experiences to residents so they could have their daily life paths interacting with the surroundings. One of the importance of the arrangement of different programs in an area is that it can induce social interactions, and hence, giving aids to people to create their own experiences.

2.2 Summary of Literature Review
In short, podium-tower design has had received different criticisms from different aspects. As it is so far the most efficient form of residential buildings in Hong Kong, undoubtedly it will still be adopted in view of efficient land use in the future. Although the above literatures did not covered on the issue of this research directly, they have given very valuable and important background information for this research to develop. Individual studies from different topics usually tackle merely one single problem. If this research could gather all these problems from the same urban fabric, and to provide comprehensive insights to improve the whole residential environment, it will be useful that we can start improving the living quality and the environment from the physical aspects in the neighborhood for the future development of the podium-tower residential development in Hong Kong.

2.3 Hypothesis
Based on the literature review, the existing drawbacks of podium-tower design can be divided into 2 groups. First, how does the podium-tower design affect residents and pedestrian communication and movement around the urban fabric physically? And second, how does the built form affect the building of neighborhood and hence, affect the sense of belongings for residents? For these, two hypotheses are set:

Hypothesis one: Existing podium-tower design would hinder the overall pedestrian movement and communication in the whole urban fabric, hence segregating social distance between dwellers and the environment.
Hypothesis two: Uniform and universal design of podium-tower residential development withdraws the sense of belonging and sense of neighborhood, hence, fail to achieve place making.
3. METHODOLOGY

3.1 Research Question
Based on the review of others work on similar study topics, it seems that there is no research that focuses on the overall collaborating effect on how the different physical settings affect pedestrian and residents living patterns (such as route choices and sense of neighborhood and etc.). Hong Kong has special background on residential environment that limited land resources resulting in high land price. It is kind of ‘luxurious’ for citizens to ask for bigger living units as the price is not really affordable for everyone (around HK$10k /sq.ft for new development in Tuen Mun). Quality space in residential environment is not a must to be privatized. Public space, shared space and the neighboring area are also important elements making up a habitable and holistic living environment. Therefore, the research will focus on these spaces other than the privatized living unit. And the research question of this study is set to be ‘What Makes the More Habitable Residential Environment in the Future of Hong Kong’. (Definitions of concepts can refer to Section 1.2)

3.2 Research Methods
3.2.1 Hypothesis 1
The first hypothesis suggests that podium-tower design would hinder the overall pedestrian movement and communication in the whole urban fabric, hence segregating social distance between dwellers and the environment. On-site data collection was administrated on a weekday and weekend in late October 2013 so that the data collected can reflect the actual conditions on different days.

First, walking time taken from travelling around different points in the site were measured and recorded. Both podium route and street-level route, 14 routes in total (Figure 3.1, Figure 3.2), were taken and recorded so as to allow comparison between the two, and hence, dissecting the hindering effect of this built form in terms of time and distance. The number of pedestrian travelled on both the podium
and street levels, and the destinations of pedestrians were collected as well. For the data set of pedestrian number and their destinations, it is hoped to find out the reasons and forces that affect their route choices. First, the pedestrian numbers were counted by tally for 5 minutes at the same 14 points as the previous set of data, for both podium and street locations. Then, every 5th pedestrian passing these designated points on the site had been followed for 5 minutes each. The locations where they remained at the 5-minute interval were recorded for the analysis as well. All three sets of data are used in the analysis in later stage so as to find out the degree of hindrance in terms of connectivity and how the podium would affect pedestrian footprints.

3.2.2 Hypothesis 2
The second hypothesis suggests that uniform and universal design of podium-tower residential development withdraws the sense of belonging and sense of neighborhood, hence, fail to achieve place making. Sectional study is conducted on the 6 residential developments in the site. Sectional study is the study of different sectional cuts of the site. In this study, 7 sections are cut based on the major routes of pedestrians in these 6 residential complexes (Figure 3.3). Along each sectional cut, different programs on different levels can be identified clearly and the linear

![Figure 3.1 – Study Points (Street Level)](image1)

![Figure 3.2 - Study points (Podium Level)](image2)
nature of the cut can also provide information on the relationship between programs and people's route choices. Also, pedestrians' experiences when walking on different levels can also be mocked, so as to give clues to study how the arrangement of programs in these residential development affect the sense of neighborhood (Figure 3.4).

3.3 The Site
3.3.1 Selection of the Site
There are two criteria for the site selection. First of all, the site should be representative that contains different podium-tower residential developments from
different completion time. It is important for the site to contribute to the study as different developments from different time period can provide evidence of how they affected the change of urban fabric and hence people’s lifestyles. The second criteria would be the site area and the connectivity. It will be great if all the podiums are joined to each other so that the effect of podium on pedestrian communication to the site can be compared to the one on street level. The site chosen for this study is the Tuen Mun Town Centre complex (Figure 3.5). This site is targeted because it is a network of large-scale residential estates, which comprises 6 projects, completed in 3 decades (from 1970’s to 2010’s) respectively. There are 27 towers in total sitting on 9 inter-connecting podiums. Being located in the central area of the district and together with sufficient number of towers, podiums and residents, the site provides a very good platform with sufficient potentials to conduct the study in different perspectives such as land-use pattern, pedestrian footprint, connectivity and sense of neighborhood.

3.3.2 Site Background
Tuen Mun is the district where the site for this research is located. Before it was identified for new town development as part of government’s strategy of
decentralization of urban development from the congested urban areas in the 1960’s, it used to be a remote town which is around 30 kilometers away from the Kowloon Peninsula, where the majority of people there were engaged in fishing and farming. In the 1960’s, Tuen Mun new town was planned based on 2 main concepts: to be a ‘balanced development’ and ‘self-containment’. As such, it was developed in various perspectives such as housings, industries and community facilities.

As Tuen Mun covers a land area of approximately 8400 hectares, an ‘urban core development’ was one of the design principles, and this urban core, is where the study area of this research is. It accommodates a bulk of housings, industrial, commercial and associated recreational and community facilities (Figure 3.6 and Figure 3.7). Although the light industries in Hong Kong started declining since the late 1990’s, the uses of the industrial buildings in the urban core have slowly evolved to office use, helping the area to remain active and vibrant. In tandem with the completion of Tuen Mun Station in 2003, Tuen Mun has had better connection with the other parts of Hong Kong as it joined the railway network. Therefore, this urban core in Tuen Mun still, has a lot of potentials to further develop in the near future.

Figure 3.6 - Context of Tuen Mun urban core  
Figure 3.7 - Land use in urban core
3.3.3 Physical Attributes

3.3.3.1 Macro Site – Tuen Mun Urban Core

There are mainly 8 types of land-use in this urban core of Tuen Mun. Industrial use constitutes the majority of it *(Figure 3.8)*. When Tuen Mun was planned and developed, light industry was the main support of the economy of Hong Kong. Industries such as manufacturing plastic products, toys and assembling watches and electronic products were very flourished. Therefore, these industrial buildings were located in the center of Tuen Mun so that residents who lived in every corner of the district could go to work easily. Although light industries has declined a lot since the 1990’s, these buildings were first abandoned and now they are occupied by companies and use them as office.

![Figure 3.8 - Land use: Industrial](image)
![Figure 3.9 - Land use: Residential](image)

The second land-use that constitutes a lot in the urban core is the residential use *(Figure 3.9)*. In the early 70's, different public housing estates were built close to the industrial area as most of the residents were blue collars. As the economy lifted up in the 80's, people had higher pursuance in their living standards and qualities. Hence, different private mixed-used residential developments were built since then. These developments are where this study focuses on and they will be discussed in the next subsection. Residential development is still on going in this urban core but most of
them are private housings. The newest is The Century Gateway in 2013, which is developed from putting down the oldest public housing in the area. Most of the land area in Tuen Mun has been developed so it can be foresee that redevelopment will possibly be the trend for the mode of development in Tuen Mun in the coming years.

The population of Tuen Mun had been rising up since the 1970’s so there were evolution in the transportation system as well. Light rail network was completed in 1988 and it serves the major mode of transportation in the area. West rail line of MTR was also completed in 2003 (Figure 3.10). The time to travel from Tuen Mun to town has shortened a lot. It takes only half an hour to reach Kowloon and it does provide convenience for people who lived in Tuen Mun.

3.3.3.2 Micro Site – The Residential Complexes
The examination of physical attributes of each of the studying residential development has been taken in different parts of the complexes. Attributes such as the entrances, different facilities, connection points to public transports, the walking networks and etc. would be the focuses. By studying these attributes, better understanding of the site can be achieved and we can further understand the relationship between the 6 complexes.
Pedestrians are free to enter the podium complex from both the street and the elevated level (podium). For residents from any of the residential blocks in the 6 developments, they can also access the complex from the top of the podium. The elevated level has the most number of entrances out of all as it is connected to the elevated MTR station and the Light Rail stations. Also, it is the only level that connects the entire different podium blocks together. Pedestrians can travel to different podium blocks without any blockage in the routes as they are all sheltered and connected. However, for the street level, pedestrian cannot stay on the same level all the way to finish their travel to different blocks. Part of the Tuen Mun Expressway penetrates through the complex and there are no pedestrian crossing facilities provided (Figure 3.11). Therefore, pedestrians must walk up to the elevated level (into the podium) so as to reach the other podium blocks on the other side of the Expressway.

For the general programs, within the complex, the program-pattern is quite clear: both street and elevated levels serve as transportation nodes, car parks and commercial uses (shops and restaurants) while the podium top accommodates some leisure facilities and open spaces for the residents. The detailed program study will be discussed in the Chapter 4.
4. FINDINGS AND ANALYSIS

4.1 Collected Data

4.1.1 Findings and Analysis for Hypothesis 1

This set of data helps to find out if the podium-tower design hinders overall pedestrian movement and communication around the urban fabric in terms of number of pedestrians and walking time. And, if yes, the factors behind the hindrance are also hoped to find out from the collected data.

(a) Number of Pedestrians on Different Levels

For this set of data, the results are presented in two bar charts. The first chart (Figure 4.1) illustrates the weekday data of the number of pedestrian passing through each of the seven sets of points in a five-minute session while the second chart (Figure 4.2) represents the collected data on weekend. Almost all study points showed that there were more pedestrians walking on podium than the street levels in average. The numbers above each bar annotates the percentage difference in the number of pedestrians of that study point. They showed 3.6% - 1046.9% difference in the number of pedestrian on the two levels. In another words, there are at most 10 times of the pedestrians walking on podium (Point 2, weekday, night) than that on the streets. Apart from judging if the podium is good for pedestrians, the huge imbalance of the number of pedestrian on different levels is already worth to study.

There are several factors that may lead to the differences in two levels. For the data of Point 7, it is stood out from the other sets of data as the number of pedestrians on street levels are much higher than that of the podium ones. The reason for it to be different from the other data could be the physical connections of the area. Being located at the edge, it is the last block of the whole podium fabric. There is no continuation of the pedestrian walkway but only a bus stop and the expressway with no pedestrian crossing facilities. Pedestrian must change their walking level if they want to continue their journey to the other side of the area. Therefore, there are a lot more pedestrians recorded on the ground level of this point than the podium point.
Figure 4.1 - Number of Pedestrians and Percentage Difference (Weekday)
Figure 4.2 - Number of Pedestrians and Percentage Difference (Weekend)
Other than physical connections, by looking at different data with different traffic conditions, pedestrians and vehicular traffic could also be a factor affecting the distribution of pedestrians. In the morning sets of data, as the time has already passed the peak hours, the vehicular and pedestrian traffic is not congested at all comparing to other studying times. The walking environment is pretty pleasant as there are no crowds no matter on which level. However, for particular times such as lunch peaks and the weekend crowds, the podium has an advantage of having no vehicular traffic and hence, drawing people up from the busy ground levels to the podium level.

On the other hand, Hong Kong's unique weather makes the emphasis of the quality of the walking environment. Hong Kong has definite seasons with different characteristics - cold winter, hot and stuffy summer and the humid spring play an important role for people to decide their routes. Therefore, the settings of the walking environment such as provision of shelters, temperature control and security will affect people's walking experiences. Due to the limitations on the research time, data from different seasons with different weather conditions are unable to compare. Yet, from the data in-hands now, we can see that there were more pedestrians choosing the completely sheltered and partially air-conditioned podium route at the hottest time of the day - the noon. For the only point without any shelter (2S), there were 7 and 8 times of pedestrians walking on podium than on the street level, strengthening the argument here in the research.

(b) Walking Distance and Time Required
For the set with the walking distance and time, the results are listed in table (Table 1). The point-to-point distances are very similar for both podium route and street route of the same point in most of the case. As there are vehicular traffics on the streets, plus the fact that all street points have longer distance than that of the podium. So in theory, the time taken for walking on the streets should be longer as pedestrians have to wait for the crossing facilities. However, surprisingly, for point A1S and A3S, walking in longer distance on the street took less time compared to that of walking
on the podium. For this, the underlying reasons for hindrance on podium level could possibly be the pedestrian crowds. Other than the traffic, again, the physical connection is also a factor leading to the result. The design of the connection points such as the location of footbridges will also affect the mobility of pedestrians. On the streets, people can take shortcuts to their destinations because they have choices not to follow the pedestrian crossing facilities and walk in whatever route they want, like walking diagonally across the roads. When it comes to the podium level, their movement is very much controlled or pre-designed by the layout of the connection points because it is physically not feasible of them to take shortcuts over the air.

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*WD = Weekday; WE = Weekend

Table 1 - Walking distance and timetable

(c) Destinations of Followed Pedestrians
Specific pedestrians were then followed and their routes and destinations are recorded (Figure 4.3, Figure 4.4). By studying this set of data together with the number of pedestrians distributed on different levels, it hopefully could give more clues and references in finding the factors that lead to different route choices by pedestrians. The results show that pedestrians barely changed their walking levels within the 5-minute-follow. For the street level movement, more than 30% of the pedestrians’ destinations are transportation. While for the podium level movement,
the most destinations are shops (49%). Among 70 pedestrians followed, 8 pedestrians (11%) changed their walking level during the walk. In short, we can say that the street level movement is more ‘purpose-driven’ and the podium level movement is more ‘non-purpose-drive’.

*Figure 4.3 - Destinations of Followed Pedestrians (Street Level)*

*Figure 4.4 – Destinations of Followed Pedestrians (Podium Level)*
Before we have podiums, streets used to play an important role in urban area. There are numerous studies that have shown why it is irreplaceable. Yet, so far we could not see how the podium-tower design benefits the overall pedestrian movement as it seems dragging most of the lives from the streets. What are the factors that make the podium so dominate to the streets and hence, hinder the pedestrian movement?

4.1.2 Findings for Hypothesis 2
For the second hypothesis, it is hoped to see if it could help us to find out whether the uniform design of the podium-tower type withdraws the sense of neighborhood from the residents.

(a) Programs
First, the programs on both levels are studied and annotated with different color codes. For ground level programs (Figure 4.5), Bank and Service comprises the biggest portion of the programs (15.5%), followed by Restaurants (14.9%) (Figure 4.6). These types of programs are purpose-driven that people go there with reasons. For podium level programs (Figure 4.7), it is different with the ground that most shop types are not purpose-driven such as Fashion Shops, making up 40.0% of the total programs while Beauty and Personal Care (12.8%) follows behind (Figure 4.8). For both podium and street levels, there are no spaces dedicated to leisure enjoyment such as parks or spaces that can reach fresh air within the podium from this data set.

It is understandable to have put purpose-driven programs such as clinics and banking services on the ground level as some requires 24-hour running while the podium blocks themselves are not accessible at any time of a day. However, by separating the programs in this way, it has led to uneven distribution of pedestrians at different times, especially on weekends and public holidays. Purpose-driven programs like banks would close on these days while the non-purpose-driven programs - shops would be very crowded instead, resulting in empty streets and over-crowded podium floors. Because of the improper arrangement of programs, here it comes the failure in the utilization of space.
Figure 4.5 - Program Plan (Street Level)

Figure 4.6 - Percentage Composition of Programs on Street Level
Figure 4.7 - Program Plan (Podium Level)

Figure 4.8 - Percentage Composition of Programs on Podium Level
From the programs study, we can also see that there are a few shop types that are sort of dominating the programs for both podium and streets level, such as Fashion (32.2%), Beauty and Personal Care (11%) and Jewelry and Accessories (10.3%) (Figure 4.9). The proportion and composition of the programs have direct effects on the neighborhood setting of the area. The podium blocks, being the immediate neighborhood of residents, should be associated with amenities that tightly bounded with resident's routine, and hence offering important source of identity (World Health Organization, 2007). In the case of Tuen Mun, the top 3 programs that made up the most of the composition are not residents oriented but shoppers' and tourists'. They do not have the opportunities to establish sufficient interactions with their residential area. Together with many tourists and shoppers, the sense of security is also very weak.

![Figure 4.9 - Percentage Composition of Overall Programs in Tuen Mun Complex](image)

In comparing the collected data with the programs composition in the podium block of Mei Foo Sun Chuen, the pioneer project with 15-meter-tall podium in 1960's (Figure 4.10), we can see that the compositions of programs of these projects have some differences. It seems that Tuen Mun Complex and Mei Foo Sun Chuen do not have much difference in terms of programs types. Most of their programs are similar, covering Housewares, Beauty and Personal Care, Services, F&B, Fashion.
and Restaurants. However, their proportions are so different, it is almost completely reverse of the data. The most programs of Tuen Mun Complex - Fashion Shops occupied almost the least in Mei Foo while the dominant program in Mei Foo - Housewares and Fresh Food makes up only a small portion in Tuen Mun Complex. One of the causes of the composition today is the economic factor in a development. Programs for the residents are usually profit-unattractive when comparing to those chained-brands of shops. Therefore, developers usually will give up the needs of residents under economical concerns.

(b) Sectional Study
For the sectional study, each section represents one of the most popular routes of pedestrians to go across different podiums (Figure 4.12 - Figure 4.18). First, the programs of both podium and street levels are studied and the data is represented in charts and values (Figure 4.11). The charts show the proportion of programs on different levels while the value shows the diversity of programs on the level. The value is basically the ratio of total number of programs to the number of program types. The smaller value means it is more diverse. For the program composition, we
can see that there are particular types of programs dominating certain routes. The percentage of the most dominant types on podium level ranges from 29% to 71%, having an average dominance level of 45.8%. In other words, it means that there is, in average, one type of program occupying almost half of the total programs of one route. For the ratio value, it can be seen that all values from the street levels (ranges from 1.8-3.5) are smaller than those from the podium level (ranges from 3.2-6.2), suggesting that there are more program types on the ground level.

![Proportion of Different Programs]

*Figure 4.11 - Summary of Statistic in Sectional Study*

For this, in views of shoppers and residents, the less choices and experiences provided the fewer movements of them could be triggered. Other than hindering people's movements, the similar experiences in different routes also make them more difficult to identify different spaces on the podium levels.
Figure 4.12 – Sectional Study – Section 1-1’
Figure 4.13 – Sectional Study – Section 2-2’
Figure 4.14 – Sectional Study – Section 3-3’
Figure 4.15 – Sectional Study – Section 4-4′
Figure 4.16 – Sectional Study – Section 5-5’
Figure 4.17 – Sectional Study – Section 6-6’
Figure 4.18 – Sectional Study – Section 7-7’
4.2 Conclusion of Findings and Analysis

In short, there are different underlying reasons leading to the existing problems. It seems that the current design has not paid enough attention and effort on the several physical factors such as traffic and weather conditions, physical connections with the existing urban fabric and the arrangement of programs within the podium blocks. The above factors are all inter-related to each other as in the traffic and weather conditions would affect the distribution of pedestrians while physical connections helps to induce different choices of routes. Together with the arrangement of programs, it helps people to become more acquainted and engaged to the residential environment by developing different kinds of interactions and conducting different activities with the living programs.

Podium-tower form, being the most common type of residential development today, plays an essential role in building and evolving the urban fabric of the city. The form itself is where all the residents and citizens inhabit, and it is the cradle and container for different activities to exist, different interactions to be induced. With the problems diagnosed now, immediate actions with strategic directions should be explored so as to stop worsening the current situations. The next chapter will give some design ideas of the current study as well as making recommendations for the future development of this form of residential design in Hong Kong.
5. IDEAS FOR FUTURE

5.1 Design Rationale
To tackle the current problems, the studying site in this research – Tuen Mun Town Centre Complex will be used as a background and example, to show how the podium-tower form can be transformed into a more habitable option by certain amendments and alterations. Among the six developments, one of them is chosen (Figure 5.1).

Figure 5.1 – Location of Selected Site for Redesign

5.1.1 Habitable and Holistic Perspectives
The case study of Tuen Mun Complex reveals that there are quite a number of weaknesses of it to become a habitable residential environment. The background information of Tuen Mun has also shown that the developing trend of Tuen Mun will still be very active in the near future. Therefore, redevelopment and redesign of these residential projects should be planned in new perspectives and be guided in fresh visions. Habitable and holistic perspectives should be taken into account to balance different needs from different stakeholders such as developers, residents and pedestrians so as to improve the residential and urban environment in the city.
5.1.2 To Promote Living Diversity
For now, due to economic concerns, most podiums are used as shopping malls so as to maximize the profits that the developer can make in the whole project. Although the development type is called as 'mixed-used' or 'composite', the program mix and the experience provided are still not rich enough in views of different user groups such as residents and shoppers. In order to satisfy different needs, promoting the living diversity within Tuen Mum Town Complex is one of the important design rationales for this research.

5.1.3 To Increase Sense of Belongings and Neighborhood
For most of the existing podium-tower residential developments, it is obvious that they all look very similar to each other due to the universal design. Same building form as a rectangular box, similar floor plan layouts and interior space are all the components making up the universal experience within the podiums. Some say that podium is the elevated-ground. If so, it should possess some unique features of the street level. It is one of the important elements to help to podium-tower type to attain its uniqueness and help the residents to achieve and acquaint their sense of belongings and neighborhood as well.

5.1.4 To Re-inject and Revitalize Street Lives
Before the development of podium-tower type buildings, streets used to be vessels and one of the major elements of the urban area. Most activities happened along the vibrant and diverse streets. However, streets seem to be disappearing as some of them are being privatized or losing their functions progressively as the podium-tower type rises. Busy traffic conditions on the streets also discourage diversity. Street, being accessible by any one at any time, unlike podiums, is the real public and shared space. Pedestrian movement and activities are not limited by any physical barriers like the podium form do. Therefore, streets, as well as street lives should be in-inject, re-promote and revitalize in the new podium-tower form of residential design.
5.2 Design Strategies

5.2.1 The Increase in Porosity of Podium Block

Previous studies have shown that visibility is one of the factors affecting pedestrians' movement and being able to see the unique streetscape, landscape and landmarks of area is also helpful to promote sense of belongings and to create sense of neighborhood to residents. Controlling the porosity of different parts of the podium block can be one of the strategies to improve the current drawbacks.

(a) Building Form

Currently, all the preceding cases possess 100% coverage to their podium blocks due to the allowance in Building Regulations. However, having such a mega block to erect from the ground level to 15 meters have caused several problems such as internalizing streets and dark street environment. To tackle this, the building mass could be cut up from one whole mass into several small blocks. According to APP-152, Practice Notes for Authorized Persons under Building Regulations in Hong Kong, the development can exempt gross floor area for the building features that help to achieve better air ventilation, enhance environmental quality of living space particularly at pedestrian level. Features like building separations, building set back and coverage of greenery can also be exempted. So in this case, cutting up the podium block will not have much effect on developers' profits but have big influence in improving the quality of space.

By cutting up the block, not only does it create more internal streets without traffic but also provide a safe and more pleasant walking environment for pedestrians. With the new setting, activities once could not be held on the ground level because of the busy traffic can now happen. Programs such as outdoor sitting area for residents and outdoor street performance or flea markets to increase vibrancy of streets are some of the examples (Figure 5.2).
(b) Building Envelope

With the new massing of the podium block, more surfaces on the building envelope will be exposed to the streets. If the surfaces are treated well, the interactions between the podium users and the outdoor environment can be drawn closer. Numerous ways are available to alter the porosity of the building envelope such as creating physically openings and changing the opacity and transparency of the facades at different levels.

Not only does the façade treatment help to promote interactions between people and the environment but also the quality of the environment. Some studies have commented that the façade treatment of the building will affect the sense of liveliness onto the streets and hence, the attractiveness to pedestrians (Jacobs, J., 1961). By creating openings and controlling opacity of façades, the activities inside the building will become porous to the pedestrians on the streets, hence injecting liveliness onto the original dull and solid building facades (Figure 5.3).
5.2.2 Floor Plan Layout
Currently, it seems that most of the available views to the outside are occupied by different tenants. There are very few locations on the elevated level that pedestrians can visibly reach the outdoor environment. For most of these locations, their full-height glazing is covered by advertisement boards. With the existing floor plan layout, the tenants and the advertising boards are just like the barriers separating the podium block with the environment. Other than being an anchor, the podium blocks also serves the function of connecting the urban fabric. Therefore, the view should not be only for shoppers inside the tenants to enjoy but everyone.

The row of shops could be shifted inwards to the center of the block, so as to free up spaces on the edges and allow pedestrian movement. If the visibility between indoor and outdoor environment is increased, pedestrian movement can then be promoted and more routes will be induced as pedestrians are allowed to visually reach more things other than storefronts and mall interiors. The new movement and routes will not be limited on the same level but from level to level, from podium to streets and vice versa (Figure 5.4).
5.2.3 Rearrangement of Programs

Currently, many shopping malls would categorize their shop types and try to put them into different zones such as ‘Beauty Street’ and ‘Food Fest’. It may be one of the ways to organize shops so as to provide convenience to different target shoppers. However, previous chapters of this research have already shown that this kind of zoning strategy results in monotonous experience when walking inside the podium block. Other than shoppers, residents are also the majority of the podium users. Having certain programs dominating particular routes is not a way to show the diversity of the neighborhood. Therefore, rearranging the programs and adding new programs are essential for improving the sense of neighborhood.

As most of the programs are shopper-oriented, more leisure facilities for residents such as small parks and outdoor resting area can be added to different levels of the podium block. It is found in the study that programs particularly for residents such as fresh food market and family-businesses are lacked in the current design and hence, hindering residents to develop and extend their social networks. Suggestion like putting these programs back to the urban fabric is beneficial to different urban dwellers as well.
5.3 Illustration of Design Solutions

Based on the above guidelines, some of them are brought to computer modeling and expressed as the following figures (Figure 5.5 – Figure 5.8). Wider public streets, quiet and protected internal streets for different potential activities and the porous building enveloped that have mentioned above are shown. They are just conceptual drawings that illustrate the suggested adjustment of the existing podium block. Actual designs and applications of these guidelines are still sensitive to different site factors and conditions for different re-design and redeveloped projects.

Figure 5.5 – Perspective from Existing Streets

Figure 5.6 – Perspective of New Internal Streets

Figure 5.7 – Existing Building Envelope

Figure 5.8 – Perspective of New Building Envelope
6. CONCLUSION

It is doubtless to say that the current podium-tower form of residential design makes the most efficient use of land. It cannot be ignored that the high accessibility and connectivity are still effective in joining the urban fabric physically. However, attentions should also be paid on the increasing number of criticisms and demerits on the form.

The new design approach suggested in this research brings new insights with different perspectives and it is hoped to contribute to the future residential development in Hong Kong. Also, it is hoped that the study can raise and arouse people’s awareness and consciousness in the planning of compact and composite residential environment. If there is the opportunity, this research to go further by studying more of the different kinds of podium-tower residential environment, such as residential environment in Kowloon and Hong Kong Island, so that there will be comparison between new towns and old towns in Hong Kong. The environment is shared by different walks of life in the community and of course the design of residential environment should also be able to balance different needs of different stakeholders such as developers, residents and pedestrians.

Although the design solution is kind of site-specific as it is not easy for residential developments from different decades and different designs to come up with a common picture of how they could work well together, it is always useful for large-scale projects or re-development projects to slowly evolve the urban fabric, improve the quality of space and strengthen the sense of neighborhood. If the neighborhood setting is well planned, quality residential space will not be limited in the size of the flat, will not be limited in the price of the unit but everywhere, and it is free.


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