

Plugin Homes
Metabolic Framework: Hong Kong as a Testing Ground

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Abstract

Plugin Homes
Metabolic Framework: Hong Kong as a Testing Ground

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Architecture

Hong Kong presents a complex and oftentimes paradoxical system of housing. It is the product of many contradictory elements: traditional village development and more recent urbanization; extremely organic urban growth and extremely standardized market; self-built architecture and centralized regulatory body. One of the symptoms of a system built on these extremes is the divide between the wealthy and the poor. While Hong Kong has the most millionaires per capita, the region also has the lowest rating in global housing affordability where even the middle-class families struggle to acquire a home and safeguard their home ownership.

In many ways, Hong Kong is facing the very problems that Japan faced in the postwar years and during the reconstruction of the nation: limited resources, growing population, the clash of old and new, the urgency of a nation-wide urban planning program that addresses the needs and reflects optimism to name a few. In this rebuilding effort of the country, a movement was born under the tutelage of Japan's preeminent architect Tange Kenzo*: Metabolism. This thesis will use the theoretical framework of Metabolism and propose a set of design strategies to address housing issues in Hong Kong today.



*In this document henceforth, people’s names will be written in the format of their respective national convention.

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Prologue

As a Chinese province under the Qing Dynasty, Hong Kong - Hong Kong Island and Kowloon Peninsula in particular - was a contested territory between China and Britain during the two Opium Wars. This resulted in the 99-year lease of Hong Kong to the British Empire. This lease was an addition to an existing period of British occupation in Hong Kong since the First Opium War, thus making for a total of more than 150 years of British Hong Kong. During these years, cultures and languages fused and clashed between the ruling - the Crown Colonial government - and the ruled - native Hong Kongers.¹ While the negative attributes of Colonialism cannot be ignored, British Hong Kong inherited an extensive jurisprudential framework, social structure, and civil rights from Britain², making this land an example of a modern and successful legal system in East Asia. Beyond that, modern institutions and infrastructure in Hong Kong made it an envy to neighboring countries. Thanks to its strategic location, Hong Kong also became an active seaport with high volumes of commercial goods transferred

1 Shelton, B., Karakiewicz, J., & Kvan, T. (2011). The Making of Hong Kong: From Vertical to Volumetric. pp 15-18

2 Loh, C. (1996). The Commonwealth and Hong Kong. Round Table, (338), 231-237. <https://doi.org/10.1080/00358539608454307> pp 234

3 Strachan, I. (1994). Hong Kong and the Commonwealth: Present and Future. *The Round Table*, 83(329), 41–45. <https://doi.org/10.1080/00358539408454190> pp 42-43

4 Zamira, R. (2019). The Song from Les Misérables that Has Become a Protest Anthem in Hong Kong. *Independent*. Accessed 02/23/2020. <https://www.independent.co.uk/arts-entertainment/music/features/les-miserables-hong-kong-protests-do-you-hear-the-people-sing-musical-a9081401.html>

5 Loh, C. (1996). The Commonwealth and Hong Kong. *Round Table*, (338), 231–237. <https://doi.org/10.1080/00358539608454307> pp 231

through the city every day. This turned the city into a major regional hub for seafaring and maritime industries with several important naval docks, including the British Royal Shipyard, and in later economic transformations an international center of finance for high-profile trades.³ Starting with the decolonization of the Crown Colonies since the first quarter of the 20th century and the recognition of self-governance in these territories, the Commonwealth was established. Though British Hong Kong citizens could qualify for British Nationality and participate in elections and other political matters in the UK under some restrictions, Hong Kong was never added to the Commonwealth as a sovereignty because it never was one.

After the Handover of 1997 back to China, Hong Kong has been titled a Special Administrative Region (SAR) under China's policy of "One Country Two Systems". Within this system, Hong Kongers only get to elect their officials from a short list of candidates pre-appointed by Beijing. Beijing's direct intervention and meddling in Hong Kong's electoral process has resulted in social unrest and countless protests in recent years. Perhaps no more moving scene can be observed than "Do You Hear the People Sing" from *Les Misérables* being sung in Cantonese during these protests.⁴ In recent protests, the flags of USA were seen as a cry for freedom and liberty, showing a borderless ideal and pursuit.

This concludes that Hong Kong has never been independent. And yet, as strange as it may seem, Hong Kong has in fact been a beacon of liberty in East Asia throughout its history as the richest and freest land in the region.⁵ Before the Handover, Hong Kong had already been known for its well organized protests in opposition with the colonial government

6 Lambot, I. (2017). Self-Build and Change. *Architectural Design - LooseFit*, 87(5), 122–129.

Girard, G., & Lambot, I. (1993). *City of Darkness - Life in Kowloon Walled City*.

7 Harter, S. (2000). Hong Kong's Dirty Little Secret: Clearing the Walled City of Kowloon. *Journal of Urban History*, 27(1), 92–113. <https://doi.org/10.1177/009614420002700106>

and later semi-autonomous body of governance. Since 1997, Hong Kong people have inspired the world over with their civil movements, especially against the influence of the totalitarian regime in China. In the history of this land, the Kowloon Walled City stands out as another symbol of civilian autonomy and self-governance. The city was a remnant of a Chinese citadel that was subsumed into Kowloon Island under the Sino-British agreement that added New Territories to Hong Kong. This city within a city was geographically outside of mainland China but jurisdictionally outside of Hong Kong's authority as well. It became a shelter to many immigrants who fled the mainland during the Chinese Civil War and the downtrodden from other parts of Hong Kong seeking a second chance.⁶ The Walled City might have seemed lawless, squalid, and chaotic to undiscerning onlookers, but to the inhabitants it was a place of social harmony, self-reliance, and individual freedom.⁷

The demolition of the Walled City in 1993, which brought about the eviction of a population larger than 30,000, was perhaps the harbinger of something more problematic: the collapse of democracy and autonomy of Hong Kong that occurred only a few years later. In addition to social upheavals due to political reasons, Hong Kongers' indignation has been closely associated with the level of economic inequality among the citizens. One of the most significant indicators of such disparity is housing: while many luxury penthouses and villas can be found in this high-rise city, public housing in Hong Kong suffers from a space area standard that is among the lowest in the world; even so, supply can never seem to match demand. While it is true that disparity does not necessarily mean inequality, that upward mobility is rather stagnant in lower-income groups

indicates a high level of inequity. To make matters worse, in Hong Kong, there exist various types of informal settlements and urban slums that will probably not be addressed in any near future. With a rapid growth in both population and economy within a confined boundary, Hong Kong is facing a challenging situation to find a housing solution that works in a multi-scale manner and with limited resources. This campaign is no longer about housing provision, nor is it strictly about architecture, but about building a new urban fabric that can evolve and adapt.

In this regard, today's Hong Kong greatly mirrors yesterday's Japan - the Japan of 1950s right after the war. Looking back into the history of Japan, into the postwar nation-building efforts of this country, one may learn many important lessons, one of which is about an architectural movement that emerged out of the ashes of war: Metabolism. Steeped in historical, political, social, and economical considerations, this movement represents not only a bold and brave endeavor, but also hopes and visions from a new generation of thinkers. Taking Metabolism as a theoretical framework, this thesis seeks to extract the design strategies - both philosophical and practical - that may be applied to Hong Kong as well as any cities that are confronting similar challenges. However, it is not the intention of this thesis to mimic Metabolism nor to recreate it as a Metabolism-Revival movement. The thesis is about an entirely new and different approach in housing development, residential design, and urban planning, but nonetheless one that stems from the Metabolist way of thinking. It may be viewed as a metabolized version of Metabolism 60 years after it first emerged.



Fig. 01: Montane Mansion
Peter Stewart

WHY HONG KONG?

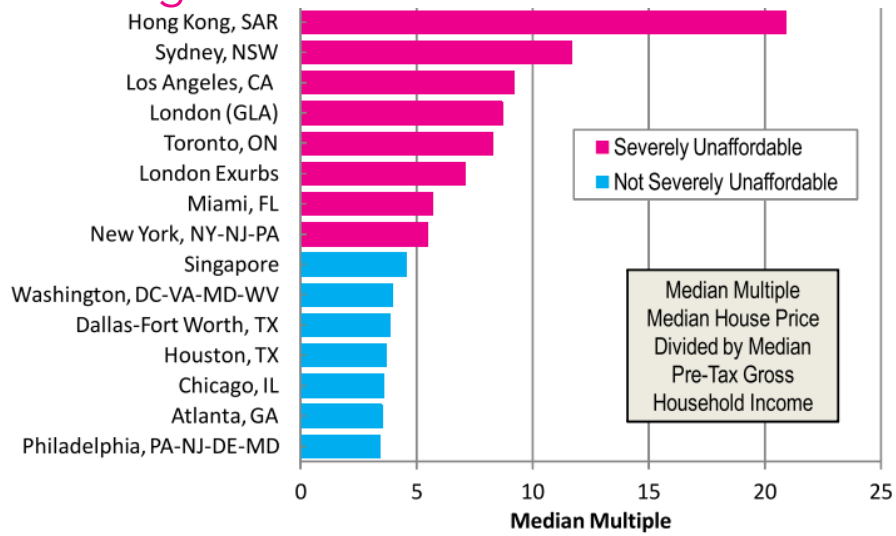
Александр Солженицын

Aleksandr Solzhenitsyn

From our experience of the past and our literature of the past we have derived a naïve faith in the power of a hunger strike. But the hunger strike is a purely moral weapon. It presupposes that the jailer has not entirely lost his conscience. Or that the jailer is afraid of public opinion. Only in such circumstances can it be effective. (The Gulag Archipelago)

Let us not proceed with a debate over morality and emotion, for it is full of presumptions, but with one over the plausibility of the logics and the effectiveness of the actions.

Housing in HK at a Glance



Housing Affordability Rating	Median Multiple
Affordable	3.0 & Under
Moderately Unaffordable	3.1 to 4.0
Seriously Unaffordable	4.1 to 5.0
Severely Unaffordable	5.1 & Over

Median multiple: Median house price divided by median household income

Fig. 02: Housing Affordability Survey (opposite) and Affordability Ratings (above).
15th Annual Demographia International Housing Affordability Survey.

Global housing affordability is often measured in accordance with the median property price to income ratio. The agency that conducts this annual index is Demographia, founded by Wendell Cox. According to the latest ranking, Hong Kong ranks highest with the index number of 20.9. This means that, excluding expenditure for everything else, an average property would take an average income person almost 21 years to pay off. To put it in perspective, the Bay Area in San Francisco – least affordable in America – has an index number 9.4.

However, the index does not reflect what housing tenants actually pay after subsidies, as it is worth noting that government subsidies and welfare programs in Hong Kong are known to be extensive in addressing housing needs. For this reason, the Hong Kong government uses not only Median Rent-to-Income Ratio (MRIR), but also Residual Income (RI) to measure the affordability of their housing market.¹

1 MRIR: Median rent divided by median income. This is the most frequently used metric to gauge housing affordability.

RI: What is left after paying for housing cost. This is to gauge if tenants can afford food, clothing, and other living expenses.

2 Chou, W. L., & Shih, Y. C. (1995). Hong Kong Housing Markets: Overview, Tenure Choice, and Housing Demand. *The Journal of Real Estate Finance and Economics*, 10(1), 7–21. <https://doi.org/10.1007/BF01099608>

3 Chan, H. L., Lee, S. K., & Woo, K. Y. (2001). Detecting Rational Bubbles in the Residential Housing Markets of Hong Kong. *Economic Modelling*, 18(1), 61–73. [https://doi.org/10.1016/S0264-9993\(00\)00030-4](https://doi.org/10.1016/S0264-9993(00)00030-4)

4 In a 2008 article, Cecilia Chu calls the land scarcity a “myth” among two other: that public housing provision show the government’s benevolence to hedge against market, and that private housing is part of a free, competitive, and laissez-faire economy.

Chu, C. (2008). The Myths and Politics of Housing in Hong Kong: The Controversy over the Demolition of the Hunghom Estate. *Habitat International*, 32(3), 375–383. <https://doi.org/10.1016/j.habitatint.2007.11.002>

Out of Hong Kong’s total area of 1075 square kilometers, only 146 had been developed as of 1991.² Due to the city’s topographic characteristics, it has been estimated that only 20% of Hong Kong’s total land is developable, a quarter of which (about 50 km²) was set for residential developments.³ In 1954, the Hong Kong government initiated a public housing program whose policy encourages high-density and standardized developments.

In Hong Kong, the government controls the selling of land and the planning of urban areas through strict regulations, and rightly so. As a British colony and later a special administrative region of China, the small mountainous territory justifies the government’s need to ration each piece of land for housing, prioritizing high-density developments.⁴ The government used to be in charge of 100% of Hong Kong’s housing development, but, starting in 1987 with its **Long Term Housing Strategy**, it has gradually shifted the market share to the private sector, while still maintaining its exclusive position to make and enforce

5 Grange, A. La. (1998). Privatising Public Housing in Hong Kong: Its Impact on Equity Privatising Public Housing in Hong Kong. *Housing Studies*, 13(4), 507–525. <https://doi.org/10.1080/02673039883245>

policies.

The privatization of home development created significant changes in subsidy programs concerning home provision, but it did not seem to cause inequality between income groups.⁵ The shifting of market share from public to private sector not only helps reduce the burden on the government but also speeds up construction turnaround and delivery. To be sure, there certainly exists disparity and inequity in the Hong Kong’s housing market, but as identified by various studies, it is not caused by the private market, but rather by the subsidy policy enforced by the government. According to many scholars, privatization is not at fault; it is the government’s market manipulation to use subsidies as incentives in a miscalculated manner, to protect the existence of its agencies (namely, Housing Authority and Housing Department), as well as its lack of alacrity to rectify past mistakes that created problems.⁶

6 Grange, A. La. (1998).

Ho, L. S., & Wong, G. W. C. (2006). Privatization of Public Housing: Did It Cause the 1998 Recession in Hong Kong? *Contemporary Economic Policy*, 24(2), 262–273. <https://doi.org/10.1093/cep/byj017>

Ho, M. H. C. (2004). Privatization of Public Housing in Hong Kong: A Genuine Agenda or Propaganda. *Habitat International*, 28(3), 481–494. [https://doi.org/10.1016/S0197-3975\(03\)00046-8](https://doi.org/10.1016/S0197-3975(03)00046-8)

Privatization of HK Public Housing Market

There are four major methods of privatizing the public housing market in Hong Kong. Some experts identify these to be in conflict with one another, and urge the government to take a holistic look at the big picture instead of implementing piecemeal stopgaps. For example, the Tenant Purchase Scheme may benefit well-off tenants far more than it should, and thus contradict the principle of vertical equity that the Market Rent Matching seems to promote.¹

The order below is the gradation of these privatization methods from most public-favored to most private-favored.

Full reversal of Public Housing stock to Private Sector is the new market trajectory that we should leverage.

Tenant Purchase Scheme

Sale of flats to sitting tenants in Public Rental Housing (PRH).

Turns existing PRH units into private stock. Creates mixed mode of rental and owned units.

Demand-side-focused

Market Rent Matching

Rent setting for well-off tenants to match market rate to encourage them to purchase instead of rent, leaving room for more needy tenants in PRH.

Creates mixed-income tenant groups and efficient allocation of subsidies.

Demand-side-focused

Assisted Private Market

Vouchers and rental allowances for tenants in private sector. Subsidized flats or loans for home buyers.

Shifts demand to private sector.

Demand-side-focused

Reversal of Public Market

Complete reversal of the function of public housing agency, returning housing provision and delivery to NGOs instead.

Shifts supply to private sector.

Supply-side-focused

Category of tenants	Types of rent	% of tenants*	MRIR**
Normal tenants	Normal rent	96.41	9.3% [#]
Poor tenants	Half normal rent	0.44	na
Better-off tenants	One and a half normal rent	2.51	6.4%
Rich tenants	Double rent	0.61	na
“Super” rich tenants	Market rent	0.03	na
All tenants		583,139	10.2% ^{##}

Source: Information provided by the HKHA to the authors.

Note: MRIR (Median Rent-to-income Ratio), *as of March 2001, **as of 2000 third quarter, [#]excludes social assistance claimants. ^{##}includes social assistance claimants, na: Not available.

1 Ho, M. H. C. (2004). Privatization of Public Housing in Hong Kong: A Genuine Agenda or Propaganda. *Habitat International*, 28(3), 481–494. [https://doi.org/10.1016/S0197-3975\(03\)00046-8](https://doi.org/10.1016/S0197-3975(03)00046-8)

2 Ho, M. H. C. (2004).

Grange, A. La. (1998). Privatising Public Housing in Hong Kong: Its Impact on Equity. *Privatising Public Housing in Hong Kong. Housing Studies*, 13(4), 507–525. <https://doi.org/10.1080/02673039883245>

3 Full competition is expected to ensure quality, bring down overhead and other costs, improve efficiency, and increase options for consumers.

Scholarly researches suggest that crises ensue when the government becomes more like a business enterprise and the supplier of housing stock.

Fig. 03: Tenants and Types of Rent

Yip, N. M., & Lau, K. Y. (2002). Setting Rent with Reference to Tenants' Affordability: Public Housing Rent Policy in Hong Kong. *Journal of Housing and the Built Environment*, 17(4), 409–418. <https://doi.org/10.1023/A:1021118714418>

In Hong Kong, the governing body of public housing (Hong Kong Housing Authority, Hong Kong Housing Society etc.) is also the provider of housing stock. Such has been criticized by many experts and scholars specializing in the subject.² They suggest that to prevent conflict of interest, the legislative body should not have any business in the areas that its policies directly affect, and the housing market should be fully privatized. Even though the privatization of public housing has been shifting the market to the private sector, the governing body has remained a supplier of housing; this is rather contentious. Clearly, the referee must not also be a player. The full reversal of the public market should be realized. That is, the governing body should continue to regulate and upkeep the standards, but the provision of supply should be delegated to Non-Government Organizations in the private sector. This will allow for full competition³ among suppliers in the private sector, while the rules are still monitored closely by the government to ensure fair play.

Timeline of Public Housing and Economy

Great Fire of Shek Kip Mei 1953

First public housing plan to shelter victims, Mark I standard block 1954

New Shek Kip Mei Estate blocks 1972

Hong Kong Housing Authority 1973

Home Owner Ship Scheme 1978

Long Term Housing Strategy 1987

Tenants Purchase Scheme 1997

Handover to China 1997 & Asian Financial Crisis 1997-1998

The 85,000 Units Plan 1997

Reverse Mortgage Program for citizens 55 and above 2011

1953 1953 1958 1963 1968 1973 1978 1983 1988 1993 1998 2003 2008

Fig. 04: Major Milestones in Public Housing Policies.

The first official plan for public housing provision in Hong Kong occurred after the fire of Shek Kip Mei on Christmas Day of 1953 which eradicated the shantytown and rendered thousands of urban dwellers homeless overnight. This plan was thus born out of an emergency to shelter the victims. Nonetheless, it gave way to more public housing programs later.

Before 1954, housing for the mass in Hong Kong included self-built structures, shantytowns, tong laus (tenement halls built in Western styles) etc. without clear standards. As public housing came into place as a policy, standardization became a necessity. These standards progressed in keeping with Hong Kong's transformations in quality of life, technology, and most importantly economy.

Pre-1950s Entrepôt economy

- Geographical advantage
- Seafaring tradition
- British colonial infrastructure
- Low-skill labor force

50s-70s Manufacturing economy

- Embargo of Western world on China
- Existing labor force from seaport industries
- Medium-skill labor force

70s-00s Higher Services economy

- China opened to world trade and competition
- Economic and social stability made smooth transition
- High-skill work force in banking, hospitality, & finance

00s-Now Innovation & Hi-Tech economy

- Highly educated young population
- Professional work force

Fig. 05: Major Economic Transformations in Hong Kong.

With each economic transformation came a new set of challenges that the labor force would have to confront. Many workers could not keep up with new demands from the jobs, given limited education and skills, and age. These people could not stay in the same industry as it kept changing; nor could they easily transition to a new one. This created gaps and voids in not just the economy, but the housing market as well.

Renters and owners might no longer be able to afford their homes, which would necessitate more subsidies or assistance from the government, thus creating even more burden to the economy.

Also, during the time of the later two transformations, immigrants from mainland China became more commonplace than before; they possessed even lower skills. Unlike Hong Kongers, these mainlanders would not be able to get immediate assistance because any PRH would require a tenure of residency.*

*Application for Public Housing, by HKHA: at least 1/2 household members must have at least 7 years of HK residency.

Formal Housing in HK

1960s The first generation is the “Mark series” that came immediately after the Shek Kip Mei fire.

Space standard: 2.25m²/person
Typical height: 7 stories
Note: Shared kitchens & toilets

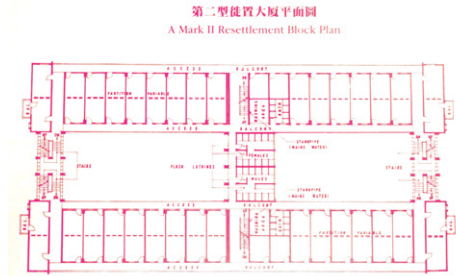
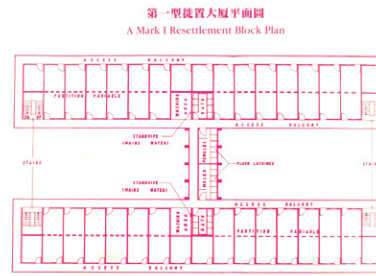
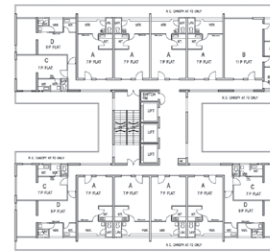


Fig. 4: First generation of PRH: the Mark series.
[Chan 38 Blogspot.](#)

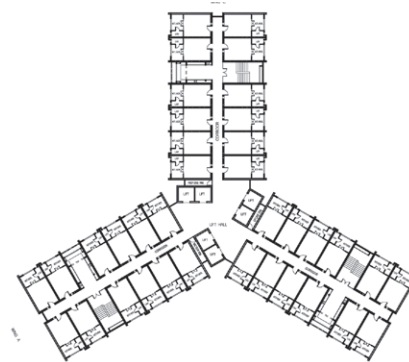
1970s H-Block and Twin Tower

Space standard: 3.25m²/person
Typical height: 20-24 stories
Note: Private balcony, kitchen, toilet, & shower



1980s Trident

Space standard: 5.5m²/person
Typical height: 40 stories
Note: All sleeping & living areas have windows for ventilation & light

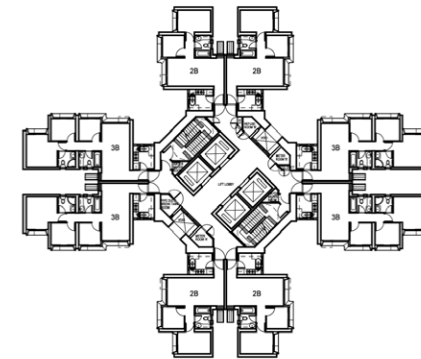
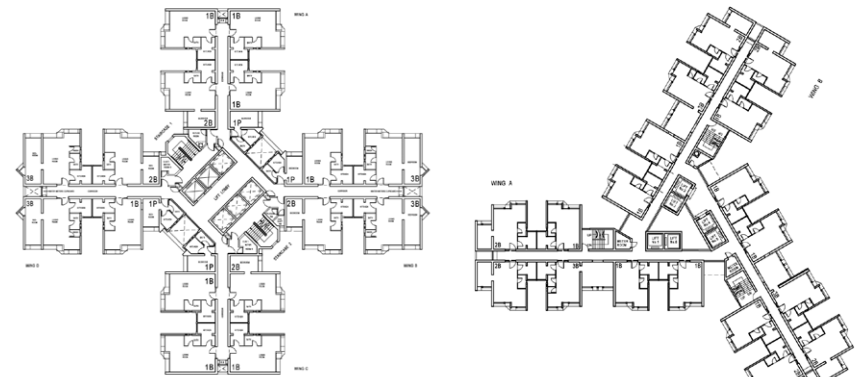
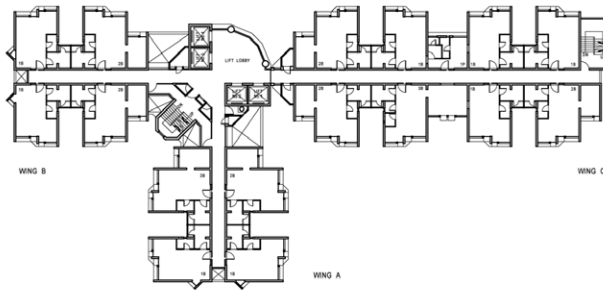


Data: Sullivan, B., & Chen, K. (1997).
Graphics: Hong Kong Housing Authority
*Floor plans are not to scale (NTS)

1990s to Present

Left to Right: Harmony 1, 2, 3, & Concord

Space standard: 7.5m²/person
Typical height: 40 stories
Note: Modular units for footprint reconfigurations



1 Sullivan, B., & Chen, K. (1997). Design for Tenant Fitout: A Critical Review of Public Housing Flat Design in Hong Kong. *Habitat International*, 21(3), 291–303. [https://doi.org/10.1016/S0197-3975\(97\)00061-1](https://doi.org/10.1016/S0197-3975(97)00061-1)

Standard blocks through the years can be charted by how design and space area allowance evolved. The massing of each residential tower indicates its age and the generation of housing to which it belongs.¹ Not shown here are numerous other building designs, including Slab, New Slab, Linear, New Cruciform, New Harmony, to name a few.

Since the 1990s with the production of the Harmony and Concord series, units may be built in a modular fashion to adapt to various building footprints. This modularity is **metabolic** in its essence as it implies potential expansion and contraction by adding or removing the cellular units of the whole structure and reconfiguring them. Most designs endorse the concept of “tenant fitout” to allow residents to furnish their interiors.

Subsidization in HK Public Housing

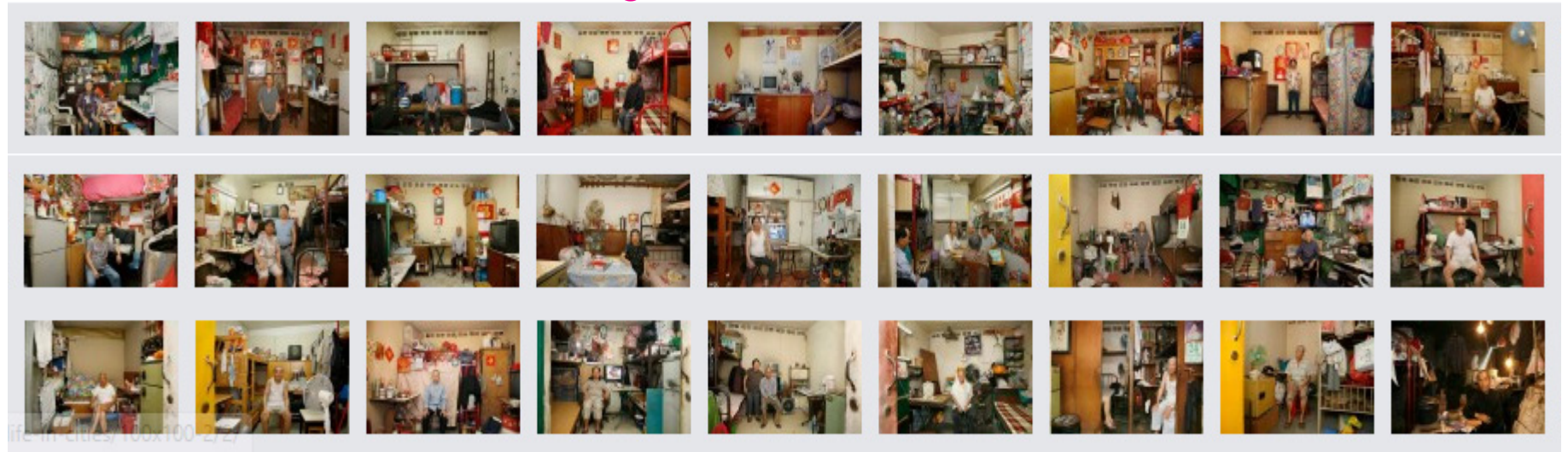


Fig. 06: "100 x 100"
100 households in 100 ft² units in the Shek Kip Mei Estate - the site of the Shek Kip Mei fire and also the first public housing project in Hong Kong.
Michael Wolf

Contrary to the popular image of a laissez-faire market economy, Hong Kong is in fact a welfare-rich environment, operating one of the biggest public housing programs in the world. As of 1995, some 600,000 Hong Kong citizens used a form of home purchase assistance service, accounting for about 10% of the 6.1 million in population. Meanwhile, 2.5 million were living in PRH¹

However, similar to those in Newly Industrialized Economies (NIEs, such as Singapore, South Korea, Taiwan etc.), Hong Kong's welfare programs tend to invest in public goods such as infrastructure, housing, health care, and education, while the interest in personal provision such as transfer payments, pensions, and unemployment benefits has been low.²

Two agencies that are most prominent in setting the field for public housing is the Hong Kong Housing Authority (HKHA) and the Hong Kong Housing Society (HKHS), which have established various comprehensive schemes to assist tenants in finding their flats and paying their rents or mortgages.

Besides rent assistance programs, the Long Term Housing Strategy that HKHA introduced in 1987 seeks to promote rent-to-own practice through various schemes, including Home Ownership Scheme, Private Sector Participation Scheme, and Home Purchase Loan Scheme, to name a few. Other subsidies also seek to provide “discount” of 20-50% of the market value for flats by means of vouchers and rebates.³

The Hong Kong government has been running a massive and extensive welfare program to address housing needs. This may contradict the non-interventionist attitude that many find a hallmark to the market economy of this region. Through interventions, the government seeks to regulate housing affairs in a resource-conscious manner. However, because real estate plays such a major role in Hong Kong’s economy, with about 45% of all bank loans being property-related, about 50% of which are mortgage loans as of 1998,⁴ any manipulation in the housing market can be expected to cause a huge impact on the whole financial structure of the region.

1 Yu, S. W. K. (1997). The Hong Kong Government’s Strategy for Promoting Home Ownership — An Approach to Reducing the Decommodifying Effects of Public Housing Services. *International Journal of Urban and Regional Research*, 21(4). <https://doi.org/10.1111/1468-2427.00100>

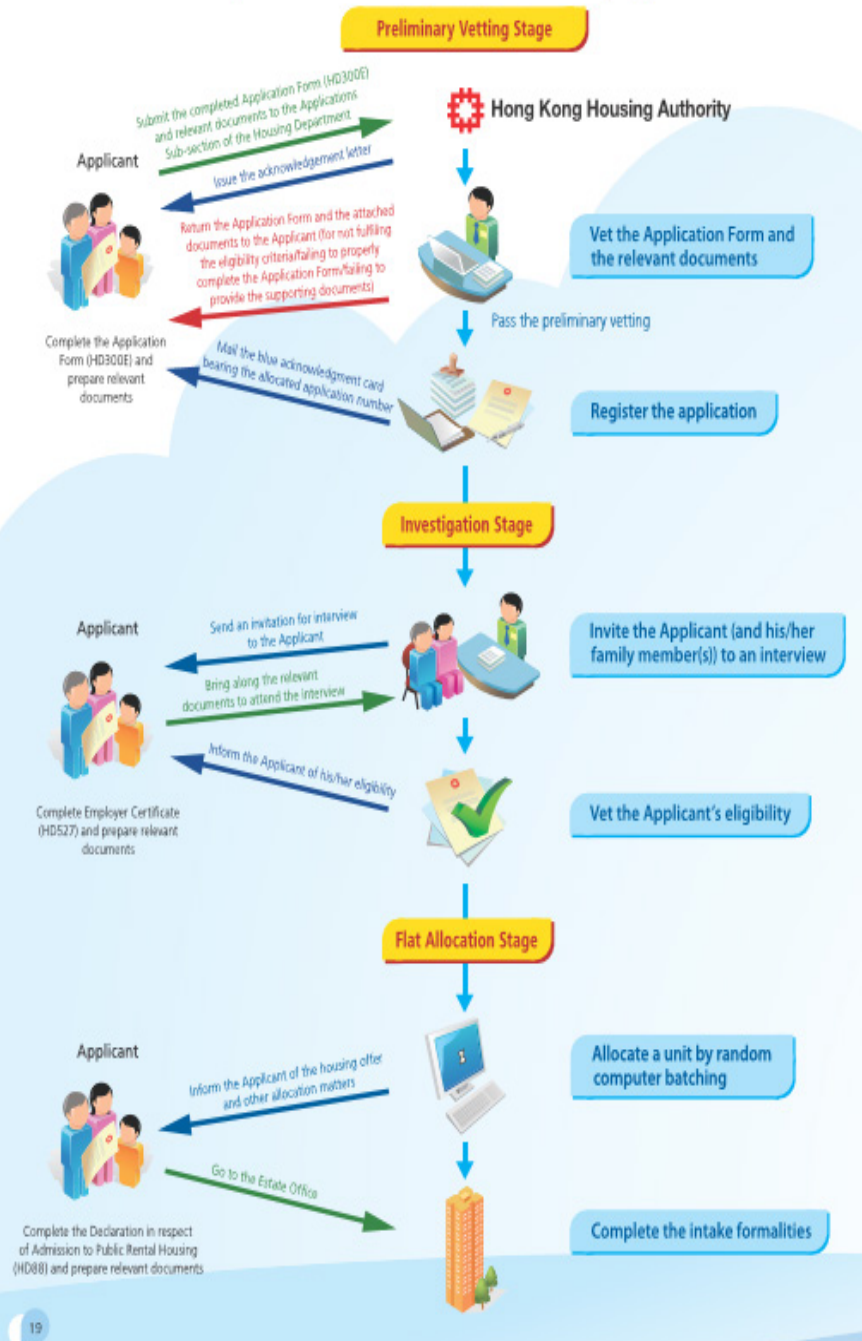
2 Grange, A. La, & Yung, B. (2001). Aging in a Tiger Welfare Regime: The Single Elderly in Hong Kong. *Journal of Cross-Cultural Gerontology*, 16(1), 257–281. <https://doi.org/10.1023/a:1011932006955>

3 Grange, A. La, & Yung, B. (2001).

Yip, N. M., & Lau, K. Y. (2002). Setting Rent with Reference to Tenants’ Affordability: Public Housing Rent Policy in Hong Kong. *Journal of Housing and the Built Environment*, 17(4), 409–418. <https://doi.org/10.1023/A:1021118714418>

4 Chan, H. L., Lee, S. K., & Woo, K. Y. (2001). Detecting Rational Bubbles in the Residential Housing Markets of Hong Kong. *Economic Modelling*, 18(1), 61–73. [https://doi.org/10.1016/S0264-9993\(00\)00030-4](https://doi.org/10.1016/S0264-9993(00)00030-4)

Simplified Flowchart of Public Rental Housing Application



HA currently provides the following applications for allocation of PRH units:

- (i) General Application
 - (a) Ordinary Families
 - (b) Single Elderly Persons Priority Scheme
 - (c) Elderly Persons Priority Scheme
 - (d) Harmonious Families Priority Scheme
- (ii) Application by Non-elderly One-person Applicants

Fig. 07: Application Process and Applicant Categories.
Application Guide of Public Rental Housing, Hong Kong Housing Authority.



Fig. 08: "a39"
Architecture of Density
Michael Wolf

Informal Dwellings in HK



Benny Lam



SoCO Exhibition



SoCO Exhibition



K Y Cheng

Subdivided Flat

Rent: \$29.1/sf
(Source: [South China Morning Post](#))

Physical partition

Multi-occupancy

In-unit service spaces

Coffin Home

Rent: \$20.9-\$29.1/sf
(Source: [The Guardian](#))

Semi partition

Single occupancy

Shared service spaces

Cage Home

Rent: \$6.5-10.0/sf
(Source: [South China Morning Post](#))

No observable partition

Single occupancy

Shared service spaces

Rooftop Dwelling

Rent: \$3.0/sf
(Source: [CNN](#))

Physical partition

Multi-occupancy

In-unit service spaces

Hong Kong is considered one of the most densely populated cities on earth.¹ At 7 m² (roughly 75 ft²), its area per capita allowance in public housing is among the lowest global standards. Residential high-rises constitute a large portion of Hong Kong's skyline and are often described as "pancake stacks" due to their repetitive extrusion of floor plates. Even within the same floor, apartment units are also built as modules in a standardized manner for ease of planning and configuration.

The *efficiency* and *scalability* of this design approach can hardly be surpassed in addressing the urban density in a place like Hong Kong. However, while the volume of these residential high-rises has yet to match the demand from low-to-middle-income families, the *affordability* of housing also leaves much to be desired, using inadequate measures such as median rent-to-income ratio (MRIR) or residual income (RI). Nor does the housing policy solve the *accessibility* problems among different income groups, giving them very limited choice.

This has resulted in a category of dwellings called "subdivided units" (SDUs), which further bifurcates into two types: with and without observable physical partitions – the latter being the most problematic as it is tied to a demographic with little to no upward mobility and regarded as squatters. This type of housing is recognized by the census bureau, tolerated to an extent by development agencies, but nevertheless listed as a type of slum. As a result, these housing issues are *well acknowledged but never fully addressed*.²

1 Lawrence Lai (1993) shows in his research that as of the time of enumeration, 80% of 5.6 million Hong Kong people lived in only 10% of the total land area. This translates into 44,800 persons/km². The April 2015 report from the Census and Statistics Department of the Hong Kong government shows that at mid-2014, the average density of the whole region is 6,690 persons/km². However, this is the density over total land; the actual population density is more accurate when measured per urban district.

Lai, L. W. C. (1993). Density Policy Towards Public Housing: A Hong Kong Theoretical and Empirical Review. *Habitat International*, 17(1), 45–67. [https://doi.org/10.1016/0197-3975\(93\)90045-e](https://doi.org/10.1016/0197-3975(93)90045-e)

2 Smart, A. (2002). Agents of Eviction: The Squatter Control and Clearance Division of Hong Kong's Housing Department. *Singapore Journal of Tropical Geography*, 23(3), 333–347. <https://doi.org/10.1111/1467-9493.00134>

Sub-Divided Units

Household size of SDUs is typically small, with 1-person households as the predominant at 31.5%, and 2-person households as the median.¹ According to the Thematic Household Survey Report of 2016, the number of SDUs is around 88,800, serving nearly 200,000 people. **Of 88,000 SDUs surveyed in this report, about 5,800 of them (6.5%) are without observable partitions.** These come from about 25,000 sublet quarters, meaning each quarter has an average of 3.5 SDUs. The median monthly rent of these SDUs is 4,200 HKD (about 535 USD), accounting for 32.3% of their income, whereas post-subsidy MRIR in public housing is around 15%.²

These figures come from surveying two types of SDUs: **with observable partitions** (interior concrete or wood walls) and **without observable partitions** (wire cage homes, box beds etc.). It is the latter that is of grave concern, as the tenants may pay less for rent, but it is at a significantly lower quality of living, and their income is also significantly less than the other category. The Thematic Household Survey Report shows that of all 88,800 households living in SDUs, less than half have applied for public housing at least once. It means that the other half have not intended to apply for public housing from which they could benefit. Nor can they easily do that. Knowing that these SDUs dwellers are mostly immigrants without official tenure status, it is unlikely that they may be qualified for subsidies and welfare aids. This income group also includes those with low level labor skills, mostly without educational background, and thus are not compatible with the service economy of Hong Kong. The unemployment rate in this income group is also high.

1 Census and Statistics Department. (2016). Thematic Household Survey Report No. 60. Retrieved from www.censtatd.gov.hk

2 Census and Statistics Department. (2016). Thematic Household Survey Report No. 60. Retrieved from www.censtatd.gov.hk

MRIR = Median Rent to Income Ratio

3 Census and Statistics Department. (2016). Quarterly Report on General Household Survey. Retrieved from www.censtatd.gov.hk

4 Census and Statistics Department. (2016). Thematic Household Survey Report No. 60. Retrieved from www.censtatd.gov.hk

Monthly household income (HK\$)	No. of households	%
< 6,000	7 900	9.1
6,000 - 7,999	2 300	2.7
8,000 - 9,999	8 700	10.0
10,000 - 14,999	22 500	25.7
15,000 - 19,999	11 600	13.3
≥ 20,000	10 300	11.7
Refused to answer	24 200	27.6
Total	87 600	100.0
Median monthly household income (HK\$)*	12,500	

Fig. 09: Monthly Income of SDU[^] Households

Thematic Household Survey Report 2016.

Notes:

[^] Referring to sub-divided units in private domestic / composite buildings (excluding village houses) aged 25 and above in Hong Kong.

* Excluding households which refused to provide information on monthly household income.

It should be noted that as the proportion of households which refused to provide information on monthly household income was not low (27.6%), the figures above are for crude reference only.

Up to standard?

Basic living standards for adequate housing

- 1 Average living space per person no less than 75 sq ft (Housing Authority standard)
- 2 Rent increase no more than yearly inflation rate
- 3 Utility fees the same as government rates
- 4 Formal rental contracts
- 5 Landlords willing to provide some maintenance services
- 6 Separate kitchen
- 7 Separate toilet
- 8 Windows and good air ventilation
- 9 No water seepage or flaking concrete from walls and ceiling
- 10 Air-conditioning

Subdivided flat residents able to fulfill the criteria (%)

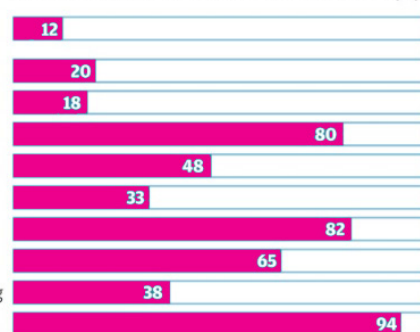


Fig. 10: Living standards in HK's subdivided flats

Kwai Chung Subdivided Flat Residents Alliance, South China Morning Post

According to **Fig. 09**, 25.7% of SDU tenants are within +/- 2,500 HKD of the median 12,500, which is a 20% margin for deviation. In the same year, the median monthly income for all Hong Kong is 15,000 as of Q3.³ It shall be noted that in urban districts, the median income may be higher than that, and is thus more comparable with the median income of SDU tenants as they are concentrated in urban areas.

Also, 21.8% of SDU tenants earn less than 10,000 HKD a month, which is not a terribly high rate, but not at all low either. This is a problematic income bracket that the new housing typology should consider, as it may be inferred that the quality and standard of living reflect earning situation. The median rent to income ratio (MRIR) among SDU tenants is 32.3%⁴, which indicates unaffordability. That says nothing about the quality of life in these SDUs, which is subpar and oftentimes unbearable, especially to children and the elderly.

Based on the presented information, the proposal should target small units as the basis of design.

1 Task Force on Land Supply. (2017). Reclamation Outside Victoria Harbor.

Chou, W. L., & Shih, Y. C. (1995). Hong Kong housing markets: Overview, tenure choice, and housing demand. *The Journal of Real Estate Finance and Economics*, 10(1), 7–21. <https://doi.org/10.1007/BF01099608>

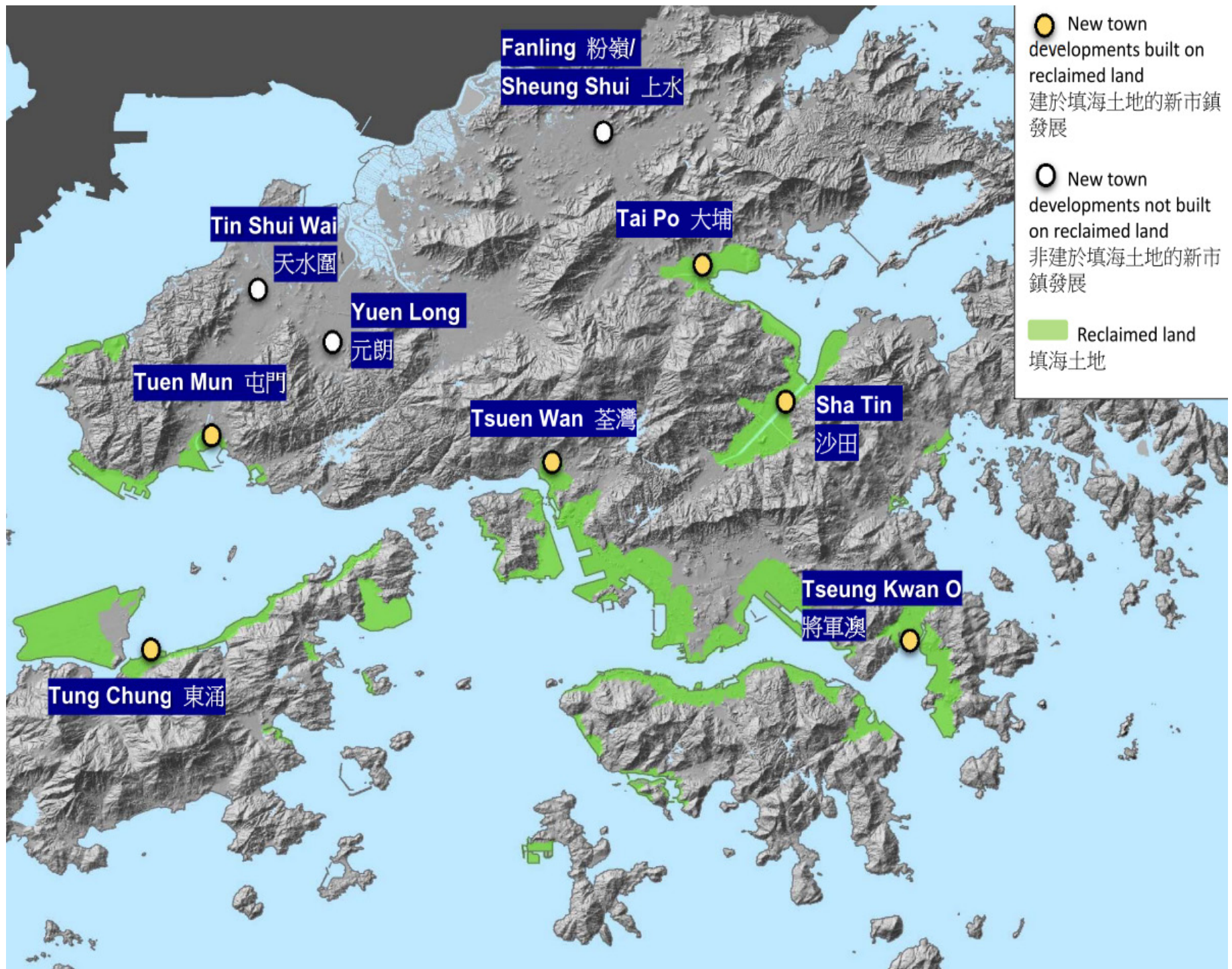
2 Task Force on Land Supply. (2017). Reclamation Outside Victoria Harbor.

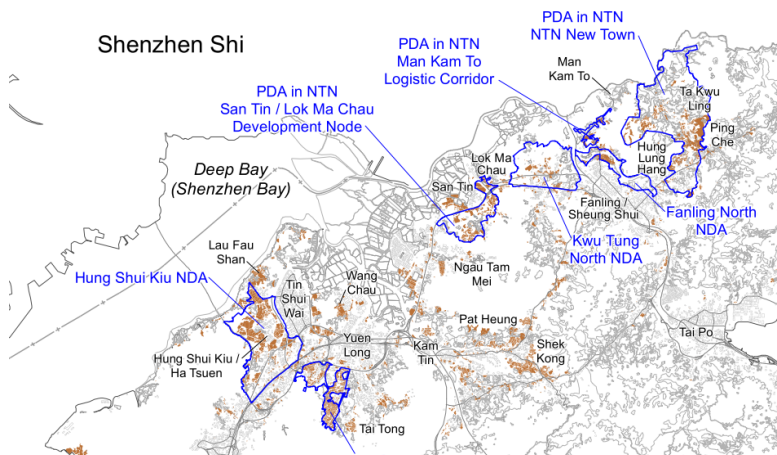
As of 2016, the land area of Hong Kong was about 1,106 km², showing an increase of about 40 km² from 1991.¹ This reflects a conventional practice in Hong Kong to procure land supply by reclamation. In fact, about 70km² of Hong Kong land was formed by this practice.² However, this process of land reclamation has been mainly near-shore land infills. The Land Supply Task Force - a research organization for land expansion in Hong Kong - has been looking into various innovative options to bring about a relief of land supply for developments, residential and commercial alike.

Besides promoting Public-Private Partnership to tap into private agricultural lands in rural areas, as well as optimizing existing land use, the Land Supply Task Force offers a number of schemes to enlarge the developable reserve for Hong Kong to alleviate the land shortage, including the considerations for brownfields, caverns, and land reclamation in the harbor. It is worth reiterating that developable land in Hong Kong accounts for a low percentage of total land, due to the hilly topography.

Apart from increasing land supply, new construction technology may be able to overcome the constraints and limitations of building in such a mountainous land. For example, a braced frame tower free from conventional foundation that elevates the building mass may be a good option when building on a hillside.

Fig. 11 (opp): Locations of Land Reclamation in Hong Kong Task Force on Land Supply. (2017). Reclamation Outside Victoria Harbor.

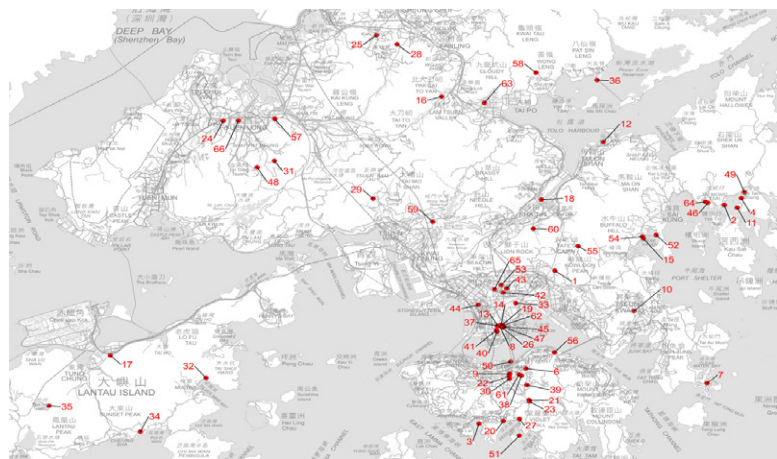




Brownfields

Short-to-medium term (10 years)

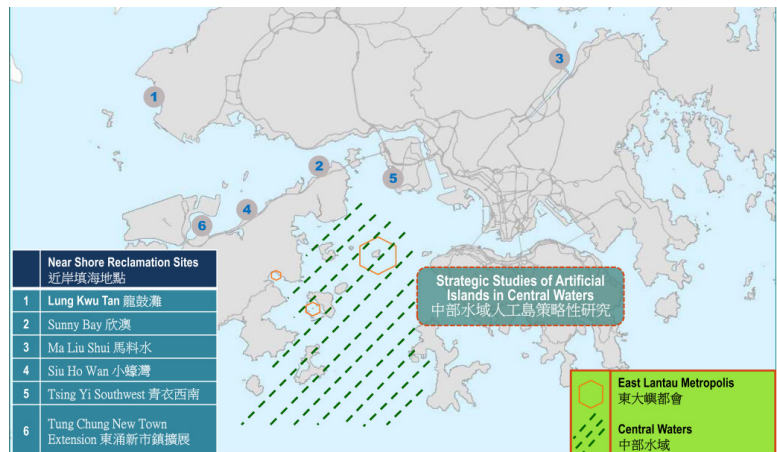
Land expansion into formerly industrial lands with low activities of development. There is a high concentration of such pieces of land in the New Territories as they were converted into storage and backup facilities for the port economy.



Private Recreational Lease

Short-to-medium term (10 years)

Potential withdrawal or freeze on renewal of leases for community centers, recreational facilities, and sports clubs. This supply can then be converted for residential uses.



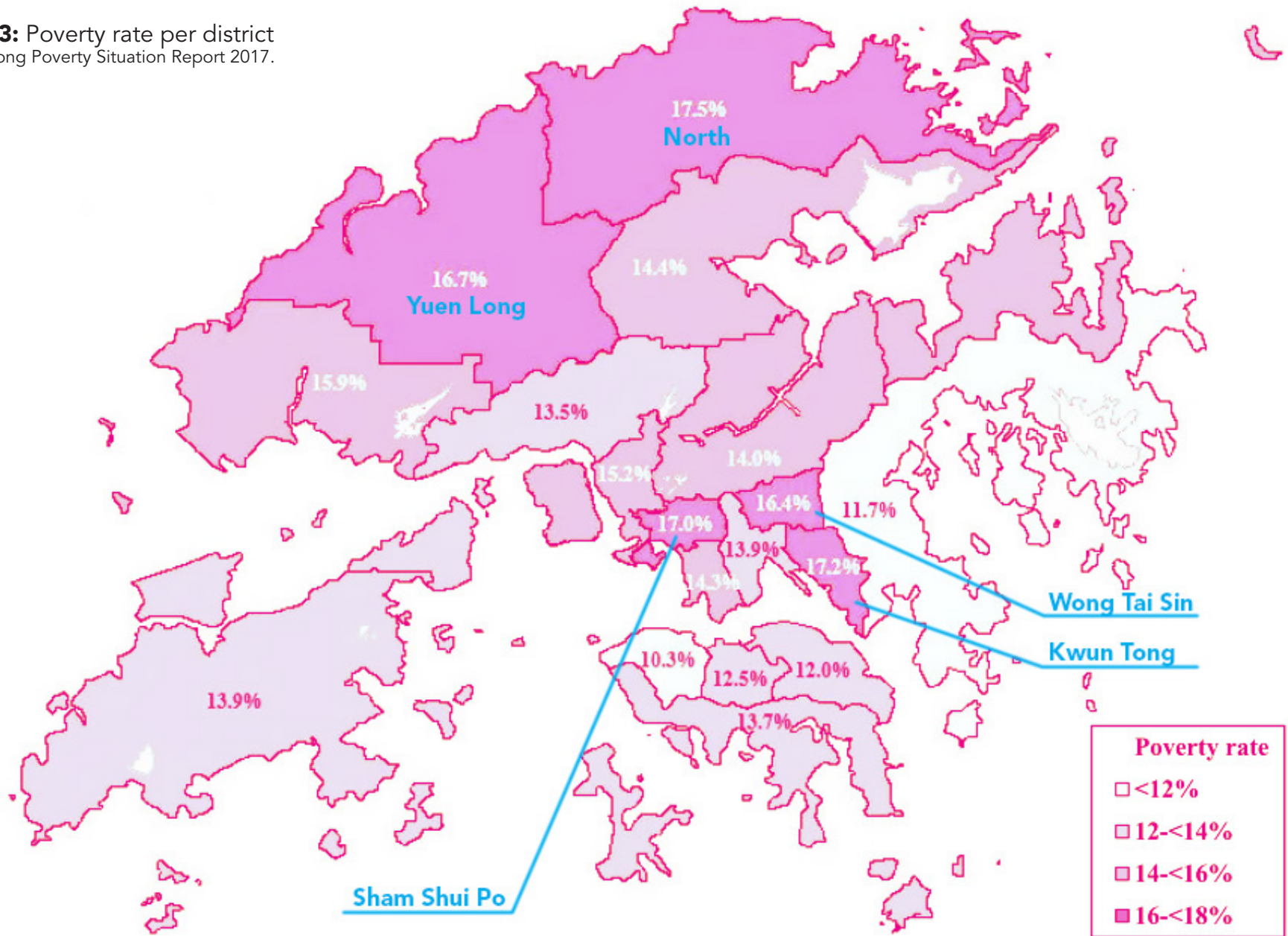
Near-shore Reclamation

Medium-to-long term (10-30 years)

Land reclamation by the shoreline has been in practice in Hong Kong for a long time. The technology is thus mature and conventional. However, the new plan is rather extensive and invasive as it looks at the Central Waters between Hong Kong Island and Lantau Island, and thus can be a contentious one.

Target Districts

Fig. 13: Poverty rate per district
Hong Kong Poverty Situation Report 2017.



Note: Based on poverty statistics after recurrent case intervention
Source: General Household Survey, Census and Statistics Department

1 As shown in previous figures, non-elderly single persons are not considered for general applications.

2 Census and Statistics Department. (2018). Hong Kong Poverty Situation Report 2017.

3 According to *Hong Kong Poverty Situation Report for 2017*, North and Yuen Long also experienced a decrease in poverty rate from 2016.

In identifying locations to implement a new housing typology, some criteria may be considered:

- Average income of district: areas falling under the poverty guideline will be considered first. Poverty rate is used to determine which districts are more at risk.
- Overall age of housing stock: many apartment buildings are on the verge of disrepair and need to be replaced, especially old *tong laus* and old PRH towers from the 60s. This provides an opportunity to propose and introduce a new typology to the market.
- Demographics: single persons age under 65¹, tenants of informal dwellings and settlements, and people without tenure of residency will be invited to participate first in the new scheme.

At-risk districts are five with the poverty rates above the overall average of Hong Kong 14.7%, namely: Sham Shui

Po, Wong Tai Sin, Kwun Tong, North, and Yuen Long.² In this group, North and Yuen Long are rural areas, therefore their poverty rates are naturally above average.³ These two districts may be ruled out, which leaves us with:

- **Sham Shui Po:** 17.0% poverty rate. 0.2% increase from 2016

This district includes Sham Shui Po, Shek Kip Mei (site of the great fire in 1953), Lai Chi Kok, and Pak Tin.

- **Wong Tai Sin:** 16.4% poverty rate. 1.0% increase from 2016

This district includes East Kowloon (site of Kowloon Walled City), San Po Kong, and Diamond Hill

- **Kwun Tong:** 17.2% poverty rate. 1.0% increase from 2016

This district includes Kwun Tong, Laguna, Cha Kwo Ling, Kowloon Bay, Ngau Tau Kok, and Jordan Valley.

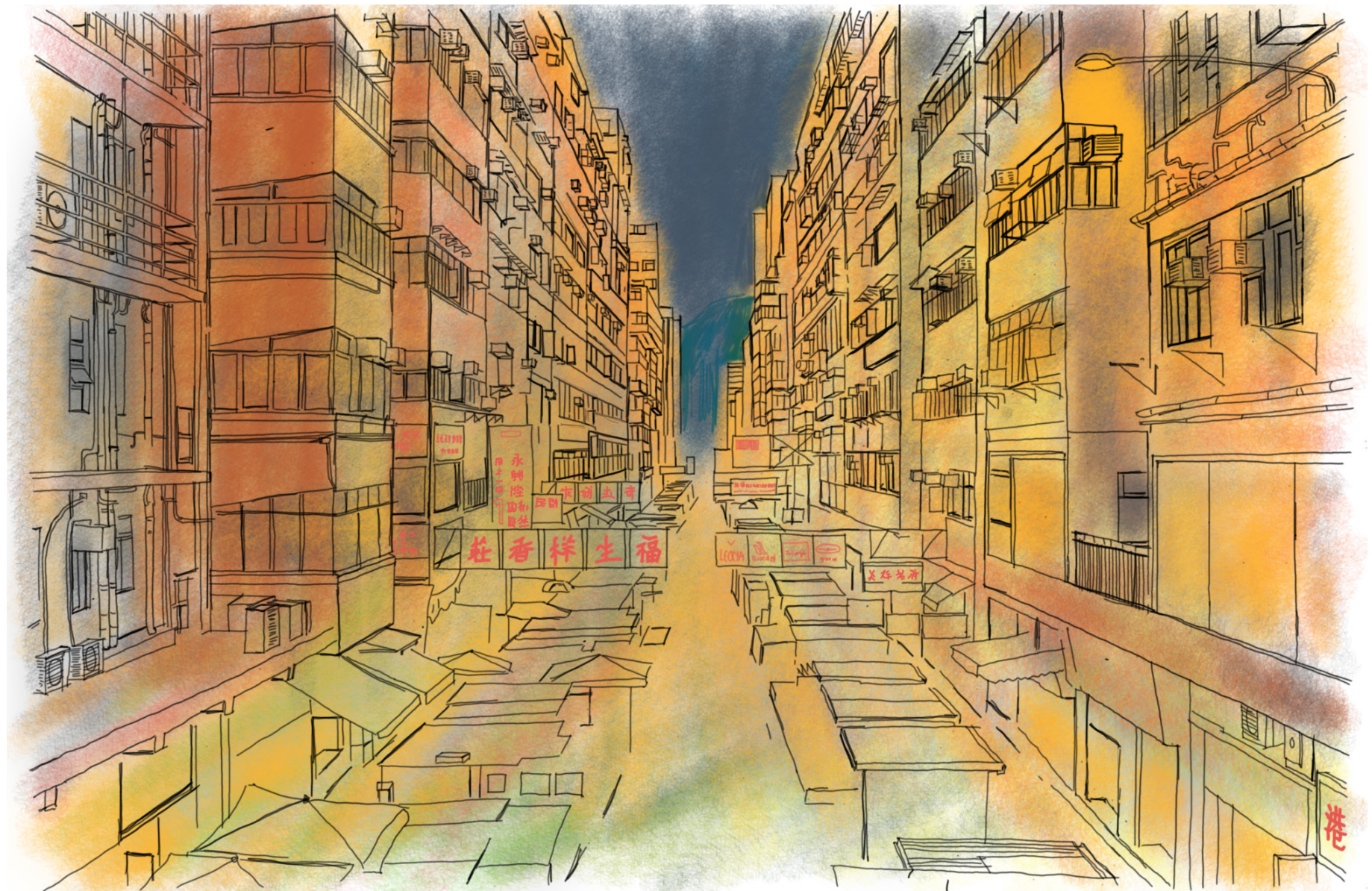


Fig. 14: "Fa Yuen Street" - Mong Kok
Postcard Series: Hong Kong
Daniel Vu
036

	Elderly poverty rate	Child poverty rate	Share of non-CSSA working poor persons [~]	Share of non-CSSA unemployed poor persons [~]	Share of CSSA households [^]	Share of single-parent households [^]	Share of new-arrival households [^]
North	x	x	x	x	x	x	x
Kwun Tong	x	x	x	x	x	x	x
Sham Shui Po		x	x	x	x	x	x
Yuen Long	x	x	x	x	x	x	x
Wong Tai Sin		x	x	x	x	x	
Tuen Mun	x	x	x	x	x	x	
Kwai Tsing		x	x		x	x	
Overall	30.5%	17.5%	4.5%	0.9%	6.5%	2.8%	2.8%

1 Census and Statistics Department. (2018). Hong Kong Poverty Situation Report 2017.

2 Grange, A. La, & Yung, B. (2001). Aging in a Tiger Welfare Regime: The Single Elderly in Hong Kong. *Journal of Cross-Cultural Gerontology*, (16), 257–281. <https://doi.org/10.1023/a:1011932006955>

Fig. 15: Socio-Economic Profiles of Poor Districts
Hong Kong Poverty Situation Report 2017.

Notes: (~) Proportion in the labor force of the corresponding districts.
(^) Proportion in the total number of domestic households of the corresponding districts.
“x” represents a higher-than-overall relevant proportion in the corresponding districts. Poverty statistics refer to statistics after recurrent cash intervention.

CSSA = Comprehensive Social Security Assistance

Source: General Household Survey, Census and Statistics Department.

Though the poverty rate among the elderly (persons 65 and above) seems high, it may be overrepresented as this demographic may be “asset-rich while income-poor” yet still classified as poor.¹ Furthermore, the elderly population enjoys many social benefits, including cash allowances, health care services, housing assistance, and priority in other welfare programs. However, it is worth noting that many elders still have to cope with low liquidity, because, as noted before, Hong Kong’s welfare programs invest in infrastructure and services, not transfer payments.²

Because housing is part of the infrastructure and services, the elderly population in Hong Kong does not have to face much hardship when it comes to this subject. Moreover, Hong Kong society encourages the practice of *filial piety* - a Confucian virtue and tradition in which the young live with the elders to take care of them. Housing policies do reflect this direction to have multi-generation families, as evident in the Harmonious Families Priority Scheme by HKHA.



Fig. 16: “Ki Lung Street”
The Last Tong Lau Series
Stefan Irvine

3 Average waiting time (AWT) for elderly single persons is 1.8 years, according to the 2015 report by the Transport and Housing Bureau. Meanwhile, the Housing Authority pledged to maintain a target AWT of 3 years for all general applicants.

Appendix A1, Transport and Housing Bureau. (2015). Hong Kong: The Facts - Housing. Retrieved from <http://www.thb.gov.hk>

Hong Kong Housing Authority. (2015). Application Guide for Public Rental Housing. Retrieved from www.housingauthority.gov.hk

Because elderly persons take priority in various social welfare programs, they are not the target testers of this experiment. With housing, this demographic experiences less waiting time in the application process than other groups.³ The elderly are considered in 3 general application categories: elderly couples, single elderly persons, and elderly living with children (Harmonious Families). Apart from that, the general application section also prioritizes “regular families”. Thus, this category of nuclear families may also be considered low on our urgency scale.

In fact, none of the demographics qualified for general applications by HKHA’s regulation are considered for the new housing type that this project aims to propose. The category of dwellers that this project seeks to offer the new typology first is those with low priority in the PRH application process but who are at high risk. **They are low-income single persons under 65.** This demographic is facing growing challenges in housing affordability and accessibility. Especially for those not having

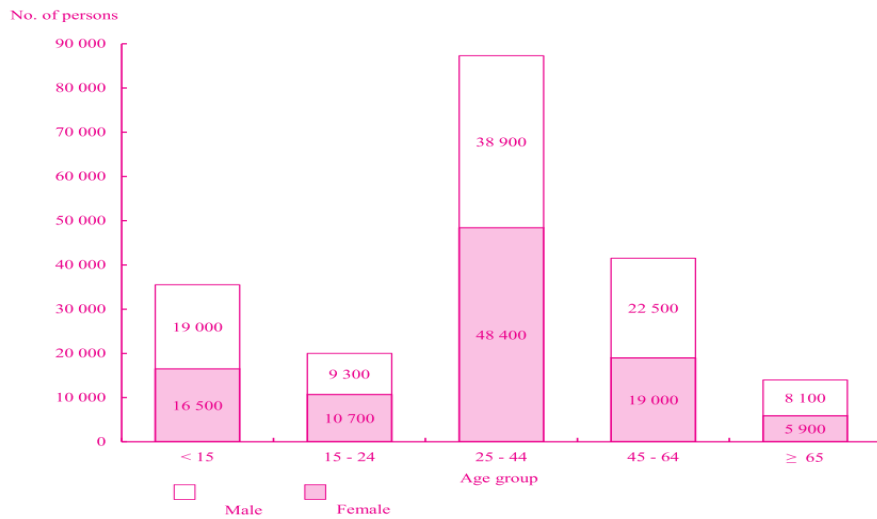


Fig. 17: Age and Sex in SDUs
Thematic Household Survey Report 2016.

the tenure of residency (7 years), the vetting policy for public housing can be extremely strenuous. These people often have to resort to subletting and informal dwelling types, all called subdivided units (SDUs).

In this demographic, the predominant age group is 25-44, accounting for 44% of SDU tenants. Within this age group, females are of the majority (over 55%). It is worth noting that this age group consists of young workers and professionals, therefore living in SDUs may be a money saving strategy rather than a last resort. If two tenants are married, this living arrangement may also be the interim while waiting for public rental flats.

About 21% of SDU tenants are in the age group of 45-64. Many in this group are from the previous economic transformation of Hong Kong (manufacturing to higher services)

and thus find themselves now at a gap in the labor force. This age range also makes it hard for them to receive more training and education to adapt to a new economy. Thus, this group is of more concern and may rank higher in the urgency scale than others.

Further data collection and analysis are necessary in order to extract accurate number of single persons living in SDUs, their income, and their performance in the job market.

/The category of dwellers that this project seeks to offer the new typology first is low-income single persons under 65./

1 Grange, A. La, & Yung, B. (2001). Aging in a Tiger Welfare Regime: The Single Elderly in Hong Kong. *Journal of Cross-Cultural Gerontology*, (16), 257–281. <https://doi.org/10.1023/a:1011932006955>

In this report, La Grange and Yung sample questionnaire responses from 402 low-income single elders (60 and above). The findings are astounding with a wide range of money-saving mechanisms.

CHAPTER CONCLUSION

Hong Kong is among the Newly Industrialized Economies in East Asia that include also South Korea, Taiwan, and Singapore. As a side-effect in these economies, living expenses are high and housing has become a hot commodity. Granted that living standards have also been advanced to be commensurate with the economic growth, many in the population are still experiencing extreme poverty and have not yet experienced improved living conditions. To cope, these people self-regulate and lower their own standards, demonstrating more resilience, tolerance, and endurance than expected.¹

The best housing strategy for the low-income demographic is therefore one that allows the occupants to make choices that befit their diverse lifestyles. For lack of better terms, we shall call it the “strategy for tenants’ autonomy”.

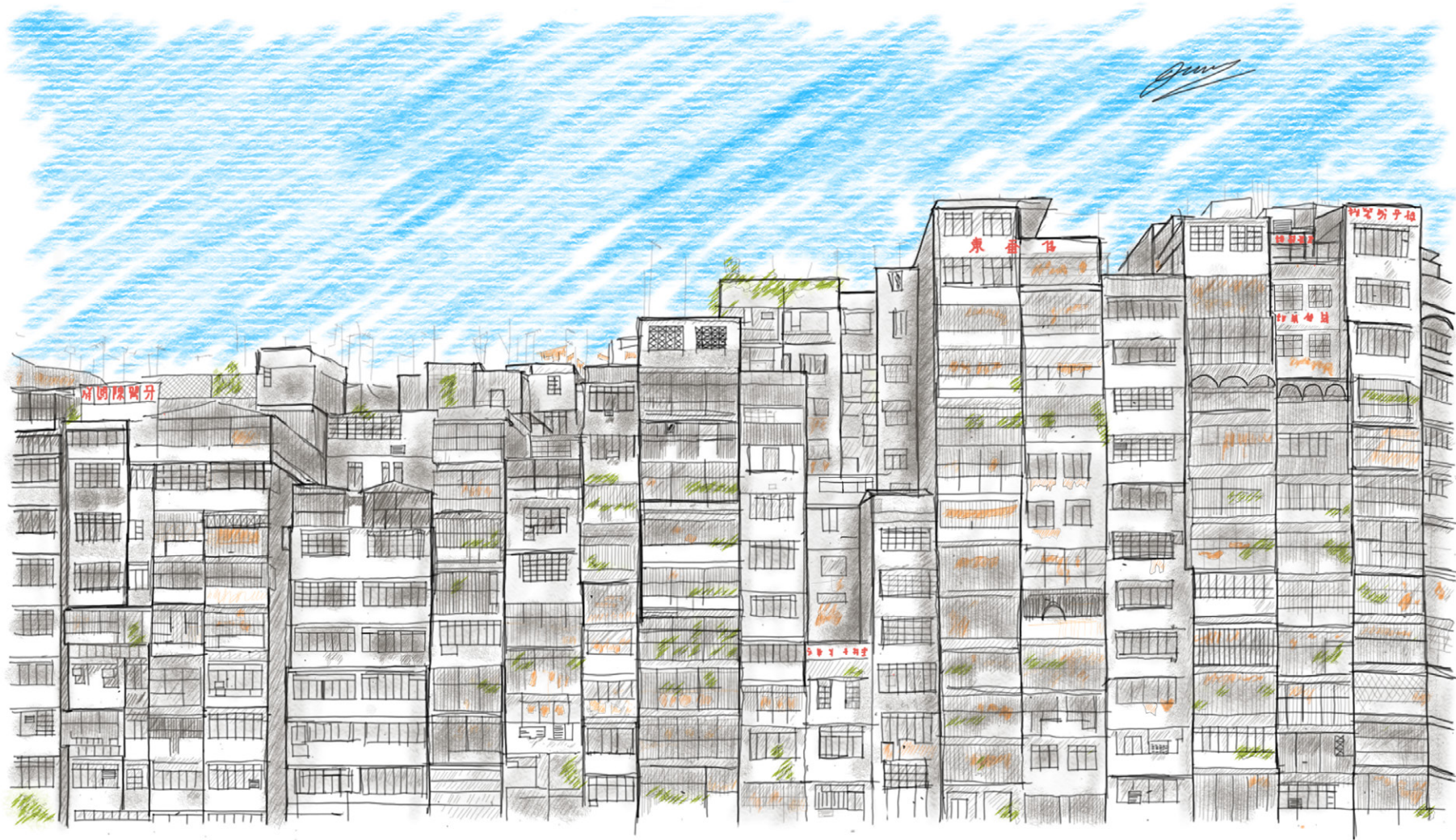


Fig. 18: "Kowloon Walled City"
Postcard Series: Hong Kong
Daniel Vu
042



Fig. 19: Home-brewed Metering Tableau System
City of Darkness (047)

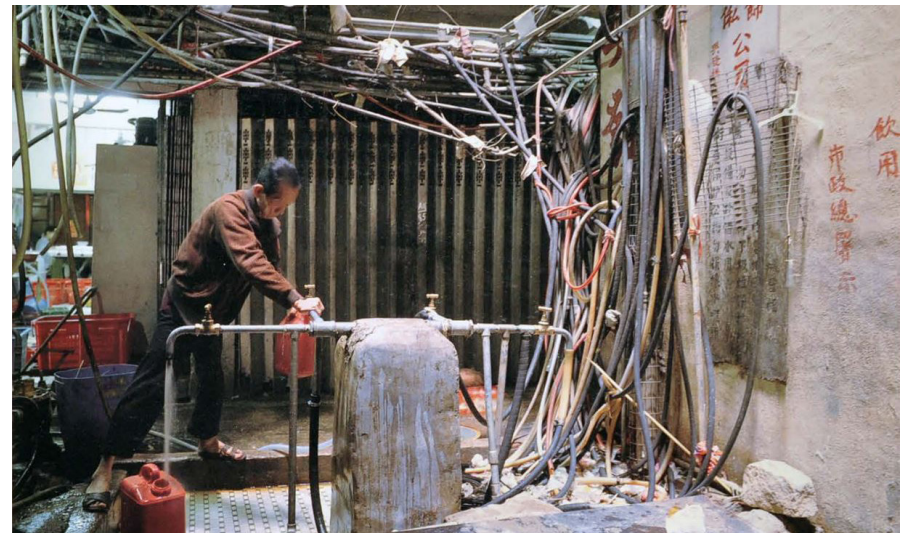


Fig. 20: Communal Water Well
City of Darkness (039)

Hong Kong used to have a completely autonomous community that lived inside a structure known as the Kowloon Walled City. This autonomous governance was the reason the Walled City, seemingly chaotic to the onlookers, maintained its social harmony and coherence from within. This self-built, self-reliant, self-governed, 7-acre complex once housed up to 33,000 tenants, lots of whom speak fondly of their memories living inside it.

Geographically outside the reach of China and jurisdictionally outside the reach of Britain's colonial and later Hong Kong governments, the walled city became an icon of extremely decentralized and organic urban growth, for better or worse. Gamble dens, brothels, Triad headquarters, black market goods, and anything clandestine used to be found alongside a robust community of immigrants and the downtrodden.



Community Kindergarten

127

Operated by the Salvation Army, this was one of many social services independent of any governmental programs. Parents only had to pay a nominal fee, about 3% of the actual cost per pupil. Frequent events included outings outside of the City, fire-escape drills, and play in the dark because of power outages.



Family Dinner

113

Chung Yo Ling had lived in other spots of the Walled City before finally acquiring an apartment lofty enough to accommodate her big family. She had 10 children that usually joined her at family meals.



Mom & Pop & Son Shop

056 - 057

Lee Pui Yuen was a fisherman who emigrated to Hong Kong illegally and was arrested upon arrival. Through the help of a Christian organization, he got out of jail, went through various life events, and moved to the Walled City, where he established a family shop that used to run all day until his family of three turned off the light.



Multi-generation Business

142

Lee Yu Chun had maintained her family's candy business from outside the Walled City before setting shop inside it later on. Helping her were her family members, including her mother and children. The factory also employed other kids in the neighborhood who wanted to earn pocket money after school.



Dental Care for Less

025

Lam Mei Kwong had been trained in dentistry in the mainland before moving to Hong Kong in the advent of WW2. His office was built by a contractor who drafted up the floor plan, ran electric wiring, and made plumbing service all by himself. Inside the Walled City, Lam's was as good a setup as one could get.



Helping Hands

171

Jackie Pullinger (striped overall) ran one of the most successful missionary services in all Hong Kong to rehabilitate drug addicts, many of whom were members of the Triad. Through this program, former gang members were reformed, which helped reduced crime rate in the City.

Fig. 21 (all photos this spread): "City of Darkness" by lam Lambot and Greg Girard

Sub-Divided Units





Fig. 22 (all photos this spread): "Subdivided Flats" series by Benny Lam - Part of a SoCo Exhibition

Coffin Homes





Fig. 23 (all photos this spread): "Trapped" series by Benny Lam

Cage Homes





Fig. 24 (all photos this spread): by Bryant Cheng - Part of a Journal Article by Hong Kong Free Press

Rooftop Dwellings





Fig. 25 (all photos this spread): "Portraits from Above: HK's Informal Rooftop Communities", Stefan Canham & Rufina Wu 053

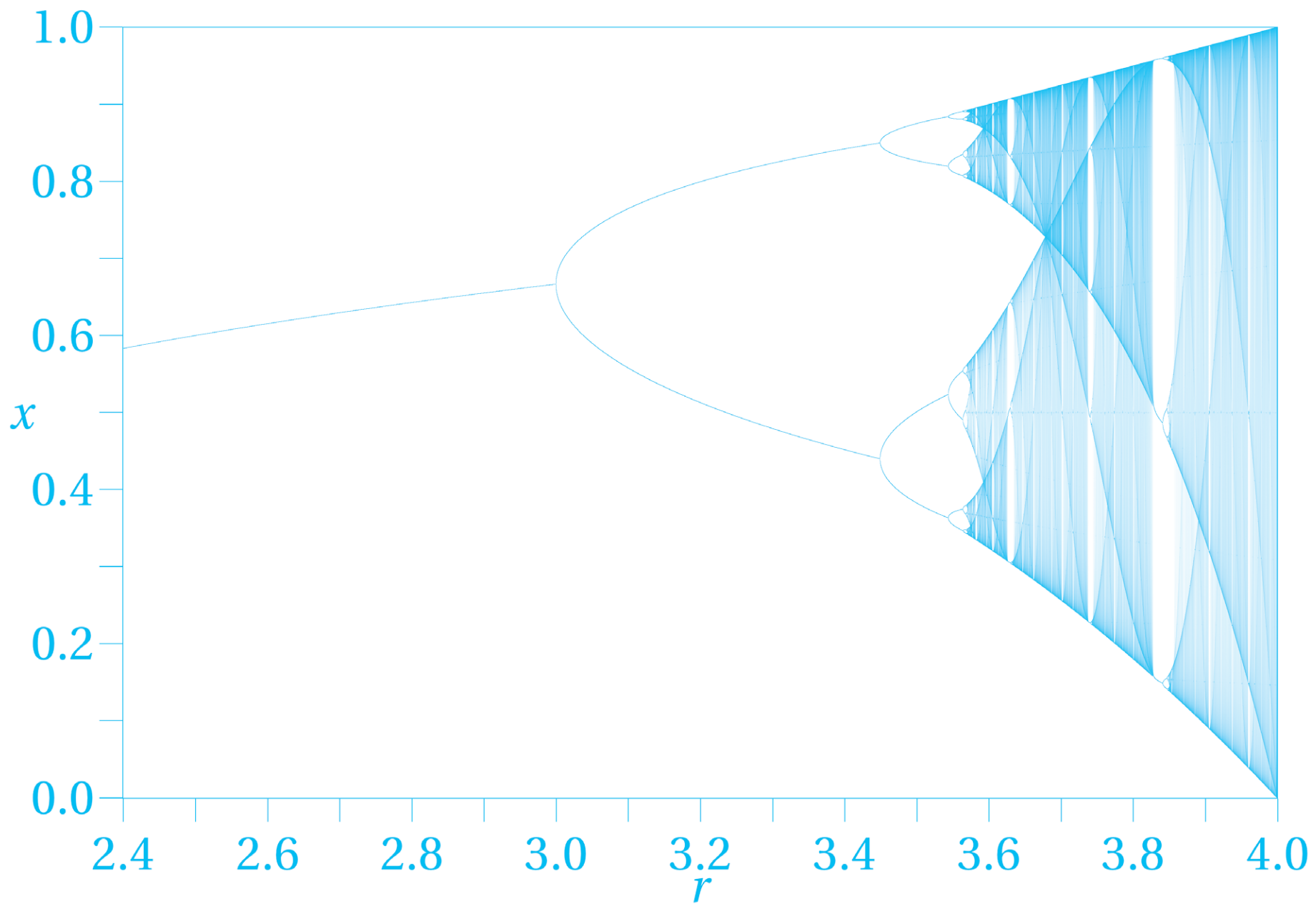


Fig. 26: Period Doubling Bifurcation
Jordan Pierce

WHY METABOLISM?

$$x_{n+1} = rx_n(1-x_n)$$

From a relatively simple equation of a logistic map, a series of period-doubling bifurcations creates chaos. Such is the reverse process of the Chaos Theory in which a complex system is analyzed in its innate state of chaos to find the underlying pattern. The period-doubling bifurcations diagram, when magnified, actually shows the same thing as the larger structure over and over again in a fractal manner.

In the same fashion, an architect can design a simple set of rules and let his creation play out by itself. His interest is to initiate the input, not to control the outcome.

The architect gives order. His order makes chaos. Out of chaos, a pattern can be extracted, and this makes order.



Fig. 27: Kikutake, Kurokawa, and Maki's Work at PREVI, Peru
1969
Metabolism: The City of the Future (162)



Fig. 28: Logo for Metabolism Team Designed by Awazu Kiyoshi
1960
Project Japan: Metabolism Talks (234)

The following discussion explores Metabolism in three main areas:

1. The relationship between Chaos and Order that makes up the organic nature of Metabolist urban planning.
2. The relationship between Parts and Groups that creates a multi-scale thinking process.
3. The venture into new territories as artificial ground that was both heroic and poetic.

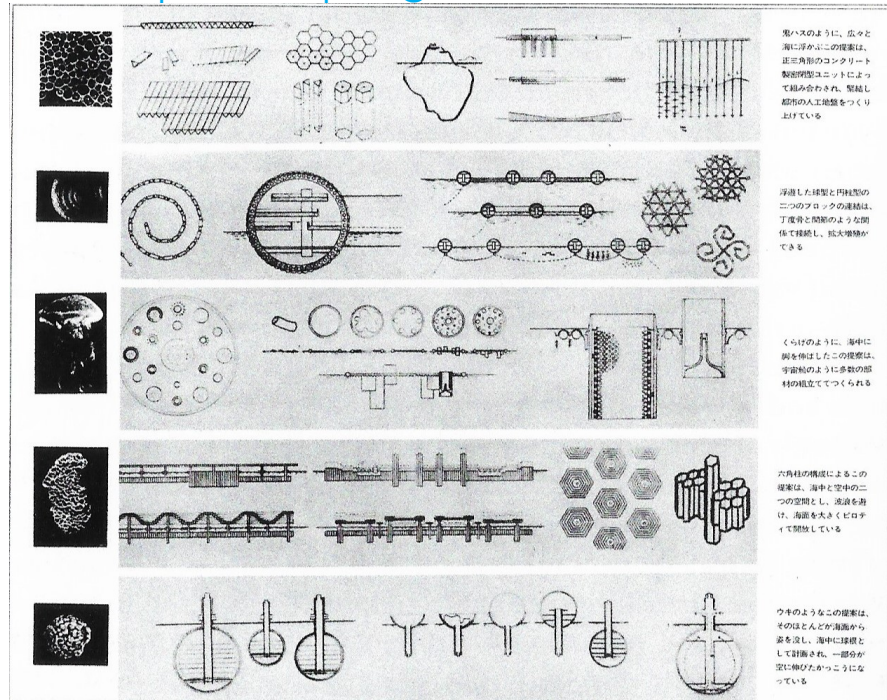


Fig. 29: Kikutake's Diagram of Oceanic Creatures as Architectural Syntax 1959
Between Land and Sea (092)

The formation of the Metabolist group rose out of the uncertainty and apprehension from a generation of wartime but also from the optimism for the future. It was a movement of paradoxical elements: to preserve the uniqueness of national identity by avoiding to be derivative of Western influences, but also to start afresh by distancing from the mentality of the past regimes. The design philosophy was full of contextualization regarding history, politics, war vs peace, imperialism vs democracy, death vs rebirth, but the designs themselves always wanted to be acontextual. Megastructures were never

fully detailed, and nanoquarters were designed to be placed anywhere.

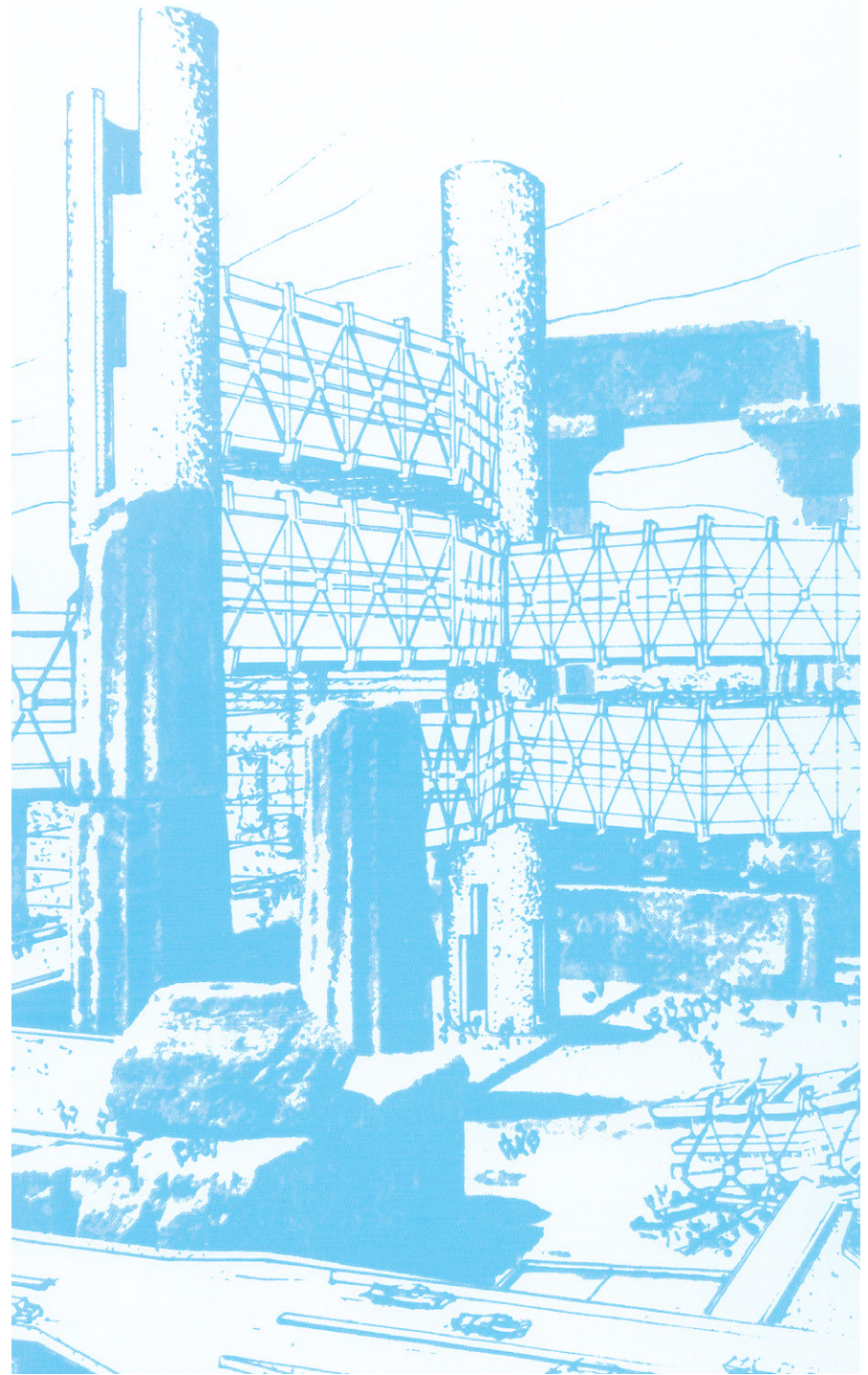
That Metabolist projects tend to neglect reality is the contention from critics like Reyner Banham. Unfortunately, these critics did not get the point: Metabolist architecture is the architecture of nowhere and anywhere. It is not denial of the real world that Metabolist projects don't incorporate the context, but it is precisely the acknowledgment of the reality that they negate such context - the reality of ephemerality, impermanence, and destruction.

/Order is born from chaos, and chaos order.

Extinction is (the same as) creation./ 'Material and Man' Kawazoe Noboru

The ruins signify reform. Hyper-futuristic appearance signifies traditions. **Chaos is an expression of order.** This cyclical change lends an analogy of cities as ever-growing organisms, a medical and biological concept adopted early in the formation of the group of young architects. *Any complex organism can break down to microscopic unit cells, and vice versa, any simple cells in large number can constitute a much more complex living system.*

Fig. 30: Isozaki's Incubation Process
1961
Metabolism: The City of the Future (039)



Royal Danish Embassy 1973

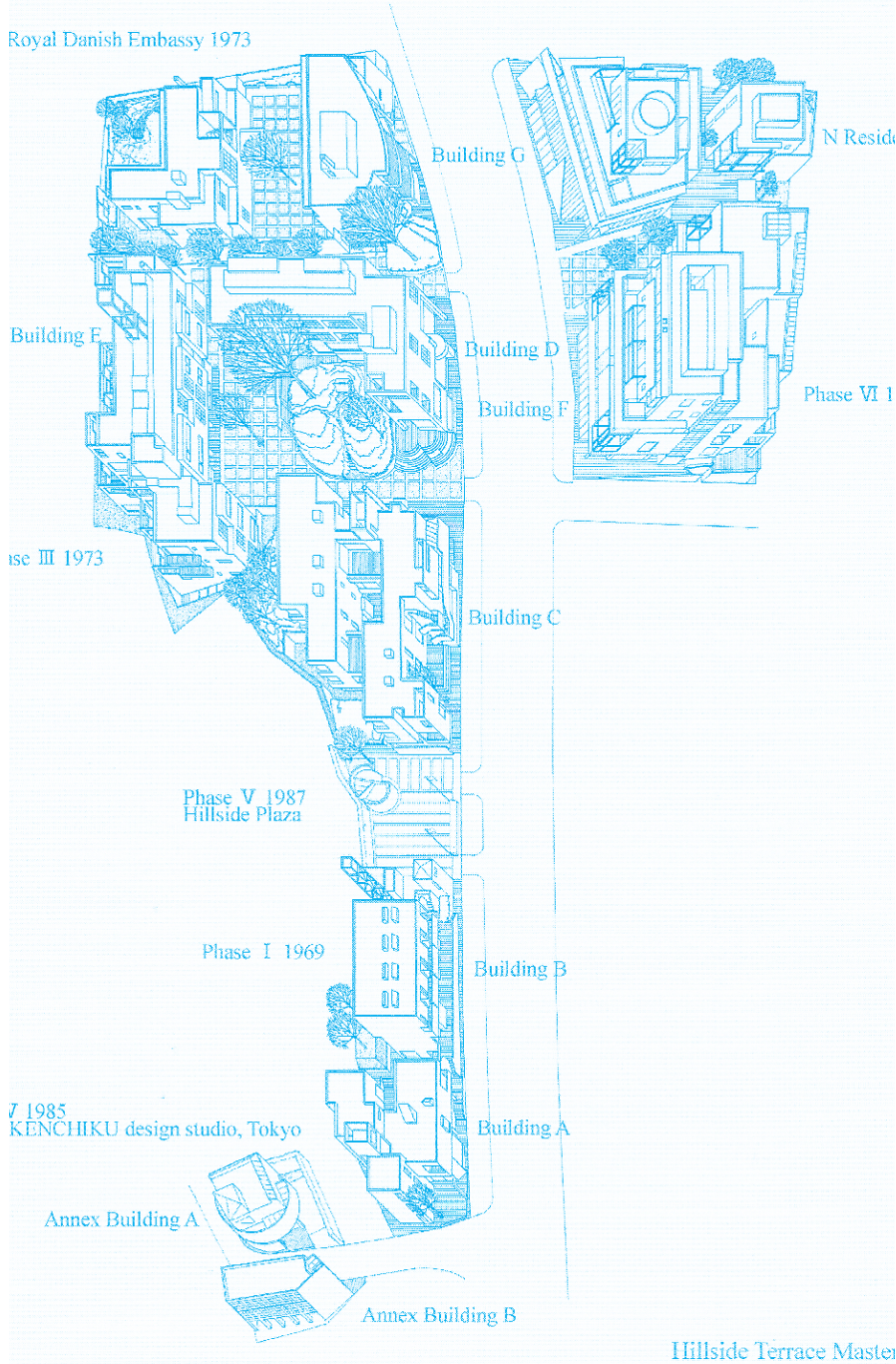


Fig. 31: Maki's Hillside Terrace
1969-1992
Metabolism: The City of the Future (140)

Hillside Terrace is a complex of 13 buildings developed over 6 phases, each responding not only to their respective requirements but also to the previous buildings within the complex, exemplifying Maki's theory of *Group Form* with the concept of nodes and linkages. The growth of the complex over time also signifies the metabolic development of group structure.

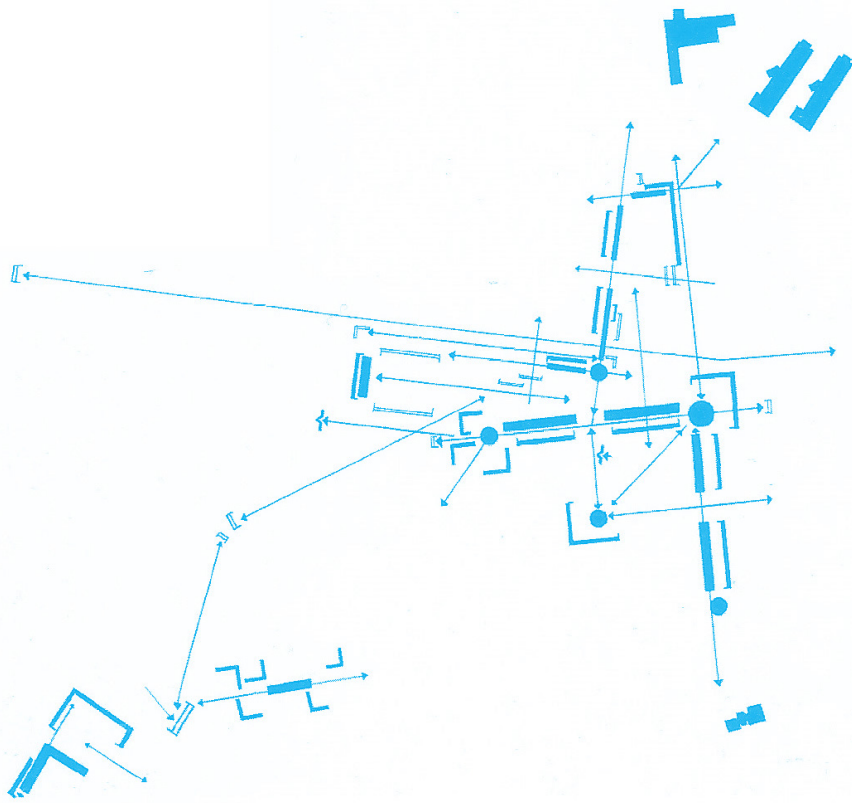


Fig. 32: Maki's Risho University Master Plan Diagram
1968
Metabolism: The City of the Future (138)

1 Kurokawa, Kisho. Introduction by Charles Jencks. *Metabolism in Architecture*. London: Studio Vista, 1977. Print. pp 9

2 Kurokawa, Kisho. 1977. pp 92

As much as Metabolism is about the anticipation of the changes that occur over time, it is about the freezing of time as well. The practice of rebuilding a Shinto shrine - most notably Ise shrine - to the exact form every 20 years is symbolic of a Buddhist belief in reincarnation, rebirth, and renewal.¹ This practice almost mimics the cellular replacement in a biological sense: the cells constantly renew inside their respective tissues, while their tissues constantly renew inside a body, without changing the configuration. In a philosophical truism, this process of change is what maintains the unchange.

The Metabolist approach to design and architecture thus became two-fold: what makes up the units, and what the units make up. On one hand, it was a study to perfect the living capsule as is analogous to the cellular evolution; on the other hand, it was the constant refinement in the arrangement of these units and the layout of the overall structure to create the optimal group form, to render the coherence of the new and modern cities.

- **The Parts:** Besides the highlight on prefabrication and mass production, Kurokawa Kisho underscored the importance of **interchangeability** of the components that make up a modern apartment. This, the architect said, would allow for cost-saving operation and maintenance and flexibility in living arrangements.²
- **The Groups:** Most passionate about group form among his peers is perhaps Maki Fumihiko, who spent his career to perfect his theory of the **Collective Form**. Isozaki Arata also invested a great deal in optimizing group structures and clusters of smaller parts for specific locations in Tokyo.

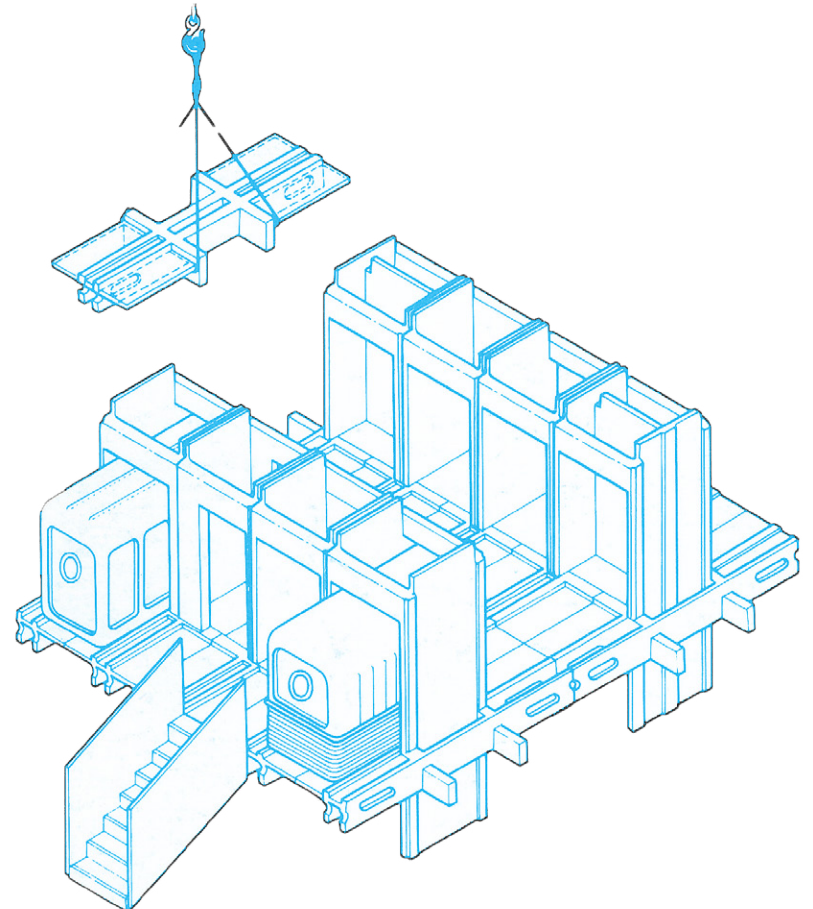
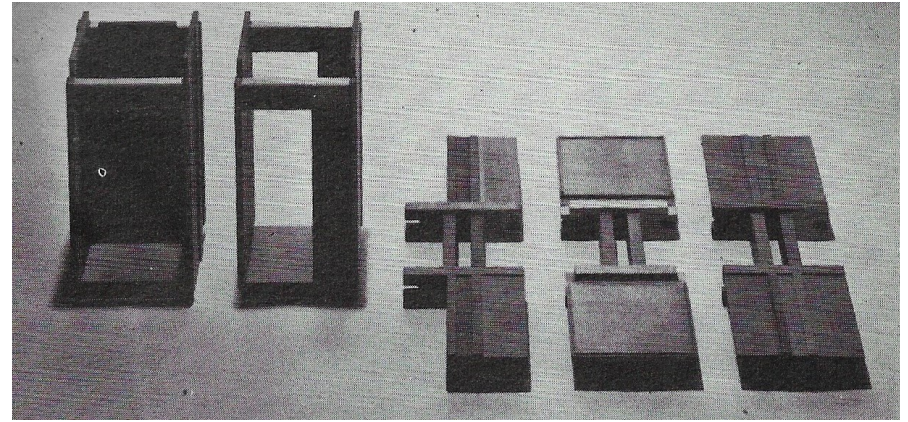
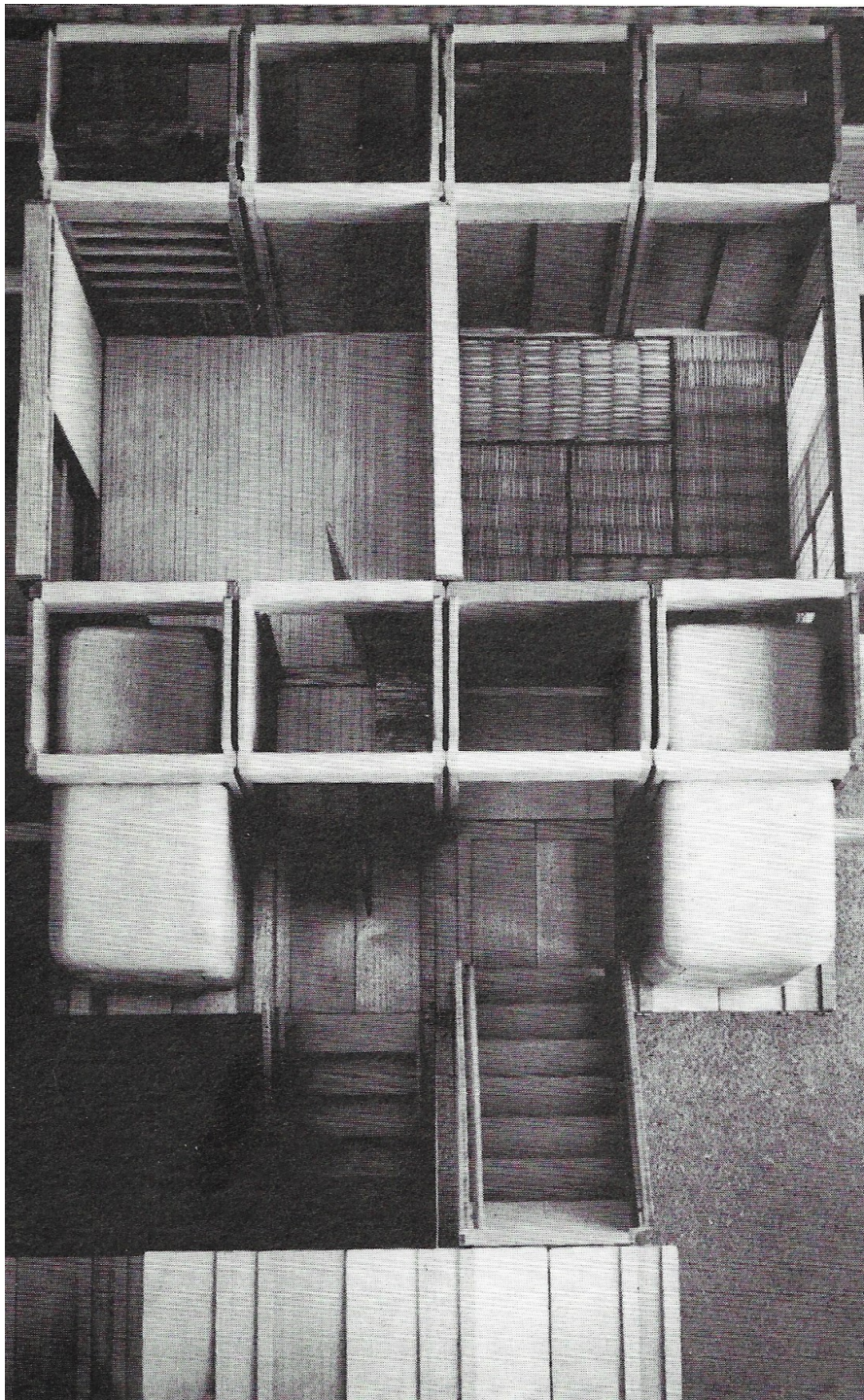


Fig. 33: Kurokawa's Prefabricated Apartment Model
1963
Metabolism in Architecture (093-094)

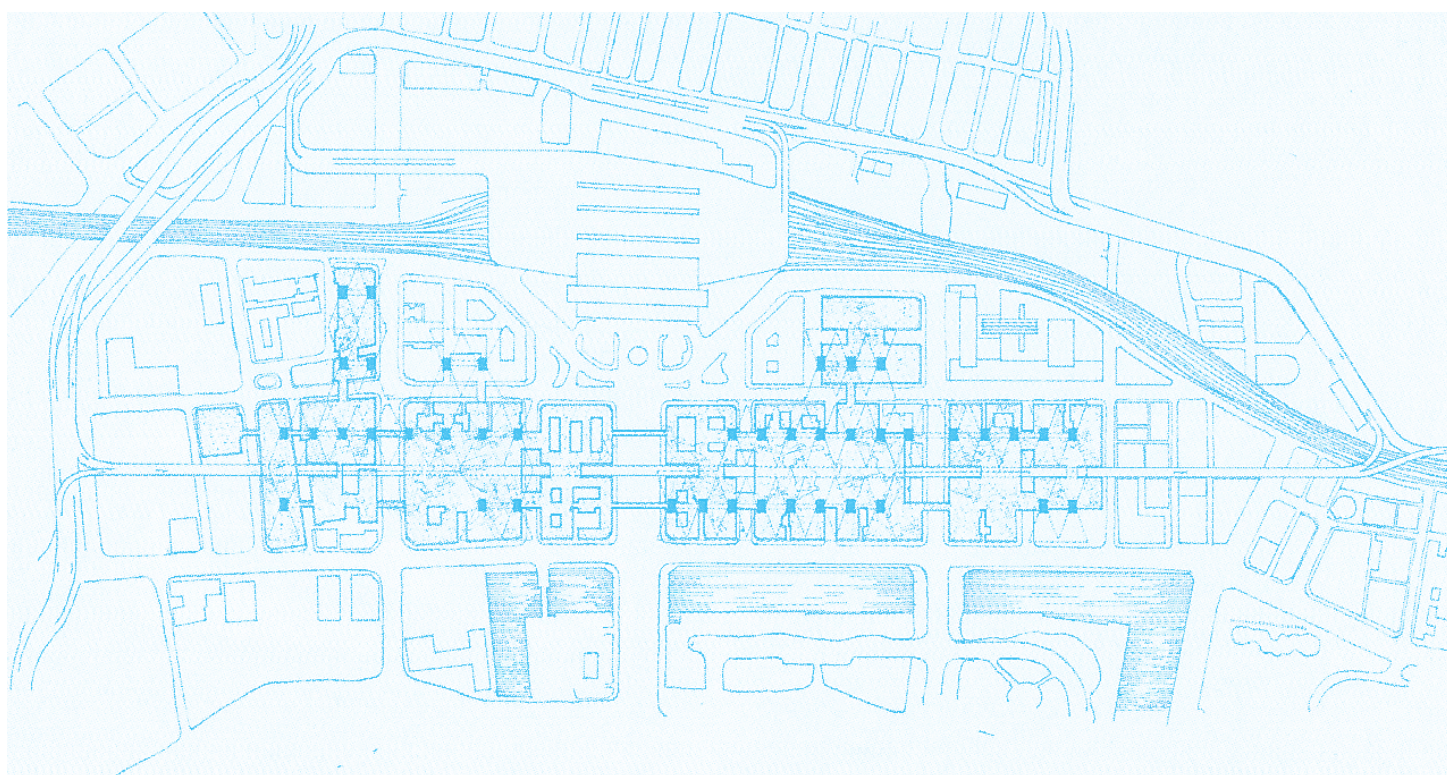
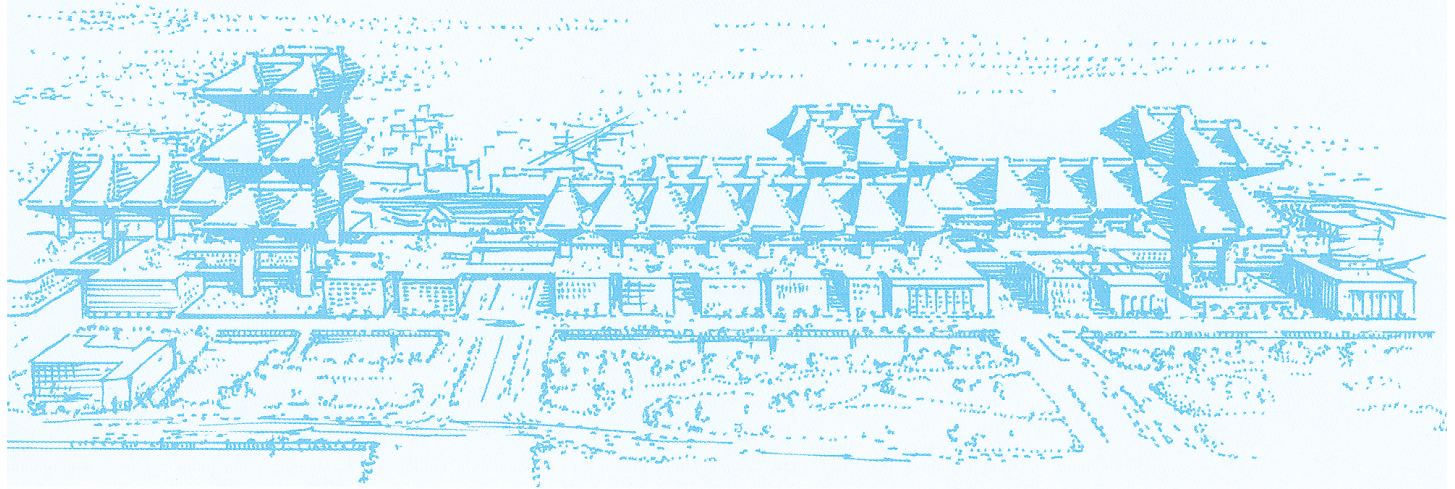
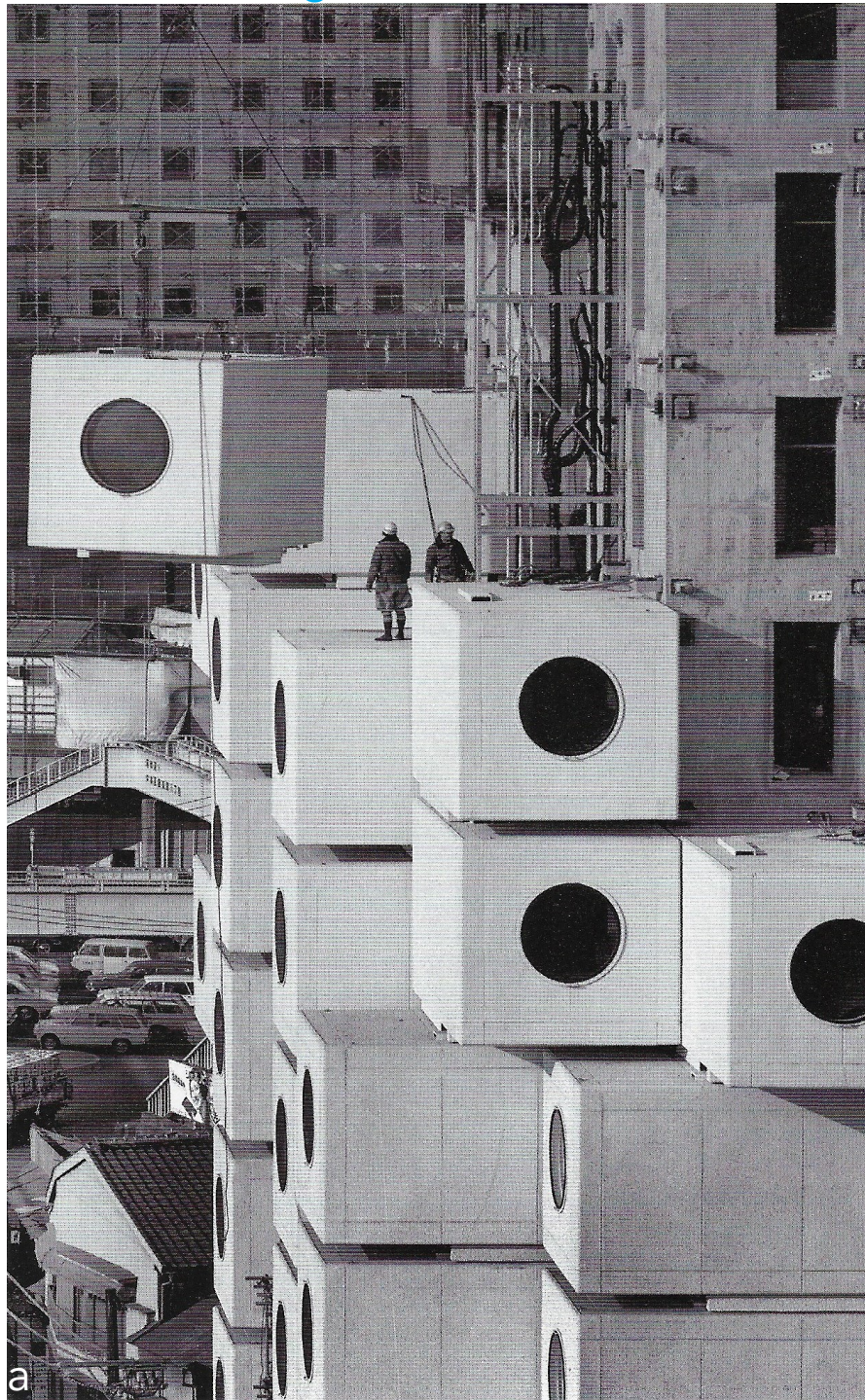
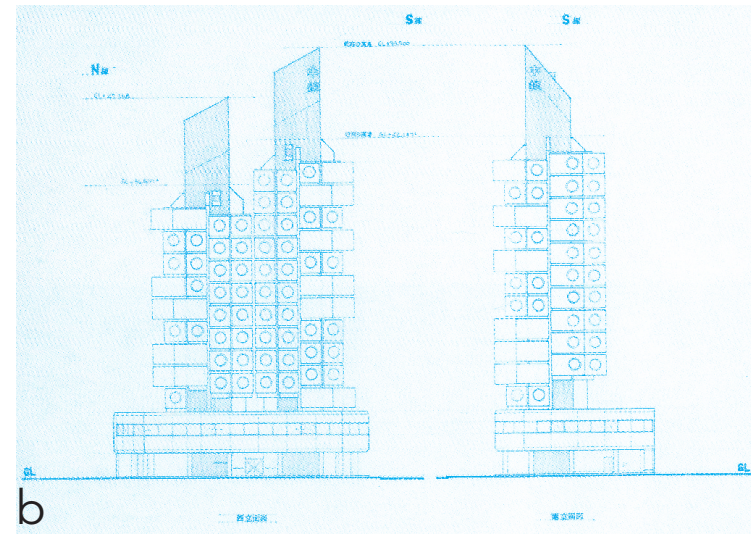


Fig. 34: Isozaki's Marunouchi Aerial Sketch & Master Plan
1963
Metabolism: The City of the Future (090)



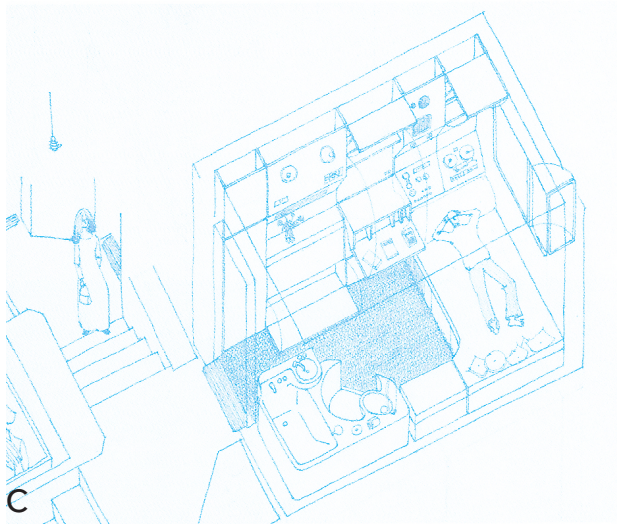
a
064



b

To many, the concept of “pods” and “capsules” represents the bastardization of the Metabolist philosophy.¹ Kurokawa Kisho’s Nakagin Tower may have enjoyed pop culture popularity, but other Metabolists and critics were not impressed. However, it made a second wind of public recognition of Metabolism after the group had disbanded for a decade, creating a structure that the public could see and touch and occupy outside of an exposition.²

In a sense, the capsule unit resembles a bunker or bomb shelter, representing survival. It is not pessimism, but rather realism. The Oil Crisis of 1973 struck a strong chord on mass public’s definition of modern living, giving even more positive recognition to Kurokawa’s creation that would soon be completed in 1974. In more current days, the idea has manifested and proliferated into a novelty of “pod living” with hotels carrying the theme of dwelling for singletons popping up all over the world.

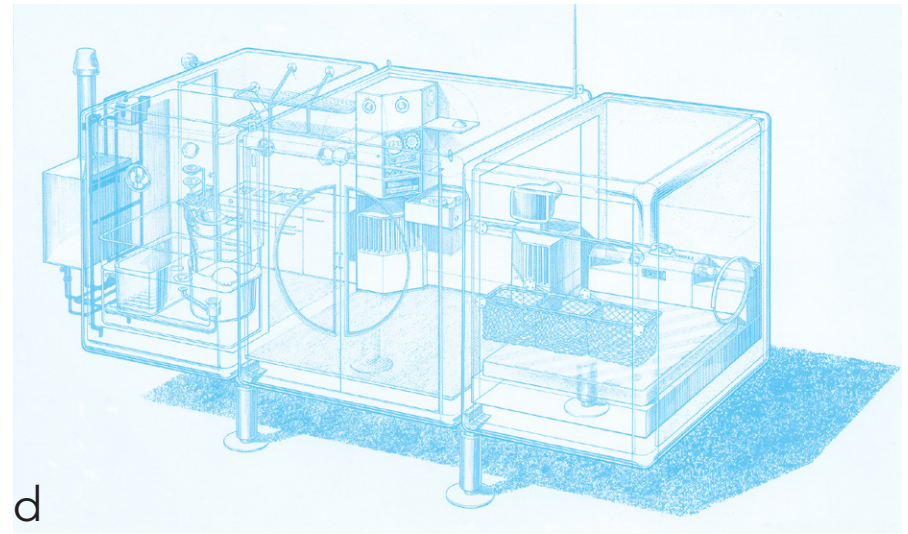


c

1 The exact wording that Wendelken uses is "vulgarization".

Wendelken, C. (2000). Putting Metabolism Back in Place: The Making of a Radically Decontextualized Architecture in Japan. In *Anxious Modernities: Experimentation in Postwar Architectural Culture* (pp. 279–299).

2 While it is true that at Osaka Expo '70, Tange Kenzo orchestrated the grand scheme with the help of his Metabolist disciples, these architects were essentially acting as individuals and no longer members of a group. Their formation as a group arguably had terminated by the end of World Design Conference '60.

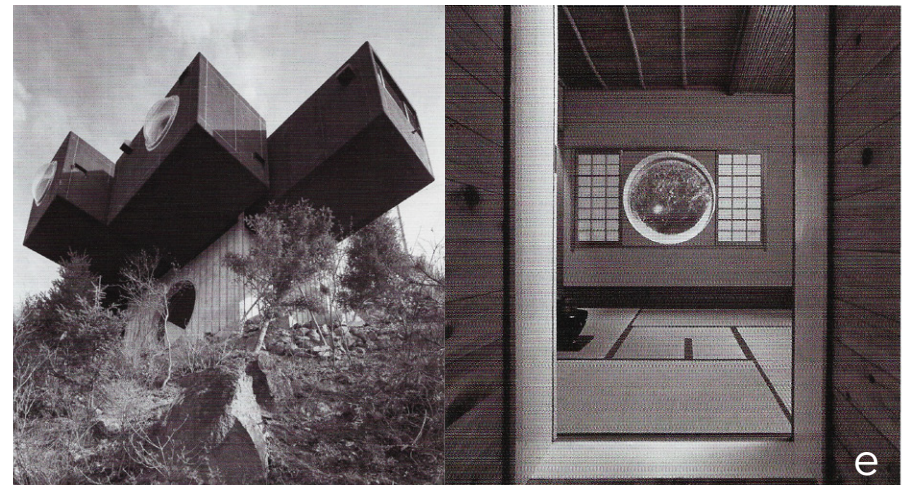


d

Fig. 35:

- a. Construction of Nakagin Capsule Tower, c. 1974
- b. Elevation Drawings of Nakagin
- c. Axonometric Drawing of One Unit in Nakagin
- d. Leisure Capsule, 1972
- e. Capsule Summer House K, 1974

Metabolism: The City of the Future (146, 148, 149, & 151)



e

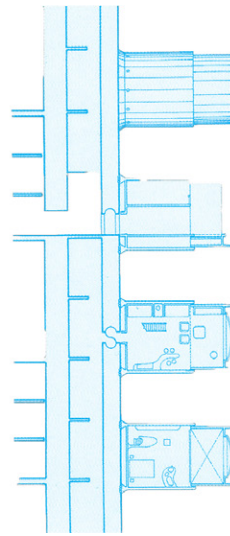
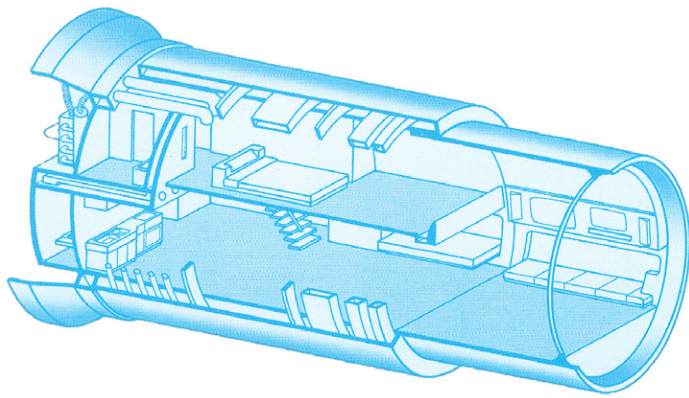


Fig. 36: Kikutake's Marine City Residential Pod

1963

Metabolism: The City of the Future (078)

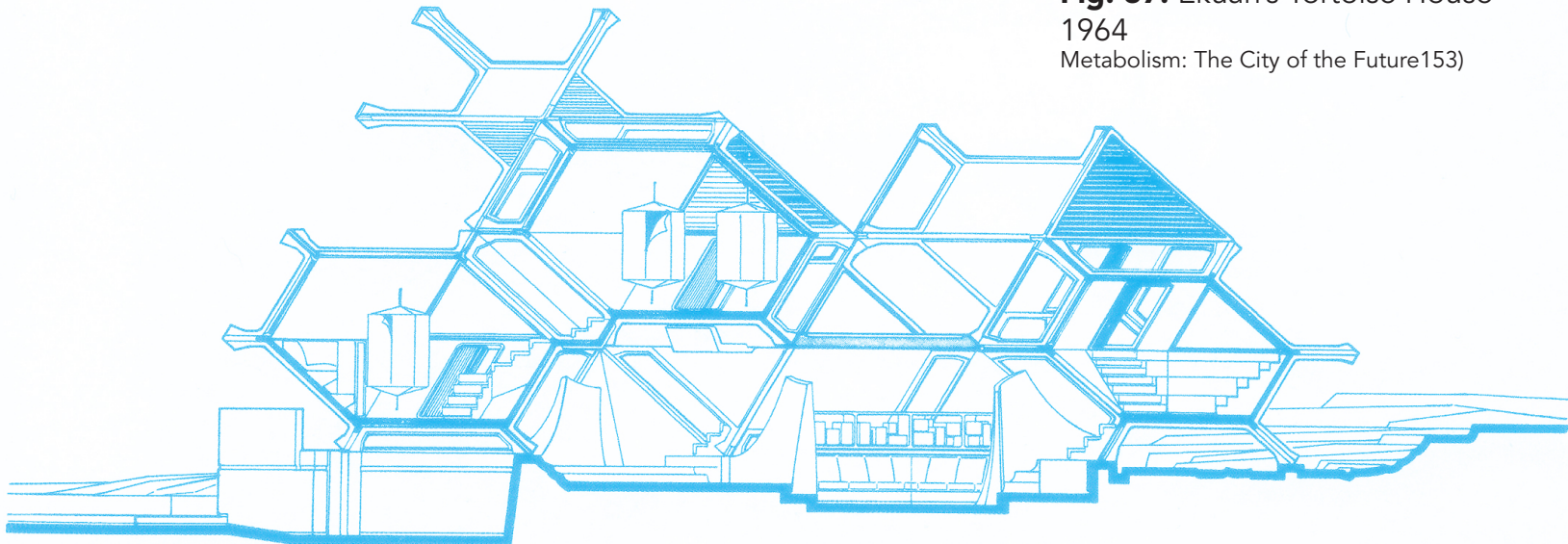


Fig. 37: Ekuan's Tortoise House

1964

Metabolism: The City of the Future 153)

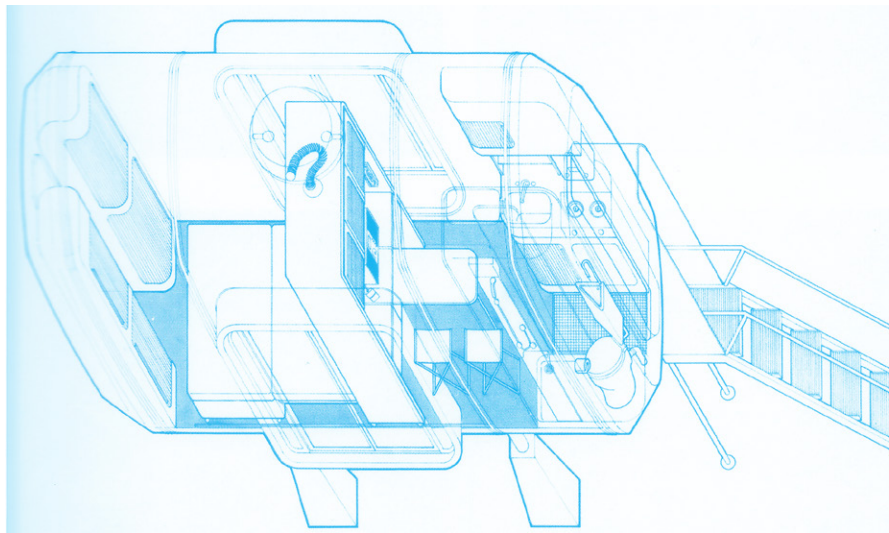


Fig. 38: Ekuan's Yadokari (Hermit Crab) House

1969

Metabolism: The City of the Future (157)

While Kurokawa's "capsule life" popularized the idea of single-occupant dwellings as extreme examples of minimalism in modern life, it was not an original one. Nano living space had been given much thought as part of the [metabolism](#) of cities on a cellular level, the capsule being a cell in this process. Before Nakagin, there had been Yadokari (Hermit Crab) by Ekuan Kenji in 1969. Before Yadokari, there had been Tortoise House by Ekuan himself in 1964 and Residential Pod for Marine City by Kikutake Kiyonori in 1963. However, unlike Nakagin, these were unbuilt.

Similar to the criticism for the Nakagin Capsule Tower, these nano living units perpetuate the definition of urban dwellings as life support machines, not as meaningful

and hospitable spaces. But perhaps that is the whole point: these units are not meant to be a long-term solution, but are comfortable enough to shelter humans.

Postwar Japanese residential architecture always shows a hint of trauma in the minimalism that it expresses. It sprang from the stress over limited resources in the rebuilding of the country. Ironically, after the economy had taken off, such minimalism began being used in response to another issue: limited urban land.

[Nanostructures are easy to make in "guerilla" projects, but require careful standardization in mass-production. Over-standardizing can produce too much rigidity. Multiple units of nanostructures can assemble into a megastructure.](#)

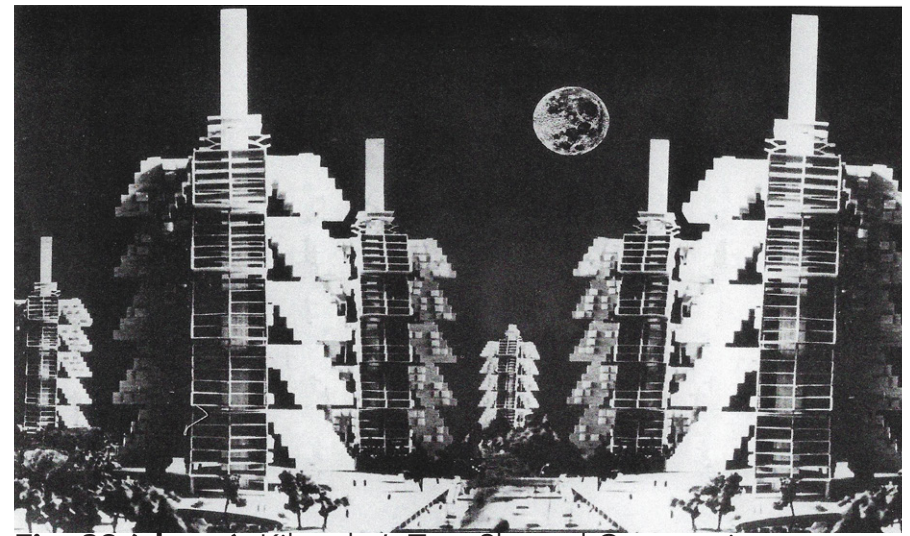
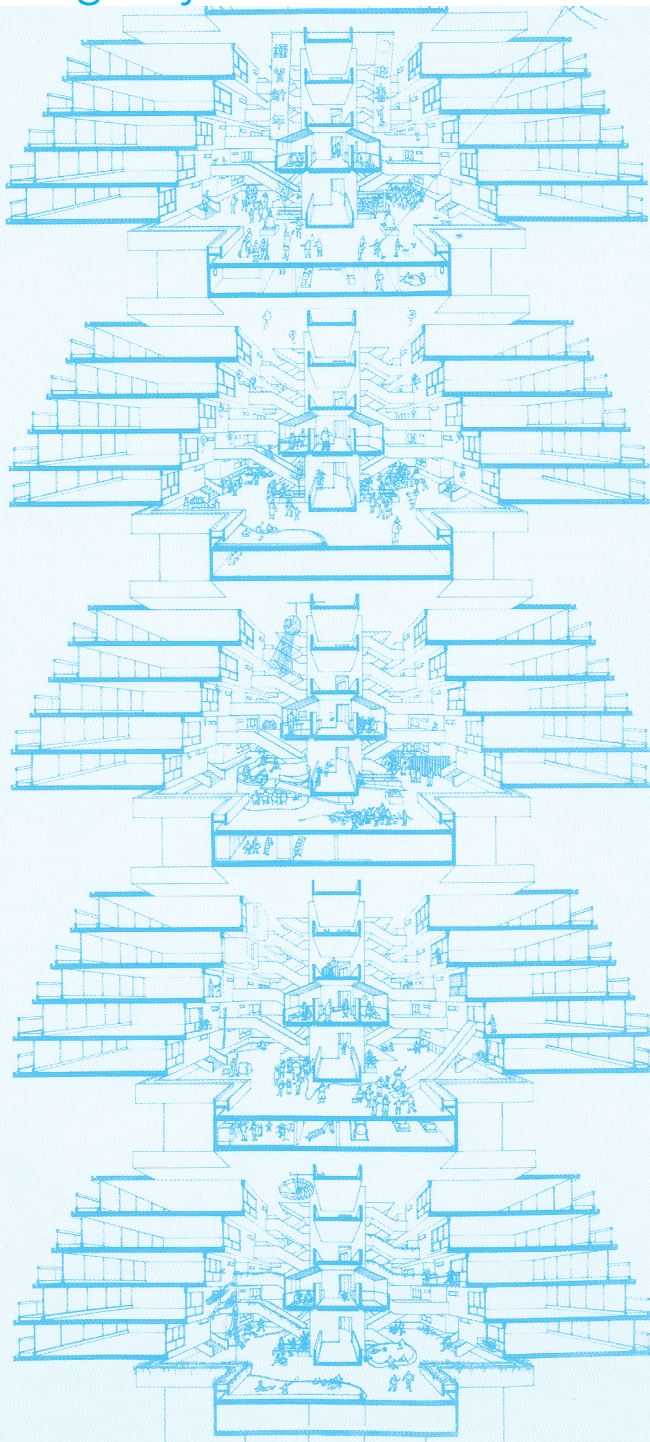


Fig. 39 (above): Kikutake's Tree Shaped Community
1966
Between Land and Sea (158)

Megastructure is arguably the most attractive type of research among the Metabolists, perhaps thanks to its allure of potentially redefining the city's skyline. The *tabula rasa* that was postbellum Japan urged and inspired young thinkers to make a bold gesture - one that was both heroic and poetic - to create a vision for their country. These concepts were greatly influenced by the Plan for Tokyo Bay by their mentor Tange Kenzo.

The megastructures have also been heavily criticized for their tendency to reject the context of existing urban fabric and to create overly acontextual designs. However, this is a rather superficial criticism, as the designs are decontextualized rather

Fig. 40: Kikutake's Tree Shaped Tower in Section
1966
Metabolism: The City of the Future (131)

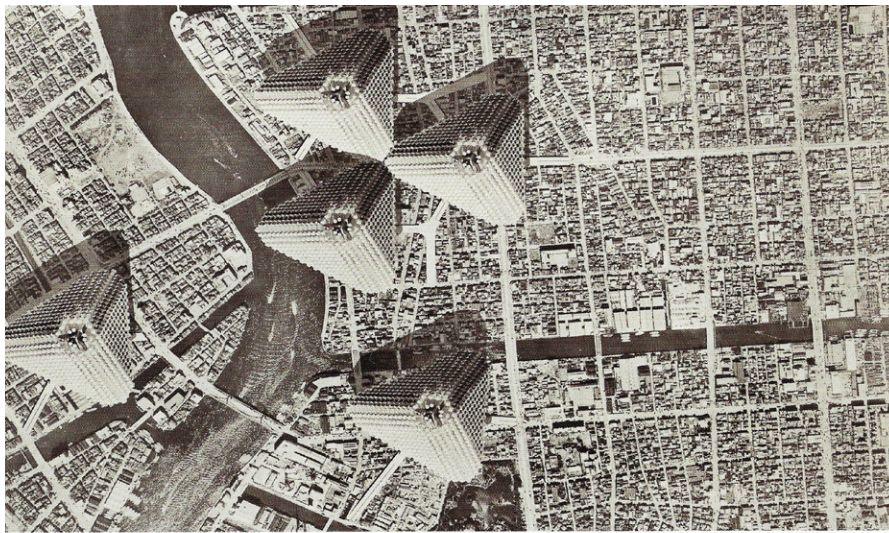


Fig. 41: Ekuan's Chandelier City
1964

Metabolism: The City of the Future (084)

1 Wendelken, C. (2000). Putting Metabolism Back in Place: The Making of a Radically Decontextualized Architecture in Japan. In *Anxious Modernities: Experimentation in Postwar Architectural Culture* (pp. 281)

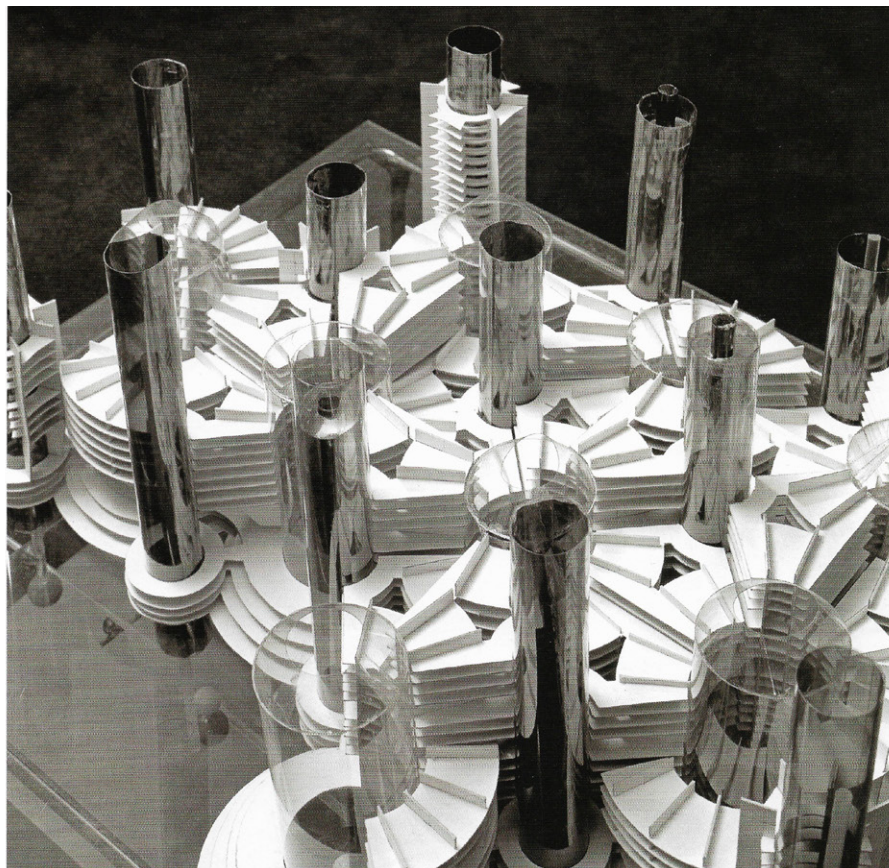


Fig. 42: Maki's Golgi High Density City
1967

Metabolism: The City of the Future (088)

than acontextual. That means, this is a deliberate process, to "sidestep any debt to foreign sources and evade any dependence on any particular place or time in Japan."¹

Where pragmatism is of concern, megastructures are easy to conceive (for their lack of details and contextualization) but hard to achieve because they require large-scale infrastructure, comprehensive urban planning, and central governance.



Fig. 43: Kikutake's Marine City
1963

Project Japan: Metabolism Talks (151)

1 Mori Bijutsukan, International Union of Architects. World Congress, and Nihon Keizai Shinbunsha. Metabolism, the City of the Future : [dreams and Visions of Reconstruction in Postwar and Present-day Japan]. English-language ed. Tokyo: Mori Art Museum, 2011. Print.

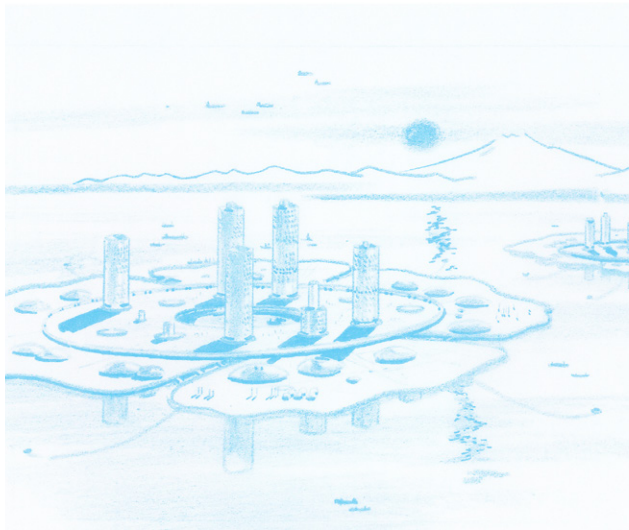


Fig. 44: Kikutake's Marine City 1963
Between Land and Sea (194)

Though Tange Kenzo was never part of the Metabolist discourse and polemics, his theoretical works gave great inspiration to his Metabolist disciples. In return, the Metabolist research also stimulated a great number of ideas in Tange.

His Tokyo Bay Plan in 1960 was a significant one in which the dialogue between the master and his disciples was most visible. Echoing Tange's scheme very closely was Kikutake's Tokyo Bay Project of 1961, which includes *Ocean City*, *Koto* scheme, and *Tetra* scheme. These schemes feature land infills over water, artificial landscape, tall structures with single or joint cores, and expandable modularity. One of the most prominent features is the expansion of urban structure into three areas:

- **Air:** High-rise towers that are interconnected to create an elevated cityscape.
- **Land:** The use of artificial platforms (highways, bridges, tall megastructures, etc.) as an extension of native land of both sides of the Bay.
- **Sea:** Water is incorporated as part of the city structure,

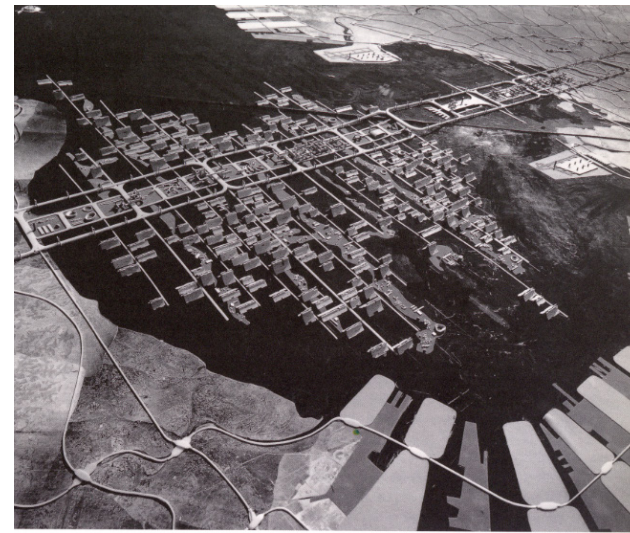


Fig. 45: Tange's Plan for Tokyo Bay 1960
Photo: Kawasumi Akio
Putting Metabolism Back in Place (291)

no longer a foreign territory.

Forever at the periphery of the Metabolist movement but nonetheless an important catalyst, Isozaki Arata's City in the Air series also shows a strong outreach toward the sky. His various schemes for Marunouchi, Shibuya, Shinjuku, and other districts of Tokyo convey a deep interest in high-rise megastructures that are lifted off the ground and interconnected - a design feature that he had developed under Tange's tutelage. This feature was also a response to the lift of height restriction for new buildings in 1962.¹



Fig. 46: Isozaki's Twice Ruined Hiroshima

1968

Electric Labyrinth, XIV Triennale di Milano

Original Photo: Tomatsu Shomei



Fig. 47: Kikutake's Tokyo Bay Project
1961
Metabolism: The City of the Future (081)

1 Kikutake, Kiyonori, and Oshima, Ken
Tadashi. *Between Land and Sea*. Cambridge]
: Zurich: Harvard U, Graduate School of
Design ; Lars Müller, 2016. Print. (119)

CHAPTER CONCLUSION

The works of the Metabolists did not only epitomize their own ideals for the architecture of change¹; they did so on an arch-theory level: Metabolism is a continuation of many preceding theories, as it is a predecessor of many others to come. This notion is unfortunately sometimes lost in recent discussions regarding the movement; Metabolism is often seen as an insulated and isolated event in its own context.

In the arch-theory of which Metabolism is a part, it absorbs existing knowledge and continues to evolve in many shapes and forms. In short, it [metabolizes](#).

How Metabolism Metabolized

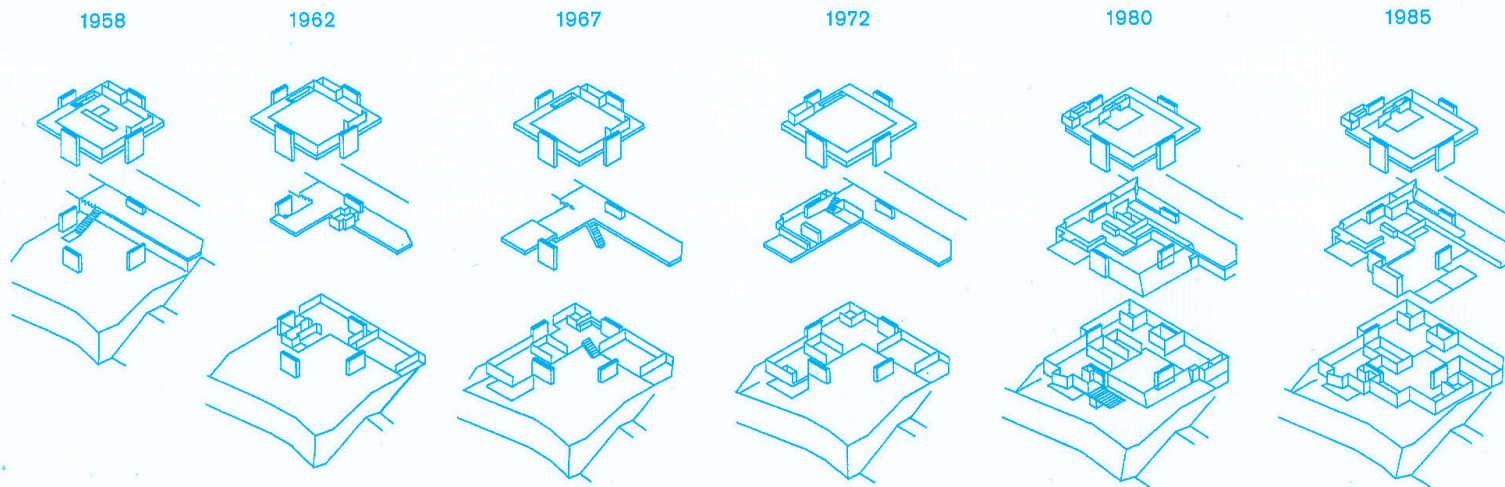


Fig. 48: Kikutake's Skyhouse Diagrams 1958-1985
Between Land and Sea (118)

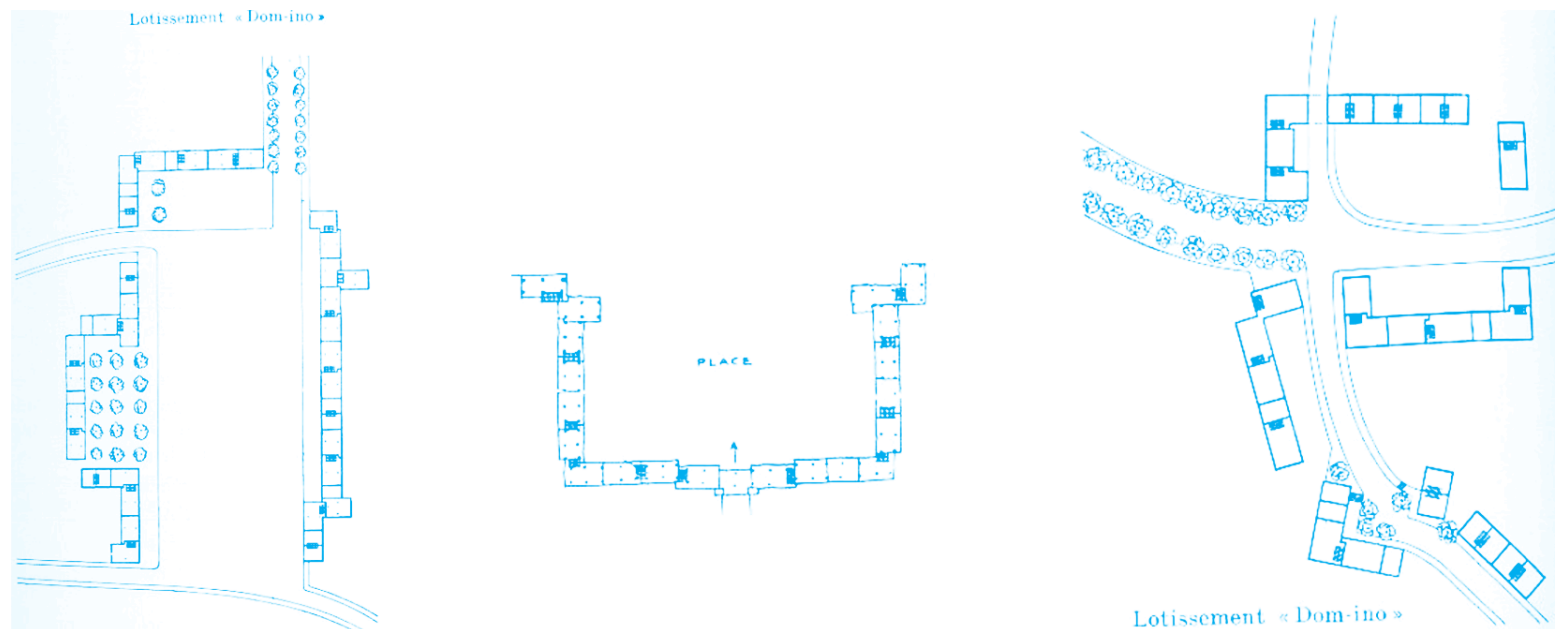


Fig. 49: Le Corbusier's Diagrams of Maison Dom-ino 1914-1915
Le Corbusier: Œuvre Complète Vol. 1 - 1910-1929 (24-26)

1 Jeanneret, Pierre, Boesiger, Willy, Stonorov, Oscar, and Bill, Max. *Œuvre Complète*. Vol. 1. Zürich: H. Girsberger, 1935. Print. (023)

Translation by Daniel Vu: "structural system completely independent of the functions of the house plan".

2 Where Tange would see two buildings by Le Corbusier: Unité d'Habitation and UN Headquarters, respectively.

3 Le Corbusier created his town planning masterpiece in Chandigarh.

In Kikutake's Skyhouse, which [metabolized](#) over the years subsequent to its completion, the architect's only concern was to create an armature that functional spaces could be added onto. It is perhaps not about the *hanging on* of these functional spaces but their *plugging in*. This concept of an armature echoes a concept that predates it some 45 years.

The one in 1914 spoke about a "système de structure complètement indépendant des fonctions du plan de la maison"¹ - an *ossature* (frame) that only has *planchers* (floor) and *escalier* (stair). The author of this concept, certainly, was Le Corbusier. However, to say that Kikutake was inspired by Le Corbusier would be reductive, because Metabolism was inspired by many international movements, by architects and thinkers of different schools. This inspiration perhaps stemmed from the extensive travels that Tange and his students made in the early days:

- [Tange](#): conference with CIAM in the UK, visits to Rome, then to Marseille and New York², then to China, the USSR, India³, then to Brazil, teaching position at MIT, visits to Chicago and San Francisco, etc.
- [Maki](#): education in the US, research travels to Southeast Asia, South Asia, Middle East, Europe, etc.
- [Kurokawa](#): travel to the USSR by invitation, namely Leningrad and Moscow.

Therefore, Metabolism cannot be viewed as an insulated movement, as much as the members wanted to be the voice of the new Japan, unique and independent. It is a successor of Futurism, Bauhaus, Brutalism, Chicago school, International school, Modernism, to name a few.

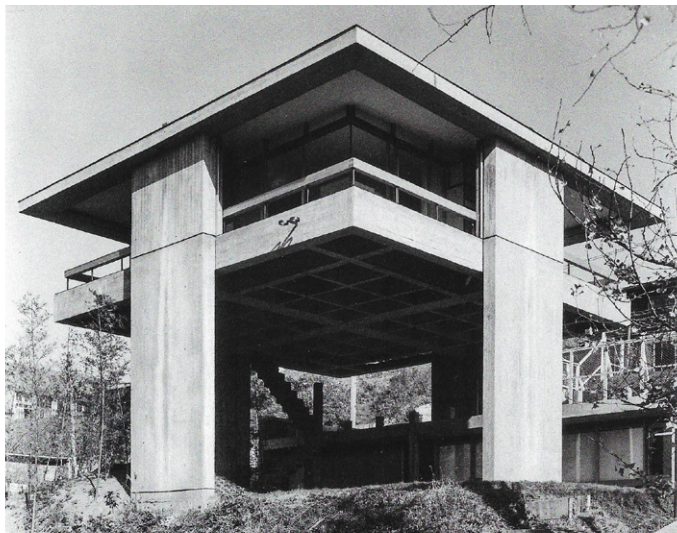


Fig. 50: Kikutake's Skyhouse Diagrams
1958-1985
Between Land and Sea (118)

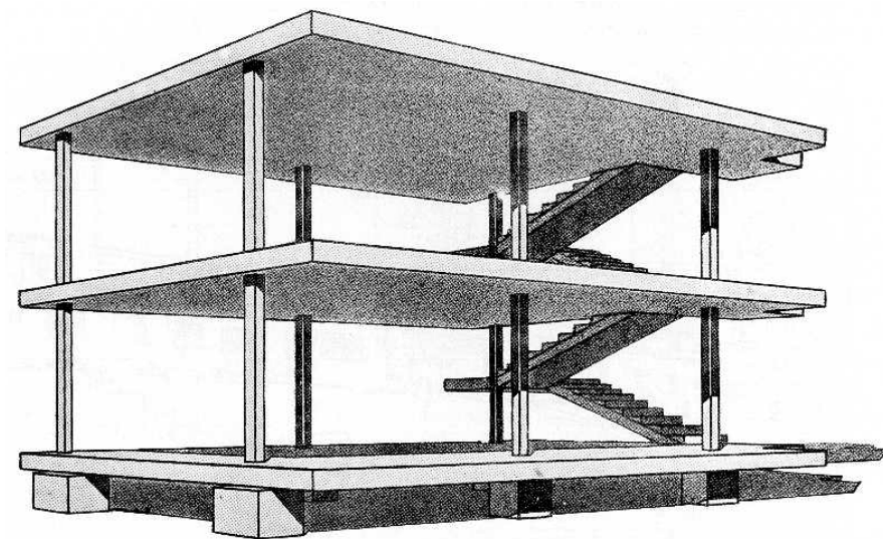
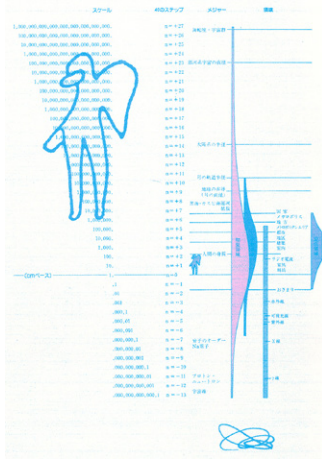


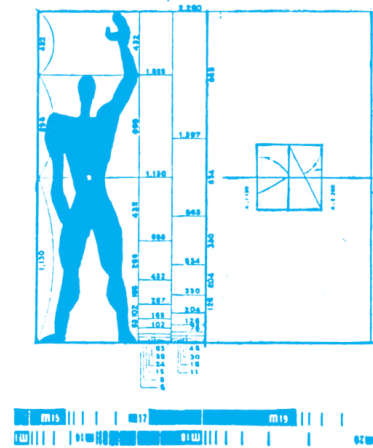
Fig. 51: Le Corbusier's Diagrams of Maison Dom-Ino
1914-1915
Le Corbusier: Œuvre Complète Vol. 1 - 1910-1929 (24-26)

Fig. 52: Asada's Scale
1955
Metabolism: The City of the Future (041)



FROM MAN AS A MEASURE AND FROM THE NUMBERS AS A MEASURE: THE MODULOR DEVELOPED BY LE CORBUSIER, IS A SCALE FOR HARMONIC MEASUREMENT OF SPACE

Fig. 53: Le Corbusier's
Modulor
1955
Modulor 2 ((302))



1 Mori Bijutsukan, International Union of Architects. World Congress, and Nihon Keizai Shinbunsha. Metabolism, the City of the Future : [dreams and Visions of Reconstruction in Postwar and Present-day Japan]. English-language ed. Tokyo: Mori Art Museum, 2011. Print. pp 041

2 Mori Bijutsukan, International Union of Architects. World Congress, and Nihon Keizai Shinbunsha. Metabolism, the City of the Future : [dreams and Visions of Reconstruction in Postwar and Present-day Japan]. English-language ed. Tokyo: Mori Art Museum, 2011. Print. pp 014

In Tange Lab, professors and students used to have what was dubbed the “Tange Modulor” developed on top of Le Corbusier’s Modulor. However, Asada Takashi of Tange Lab also developed another proposal for a measuring system prior to WoDeCo (World Design Conference) in 1960. For this project, Asada assigned to Kurokawa Kisho some field works, such as data collection and other clerical tasks.¹

In a similar manner, the Metabolists reinterpreted Buckminster Fuller’s self-contained and self-sufficient Dymaxion units through their capsules², not only in form and scale but also in the underpinning principles of mass production and prefabrication.



Fig. 54: Construction Site at Habitat 67
1967
Moshe Safdie Archive, Rare Books & Special Collections,
McGill University

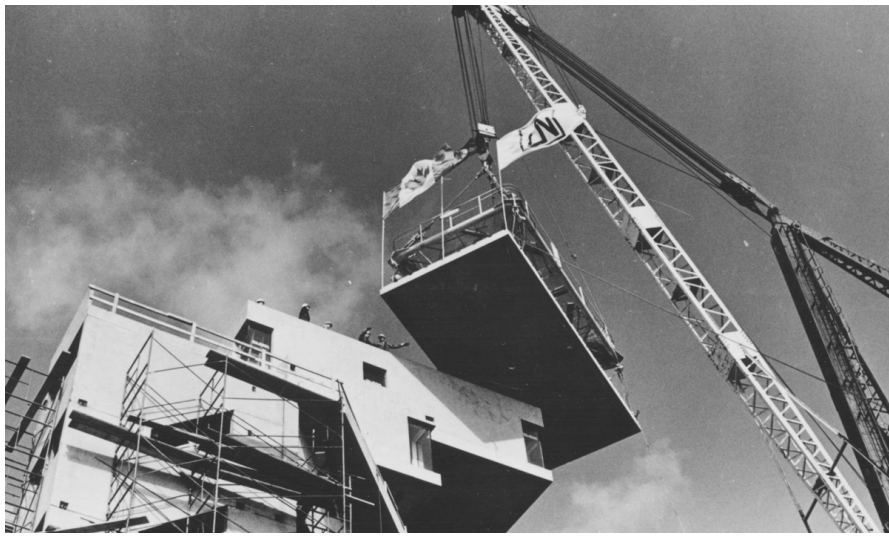


Fig. 55: Plugging in a Prefab Unit at Habitat 67
1967
Moshe Safdie Archive, Rare Books & Special Collections, McGill University

Parallel to the research and development of the Metabolist Group, global architecture and urban planning witnessed the rise of designs that emphasized prefabrication and the morphing of structures. Canadian architect Moshe Safdie made a rather dramatic debut with a grand commission to design and construct a residential pavilion complex for Expo '67 in Montréal; Québec. This design was a continuation of Safdie's thesis work from McGill. Though the complex may seem [metabolic](#), Safdie never claimed inspiration from Metabolism.

Safdie, who interned at Louis Kahn's office, probably took inspiration from Kahn and Anne Tyng's proposal for the Philadelphia City Tower in 1953, which people in the Tange Lab might have seen too. On the other hand, Safdie himself



Fig. 56: Anne Tyng and Her Model of Philadelphia City Tower
2011
Charles Fox, The Philadelphia Inquirer

might very well have been influenced by the Metabolist Group across the sea and the movement that was stirring up the media. Whatever the case, that Habitat 67 building exhibits many characteristics of a Metabolist structure and its timeline between WaDeCo 1960 and Osaka Expo 1970 show the interconnection of theories in the architecture world.



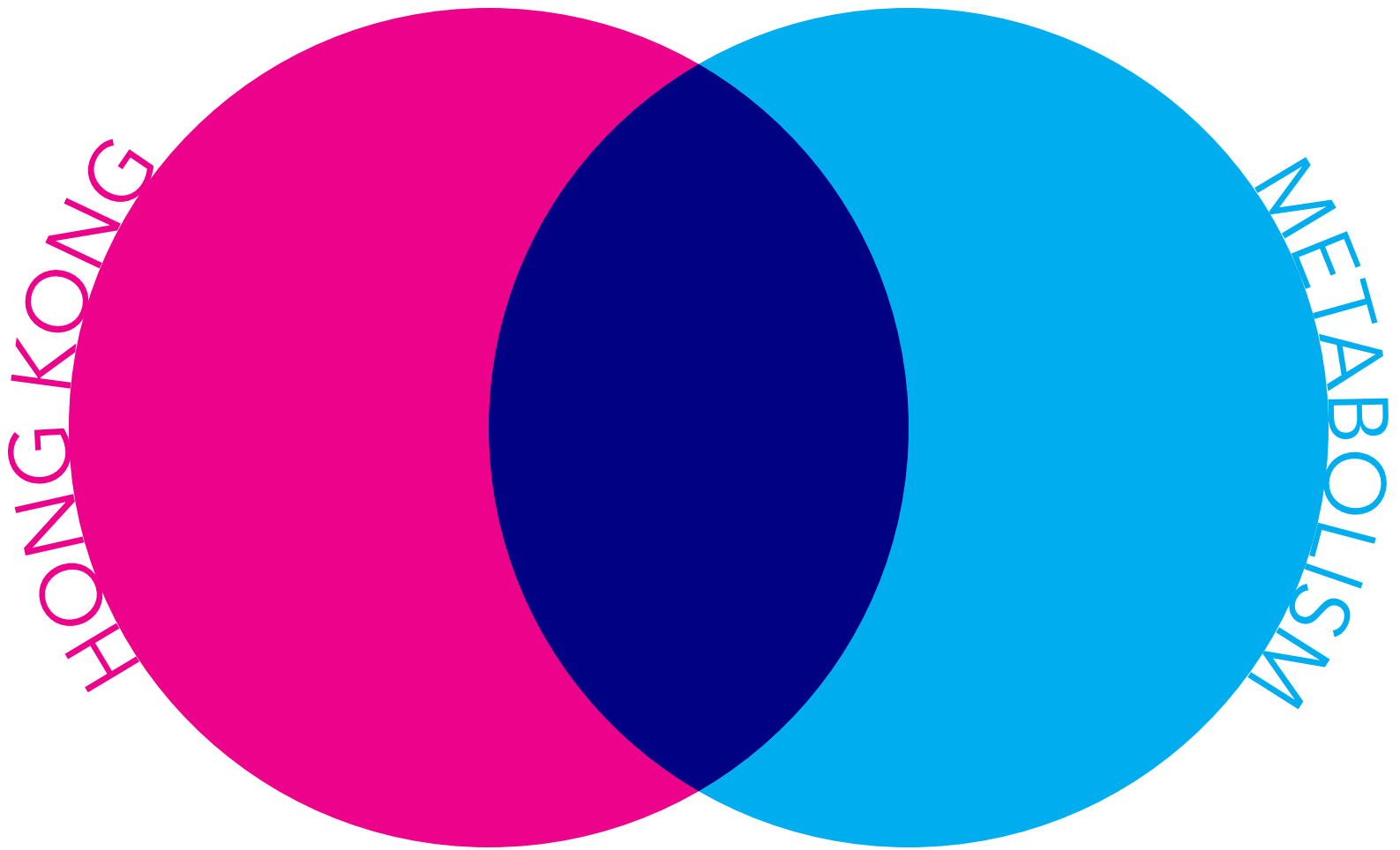
Fig. 57: Nakagin Capsule Tower in Modern Day
2018
Daniel Vu

Sharing the traditional belief system of ephemerality, impermanence, and reincarnation of Buddhism in Japan, Metabolist architecture champions renewal but also embraces replacement. This perhaps traces back to a sense of aesthetics known as *wabi sabi* in which the passing of time, the aging of materials, the blemishes and the imperfections are to be cherished.

Getting off at either Shimbashi Station or Ginza Station, one can take a leisurely walk to the Nakagin Tower, only to be flabbergasted by the level of decay that the building exhibits. Streaks of wet rust, free-hanging electrical cords, waterproofing tarps, and netting around the capsules indicate the coming demise of a once-great icon of Metabolism in pop culture. Nature's encroachment is visible and tangible.

The building is no longer one of the tallest in Shimbashi, but rather a modest structure overshadowed by surrounding high-rises. On the ground floor, people can be seen going in and out the pedestal part of the building or walking nonchalantly on the broad sidewalk. A conbini (Japanese convenience store) occupies one section of this level. Taking an elevated walkway that leads to Shimbashi Station, one can look back at Nakagin across the partial obstruction of the highway, and imagine a Ginza without this building standing.

At the same time as Metabolism inherited the characteristics of preceding schools, this short-lived movement left behind a legacy of something beyond construction: [reconstruction](#). The movement also inspired a new generation of young(er) architects who set out to plan for the optimistic future.



Standardized Units Democratized Market	Chaos Order
Single Occupancy High-Density Towers	Parts Groups
Land Reclamation	Air Land Sea

Heterokaryon

\ he-tə-rō-'kar-ē-ən \

A multi-nucleate cell that is the product of cell fusion between two genetically different nuclei. This occurs rarely in nature, mostly in fungi, but can be widely created through artificial cell fusion in the laboratory.

One of the applications of heterokaryon is hybridizing two nuclei to create a new cell structure that corrects itself from a specific syndrome.

PLUGIN HOMES

/mechanical design of building components to allow for organic growth of urban elements/

/structural framework that anticipates maximum development and acts as armature for incremental infills/

/comprehensive regulation of parts from the government and complete autonomy of development from the free market/

In many ways, Hong Kong today represents a parallel reality of Tokyo 60 years ago: bay geography, limited resources, mature but still growing economy, advanced infrastructure, extensive social security programs, to name a few. Hong Kong is also facing an issue that Japan once had, which is the extreme pressure to provide mass public housing. Hong Kong's shortage of land may be equivalent to Japan's scarcity of resources after WWII. At the same time, it would be remiss not to acknowledge the advantages that Hong Kong has today compared to postbellum Japan, such as a strong economy instead of a war-torn country and a sophisticated housing market that accommodates many, albeit not all.

Since 1954, public housing has been a function of the government in Hong Kong and has matured into an industry of clear standards and agenda. However, the centralized governance in housing has not proven sustainable, because neither its policies nor prototypical designs can address the variety of household sizes, lifestyles, and demographics in Hong Kong, which results in inefficient allocation of resources. For example, units are designed for nuclear family and multigenerational family formats, which makes them easy to plan and prefabricate, but does not allow for the flexibility needed in urban life. In short, the practice of the housing industry in Hong Kong has been operated on a *macro* scale, while a lot of its issues appear on a *micro* scale. That means, instead of standardizing the building form and unit layout, the housing authority can perhaps standardize the building components inside each unit, and let the occupants assemble their own units to suit their lifestyle and financial capacity. This interplay between **parts** and **groups** is something that the *Metabolists*

already thought deeply about in the 1960s, especially Kikutake and Kurokawa. They both proposed various schemes for unitized housing types that can expand (or contract) according to future changes, which can fluidly form bigger structures of many shapes, defined or undefined. A synthetic strategy for Hong Kong in this regard: **mechanical design of building components to allow for organic growth of urban elements.**

To alleviate land shortages, the Hong Kong government has been actively searching for innovative ways to procure developable land. This offers a potential to consider the Metabolist way of planning that sought to expand buildable surface in not just **land** but also **air** and **water**. In this system, buildings are free standing and structurally sound by themselves but can be annexed into larger structures. Modular design that is flexible and modifiable is imperative in this process. A synthetic strategy for Hong Kong in this regard: **structural framework that anticipates maximum development and acts as an armature for incremental infills.**

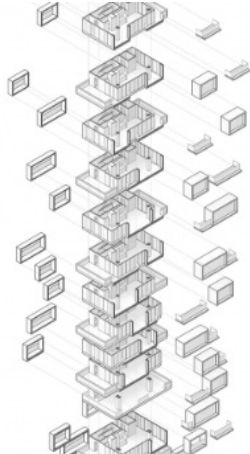
The gradual shift of housing stock towards the private sector is the right direction for housing in Hong Kong, because it relieves the government from the burden of supply, utilizes the efficiency of private development for speed, while it upholds the quality as regulated by the housing authority. This gives momentum for the Hong Kong government to make a full reversal of the housing market to private supply, in which the government creates **order** on a micro scale and lets the **chaos** address itself on the macro. A synthetic strategy for Hong Kong in this regard: **comprehensive regulation of parts from the government and complete autonomy of development from the free market.**

Studio: Meta Design - Collective Self-construction for the People

Instructor: Hsieh Ying Chun



The project envisions a democratized process in which the occupants build or assist to build their own dwellings into a vertical village over time. The outcome of this research also produced a set of standardized connections and parts for easy assembly.



Studio: Try a Little Slenderness - Exploration of the HK Pencil Tower

Instructor: Jason Carlow

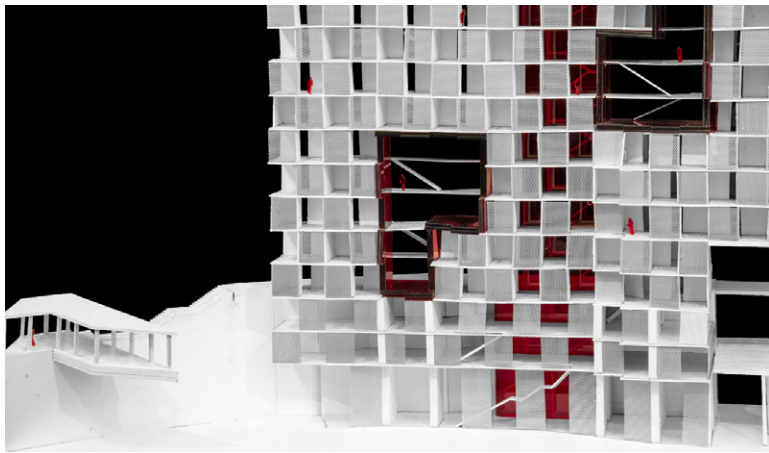
With an undertone in politics, geography, and population, this studio explored a byproduct of an extremely profit-driven typology: high-density residential skyscrapers over a small footprint. The studio surveyed over 50 real "pencil towers" and sited the design proposals in Kowloon, offering a relevant investigation into the housing issues in Hong Kong.



Thesis by Lee Katrina

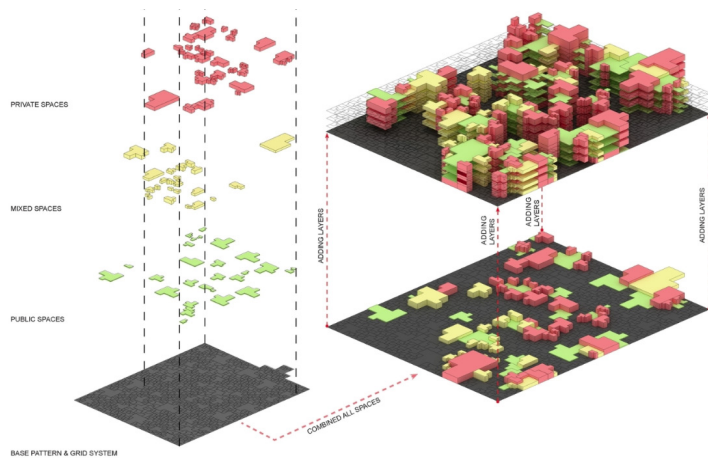
Instructor: Tao Zhu

The project conveys the metabolic process of an urban development that grows in 3 phases from 2011-2020. The thesis envisions a dystopian future with political upheavals and activism that brew under the oppression from Beijing.



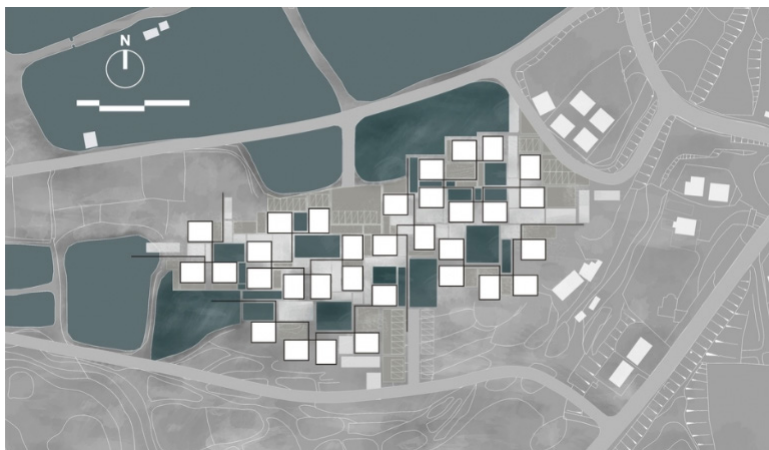
Studio: Occupy MidLevels - Affordable Youth Housing in Hong Kong
Instructor: Au Fai

In this studio, the “Mid-Levels” are the economically defined areas where upper-scale housing units can be found. The studio sought to promote youth housing in close proximity with luxury apartments as a means to bring upward mobility to the youth population, as indicated by the word “occupy”.



Studio: Metabolism Revived
Instructor: Thomas Daniell

The studio directly investigated various concepts from Metabolism, and created the so-called “Neo-Metabolist” prototypes that were divided in two themes: organic and flexible growth in urban design, and creative definition of “ground” to expand the buildable territory. Though the study was located in the Macau peninsula, lots can be learnt from the research.



Studio: Ideas for the Village - Rethinking Village House Typologies
Instructor: Christian J Lange & Weijen Wang

The studio explored the concept of small village housing types in the New Territories - and rural areas in general - to decompress the housing bubble in the dense urban lands. The investigation resulted in not just housing typologies but also various urban planning schemes in the bay, reminiscent of Tange Kenzo’s Plan for Tokyo Bay in 1960.



Fig. 59: OPod Housing rendering (opp.) and real prototype unit in Kwun Tong (above)
James Law Cybertecture

OPod Housing Unit by James Law Cybertecture: a contemporary R&D project that utilizes readily available sewer pipe sections to create housing units. This is one of many examples to address single occupancy housing - a sector underserved by the public housing market. It uses a Metabolic approach, but is reliant on a single building material; the units are monodirectional and can only be expanded one way. This approach makes the group structure free from a framework, but is rather restrictive for modifications. Launch production is set to be in 2020.

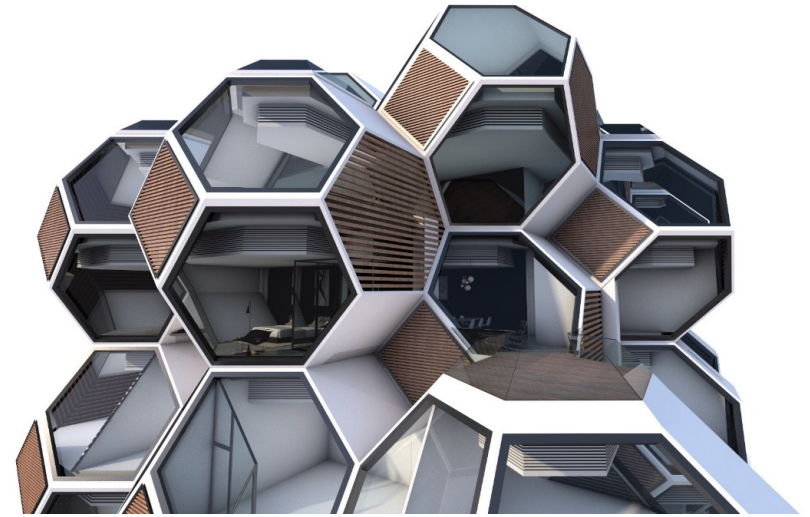


Fig. 60: Matrix Tower
James Law Cybertecture

Matrix Tower: another R&D project by James Law Cybertecture that is reminiscent of the Nakagin Capsule Tower by Kurokawa Kisho in Tokyo. Because of the same approach using a central core and highly standardized prefabricated units, it may be prone to the same issues that the Nakagin Tower underwent, such as lack of personalization and renewability of its units. No immediate implementation has been specified.

Global Knowledge: Incremental Architecture - Elemental

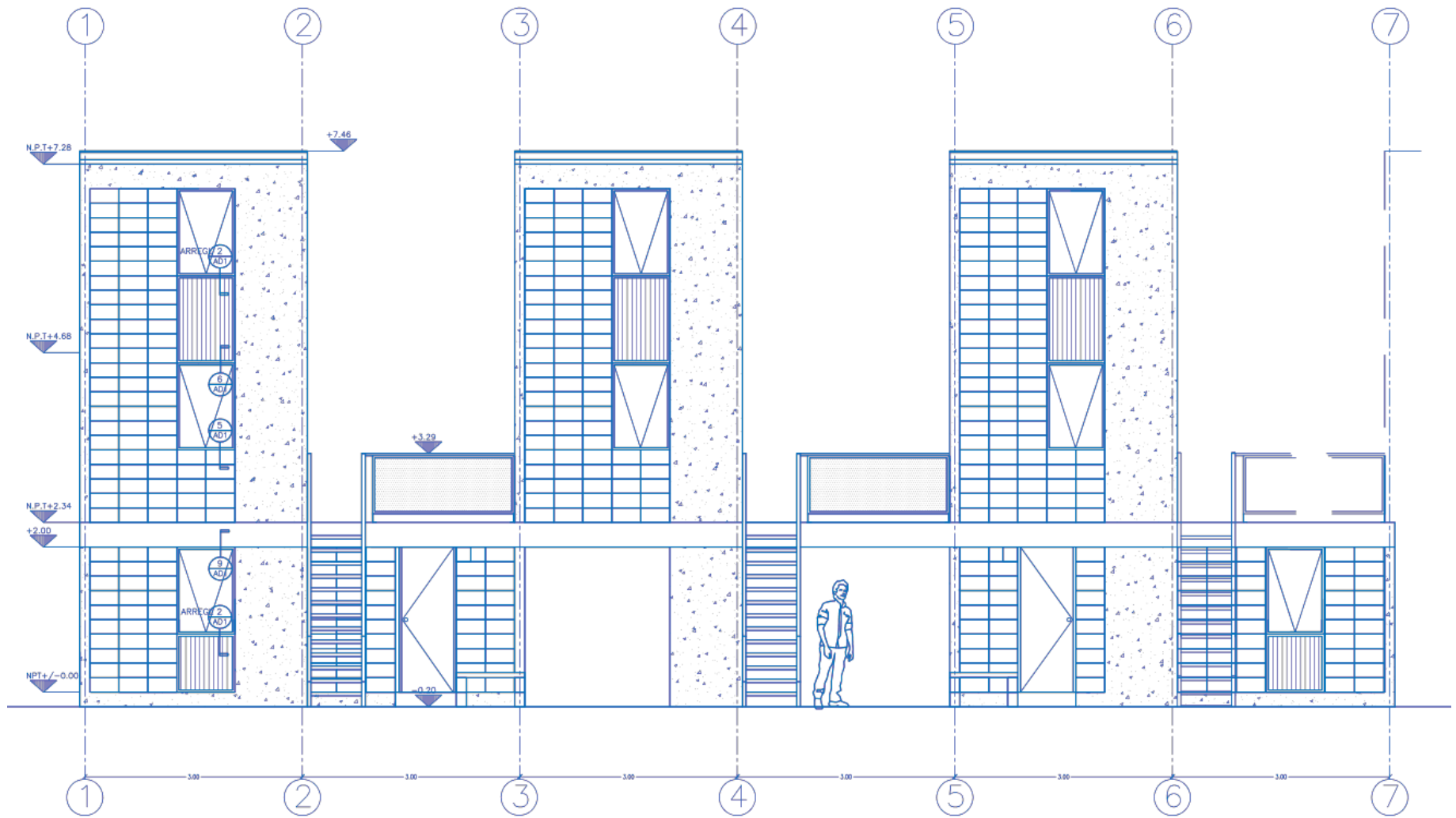


Fig. 61: Quinta Monroy Type Homes Drawing (Free Access)
Elemental Architecture
<http://www.elementalchile.cl/wp-content/uploads/2018/07/ABC-VIVIENDA-ELEMENTAL-HOUSING.zip>



Fig. 62: Quinta Monroy with Medium Tenant Improvement
Cristóbal Palma



Fig. 63: Quinta Monroy with Maximum Tenant Improvement
Cristóbal Palma

1 In 1950s, with the rise of shantytowns (*barriadas*) in Lima and their inherent problems, the Peruvian housing authority promoted the concept of self-help projects and elemental housing (*viviendas elemental*).

Kahatt, S. S. (2011). PREVI-Lima's time: Positioning Proyecto experimental de Vivienda in Peru's modern project. *Architectural Design*, 81(3), 22–25. <https://doi.org/10.1002/ad.1233>

Chilean architecture firm Elemental was not the first to apply an “incremental development” approach to construction.¹ However, their works have been considered some of the most successful. Readily available online, their drawing sets of various townhome types (currently 4) can be downloaded and used by anyone from anywhere.

The typology exemplifies the “build for tenant improvements” philosophy that delivers a half-built framework for tenants to complete as they see fit. The result is cost savings, creative freedom, and a diverse urban vibrancy for the tenants, while housing providers are alleviated from the full burden.

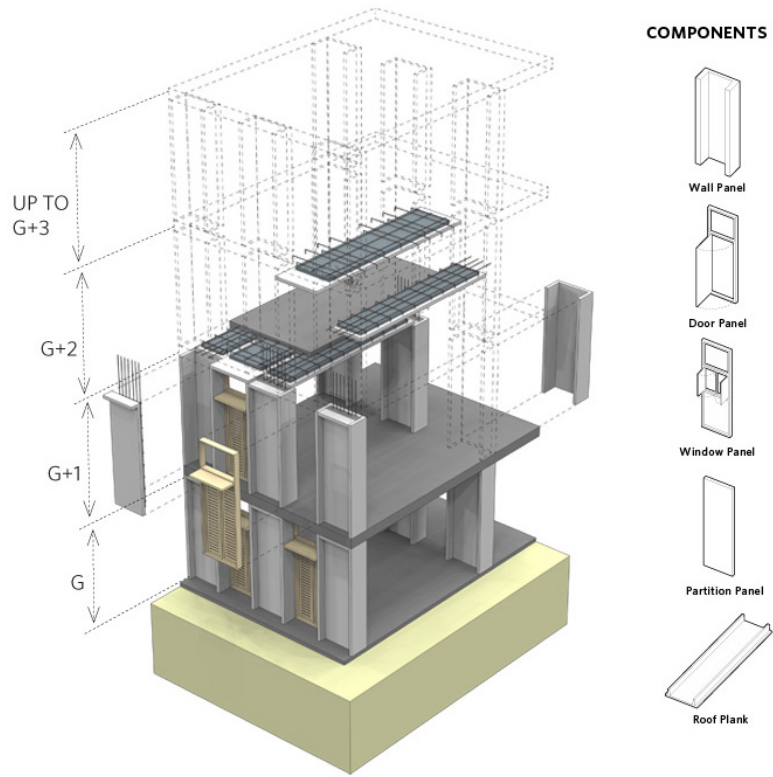


Fig. 64: Ideal Choice Homes
Kieran Timberlake

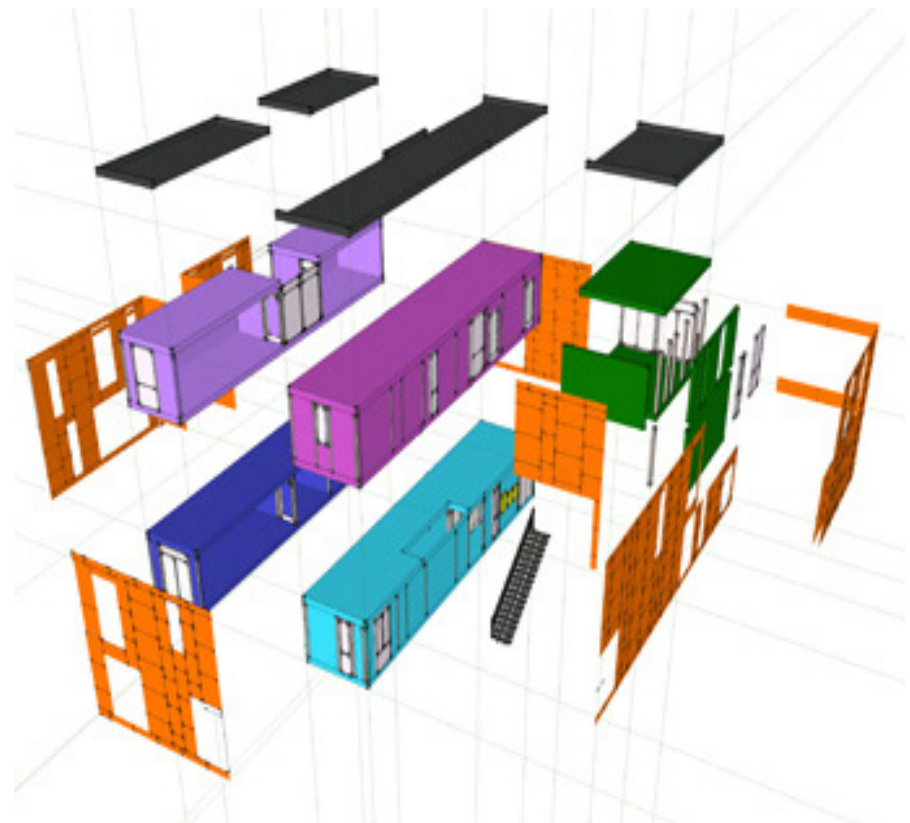


Fig. 65: KTHL 1.5 from LivingHomes Series
Kieran Timberlake

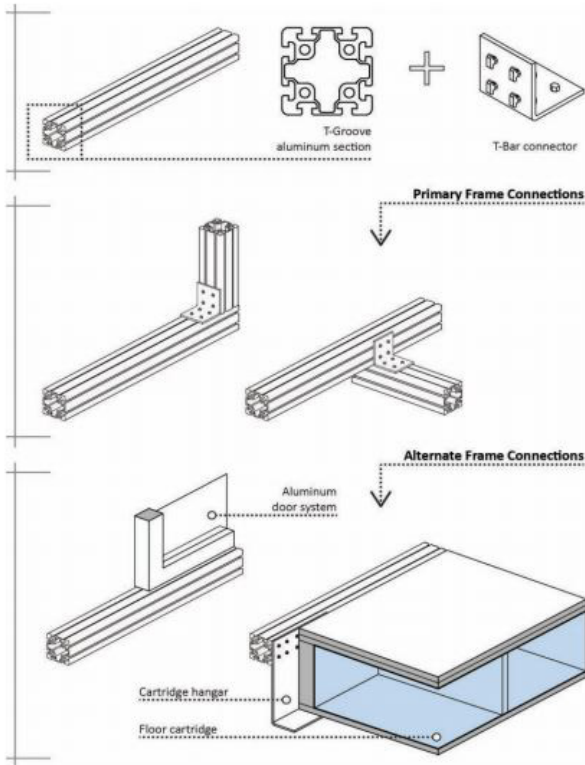
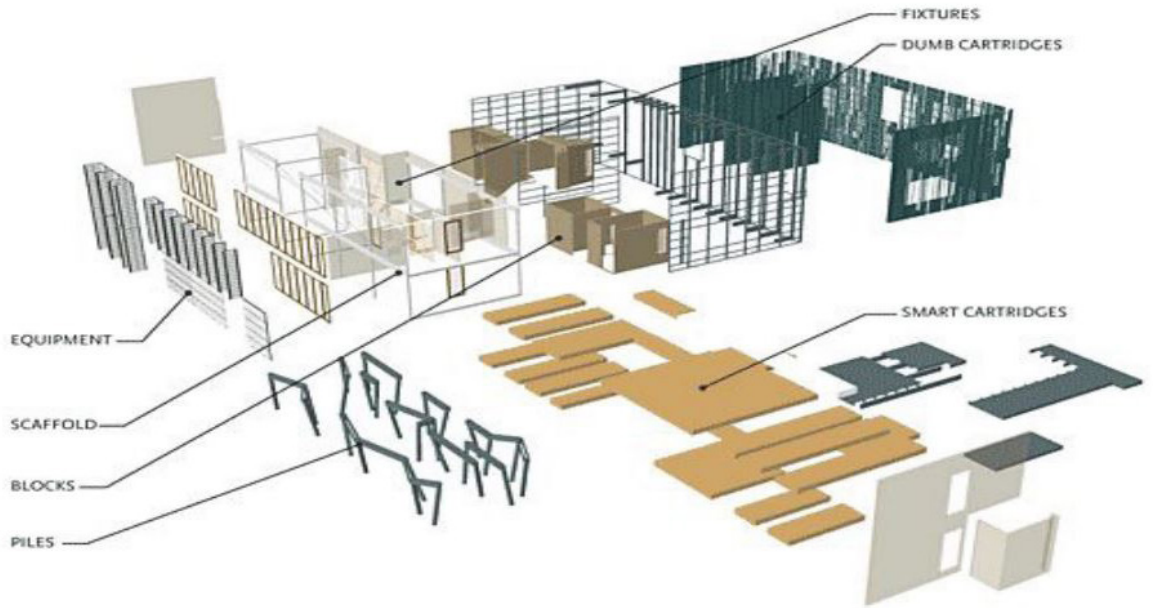


Fig. 66: Loblolly House
Kieran Timberlake

1 "Loblolly House: Prefabricated Architecture Integrated with Nature." KIERAN TIMBERLAKE, 2013. Accessed 05/24/2020.

kierantimberlake.com/page/loblolly-house.



Kieran Timberlake (stylized KieranTimberlake) is an architecture firm from Philadelphia that has pioneered many techniques in construction and sustainable systems. Their mass housing projects are both experimental and practical, leveraging some of the latest technologies in materials and prefabrication.

The design approach echos lots of the Metabolist strategies, including the use of "smart cartridges"¹ that are integrated panels. In this system, wall, floor, ceiling, and MEP can be prebuilt in ready-to-ship blocks. Parts are also custom-built to be versatile to handle multiple functions.

CHAPTER CONCLUSION

As implied in previous sections of this thesis, the happy medium that the Metabolic process offers lies somewhere in between the nanolivingstructures and the megacitystructures, between the order and the chaos, and between the planned and the unplanned. It will take some form of centralized governance to maintain the underlying pattern, but also a democratized process to foster the complex development of the urban fabric. Hong Kong exhibits both extremes of the gamut: the sporadic slums (including now-demolished Walled City of Kowloon) and the standardized PRH system, with very little in between.

To draw a broader perspective of the matter, it is worth looking at some extreme examples of both centralized and decentralized schemes in public housing across the world.

Extreme Democratization



Fig. 67: Favela da Rocinha
Viator Tours

Shantytowns are so commonplace in Brazil that they have their own dedicated term: favela. One of the most notorious favelas is the town of Rocinha, built over a hillside and is still continuing to grow. Like many favelas, this town is known as an incubator of drugs, violence, gang activities, and sex crimes.

In popular culture, towns like this have gained attention from mainstream media and become amusements in *poverty tourism*. In the picture is the scene of Rocinha on a tour posting by Viator, in which spectators can walk or rent a Jeep to navigate through the labyrinthine slum.



Fig. 68: Larung Gar
Jesse Rockwell

Also built on a hillside, the Buddhist monastery of Larung Gar, despite being not an urban slum, shows the same growth pattern as Rocinha. It is an example of an extremely organic configuration of many similar-sized home units, built completely by an autonomous community of residents.

As of late, the Chinese government has implemented forced eviction of monks and nuns, as well as compulsory demolition of their dwellings. This continuing policy is associated closely with the Free Tibet movement.



Fig. 69: Torre de David (Centro Financiero Confinanzas)
Iwan Baan

Often compared to the Kowloon Walled City, Torre de David is a half-completed building, with its main structure built but left unfinished, due to complication in finance and ownership after the death of the investor. The building exhibits the resilience of its illicit tenants (squatters) who created a vibrant community in a haphazard armature that is a concrete frame. Much similar to the Kowloon Walled City, tenants in Torre de David have their resourceful and ingenious ways to procure water supply, maintain electricity, furnish their own units, and create an active social life inside the structure.

All tenants were evicted and relocated to the south of Caracas in 2015. The tower is still standing today, facing an uncertain fate.





Fig. 70 (all photos this spread): Interior Views of Torre de David (Centro Financiero Confinanzas)
Iwan Baan

Extreme Centralization



Fig. 71: Stuyvesant Town and Peter Cooper Village
Stuytown.com

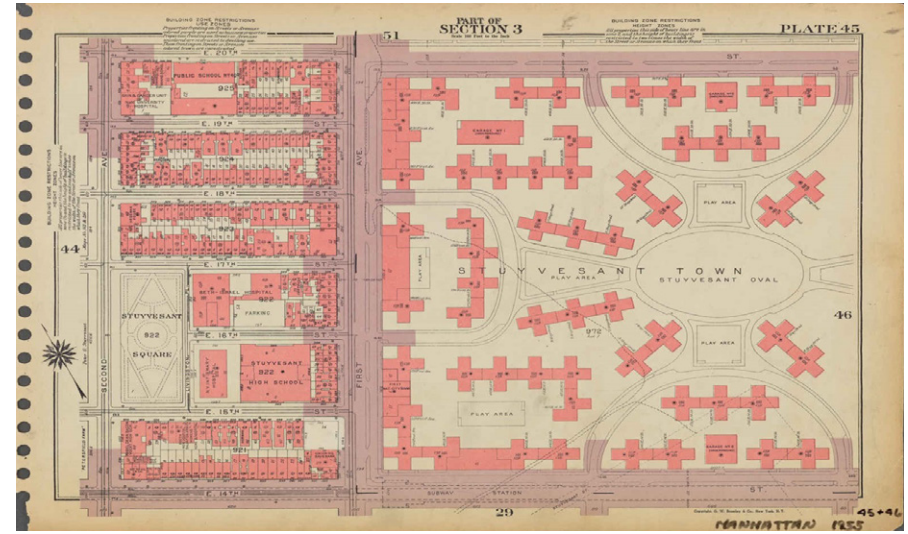


Fig. 72: Stuyvesant Town and Peter Cooper Village master plan
New York Public Library Archive

1 Durkin, Erin. De Blasio Inflated Benefits of the Stuyvesant Town Complex Sale to Preserve Affordable Housing, Report Says. Accessed 02/14/2020. <https://www.nydailynews.com/news/politics/de-blasio-inflated-numbers-preserve-affordable-housing-deal-article-1.3738686>

Conceived and built in postwar New York to provide public housing for the masses, this development of twin towns Stuyvesant Town and Peter Cooper Village shows planning principles of both Garden City and La Ville Radieuse, as evident in the master plan. Controversies arose when tenant selection was implemented in the policies, showing racial discrimination and segregation. This project is an example of how public housing providers can use housing as a tool for nefarious agendas.

According to an investigation by the Daily News (NY), Bill de Blasio inflated the value of the affordable housing deal when the complex changed hands in 2015, wasting public money on subsidies that were not needed.



Fig. 73: Pruitt Igoe Aerial View
United States Geological Survey



Fig. 74: Pruitt Igoe Site Plan
United States Geological Survey

A classic case of rigid grid system and uniform building design, Pruitt Igoe was praised in the beginning as a new paradigm of high-rise public housing in America, despite the scarcity of funding and material resources after the war. Completed in 1954 in St. Louis, the complex witnessed a rapid decline and was ultimately demolished in 1972. The design is often cited as the root cause that ignored neighborly relationships and community fabric. However, only blaming the planning and architecture would be oversimplifying the issues, which lay in the managerial agenda of the project, including segregation, tenancy control, and maintenance or lack thereof.



Fig. 75: Marzahn Housing Complex
DPA (Germany)

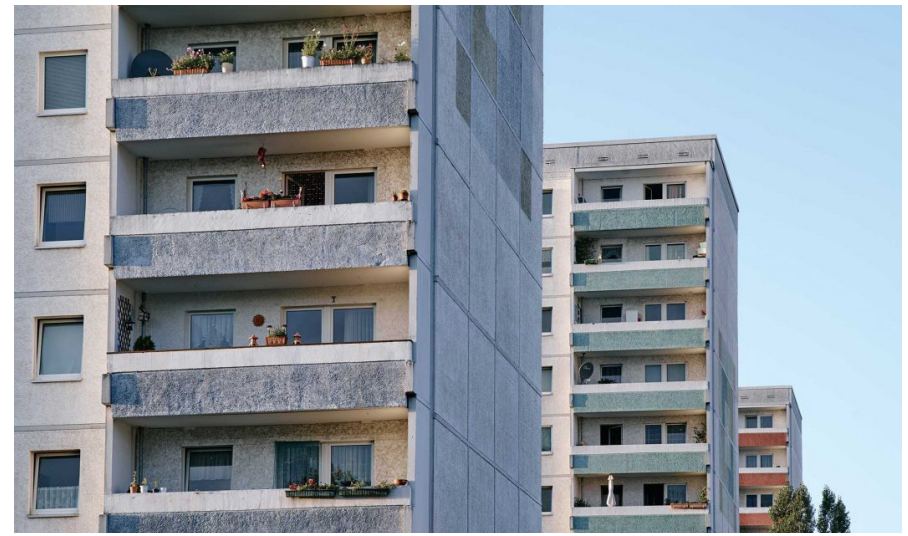


Fig. 76: Marzahn Housing Complex
Jur Oster

1 Statista. Germany: Unemployment Rate from 1999 to 2019. Accessed 02/14/2020.
<https://www.statista.com/statistics/375209/unemployment-rate-in-germany/>

2 Hess, Daniel Baldwin, Tammaru, Tiit, and Ham, Maarten Van. Housing Estates in Europe : Poverty, Ethnic Segregation and Policy Challenges. Cham, Switzerland: Springer Open, 2018. Print. Urban Book Ser. pp 116

A typical *plattenbau* district in East Germany, Marzahn came to be known after the Second World War as a public housing town. As a Socialist program in a Communist country, the development exemplifies uniform top-down planning and design. After the Fall of the Berlin Wall, the area witnessed a decline in population, but has begun to gain back popularity as of late for its low-cost housing options, including and especially those for expatriates, thus becoming a turf-war zone between gang members of different ethnicities. In 2014, the unemployment rate of Germany in general was 5%¹, while the rate in Marzahn-Hellersdorf was 9%².

From **Cabrini-Green** in Chicago to **Aylesbury** in London and **Chertanovo** in Moscow, examples of mass housing failures are all over the world. To be sure, there are other, successful, cases of mass housing projects. However, it is imperative to recognize that while mass production and prefabrication allow for the much-needed efficiency, they simply cannot avoid the cold and rigid feelings associated with this type of housing projects. Furthermore, as a complete undertaking by the public sector, high-rise and high-density projects do not encourage social responsibility among the inhabitants, which led to eventual negligence down the line.

This is not an attempt to denigrate the centralized housing provision since many other socio-economic forces factored into the outcome of these projects. Their scale was and still is a matter of urgency for many municipalities and governments. It was a dream that Le Corbusier dreamt through his *Ville Radieuse* and *béton brut* architecture, but not a dream without problems that need careful and thoughtful consideration. The **high density** that Le Corbusier and other Modernists envisioned soon resulted in **overcrowding** instead, which are two separate concepts often mistaken for one another. This confusion is something that urbanists like Jane Jacobs once advised to avoid:

“[...] high densities of dwellings and overcrowding of dwellings are often confused. High densities means large numbers of dwellings per acre of land. Overcrowding means too many people in a dwelling for the number of rooms it contains.”¹

The effects of overcrowding has been researched by many, including psychologist and anthropologist Robin Dunbar

through his studies of primates.² According to his theory, the size of the group strongly determines the social cohesion of that group, and overcrowding is the root cause of many problems. Regardless of the connection between Dunbar's work and Jacobs' discussion of overcrowding, what Jacobs is getting at is the importance of having ownership of space, not to be isolated, but to be private. Jacobs wrote her *chef-d'œuvre* right after the dissolution of CIAM - an iconic coalition of international Modernism - which took place in 1959 and was hosted by Team 10. From that point, public housing steered to a different direction: high-density but low-rise. This would then allow for a more decentralized approach to planning and building, since low-rises were easier to construct, which could foster self-help programs among the occupants. That was exactly what the Peruvian government under president Fernando Belaúnde Terry strived for with an experimental project named **PREVI** which invited an all-stars team of international architects to participate with domestic Peruvian ones. Among the most prominent ones such as Sir James Stirling, Aldo van Eyck, Herbert Ohl, Atelier 5, and Charles Correa, the young team of Metabolists - Kikutake, Kurokawa, and Maki - was invited, and that was not a coincidence. The potential that Peter Land - PREVI's director - saw in Metabolism goes beyond the formal or technological qualities that it offers: it is about the self-fulfillment of occupants through a self-help process.

1 Jacobs, Jane. *The Death and Life of Great American Cities*. Vintage Books ed. New York: Vintage, 1961. Print. p 205

2 Dunbar, R.. *Primate Social Systems - Studies in Behavioural Adaptation*. Croom Helm, 1988. Print.

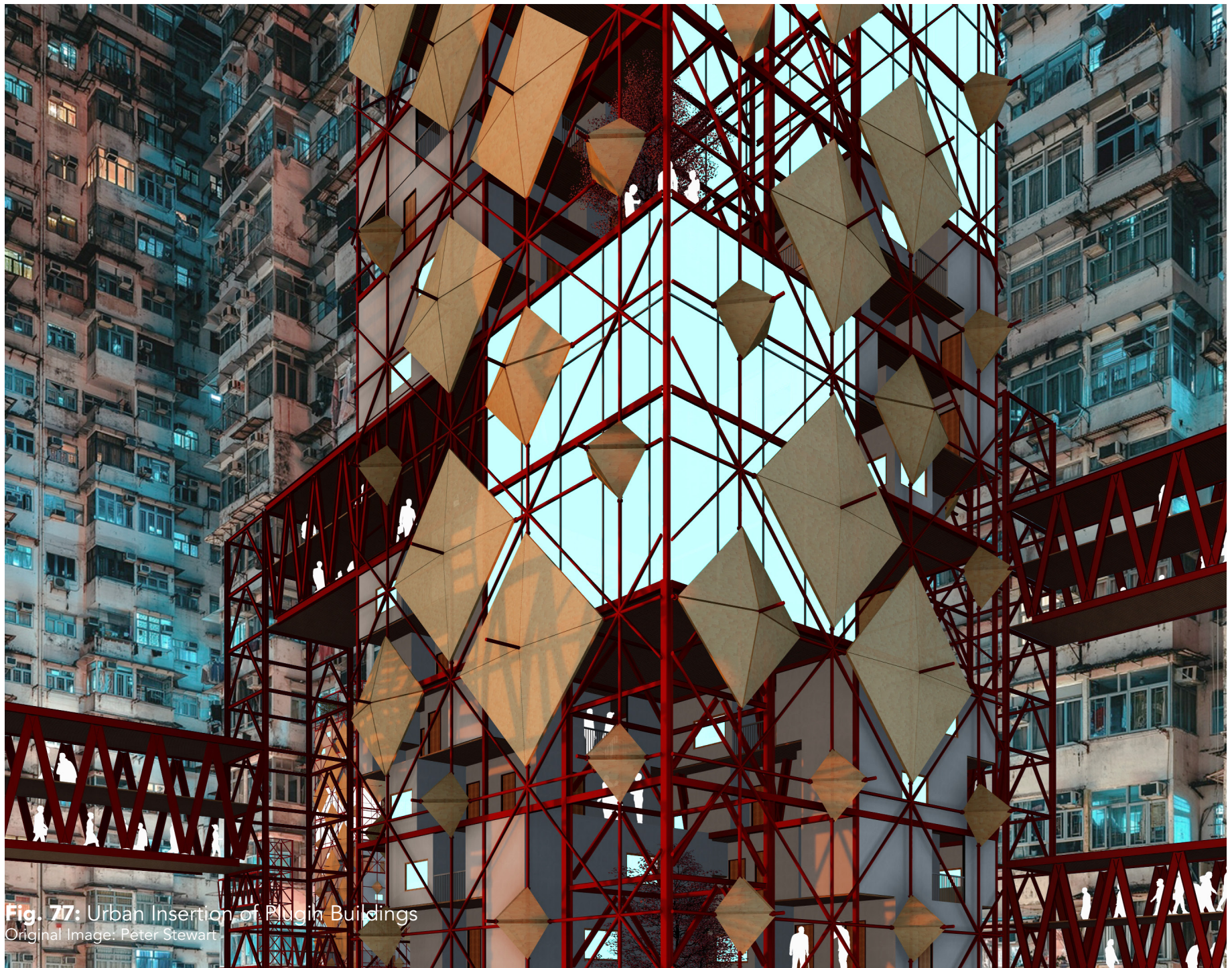


Fig. 77: Urban Insertion of Plug-in Buildings
Original Image: Péter Stewart

The Wealth of Nations

*By preferring the support of domestic to that of foreign industry, he intends only his own security; and by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it. **(Adam Smith, Bk.4, Ch.2)***

The wealth of a nation depends on the wealth of each of her citizens. Let us create an environment in which each individual has the liberty of self-determination to flourish in such a fashion that is best for her/him. Such is the fastest way to help the society prosper.

DESIGN FOR INDIVIDUALS

1 Daniell, Thomas. (2008) After the
Crash : Architecture in Post-bubble Japan.
1st ed. New York: Princeton Architectural.
Print. p 72

Scripted Actions | Unscripted Spaces

Any work of design is a work of fiction, built as a fantasy of the author around an understanding of reality.

The human body and the spaces around it can be scripted or unscripted. For the most part, our daily life shows a routine, a pattern, a script. That is why as a convention we have scripted spaces: a kitchen to cook, a bedroom to sleep, a bathroom to bathe. Metabolism recognizes the shortcomings of that convention, especially given the shortage of resources. The theory proposes unscripted spaces that are multi-purpose and fluid. However, many, if not most, of the built projects from this movement in the residential sector did not live up to this philosophy because they were too scripted, especially in the case of nano units like Kurokawa's Nakagin Capsule Tower. In contrast, Kikutake's Sky House underlines such philosophy, but it is a free-standing building in which the reconfiguration of spaces is easier to realize. The "unscripted spaces" approach has not seen its implementation on a larger scale.

Metabolist philosophy, ironically, adheres more to the traditional Japanese dwelling than preceding postwar attempts to address housing problems in Japan. Traditional Japanese dwellings, from *shoin* style to *sukiya* style, show fluid floor plans with movable partitions and flexible arrangements. The free flow of space means that family members constantly see each other, which is an attribute not seen in later modern housing types. In traditional dwellings, the spaces do serve specific functions, but are not dedicated. Post-war housing in Japan, however, started to incorporate the Western-influenced nLDK formula: living room (L) + dining room (D) + kitchen (K), and how many bedrooms there are for the family members (n). Thomas Daniell cites this type of individually divided spaces

as the reason behind contemporary psychological phenomena such as social withdrawal (the *hikikomori* culture) and juvenile delinquency in modern Japanese society.¹

"Unscripted spaces" does not mean these spaces are undefined. Nor does it mean that they must be underdesigned. In fact, they shall be well thought out and flexible enough to accommodate the actions, most of which are scripted through our daily life.

With that in mind, the next few pages will provide a fictional work, nonetheless one that is based on real characters, places, and events. These prototypical qualities are meant to provide a glimpse into the daily life of common Hong Kongers, as they represent a range of ages, sexes, and occupations. This is a script of actions by which unscripted spaces can be informed. These characters, while diverse, do have one thing in common: that they are struggling to make ends meet, and are seeking a better, more meaningful, living situation. This is a story the likes of which have been told many a time verbally, but almost never architecturally. This thesis offers to do just that.

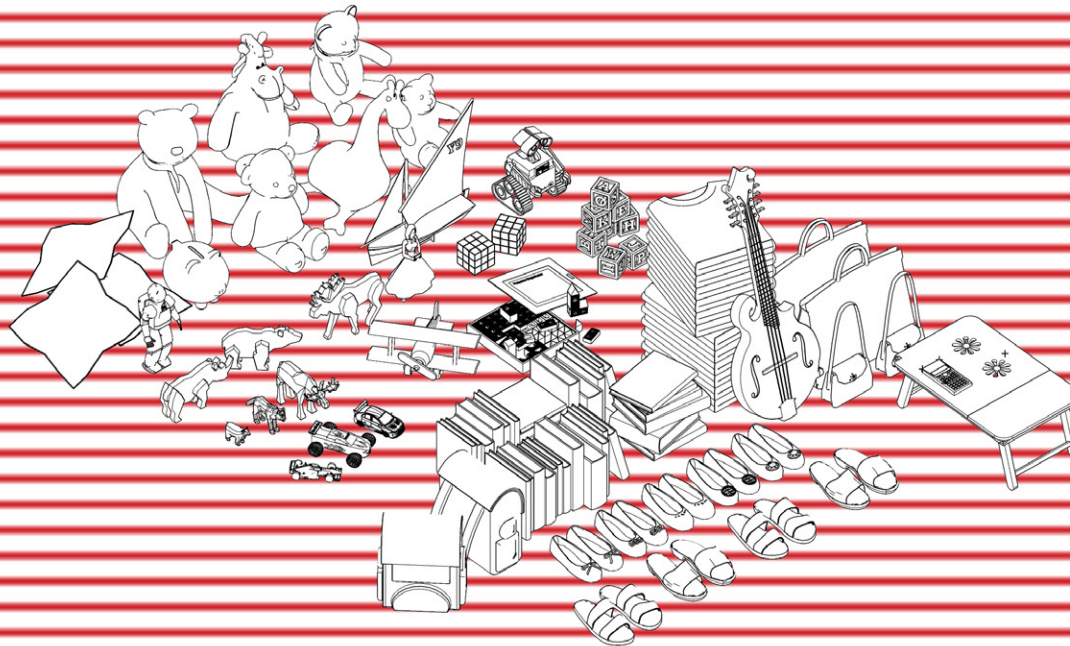


Image: Portrait Series: Hong Kong - Daniel Vu

Elsa Chou (12) & Anna Chou (9)

Students | Subdivided Flat (w/ Parents) | Sham Shui Po

7:00am	Wake up, eat breakfast, and change
7:45am	Take bus to school
8:00am	Arrive at school
3:30pm	Leave school, go to Tung Choi market for quick bites
4:30pm	Go to cram school nearby in Prince Edward place
7:00pm	Go home
7:30pm	Arrive at home, eat dinner
8:00pm	Do homework
11:00pm	Go to sleep



- (2) backpacks w/ Frozen graphics
- (20+) plushes & other toys
- (60+) textbooks of 4-year span
- (80+) clothing articles & other accessories
- (8) pairs of shoes
- (5) bags and purses
- (4) pillows & (2) blankets
- (1) foldable desk
- (1) calculator
- (1) mandolin

Elsa and Anna Chou are the only children in a family of four. Their father is a construction worker and their mom works in a restaurant. The Chou sisters share the top level of a bunk bed, while their parents sleep below. They have a foldable desk to do homework in that bed. They are both fans of Disney movies, especially Frozen.

For cram school, they go to Prince Edward place near Tung Choi market where Aunt Tam works.



Aunt Tam

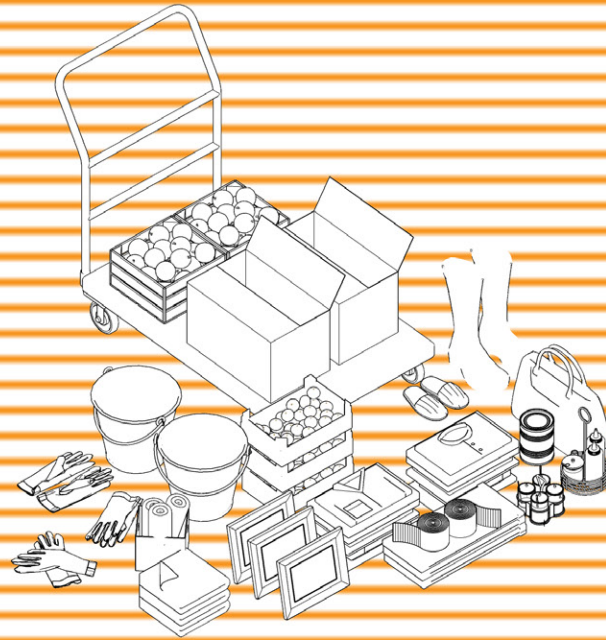
59

Image: Portrait Series: Hong Kong - Daniel Vu

Aunt Tam (63)

Street Hawker | Coffin Home | Kowloon Tong

5:00am	Wake up, eat breakfast, and change
5:45am	Go to Tung Choi and Sai Yee markets, pick up goods
6:30am	Set up tarp, unpack vegetables for sale
11:30pm	Eat lunch from nearby food vendors
5:30pm	Pack up, go to Yau Ma Tei to shop and visit relatives
7:30pm	Go home
Weekend	Visit Wong Tai Sin temple and elderly center
9:00pm	Go to sleep



- (3) plastic tarps
- (1) trolley
- (2) water buckets
- (5) wooden crates
- (50+ kg) vegetables and fruits at any given time
- (100+) plastic bags in assortment
- (1) purse
- (10+) clothing articles
- (2) pairs of gloves
- (2) pairs of shoes
- (3) blankets & (1) pillow
- (5) toiletry items
- (10+) dry food items & condiments
- (3) picture frames

Aunt Tam sells anything from bok choy and bamboo shoot to pumpkin on a plastic tarp with a trolley that keeps her mobile. She used to have a market kiosk, but could no longer afford the rent. Her husband died 10 years ago, and her children all moved away. She's still on the waiting list for subsidized housing, but at this rate, she'll qualify for an elderly home before that happens.

She frequents Wong Tai Sin temple where Mr. Yip volunteers.

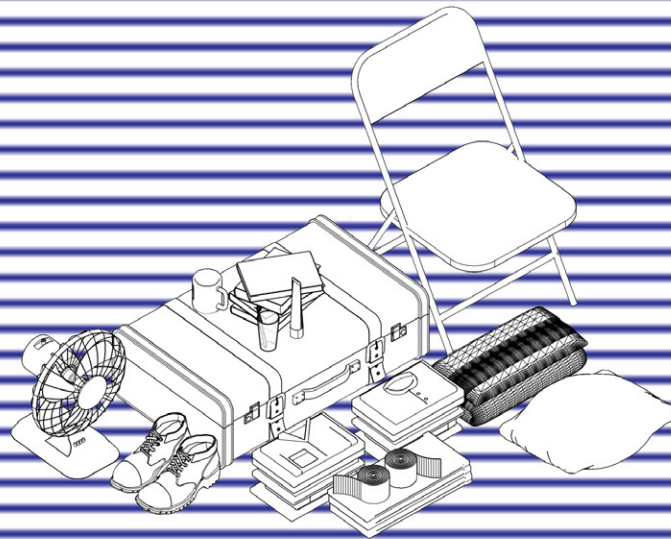


Image: Portrait Series: Hong Kong - Daniel Vu

Yip Lok Cheung (58)

Unemployed (Former Carpenter) | Cage Home | Kwun Tong

6:00am	Wake up, go to nearby park to practice Tai Chi
7:30am	Go to Wong Tai Sin temple to volunteer, eat breakfast
11:00am	Eat lunch provided for by temple
12:00pm	Go to Sham Shui Po to do part-time work (dish washing)
3:30pm	Go back to Kwun Tong
Wednesday	Stop by Social Services office in Kowloon Bay
5:30pm	Go to nearby chess alley
7:30pm	Go home
8:00pm	Arrive at home, share dinner with other tenants
9:30pm	Go to sleep



- (1) small suitcase
- (7) clothing articles & (1) windbreaker
- (1) pair of shoes
- (5) toiletry items
- (5) books
- (1) single mattress & (1) blanket
- (1) electric fan
- (1) chair

Mr. Yip speaks fluent English, which is better than most students these days, thanks to his education under British schooling. He used to work in manufacturing, but the economic transformation to higher services took place and never went back. He never married, so losing his job left him no option but to move into a cage home in a *tong lau*.

Yip Lok Cheung is still seeking employment through HK Social Services, but chances are slim. He's an active volunteer at various places, one of which is the Wong Tai Sin temple that Aunt Tam visits weekly.

Elaine Hui

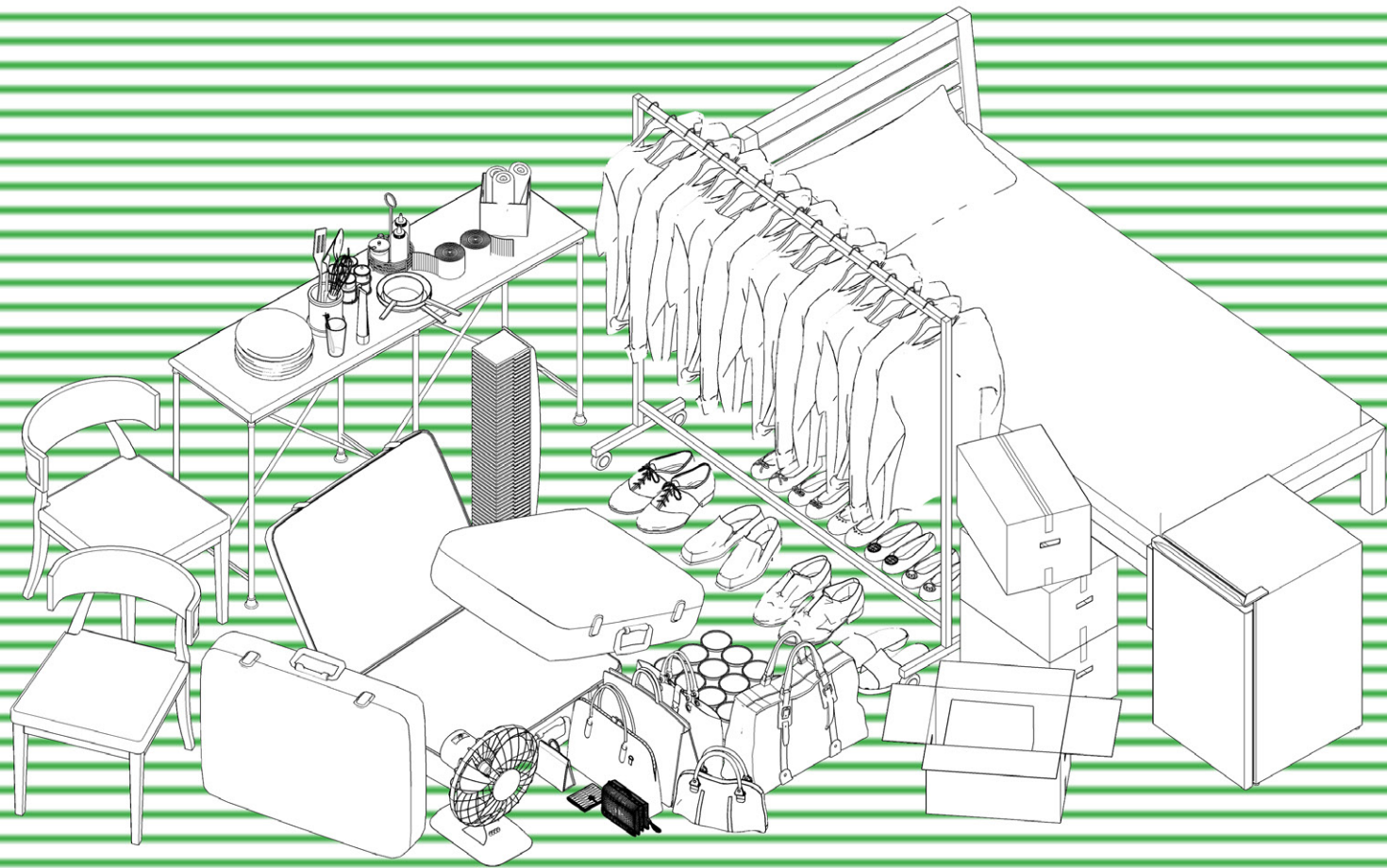


Image: Portrait Series: Hong Kong - Daniel Vu

Elaine Hui (37)

Store Owner | Subdivided Flat | Sham Shui Po

5:00am	Wake up and change
5:30am	Take MTR to Yau Ma Tei to do business and have breakfast
6:30am	Head to Wanchai
7:30am	Open store
11:30pm	Eat lunch from nearby restaurants
5:30pm	Go back alone to Kowloon
6:30pm	Arrive at home
7:00pm	Dinner and home entertainment
10:00pm	Go to sleep



- (3) suitcases & (2) boxes of clothing
- (20+) toiletry items
- (8) furniture items
- (1) beds & (1) single mattress
- (1) tv screen & (2) laptops
- (10+) toiletry items
- (30+) dry food items & condiments
- (10+) kitchenwares & cookwares
- (1) mini fridge
- (2) boxes of CDs & DVDs
- (2) picture frames
- (1) electric fan

Elaine used to live in Wan Chai where the apothecary shop inherited from her father is located. After both her parents passed away and due to rent raise, she moved to Sham Shui Po and started a long commute to work then. Her shop also carries fruits, and during the viral outbreak, surgical masks, tissues, and disinfectants are hot sales.

At home, Elaine would open her doors to help hide protesters from the police, as many as she can, when she can.

Gigi Ng

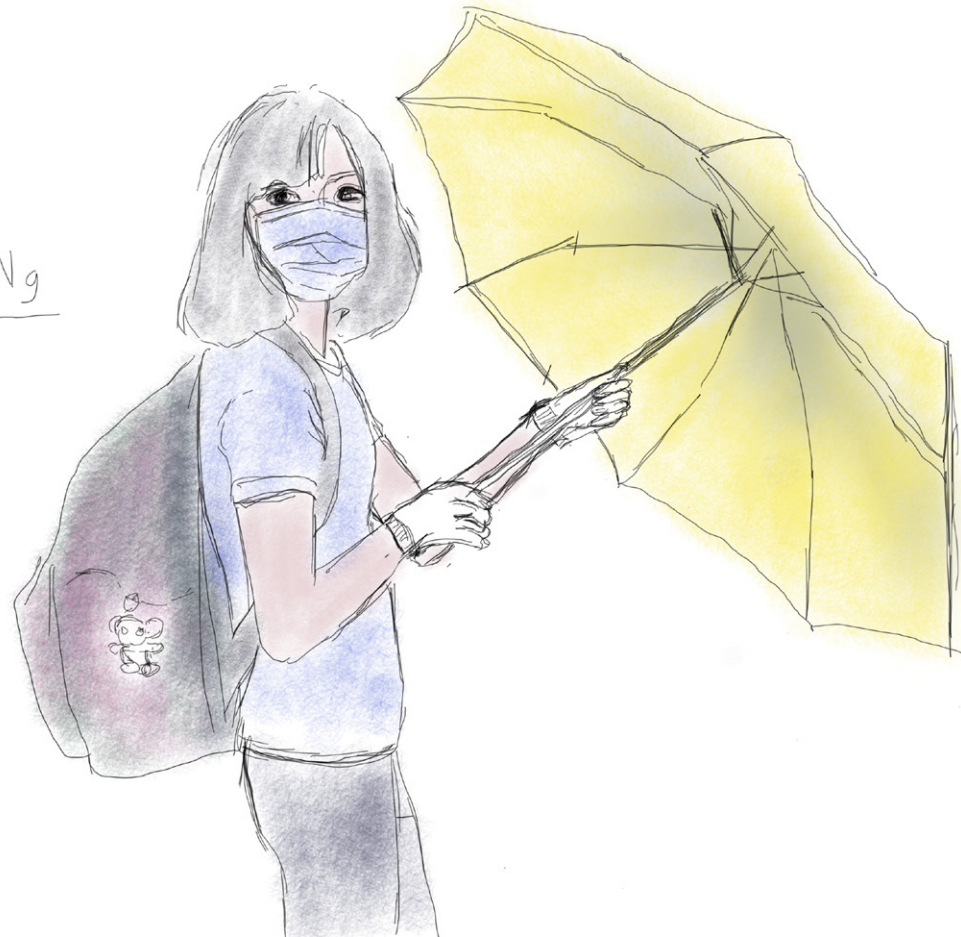
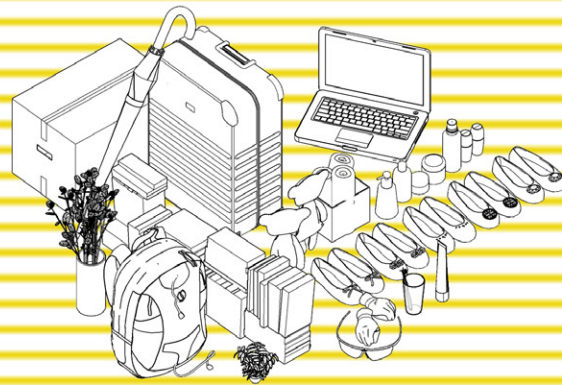


Image: Portrait Series: Hong Kong - Daniel Vu

Gigi Ng (18)

Student & Protester | Subdivided Flat (w/ Brother) | Quarry Bay

6:30am	Wake up, eat breakfast, and change
7:15am	Head to school in North Point
7:45am	Arrive at school
3:30pm	Leave school, go to Star Ferry and change at station
4:15pm	Arrive at Hung Hom station, head to Sham Shui Po
5:00pm	Arrive at Sham Shui Po, meet up with other protesters
7:30pm	Go home using different route
8:30pm	Arrive at home, eat dinner
9:30pm	Do homework
11:30pm	Go to sleep



- (1) suitcase & (1) box of clothing & accessories
- (3) protective ware items
- (3) pairs of shoes
- (10+) toiletry items
- (1) laptop
- (3) plushes
- (1) backpack
- (10+) textbooks & (20+) books
- (3) cacti & (2) plants
- (1) umbrella

Gigi went to her first protest 6 years ago with her older brother during the Umbrella Movement. Since then, she goes to protest when she can after school. To avoid digital fingerprint, she takes longer route with the Star Ferry and pays fare by cash only. Her activism is more prioritized than her school work because "Education means nothing without intellectual freedom." She'd like to move out after graduating from university.

Gigi's protest team leader is Patrick Wong.



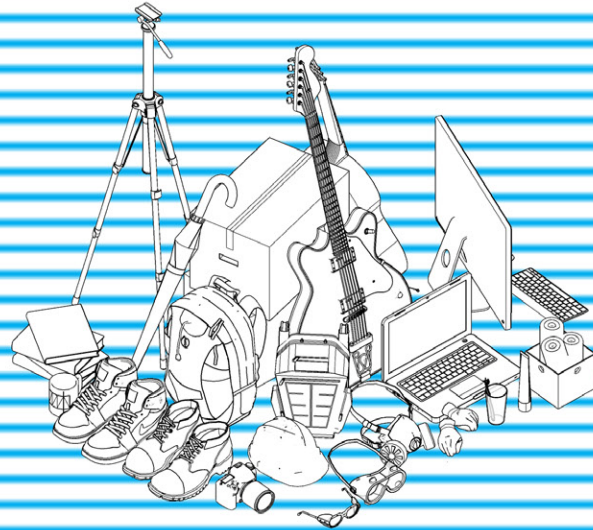
Patrick Wong

Images: Portrait Series: Hong Kong - Daniel Vu

Patrick Wong (24)

University Graduate & Protester | PRH (w/ Parents) | Sheung Wan

7:30am	Wake up and eat breakfast with parents
8:00am	Check email from protest movement & press
9:00am	Start freelance work or look for jobs
12:30pm	Go out for lunch and discuss with other protesters
2:00pm	Head to Kowloon
3:00pm	Arrive at Sham Shui Po, meet up with other protesters
8:00pm	Eat dinner and go home
10:00pm	Arrive at home, check email and look for jobs
12:00am	Go to sleep



- (2) box of clothing
- (5) protective ware items
- (5) toiletry items
- (2) pairs of shoes
- (1) laptop & (1) desktop
- (2) guitars
- (2) backpacks
- (1) bag of camera gears
- (20+) books
- (1) umbrella

Patrick graduated from U of HK 2 years ago, but has not been able to find a salary job. He lives with parents but plans to move out once his finance allows, which could take years. In the meantime, he's an organizer in the latest wave of protests, among which most critical ones have been along the Sham Shui Po - Tsim Sha Tsui corridor. He has been captured 3 times.

He is good friend with Gigi and her brother.

User Experience Mapping

Fig. 78: User Mapping through Hong Kong Island and Kowloon Island. All Users are Presumed to Take Public Transit, Including Bus, Railway (MTR), and Ferry.

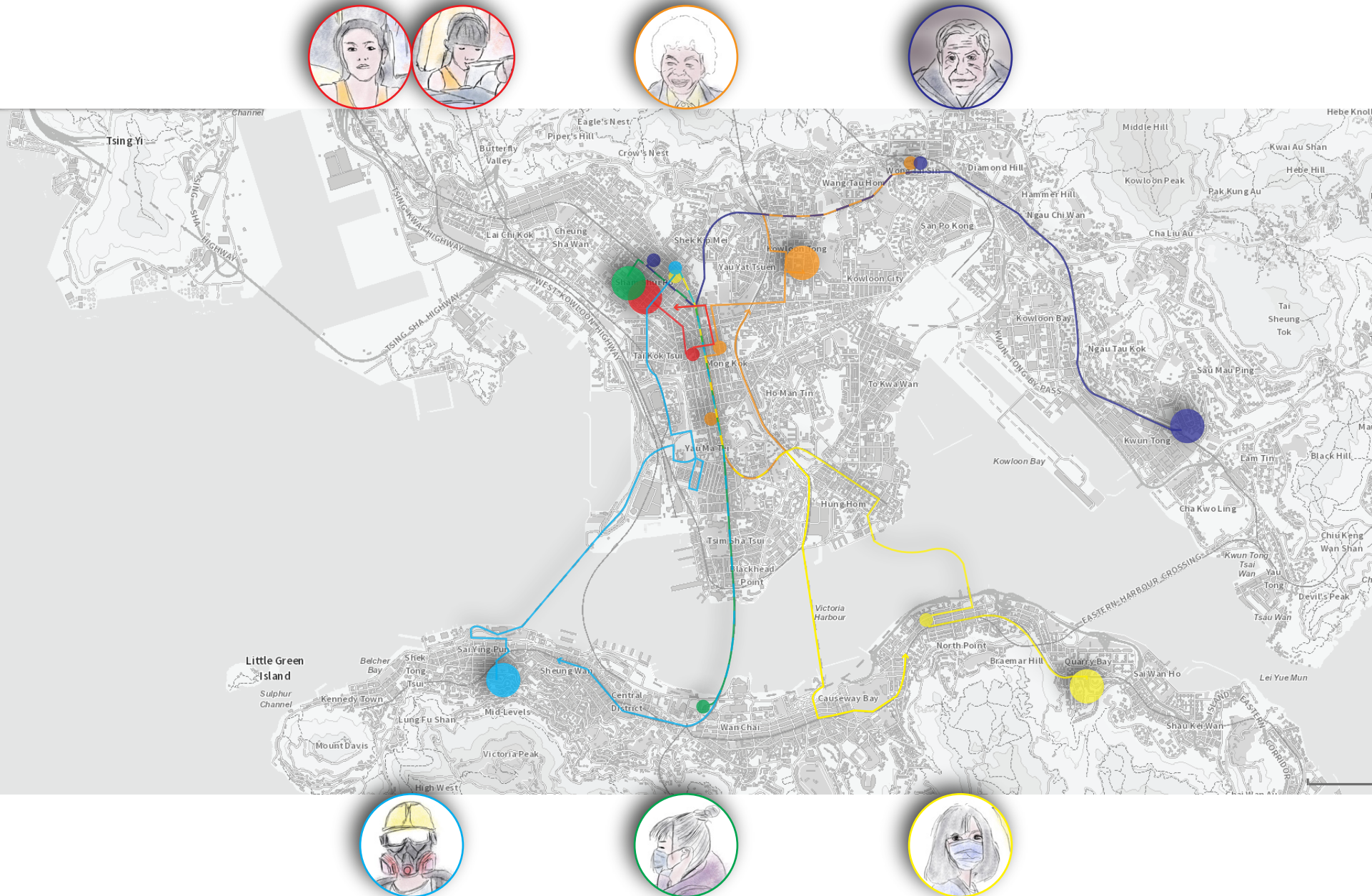
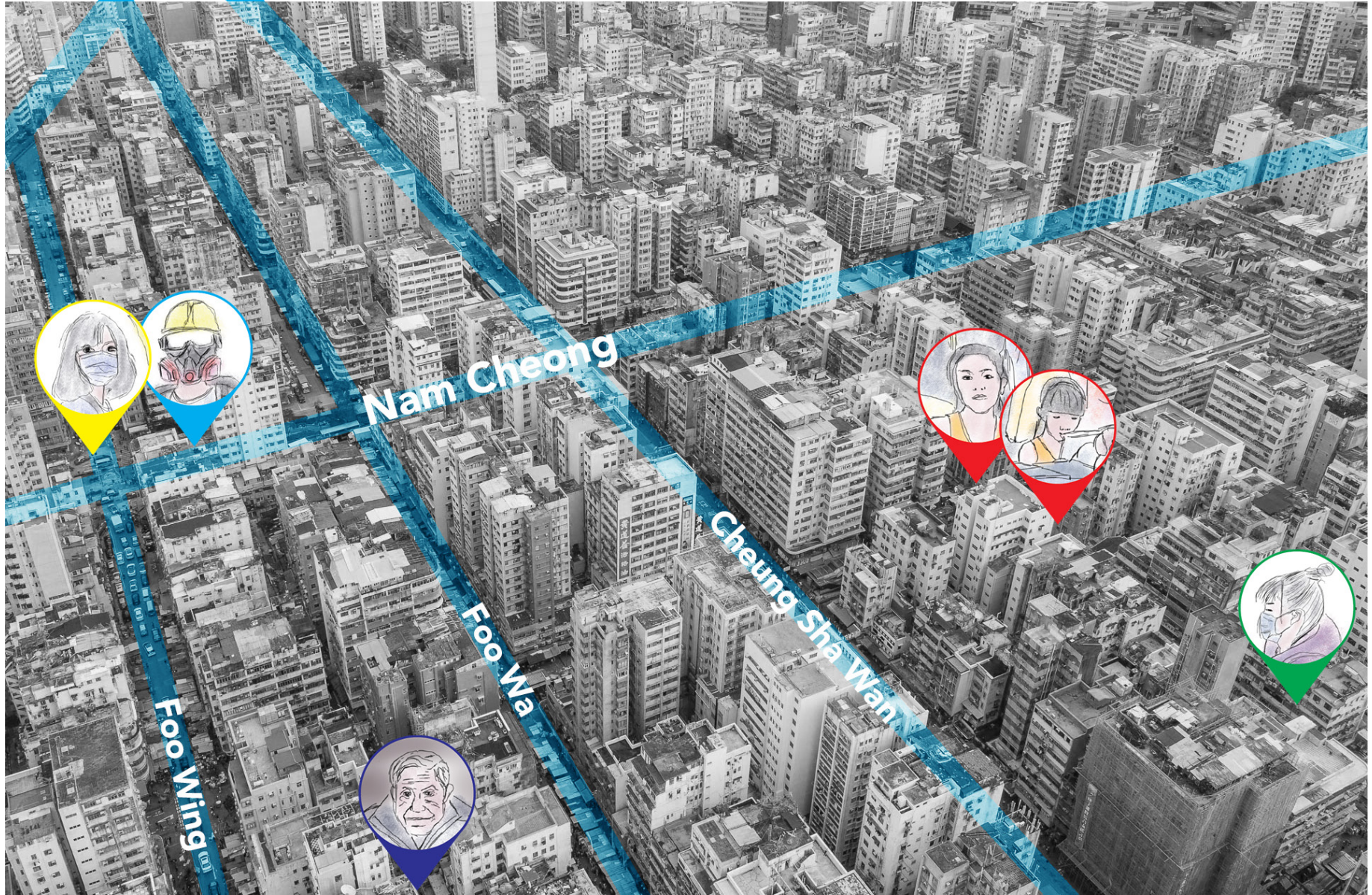


Fig. 79: Convergence of User Experience in Sham Shui Po
Original Image: Toby Harriman



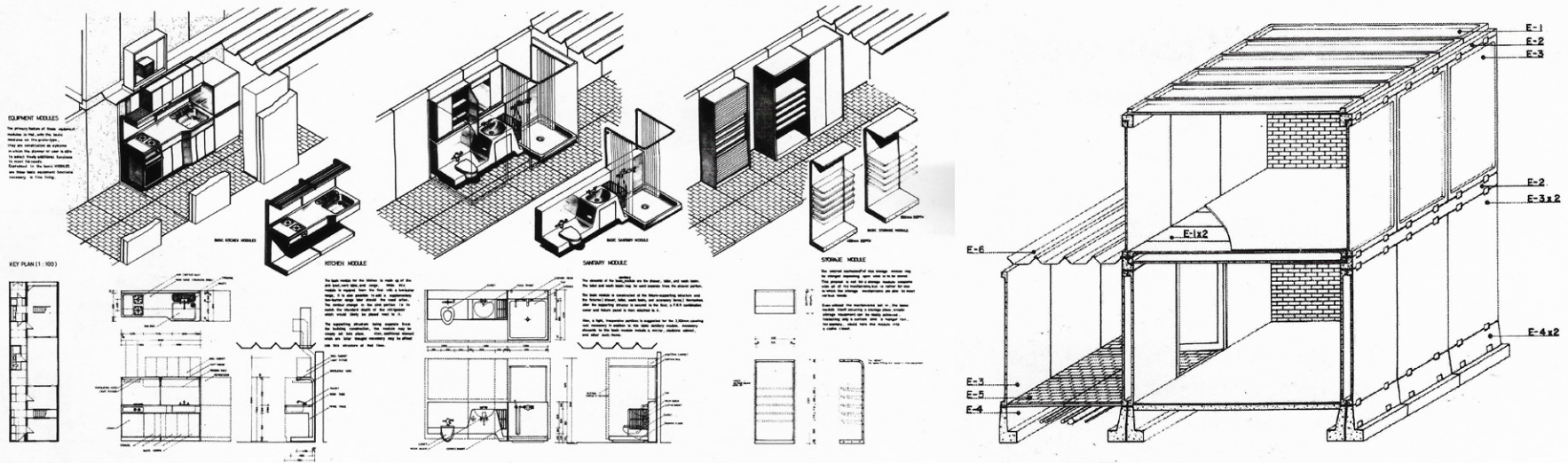


Fig. 80: Design Drawings for PREVI by Team Japan. *Metabolism: The City of the Future* (164)

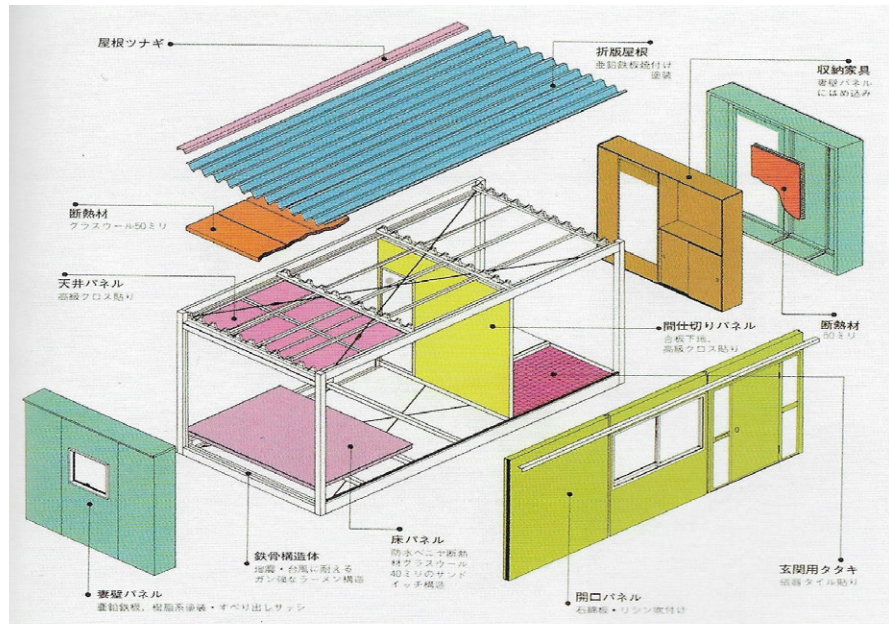


Fig. 81: Sekisui Heim M1. *The Japanese House: Architecture & Life After 1945* (051)

1 Mori Bijutsukan, International Union of Architects. World Congress, and Nihon Keizai Shinbunsha. *Metabolism, the City of the Future : [dreams and Visions of Reconstruction in Postwar and Present-day Japan]*. English-language ed. Tokyo: Mori Art Museum, 2011. Print. pp 162-164

Land, P.. *The Experimental Housing Project (PREVI)*, Lima: design and technology in a new neighborhood. In Bogotá, Colombia : Universidad de los Andes, 2015.

2 Fujioka, H., Hosaka, Kenjiro, & Tokyo Kokuritsu Kindai Bijutsukan, host. *The Japanese House: Architecture and Life After 1945 (初版.. ed.)*. Tokyo; Shinkenchiku-sha, 2017. Print. p 039

3. *ibid.* p 051

The standardization of parts enforces the **order** that would then foster **chaos** on the larger scale. Standards exist to ensure quality and safety, as well as the coherence and harmony of the parts when assembled. However, these standards do not and shall not coerce consumers to use any proprietary products. In fact, this development of a set of standardized parts serves as a blueprint that could then be used by any third party, even by the end users themselves, to manufacture their own parts, according to their ability and preference. This is a strategy to promote market competition, which will in turn create continuing refinements in quality and improvements in cost and efficiency.

Kit-of-parts designs have been used to not only create detailed construction documents, but to also study greater application and impact in an urban context, as can be observed in the “Nanolivingstructures” section of *Metabolism*. The PREVI competition in Peru in the late 1960’s is an example of this. Backed by the United Nations, the Modern Projects program in

Peru under architecturally trained president Fernando Belaúnde Terry commissioned renowned architect and academic Peter Land to host a mixed competition of domestic and international architects. Out of 13 international architects/groups invited to participate, the young Metabolist team of Kurokawa, Kikutake, and Maki produced a fascinating, comprehensive, set of modular parts based on the increment of 1 meter.¹ The set ranges from prefabricated floor and wall panels to designated service spaces such as kitchen module, sanitary module, and equipment module. This approach implies that these modules may be swapped to allow for the flexibility of life, which is the strength of the Metabolist thinking. However, the design still reflects greatly the “dedicated spaces” paradigm, while these spaces can serve multiple purposes at once.

Nonetheless, the Metabolist team and their design showed a long continuation of modular and prefabricated approach to housing in postwar Japan, from Maekawa Kunio’s **PREMOS House** (1946) which mass-produced some 1000 units as of 1951² to **Seikisui Heim M1** (1970) which was a prototype developed by Ohno Katsuhiko and the Sekisui Chemical Company and aimed to enhance production efficiency while reducing construction cost.³

In a similar manner of thinking, the design of parts in this project seeks to promote modularity and prefabrication. However, it also shows interest in a democratized market in which components may be produced by users too. Parts can be manufactured off-site using industrial methods, or on-site by the residents using anything from traditional carpentry (brise soleil) to 3D printing (floor panel).

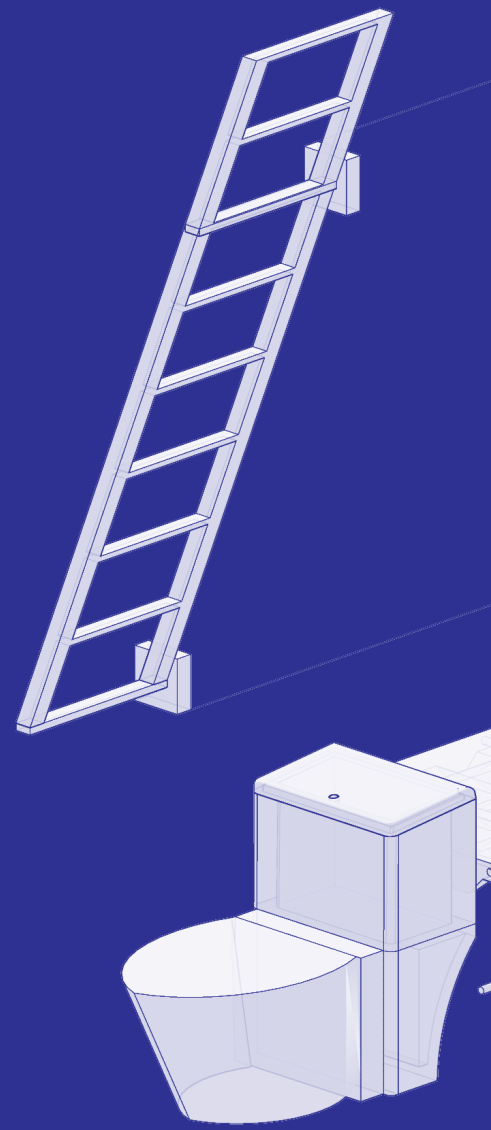
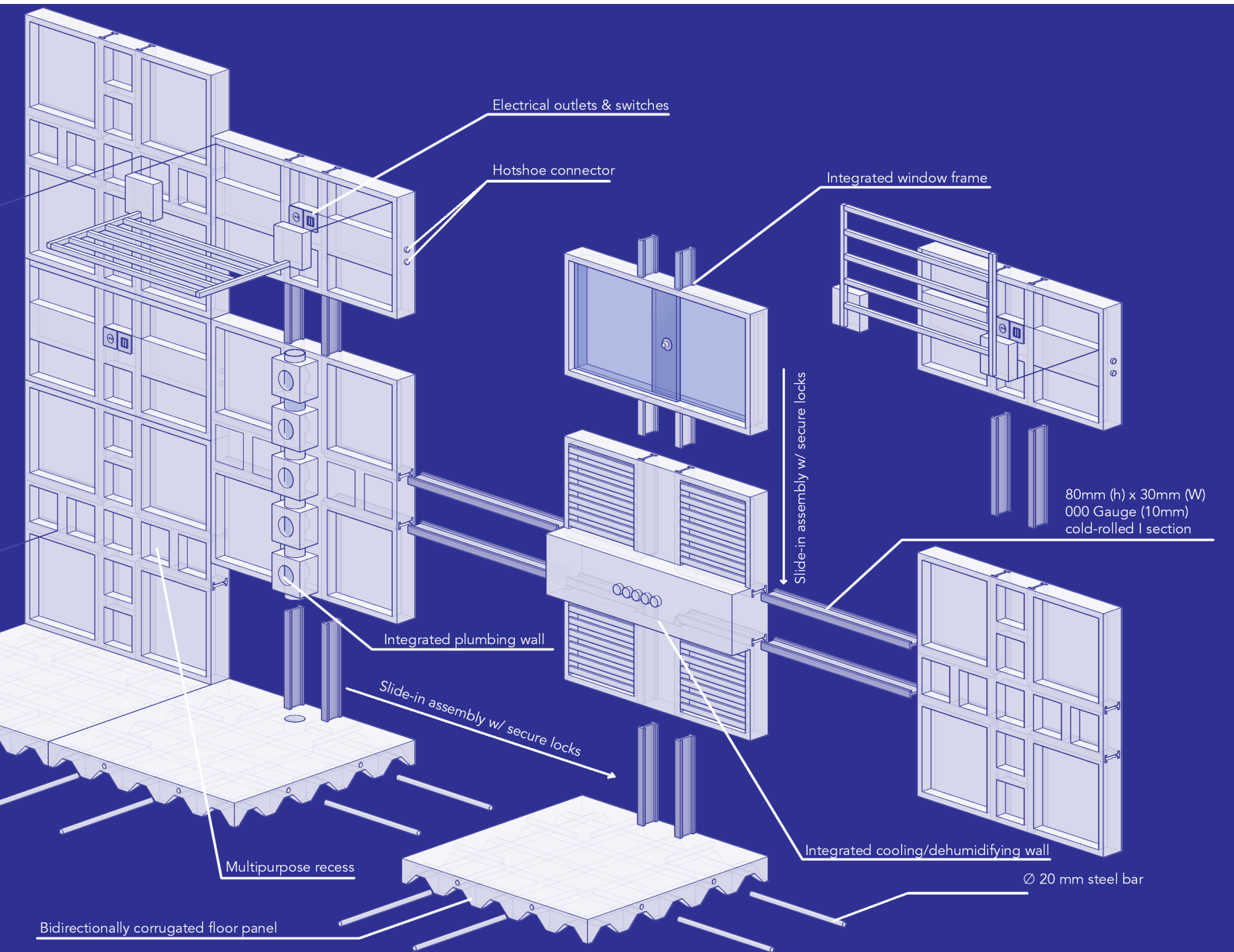


Fig. 82: Interior Wall & Floor Assemblies.



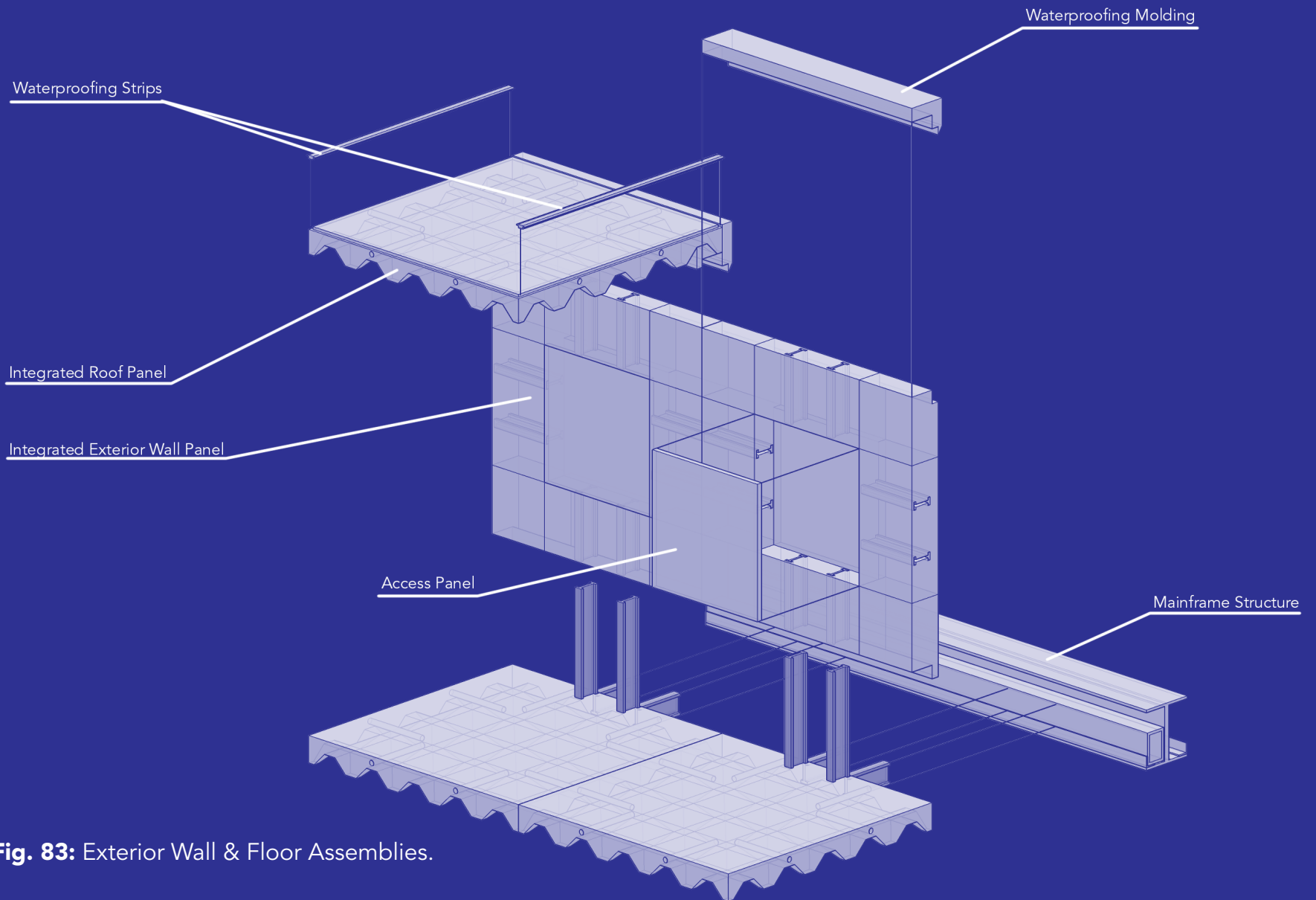


Fig. 83: Exterior Wall & Floor Assemblies.

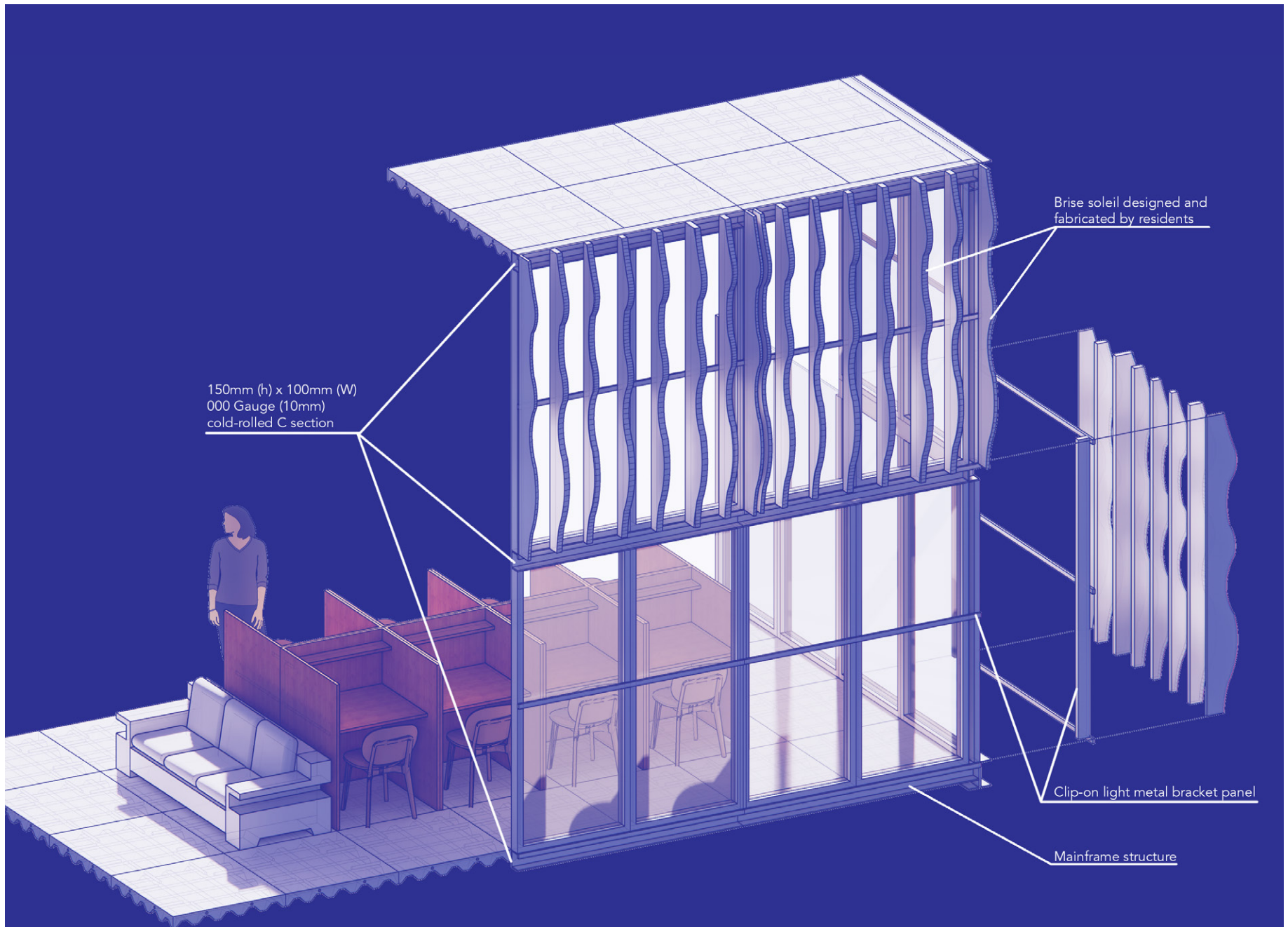


Fig. 84: Example of Fenestration System at Community Spaces.

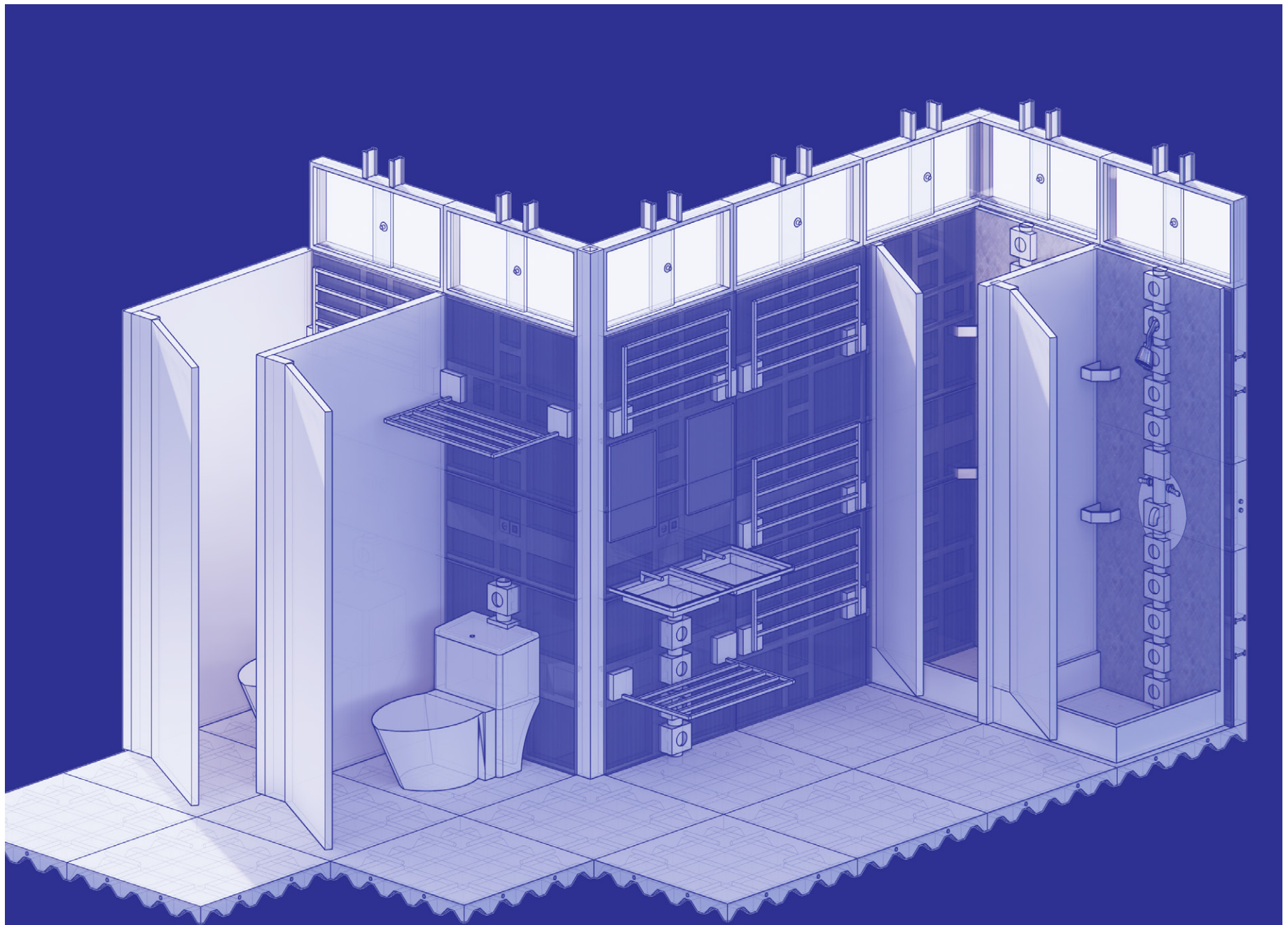


Fig. 85: Example of Communal Bath.

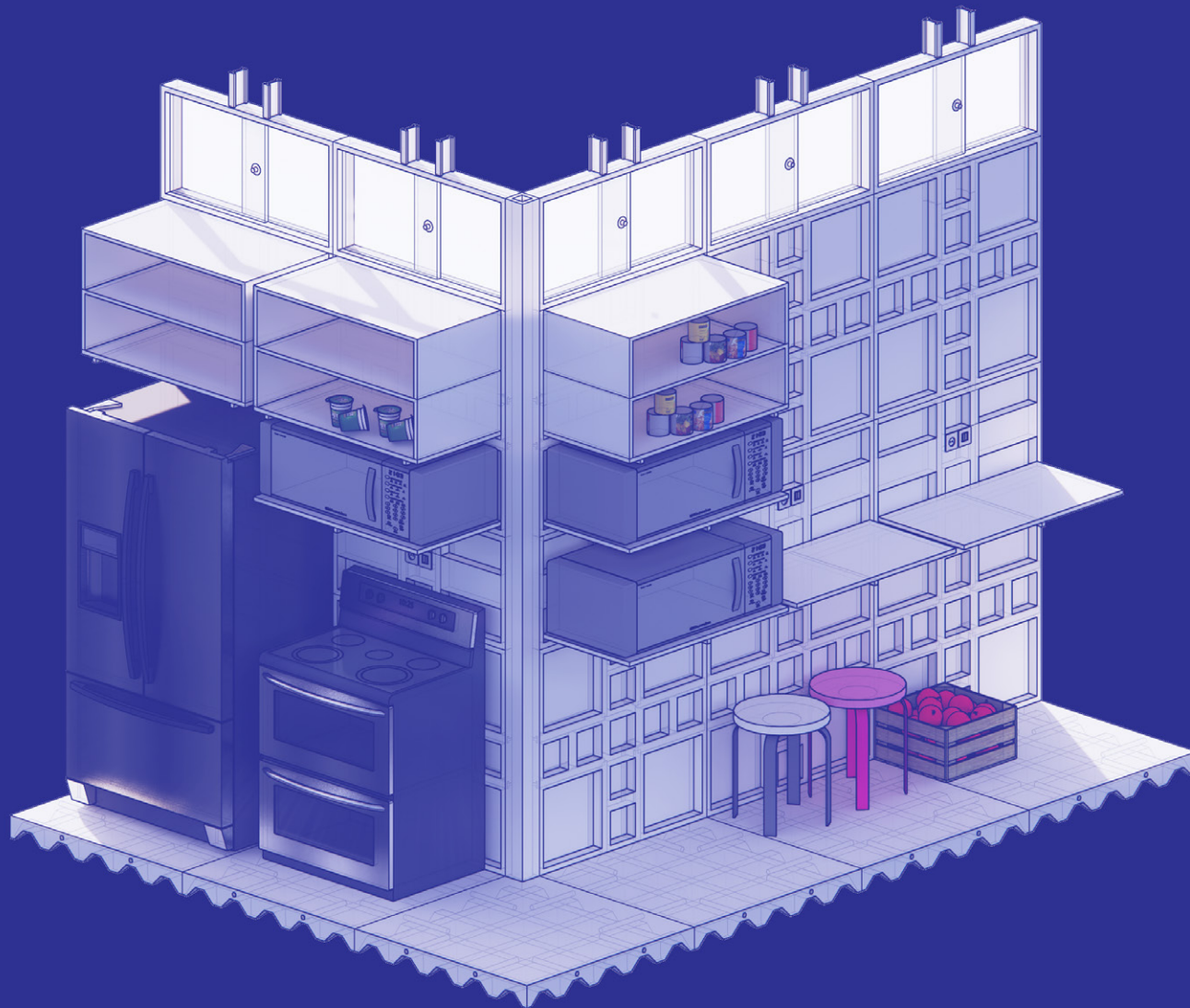


Fig. 86: Example of Communal Kitchen.

Design for Undo and Redo

Steel tube, predrilled at intervals to receive rods
HSS8x4 minimum

Starter steel rod

Bidirectionally molded
1m² floor panel

Molded cap strip when needed
Size varies

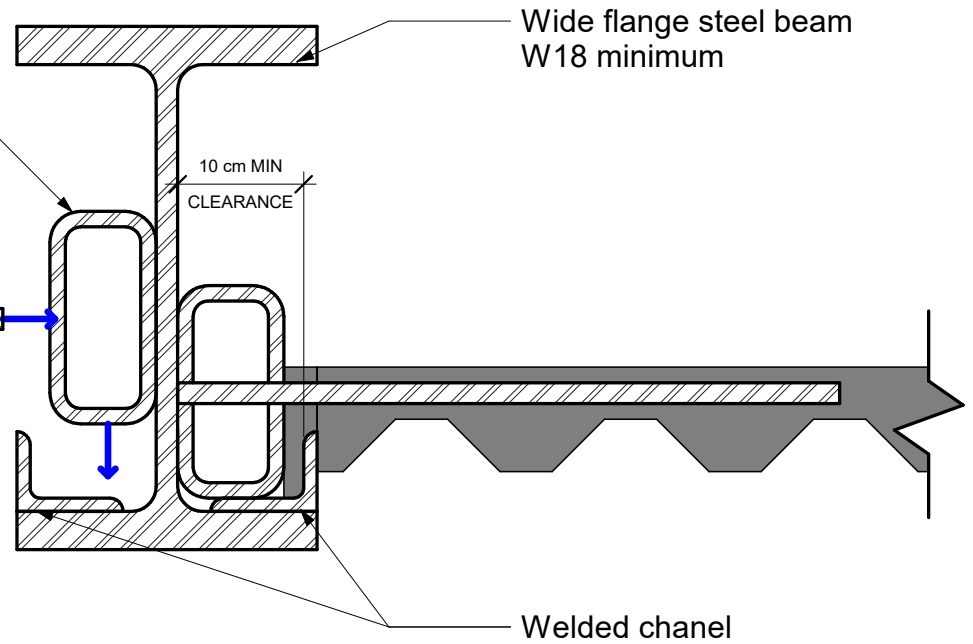


Fig. 87: Structural Support of Floor Assembly.

The assembly strategy promotes slide-in and bolted connections that could be undone rather than welded ones that are more permanent. To be sure, welded and other permanent connections are needed because they allow details to be quality-controlled and fabricated off-site.

As shown in the detail drawing above, the major structural component is the wide flange beam, which has to be transported using standard logistics and assembled with heavy equipment. Apart from that, the rest can be assembled by human labor, including and especially by the residents themselves.

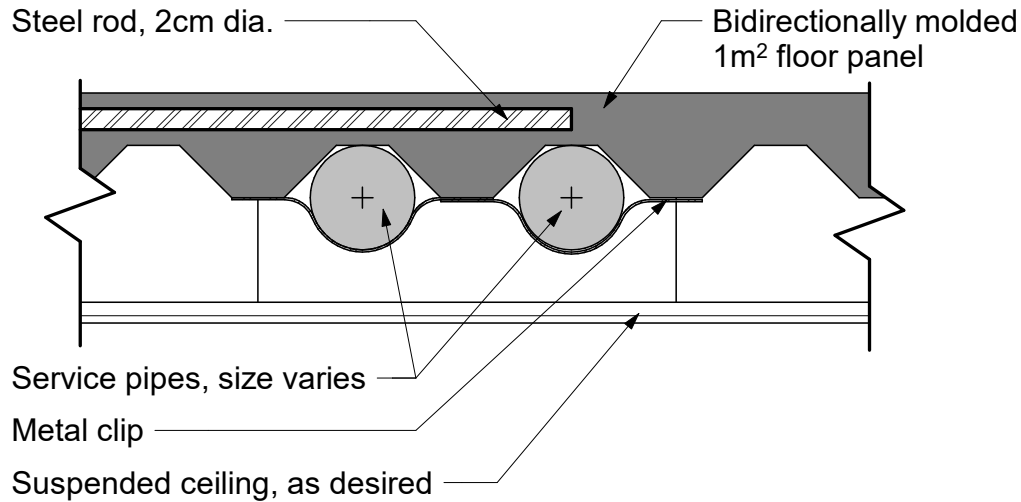


Fig. 88: Structural Support of Under-Floor Service Assembly.

Piping can be fitted under the bidirectional floor deck using appropriately sized clipping. Because the floor panels are molded in both directions, piping can go either way and can even bend up to 90° as needed. To make the underside of the floor accessible for maintenance, it may be left exposed or covered with a suspended ceiling system.

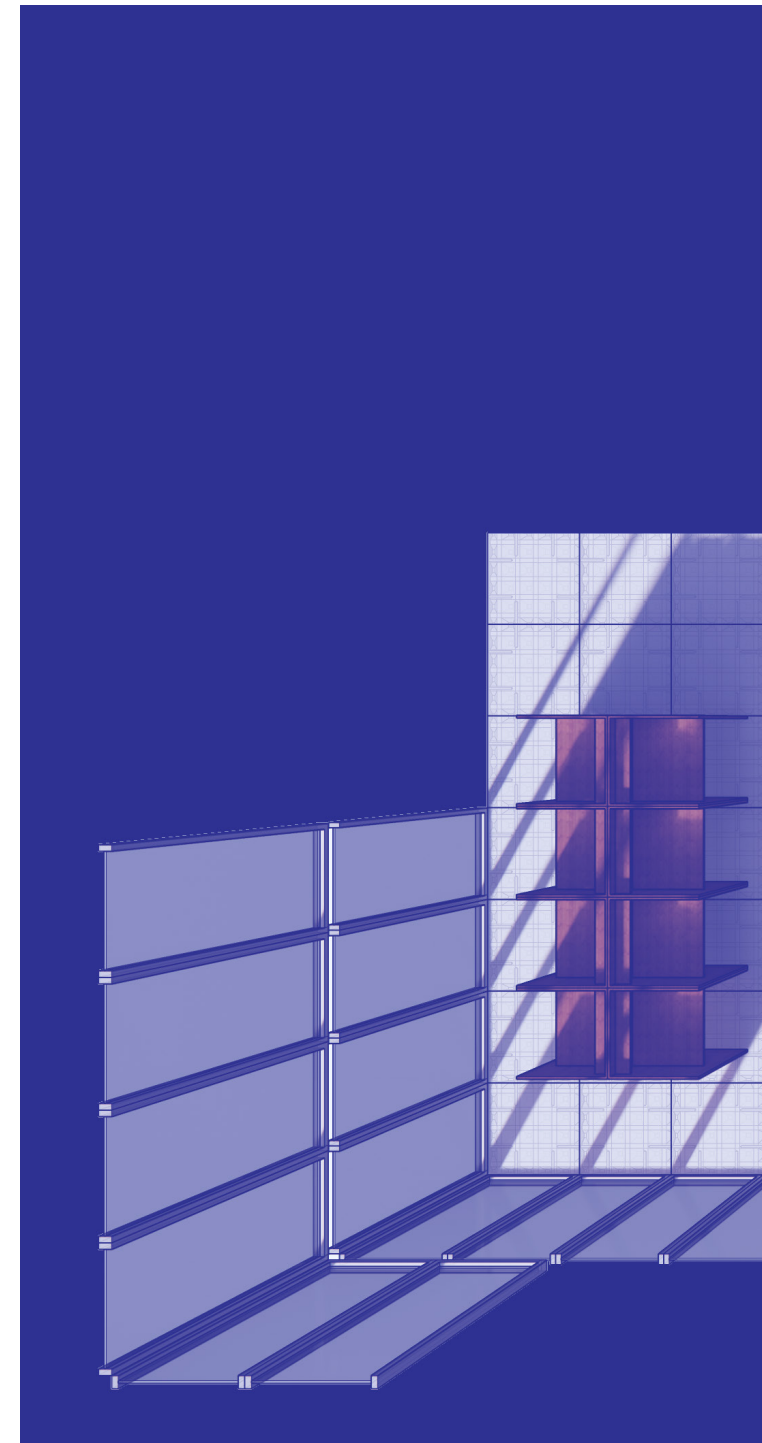
Other accessories to consider are acoustic and insulating components to fit into the underside of the floor and above the ceiling panels to enhance the sound and thermal quality of each unit. Residents in the units above and below shall work out this arrangement among themselves.

Use Implementation

Standardized components and unscripted spaces can be fit-tested to ensure they can facilitate the scripted actions of individuals in our sample group of users. The most important metric to evaluate is **flexibility**. The meaning of flexibility is two-fold:

- Spatial: Same components, through combinations, can produce vastly different spaces that cater to different activities and lifestyles.
- Temporal: Spaces can be modified, enlarged and reduced, in accordance with the changes that occur throughout the lifetime of the structure and its inhabitants.

The sample group of clients offers adequate input to simulate this flexibility in both **spatial** and **temporal** senses. In any case, the decision is left to the residents to alter their units as they see fit, thus making for the most efficient allocation of resources. The flexibility is then observed on two fronts: what each individual can do for their respective unit and how the community of such individuals can affect the building as a whole in a collective effort. The former is studied in this chapter, while the latter will be discussed in the next. The importance of these two scales cannot be overstated, as it selectively combines the strength of both nanolivingstructures and megacitystructures to create a new form of urban living that can be integrated into the cityscape of Hong Kong.



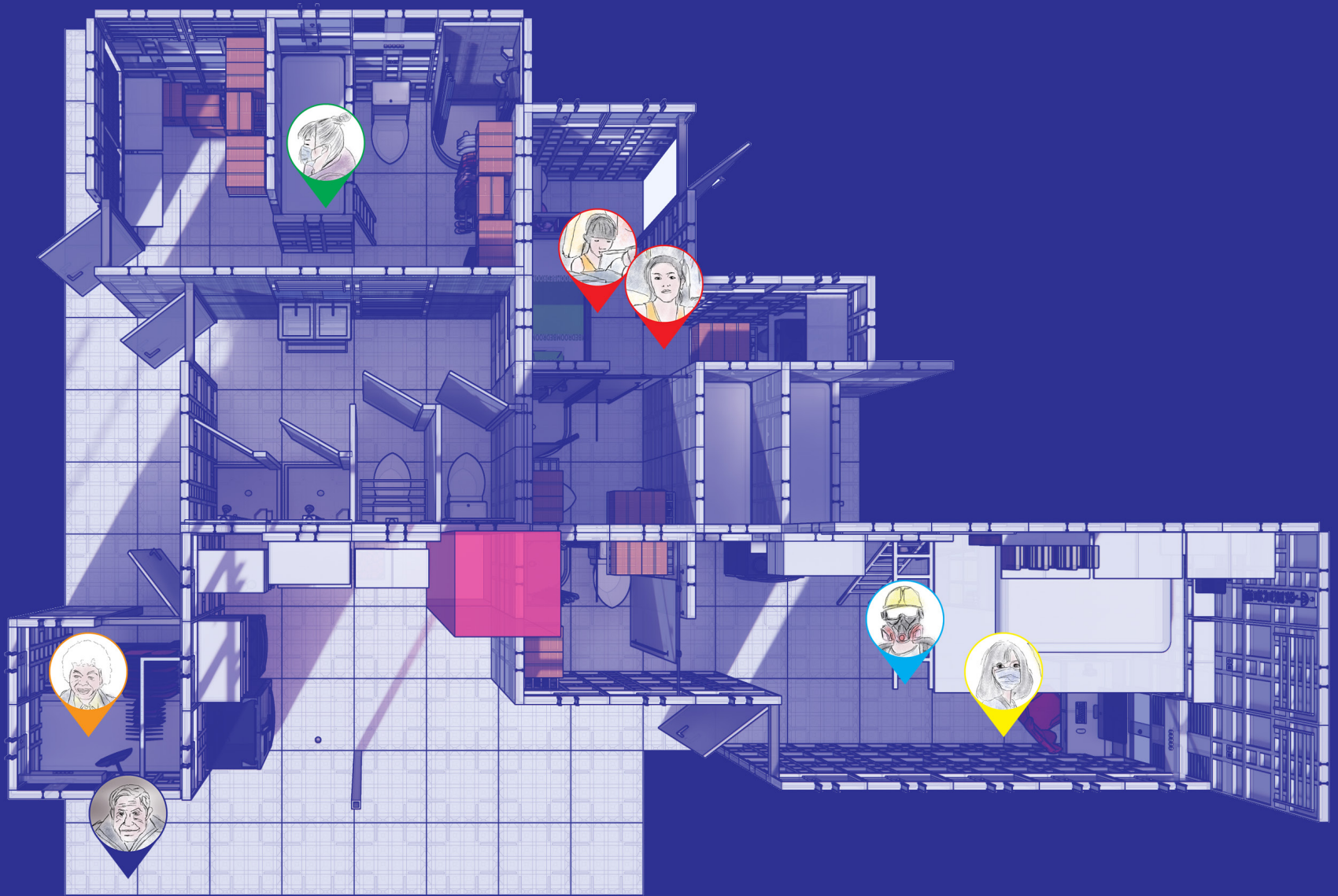
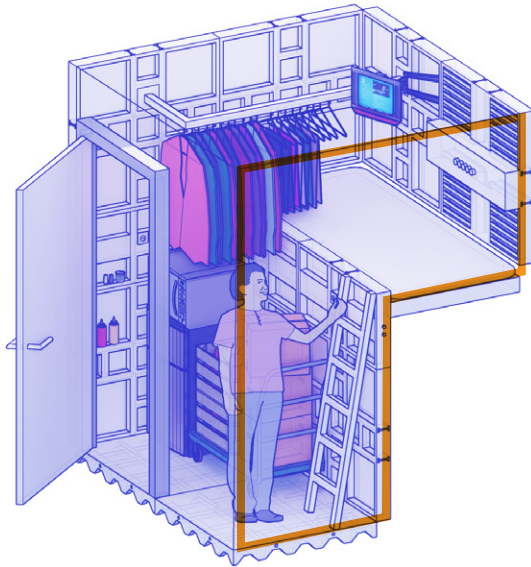
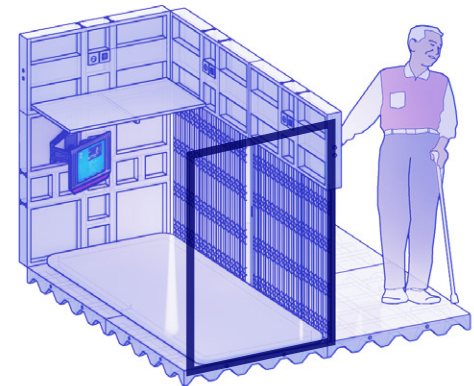


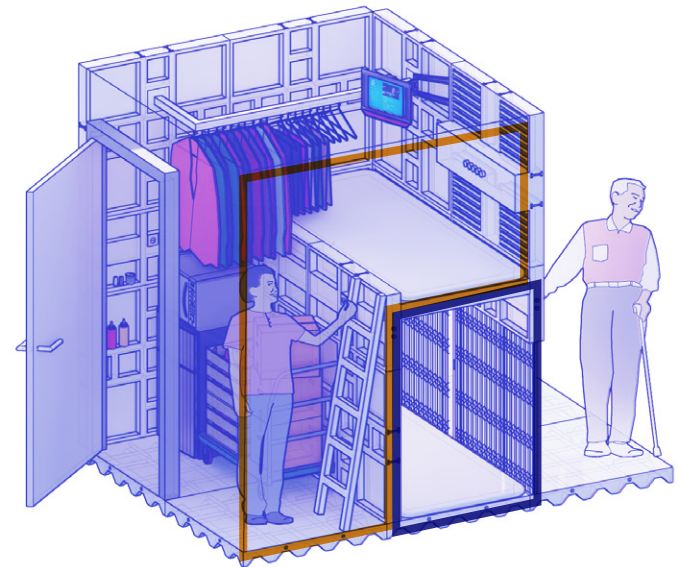
Fig. 89: Diagrammatic Floor Plan.



Aunt Tam has an elevated bed, Though she occupies an area of 4 m², she is charged 2.5 cubic meters less, helping her save on unused space.



Underneath Aunt Tam's elevated bed is Yip Lok Cheung's sleep alcove. While modest, this space serves as his transitional shelter and is a step up from his cage home.



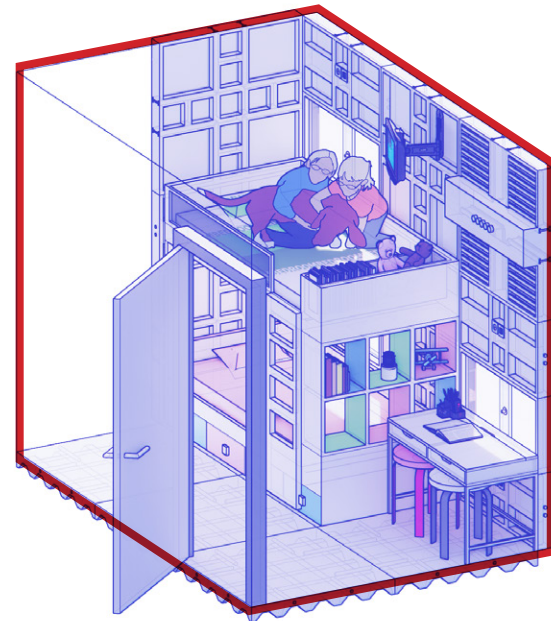
Aunt Tam and Mr. Yip's arrangement is one example of essential living spaces. These residents rely on the low-cost food industry in Hong Kong in which take-outs are cheap and convenient, so they never need a dedicated kitchen. They also use communal spaces in the building such as water closets, kitchen, lounge, tool shed, and library. These spaces outside of the sleeping compartment are their social infrastructure and are incorporated into the building.

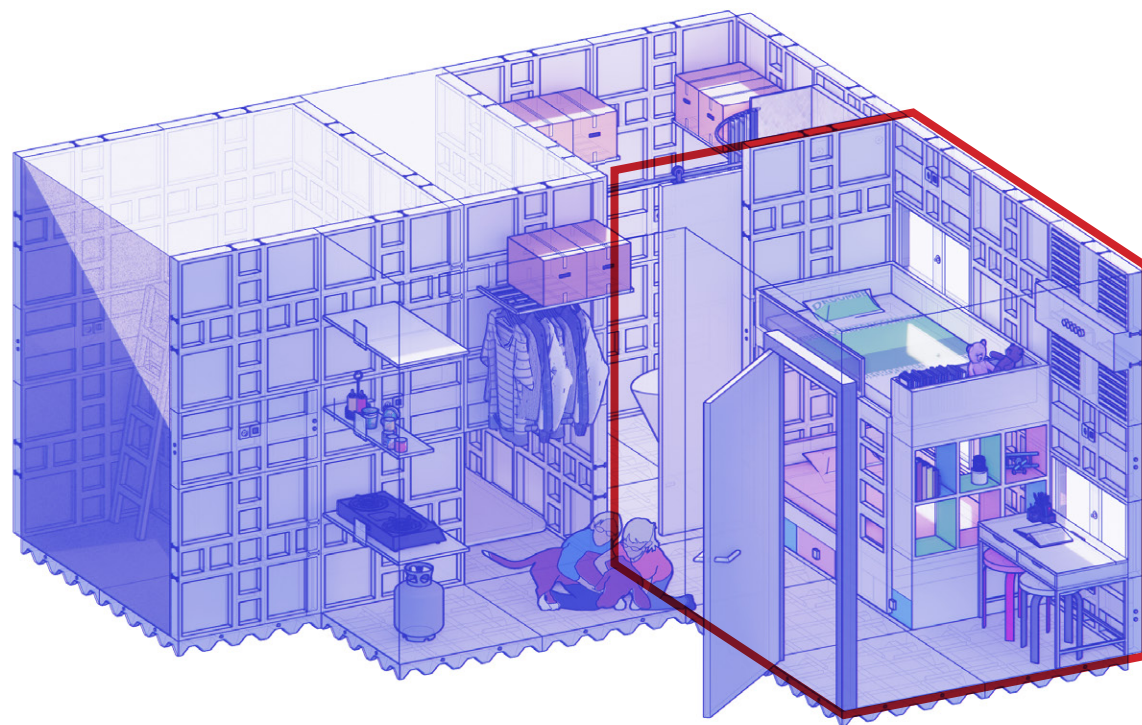


The Chou sisters still share a bunk, except they have their own beds now. At 6 m², their bedroom offers enough space for a desk and storage for clothing with smart wall shelvings.

Their parents have a double-wide sleep alcove. Even though family members can constantly see each other, this arrangement still offers a level of privacy.

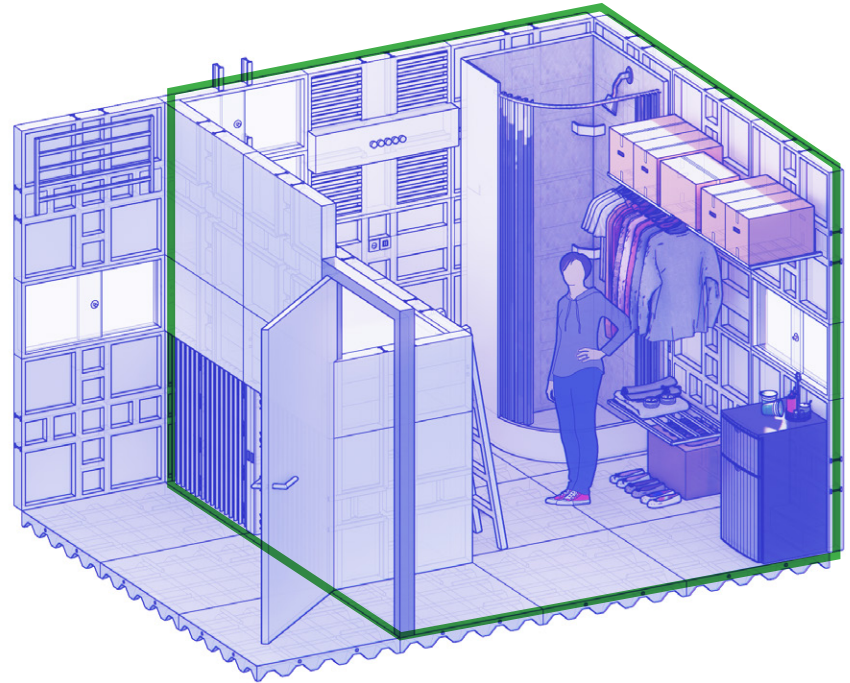
The Chou family also has a kitchenette and a bath/closet hybrid.

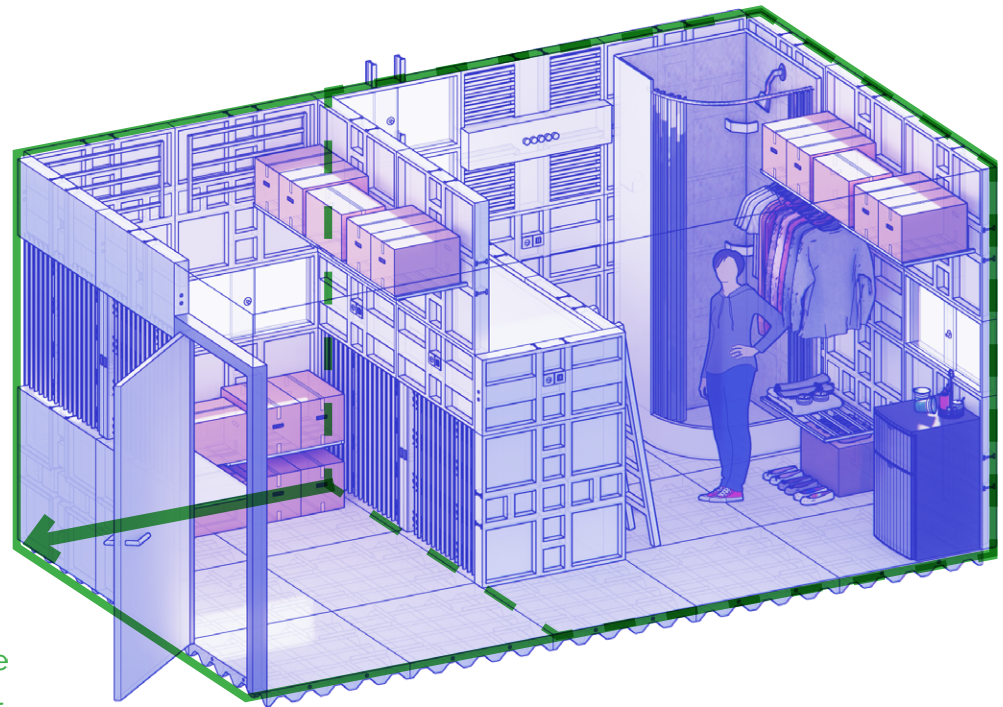






Elaine Hui's room includes shower and toilet, using in-wall plumbing connections. This arrangement works for a single person who does not need other features, like a space to cook. The 3D egg-crate floor system doubles as both structural and conduit-carrying element. Hers is also an elevated bed. Outside her apartment is a sleep alcove that she could rent out or use as a secondary storage for her store in Wan Chai.



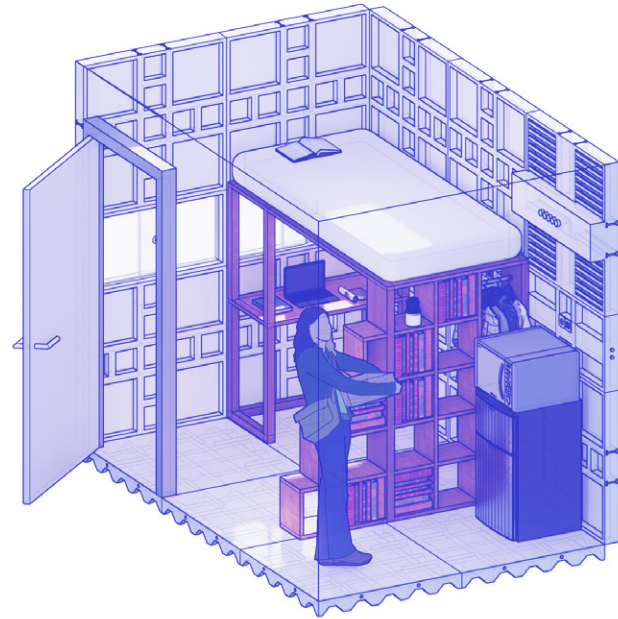


After a couple of years, Elaine gave the apothecary shop in Wan Chai to her younger brother, acquired the space in front of her unit, and turned it into a small grocery store selling dry foods to neighbors in her building.



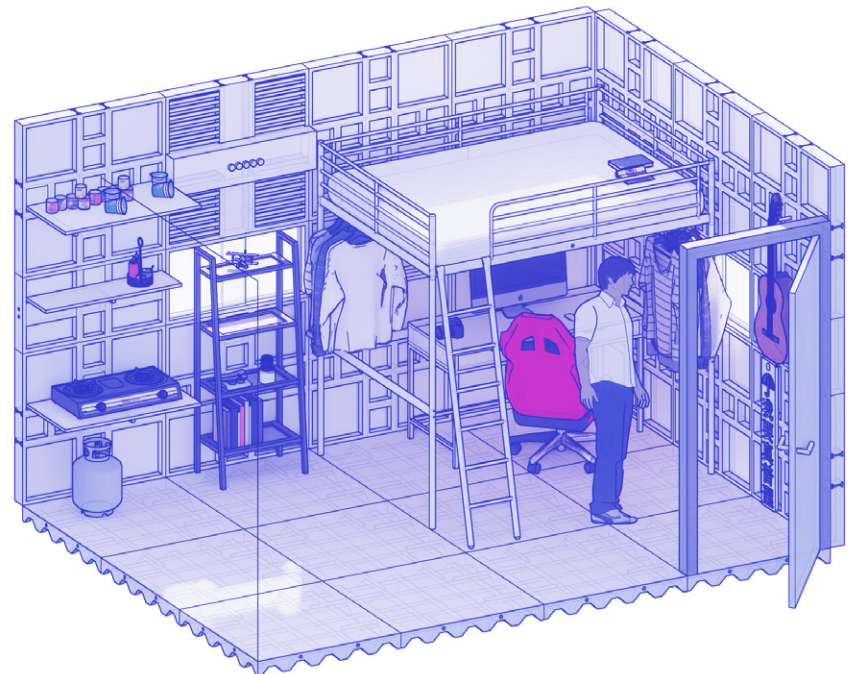
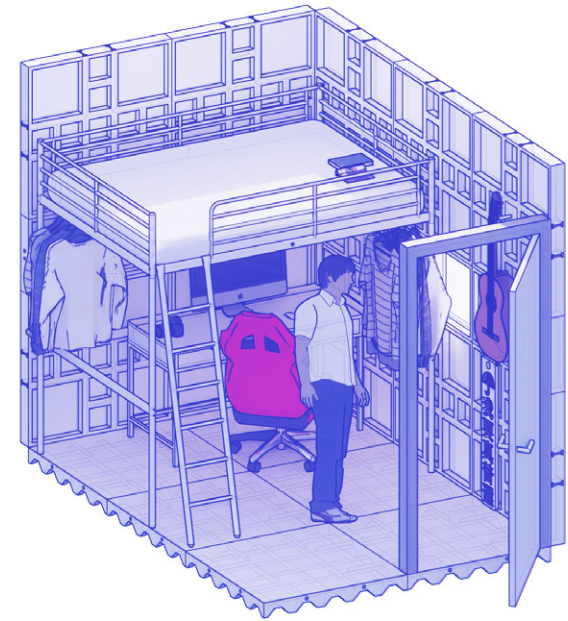
Gigi moved out to a 6 m² room a year before she finished college, using her part-time earnings and her brother's help to pay rent. Her bed doubles as a study space too.

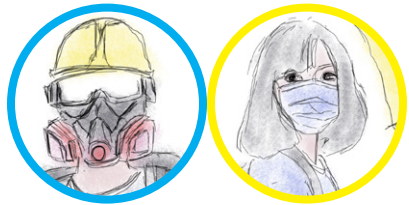
This room is perfect for concentration while studying, though Gigi also liked to use the community library inside her tower to study, where she also worked as a part-time librarian. She also volunteered to tutor the elders in computer and internet literacy.





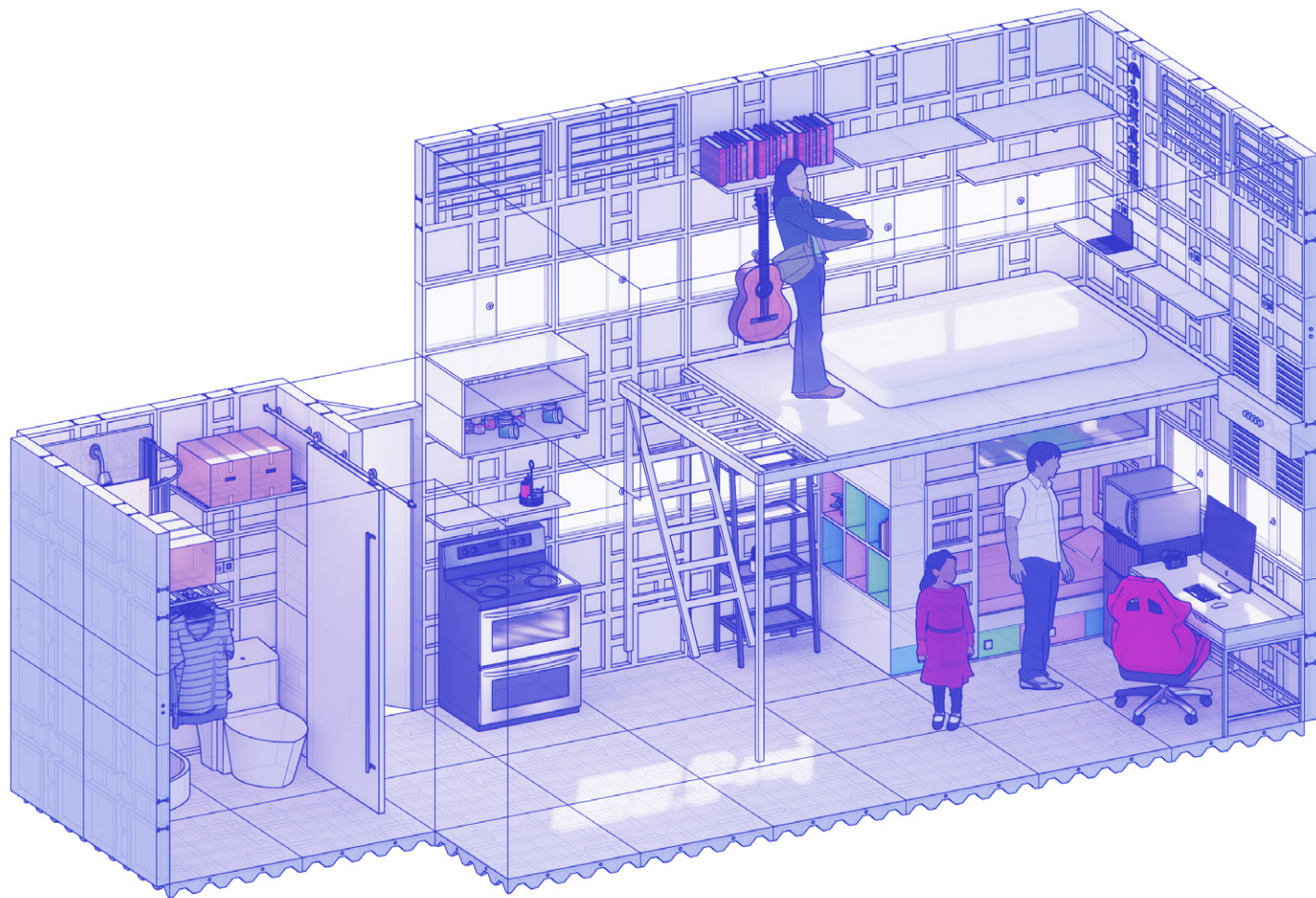
Patrick finally moved out as well, first with his freelance pay. Later with his permanent salary as a photojournalist, he expanded his unit once, of course with the addition of the much-needed cooling wall panel.

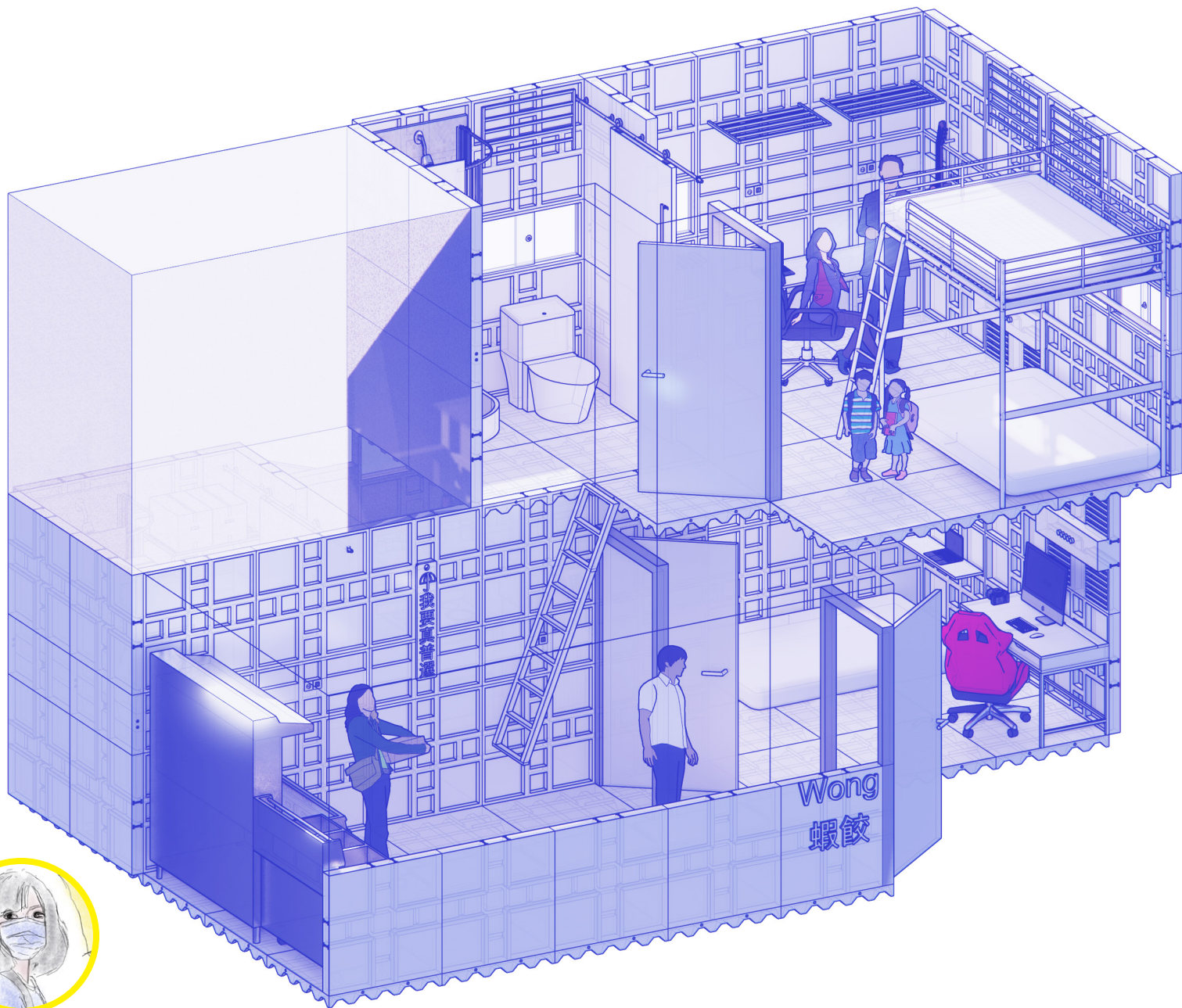


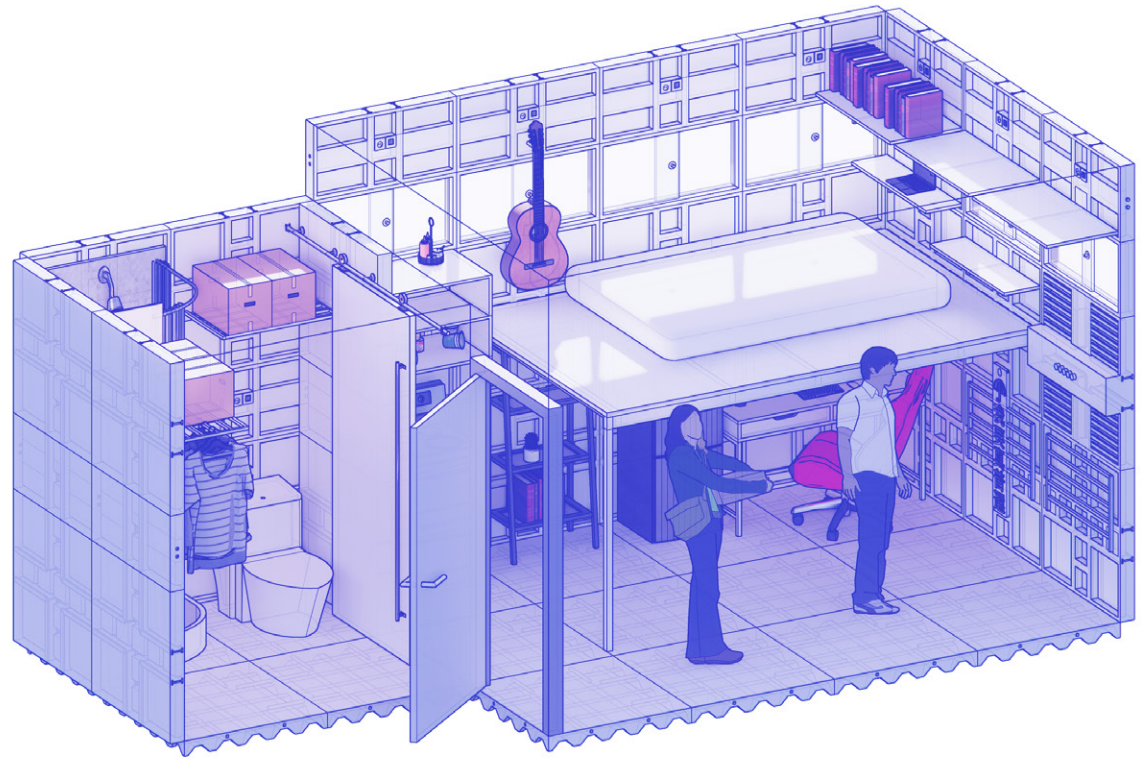


Patrick asked Gigi out and after being together for a few years, the couple gave birth to baby Sophie. They then expanded Patrick's unit once more (next page).

Before Gigi moved out of the old unit, wall and floor panels were flat-packed and stored away. They were then used for this expansion.







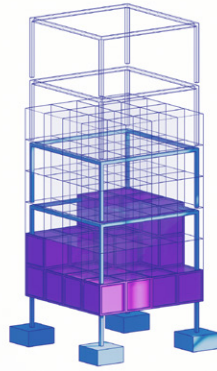
Patrick and Gigi expanded the loft into a full studio when Sophie turned 12. Sophie became a novelist, got married, and moved to the UK with her husband Lucas who works as an architect, whom she met while he came to Hong Kong to study Metabolic urbanism. Together, they have two kids.

Gigi and Patrick retired from office jobs and opened a by-the-counter *har gow* shop by annexing 12 m² right outside their residence. Sophie's old room

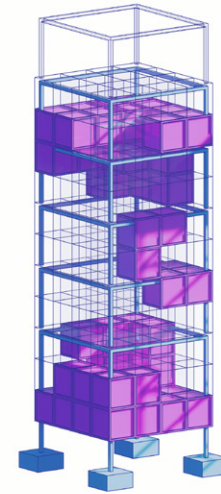
serves as a guest room whenever her family comes to Hong Kong, or gets rented out for short-term stays. Sophie and Lucas' kids often spend weeks here when their parents go on international business trips.

When Gigi and Patrick fully retire, they will be aging in place. The *hargow* shop will be converted into living space, at which point Sophie's family can move back with them permanently, or they can lease the space. Otherwise, Gigi and Patrick can retreat into a reduced apartment.

Financing Models



BUILD AS YOU GO



CO-OWNERSHIP



EARLY ADOPTERS

UPFRONT COST

Minimum

Shared absorption

Investor-burdened

TENANCY

Early tenants have lower rent as trade-off for view

Investing tenants get future returns

Early adopters get premium benefits

FRAME

Flexible growth

By arrangements

Fixed as built

UNITS

From ground up

By arrangements

Most likely from top down

DEMOGRAPHICS

Low-income first, well-off later

Mixed at any time

Well-off first, low-income later

There are various possible ways to finance a *plugin housing* tower, which can be sorted in three main categories:

Build As You Go: This model has the least upfront cost because the frame only needs to grow as more tenants move in, making for the most flexible financial option for developers in the beginning. It however shows a shortcoming when early tenants will not have a choice but to live close to the ground, thus sacrificing view and fresh air. This could be addressed by offering early tenants lower rent and rent freeze for a certain period.

Co-ownership: The partnership between developers and prospective tenants helps absorb the upfront cost and expedite financing the project. In return, investing tenants enjoy profit-sharing in the future. The tower may take final form in the beginning or much later, depending on internal arrangements between managing members. This financing model also allows for mixed incomes at any given time, since not all tenants have to invest in the construction.

Early Adopters: Investors/developers have to pay out of pocket for upfront cost of construction. They may procure capital by recruiting prospective tenants, who are most likely wealthy enough to alleviate the cost. This method is similar to crowd-funding in grassroots product developments. In return, these tenants enjoy premium view and other perks. This means that the frame is a one-time construction, and the earlier the tenants move in, the better options they have for a unit.

Regardless of the financing methods, all infrastructural elements need to be accounted for very early on. Major sewer lines, footing, and vertical lifts are some fixed components that need to exist from the beginning. These components are determined by the maximum allowable building envelop, which is informed by building code, zoning, and other ordinances per district in Hong Kong.

The development of new Plugin Housing towers will also provide an opportunity to study different business models at different testing locations in Hong Kong; these locations will be discussed further in the next section. Success level of each method will vary in the initial implementation, which will inform the next phases of this new market. No matter the case, the market shall be democratized and open so that private competition can occur. This will encourage the most viable and functional to remain, while ruling out the least resistant to market frictions.

It is also strongly recommended that the market offers various business models at once, so the occupants will have options. As they find the best fit, they can simply move to the building that is financed the way they want.

As discussed in previous chapters, all land and land use in Hong Kong are managed by the Hong Kong Government - or the HK SAR Government to be exact. The distinction of language that one shall be clear about is that while the management is performed by the local government, the official ownership belongs to mainland China. This status is expected to change in the future, after the 50 years of transition (the "One Country Two Systems" motto) since the Handover of 1997 tapers off, in which mainland authority will have more say in the use of land. Mainland developers have already been quite active in the Hong Kong market as of late.

Under the governance of the HK SAR Government, virtually all land use is leasehold, as opposed to freehold in many other places. This means that the government enforces a standard lease term policy, which generally has the duration of 50 years for long-term commitment. Additionally, special-purpose leases like gasoline stations usually have a lease of 21 years, while short-term ones such as car park facilities typically have a one-year contract.¹

Metabolic Plugin Buildings will most probably have the long-term agreement of 50 years before a renewal is needed. However, if the month-to-month lease basis makes more sense in making the land more affordable to tenants while still generating sufficient revenue for the landowner, i.e. the government, a negotiation shall be made possible. In other words, we don't factor in that the tenants of Plugin Housing enjoy any cost reduction on land lease, because that would be unwarranted. Nonetheless, we can always advocate for a flexible lease agreement policy, so the developers-occupants can make a balanced choice.

¹ Lands Department. (2017). Land Tenure System and Land Policy in Hong Kong.

<https://www.landsd.gov.hk/en/service/landpolicy.htm>

Lands Department. (2020). Short Term Tenancy Tender Result Records: Year 2020 First Quarter.

<https://www.landsd.gov.hk/en/stt/2020q1.htm>

Tenant	Dragon Parking Ltd.	Goldway Parking Ltd.	Prince Edward Petrol Station	Kai Tak Redevelopment	Castle Peak Residence
Tenancy Type	Short Term	Short Term	Special Purpose (21 years)	Residential (50 years)	Residential (50 Years)
Location	Tsing Yi, New Territories	Sham Shui Po	Kowloon	Former Kai Tak Airport, Kowloon	Tuen Mun, New Territories
Area (Square Meter)	546	5,540	747.6	18,353	13,538
Cost per Time	30,800/Month	573,000/Month	564,000,000/21 Years	15,952,900,000/50 Years	3,500,000,000/50 Years
Cost per Floor Unit per Year	676.9/m ² /Year	1,214.2/m ² /Year	35,924.5/m ² /Year	17,384.5/m ² /Year	5,170.6/m ² /Year

Fig. 90: Market Rate Comparison of Some Recent Auctions.

Source: Lands Department Sales Reports

<https://www.landsd.gov.hk/en/stt/2020q1.htm>

<https://www.landsd.gov.hk/en/landsale/records/2019-2020.pdf>

For example, according to a few recent land sales reports by the Lands Department of Hong Kong, short-term tenancy enjoys lower cost per floor unit, compared to other types of land use. However, that is because these establishments are typically low-rise, pay more in tax, and can be relocated on short notice. This type of low-profile land use is suitable to Plugin Housing towers that are temporary and small. On the other hand, suppose a residential tower in Kai Tak or Castle Peak has 40 stories; suddenly their cost per floor unit does not seem as high when the same number is divided by 40. When we need to build higher, the long-term lease will be considered.

Another way of viewing these numbers is by cost a tenant is expected to cover each year. A single-bay Plugin Housing tower can afford 40 tenants per floor at a foot print of 256 m². A 40-story tower is able to house up to 1,600 occupants; even accounting for spaces dedicated to shared functions at 10% of space use, we are still looking at 1,440 occupants. A development site in Kai Tak Peninsula at \$17,384.5/m²/year

means that each of the 1,440 occupants has to shoulder 3090.5 HKD (~400 USD)/year to cover land cost. This, of course, is a prime location for extremely high-end developments, and we use this only to illustrate that we can afford land at market rate, so long as density and occupancy maintain. At other locations, especially residential areas and poorer districts, land cost will be much lower.

Furthermore, before making any new land lease, Metabolic Plugin Housing developers-occupants shall make an effort to reuse old buildings past lease, especially the *tong laus*. Depending on the date of construction and lease, many of these buildings are not subject to the latest lease rate, and therefore can be part of the cost-saving mechanism. Plugin Homes can first have a symbiotic relationship with these old *tong laus* before eventually replacing them as they are past repairable condition.

Sham Shui Po Coalition

In 2025, Patrick Wong became a district council member in Kowloon West, representing the district of Sham Shui Po. He advocated for an experiment with Plugin Homes, and led to form a local coalition that included Gigi Ng, Elaine Hui, and Elsa Chou. This group - named the Sham Shui Po Coalition (SSPC) - promoted Plugin Homes to prospective dwellers and investors, and garnered lots of interest in the public.

After months working with - and sometimes against - LegCo (Legislative Council of Hong Kong), the group succeeded in lobbying to free up regulations and release a blockade that would otherwise prevent the construction of Plugin Towers, especially the use of land. Hong Kong has a system of *leasehold*, and the government is the sole *freeholder*. This means that the government determines land use and market price, which it uses to auction land lease and generate revenue. This also means that in order to obtain a piece of land for development, an entity has to pass both finance and land use approvals.

The SSPC successfully campaigned to get “privately owned structures in shared ownership, constructed with interchangeable components, in the low-cost housing category” approved for land use, while generating enough liquidity to win a land bid in a crowdfunding project. This allowed the first Plugin Tower to be built without the need of any single-party investment. The SSPC hired a team of architects and contractors who were experienced in modular construction and digital fabrication. Because the project was the first of its kind, it took one year to fine-tune the details. Elaine, Gigi, and Patrick formed a co-op that would then monitor and maintain the building. They were also among the early adopters who got to choose the location of their lofts as a bonus. Later tenants

like Aunt Tam and Mr. Yip could also opt in to be part of the co-op with a small annual fee. The first Plugin Tower was started at the site of an abandoned tenement block in Sham Shui Po in 2027. No completion date may be found, as the structure continued to grow and be modified over time. The first 10 stories were built in the first construction phase.

As demonstrated, the SSPC used a mixed mode of financing models to fund their project, but with an emphasis on Co-ownership. The co-op board could vote to determine rent, and its investing members could be part of the internal profit-sharing of the building. How and how much they generate is left entirely to them to decide. The money would first go to pay the outstanding lease, its proceeds could go into funding future maintenance, renovation, a new Plugin Tower, or deferrals of tenants’ past due. This system allowed any residents to be part of the board, so that there would always be checks and balances to ensure no overstepping of power would ensue.

After the first Plugin Tower had been in use for one year, other metabolic towers also started to populate around Hong Kong, first in sub-prime areas like Quarry Bay, East Kwun Tong, Wong Tai Sin, and Yuen Long, and later in central locations such as Sheung Wan, Wan Chai, and Hung Hom. Each new building came with new modifications and improvements. The cost to build later iterations also became significantly less, thanks to lessons learned in earlier projects. Designer and builders became more versed in this kind of construction, which benefited the efficiency and turnaround of these projects. On the investment side, market competition also became lively. Private investors competed with co-op groups like SSPC in both quality and cost, knowing that these groups could outbid

Patrick Wong elected as SSP District Council | May 10 - May 10

Sham Shui Po Coalition (SSPC) created | Oct 11 - Oct 11

First public legislation review with LegCo | Mar 12 - Mar 12

First crowdfunding campaign | Mar 26 - Apr 26

Project proposal cleared for landuse approval | Aug 27 - Aug 27

Project architect and manager hired | Sep 1 - Sep 1

Second crowdfunding campaign & Schematic design revealed | Sep 15 - Oct 15

Construction of first Plugin Tower began | Oct 1 - Oct 1

Tenants move-in date | Apr 1 - Apr 1

Construction of new Plugin Towers in Quarry Bay, Kwun Tong, and Yuen Long; IKEA and Home Depot officially opened local branches to supply building components for Metabolic housing | Apr 1 - Oct 1

Fig. 91: Major Milestones of Metabolic Plugin Housing.

their commission at anytime.

In 2029, IKEA HK began to offer a whole section of off-the-shelf components that were mainly used for Plugin Homes. Home Depot also arrived in Hong Kong and mainland China that year as a home improvement emporium. Unlike the original Home Depot in North America, these international branches specialized in prefabricated components in direct competition with IKEA HK, Alibaba, and Amazon China. However, these international enterprises struggled to rival with Harbour City Builds - a local manufacturer of plugin components with factories in Lantau Island, Aberdeen, and Shenzhen. The company was known for making hardboard using bamboo, reclaimed wood, and resin of recycled plastic.

This shall conclude our small novel that follows seven characters. Though a fictional narrative, it is still a very attainable scenario. This work of fiction is not dissimilar to a construction document, except this is the projection of a timeline full of possibilities and not about a single building. Moreover, this shall not be the only projection. Much like Metabolic architecture, it shall be a story that writes itself, in which everything is intentional but not everything is predictable. As architects and designers, our task is to pave the path for the future, calculable and unforeseeable alike, to happen.



Fig. 92: Shared Corridor Inside a Building



Fig. 93: Shared Kitchen and Emergency Food Storage



Fig. 94: Community Center with Library, Daycare, Recreation, and Job Training Services



Fig. 95: Community Center with Library, Daycare, Recreation, and Job Training Services



Fig. 96: Home for a Single Entrepreneur



Fig. 97: Bedroom for Two Sisters



Fig. 98: Home for a Young Couple



Fig. 99: Home for a Young Couple



Fig. 100: Home for a Young Family



Fig. 101: Shared Corridor Inside a Building



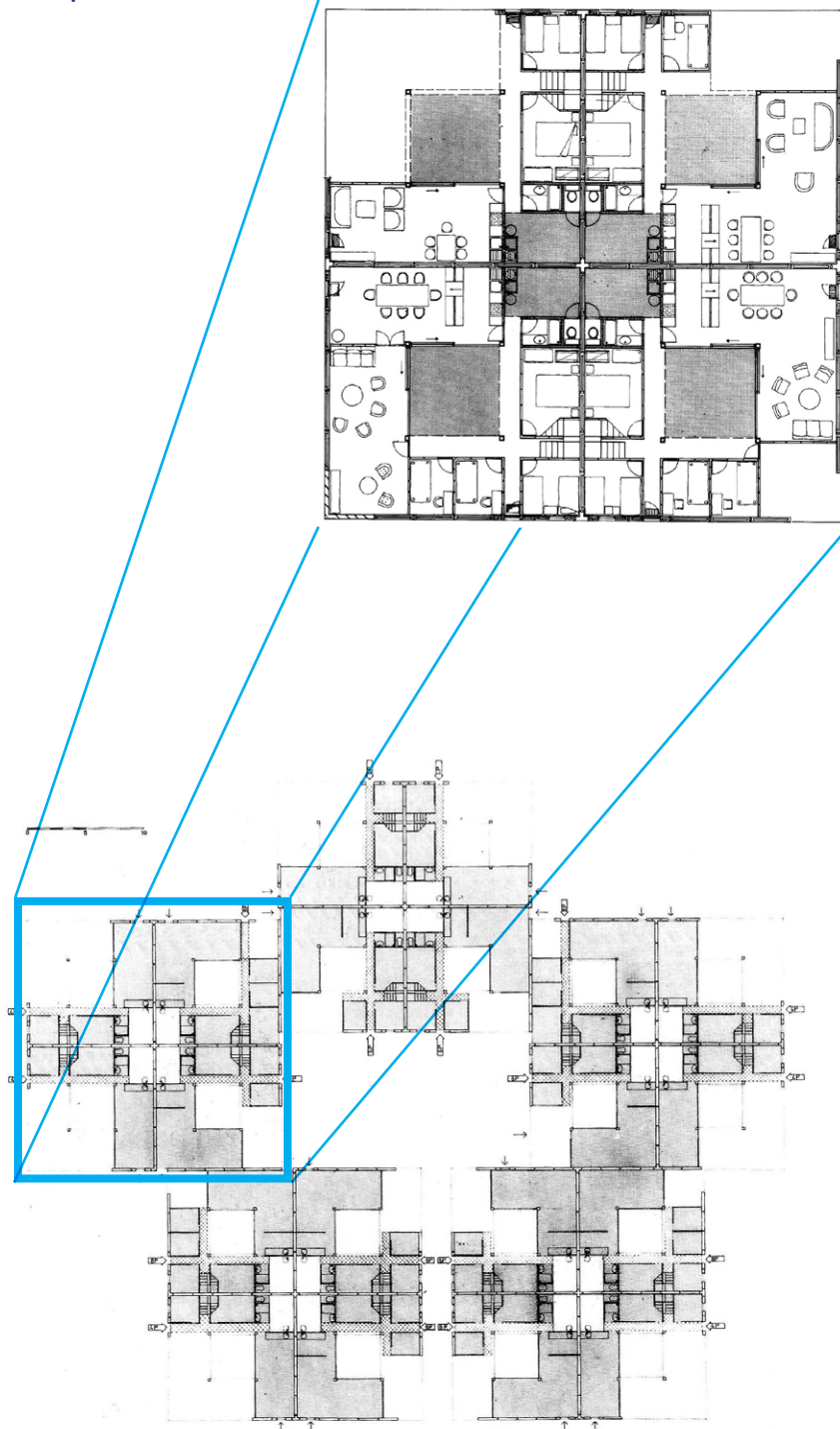
Fig. 102: Urban Insertion of Plugin Buildings
Original Image: Toby Harriman

DESIGN FOR SOCIETY

OSM + UGC

Open-Source Model and User-Generated Content are two models in program development that outsource the task of data collection to the end users of the products, creating an active feedback loop that is then used to improve the program itself. This approach is among the most efficient and cost-effective in data gathering, but may make a burden in data analysis for the bulk of information it provides. However, because data collection is democratized, it will have a better representation; and because live update can happen instantly, data can be more accurate as well.

OSM and UGC have extensive applications in programming, engineering, medicine, and other research sciences.



The Metabolist team of Kikutake, Kurokawa, and Maki was not the only one that employed the multi-scale way of thinking during their participation in PREVI. Sir James Stirling from the UK was probably even more vigorous in pursuing this aspect of urban design. Stirling's scheme shows a strong interest in preserving the social interaction by having four units form a cluster. These units share wet walls in bathrooms, plumbing pipes, conduits, and other components to help conserve construction cost. The configuration of units varies in as-built but can also be modified over time to suit the needs of the occupants. They also share a patio in the center, which highlights the open core of the structure. These smaller clusters can then form larger groups, the gaps between them defining the streets and introverted paths that connect other extroverted public spaces.

The biological analogy of Metabolism (one that was most fondly expressed and pursued by Kurokawa out of the movement) is strongly reflected in this multi-scale design. Each home unit acts as a cell that can be grouped together to form a cluster, while these clusters act as tissues that can then form an organism. Just like cellular development, there are countless **combinations** of various cell and tissue types, but there are also numerous **mutations** among them. In this analogy, the body - the ultimate outcome of the sum of all cells and tissues and organs - can be a single building or an entire city that is defined by a number of these Metabolic buildings.

Fig. 103: Partial Site Plan (top) and Whole Site Plan (bottom)

Socks Studio

<http://socks-studio.com/2019/01/20/clusters-and-growth-previ-housing-project-by-james-stirling-1976/>

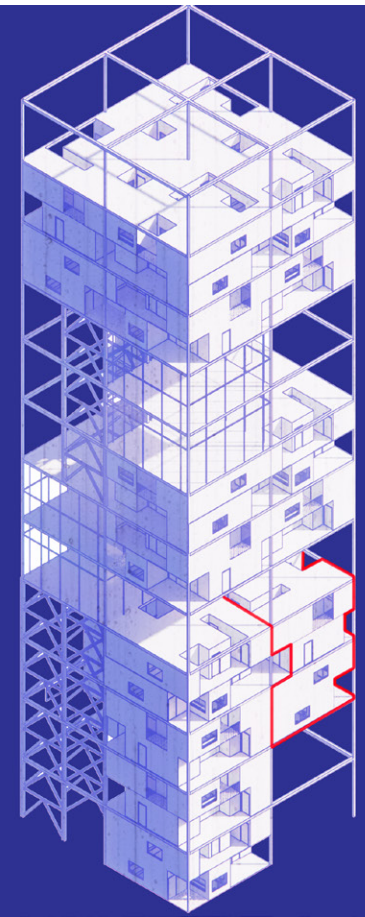
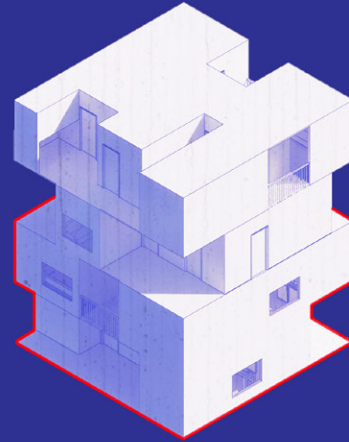
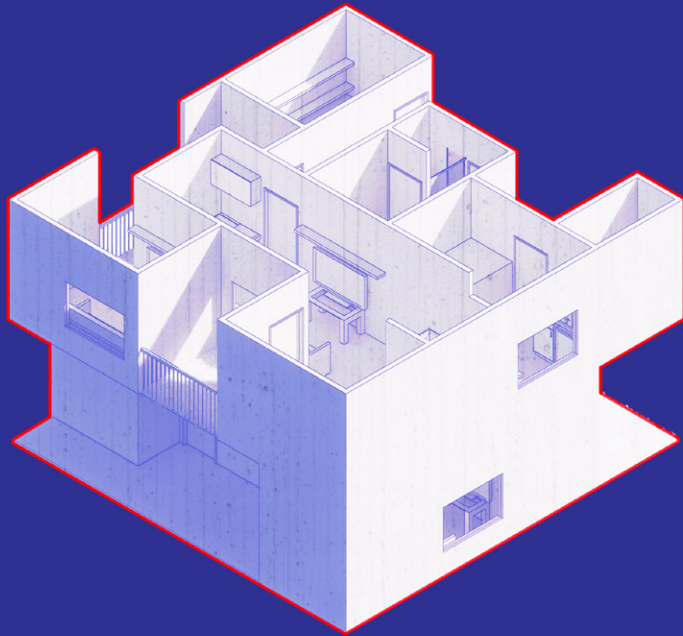


Fig. 104: Metabolic Progression from Units to Floors to Clusters to Tower.

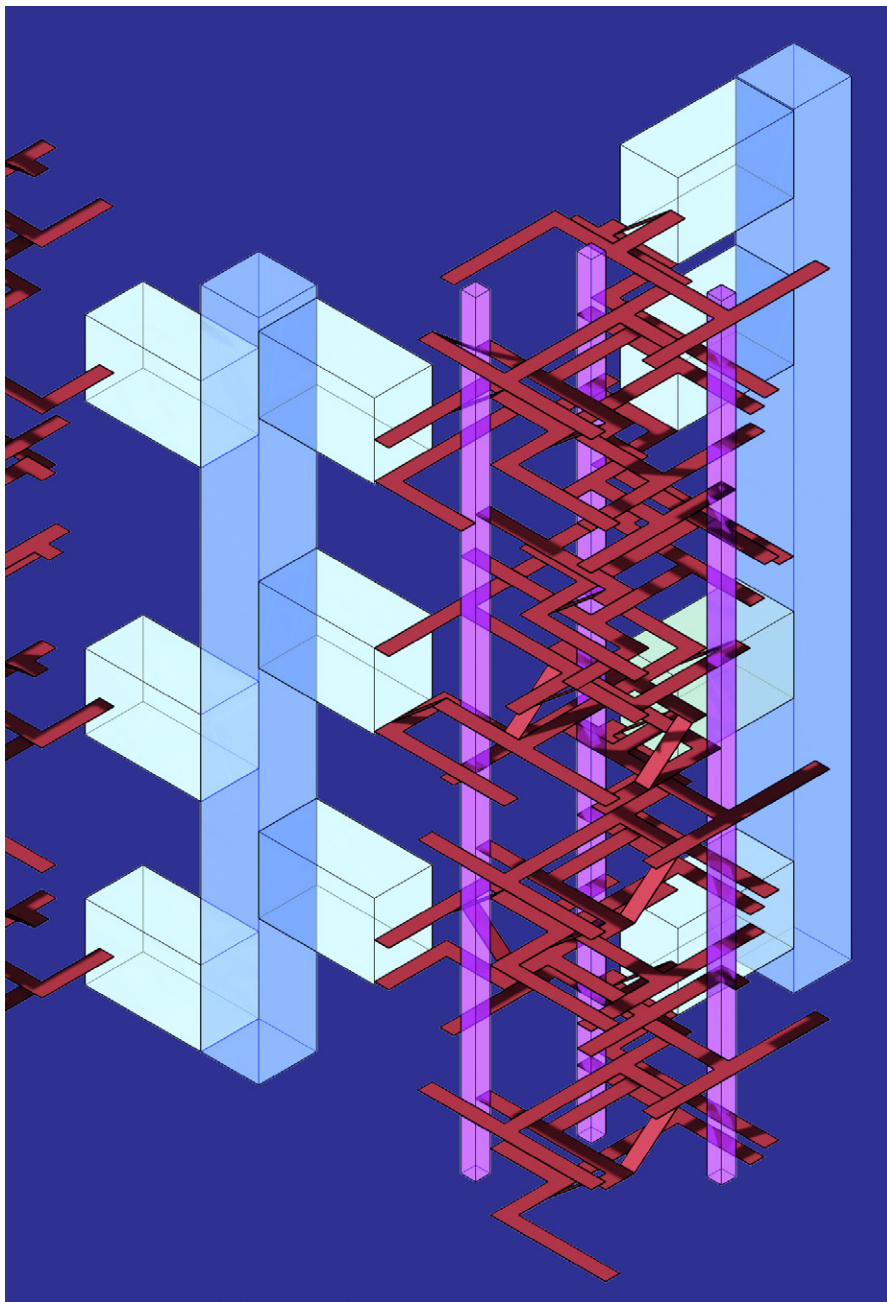


Fig. 105: Possible Circulation Routes inside a Tower, Dedicated Vertical Circulation Shaft for Means of Egress, and Service Shafts.

The Metabolic process occurs not only on the scale of individual units. As the need to expand emerges and as the economy allows, single tower cores can multiply, echoing the incremental development of units to floors and to clusters to form a building.

The challenge of designing for this scale, however, is that the infrastructure and services have to be ready to afford future expansion. Such was also one of the problems that the Metabolists like Kikutake and Maki - and their colleagues from the Tange Lab like Isozaki and Ekuan - faced when drafting their versions of sky-high towers in the “megacitystructures” section. To tackle this, permanent components such as footing and underground piping will have to be in place to anticipate 100% buildout of the structure, no matter the way the building will evolve over time. One good thing about this is that permanent components do not arithmetically correspond to the buildout. For example, depth of footing excavation between a single-core and a quadruple-core building is almost the same, because the soil quality is presumably invariable in such a small area. The size of main sewer and water supply pipes does not correspond to the buildout either; a tower for 25 families and one for 75 require very similar main lines. Nonetheless, these are important factors to be studied per case.

Another challenge of large and ever-evolving towers is vertical circulation. This is one area where the Metabolist premise of changeable structure fell short, and high-rise towers born out of Metabolism often show very rigid joint core design. To address this, vertical circulation must be flexible as well, and can be either **incorporated** into the mainframe, or dedicated and **detached** from it, or both.

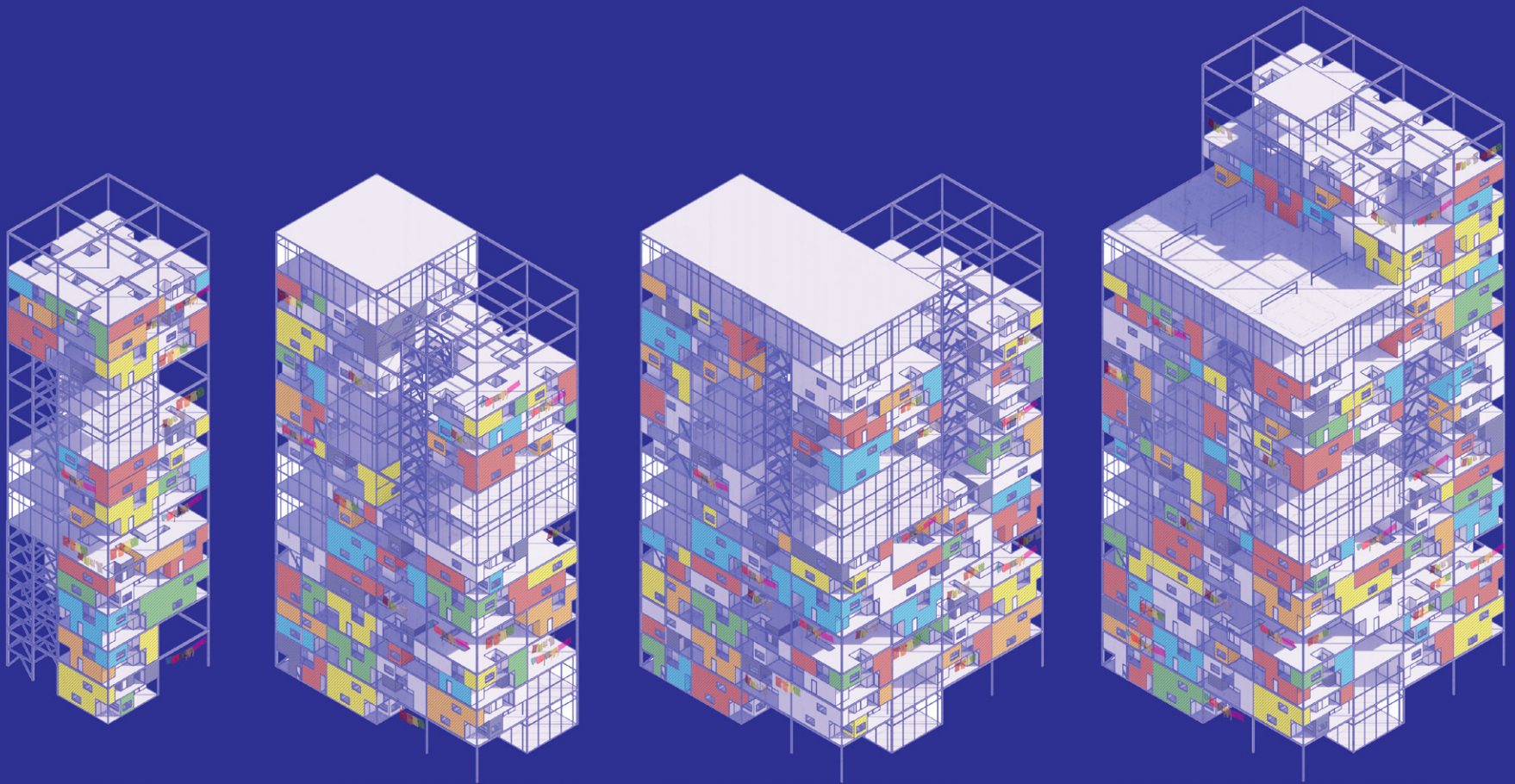


Fig. 106: Example of a Metabolic Evolution of a Residential Tower from Single Core to Double, Triple, and Quadruple.

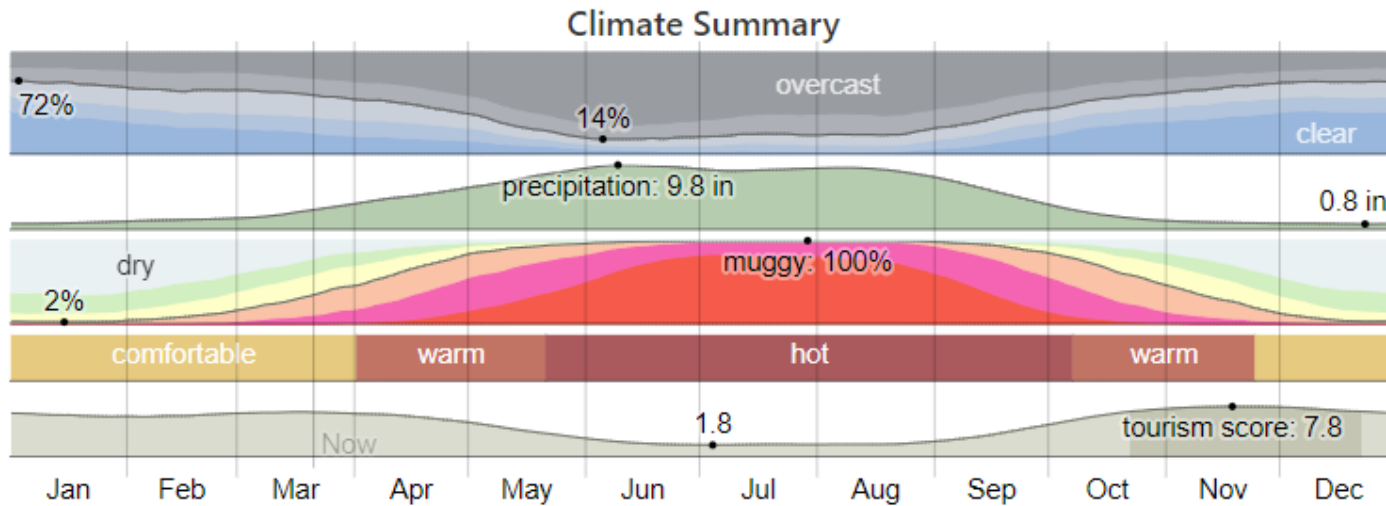


Fig. 107: Climate Summary of Hong Kong

Weather Spark
<https://weatherspark.com/y/127942/Average-Weather-in-Hong-Kong-Hong-Kong-SAR-China-Year-Round#Sections-Humidity>

Though the organic variations between units and clusters of units should render the distinct characteristics of each building, the overall appearance of these residential towers may still be rigid. To dampen such effect, façades are deployed to give each building its own **identity**. Moreover, the use of façades shall be a conscious choice of design patterns to enhance the climate control of the buildings and as such should be informed by the weather conditions in Hong Kong.

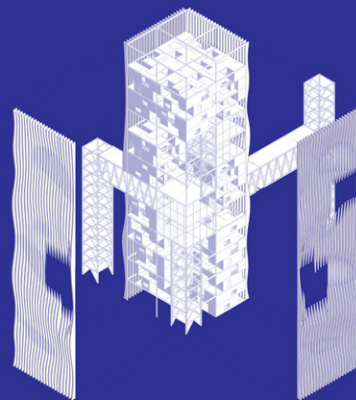
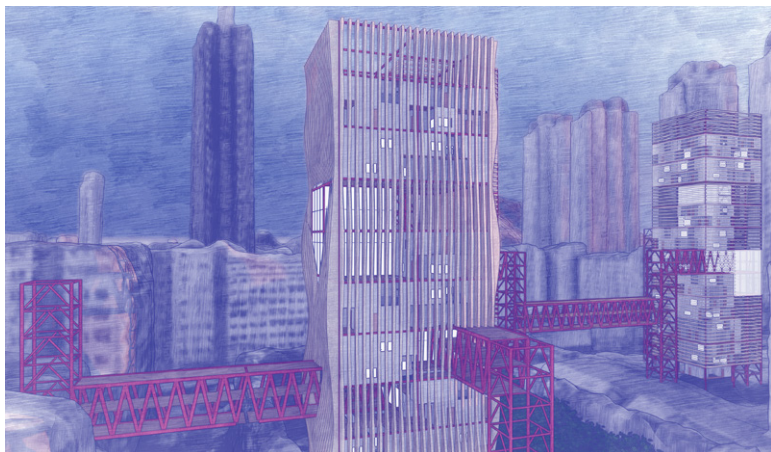
Hong Kong does have four seasons, but its climate year can also be divided into a wet and a dry season. The wet season is generally hot, with prolonged high temperature and precipitation throughout the day. Conventional apartments in Hong Kong therefore rely heavily on air conditioners for this season. **Open façade** and **adaptable fenestration** systems would offer natural ventilation within the units and also their shared corridors.

A façade shall comprise multiple modules which can be clad onto the existing mainframe. This approach means that

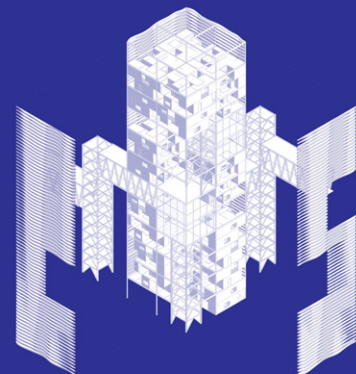
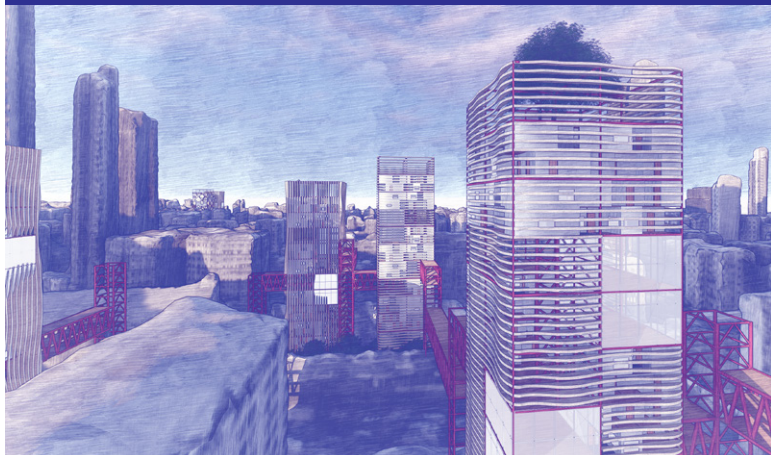
the design can be changed over time, and the residents can participate in the making of the façades in both their design and production. The three options on the opposite page serve as suggestions of what can be, and the reality may be vastly different.

Meanwhile, roof terrace, which could move up and down as the building evolves, can retain water runoff during the wet season to cool the building or be used as potable water after filtration. Furthermore, smaller terraces and community gardens can occur spontaneously in unused pockets in the buildings. These pockets will later be infilled as occupancy grows.

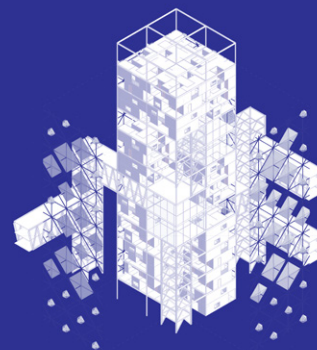
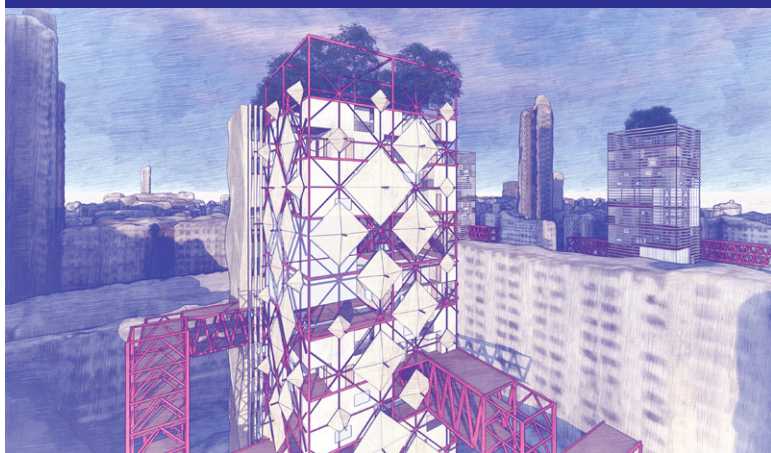
Fig. 108 (Opp.): Examples of Various Façade Clad-ons



Vertical brise soleil



Horizontal light shelves



Automated parasol

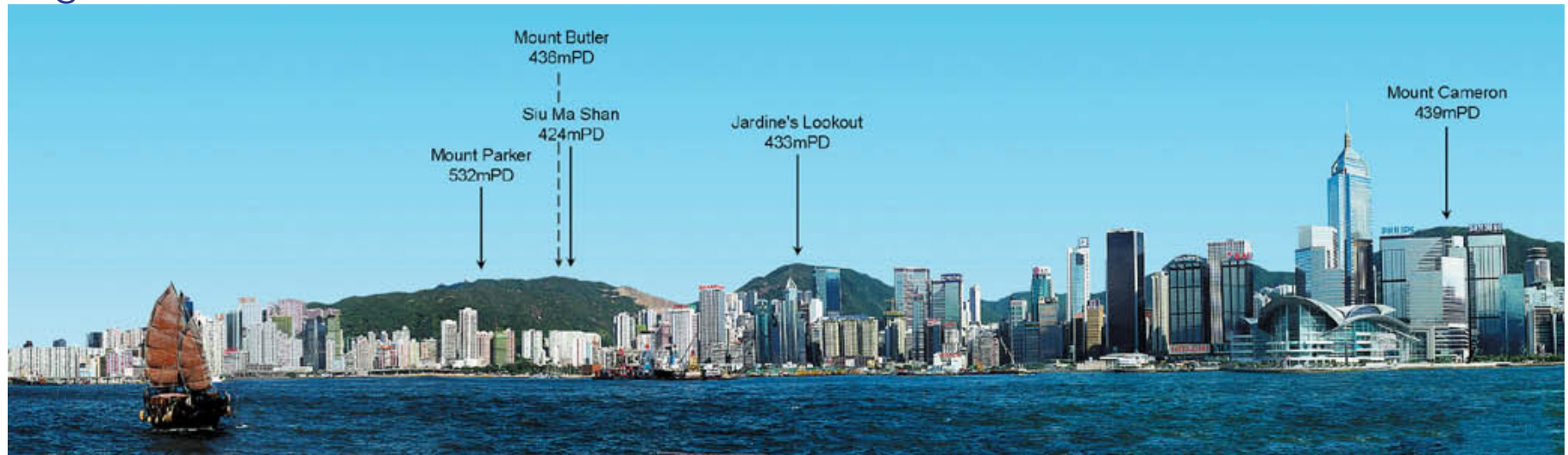


Fig. 109: View Study at Tsim Sha Tsui's Cultural Complex Looking towards Central
Hong Kong Planning Department

Urban planning in Hong Kong reflects a strong priority for high density developments. The top interest is to maintain the ridgeline views - lines of sight toward the mountains from both sides across the water. The mountainous topography then adds another layer of complexity on the ground. This combination of air and ground constraints means that height restriction is considered per case and not governed by a uniform regulation.

Then again, building height regulation in Hong Kong can be regarded as quite lax, with zoning maps often showing land use but not clear height limits. In fact, the most restrictive regulation used to be in Kowloon because of the proximity to the Kai Tak Airport, which was the only reason why the Kowloon

Walled City could not grow taller. Without the concern for ridgelines and airways, buildings can basically go as tall as they can.

What the construction practice in Hong Kong shows is a lax system that encourages new buildings and a strong emphasis on conserving the overall vistas. Building codes do express regulations on safety measures, fire resistance, thermal quality, but are not as stringent as codes in many other developed countries. Architecture and construction practice in Hong Kong also considers various *feng shui* elements, including orientation, materials, color, topography etc. which should be taken into account.

/the most restrictive regulation used to be in Kowloon because of the proximity to the Kai Tak Airport, which was the only reason why the Kowloon Walled City could not grow taller/

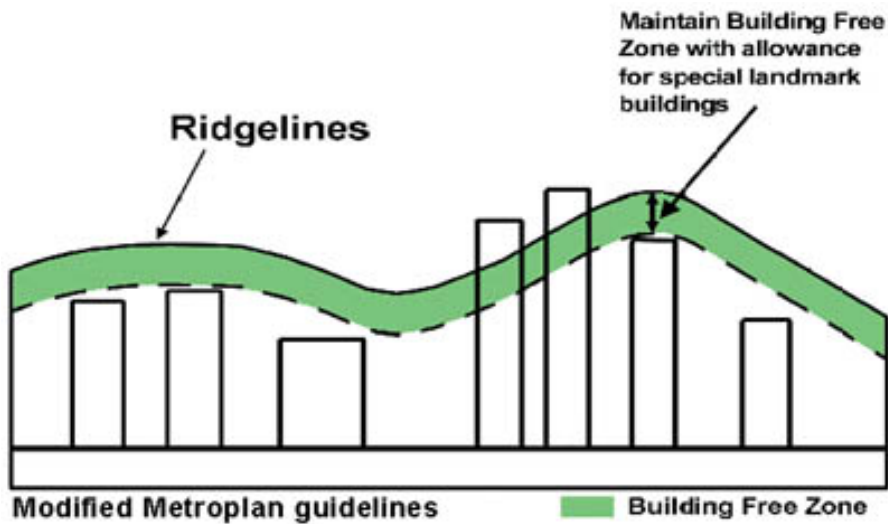


Fig. 110: Illustration of Ridgeline-based Regulation
Hong Kong Planning Department



Fig. 111: View study at Tsim Sha Tsui Peninsula
Hong Kong Planning Department

Kowloon towards Hong Kong Island

- VP1** Proposed Cultural and Arts District, West Kowloon Reclamation
- VP2** Cultural Complex, Tsim Sha Tsui
- VP3** Proposed Promenade, South East Kowloon Development

Hong Kong Island towards Kowloon

- VP4** Quarry Bay Park, Quarry Bay
- VP5** Convention and Exhibition Centre New Wing, Wan Chai
- VP6** Sun Yat Sen Memorial Park, Sai Ying Pun

From Victoria Peak

- VP7** Lion Pavillion, The Peak

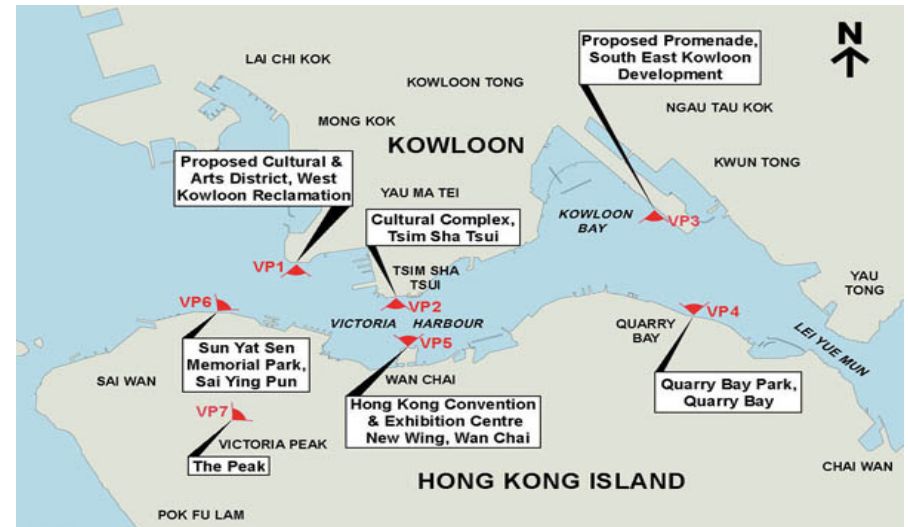


Fig. x: Proposed Viewpoints
Hong Kong Planning Department

With light-weight construction and highly adaptive configuration, plugin towers present a unique opportunity to be integrated into public infrastructure such as transit stations, civic centers, libraries, and other public facilities. Residential towers no longer have to be isolated structures, but are connected among themselves and with other structures.

Also, within each building, community spaces break up the otherwise monolithic density of residential towers. Units around these spaces may be used for commercial activities such as small shops and eateries, thus diversifying the use of these units. This typology could pave the way for vertical mixed use, which is an urban form that is enjoying popularity around the world yet does not exist with this granularity. In conventional mixed-use buildings, lower floors are dedicated to commercial and civic functions, while upper ones are residential. However, plugin towers seek to encourage the mix that occurs throughout the buildings.

The mixing of uses at this fine scale is not foreign to urban environment, but it almost only occurs in informal settlements. Therefore, it may be considered a natural occurrence of urban development and should be encouraged instead of curtailed by regulations and restrictions. This mix of uses makes for a vibrant city life that Hong Kongers are used to enjoying on the ground level in the horizontal plane. Because we are introducing the Z axis into the equation by living vertically, we need to operate in that dimension too. Our plugin units, therefore, should not be limited to only be residential, but should be capable of being converted for neighborhood commercial use on all floors.

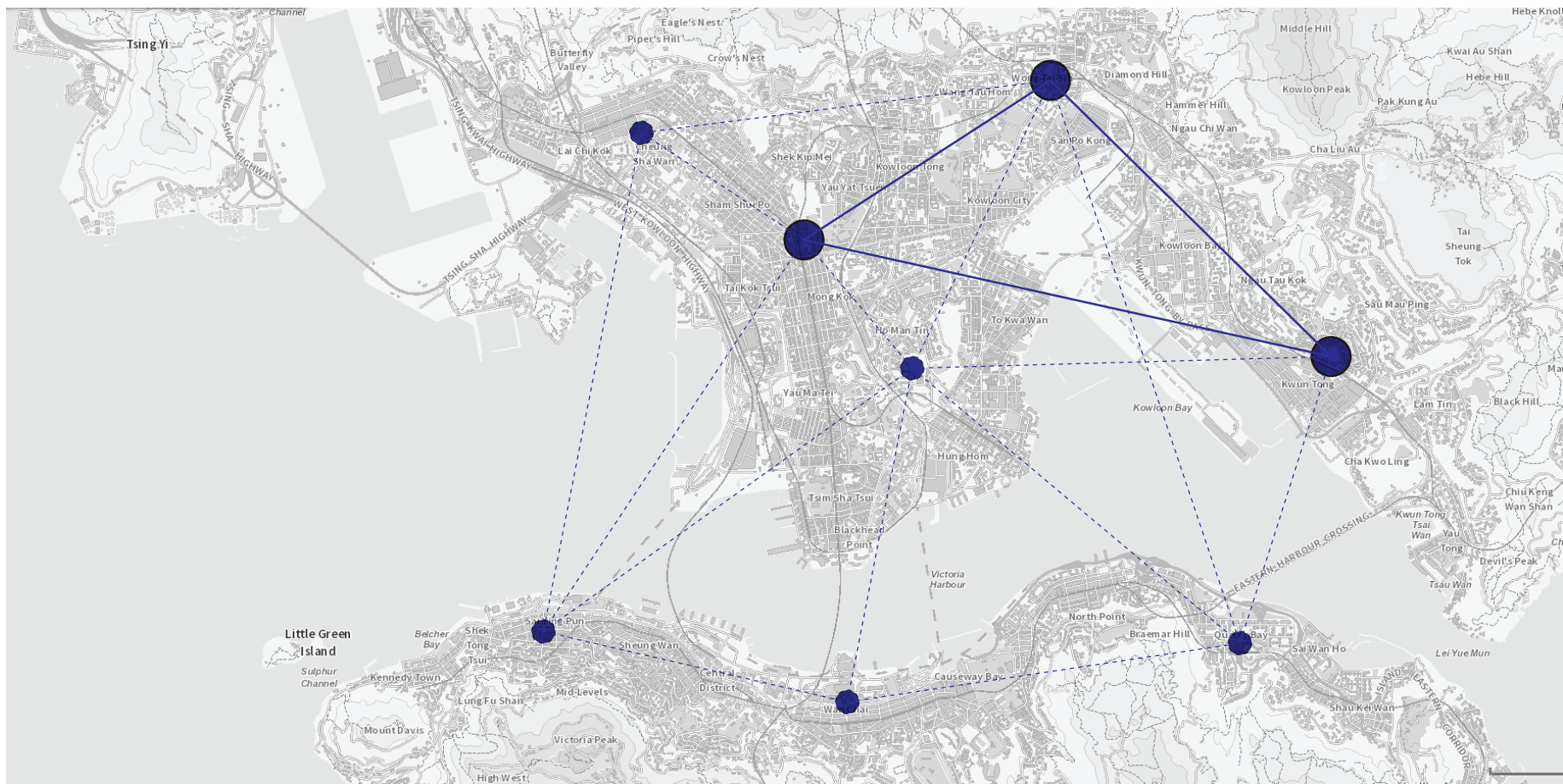


Fig. 112: Example of Two Plugin Towers Built around a Transit Station.

To introduce **mutations** to the regular **evolution** of Hong Kong's urban *metabolism*, we need to genetically engineer this evolution of urban forms by implanting certain "seeds" into target districts/neighborhoods. As identified in previous chapters, Sham Shui Po, Kwun Tung, and Wong Tai Sin are our three candidates to run this test. We have also studied in depth the possible development of Sham Shui Po on an end-user level; this study can also be replicated in the other two districts.

By having at least three districts implanted with the seeds, we can create a triangle out of only three points of effect. If the effect proves to be successful in all three districts, natural resonance will occur which will then amplify the success to other areas within and around the triangle. If one district seed does not garner success, it can be modified individually or die out altogether without affecting the other two.

In the next pages, a site implementation study will be conducted in Sham Shui Po. To reiterate a point, this same process can be replicated for Kwun Tong and Wong Tai Sin. For Sham Shui Po, the site of a derelict apartment building was chosen for testing. This site is right adjacent to the Shek Kip Mei Estate - the first and still a continuing public housing project that dates back to the Great Fire of 1953. Surrounding the site are many old *tong laus* and tenement halls, many of which are dilapidated. Together with the Shek Kip Mei Estate, these buildings show the contrast of old and new and layers of history of housing in Hong Kong. To account for contingencies, a secondary site will also be proposed; this site is currently a sports facility and has a smaller capacity than its primary.



- Original seed
- Future secondary seed

Fig. 113: Possible Mesh of District "Seeds" of Plugin Housing. Network May Extend to also Cover Lantau Island in the West and New Territories in the North.

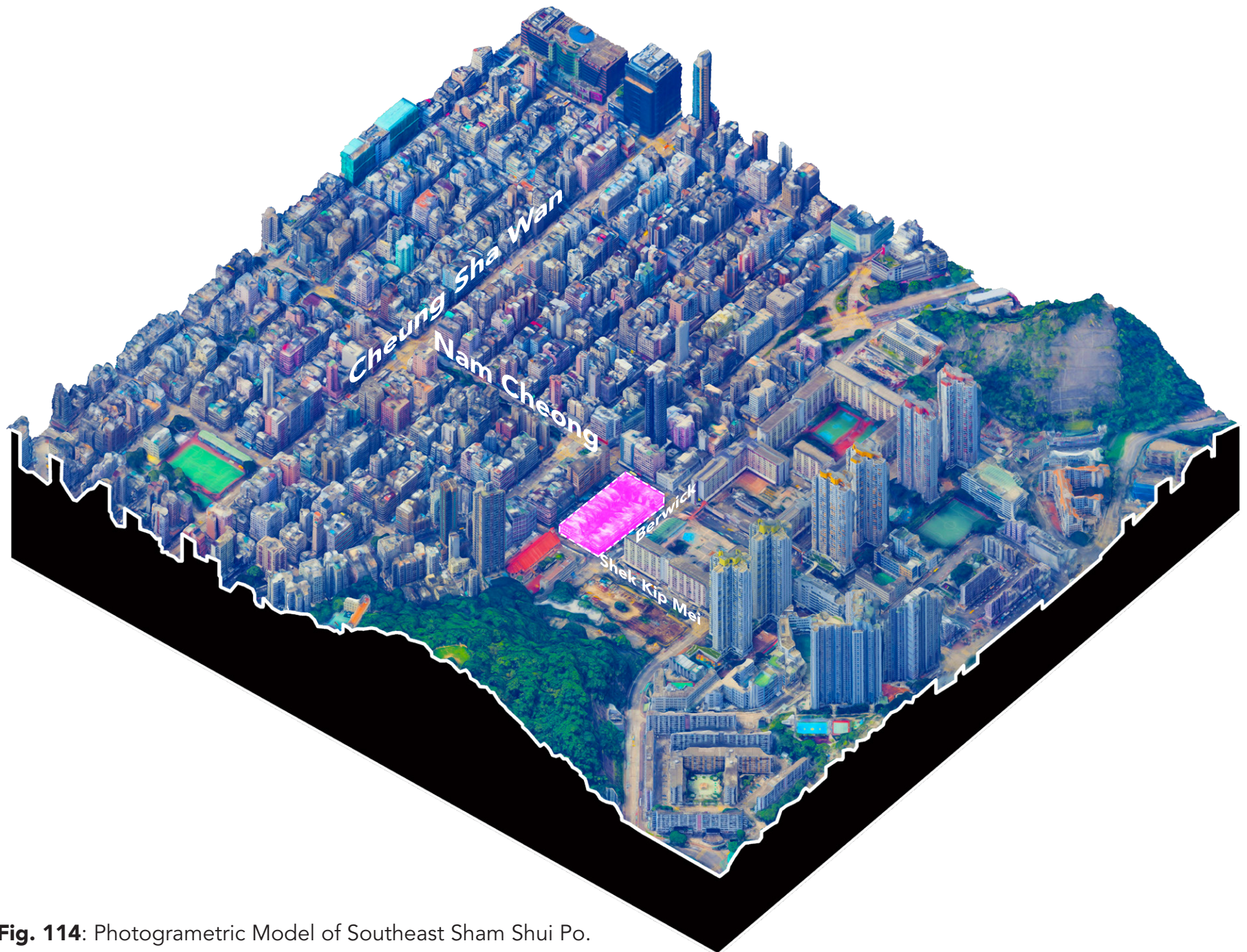


Fig. 114: Photogrammetric Model of Southeast Sham Shui Po.

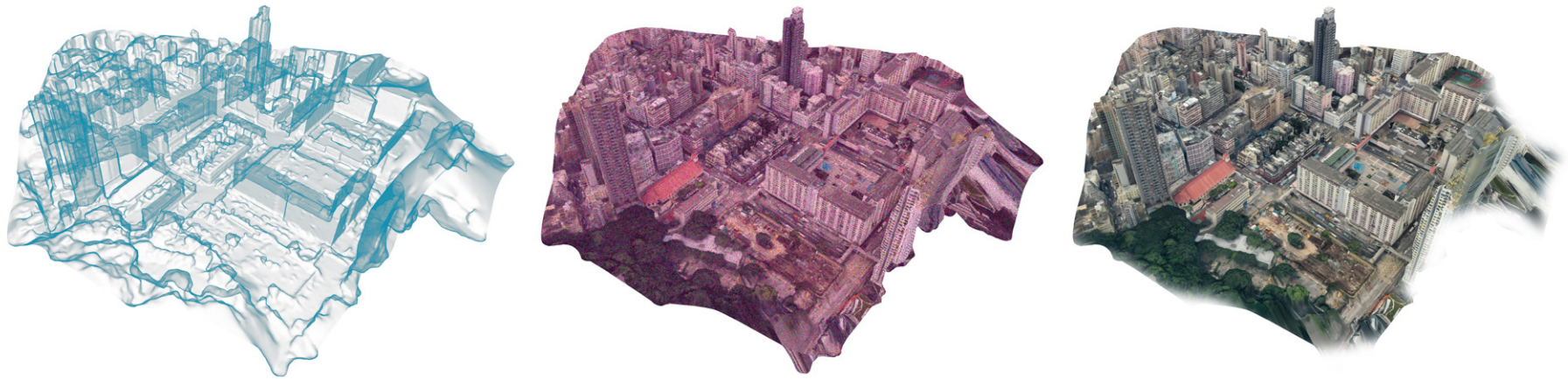


Fig. 115: Meshing and Texturing of 3D Scan, Sham Shui Po.

By using a technology called photogrammetry, a section of Sham Shui Po may be recreated as a digital model. The workflow is as follows:

1. A series of photos is taken at an appropriate interval and with adequate overlap. Google Earth Studio (available in beta testing mode by invitation) is a good option to produce these photos remotely and globally in consistent quality and with great control.
2. This series of photo is then processed by a photogrammetry program such as Autodesk Recap to interpolate 2D data points into 3D form, either as a 3D model or point cloud.
3. An export of this 3D model can be made, which then may be used in modeling programs such as Revit, Rhino, or Sketchup.

Center of focus should be target-locked, and angle of photos should be consistent with consideration for obstructive structures so as to give them enough clearance in the photos. Where location permits, drone photos may be used to deliver better quality of imagery for better texture-mapping.

Due to limitation in satellite imagery, photogrammetry is inferior in accuracy to LIDAR, which is done on-site and with laser scanning technology. Nonetheless, photogrammetry using Google Earth and other satellite imagery is much better than some mapping services which may not document building heights and the complex arrangement of buildings within the same block as seen in Hong Kong.

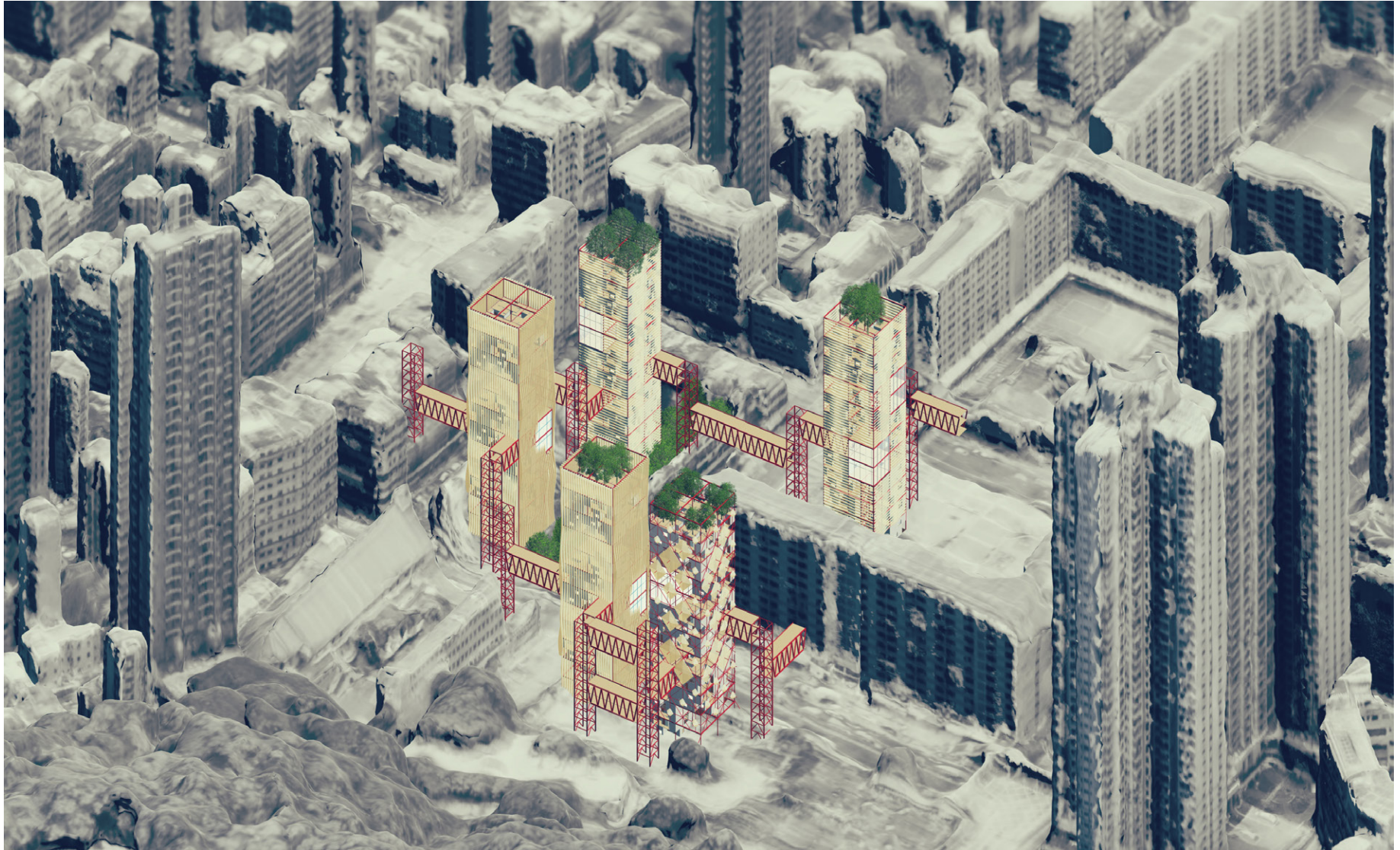


Fig. 116: Sample Plugin Housing Towers Integrated into the Site.

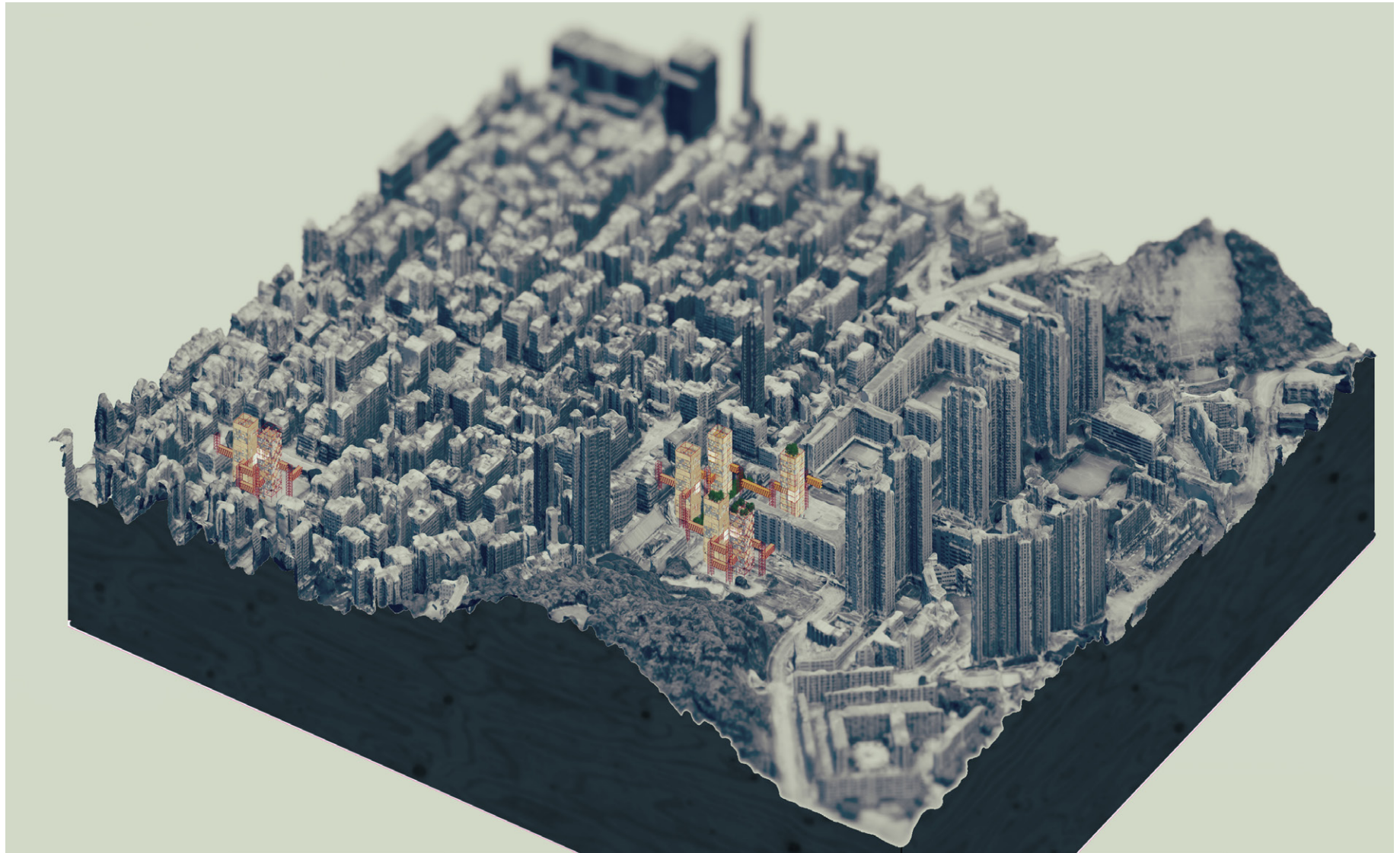


Fig. 117: Primary Site (Left) and Its Secondary (Right).



Fig. 118: Water Implementation at Stanley Bay
Original image: DL Hong Kong



Fig. 119: Mountain Implementation at Lan Tau Island
Original image: DL Hong Kong



Fig. 120: Urban Insertion of Plugin Buildings
Original Image: Ken Welsh through Getty Images

The Origin of Species

I may here recall a remark formerly made, namely that it might require a long successions of ages to adapt an organism to some new and perculiar line of life, for instance to fly through the air; but that when this had been effected, and a few species had thus acquired a great advantage over other organisms, a comparatively short time would be necessary to produce many divergent forms, which would be able to spread rapidly and widely throughout the worlds. (Charles Darwin, Ch. 9: On the Imperfection of the Geological Record)

The process of transmutation is long and painstaking, but it is exponential, not linear. Rapid changes will occur after an agonizing beginning. When treated like a form of organism, architecture can then behave similarly, and will equip itself with a natural ability to adapt. A democratized system simply helps accelerate this transmutation by way of selection.

DESIGN FOR ADAPTATION

Climatic Adaptation

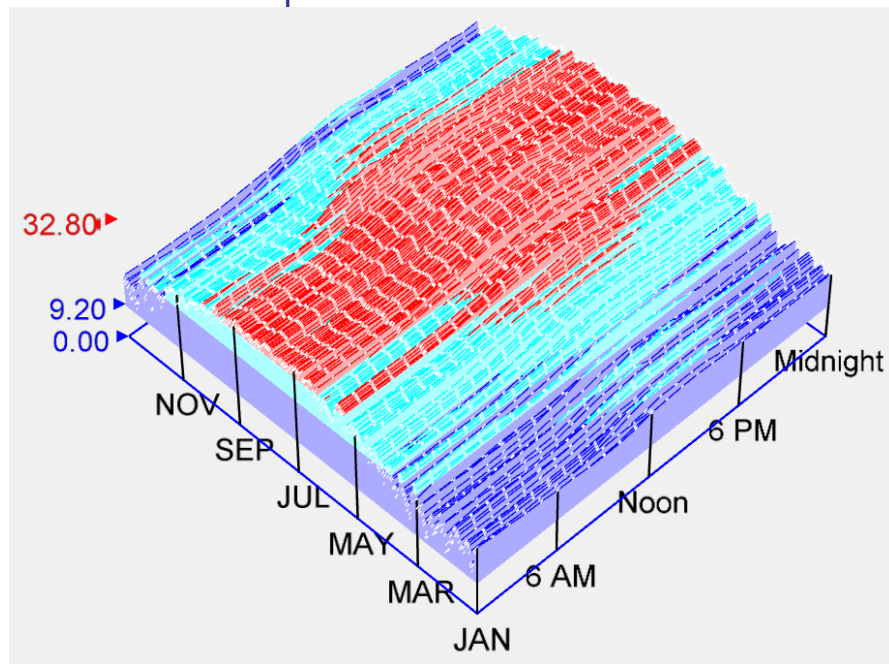


Fig. 121: Daily Dry Bulb Temperature throughout a Year
Climate Consultant

The ability to adapt that Metabolic Plugin buildings can afford us does not just refer to the spatial configurations of units and clusters of units; it refers also to the adaptation of the structure to the fluidity of weather and climate. Hong Kong does not have a big fluctuation in annual climate; in fact, its climate is monsoonal (wet and dry seasons) and is rather relatively stable. However, it does have long heat exposure that lasts half a year, from April to October during the wet season. In this season, there is also a tendency to have typhoons, which affect shoreline activities, especially those around the fishing villages. The cold and arid season has the average mean of 64° F between November and March.¹ This is not terribly cold and is mostly negligible indoors.

To analyze the weather conditions in Hong Kong, this study uses data provided by Energy Plus as an open source, with the data set collected by station 450070 by the City University of Hong Kong. This data is then fed into a free program called Climate Consultant (6.0) for graphic representation. The comfort model chosen to analyze is ASHRAE Standard 55. This comfort model acknowledges the adaptability of residents by changing clothes, opening windows, as well as other metabolic activities.

Another comfort model that was considered in this study is ASHRAE Adaptive, which rules out the use of mechanical cooling and does not apply when mechanical heating is in use, and therefore may not be realistic in Hong Kong.

It is worth noting that this study considers thermal comfort to be the most importantly factor, while there are others like precipitation and wind to be weighed in as well. There shall also be considerations of future climatic changes too.

1 Data provided by Energy Plus. Data set: Hong Kong SAR 450070
https://energyplus.net/weather-location/asia_wmo_region_2/CHN//CHN_Hong_Kong.SAR.450070_CityUHK

Data is analyzed using Climate Consultant 6.0.

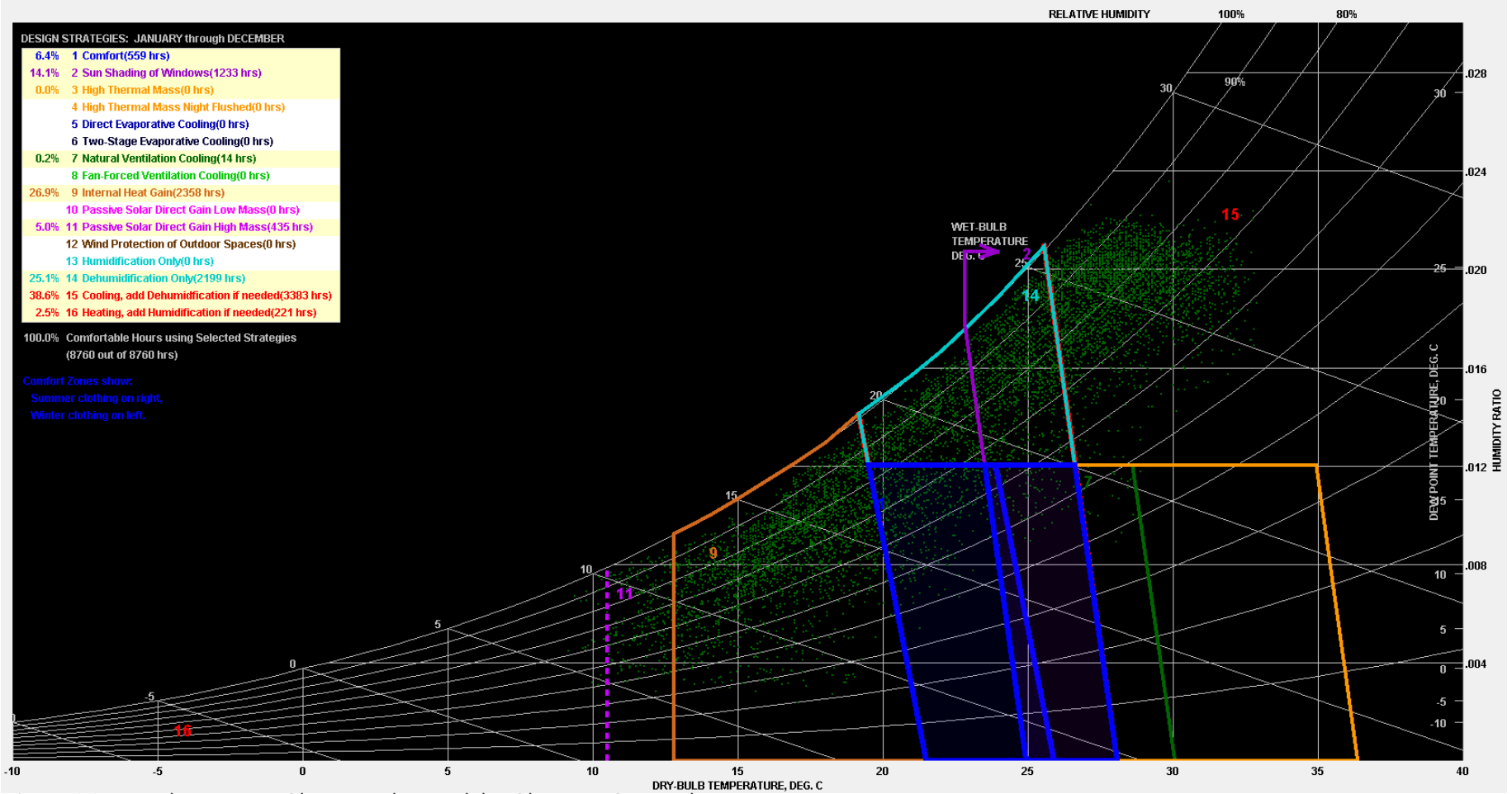


Fig. 122: Psychrometric Chart and Possible Climate Control

Strategies

Climate Consultant

DESIGN STRATEGIES: JANUARY through DECEMBER

6.4%	1 Comfort(559 hrs)
14.1%	2 Sun Shading of Windows(1233 hrs)
0.0%	3 High Thermal Mass(0 hrs)
	4 High Thermal Mass Night Flushed(0 hrs)
	5 Direct Evaporative Cooling(0 hrs)
	6 Two-Stage Evaporative Cooling(0 hrs)
0.2%	7 Natural Ventilation Cooling(14 hrs)
	8 Fan-Forced Ventilation Cooling(0 hrs)
26.9%	9 Internal Heat Gain(2358 hrs)
	10 Passive Solar Direct Gain Low Mass(0 hrs)
5.0%	11 Passive Solar Direct Gain High Mass(435 hrs)
	12 Wind Protection of Outdoor Spaces(0 hrs)
	13 Humidification Only(0 hrs)
25.1%	14 Dehumidification Only(2199 hrs)
38.6%	15 Cooling, add Dehumidification if needed(3383 hrs)
2.5%	16 Heating, add Humidification if needed(221 hrs)

100.0% Comfortable Hours using Selected Strategies
(8760 out of 8760 hrs)

Comfort Zones show:

Summer clothing on right,

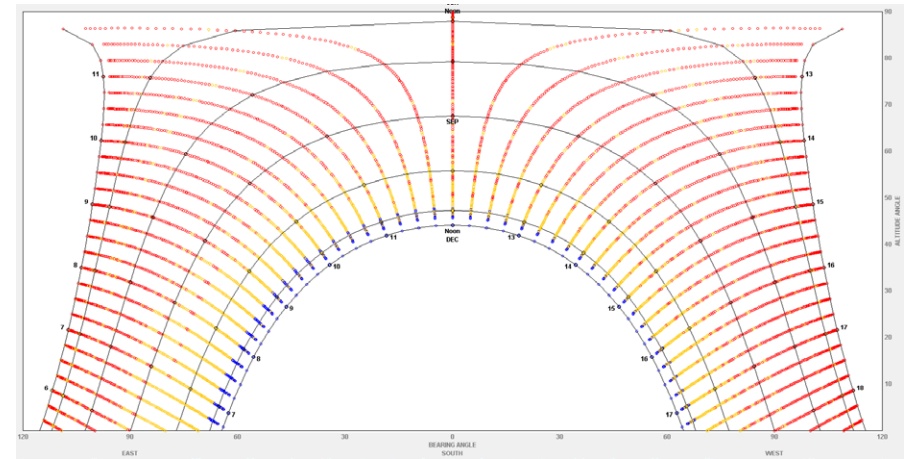
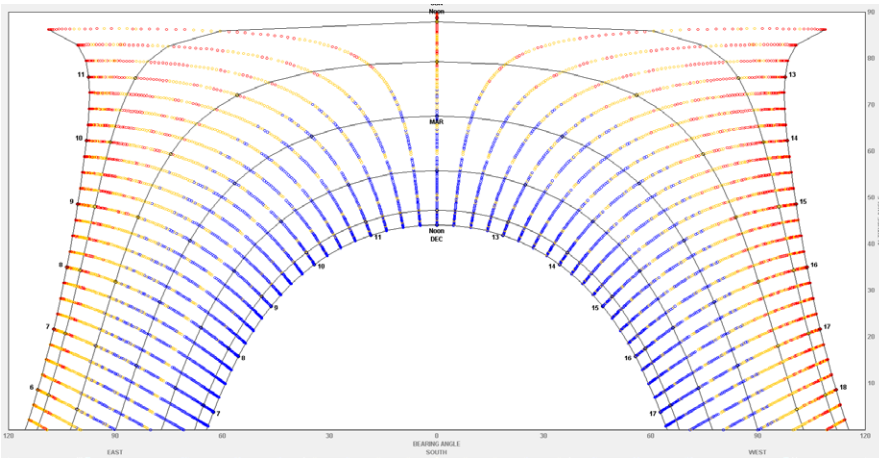
Winter clothing on left.

Fig. 123: Suggested Design Strategies
Climate Consultant

Climate Consultant is also a powerful tool to generate design suggestions. For example, according to the program, indoor comfort level can reach 100% if these measures are in place:

- Cooling with Dehumidification (38.8%). This can be addressed by using air conditioner or heat pump.
- Dehumidification (25.1%) without active cooling is also enough to maintain thermal comfort in some cases. This suggests that AC and heat pump units shall have this function so that they can run dehumidifier without generating cool air, thus reducing energy consumption.
- Heating with Humidification (29.8%). This can be substituted by utilizing Internal Heat Gain (26.9%) which is a better option because it reduces power consumption. The micro unit design of Plugin housing actually helps in generating and maintaining this natural heat gain that occurs by the daily activities on the residents.
- Shading (14.1%) shall be employed. However, the rather modest percentage of effectiveness suggests that high temperature is not due to sun exposure, but rather due to the air, which is humid. The Sun Shading Charts suggest that there are up to 1,977 warm-hot hours (>80.5° F) that require shading.

In residential architecture, climate control methods depend greatly on the design of the shell (envelop-dominant) as opposed to the heavy dependency on mechanical systems in non-residential buildings. The light-weight construction of Metabolic Plugin Towers was thought to be a shortcoming



for not being able to provide thermal mass that can stabilize heat gain. However, as Climate Consultant shows, thermal mass yields 0% of effectiveness. Natural ventilation was also considered a driving factor to control thermal comfort, but the data shows that it has very little to do with that with only 0.2% effective hours. What this means is that the buildings do not need to reserve a certain percentage of common corridors to maintain cross ventilation.

Mechanical cooling and dehumidification are still required to maintain thermal comfort for the occupants. To mitigate this dependency, a building-wide system of dehumidification may be used. The system may be attached to vertical circulation shafts, shared spaces, and other common areas. Though the technology has yet to mature, façade screens may use materials that act as natural condensers by trapping the humidity in the air or liquid cooling tubes to help bring down the temperature without evaporating the liquid.

Fig. 124: Sun Shading Charts, December to June and June to December, respectively
Climate Consultant

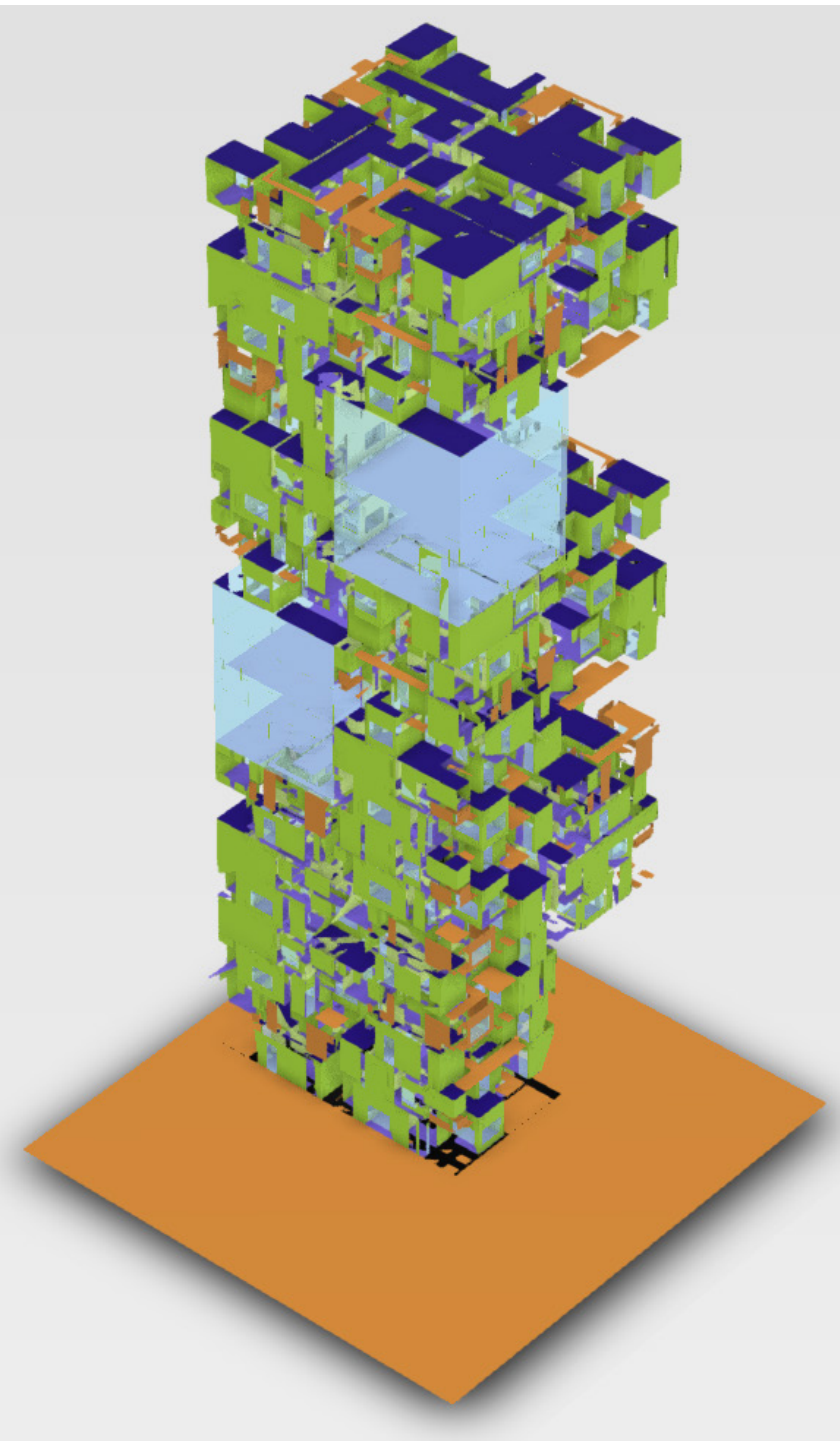


Fig. 125: Energy Model of Plugin Tower, Single Configuration
Autodesk Insight

Besides climate data as input for design, the study also uses Autodesk Insight to analyze the digital models. This process requires that the models be built using Autodesk Revit. For an alternative workflow, Rhinoceros and plugins like DIVA can also provide very good estimates.

Inside Revit, an Energy Model can be generated from building components. This model contains general massing and spaces of the building, with considerations for geographical location and range of study time (specific time of day, specific day, or year round; for this study, the building is examined year round). The Energy Model can then be sent to Autodesk Insight's cloud service for analytics. Feedback includes estimated energy cost and suggestions on orientation, construction, and other factors. There are also several target presets such as Net Zero and 2030.

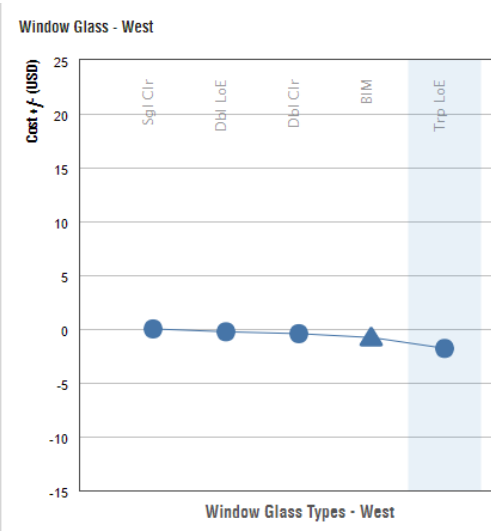
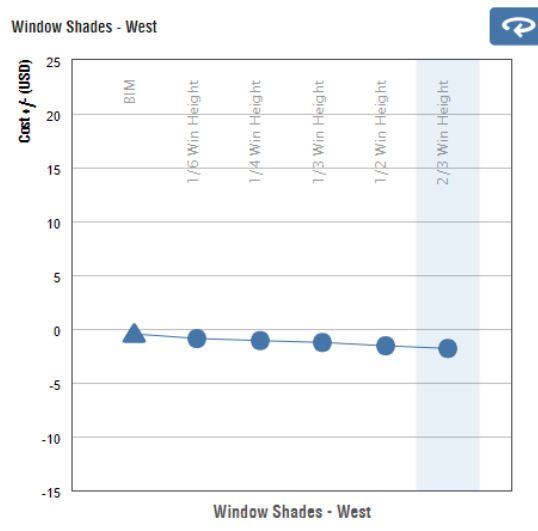
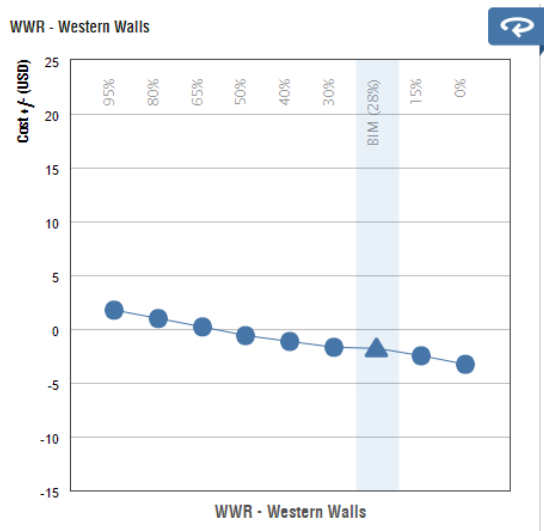


Fig. 126: West Wall Opening Percentage, Sun Shades, and Glass Type, respectively
Autodesk Insight

Based on Insight's suggestions, building orientation does not alter the energy consumption much; the difference may have to do with large civic spaces that have more glazing than others and their solar exposure. These spaces need to face North. Current percentage of wall openings seems to be optimal. Window shading at 2/3 window height and Triple Low-E glass are recommended. For HVAC, high efficiency package terminal is preferred. Lighting efficiency of 7.5 W/m² is also advised to reduce energy cost.

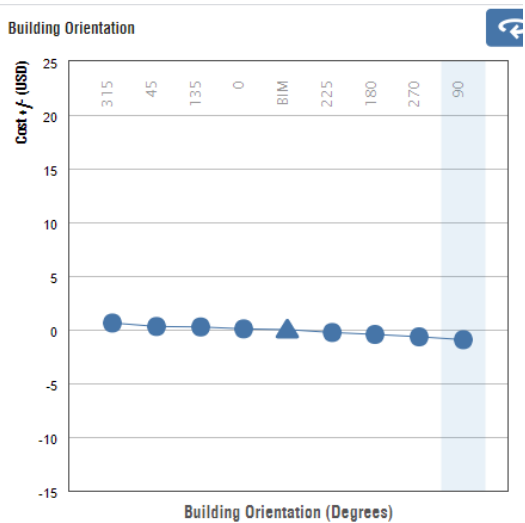
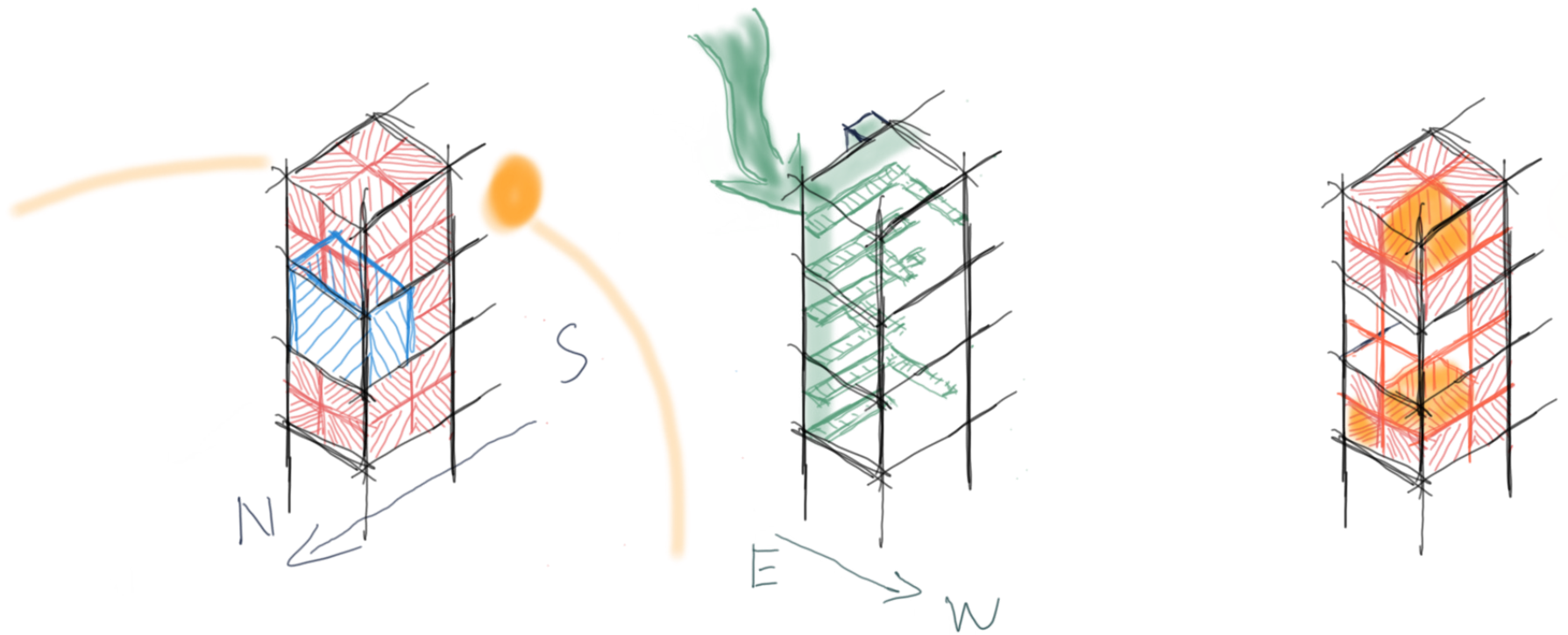


Fig. 127: Building Orientation Scenarios
Autodesk Insight

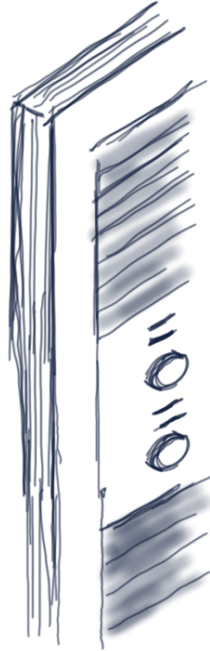
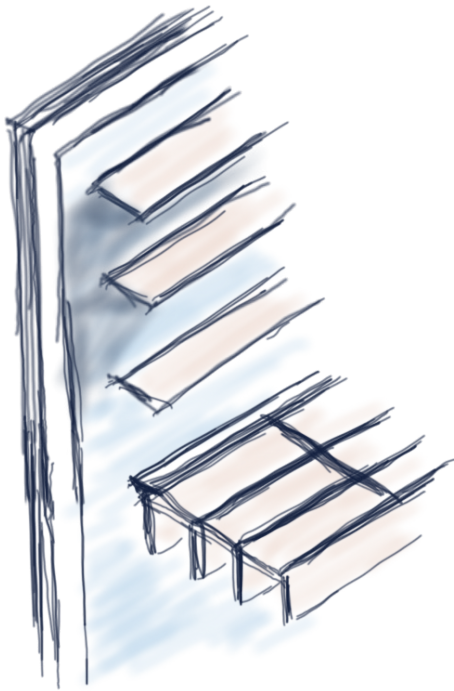
When suggested optimization is practiced, the bottom-line cost of energy is around \$1.5/ft²/year or \$16.5/m²/year. There shall be further research to optimize the use of energy to bring the cost down even more.



Though Metabolic Plugin architecture promotes spontaneous design by end users as a form of adaptation, a set of design guidelines shall be considered to optimize the ability of these buildings to respond to climate and weather conditions. The following strategies are some suggestions from the previous climate study, and can serve as a first level of considerations when building a tower. These basic strategies shall be expanded into a more comprehensive set, but shall only serve as suggestions, not to hinder the organic growth of Metabolic structures.

Building Design Guideline, from left to right:

- Civic centers (libraries, daycare, community rooms etc.) with high amount of glazing shall be oriented to the North of the tower to avoid sun exposure.
- Shared circulation paths shall concentrate to the East side of the tower to receive the prevalent wind.
- Pocket open spaces shall punctuate throughout the building. These spaces can be paired with neighborhood commercial units to create a vertical mixed-use configuration through the entire volume of the building.



Unit Design Guideline, from left to right:

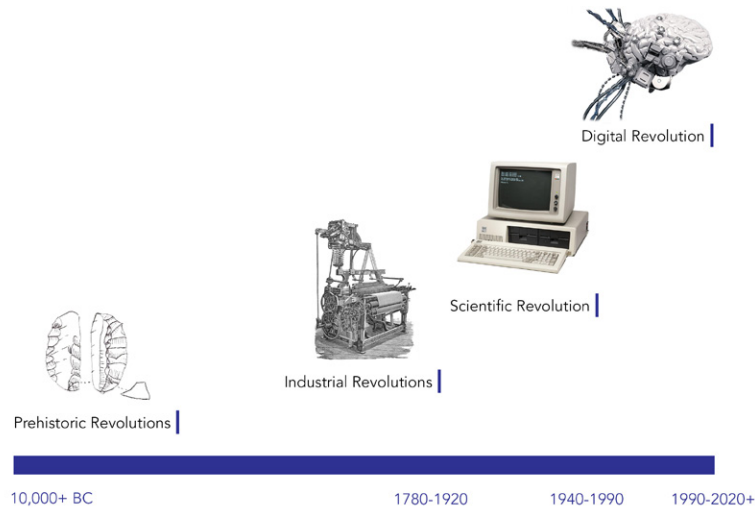
- Openings shall be equipped with individual sun shades, which can be in vertical or horizontal arrangements depending on the wall orientation.
- Active cooling and dehumidification are the most effective climate control measure and shall be integrated into the outer wall of each home.
- Circulation of air is far less effective than active cooling, because of the hot humid air. However, it can be used to save energy when appropriate. Outer walls can be equipped with a small fan with a resealable opening.



Fig. 128: A Demonstrative Curved Wall Panel by Branch Tech.
Branch Technology
<https://www.branch.technology/process>

Prefabrication in architecture and construction has been a serious field of research and has enjoyed vast popularity since the First Industrial Revolution that allowed architectural icons such as the Crystal Palace and Eiffel Tower to be built. In terms of artistic gesture, prefabricated parts were first subverted by other traditional building elements and were used merely as structural reinforcement. For example, Beaux-Arts and Second Empire buildings utilized metal reinforcement inside their stereometric materials to render the design more slender and elegant, giving little to no hint about the technique being employed. Bibliothèque Sainte-Geneviève by Henri Labrouste was one of the early celebrations of prefabricated parts in which the architect proudly displayed wrought iron and cast iron as decorative elements. Through these iconic structures, the key technological advantage of prefabrication is highlighted in two ways: the efficiency of production including speed, and the scale in which these structures can operate. Buildings can now be taller and lighter at the same time.

Fig. 129: History of Technological Revolutions



The Industrial Revolutions that occurred through two major phases over the span of nearly 1½ centuries created power-assisted manual labor. The succeeding technological revolution was the Scientific and Technical Revolution that happened in the mid-20th century. With the proliferation of personal computers and the advancement in computational technology, this revolution created yet another enhancement to how humans perform work: power-assisted cerebral labor.

We are now entering another technological transformation, one that is not less significant than the last. While the previous ones underscored a streamlined process of manufacturing that depends heavily on the machine, the human body and the machine are two distinct entities. The Digital Revolution will integrate human mind with the virtual environment and even automate our thinking process. This revolution will liberate humans to be solely the creative agents, not the labor force, with the assistance of the computer. In this process, virtual work stations, robotics, and 3D printing are

some of the most important factors while physical interaction is less and less relevant.

Though varied in their historic significance and implementation, these revolutions all share similar underlining principles: the time interval between any two revolutions is shortened by the next one in a logarithmic manner; population grows exponentially, thanks to better hygiene and better public health that result in less infant mortality and death by diseases; production yields less importance in physical labor and more emphasis in creative thinking; at the same time, production of the intangible has become just as important as that of the material and the physical, so that information is a product by and of itself. In this trajectory of market demands, it is true that we are becoming more and more dependent on the machinery. However, it is not something that we should pessimistically curtail; we need to leverage it and use it to our advantage.

With the Scientific/Technical Revolution, duplications of the intangible (media, information, communication etc.) cost us



Fig. 130: Wall Assembly Sample with Window and Outlets
Branch Technology
https://www.architectmagazine.com/technology/this-architect-designed-wall-system-has-a-3d-printed-core_o

next to nothing. With the ongoing Digital Revolution, we can reproduce the tangible too (home appliances, engine parts, even buildings etc.) at a fraction of the conventional cost and with less wastage. We will and can do that using the readily available technology which will only be more refined.

In recent years, companies like Icon Build have made a great stride in 3D printing construction materials, most notably concrete. Their latest printer - the Vulcan II - can print a 1in tall x 2in wide extrusion at 5-7in/second. Using this system, a simple home can be built in the course of a few hours by a small crew that monitors the machine. Unlike traditional concrete pouring methods, the printer head can move in a zig zag pattern, helping conserve the material while enhancing the structural integrity of the walls. This technology will allow for swift deployment of housing projects, especially low-cost and temporary ones at remote regions, as long as a truck that carries a printer can get there. Architects can now send a print file to any connected printer on earth to make a building, shortening the end-to-end delivery.

Alongside on-site printing is off-site prefabrication using robots. This industry delivers ready-to-assemble panelized components and is especially applicable to the vision for Hong Kong's Plugin housing. As demonstrated by a company called Branch Technology, wall, floor, and roof panels are highly customizable in both their compositions and shapes. The structure of these panels is pneumatized, mimicking that of bird's skeleton, to reduce weight and increase strength. Wall panels can be built to house electrical outlets, windows, insulation, and other features.



Fig. 131: A House Built with Icon's Vulcan Printer in Partnership with New Story.

Icon Build

<https://www.iconbuild.com/technology>



Fig. 132: World's First Digitally Fabricated Bridge - The Bridge that Built Itself.

MX3D

<https://mx3d.com/projects/mx3d-bridge/>



Fig. 133: Construction Method of Contour Crafting - a Company that is Conducting R&D to Build in Outerspace

Contour Crafting

<http://contourcrafting.com/building-construction/>

Transformative Urbanism

Metabolic growth does not only occur at building level but also at that of district and city. Temporal change will be commensurate with the physical scale; therefore when looking at the Metabolism of the city, we may be looking at a time span of multiple decades. This understanding helps in planning ahead for the future through various stages:

- **Inchoate Stage:** Early structures are in place to make way for the filling of spatial elements. Construction cranes and temporary trusses can be seen, and sound of riveting can be heard. Some scaffolds become permanent support for vertical circulation and other units.
- **Prime Stage:** Production is enhanced by new technologies. Market adoption is at optimal capacity. Buildings reach maximum buildout at a rapid rate.
- **Stasis Stage:** Entropy initially introduced into the system becomes homogenized and less effective. Market reaches maturity and begins to slow down until hitting equilibrium when things start to decline. Improvements become incremental and marginal rather than radical as in earlier stages. This urges the typology to evolve into an entirely new one.
- **Vestigial Stage:** The earliest elements in place - the frameworks - are now the last remnants to be seen. Buildings start to be vacated by other newer and better options on the market, and eventually are abandoned altogether. These buildings get dismantled, their parts reused and reclaimed, thus beginning the next *Metabolic* cycle.

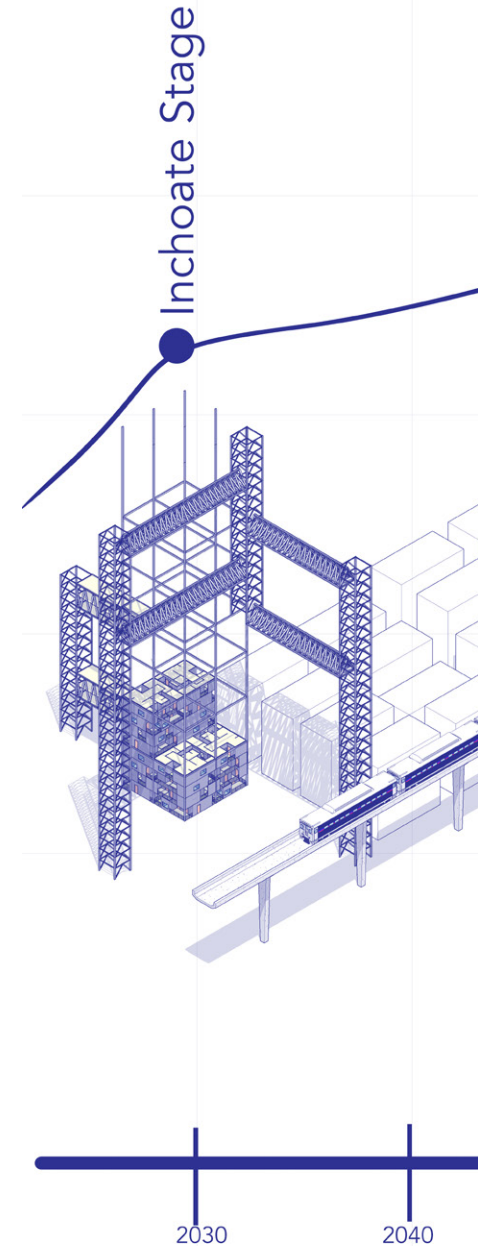
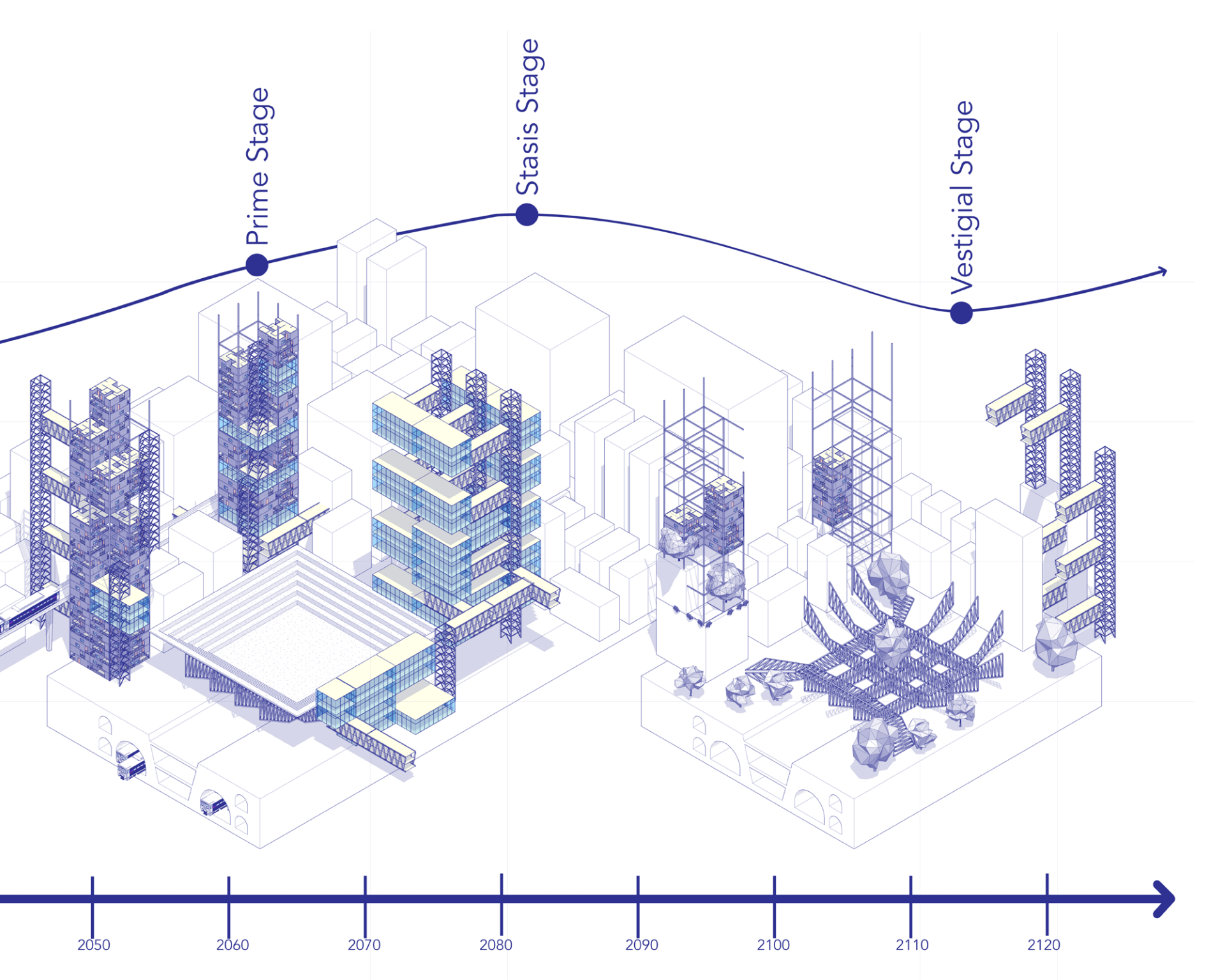


Fig. 134: Temporal Change of Hong Kong's Cityscape in the Next Century.



Prime Stage

Stasis Stage

Vestigial Stage

2050

2060

2070

2080

2090

2100

2110

2120

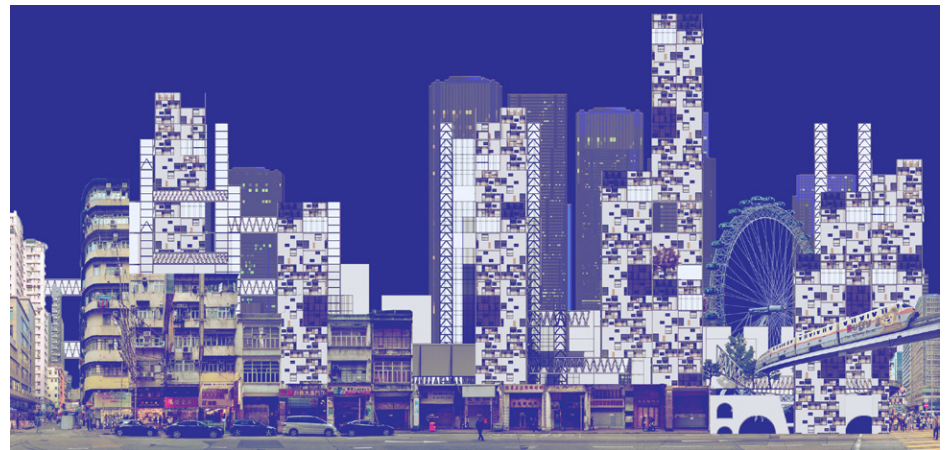


Fig. 135: Temporal Change of Shanghai Street: Chronos
Original Image: Stefan Irvine

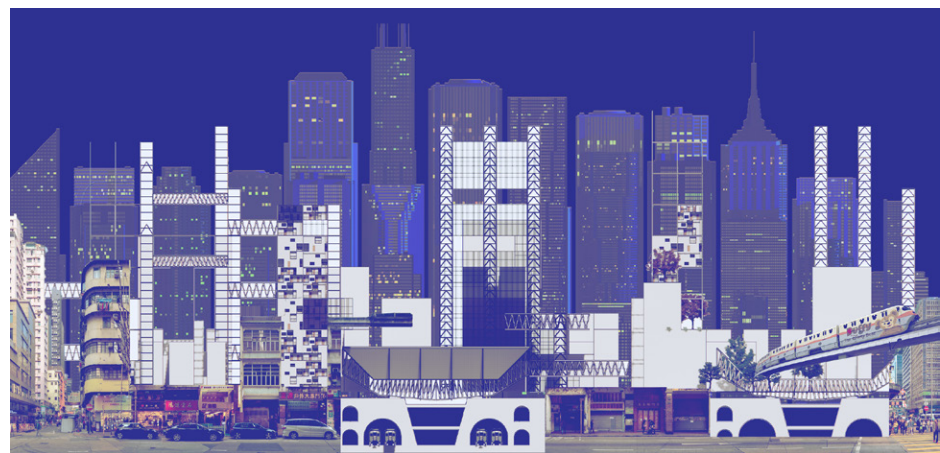
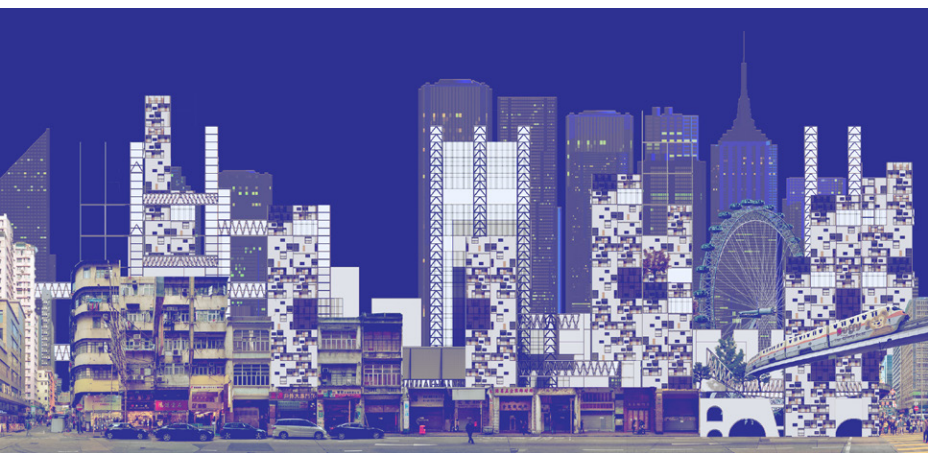
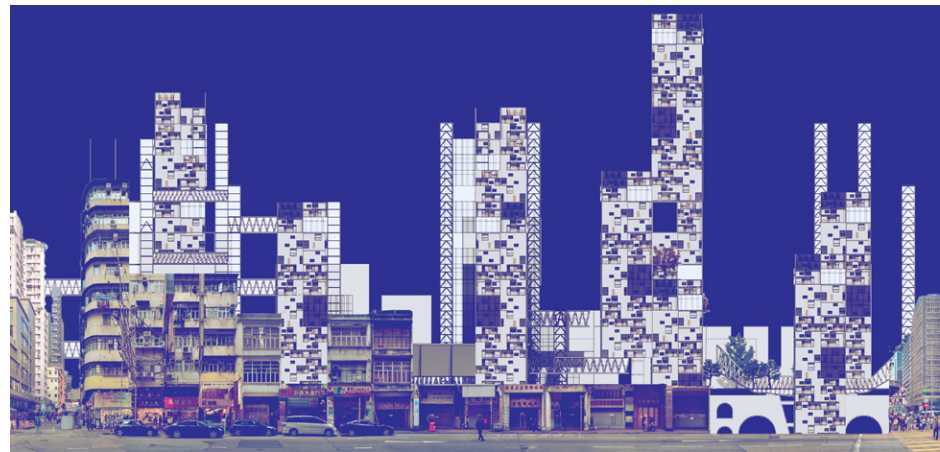


Fig. 136: Temporal Change of Shanghai
Street: Kairos
Original Image: Stefan Irvine
202





香港樓
FOR RENT

香港民主

CATHAY PACIFIC

Puffy
The Disney Bear

源昌五金裝飾材料

源昌五金裝飾材料

英皇娛樂



Fig. 137: Isozaki's Sketch of Cities in the Air
1960-1963
Arata Isozaki (036)

"Oh, you've really thought it out!", exclaimed one of the jurors after I'd answered a question about how a home as a property can be passed down to the next generation when Metabolic urbanism does not seek to fight, but rather cherish, the ephemerality of the land lease system. It was June/03/2020, the day of the presentation of this thesis - the date that I will forever remember, because it was the culmination of months working on this project. It was the moment of truth for the project as it had to convince the most discerning minds.

...

But I have not always thought things out. My education in architecture has been a series of studio works that follow the same pathway: the *premise*, the *process*, and the *solution*. Both the premise and the process are given by the instructors, and it is only up to students like myself to arrive at the solution. My professional training in the field has further solidified that pathway: architects and engineers work as solution makers for the given. This practice of only viewing things at the bottom line of the reality has harmed our critical thinking in many ways, and we as designers only passively react to what is presented to us. That is why I, among many others, have often not thought things out.

What if we can design the process? Hell, what if we can alter the premise? I asked myself these questions at the very beginning of this project. Viewing the single problem that is Hong Kong's housing affordability in the "big picture" scope has helped me account for and anticipate many possible issues. For this, I have my advisors to thank, because throughout the project they constantly reminded me in numerous ways that I was designing a process more than just a structure. The structure was and is important to prove the concept, but is only a vehicle. The jurors noticed that there were not any floor plans throughout the whole presentation, which was rather uncommon in a design project, and were pleased by that. I think they also recognized that the design is about a blueprint for the future, not one for any particular building.

My approach to the market and policy structure may be viewed as anti-top-down, but it could not be further from the truth. It is evident that by attempting to design the *process*, I must work from the top. My approach is simply pro-bottom-up, rather. While I do recognize the strength in regulations and central governance, I want to promote and leverage the thinking power of the populace, too. The product of my design exercise is the unification of top-down and bottom-up, of centralized

governance and decentralized market, of the experts and the common people, of yin and yang, of chaos and order.

I thought about the winter of 2013, when I took a class in Modernist Architecture that Professor Oshima taught. He showed us a black and white photo of a group of Japanese architects sitting shoulder to shoulder in a room full of smoke from their cigarettes. One thing led to another and I found myself checking out Oshima's book on Isozaki Arata from the library. Isozaki wrote so beautifully about the ephemeral nature of architecture, of cities, and of life itself. He turned the concept of death and destruction into almost a poetry of life and creation. I believe my love for Metabolism started there. The thesis work thus became a very personal, almost sentimental, thing to me. At the same time, I tried to remove myself as much as possible from the story I want to tell about the future and the Metabolic Hong Kong. Talk about paradoxical stuff.

...

While thinking about 2027 as the proposed time for the first Plugin Homes building in Hong Kong and how everything may be set in motion now, I realize the "now" itself is relative. It may very well be that winter morning in 2013 that set everything in motion. Butterfly effect? Chaos theory, again?

**2027
STARTS NOW**

Epilogue

In 2014, I wrote a blog entry defending a French Colonial department store in Saigon, Vietnam that was on the verge of being torn down. The blog got to an editor in chief of a major newspaper in Vietnam, who contacted me the next day to publish it as an *à la une* feature on a Sunday issue. That event started my “side gig” with a rather extensive network of preservationists I hadn’t known before - a group of architects, urbanists, historians, journalists, artists etc. from many countries who share a vested interest in the complex history of Vietnam and its architecture. Our work usually entails analyzing the historical significance of buildings from the Nguyễn Dynasty to French Protectorate era, and to post-1945. I was first intrigued by the fact that many researchers in the team can read and speak Cantonese, even though they may be British, Australian, or French. When asked, one of them just winked at me, “It comes in handy. You’ll see.” And I did see very shortly.

Saigon as we know today used to be divided into two towns: Saigon and Cholon. The latter was an early settlement

of the Anti-Qing diaspora who took shelter in Vietnam since the 17th century. They are called the “Hoa people” and most of them came from Guangdong, Fujian, and Teochew. Though constituting a minority, they were known to be entrepreneurial and took no time to be one of the driving factors in the economy of their new home. Their culture became integrated as part of the development of Saigon-Cholon since then, which is clearly reflected in the architectural influence. Documents and records of these buildings, including decorative inscriptions, oftentimes contain Traditional Chinese. A working knowledge of the language is a powerful tool that any preservationist should have. In daily life, the Saigonese dialect of Vietnamese also shows numerous examples of a linguistic integration with Cantonese, of which few Vietnamese people are aware, because of how quotidian some of these words are. Once, I overheard a conversation on the street and was amused by the topic, until I realized it was in full Cantonese - a language I didn’t speak and yet still somehow understood. I grew up knowing many people from the Chinese diaspora. One of my best friends in high school is from a Hoa family, who ironically does not read or speak Cantonese, but her flair for entrepreneurship is unmistakably that of a Hoa person.

My work in historic preservation introduced me to a few colleagues in Hong Kong, who are facing similar challenges to protect historically sensitive architecture while having to maintain a balanced view on rapid urbanization. Some of them were even born in Vietnam but repatriated to China. Through these contacts, I got to know more about Hong Kong as a hot spot of tension, especially in the fight for independence from Beijing, which only inspires me even more. The resourcefulness

and resiliency I know about the Hoa minority in Saigon is parallel with that of the people in Hong Kong; they most probably share the same ancestors. Hong Kongers are often referred to as examples of tolerance, both political and economical. However, everything has its limit and their tolerance is being stretched quite thin as the economy and their own governance become more and more controlled by the central government in mainland China. In this economy, housing has been used as a measure to control, appease, and manipulate the public.

In various conversations with these Hong Kong friends, they expressed a view that while their housing system needs fixing in both design and market structure, they find proposals from foreign onlookers to be imposing and shallow all the same. That is why many reputable architects have tried and failed in their attempts to “fix Hong Kong”. The problem I see, and my Hong Kong friends concurred, is that all these designs tend to follow the same one-size-fits-all trail, with some degree of variance, that is not dissimilar from what the government has been doing all these years. Young professionals cannot afford a two-bedroom-sized apartment, so they usually face two options: wait until they get married to move out, or live temporarily in a subdivided flat where they become neighbors with squatters and other people much lower in the economic scale. The persistent problem is that there is no in-between option for these people.

This predictability of life is what gives my friends much grief, but it is nothing compared to what awaits them ahead: limited choice of units and huge mortgage. Subsidization, while exhaustively detailed and involved, is not the ultimate solution and has proven unsustainable. “Why not decentralize

the system and let the people decide? Software developments utilize decentralization and crowdsourcing of information all the time, which makes it less burdensome and more efficient in data collection as well as computation,” I asked these friends. They usually would respond with the question “How?” If only we have a system of design principles - an architectural theory - that focuses on the democratization of decisions and allows things to organically mutate and evolve as the users see fit.

Metabolism?

Metabolism was born at an appropriate time for Japan, but arguably not at the right time for the movement itself. The movement forever remains a collection of unbuilt projects with few realized ones that are admittedly prominent yet still scarce to be of stronger impact. While many think that Metabolism is only provocative in the theoretical realm and never really took off in practice, I want to argue that the theory was not tested in full. Kurokawa’s Nagakin Capsule Tower is the tangible manifestation probably closest to his interpretation of Metabolism, as clearly defined in his book *Metabolism in Architecture*, but it was not replicated elsewhere and did not pan out due to reasons of business model and technology. The complete design of capsule units was actually a compromise on Kurokawa’s part to make the project marketable, sacrificing his point on adjustability of internal layout and replaceability of components. Kikutake’s Sky House, on the other hand, reflects the evolutions through a lifetime of the structure and is a living proof of the concept, but was never replicated because the technology to afford mass production of his system clearly was not ready, which rendered mass application unfeasible. Additionally, the collective enthusiasm of the young disciples

from Tange Lab petered out soon after the WoDeco, each pursuing a separate path and progressing in individual career; the group was only brought back briefly by Tange himself in the Osaka Expo of 1970 but that was not much help. Metabolism became an ideal abandoned and never really revisited. Some of its true potentials remain forever unrealized and untapped.

In recent years, public interest has revived deep conversations regarding this movement. The movement is no longer treated as another shelved urban concept but something highly applicable in today’s urban architecture. So what changed? The main reason being technological advancement: not only do we have sufficient construction technology, we also have a more accessible process that makes it easier for anyone to manufacture and learn how to build. Now, the other issue we need to examine is the business model: is today’s market apt to use Metabolism? And where?

Hong Kong presents an environment that meets two criteria: that the need for Metabolism exists, and that its true potentials can be tested and metered. A growing population with diverse lifestyles, especially young and single citizens, will benefit from a highly adaptive architecture. A new cultural shift also means that people will get married much later and there will be fewer multi-generational households - a trend that will curtail the household model that Hong Kong Housing Authority has been pursuing. Furthermore, the trajectory of the housing market shows an opportunity to adopt a new typology, starting with the gradual shift towards private sector. This is a timely chance to rapidly test new ideas.

As eloquently observed by Sir Peter Hall from The Bartlett when he visited Hong Kong in the 1970s, Hong Kong’s

lax regulations compared to the UK were probably the driving force behind its success while the UK then was struggling with recession.¹ Apparently Hall was not the first to make such remark. Prior to Hall, his colleague from the University College London Grenville Pullen had also expressed that the legislative and regulatory body of the colonial government posed a challenge, rather than accommodation, to the progress of Hong Kong which Pullen found quite impressive. Governance is of high importance in town planning and assurance of quality and safety, but red tape will be a hindrance.² In previous chapters, we have analyzed how the housing system could be abused and manipulated by the authoritative entity called the Housing Authority. To address it, it is important to decouple this department's power to regulate from its power to supply.

On the same note about legislation, we also discussed the land use structure in Hong Kong. Unlike other places such as the US, Hong Kong's land use is a leasehold, instead of freehold, system. It means that the government controls the right to use, and land is not free to sale among its citizens. With a scarcity of land like that in Hong Kong, this makes perfect sense. However, the auctions shall be more transparent, and land use permits shall be geared more towards private developments of housing stock. Revenue generated by these auctions shall also be made into investment of infrastructure or transfer payment to help low-income tenants, instead of direct construction of housing supply by the government.

A lot more can and will be studied in the future regarding the housing market in Hong Kong as well as the design development of this Metabolic framework. This thesis is a prelude to that long and involved pursuit.

1 Caryl, Christian. Building the Dragon City : History of the Faculty of Architecture at the University of Hong Kong. Aberdeen, Hong Kong: Hong Kong UP, 2012. Print. (102-103)

2 Ibid.

Acknowledgement

I thank Ken Oshima for his inspiring works to promote Japanese architecture that kindled in me a great interest in Metabolism during my undergraduate years. His enthusiasm in the education of architectural history can only be rivaled by his tireless support through this thesis.

I thank Alex Anderson for being instrumental in pushing this thesis from being mainly conceptual to being also seriously pragmatist. His inquiries from the technicality of prefabrication to the applicability of market elements were the force that propelled this research further.

I could never ask for a better advisory committee than these two professors. Their guidance has served me tremendously through this project, and will surely continue to influence me greatly in my future endeavors.

I'd also like to extend my thanks to researchers and scholars from Hong Kong whose works have been foundational to my understanding of the housing system and its market. A few names come to mind: Eddie Chi-man Hui, Adrienne La Grange,

Michael H.C Ho, D.W Drakakis-Smith, Lawrence Wai Chung, Betty Yung, and many more. Their prolific bodies of research were studied in great detail alongside official publications by the Hong Kong government. I would be remiss not to mention the preceding works by students and faculty at the University of Hong Kong, Department of Architecture, which have helped to strengthen my knowledge and reasoning.

As a photographer, I took inspiration from the works of the late Michael Wolf, as well as those from my generation such as Andy Yeung, Benny Lam, Peter Stewart, Toby Harriman, Bryant Cheng, and Stefan Irvine, who share a profound passion for urban photography. The power of visual documentation in architecture can never be more strongly stated than by the work of Ian Lambot and Greg Girard, whose precious record of the Kowloon Walled City and its autonomous governance was an early inspiration to launch this project and has been a frequently used reference.

Call these “white noise” or “cabinet of curiosities” or what have you, the following elements have found their way into my mind and must have manifested into the architecture in one way or another. The music by Andy Lau, Jacky Cheung, Murashita Kōzō, Terai Naoko, Fukui Ryo, Off Course, Andrés Segovia, Earl Klugh, Hilary Hahn, Martha Argerich, Joe Dassin, and many more have kept me company through many a late night. Podcasts from Vietnam, Hong Kong, Japan, Paris, and more from the US have accompanied me through long, meditative, almost therapeutic, walks. Muarakami Haruki’s novels have been my pastime reads of choice during this research. Jordan Peterson’s latest book has helped me navigate the fine line between chaos and order.

Finally, I’d like to thank my family. My maternal grandfather instilled in me a sense of intellectual curiosity from a very young age; he is the image of the scholar that I try to model myself after. Also at a young age, I came to love Hong Kong thanks to my parents’ interest in the music, movies, and arts from this land. I thank my younger brother for being an awesome travel partner and understanding sidekick. Thank you, Ngoc Anh, for your love, support, and patience. Thank you, Mozart Vu, for your loyalty, companionship, and for diligently guarding by my side as I’m writing these lines.

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