Vertical Green

An urban farm for village living in the city

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Abstract

This thesis research, **Vertical Green**, explores the possibilities of growing food in the urban context, navigating issues including food safety and food security for city dwellers. The design proposal responds to the urban development in Jiading, a suburb in Shanghai, China. The proposal tests the opportunities of adapting an existing twenty-one-story residential building through the addition of an increased threshold between interior and exterior, making space for vertical vegetable growing. This design brings together various programmes of farming including tool storage, food storage, and food processing, as well as community gathering and communal dining. Developing an urban farm located on the threshold in this way brings increased interaction between living space and farming space so that the design provides an opportunity for resident well-being and social engagement alongside healthy food production.

This architectural proposition was landed in the thesis through the research of the question, ***"What are the opportunities for village living and food security in contemporary Shanghai through high-rise building adaptation?"*** The project is intentionally seeking out the community's unique 'ways of living' within the residential compound. The contextual research evaluates several values and facts that urban residents live in their village behaviour, especially in food sourcing. The research borrows methods from ecological mapping to observe food seeking behaviours in the neighbourhood and to understand the spatial and behavioural conditions of the proposed system. The green bean is used as a test food plant to identify relationships across humans, plants and climate in ecological cycles.

The research discovers that there are positive aspects of re-thinking food production in an urban setting by paying attention to food safety and food security in village living. The high-rise building adaptation is capable to support aspects of village living, by having a vertical farm located on the threshold in the designed way. The ecological mapping identifies unusual food-sourcing methods in an urban compound and releases the intertwined connections between one testing plant and the ecological system. Overall, the thesis describes the embracement of co-living between urban living and farming explored through the architectural approach, providing a healthier opportunity for urban residential intervention.

Key words: Village living, High-rise, Building adaptation, Food safety, Urban ecology, Health and wellbeing, Residential architecture.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed
Bolong Gao

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Acknowledgements

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Introduction

> *The nineteenth-century park throughout the Western world was a monument to the landscape that was being lost in the rush to modernisation(…) an attempt to embed an artefact remnant of the rural countryside within the overwhelming denatured fabric of the expanding industrial city[1].*

Urban development is only a succession of experiments, each of which we hope will be better than the last. One method to use ecological and biological principles to understand how cities work is to learn from them. Sustainability, as well as a new set of stakeholders interested in these urban experiments, might include the surrounding environment, such as trees and plants. Alongside this, we recognise the importance of healthcare, and preventative healthcare is an essential element of city planning.

Many people have written about the importance of parks and green areas, and the literature surrounding green infrastructure is gradually being recognised. Over the last few decades, this has been the case among people involved in all facets of urban development. In 2001, according to Kunstler, who writes about parks, there would be a return to nature. And, in some ways, I believe that people's experiences with recent Covid-19 lockdown, isolation and quarantine have caused us to reflect on humanity's interaction with the natural world around us, and has prompted further attention to what is needed to develop healthy urban environments.

The thesis examines the city and nature, with a focus on more recent studies of urban agriculture in city landscape. This interest was established at the time of shifting my life from New Zealand back to China. As an immigrant who lived in New Zealand for about 8 years by far, I decided to move back on a temporary basis in order to conduct research that roots in a larger population. I was born in the Northeast part of China with ancestry linked with Manchu. From life in my hometown, I observed that in ordinary life there is attention paid to gaining nutrition and seeking quality food. Part of these reasons is due to the climate and temperature in this region, which caused less agricultural production and variety. Also, because of the concern about insecure food quality from the market, residents from my hometown cultivated behaviour that grew vegetables themselves. However, the production is always over their need, so the family would share the rest of the fresh produce to close relatives or neighbours. Taking food from kinship at no cost is a kind of concept central to their life. It also becomes a way to build social relationships across the local community. Having vegetables grown by the people you've known worry-free was a basic mindset from my childhood.

Since moving to Auckland, the living pattern had opened a new chapter for my food-sourcing experience. Washed, separated and bagged fresh food stacked in supermarket waited for taking purchase and taking home by cars. Until the site visit to Organic Market Garden (OMG) on Symonds Street, Auckland, I found something similar to my hometown - sourcing vegetables from the land. Having a community garden is rare to see in Auckland City, but this one is a model about seeing urban farms in every kiwi neighbourhood, having local jobs, and increasing food security.[2]

After relocating myself in Shanghai, while I'm doing this final year project, the shift from Tāmaki Makaurau Auckland to Shanghai indeed suggested thoughts from the food-seeking perspective. As one of the four top-tier Chinese cities, Shanghai is populated with 26 million residents with highly developed infrastructure and urban systems. Despite this, in my new living environment I curiously discovered familiar scenes from home region. In my Shanghai neighbourhood, vacant lots have been manipulated for growing vegetables, fishing is happening along the river, and signboards can be seen in parks saying "Do not dig baby bamboo". (See figures 1, 2&3.) These all acted as clues showing that the desire to seek food from the environment has not changed from the Northeast to Southern China. When the extended 2022 Shanghai Covid-19 Lockdown hits,

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[1] Kunstler, J, H,.(2001). The City in Mind: Notes on the Urban Condition. pp.112.

[2] Wong, L, M,. (2019). *Yes that is a farm in the middle of Auckland*. Stuff. Dec 30 2019. https://www.stuff.co.nz/life-style/homed/garden/118231012/yes-that-is-a-farm-in-the-middle-of-auckland

Figure 1: Manipulated lots for urban farming.

Figure 2: Fishing next to the Grand Poly Theatre.

food supply was a major problem, not only for individuals but also for the entire city. I have never experienced this difficulty of acquiring food.

The proposition for this March Prof Thesis design research was paved from some individual questions based on the described experience above:

- How to acquire food safely in a major urban metropolis?
- Why nutritious food is vital for health?
- Do people prefer to have food grown locally?

This is turn framed my research questions:
How might the urban neighbourhood living environment provides enough food for residents?

How can the urban built environment be involved in supplying food?
And, if locally grown food is important for individuals and families nutrient needs and wellbeing, how might we design gardening spaces in high-density residential architecture as essential parts of daily life in the city? This architectural proposition was landed in the thesis through the research of the question, ***"What are the opportunities for village living and food security in contemporary Shanghai through high-rise building adaptation?"***

Figure 3: Protection to stop digging bamboo shoots.

THESIS OUTLINE
The thesis document is constructed in the following way:
Part I: Context
1. Urbanisation in Shanghai introduces overview of urban development in Shanghai, such as the population growth, along with the general objectives in geography and climate.
2. Food in urban life looks closely onto some urban issues in one of the outskirts urban districts, Jiading. With rising the issues such as food safety in Shanghai, the research expand the view of seeking the relevant fragments.
3. Chinese medical care and its system explores the basic concept of Chinese medication and the history of Chinese healthcare system.
4. Urban Agriculture looked at some experiments that bring connections between urban and farming. From farm to table explains a way people staying close to their land, while Return to nature is another way that people actually bring their life back to farm.

Part II: Methodology - Urban Mapping as research tool
5. Ecology Mapping - a tool that graphs complex system identifies the research tools and examines the urban in both observational and propositional process, in terms of mapping ecology in local context.

Part III: The Project Proposal
6. Vertical Green, an urban farm for village living in the city discusses Lacaton&Vassal's architectural projects which transform residential buildings, and showcases the thesis design proposal through a set of images and description.
7. *Findings* outline the discoveries throughout the thesis research and design research in three parts: village living and food security, high rise building adaptation, and ecological mapping as research methodology, which explore urban in new means, and transformative architectural extension enables urban farming for residential blocks.

Part I: CONTEXT

1. Urban Development in Jiading, Shanghai

This chapter investigates the urban practices in the location I live, as an overview of the developing movement in a wider sense. This research begins with some general facts about Shanghai city and demonstrates the urban progressing story of this most rapidly growing metro city. Being the most populated city in a developing country, Shanghai shows both the advantages and disadvantages of urban development at the same time. Then, this section looks closely at the suburb, Jiading, which is a peri-urban area sitting in between the most developed city centre and outskirts environment. This section is aiming to unpack the ideas of urbanised culture, and what would that mean to its dwellers.

1.1 Urbanisation in Shanghai

URBAN POPULATION GROWTH

The majority of the population in China resides in the eastern part of the nation, also referred to as traditional China. Most people in China are peasants who, like their ancestors, live in the low-lying hills and central plains that extend from the highlands eastward and southward to the sea. The principal industry in this vast area, which benefits from a temperate or subtropical climate, is agriculture. The carefully cultivated fields reflect the government's continuous concern for food production and agricultural output.[3]

The rate of urbanisation in China from 1949 to 1982 was relatively slow due to the rapid growth of the rural population and the strong restrictions on rural-urban mobility. Between the 1953 and 1982 censuses, the urban population's share of the total population increased from 13.3% to 20.6 percent.[4] However, the urban population increased significantly between 1982 and 1986, reaching 37% of the total population.[5] The enormous and sudden increase was caused by several different factors. The choice to expand the standards for classifying a city or municipality was one of those. In 1984, the population of urban towns increased by more than twice as much as the number of towns that complied with the new urban requirements.[6] The national forecast was that by the turn of the century, around 50% of people would reside in cities and towns in the middle of the 1980s.[7] It was anticipated that this urban growth would be driven by the increase in the number of small to medium-sized cities and towns rather than the expansion of already-existing mega-cities.

URBAN REVOLUTION IN SHANGHAI

Since the 1978 Market Reform, China has been experiencing a full-scale urban revolution.[8] However, the development of “suburbs” are much more recent phenomena. Chinese urbanisation is rapidly evolving, and the central government publishes an Urbanisation Plan each year since 2014[9]. It has four objectives, including improved urbanisation and better city sustainability. A

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[3] "China's urbanisation growth rate slows to quarter-century low". *South China Morning Post*. 2022-02-28. Retrieved 2022-04-21.

[4] Riskin, Carl; United Nations Development Programme (2000), China human development report 1999: transition and the state, Oxford University Press, p. 37.

[5] Hillman, Ben (2013), The Causes and Consequences of Rapid Urbanisation in an Ethnically Diverse Region, China Perspectives, Issue 3, September 2013, pp. 25–32

[6] Ian Johnson (15 June 2013). "China's Great Uprooting: Moving 250 Million Into Cities". *The New York Times*.

[7] The Urbanisation of Rural China, edited by Ben Hillman and Jon Unger, special issue of China Perspectives (September 2013).

[8] X. Ren. (2008). Architecture and China’s urban revolution. City. (12/2). http://www.news.com.au/travel/world-travel/china-is-building-hundreds-of-insane- new-megacities/story-e6frfqb9-1227315920388.

[9] Hillman, *The Urbanisation of Rural China,* 26.

significant emphasis is also placed on the population that has recently moved (to metropolitan regions) and "unified urban and rural development." In order to "perfect the institutional structure for urbanisation development", it advocates for five changes in the areas of population management, land resource management, financial security, the construction of urban housing, and environmental protection.[10]

The plan's primary messages appear to be quite clear and succinct, and they demand a variety of local-level actions. New urban concepts that offered highly accessible urban transportation, vibrant street life, and mixed-use neighbourhoods combining houses and businesses were already being considered by several Chinese cities.[11] However, the unique circumstances of Shanghai's suburbs demand a variety of tailored activities and regulations.

Zheng notes that Shanghai offers a wide variety of features thanks to the planning policy.[12] It is made up of city and rural areas, aiming to create sustainable places in the metropolitan area, some satellite cities with one million residents have been master-planned and created, such as Pujiang and Anting New Town; other cities hosting 40 to 60 thousand people have also been designed and built, such as on Chongming Island. Additionally, certain targeted interventions have been planned for a few tiny settlements near Shanghai.

Shanghai's sub-urbanisation is unique in that it includes a wide range of suburbs that vary in size and location, from planned cities with plainly recognisable urban forms - such as Pujiang, Anting, and the harbour region - to suburbs that hold businesses funded by the local government. The topography of these lands, which is relatively consistent with these dynamics, can be used to explain this aspect. It is a completely flat area with an equivalent building potential, except for the east side, which is constrained by the presence of the coastline.

Figure 4: Apartment blocks in Jiading, Shanghai.

Shanghai's suburbs are diverse from a typological standpoint, starting with repetitive, monotonous clusters and structures, such as towers and multi-story buildings and apartment blocks that coexist with independent neighbourhoods and gated communities; semi-detached and detached units are more common. (See figures, 4, 5 & 6.) In contrast to Western suburbia,

[10] Hillman, *The Urbanisation of Rural China,* 26.

[11] S. Zheng. (2011) Expo 2010 Shanghai and its meaning to future city. Roma: Officina Edizioni. p12.

[12] A. Bugatti, S. Zheng (eds.). (2011). Changing Shanghai. From Expo's after use to new green towns. Roma: Officina Edizioni.

Figure 5: Detached houses surrounded by apartment blocks.

Figure 6: Multi-story buildings coexist with building towers.

only a small number of highly wealthy families can afford a villa as a dream home.[13] The expansion of public transit systems and middle to high density apartment buildings continue to dominate suburban growth in China. (See figure 7.)

With the thesis research stepping forward, the research question has been developed. In the case of questioning urban, the view is looking at more specifically into Chinese context, importantly, Shanghai settings. The following questions may have unshaped answers, but meaningfully altered the perspective of my stay in the city.

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[13] I. Delsante. (2016). Shanghainese Sub-urbanism. Features, Rise and Trends towards Unified Urban and Rural Development. Chapter 7.

Figure 7: Metro Station that connects high dense buildings to central city.

What is the "Chinese" approach to urbanisation in 21st-century? This is arguably the most important missing piece in the debate on urbanisation. What kind of lifestyle does the high dense city produce? What would high rise dwelling impact on new residents? This research collects projects that reflects the attitude towards a localised urban development.

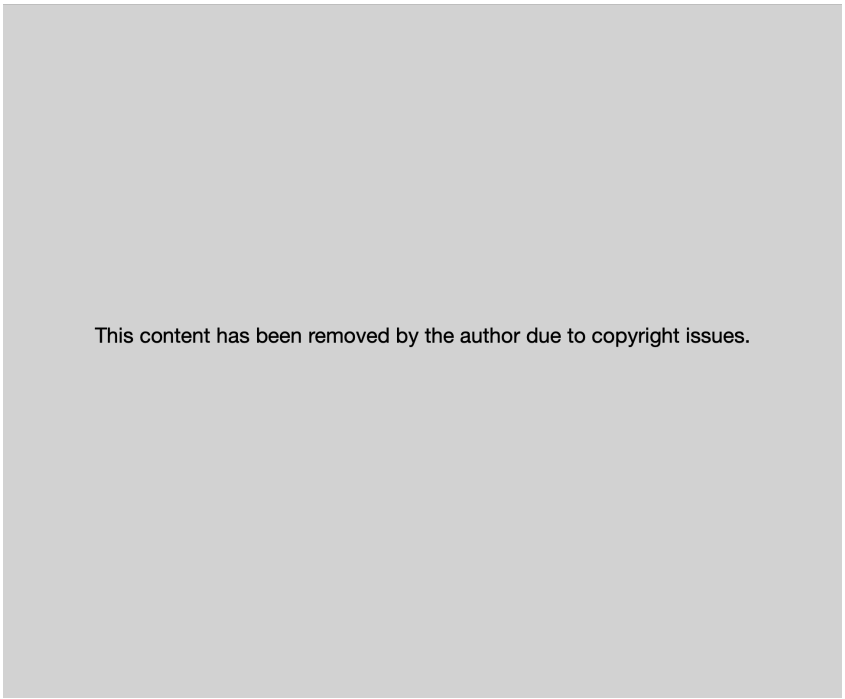

Figure 8: New mixed use development in Jiading. Model with singe units. Source: I. Delsante. (2016). Shanghainese Sub-urbanism. Features, Rise and Trends towards Unified Urban and Rural Development. Photo by Ionni Delsante.

A few small towns and villages are crucial for the Shanghai metropolitan area's balanced development process. These include small towns with about 60,000 residents are among them, such as those on Chongming Ecological Island; historical villages with conservation plans and urban renewal are also among them, such as Zhou Ji Jiao Water Town; and other small villages with a mix of old and new urbanisation. Additionally, those communities where migrant workers have established ought to be included and examined. These communities, which are typically located outside the city centre and deviate significantly from the luxury suburban model of detached homes, require urgent analysis and attention. Conservation, cultural identity, sustainable communities, and development, are all relevant topics. Renovation is one of the urban revitalisation solutions that has already been tried,[14] and to evaluate the efficacy of these approaches, more information is required. These initiatives should focus on an intermediate level of urbanisation known as the "neighbourhood" dimension.[15] According to the national urbanisation law strategy, these steps could further solidify the notion of people-oriented urbanisation.

Figure 9: A map of Shanghai. Source: Google Maps.

1.2 Shanghai Context

GEOGRAPHY
Shanghai is located on the east coast of the Yangtze River Delta. The Pacific Ocean is not far from the city across the East China Sea. The city has a total area of 6,340.5 km^2, of which 6,218.65 km^2 is land and 121.85 km^2 is water. Due to the alluvial plain of the Yangtze River Delta, the city is primarily flat. There are a few hills in the southwest corner. Due to its position, Shanghai has many rivers and lakes, making the city rich in water resources. The rivers and lakes never freeze over because of the warm temperature. [16]

CLIMATE
Shanghai experiences four different seasons in a humid subtropical environment. Winters are chilly, with occasional lows below zero. Rarely does snowfall. Siberian gusts from the northwest

[14] Y. Chen. (2011). The development of Shanghai's Architecture in the era of ecological awareness – using eastern Chongming island as an example.

[15] I. Delsante (ed.). (2007). Rinnovo urbano, identità e promozione della salute. Santarcangelo di Romagna: Maggioli.

[16] Shanghai Statistical Bureau Yearbook. (2007). http://www.stats-sh.gov.cn/2003shtj/tjnj/nje07.htm?d1=2007tjnje/e0101.htm

produce a decrease in temperature to below freezing. Between March and May, when springtime weather is in full swing, it frequently rains heavily. Summers, on the other hand, are frequently hot and muggy. For an average of 8.7 days in a row during the summer, from June to September, temperatures can exceed 35 degrees. [17] Typhoons, downpours, and thunderstorms are common during the summer and early fall. The greatest and most pleasant season is from October to November because of the bright and dry weather. December through February is typically a rainy and chilly time of year.

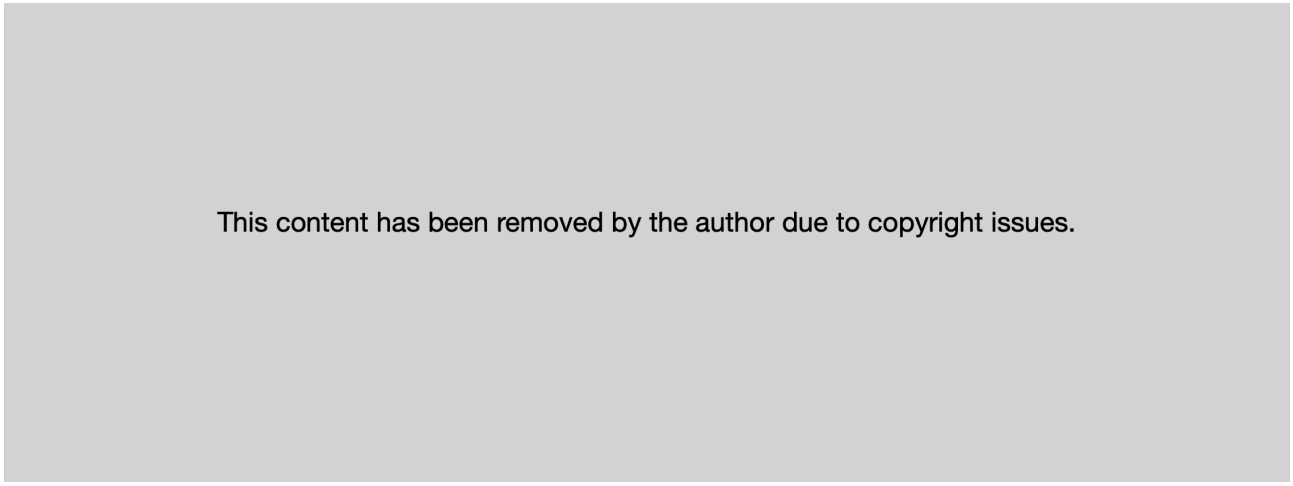

Figure 10: Climate data for Shanghai. Source: China Meteorological Administration. Retrieved from: http://www.stats-sh.gov.cn/tjnj/nje14.htm?d1=2014tjnje/E0102.htm

DEMOGRAPHY

Shanghai has a population of about 26 million people. 21% of the population live in cities, compared to 79% who live in rural areas. Long-term migrants from Anhui, Jiangsu, Henan, and Sichuan provinces make up 9 million. The number of foreign residents is rising. The number of foreign citizens doubled from 2005 to 2009. Most of them are of Japanese, American, and Korean descent. In China, there is an imbalance between the various age groups as a result. 8.3% of the population is under the age of 14, compared to 22.54% of citizens who are over 60.[18]

SOCIO-CULTURAL ELEMENTS

The city has a long history dating back more than a thousand years, and there are many beautiful places to visit. The Bund, a long boulevard along the Huangpu River, is one of the most well-known. Older western architecture, including Gothic, Roman, Baroque, Classical, and Renaissance style homes, may be seen along The Bund. The renowned Shanghai World Finance Centre is another picturesque location. Three observation floors provide a perspective of both the ancient and new Shanghai. Hu language is the name of Shanghai's local dialect. It is a component of the Wu language, which is mostly spoken in Shanghai, Jiangsu, and Zhejiang provinces. A wide variety of vowels and consonants are present. The dialect is significantly dissimilar to Cantonese and Mandarin, for instance, locals of Shanghai pronounce their initials rather than Mandarin or Cantonese. In Shanghai, there are some different religious organisations. According to a 2012 poll, the Buddhist community accounts for the largest group, at about 10.4%. In Shanghai, 1.9% of people identify as Protestant, 0.7% as Catholic, and 0.1% as belonging to another religion. The remaining 87% are either atheists or Confucianists[19].

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[17] Xiao Fu. "Small islands to beat summer heat". *Shanghai Daily*. Hosted at *China Daily*, 28 Jun 2006. Accessed 12 Jan 2015.

[18] "外省市来沪常住人口发展现状及特征". Shanghai Statistics Bureau of Statistics. 23 September 2011. Archived from the original on 2013-11-01.

[19] "Basic Statistics on National Population Census". Shanghai Bureau of Statistics. Archived from the original on 2013-05-01. Retrieved 2019-11-25.

1.3 City edge: Jiading District - a blended area to explore urban transformation

THE LOCATION: JIADING DISTRICT, SHANGHAI
Jiading District is a suburb of the city that is situated to the northeast of the downtown area. Jiading was a separate township up until 1958 when it was included in Shanghai's governance. In 1993, Jiading's status was transferred from the county to the Shanghai district. The area has undergone significant urbanisation during the past three decades.

In the middle of Jiading district is Jiading New City, which was intended to be a satellite city as early as the 1960s. The initial goal of the satellite city concept was to distribute Shanghai's inner city's overburdened population. Near the north end of Jiading New City, the Jiading Old Town has experienced continuous development for many years. The lower middle portion of the area is where an industrial park is envisioned. The remaining territory, mainly along the metro line, is Jiading New City's planned central area for residential, commercial, public facilities, and governmental uses. The agricultural land on the east and west sides has been set aside for ecological protection. It is a modern city that has been carefully designed, with resources allocated judiciously and in a balanced manner.[20]

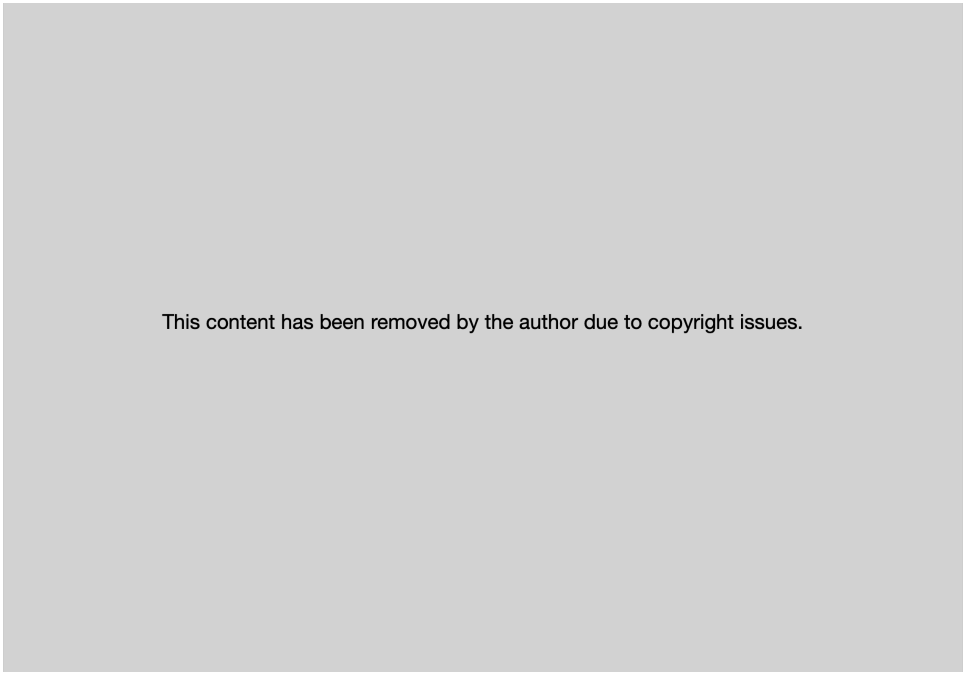

Figure 11: A map of Jiading district, Shanghai. Source: Google Maps.

JIADING DISTRICT URBANISATION AND FUTURE
Being one of Shanghai's five strategically planned "new cities", Jiading District, presented specific measures to hasten its economic and social development over the following years.

Jiading will significantly increase its industrial strength in the upcoming years as it is positioned as a vital hub along the Shanghai-Nanjing development axis and is a national experimental zone for smart transportation. Connectivity, self-driving vehicles, car sharing, and electrification are the primary next-generation auto technologies that will be

[20] Qiu, R. Xu, W. Zhang, J. Staenz, K. (2017). Modelling and Simulating Urban Residential Land Development In Jiading New City, Shanghai. Spatial Analysis, 2018, 11:753-777.

developed into a 100-billion-yuan industry, with the online new economy producing an estimated total of 400-billion yuan annually as a whole. As Jiading continues to expand its innovation efforts to drive its economy, the local government has planned two 100-billion yuan science and technology parks, one in collaboration with scientific research organisations and the other with universities and colleges. According to their plan, the new city will include around 1,400 new, high-tech businesses by 2025.[21]

[21] Shanghai Municipal People's Government. (2021). Jiading New City developing at a fast clip. Retrieve from: https://www.shanghai.gov.cn/nw48081/20210716/95d24af0a8bb429e923cfbdaaaf19bff.html

2. Food in Urban Settings

This chapter conducts research that covers different terms for obtaining food in urban. The case study looks closely at a journey that tells the difficulty of a Shanghai family seeking safe food. Then the research finds out the distribution model has been changed from old China. Urbanisation causes the way of buying food to change. Furthermore, even though the imported food culture altered Chinese diet behaviour, culture has not been removed from having traditional food types and undertaking the herb as part of self-care therapy.

2.1 Case Study - Shanghai Families' Strategies to Seek Safe Food in Urban life

This thesis research focused on a case study carried out by Ingrid Fihl from the Department of Cross-Cultural and Regional Studies at the University of Copenhagen, who spent six months in Shanghai investigating how households obtain safer food. From an ethnographic perspective, this study explored the risks associated with eating in typical family settings in urban China, as well as the challenges of navigating the urban food market and relying on family members, WeChat groups, and the Internet for guidance on how to avoid the frequently incomprehensible health risks associated with contaminated or chemically treated foods[22].

According to the investigation's findings, many urban customers believe that locally produced food is likely to be made too cheaply, chemically contaminated, or even completely fake. Recent food safety events in China have raised concerns among a lot of the country's consumers[23]. As seen by campaign-style inspections and legal actions, the Chinese government's growing political awareness of its duty to maintain food safety reflects the grave threat to public health that imperils its ability to govern. In her study, Ingrid Fihl examined how urban consumers manage food risk uncertainties by taking matters into their own hands.[24] She also examined how they perceive both physical and moral risks as arising from both physical risks associated with routine eating and from immoral behaviour of those who participate in the wet market, the country's current domestic food market. It shows how family caregivers communicate useful knowledge in private networks and how they have a moral obligation to manage food dangers in their daily lives.

The researcher discovered that family caregivers in Shanghai invest a lot of time, energy, and money into locating food for their loved ones that they believe to be safer and healthy. The results show that rather than achieving absolute and scientific safety, which seems to be beyond their reach, the families' options for obtaining safe food are all geared towards *fangxin*, a sense of success and peace of mind.

2.2 Supermarketisation

Over the last 40 years there have been many changes to the food procurement system in urban China. Since the 1980s, urban China has relied on wet market vendors to supply fresh vegetables. Before the 1980s, the state-run vegetable retail system delivered to city inhabitants.[25] Another significant location for the sale of vegetables in China is grocery stores. They were privatised in the 1990s after formerly being a part of the centrally planned retail system.[26] Grocery stores are dispersed across blocks and compounds, as opposed to stallholders who congregate on market

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[22] Fihl, I. (2019). Risky Eating: Shanghai Families' Strategies to Acquire Safe Food in Everyday Life. *Journal of Current Chinese Affairs*, *48*(3), 262–280.

[23] Chen, N. (2014). Between abundance and insecurity: securing food and medicine in an age of Chinese Biotechnology. In: Chen NN and Sharp LS (eds.) Bioinsecurity and Vulnerability. Santa Fe: SAR Press, pp. 87–102.

[24] Fihl, Risky Eating: Shanghai Families' Strategies to Acquire Safe Food in Everyday Life, 262–280.

[25] Goldman, A. (2001), "Supermarkets in China: the case of Shanghai", The International Review of Retail, Distribution and Consumer Research, Vol. 10 No. 1, pp. 1-21.

[26] Babcock, T. (2017), "Annual retail foods report - China", available at: https://gain.fas.usda.gov/Recent GAIN Publications/Retail Foods_Beijing ATO_China - Peoples Republic of_1-26-2017.pdf (accessed 6 November 2019).

sites. Due to the limited ability of wet markets to regulate food safety, the local administration views stallholders and street vendors as responsible for food safety issues.[27] Because individual grocery stores have fewer staff members, they are less able to control intermediaries and guarantee the safety of vegetables.

Municipal governments chose to replace wet markets with supermarkets during the 2000s. [28] Supermarkets are recognised for developing private food safety management systems and adhering to food hygiene requirements, both of which have contributed to an improvement in food safety.[29] A "supermarket chain" has a substantial number of outlets, operates on a national or at least provincial scale, and can integrate vertically into the value chain.[30] The emergence of supermarkets has changed China's food retail sector in recent decades with the assistance of local governments.

In the past, vegetables were typically sold through intricate networks of farmer homes, dealers, middlemen, and vendors at wet markets, grocers, and supermarkets. Traditional vegetable distribution channels such as these have been replaced by direct sales and contract farming run by big businesses as a result of the growth of supermarkets, and large-scale supermarket chains now play a central coordinating role in food chains.[31] On the other hand, there is a worry that the supermarketisation process will be different in poor countries than it is in wealthy ones.[32] This is a concern that Goldman pointed out[33], as he observed supermarketisation in developing nations and found that Asian shops prefer to purchase veggies from the same intermediaries. Walmart in China has the same external suppliers as wet markets, according to a recent study.[34] As a result, in the urban environment of China, supermarkets might not be the best at assuring the safety of vegetables.

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[27] Michelson, H., Boucher, S., Cheng, X., Huang, J. and Jia, X. (2018), “Connecting supermarkets and farms: the role of intermediaries in Walmart China’s fresh produce supply chains”, Renewable Agriculture and Food Systems, Vol. 33 No. 1, pp. 47-59.

[28] Babcock, T. (2017), “Annual retail foods report - China”, available at: https://gain.fas.usda.gov/Recent GAIN Publications/Retail Foods_Beijing ATO_China - Peoples Republic of_1-26-2017.pdf (accessed 6 November 2019).

[29] Reardon, T. and Timmer, C.P. (2012), “The economics of the food system revolution”, Annual Review of Resource Economics, Annual Reviews, Vol. 4 No. 1, pp. 225-264.

[30] Song, W., Schein, D.D. and Ravi, S.P. (2012), “The development of Chinese supermarket enterprise own brands: the case of Shanghai”, International Journal of Management and Enterprise Development, Vol. 12 No. 2, p. 93.

[31] Oosterveer, P. (2012), “Sustainability and supermarkets”, in Spaargaren, G., Oosterveer, P. and Loeber, A. (Eds), Food Practices in Transition: Changing Food Consumption, Retail and Production in the Age of Reflexive Modernity, Routledge, London, pp. 153-176.

[32] Reardon, T. and Timmer, C.P. (2012), “The economics of the food system revolution”, Annual Review of Resource Economics, Annual Reviews, Vol. 4 No. 1, pp. 225-264.

[33] Goldman, A. (2001), “Supermarkets in China: the case of Shanghai”, The International Review of Retail, Distribution and Consumer Research, Vol. 10 No. 1, pp. 1-21.

[34] Michelson, H., Boucher, S., Cheng, X., Huang, J. and Jia, X. (2018), “Connecting supermarkets and farms: the role of intermediaries in Walmart China’s fresh produce supply chains”, Renewable Agriculture and Food Systems, Vol. 33 No. 1, pp. 47-59.

2.3 Eating behaviours

FOOD TYPES

Fresh vegetables have long been regarded as one of China's most essential foods. In contrast to the diets of most Westerners, the typical Chinese diet is plant-based.[35] China consumed 447 kilos of vegetables per person in 2017, which is far more than the 134-kilogram global average.[36] Grains are also important in the Chinese diet. While rice and rice-based foods proliferated from the south up to the north, eventually burgeoning throughout the rest of the country, contributing significantly to the shaping of Chinese dietary culture and long-standing eating traditions, northern-cultivated wheat and barley found their way down to the south as a sign of early natural dietary evolution. The massive contemporary urbanisation of vast Chinese rural lands is one of the most notable factors in the change of traditional diet. The steady migration of rural people seeking better employment opportunities into metropolitan areas during the 1980s and 1990s had a significant impact on the development of traditional eating patterns.

One of the main factors that helped with the transition to modern nutrition and changes in traditional dietary practices over time was the fact that the Chinese people are not overly nationalistic to the point of rejecting imported foreign food items. Throughout history, there have been many different routes for foreign foods to enter China and become largely accepted as a part of the national culture. Despite being locally sourced and produced, traditional Chinese cuisine has long been influenced and defined by several elements, such as the great diversity of food supplies, range of physical and human geographies, different socio-ethnic culinary traditions, and faith-based food traditions.[37]

FOOD AND HEALTH

Traditional medicine has long used food as a form of food therapy or medical diet treatment in Chinese culture to promote longevity and sustain health. This is done by maintaining a balance between the Yin (receptive) and the Yang (active) with the right combination of diet and medication. This has played a crucial role in maintaining the longevity of Chinese traditional culinary culture over the years.[38]

Despite the fact that neither ginger nor garlic are indigenous to China, there is a long-standing belief in its culinary tradition that they offer a number of therapeutic benefits for illnesses ranging from the common cold, leprosy, and respiratory problems to treating gastrointestinal problems and parasite infestation.[39] The significance and extensive usage of garlic and ginger as essential components in both Chinese culinary culture and alternative medicine could be explained by this herbal medicinal philosophy.[40]

The transition from traditional Chinese full-service restaurants to more affordable fast-food restaurants in recent decades has been driven by changes in modern lifestyles, restricted free time, and physical activity. One of the most obvious changes in Chinese consumers' eating habits

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[35] Cheng, L., Jiang, S., Zhang, S., You, H., Zhang, J., Zhou, Z., Xiao, Y., Liu, X., Du, Y., Li, J., Wang, X., Xin, Y., Zheng, Y. and Shang, K. (2016), “Consumers’ Behaviors and Concerns on Fresh Vegetable Purchase and Safety in Beijing Urban Areas, China”, Food Control, Vol. 63, pp. 101-109.

[36] OECD (2018), “OECD-FAO agricultural outlook 2018-2027”, OECD, 3 July.

[37] Zhang N, Ma G. Nutritional characteristics and health effects of regional cuisines in China. J Ethn Food. 2020;7(7)

[38] Wu Q, Liang X. Food therapy and medical diet therapy of traditional Chinese medicine. Clinical Nutrition Experimental. 2018;18(1):1–5

[39] Bayan L, Koulivand PH, Gorji A. Garlic: a review of potential therapeutic effects. Avicenna J Phytomed. 2014;4(1):1–14

[40] Haniadka R, Saldanha E, Sunita V, Palatty PL, Fayad R, Baliga MS. A review of the gastroprotective effects of ginger (Zingiber officinale Roscoe). Food Funct. 2013;4(6):845–55.

is the development of Western-style fast food restaurants throughout the country.[41] High incidence of non-communicable diseases (NCDs) have been linked to increased calorie intake, saturated fats, trans fats, sugar-sweetened beverages, and sodium.[42] A significant body of research has presented evidence-based epidemiological data establishing the connection between chronic NCDs and bad eating habits, which are related to nutrition, sociodemographic change, and leading an unhealthy lifestyle.[43] Chinese people are turning away from the healthier methods of steaming and boiling food in favour of deep-frying.

2.4 Ensuring food security

China's connection to the world economy has increased since it joined the World Trade Organization in 2001. China's rural growth and the sustainability of its overall development have both been significantly impacted by agrarian globalisation. One of the Chinese government's top concerns in recent years has been food security.[44]

Food security in China is correlated with both survival and safety. Faced with these challenges, China's social work industry has started to think about how it may contribute to addressing issues of food security and the environment by examining and changing theory and practice models that could successfully direct social work in rural areas. Particularly among Chinese social work professors and practitioners, the idea of "social economy" has grown in popularity[45].

An economy that is structured to meet the wants and aspirations of common people rather than wealthy individuals is referred to as a social economy. For this to occur, it must somehow be under the control of regular people and be subject to social power.[46] In accordance with this ideology, social work groups in rural China have experimented with the social economy by, for instance, fostering collaboration between rural producers and urban consumers.

As an example of this, social workers set up cooperatives to farm organic crops in Pingzhai Village, which not only promoted sustainable agricultural methods but also satiated the growing need for wholesome food in metropolitan areas.[47] Chinese social workers helped rural farmers connect with urban consumers directly to sell their goods at a better price, which also served as a tool to help farmers escape poverty.

Residents of urban areas don't just go on agricultural excursions for fun; they also consider permanently relocating to rural areas. 500 million Chinese citizens travelled from rural to urban areas over the past 40 years in quest of better economic opportunities. A gulf between rural and urban inhabitants was accentuated by this widespread movement, and as China's middle and upper classes expanded, they wanted to further isolate themselves from their rural counterparts. However, as pollution, population, and concerns about food safety rise, this inclination toward rural areas, people, and places is shifting.

As a result, China is experiencing a reverse movement, and urban dwellers are seeking respite in rural destinations. People are beginning to realise that rural peoples, including farmers, are essential to securing safe food for the millions of people living in urban centres. Fear of pollution is

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[41] Zhang X, van der Lans I, Dagevos H. Impacts of fast food and the food retail environment on overweight and obesity in China: A multilevel latent class cluster approach. Public Health Nutr. 2012;15(1):88–96

[42] Wu HW, Sturm R. What's on the menu? A review of the energy and nutritional content of U.S. chain restaurant menus. Public Health Nutr. 2013; 16(1):87–96.

[43] WHO. Global status report on-communicable diseases 2014. World Health Organization.

[44] Christiansen, F. (2009). Food security, urbanization and social stability in China. *Journal of Agrarian Change*, *9*(4), 548–575.

[45] Christiansen, Food security, urbanization and social stability in China, 548-575.

[46] Wright, E. O. (2006). Compass points: Towards a socialist alternative. *New Left Review*, *41*(93), 93–124.

[47] H. B. Ku., & David Ip. (2011). Designing development: a case study of community economy in Pingzhai, Yunnan Province, in PRC , China Journal of Social Work, 4:3, 235-253.

also motivating people living in cities such as Shanghai, Beijing, and Hangzhou, where air pollution is inescapable, to move to more rural areas not yet beset by smog and other pollutants. Others choose to partake in ecotourism because they are unwilling or unable to permanently forsake the comforts and financial prospects provided by city living.

As pollution and concerns about the safety of food become more prevalent, the orientation toward rural areas, people, and places is shifting. In certain instances, the cultural and social gaps between rural and urban areas are closing as people form bonds with the land and learn to cherish local cultures. In other cases, the linkages disregard different viewpoints. People are now being compelled to visit farms, travel to rural locations, and relocate their life as a result of disaffection with the crowded cities of Beijing, Shanghai, and Shenzhen, which are also becoming noisier, polluted, and crowded with cars and people. Connections to rural retreats have the potential to foster veneration rather than contempt for rural populations and to foster emotive connections rather than rejection. The case studies of Shared Harvest and Dali demonstrate how rural voices and spaces are threatened by the shift from repulsion to attraction.

SHARED HARVEST

There were reportedly 100 organic farms on the outskirts of Beijing as of 2016, but only a small portion of them were certified, in part because organic certification is so expensive.[48] Dr. Shi Yan founded Shared Harvest, one of these farms, in 2012. She did this with three objectives in mind: to promote food safety, to assist farmers in earning a living wage, and to strengthen links between urban inhabitants and farmers.[49] The three locations of Shared Harvest are all devoted to community supported agriculture (CSA), in which locals sign up for a regular delivery of fresh food they can choose online. Together, they support dozens of farmers and deliver fresh, organic, and secure meat, eggs, and fruit to over a thousand members.

Through its numerous programmes, Shared Harvest helps close barriers and open doors for dialogue and cooperation. The group acts as a translator of rural voices, culture, and expertise into urban ideals and language so that future generations who inherit the farms can ensure they uphold a land ethic. The significance of rural knowledges about plants and the land will ideally endure despite the fact that much has been lost and will continue to be transformed as rural voices are translated to appeal to urban sensibilities.

DALI

People are escaping the urban lifestyle for the countryside, even if just for a brief holiday, as awareness of pollution in big cities grows. Others, dubbed "smog refugees," are moving to areas like Dali, a tourist destination in northwestern Yunnan, China, nowadays becoming the popular backpacker hang-out place, to get away from the pollutants of city life.[50] Erhai is the principal tourist attraction in Dali. The best way to explore Erhai is to meander along its banks on an electric scooter, which can be rented almost anywhere in the city. The Dali case study demonstrates the value of physical geography as a medium for communication as well as the risks of giving rural areas a higher value in a hyper-mediated world.

This thesis research investigates the opportunity for those residing in urban areas to return to organic farming and continue rural life, similar to the rural social work projects currently underway in China. The design research project helps for a vertical farm integrated into high-rise residential housing while also fostering community participation and togetherness. It does this by retrofitting an existing residential tower block and helping ‘urban farmers’ produce income.

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[48] The Food and Land Use Coalition. (2020). Sharing harvests and tables: a community led farming movement in China. Retrieved 20th November, 2020, from: https://www.foodandlandusecoalition.org/sharing-harvests/

[49] Tasting the future. (2019). Community Supported Agriculture in China: An exciting approach that aims to restore soil and human health. Retrieved 23rd July, 2019, from: https://tastingthefuture.com/2019/07/23/community-supported-agriculture-in-china-an-exciting-approach-that-aims-to-restore-soil-and-human-health/

[50] Needham, K. (2017, April 8). Smog refugees pollute Dali, China’s “hidden gem.” Retrieved May 31, 2018, from https://www.smh.com.au/world/smog-refugees -pollute-dali-chinas-hidden-gem-20170406-gvfgtj.html

3. Plant and herb-based medicine - traditional Chinese medical care

> Having examined the urbanisation of the region, and the impact this has had on food supply and food security for residents of Shanghai, this section looks briefly at traditional Chinese medicine (TCM), which has an implicit relationship to food and nourishment. With an introduction to the medical concept and principles, this section bridges the usage of herbal medicine and cultural preference.

Attempts have been made since 221BCE in China to fight disease and maintain health among the population, and they were required to adhere to the same principles as the creating a peaceful society. The same phrase, Zhi, which generally means "to put in order," was used to describe both rulings (the state) and treatment at this period, which was seen by observers of both the state and the human body (a person).[51]

Yin and Yang, the two opposing yet interconnected forces, are the foundation of everything in Chinese culture and health practice. They are two mutually dependent opposites of a whole. Yang refers to the ‘sunny or active’ aspect, while Yin refers to the ‘shady or dormant’ aspect, such as water, dark, cold, night, passive, female, as opposed to fire, bright, hot, day, active, male. The Yin Yang theory is used in Traditional Chinese Medicine (TCM) to comprehend the intricate relationships and ongoing changes in the human body. According to TCM, the human body is seen as a cohesive totality in which all of the organs and systems are linked and dependent on one another. Our bodies are typically healthy when Yin and Yang are in harmony; but, if one force predominates over the other, discomfort and illness may develop. The Yin Yang idea is used in TCM to identify patterns of disharmony and find remedies to bring about balance.[52]

Wood, fire, earth, metal, and water make up the "Five Elements" system. Each one stands for various attributes, capabilities, or external manifestations that can be applied to anything in the cosmos. All natural events are described in terms of their interactions and connections springing from this idea. The augmenting and destructive cycles are the main ways in which the Five Elements interact with one another. While the destructive cycle works by keeping each elemental phase under control to maintain balance and harmony, the augmenting cycle works by each elemental phase aiding one another by strengthening their capacity to transform. In TCM, maintaining a balance between generation and regulation is crucial for maintaining health.[53]

TCM was a practical and ideological part of China's healthcare system in the early 1950s.[54] However, China's market reform and opening up in the 1970s viewed the use of TCM as incompatible with a society devoted to modernisation.[55] In urban China, the percentage of persons who saw TCM practitioners in the formal health sectors fell from 25% to 20% between 1991 and 2004.[56]

Little research on the use of TCM in mainland China have been published in English, especially in light of the recent national health care changes. TCM is an important component of Chinese

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[51] Unschuld, Paul U.. Traditional Chinese Medicine : Heritage and Adaptation, Columbia University Press, 2018. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/aut/detail.action?docID=5276126.

[52] Hu, D. (Ed.). (2015). Traditional Chinese Medicine : Theory and principles. Walter de Gruyter GmbH. Chapter 1. Pp. 1-6.

[53] Big, L. (2007). Traditional chinese medicine : Human dimensions of traditional chinese medicine. eContent Management Pty Ltd. Chapter 2. pp. 7-34.

[54] J. Tang., B. Liu., and K. Ma., “Traditional Chinese medicine,” *The Lancet*, vol. 372, no. 9654, pp. 1938–1940, 2008.

[55] A. Burke, Y.-Y. Wong, and Z. Clayson, “Traditional medicine in China today: implications for indigenous health systems in a modern world,” *American Journal of Public Health*, vol. 93, no. 7, pp. 1082–1084, 2003.

[56] J. Lei, “From mainstream to marginal? Trends in the use of Chinese medicine in China from 1991 to 2004,” *Social Science & Medicine*, vol. 71, no. 6, pp. 1063–1067, 2010.

healthcare. The only country where TCM and Western medicine are both used concurrently in hospitals and primary care settings is China.[57] TCM has its own medical schools, hospitals, and research centres in addition to having a section within the Ministry of Health and provincial and county bureaus of health.[58] TCM therapies, which incorporate the use of medicinal herbs and foods, moxibustion, acupuncture, nutritional therapy, massage, and therapeutic mind or body activities, were primarily offered by TCM hospitals among them.[59] TCM and contemporary medicine are combined in TCM hospitals to promote patient wellness.[60]

[57] J. Wang, Y. Guo, and G. L. Li, "Current status of standardization of traditional Chinese medicine in China," *Evidence*-Based Complementary and Alternative Medicine, vol. 2016, Article ID 9123103, 7 pages, 2016.

[58] T. Hesketh and W. X. Zhu, "Health in China. Traditional Chinese medicine: one country, two systems," *BMJ*, vol. 315, no. 7100, pp. 115–117, 1997.

[59] L. Xiao and R. Tao, "Traditional Chinese medicine (TCM) therapy," *Advances in Experimental Medicine and Biology*, vol. 1010, pp. 261–280, 2017.

[60] J. Xu and Y. Yang, "Traditional Chinese medicine in the Chinese health care system," *Health Policy*, vol. 90, no. 2-3, pp. 133–139, 2009.

4. Urban Agriculture

In this section, the research investigates some emerging agricultural practices that align with ecological and sustainable ideas. The farm-to-table social movement addresses the gap between rural farmers and urban food consumers and the domination of supermarket based supply chains. Other models are emerging based on bridging the gap between crowded urban life and nature. Leisure agriculture acts as an extension of urban life. In evaluating the possibilities of farming in urban settings, this section recognises some challenges of this ideal plan.

4.1 Farm to table

A social movement called "farm-to-table" encourages offering regional cuisine in cafeterias, restaurants, and homes, preferably by purchasing it directly from the farmers. In the broadest sense, this not only includes farms; it may also include wineries, breweries, ranches, fisheries, and other types of businesses. A Sunday market, community-supported agriculture, direct sales, or a local distributor could all be used to achieve a direct connection between those who have produced the food and those that will consume it. Knowing where your food comes from and embodying a sort of food traceability are the goals of the farm-to-table movement.

Purchasing food locally has advantages from a variety of viewpoints, in addition to economic ones. Eating locally benefits the environment by preserving nearby, small-scale farms - it decreases the distance food travels which in turn decreases the usage of fossil fuels, air pollution, and greenhouse gas emissions. Food miles are the distances that food travels from the time it is produced until it is consumed - this is one factor in evaluating the environmental impact of food, such as the carbon footprint of the meal.[61]

Local food consumption also improves physical wellness. According to Peters' research, local food systems' use of decentralised production reduces the hazards to food safety.[62] Eating locally has been linked to better nutrition, a higher possibility of making healthier food choices, the prevention of obesity, and a lower risk of chronic diseases linked to diet, according to Martinez, who said that the primary reason is that the food is healthier, fresher, and less processed.[63] As a general rule, food tastes better when it is eaten fresh from the ground, regardless of how and where it was harvested. Alaimo strongly endorsed the idea of the thesis, which is to grow your own food, being truly local will reap additional health benefits from increased fruit and vegetable eating and demonstrated higher levels of physical activity throughout all age groups.[64]

Supporting locally grown food has a social advantage in that it allows consumers to learn more about the individuals who planted and harvested it. Customers can inquire about pesticides, herbicides, growth hormones, animal welfare, fertilisers, and other issues on the production of food by speaking with growers when making a purchase. Additionally, establishing links with regional producers helps local families feel more pride, trust, and a sense of belonging in their community.

4.2 Return to nature - Leisure agriculture in Shanghai

Over the past ten years, leisure agriculture, a new agricultural concept, has expanded quickly in China and gained popularity in urban areas. A new kind of urban multifunctional agriculture, leisure agriculture depends on the countryside, the natural world, farming traditions, and tourism.

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[61] Engelhaupt, E (2008). "Do food miles matter?" (https://doi.org/10.1021%2Fes087190e). *Environmental Science & Technology*. **42** (10): 3482.

[62] Peters, C.J., et al. 2008. Foodshed Analysis and Its Relevance to Sustainability. Renewable Agriculture and Food Systems, 24, pp. 1-7.

[63] Martinez, S., et al. 2010. Local food systems: Concepts, impacts, and issues. United States Department of Agriculture: Economic Research Report, No. 97.

[64] Alaimo, K., et al. 2008. Fruit and Vegetable Intake Among Urban Community Gardeners. Journal of Nutrition Education and Behavior, 40. pp. 94-101.

It is run realistically to satisfy the diverse needs of the patrons, including relaxation, experiencing farming methods, and being close to nature.

In academia, there is currently no agreed-upon definition of leisure agriculture. The phrase has several different interpretations. In Guo's article "Significance, Trends, and Prospects for the Development of Leisure Agriculture in China", leisure agriculture is considered as a new form of the industry built on the growth of the first sector and the tertiary industry.[65] Agriculture serves as the foundation, leisure is the goal, services are the means, and urban tourists are the consumers in this successful agriculture and tourism combo.[66] Walmsley believes that leisure connects urban and rural areas and encourages the growth of the tourism sectors in both.[67] A study conducted by a group Nie, Kiminami, and Yagi, from the Department of Agricultural and Resource Economics, The University of Tokyo, showed their motivation that came from the previous studies that have focused on the sustainability of leisure agriculture in Shanghai, especially in quantitative analysis.[68] Throughout their study, the findings imply that Shanghai's urban leisure farms showed a high level of economic sustainability, particularly in terms of economic effectiveness and financial independence. On the agroecological scale, however, Shanghai's urban leisure farms performed poorly. The relatively strong economic foundation of Shanghai may be the reason for the increased economic viability of the city's urban leisure agriculture. Shanghai's rapid economic and social development will surely increase in leisure travel, the desire to reconnect with nature, good health, and environmental conservation.[69]

4.3 Challenges to urban agriculture

In general, there are difficulties in everything, and urban agriculture is no exception. Concerns about its methods and potential issues suggest that its effects may not be carried out correctly.

A growing number of commercial projects must be constructed to supply accommodate for the city's expanding population because the majority of major cities are very large and densely inhabited. Due to the lack of available land for construction, this causes significant problems.

Locations are exceedingly expensive even if there are still public or private lands accessible. Although it is well known that urban agriculture transforms the land into a productive sector, these areas are not always utilised for the intended purpose. Farmers may buy or take control of the land and put it aside for a variety of activities, the majority of which are lucrative concerns. The land set aside for urban agriculture may not be an effective use of the property from an economic or environmental standpoint. Land rent can be one of the largest challenges for urban agriculture. Urban land might also be contaminated by the way it has been used in the past, for example, for chemical storage or heavy industry. It would therefore be unsuited for growing healthy food.

The crops being planted could become quite vulnerable to attack from different birds and pests. These ultimately lowering the number of crops that the land can produce and may even cause the crop in an entire field to deteriorate. This is quite concerning because urban farmers already operate their farms on a tight budget, and if it happens, it might leave them in terrible financial straits. Some people might even decide against continuing with urban agriculture.

Urban areas suffer from a severe shortage of trained and experienced personnel, particularly those with strong agricultural knowledge. The majority of those who are involved in farming reside at some distance from the city. Because of the lifestyle disparities between where they live and the city, they decide against giving in to the temptation to practice agriculture there. To carry out and manage urban agriculture in the city, not enough people make the leap. Additionally, it might

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[65] Guo, H. The significance, trend and prospect of leisure agriculture development in China. China Agric. Resour. Zoning 2010, 31, 39–42.

[66] Guo, *The significance, trend and prospect of leisure agriculture development in China*, 39-42.

[67] Walmsley, D.J. Rural Tourism: A case of lifestyle-led opportunities. Aust. Geogr. 2003, 34, 61–72.

[68] Nie, J.; Kiminami, A.; Yagi, H. Exploring the Sustainability of Urban Leisure Agriculture in Shanghai. Sustainability 2022, 14, 4813. https://doi.org/10.3390/su14084813

[69] Nie, Kiminami, Yagi, *Exploring the Sustainability of Urban Leisure Agriculture in Shanghai*.

be challenging for these farmers to cultivate as effectively as they were doing so outside the city. As a result, there is not enough labour to undertake agricultural production in the city. It takes a lot of time and money to teach and oversee people, and local governments are unwilling to make those investments.

Due to the lack of proper cleanliness in metropolitan areas, the food may potentially become contaminated. Given the capacity to travel far and quickly through the atmosphere and potentially injure the majority of people, pesticides used in urban agriculture pose a serious hazard to densely populated areas. Various allergic reactions, respiratory conditions, malignancies, and congenital birth defects could result from this. Therefore, it is crucial that local authorities strictly limit and regulate the use of pesticides and other aerosol agents in urban agriculture.[70]

[70] Dixon, J., and Richards, C. (2016). *On food security and alternative food networks: understanding and performing food security in the context of urban bias*, Agriculture and Human Values, issue 33, pp. 191–202.

Part II: Methodology – Ecological Mapping as research tool

5. Ecological Mapping – a tool that graphs complex system

> In some ways we could say the world is created and built through mapping, which also serves to measure and describe it. Long associated with city planning and design, landscape design, and building construction, mapping is particularly important in the creation of liveable environments. Scholars across a range of fields continue look for innovative mapping approaches to investigate the challenging complexity of both human settlements and ecological systems. This chapter discusses some mapping methods that I have investigated and adopted to approach the complexity of the design research topic.

5.1 The relevance of mapping for architecture

Visual techniques for gathering and structuring ideas in practice and study can be a significant methodological tool. Visual techniques like collage-making and mapping help scholars and practitioners in a variety of professions visualise how ideas are related to one another both personally and organisationally. As Schoonderbeek describes, in attempts to link spatial analysis to architectural design, mapping is considered to be one of the "promising tools".[71]

Mapping is a highly significant technique for exploring and investigating a variety of contemporary spatial conditions. In the relevance of architecture, mapping is a representation of a social construct within a spatial framework while offering a means of navigating the space it represents.[72] As Cosgrove points out, mapping, this cartographic act does not only record the city in material presence, 'but as a creative intervention in urban space,' to shape the urban life experience and performance.[73] In the writing, 'The Agency of Mapping: Speculation, Critique and Invention', James Corner describes his understanding of mapping as something that goes beyond the map, as "order is the outcome of the act of ordering".[74]

The physical thing or geographical phenomenon is produced within a certain social and political environment and is consequently enmeshed within it. As Schoondeerbeek explains, the meanings of mapping are mining possible multiplicities and facts out of the field of represented relations.[75] Harley demonstrates precisely what goes beyond the map, is a selection process. It is the

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[71] Schoonderbeek, M. (2017). A theory of "Design by Research"; Mapping experimentation in architecture and architectural design. *Architectural Design Theory*, 63-79.

[72] Schoonderbeek. *A theory of "Design by Research"; Mapping experimentation in architecture and architectural design.* 63-79.

[73] Cosgrove, D. (2004). *Carto-City*. Abrams, J. & Hall, P. (Eds). (2006). Else/where: Mapping, New cartographies of networks nad territories. University of Minnesota Design Institute. 148-163.

[74] Corner, J. (2011). *The Agency of Mapping: Speculation, Critique and Invention*, in D. Cosgrove (ed.), Mappings, London, Reaktion Books.

[75] Schoonderbeek. *A theory of "Design by Research"; Mapping experimentation in architecture and architectural design.* 63-79.

complexity of the world in which a decision has been made as to what will be represented or what not.[76]

In Schoondeerbeek's writing, he also discusses the fundamental difference between what he means by a map and a mapping, "Map offers a continuous surface or field description, while a mapping constructs a place-time discontinuity in the description and understanding of a spatial condition."[77] This means mapping is recognised as the act of drawing or producing a map, this means it is also then the cognitive process of recognising, selecting, sorting, making connections and priorities and therefore shaping our understanding of relationships in space and time. This is the creative potential of mapping.

5.2 Recording process - observational research in ecological mapping

The research asks that can those cartographic methods helps architects to illustrate the characters of space, consequence, and time within the architectural construct? The research carries out an observational view to seek possible ecological and social relationships through mapping.

Across a number of disciplines new mapping and classification methods have been developed to approach the interconnected aspects of landscapes and ecologies. Ecological maps and classifications of biogeographical landscapes that show how biotic and abiotic ecosystem components vary geographically are in demand. This demand is influenced by the development of transdisciplinary science, which calls for the development of a common conceptual framework for understanding landscape character and behaviour, institutional practices of land and water resource management and planning, as well as the growing accessibility and processing power of data. In order to define spatial entities for ecological mapping in the landscape, Carola Cullum and Gary Brierley from the University of Auckland suggested a method. Their established conceptualisation, which is based on the results of landscape classification and mapping, contains three essential elements: a biophysical template, landscape hierarchy, and archetypes.[78]

In his essay, 'The Agency of Mapping: Speculation, Critique, and Invention', James Corner mentioned a few mapping strategies for architecture: including drift, layering, game-board, and rhizome. Corner believes that the purpose of landscape imagination is to create landscapes that disturb and question society's relationship with the natural world.[79] He describes it as a critical agent and a type of social action. Corner contends that because landscapes invokes natural processes through time yet is a cultural product, it serves as the greatest mediator between nature and civilisation.

In the proposal for Downsview Park, For the many phases of the park that he envisaged, James Corner created a series of maps to depict how the site will change. (See Figure 12.) In the project High Line Park, New York, he has distinguished himself with his method of creating unconventional maps, which he refers to as map-drawings. His use of landscape photos and other data - typically collated to generate the map but left out of the finished projection - sets his map-drawings apart from regular maps. The use of numerous viewpoints and elevations to represent the terrain is one of Corner's unique methods for creating his maps. (See Figure 13.)

James Corner's maps have drawn criticism for being subjective and for not conveying information as well as conventional maps. His work has also been criticised for being too creative to qualify as actual maps. His method, though, makes me think of classical cartography, when maps were

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[76] Harley, J.B. (2001). *The New Nature of Maps; Essays in the History of Cartography*, Baltimore-London, The John Hopkins University Press.

[77] Schoonderbeek. *A theory of "Design by Research"; Mapping experimentation in architecture and architectural design.* 63-79.

[78] Cullum, C., Brierley, G., Rogers, Kevin., Witkowski, E.T.F. (2015). Ecological classification and mapping for landscape management and science: Foundations for the description of patterns and processes.

[79] Corner, *The Agency of Mapping: Speculation, Critique and Invention.*

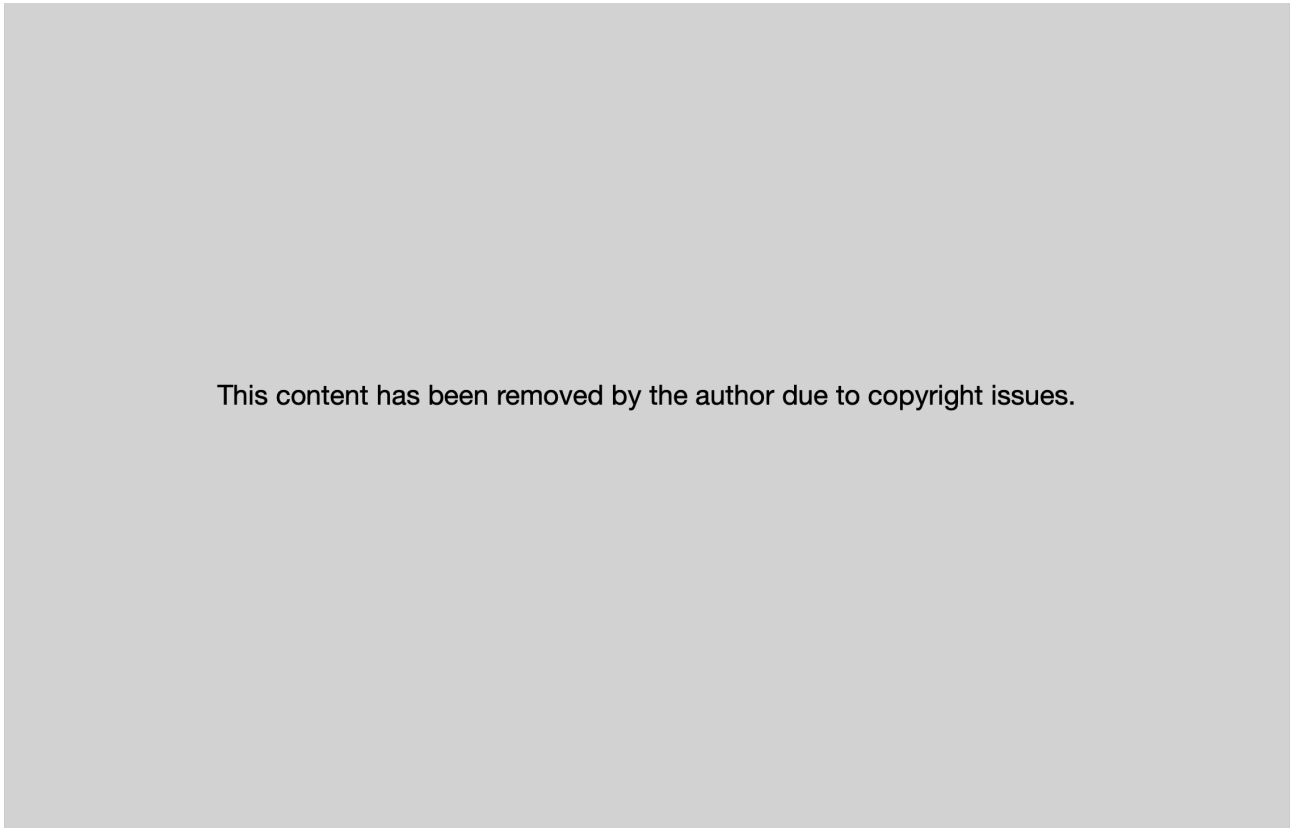

Figure 12: Proposal for Downsview Park, Toronto, 1999. Images by James Corner Field Operations with Nina-Marie Lister. Source from: Felson, A. (2016). Designed Experiments for Transformational Learning: Forging New Opportunities Through the Integration of Ecological Research Into Design. *Projections 11*.

created by hand and aesthetics were just as essential as science and technique. Early cartographers focused on a simple map design to show the elements, setting the map's agenda and removing extraneous information as their primary objectives.

He follows the same procedures for data analysis, topographic simplification, and rearranging the components of the final map. The aspect of Corner's map-drawings that appeals to me the most is that they may be interpreted rather than serving as solely a tool for presentation. They also retain an ambiguous quality that is open to further research and discussion. The map-drawings depict a range of potential outcomes that sits between interpretation and reality.

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Figure 13. Diagram illustrating varying relationships between paving (hardscape) and planting (softscape). Image by James Corner Field Operations and Diller Scofidio + Renfro.

With those findings of mapping, the research looks into the way how to employ mapping that produces cartography from the local community. From this observational view, the research focuses on what can be seen but not often being connected. As Schoonderbeek explains in the theory, “Design by Research”, the employment of mapping is an activation of the map towards architectural construction. This activation that is being set in motion through mapping can be defined as being transcriptive. For instance, Bernard Tschumi presents one important attempt at developing a mapping technique in relation to an architectural language in his Manhattan Transcripts.[80] Meanwhile, the research records a series of daily objects in terms of a one-to-one relationship. (See Figure 14, 15, 16.)

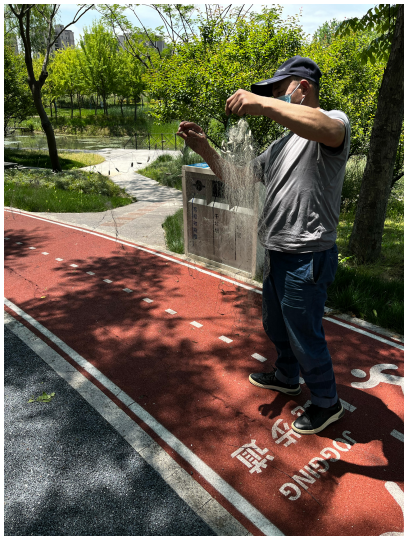

Figure 14. Mapping food seeking in the neighbourhood: A retired resident fishing in a lake beside the jogging sprints

[80] Tschumi, B. (1994). *The Manhattan Transcripts*, London, Academe Editions.

The thesis research collects physical and material facts from the local area and depicts the urban condition that focuses on food-seeking relations. Referring to Schoonderbeek's notion, this development of mapping records the existence in local space with more tangible aspects integrated in the representation of urban conditions.[81]

Figure 15. Mapping food seeking in the neighbourhood: A signboard saying 'Do not dig bamboo shoots because pesticides have been applied'.

Figure 16. Mapping food seeking in the neighbourhood: Collected dry leaves next to the vacant lot farming.

[81] Schoonderbeek. *A theory of "Design by Research"; Mapping experimentation in architecture and architectural design.* 63-79.

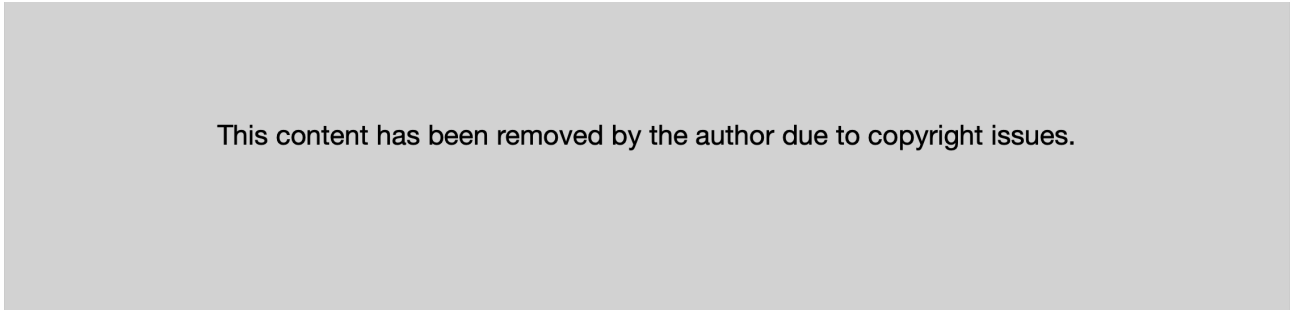

Figure 17. Collage mapping of food seeking activities. From left to right: tent in an urban farm, fishing in the city river, bamboo shots protection, farming in vacant lots, different access to farm lots. Images are taken from my neighbourhood.

Figure 18. Urban ecology map from Jiading local compound. The mapping process started from a compound, which is a typical enclosure community in Shanghai. It maps out different access to the food supply, food growing around this compound, residual rubbish recollection, public space where people digest food intake, etc.

5.3 Propositional process - Green bean as one of the ecosystem services

Many sustainable approaches in architecture and planning respond to the challenges of a dynamic world driven by climate change, resource crises, and widening economic inequalities. These ways ground social needs for food, water, energy, and health within the biophysical capacity of the surrounding environment at relevant scales. However, in the writing, 'A Social-Ecological Approach to Architecture and Planning', Richard Graves and his group members argue that sustainable design focuses on reductive approaches of efficiency and consumption, which have not challenged the traditional concept of an unlimited supply of everything. They propose a social-ecological design that aims to develop and enhance the potential of a place to support sustainable, and healthy human communities.[82]

Society is embedded within the biosphere, as people and nature are intertwined and shape each other in complex ways from local to global scales.[83] Humans benefit from so many things from the ecosystem, such as clean water, food, flood control, temperature control, and mental health. As Daily points out, ecosystem services are often undervalued, and the costs of degrading nature's ability to provide ecosystem services are underestimated.[84]

Ecosystem services have typically been assessed at the landscape scale. Recent science has made some assessment scales that are applicable in the urban context, taking into account the provision of ecosystem services by green infrastructure such as street trees, urban parks, community gardens, coastal habitats, and so on.[85]

How can ecosystem services be translated into the built environment? Within this framework, Maibritt Pedersen Zari from Auckland University of Technology, has researched and determined particular ecosystem services for the built environment in contributing to climate regulation and the purification of air, providing habitat, cycling nutrients, providing fresh water, etc.[86] Some services that humans obtain from ecosystems have been identified for this thesis research.[87] (See Figure 19.)

Ecosystem services were recognised when ecological knowledge expanded.[88] By researching through Pedersen Zari's Ecosystem Services Analysis (ESA), the research determined to explore one service which may make the ecosystem within a residential building an enclosed loop. Taking into account the food seeking behaviour I have observed in my neighbourhood, I chose the green bean to test as a plant that can possible grow in a vertical system and that can provide other ecosystem services, supporting the food seeking behaviour. Similarly to most plants, a green

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[82] Graves, R., Keeler, B., Hamann, M., Kutscke, E., Nootenboom, C. (2019). *A Social-Ecological Approach to Architecture and Planning,* in Journal of Architecture and Construction, Vol.1, Issue 4, pp.34-44.

[83] Berkes, F., Folke, C. (2000). Linking social and ecological systems: management practices and social mechanisms for building resilience. Cambridge University Press.

[84] Daily, G.C., Polasky, S., Goldstein, J., Kareiva, P.M., Mooney, H.A., Pejchar, L., Ricketts, T.H., Salzman, J., Shallenberger, R. (2009). Ecosystem services in decision making: time to deliver. Frontiers in Ecology and the Environment, 7(1), pp.21-28.

[85] Keeler, B., Hamel, P., McPhearson, T., Hamann, M., Donahue, M., Meza Prado, K., Arkema, K., Bratman, G., Grauman, K., Finlay, J., Guerry, A., Hobbie, S., Johnson, J., MacDonald, G., McDonald, R., Neverisky, N., Wood, S., (2019) Social-ecological and technological factors moderate the value of urban nature. Nature Sustainability 2, pp.29-38.

[86] Pedersen Zari, M. (2012). Ecosystem services analysis for the design of regenerative built environments. *Building Research & Information*, 40(1), 54-64.

[87] Pedersen Zari, *Ecosystem services analysis for the design of regenerative built environments*, 54-64.

[88] Heal, G.M., Barbier, E.B., Boyle, K.J., Covich, A.P., Gloss, S.P., Hershner, C.H., Hoehn, J.P., Pringle, C.M., Polasky, S., Segerson, K., Shrader-Frechette, K. (2005). V*aluing Ecosystem Services: Toward Better Environmental Decision-Making*, The National Academies Press, Washington, DC.

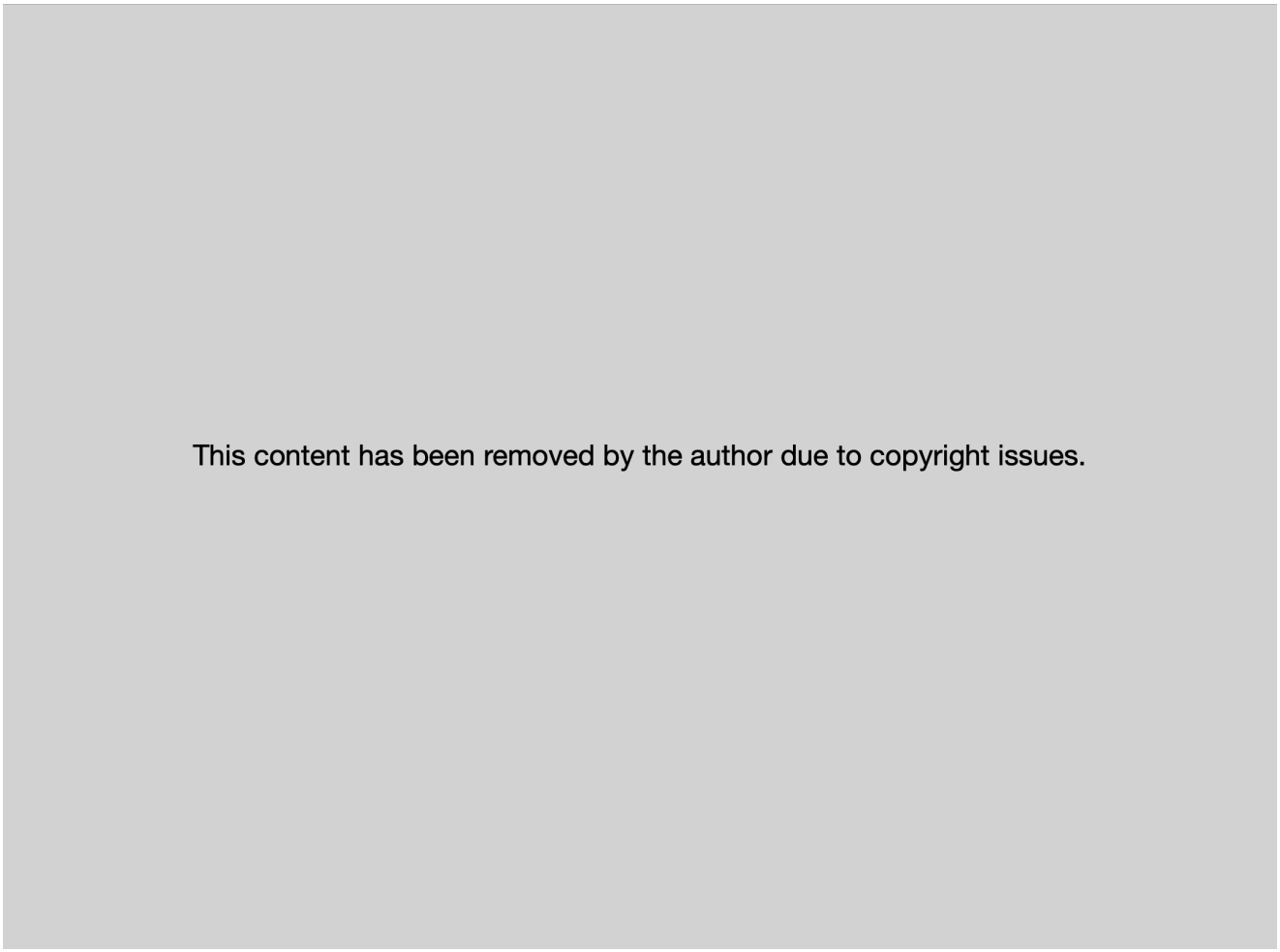

Figure 19. Key points from ecosystem service research. Highlighted in grey to show which ecosystem services are relevant to my thesis. Resource retrieved from Pedersen Zari, M. (2012). Ecosystem services analysis for the design of regenerative built environments. *Building Research & Information*, 40(1), 54-64.

bean's life cycle can be recognised in a series of phases: seed, sprout, adult plant, flower, and fruit. Then, carrying with the ecological mapping concept, the research broke down the chain of phases going to find out what other entities and relationships that link with each phase.

Seeds need certain temperature to grow. Temperature links with climate and seasons. Sunlight majorly provides heat on plant. The spatial location and direction become essential to plant seeds. Also, the allocation should think about external relationship, for example, would height impact on the temperature, or even with an ideal direction, would other buildings cast shadow to this area. With continuing the research process, the study finds out green beans fix their own nitrogen. So the soil only should be rich to produce healthy beans.

Watering helps sprouts grow. I asked, could the water be sourced naturally and is that possible to recycle the used water? As the mapping research continued, those questions were answered. According to Sarah Bell, modern cities treat water as a disposable product[89]. Clean water enters through the drinking water network, is used for domestic processes, then disposes of through the wastewater pipes. Interestingly, Bell's research pointed out that in modern cities, rainfall is treated as a hazard but not a resource. This recognition of this linear pattern of water usage has also been criticised by sustainability researchers, who look into urban from an ecological view of urban metabolism[90].

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[89] Bell, S. (2018) Urban Water Sustainability: Constructing Infrastructure for Cities and Nature. Chapter 8, Reuse. pp132.

[90] Castán Broto, V., Allen, A. And Rapoport, E. (20120. Interdisciplinary Perspectives on Urban Metabolism. *Journal of Industrial Ecology* 16, 851-861.

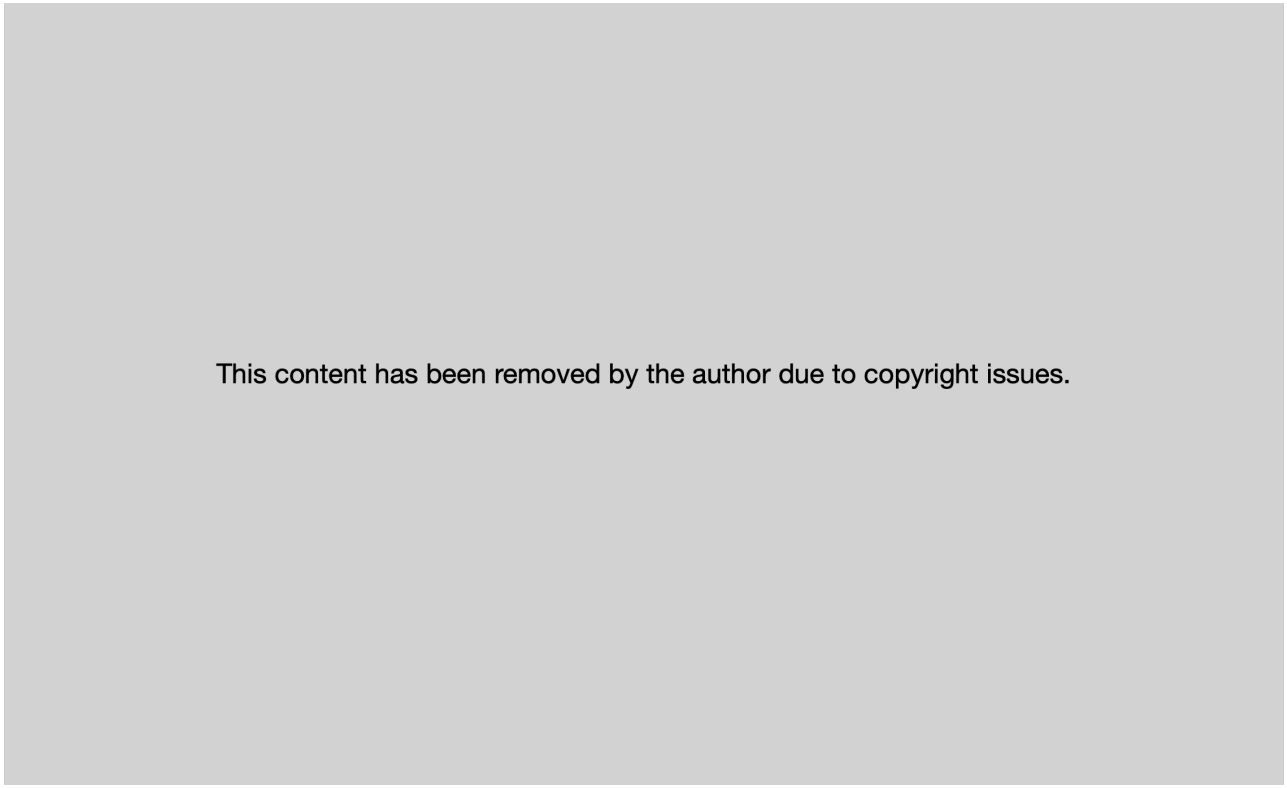

Figure 20: Mapping process on Miro board.

From a general view, water reuse is promoted as a resilience measure through diversifying water sources and providing an additional, climate-independent source of water[91]. Another researcher suggests that water resilience could be improved through either centralised or decentralised networks[92]. In this thesis, I propose that we can expand the exterior edges of a high rise apartment building to generate the resources required for a vertical urban farm. In terms of water there is the opportunity to capture and harvest rainwater from the rooftop. The water could be lightly treated (such as with UV light) for some non-drinkable use, such as flush toilet. It could also be used in the watering system for the vertical urban farm. According to local climate statics, Shanghai's annual precipitation is 1200 mm[93]. The rainy months are from June to September. The mapping process helped me to see the connections between all the factors discussed here; sunlight, climate, temperature and water, and how these might be carefully considered in the design of an urban farm.

Green beans have complete flowers, with both male and female parts. It is considered self-pollinators[94]. This finding allows proposing the vertical farming of green beans with less consideration of insects.

Harvesting is the reward phase. Matured bean pods could provide nutrition in daily meal. A ventilated space would be ideal to dry bean pods and separate them. On one hand, the seeds could be stored and planted. On the other hand, dry pods and straws could be composted for either fertilisation or biomass.

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[91] Ferguson, B.C., Frantzeskaki, N. And Brown, R.R. (2013). A Strategic Program for Transitioning to a Water Sensitive City. *Landscape and Urban Planning* 117, 32-45.

[92] Hwang, H., Forrester, A. And Lansey, K. (2014) *Decentralized Water Reuse: Regional Water Supply System Resilience Benefits.* Procedia Engineering, 12th International Conference on Computing and Control for the Water Industry, CCWI2013 80, 853 - 856.

[93] Cao, R,. Deng, Z,. Xu, J. (2022). Analysis of precipitation characteristics in Shanghai based on the visibility graph algorithm, *Physica A: Statistical Mechanics and its Applications* Volume 597.

[94] Bailey, R. (2001). Gathering the Past, Sowing the Future. *OG*, *48*(6), 29.

The ecological mapping concept is initially from biology and other environmental linked disciplines. During this mapping process, the research helped my thesis to identify key entities within this ecology and expanded the scope from architecture to other disciplines. The process traced the potential relationship between each entity. The outcome is encouraging, which brings out the ecological cycles of each phase. As the result, introducing one particular element into the existing architectural system, brings multiple relations - an ecosystem, into the program.

Figure 21: An ecological map of green bean from urban agriculture perspective.

Part III: The Project Proposal

6. Vertical Green, an urban farm for village living in the city

This chapter documents and discusses the speculative design generated from the contextual research. It analyses the condition on-site, including the activities, programmes and building forms. The process is to test opportunities in regard to food access, food security, within the validity of having a threshold farm - a land on the edge of the residential tower between the interior and the exterior. The design presents the result that brings the design concept alive - growing food sources in the urban context.

6.1 Design process

SITE LOCATION
The building tower is located at the community compound I live in, dashed in yellow. (See Figure 22.) The background information of this area has been introduced in this research from the section 1.3 City edge - Jiading District. The design focuses specifically on the compound, which is the enclosed neighbourhood area sliced by streets. The compound has very similar conditions and neighbours are tightened by boundary fence and security guards.

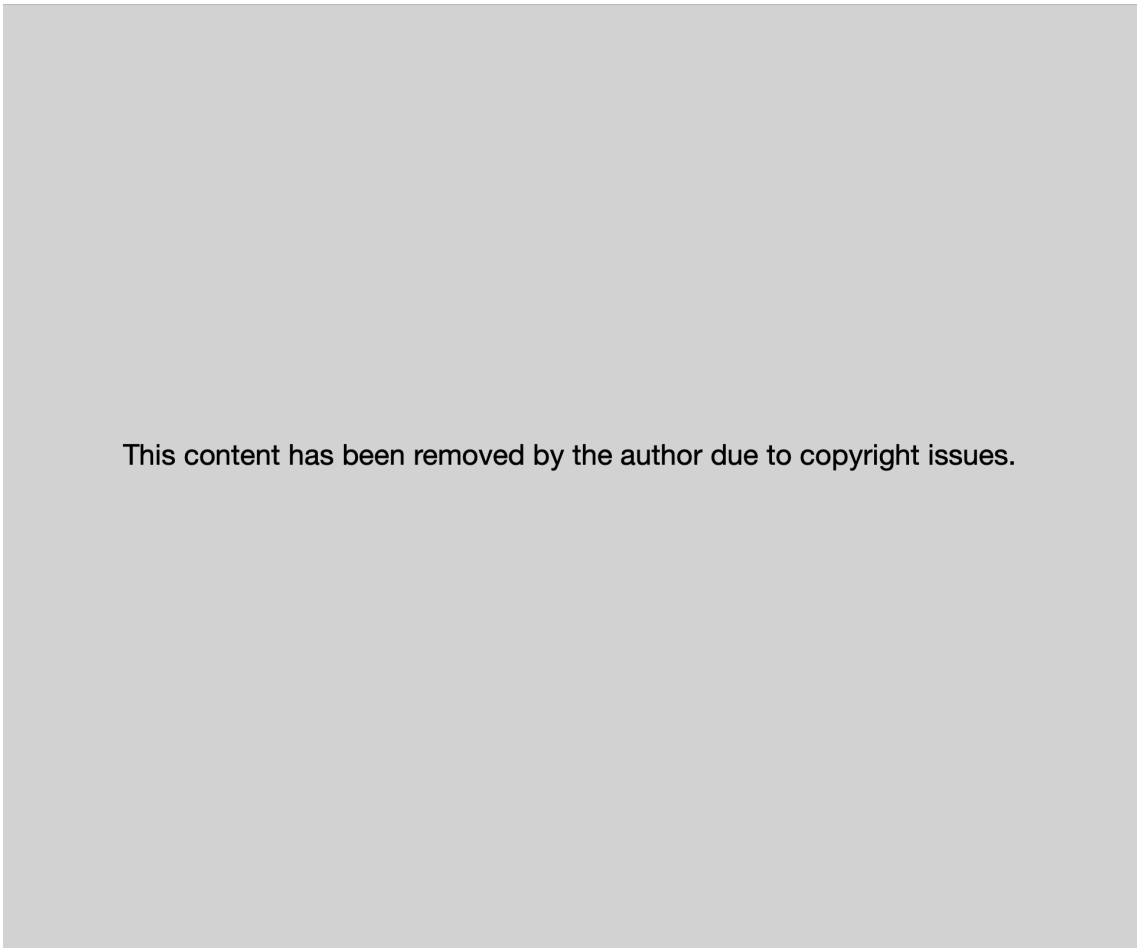

Figure 22: Site location.

Within this compound, there are four high-rise apartment buildings, 21 floors each. Unlike other common compounds that are full of high-rise buildings, this one has terrace houses as well, which significantly decreases the density of this compound.

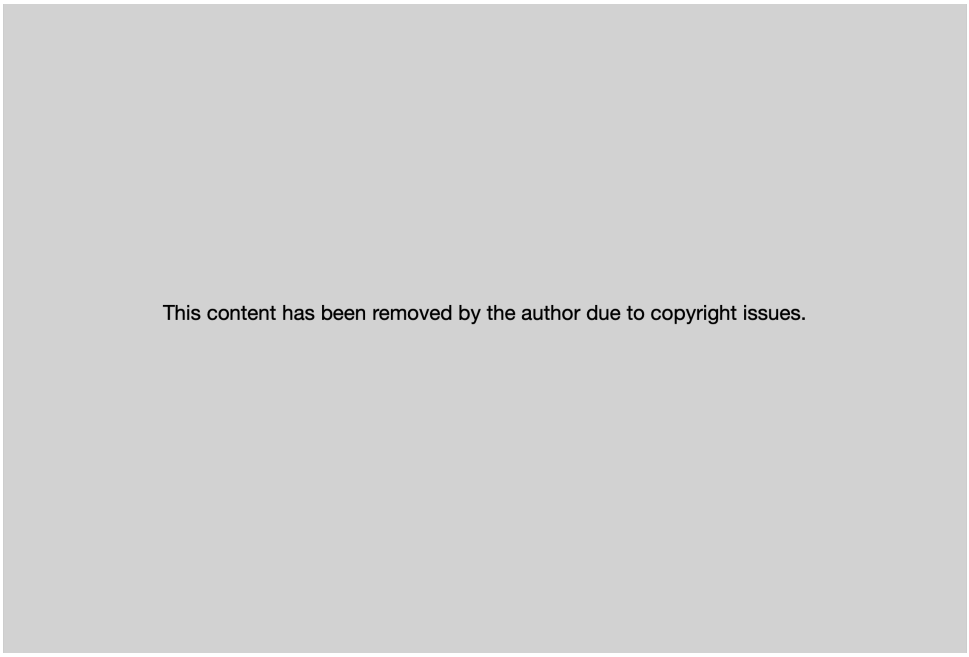

Figure 23. Industrial zone (blue) and residential zone (yellow).

SITE ANALYSIS

The area is mixed use, designated by the local plan. From city-wise zoning view, the local area can be generally seen as the divisions showing in the Figure 23.

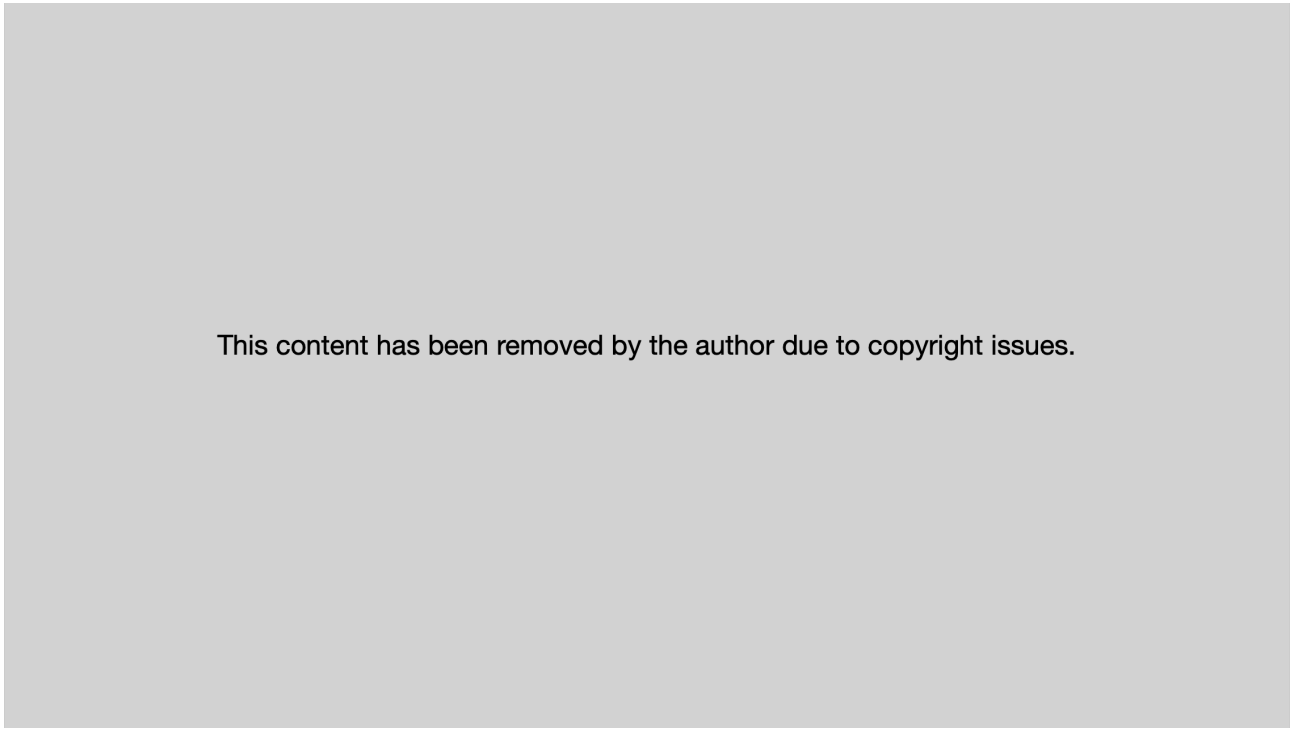

Figure 24. Map of local zones.

The surrounding has been placed with different facilities. Each compound has access to public resources, such as parks, schools, shopping mall. As an ongoing urban development, the area has vacant lots. (See Figure 24.)

There is an extreme difficult situation happening when the 2022 Shanghai COVID-19 lockdown takes in place. Each compound had to self-organise to purchase food in groups. The figure records my food-sourcing experience within the compound. Interestingly, those groups operated with basic catalogues. Someone from the community became a team leader voluntarily. Each team leader contacted the existing supplement relationships if they have any, organising single type or multiple types of food sources to be delivered. Once the connections were rebuilt organically by the team leaders, I experienced even within the compound, residents can have essential food access during the special period. (See Figure 25.)

The food supply and distribution changed during the period because residents were only allowed to stay in their compound waiting for external delivery. The new model supplies essential food but breaks the spatial relationship. Instead of going to a supermarket nearby, residents order their needs in WeChat groups established by each team leader. There are groups such as the milk and milk products group, meat group, vegetable group, etc. Team-leader collects orders daily in the group chat and makes the form of each order, which can be various because the requirements are different for each family. Once the individual-arranged food truck arrived at the compound, the team-leader takes in charge to distribute by following the order form. (See Figure 26.)

The outcome is that residents could fill their fridges with regular and essential sources. However, the process relies on digital relations, rather than the spatial relation - stepping along aisles in the markets and walking between shelves. Looking for a new food catalogue is not about asking staff from the supermarket or looking at the aisle plates, you have to ask your neighbour if luckily who knows a team leader selling the one you need. In most cases, a single person is hardly placing an order because the supplier mandatorily sells in bulk. More group chats were created to find food-sharing information and to spread new food needs or sources. Within the two-month COVID-19 restriction, residents naturally recovered their food source in the compound range based on this digital relationship. The thesis research was encouraged to look at closely how to transfer the temporary connection of food sourcing into the solid relationship that exists in the compound.

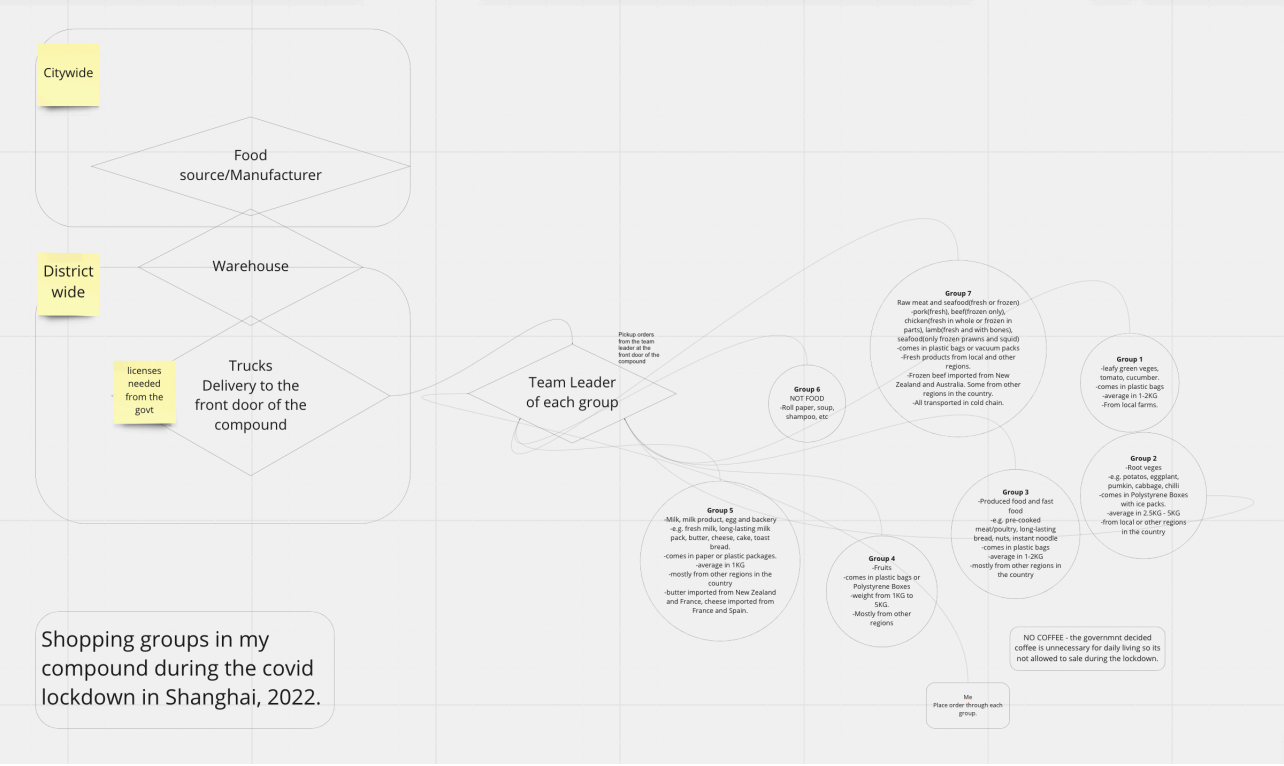

Figure 25. Diagram of food delivery groups during covid-19 lockdown.

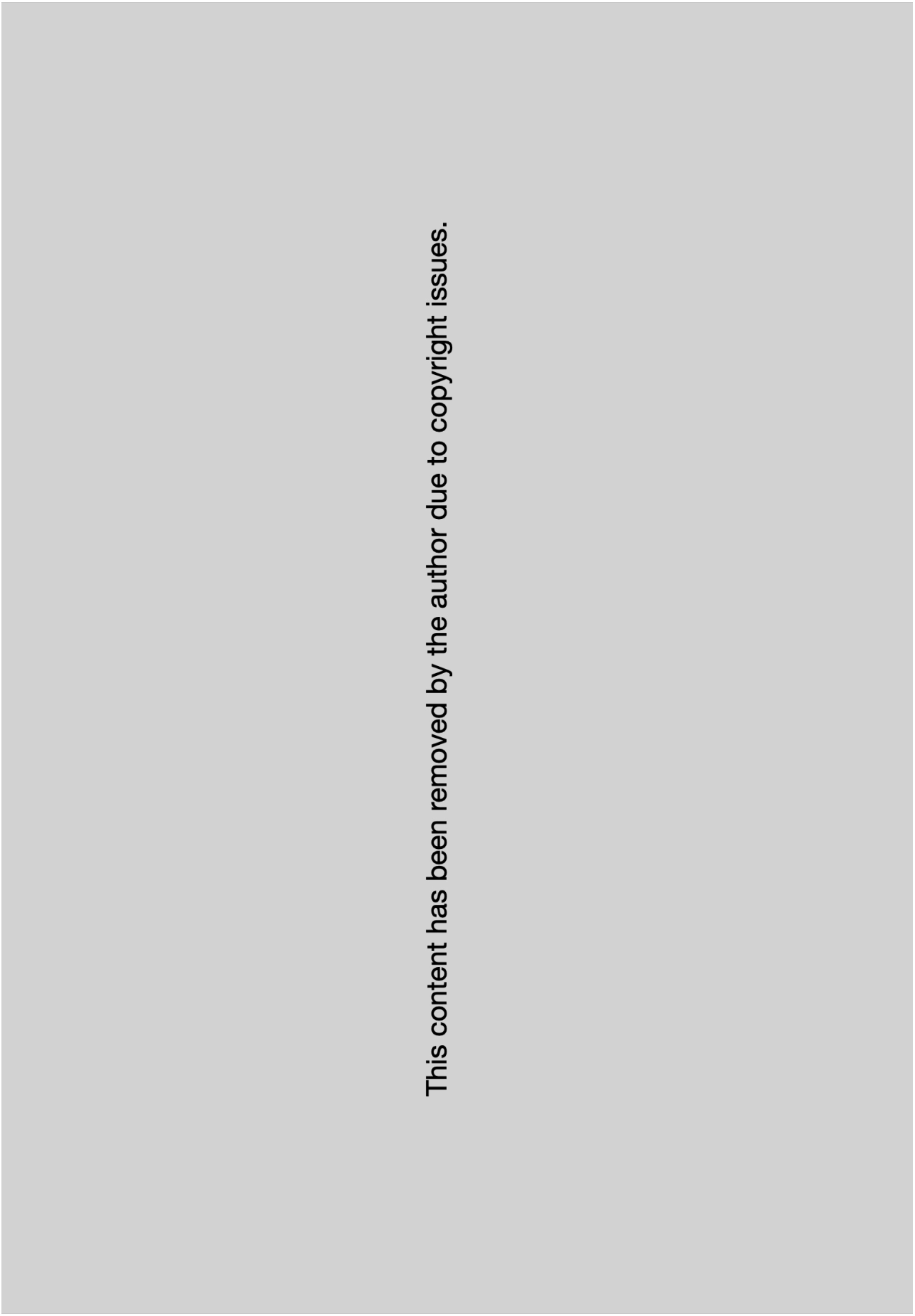

Figure 26. Drawing of food supply during covid-19 lockdown.

6.2 Design precedent

The precedent studies investigated various projects that are well-established examples of vertical urban farms and naturally embedded architecture. Those projects are planned in the urban environment concerning community, ecology, and adapted architectural form. These studies are critical evidence of how this ecological system transfers into a condensed relationship - an architectural solution that the thesis set to achieve.

French architect, Ilimelgo, proposed a vertical farming tower in the suburb of Romainville, France. The project aims to ease the growing demands for crop production in urban environments. It plans to build a greenhouse that introduces maximum sunlight and ventilation into the agricultural space. (See Figure 27.) The new architecture assigns upper floors for bio-intensive farming but without residential dwellings. The highlight of this proposal sets up the ground floor for educational space, which offers workshops and an instructional programme - a garden tutorial to teach the public about crop cultivation.[95]

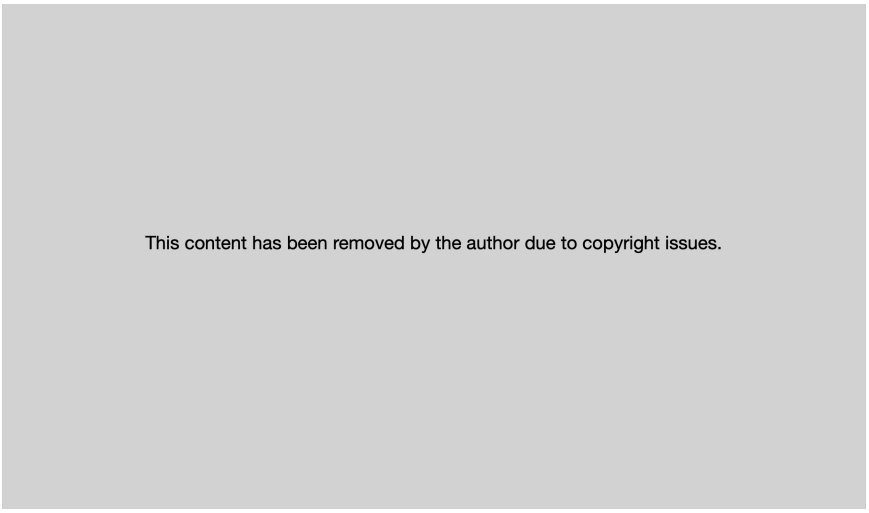

Figure 27. Architect's impression of the vertical urban farm in Romainville, France. Image by Ilimelgo Architect. https://www.archdaily.com/874922/ilimelgo-reimagines-future-of-urban-agriculture-in-romainville

AeroFarms transforms traditional agriculture with its indoor vertical farming technology. The company aims to provide fresh produce with an understanding of aeroponic and hydroponic systems. (See Figure 28.) The products are safe, have less environmental impact, and have improved nutrition. They are commercially focused and compact innovative farming within warehouse-size space.[96]

Urban Forest in Brisbane is a 30-story building tower covered in trees and plants that have been designed by Koichi Takada Architects. It is a mixed-use high-rise building including about 400-unit apartments, a roof-top garden, and a public park on the ground floor. (See Figure 29.) The green approach is using emission-reduced concrete, modular fabricated units, and locally sourced stone elements to achieve a Green Star rating. According to Architect Takada, the project embraces living materials - the people, and the plants, rather than the very hard and solid industrial materials.[97]

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[95] Zorn, A. (2017). *Ilimelgo Reimagines Future of Urban Agriculture in Romainville.* ArchDaily. https://www.archdaily.com/874922/ilimelgo-reimagines-future-of-urban-agriculture-in-romainville

[96] Myers, Joe. (2019). *This company grows crops inside, stacked on top of one another.* Agriculture, Food and Beverage. World Economic Forum. Sep 4, 2019. https://www.weforum.org/agenda/2019/09/vertical-farming-agriculture-aerofarms/

[97] Block, I. (2020). Koichi Takada unveils plant-covered Urban Forest housing high rise for Brisbane. Dezeen. 16 September 2020. https://www.dezeen.com/2020/09/16/urban-forest-koichi-takada-architects-plants-high-rise/

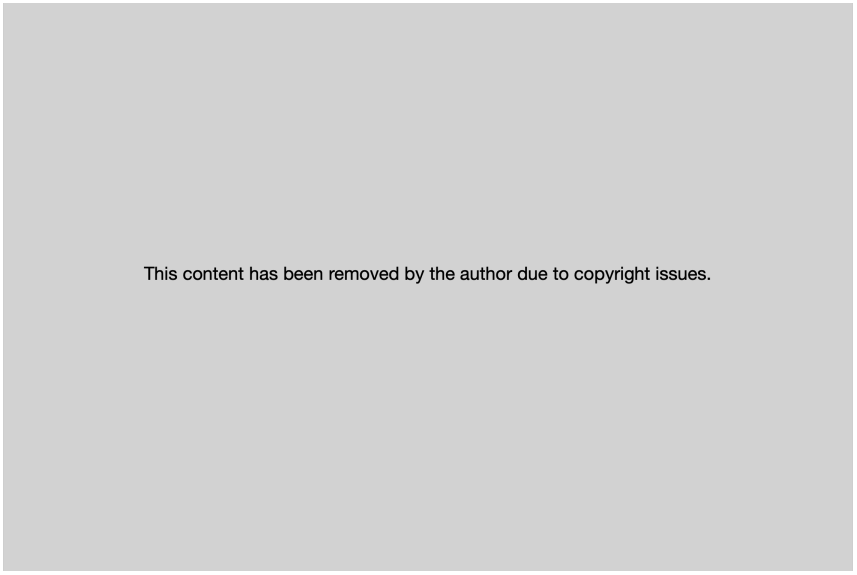

Figure 28. View inside AeroFarms. Image by AeroFarms. https://t.co/UDGl6mzIxk

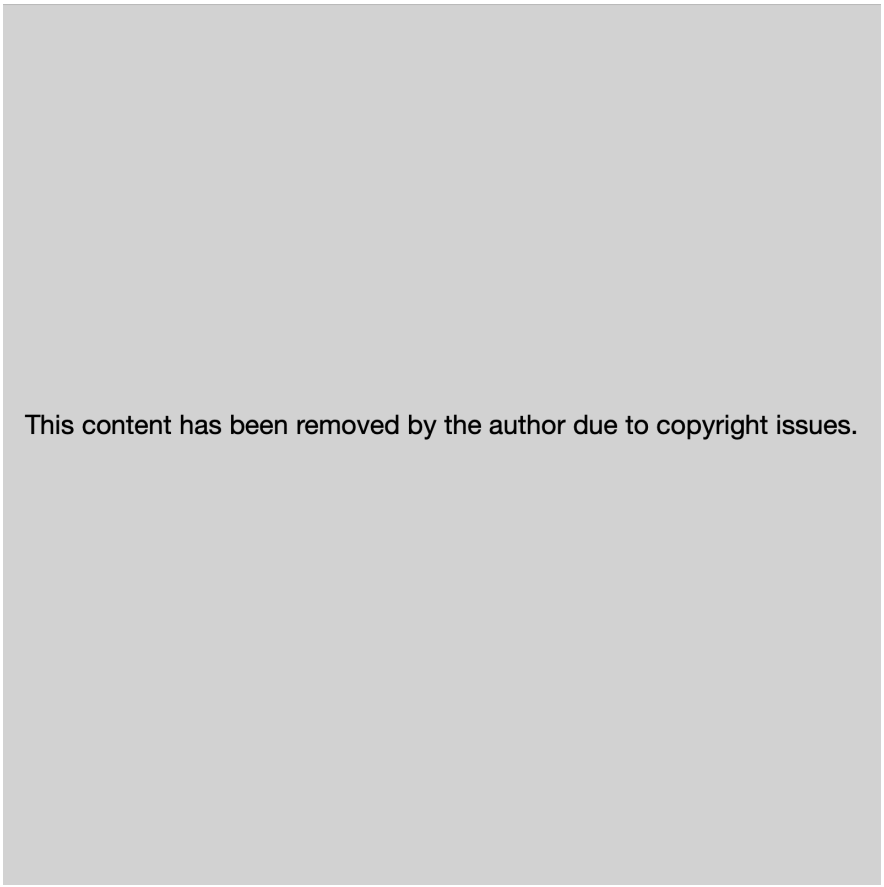

Figure 29. Urban Forest will be covered in 1,000 trees. Image by Koichi Takada Architect. dezeen.com/2020/09/16/urban-forest-koichi-takada-architects-plants-high-rise/

TRANSFORMATION OF 530 DWELLINGS - GRAND PARC BORDEAUX, BY LACATON&VASSAL
As the thesis aims to adapt the food sourcing program to the residential compound, unlike the examples above, the solution needs to balance specific programmes - residential life and vertical urban vegetable production. French Architects, Lacaton&Vassal, made a transformative project of an apartment building as an architectural solution as an architectural solution that this thesis can follow and adapt. The project entails the renovation of three social housing blocks totalling 530 apartments, in Bordeaux, France. They required a comprehensive makeover to be completed, which would also expand usable space, enhance daylighting, and considerably improve comfort. The interior of the already occupied homes is transformed to give them new attributes, including greater room, more light, a better outlook, and improved amenities.

In response to the increased need for homes in the years following World War II, this project, the Cité du Grand Parc, a huge urban project, was built in the northern part of Bordeaux during the housing crisis of the 1960s (See Figure 30). In 2018, the transformation of 530 of the 4,000 existing housing units in the area, as part of a comprehensive strategy for renewal, was a solution to the issue of the neighbourhood's gradual depopulation as a result of comfort levels that have become obsolete.

Figure 30: Building blocks before Lacaton&Vassal's renovation. Image by Philippe Ruault. Rescource from:https://miesarch.com/work/3889

The intervention, which modifies three of the linear building blocks providing social housing, refrains from interfering with the buildings' original structural elements. The idea that every useful aspect of the structures in issue should be preserved has to do with sustainability, but it also makes it easier to scale back an ambitious project to fit a tight budget. In this way, each apartment's usable floor area expands by two simultaneous operations—extension and addition —with a screen of usable garden balconies, giving each residence a private outdoor space that faces south. (See Figure 31.)

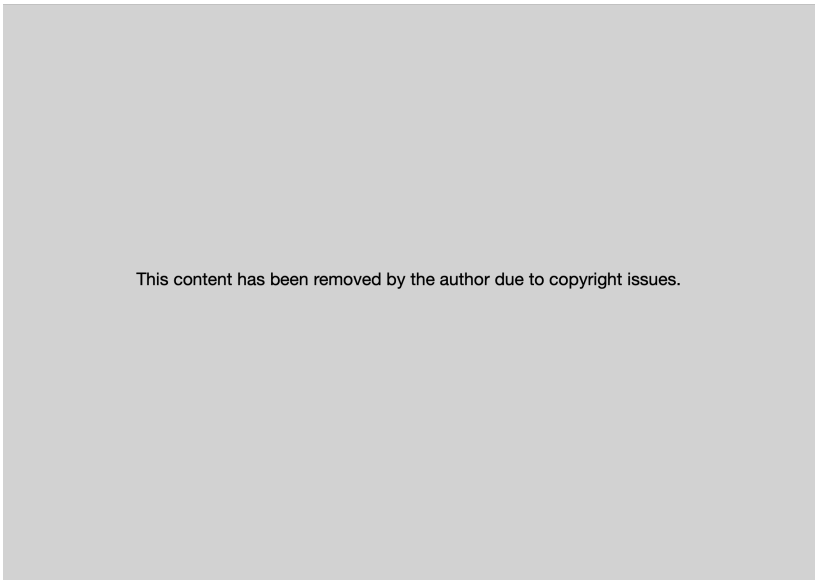

Figure 31. Section of Building H. Before and after renovation. Image by Lacaton&Vassal Architect. Resource from: https://miesarch.com/work/3889

Figure 32. Winter garden extension. Image by Lacaton&Vassal Architect.

The transformation of the project takes care of the interior. It preserves and enhances the residences while giving them new characters based on what's currently there. "… Transformation means openness, extension, more space, more light, more freedom of use." Anne Lacaton explained.[98] With the extension of the winter garden, each apartment has more room, more natural light, larger space, and better views. (See Figure 32.)

Large glazed sliding doors that open into the winter garden take the place of the modest windows that were previously present. The technical infrastructure has been improved, including the bathroom electrical installation, and elevators. Every stairway now has one larger elevator that is

[98] Lacaton, A. (2020). Make Do, in Ruby, I. And A. (Eds.), *The Materials Book*, Ruby Press, Berlin.

Figure 33. Interior of the winter garden. Image by Philippe Ruault. Resource from: https://miesarch.com/work/3889

complemented by a second elevator. The gardens in front of the building have been refurbished, and new entrance halls have been completed.

Construction uses prefabricated modules that are quickly erected in front of the building like scaffolding to shorten the duration of the work. To create a free-standing structure, precast slabs and columns are brought to the location and lifted into place by a crane. Only the foundations were built with cast-in-situ concrete. The families all remained in their homes while the building was taking place.

A lightweight façade of transparent, corrugated polycarbonate panels and glass in aluminium frames is assembled and equipped with reflective solar curtains. Glazed railings run along the balconies. Due to the city's flat landscape, the view from the winter garden is panoramic and distinctive. Ana Tostões and Jaime Silva commented on this transformative concept that has not lost the importance of nature from the high-rise building blocks. [99]

Lacaton&Vassal's transformation of this apartment building offers an architectural approach to embrace this thesis design. The general economy of the project is predicated on the decision to proceed with expansions and extensions rather than to demolish and rebuild or make significant changes to the original building's structure, staircases, or levels. This economic strategy makes it possible to focus resources on generous additions, which are the key to significantly and sustainably improving the quality and size of the homes. In addition, the extension mediates the transition to the exterior but has less impact on the surrounding environment. It makes a new mediation with the outside, it generates a space that is both private to each dwelling yet connecting neighbours in ways that were not connected before - so a new kind of semi-social space. And, as the plants in this image show, this new spaces capture sunlight through the careful choice of cladding and the way this can be opened and closed, and mediated through the solar curtains.

[99] Tostões, Ana & Silva, Jaime. (2020). Rescuing the "Machine à Habiter": The Palladian "Villa" in the second life of Lacaton & Vassal's Transformed "Grands-Ensembles". Ra. Revista de Arquitectura. 170-187.

6.3 Design proposal - Vertical Green, an urban farm for village living in the city

The design generated as part of this thesis research explores opportunities for bringing the food sourcing programme into the existing building. The ground floor which currently acts only as an entrance hall and property management office, will be planned with indoor activities, such as a shared kitchen, community dining space, workshop, or storage. The rooftop will mainly be used for food process, cleaning and drying, or food compositing. The vertical circulation remains with using the lifts and staircase in the centre of the building. (See Figure 34&35.) Considering the residents who will be living in their homes while the transformation ongoing, the extension will add space for farming, but have less impact on their living.

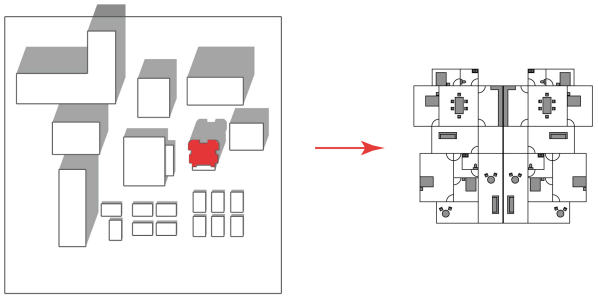

Figure 34. The exisiting floor plan will majorly remain in function while the construction ongoing.

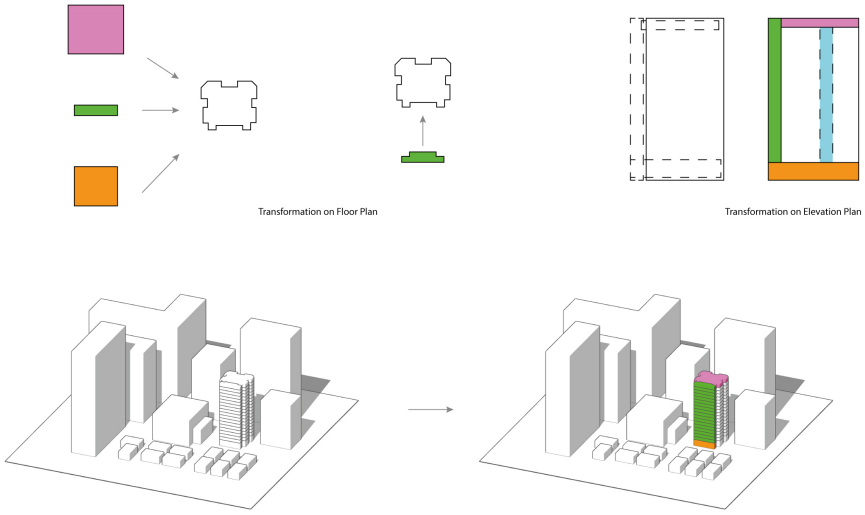

Figure 35. Adapt farming programme in the building.

Figure 36. Programme options comparison. Programme set up to test the growing proportion of leafy vegetables and fungus, and to compare the capability of having farming activities within the building.

The southern side of the building takes direct sunlight in Northern Hemisphere. If the plan contains leafy vegetables or green beans growing, they should be placed in the south facing space. Mushroom growing will be on the northern side depending on the programme. Also, thinking about the wind condition, too many cantilevers will potentially increase the risks of dropping objects from a high altitude, if the mushroom space takes outside as seen in Programmes 4 and 5.

With going through the layout comparison of potential opportunities, the proposal takes a trimmed plan from Programme 5 with only grow greens on the southern side, a shared space with a number of workshops on the ground floor as seen in Programme 4, and a function-focused rooftop from Programme 2. (See Figure 36.)

In the existing building plan the vertical circulation (twin elevators and stairs) separates neighbours. Each side of the symmetrical plan has its own lift and on every floor level each apartment has its own lift lobby. Residents living on the same floor have no way to connect with each other, it is in fact impossible to know who is your floor level neighbour. (See Figure 37.) Referring to the experience of living in this building layout during the COVID-19 pandemic as discussed in Chapter 7.1, neighbours who live across doors barely know each other until the lockdown starts. Architecture in this urban context embraces dwellers living needs but makes them isolated from social interaction, in which they mainly rely on social media group chat (eg. WeChat).

Inspired by Lacaton&Vassal architects, the design proposal is to expand the existing residential building rather than demolish it - a kind of Lacaton&Vassal's design logic - the new structure is simply attached to the existing façade without fancy connections. As they describe the approach that is free from a specific function and generously provided to residents to dwell.[100] Unlike Lacaton&Vassal, however, this proposal is not for a space 'free from function', instead the additional space is purposely designed to accommodate vertical farm activities and, additionally, foster neighbourly connection as it might occur in a more village like lifestyle.

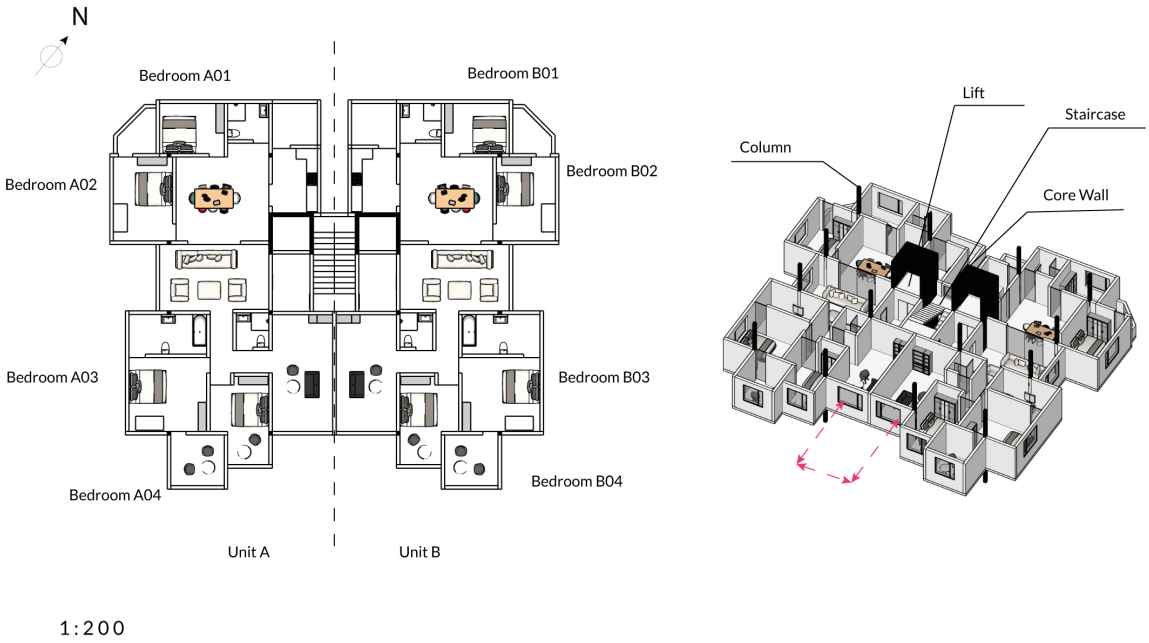

Figure 37. Existing floor plan.

[100] Panzini, N., & Quadrato, V. (2022). Pre-existence and prefabrication. Lacaton & Vassal: methodologies for social housing renovation. *TECHNE - Journal of Technology for Architecture and Environment*, (24), 52-62.

The extended space vertically attaches on the southern façade, with the new farming programme integrated into ground floor and rooftop. Due to there being no modification on the two integrated levels, only the extended balcony shall free-stand with a new foundation. According to Lacaton&Vassal's successful transformation projects, the cost could be significantly dropped, compared to reconstruction.[101]

Old residential buildings in Shanghai, which were built in the 1980s and 1990s, were planning to install elevators since 2011. The process includes building evaluation, neighbourhood committees discussion, and cost sharing. Even though the process could involve many stakeholders and rise issues, encouragingly, there were around 624 buildings initiated elevator installation in 2019. [102] This study gives critical evidence of the opportunity renovation brings and who can live with the alteration process of their buildings.

In this 'Vertical Green' design proposal, the attached extension has a specific function for residents - farming. With the general implant of the programme into the building, three major blocks are planned. In response to the farming programme which is researched from Chapter 5.3 - using green bean as an example, the proposal organises the programme into two groups: activity and tools. (See Figure 38.) Farming-related activities such as seeding, watering, and harvesting interestingly happen in one space. The process of those just on different time frame. The specific farming area on each floor could be organised and modified freely between neighbours. Through negotiation and discussion on farming plans, neighbours who live on the same floor could potentially build stronger communication.

Figure 38. Allocate activities and tools transportation.

[101] Panzini, N., & Quadrato, V. Pre-existence and prefabrication. Lacaton & Vassal: methodologies for social housing renovation. 52-62.

[102] Chen, C. (2020). Elevators give Shanghai residents a needed lift. China Daily. 04 September, 2020. Retrieved from:https://global.chinadaily.com.cn/a/202009/24/WS5f6bf3a3a31024ad0ba7b687.html

Figure 39. Threshold design for Unit A.

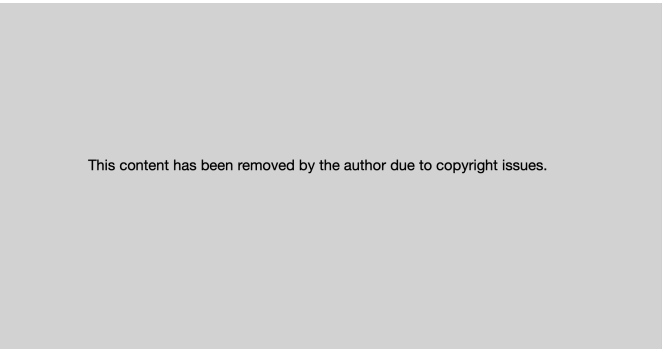

Figure 40. Threshold design for Unit B.

While the transformed farming space in between two residents could potentially increase the neighbourhood communication horizontally, the other group from programme, tools are planned to store in one place in the building but could be transported through the elevators. Farm tools, such as shovels, hoes, trowels, hand pruners, wheelbarrows and sprinklers, are not necessary to own by each family. Residents could find those tools and store them in the ground floor tool room. Picking up and returning tools from each floor increase the vertical circulation in the building. People could chat on their way to the tool room and meet others from different floors.

Based on the existing floor plan, two living rooms are taken out from both units to form the shared farming space. Light walls between the load-bearing columns are taken from bedrooms replacing with designated thresholds - folding windows facing shared space. (See Figure 39&40.)

The new floor plan creates a shared farming and cooking space by removing one living room in each unit. The shared space has access from the vertical circulation, which allows neighbours from different floors to reach others easily. A shared kitchen takes place from a bathroom of Unit A. In Unit A, the exclusive bathroom of the master bedroom becomes a shared one. Bedroom A04 uses the folding windows as its threshold to connect with the farm. The window ledge design allows residents to lean or sit on it, which could increase the opportunity to interact with others. Also, minor items could be placed on it to create a semi-private moment. The window opening inwards to the interior prevents the resident from a stable connection without moving the items on the ledge. Bedroom A03 and A04 both share the reading room, which transferred from the exclusive one. In Unit B, the threshold has a slim folding window in contrast with the one in Unit A. It gives various types of openness and privacy for different characters. Bedroom B03 remains a master bedroom. It opens to the new balcony with full-height folding doors. All transformed bedrooms, including A03, A04, B03, and B04 have a southern opening to the extended balcony. (See Figure 41, 42&43.)

The original façade and exterior coating are substituted by aluminium sliding doors. The prefabricated modules of the new balcony units are attached and integrated with the pre-existing floor slabs. As the example floor plan shows, the new space keeps the privacy from each unit and increases the interaction between the two, and could be freely occupied by the neighbours for farming and other activities such as chatting, drinking tea, or children’s play. (See Figure 44, 45&46.)

The new full-height sliding doors intend to let more sunlight into the farming space. The idea also contributes to residents' health, in both having healthier plants and staying longer under sunshine without going outdoors in some cases. The new balcony has a meter-width space with railings. (See Figure 47.) The space brings better ventilation into the updated units. With the sliding doors open, the farming space directly connects with the outside, residents spend their time here and enjoy the same condition as staying outside. When the weather gets worse, a closed sliding door creates a separate climate from the outside. (See Figure 48.)

The ground floor design has minor changes to the existing architecture but replans the programme which contains new activities. Two divisions have been set up to suit consistent

programme (in yellow) and occasional programme (in pink). (See Figure 49.) In the yellow division, a community dining area welcomes residents from not only this building but also others to join this communal event. The dining area opens with spinning doors to connect with a larger space on the east side of the ground floor, which could hold a festival gathering such as Chinese New Year's Eve. A communal kitchen is on the west side of the ground floor, connecting with short-term storage on the southern side and freezer storage and tools cleaning and fixing space on the northern side. Seeds store rooms are planned next to the chiller as this is the shadow side of the building. To use the shadow side on the other side of the building, root cellars taking two-floor height are planned on the east side. (See Figure 50.) The ground floor design uses the space to hold food processing and cooking programmes and food-relevant storage.

The staircase reaches the rooftop from the 21st Floor. On the rooftop, a pergola is designed to cover composting bins from the new programme. To make the ecological loop closed in the building, the composting site brings nutrition from food scraps back into soil. Residents who have the knowledge and experience could be the leader of the site, collecting food scraps within the building and distributing the rich soil to the farming land on each floor. Benches and shelves are placed on the northern side of the rooftop for residents to dry tools or food products temporarily as the wind at this altitude is stronger than ground level. (See Figure 51.)

Rain collection and water reuse strategies apply in this proposal. From the rooftop to the ground floor, all modular balcony has built-in rain catchment. (See Figure 52.) It collects water when rain flushes on the building. There is a designated water tank underground. It connects rain catchments and indoor farms. Rainwater is filtered and pumped up to each floor for irrigation. The farming wastewater is also collected and filtered to flush toilets. (See Figure 53.)

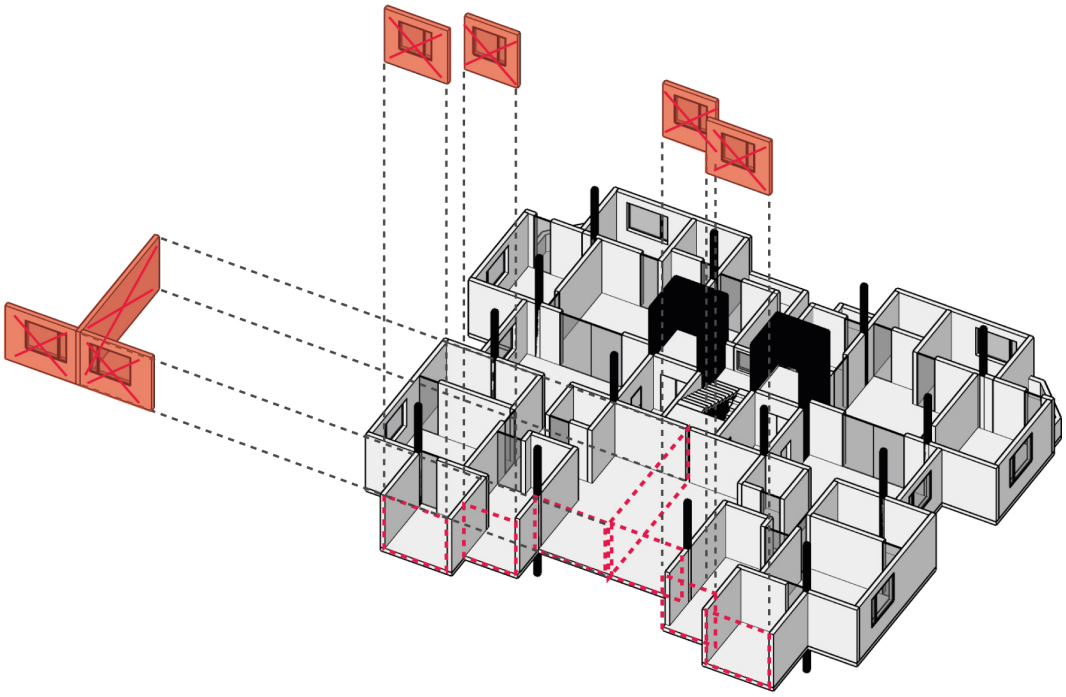

Figure 41. Existing walls and windows removal.

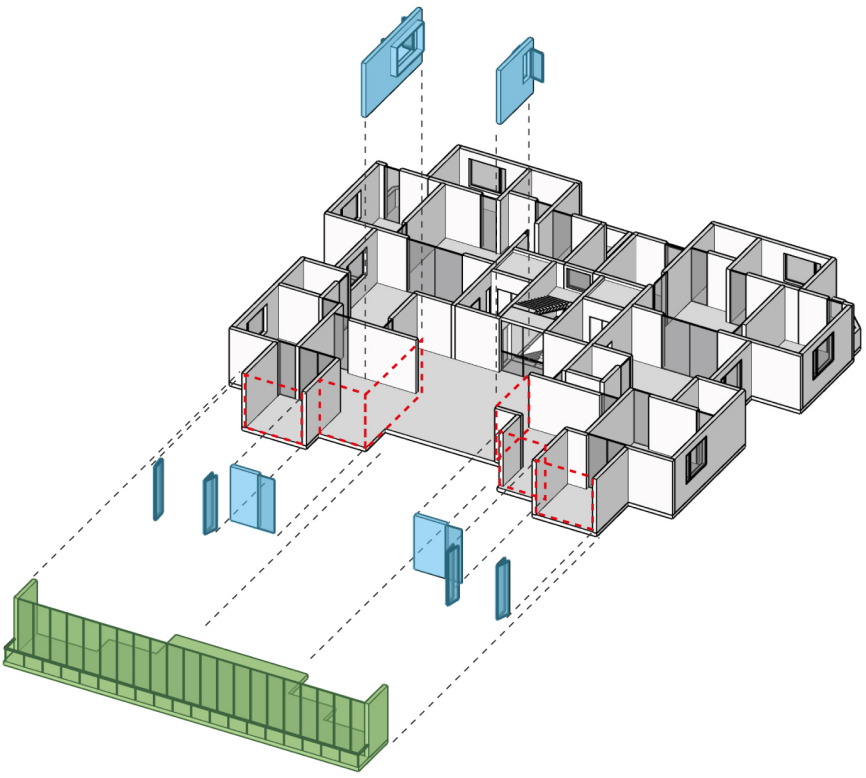

Figure 42. Adding threshold design to have internal communication.

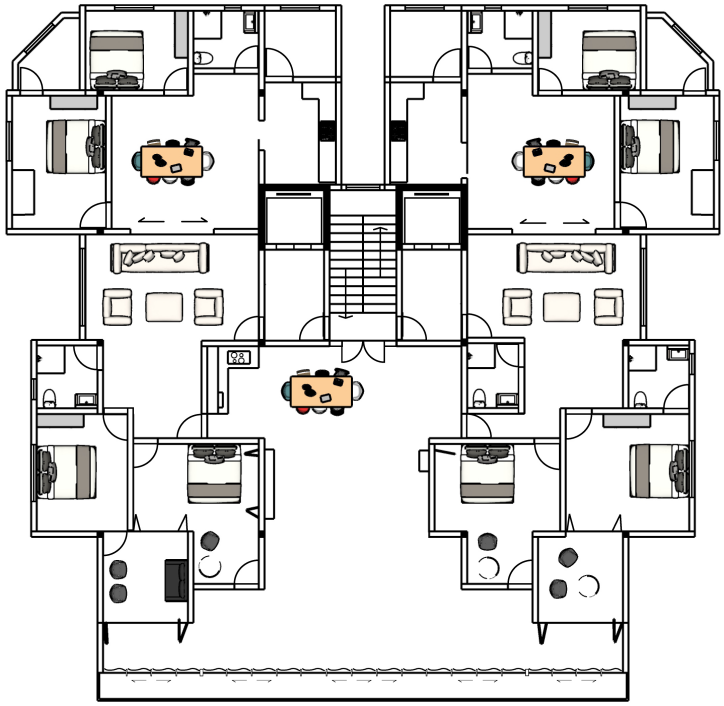

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Figure 43. Floor plan design for the typical two units.

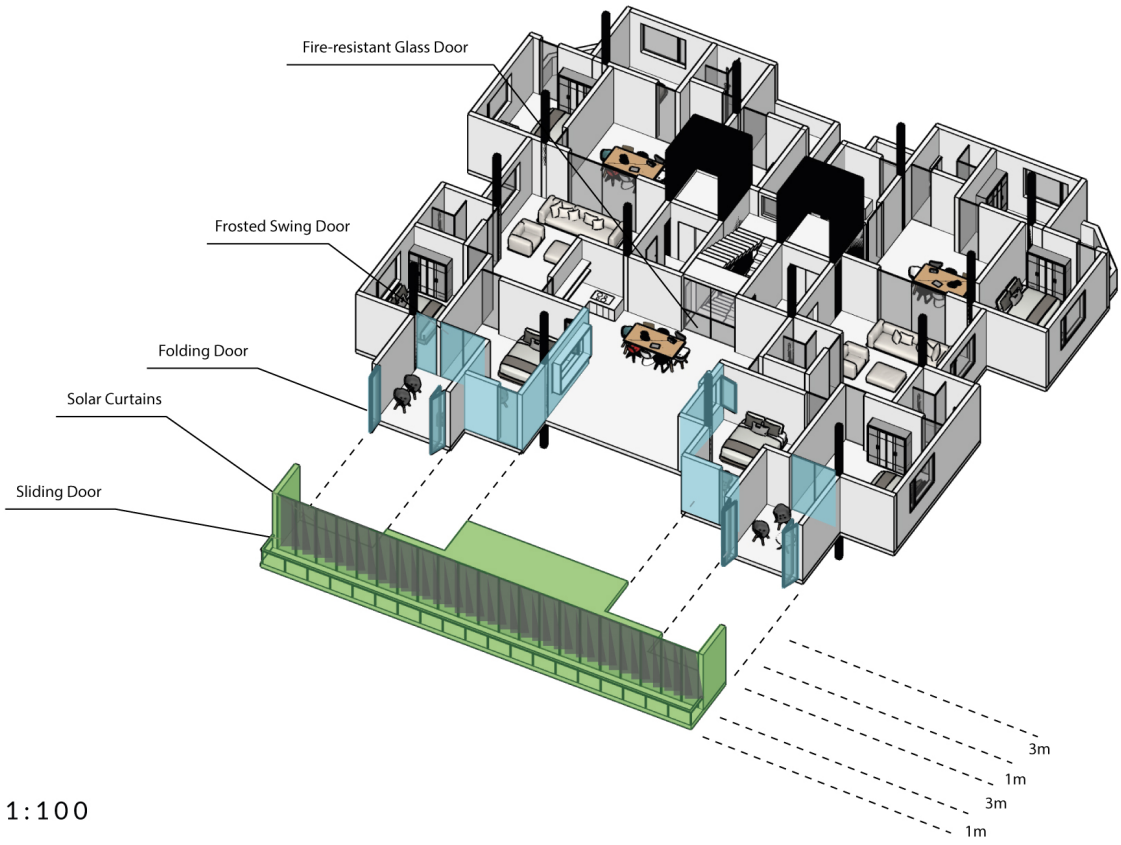

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Figure 44. Access solutions for the extended balcony.

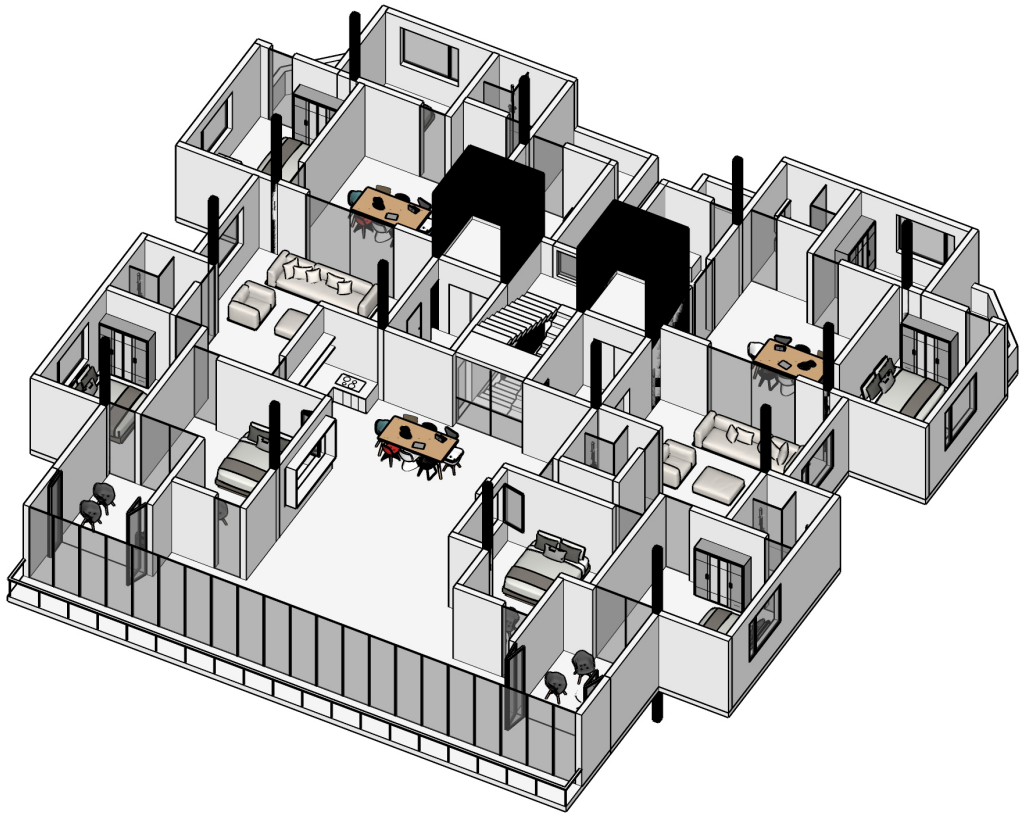

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Figure 45. Axonometric view of the floor plan with extension.

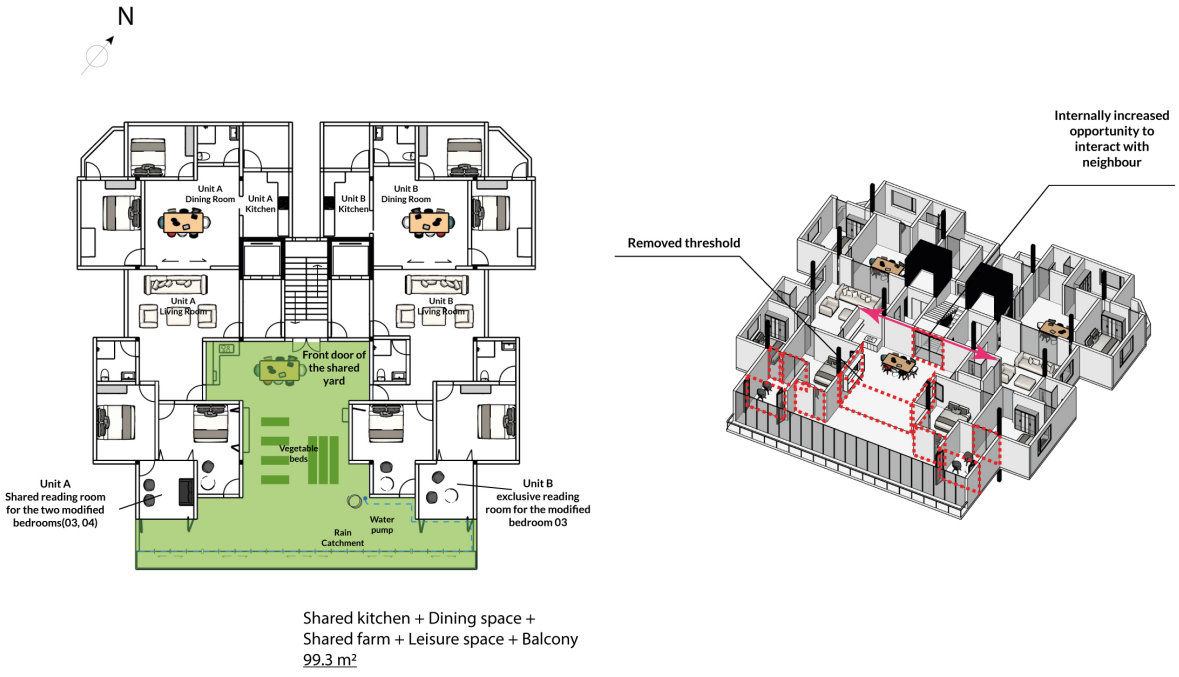

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Figure 46. Residential floor plan design has better communication between neighbours.

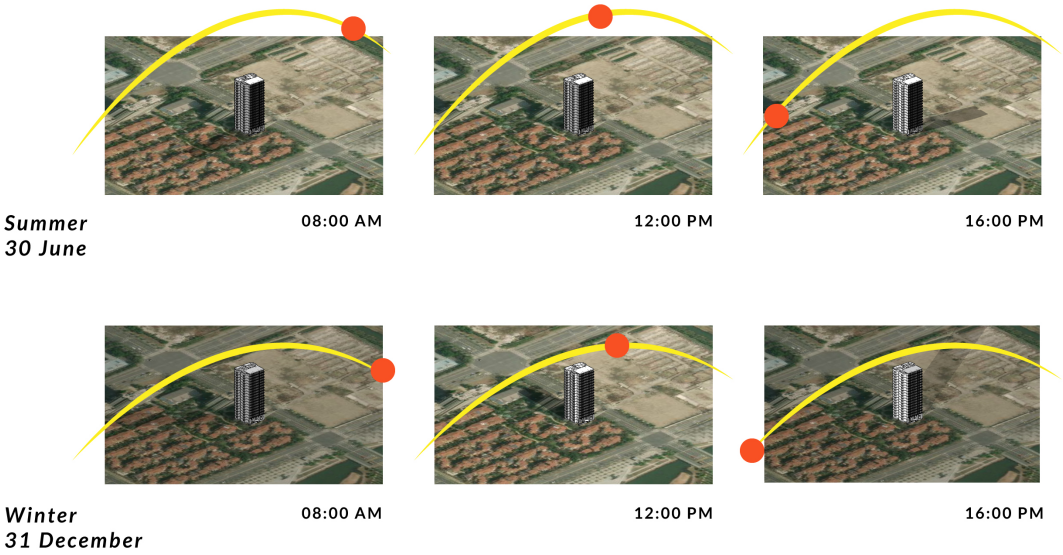

Figure 47. Sun analysis of the extension design.

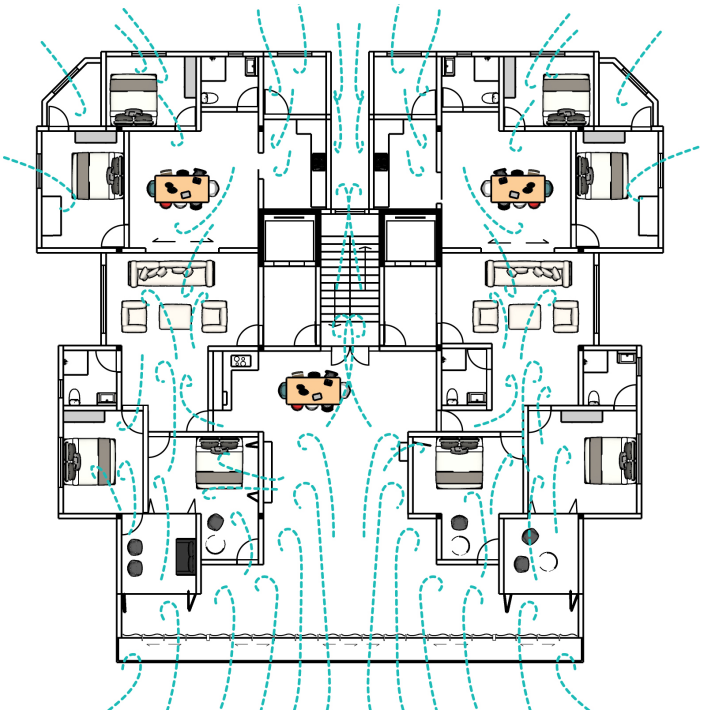

Figure 48. Cross ventilation - passive cooling effect.

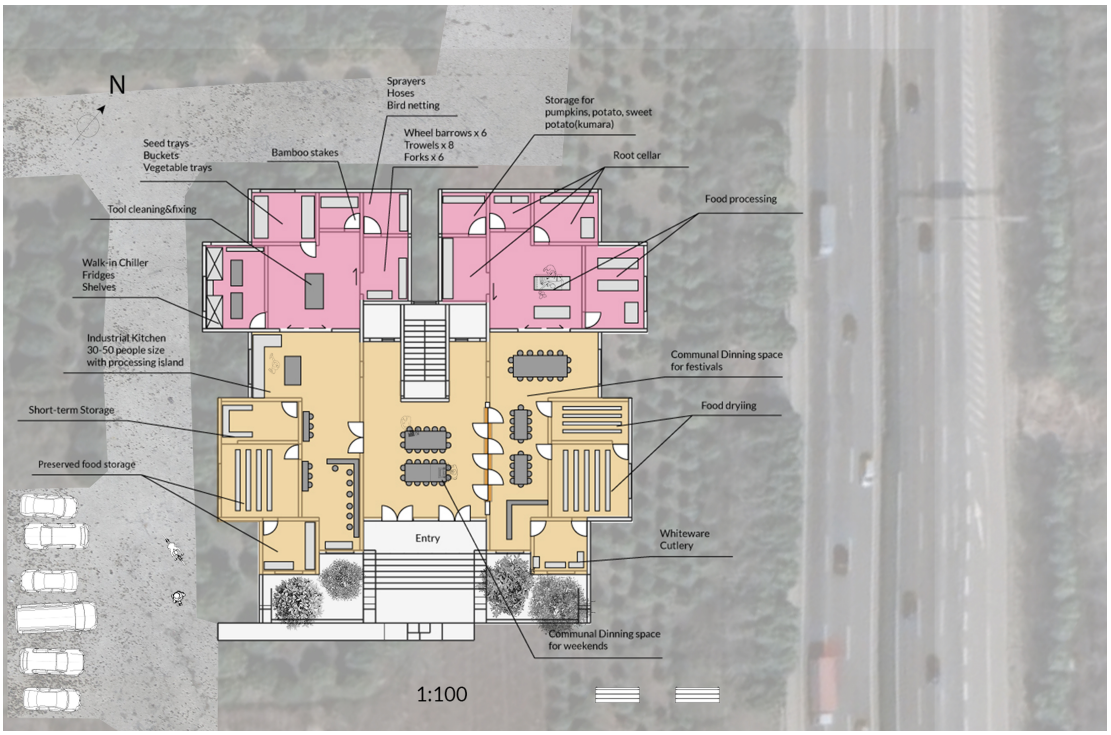

Figure 49. Ground floor design.

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Figure 50. Section of ground floor.

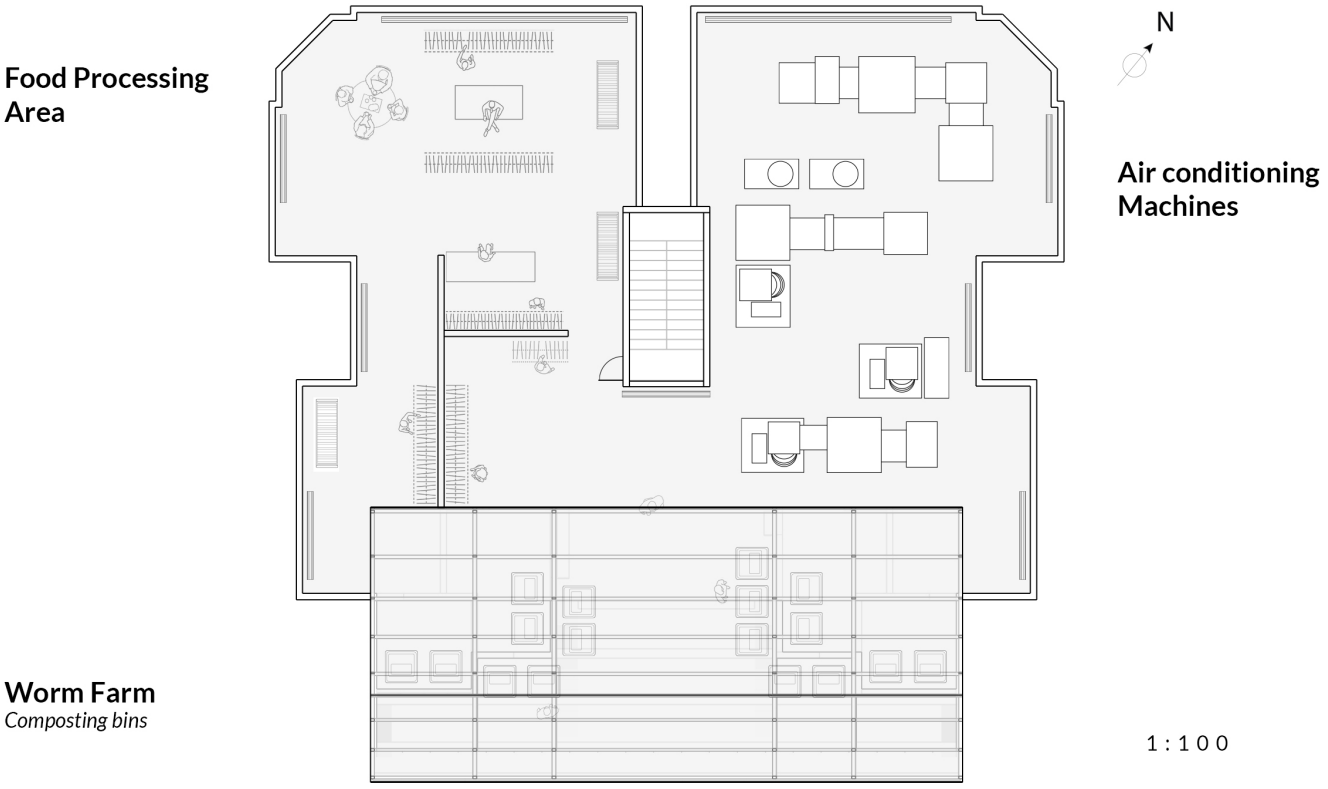

Figure 51. Rooftop plan design.

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Figure 52. Roof rain catchment design.

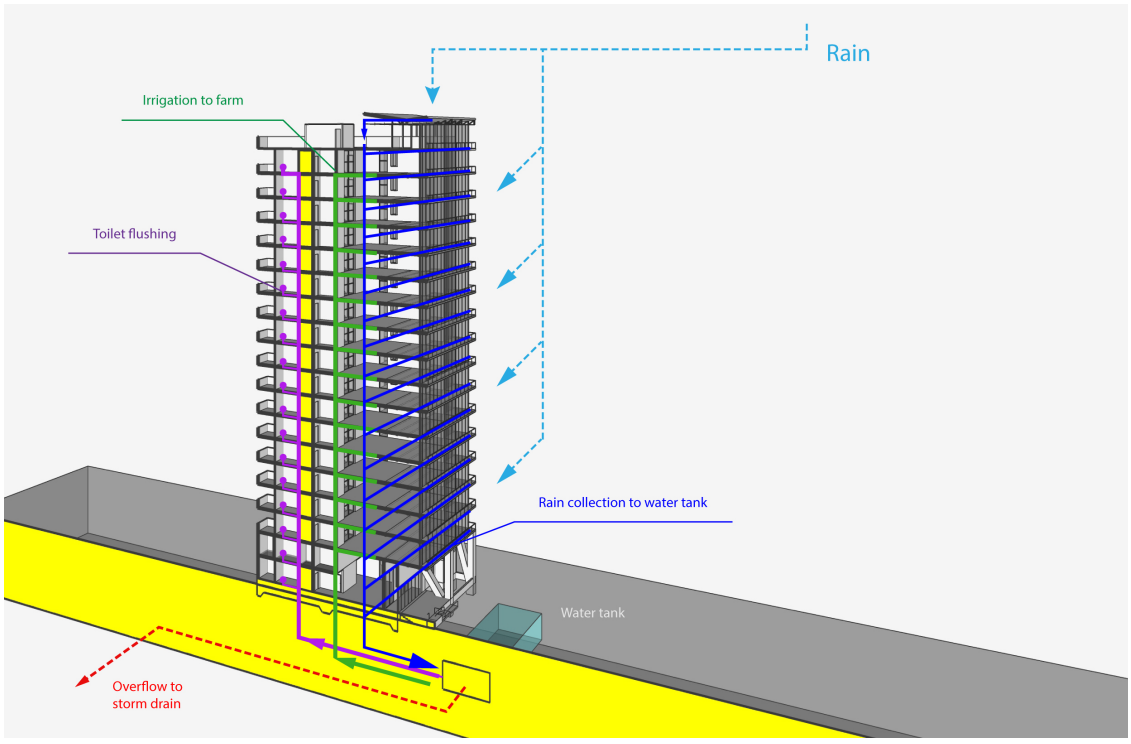

Figure 53. Rain collection and reuse for the indoor farm.

Figure 54. Section view to show interactions between residential activities and farming activities internally.

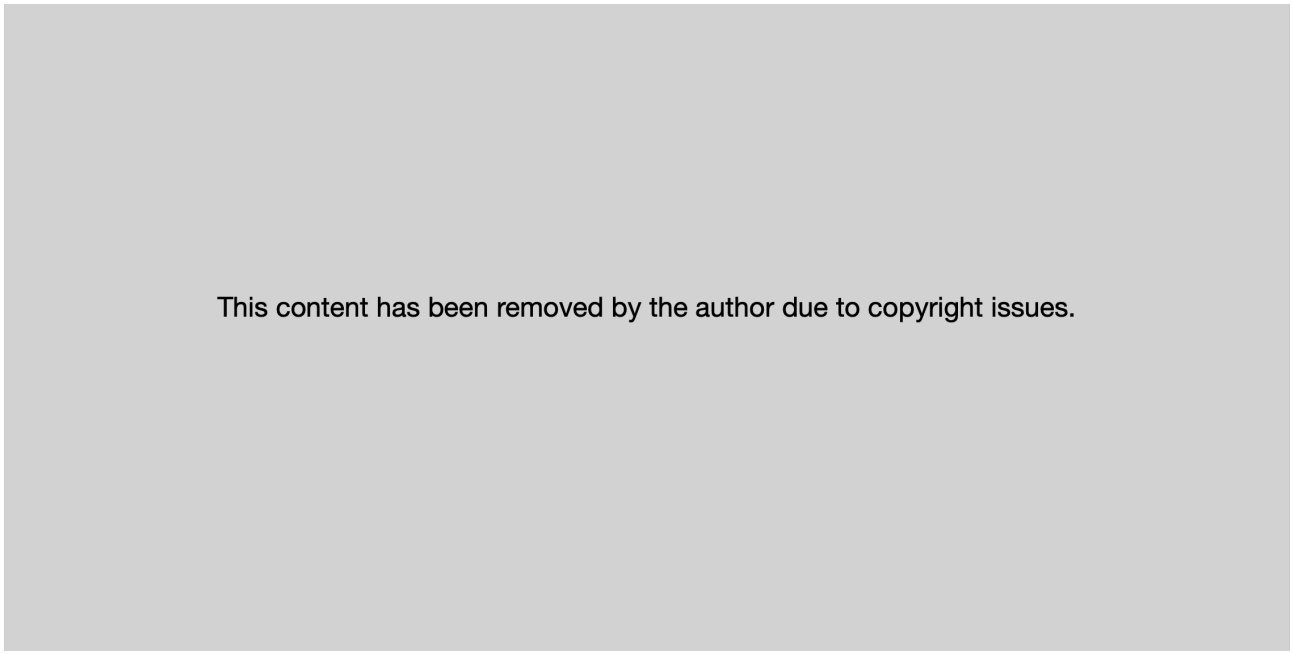

Figure 55. Residents interact with their neighbours who are farming

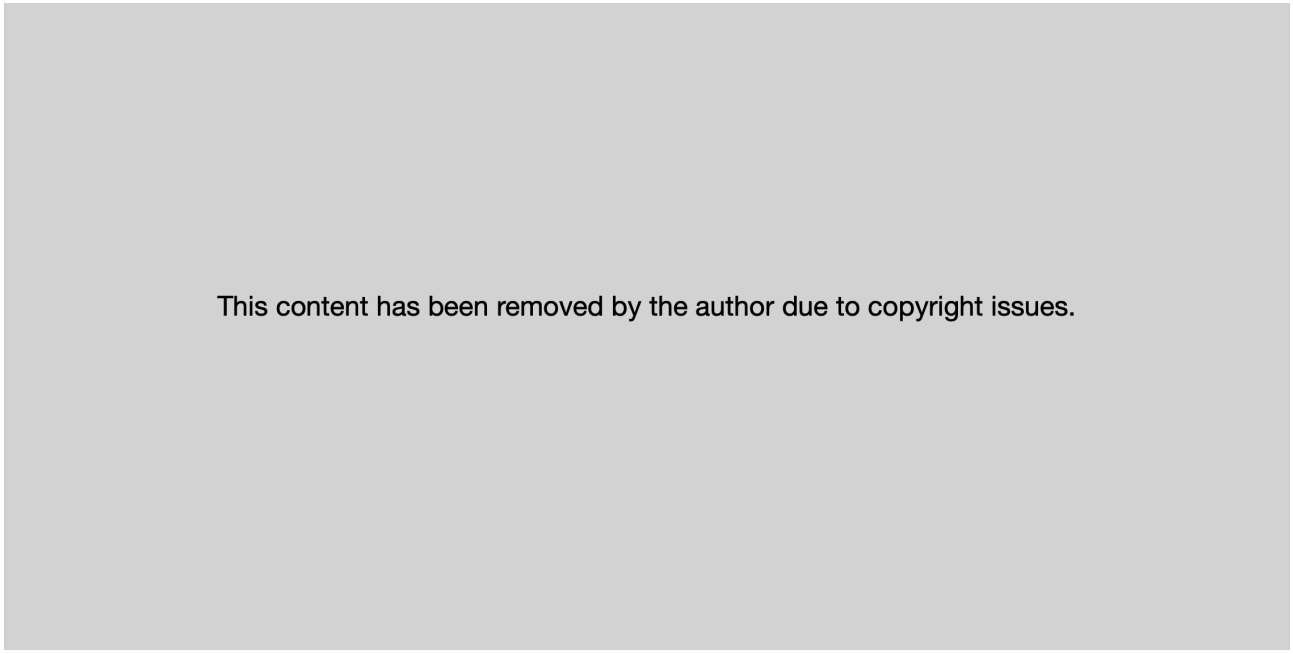

Figure 56. Perspective showing complex programme on one floor.

7. Findings

The thesis research set out to explore the question: in the urban built environment, ***"What are the opportunities for village living and food security in contemporary Shanghai through high-rise building adaptation?"*** Findings from this research are in three areas: The first is in the area of village living and food security and there are opportunities for re-thinking food supply in an urban setting by paying attention to the positive aspects of food production in village settings; the second is the capacity found in existing high rise residential buildings for adaptation to support new food-ways through vertical urban farming; the third is design research methodology that maps out closed ecological services spurred by personal experience during COVID-19 pandemic.

VILLAGE LIVING AND FOOD SECURITY IN BUILT ENVIRONMENT

As I reviewed my experience from childhood, sourcing food worry-free is one aspect of living in a village. The village environment supports the neighbourhood in exchanging house-grown food that residents (often kin) feel confident is healthy and safe. The Organic Market Garden in Auckland, a model that sourcing food from a neighbourhood-based garden increases food security.[103] As I discovered from the case study: Shanghai families seeking safe food in urban life, without living in the village, the concept for questing safe food in urbanised life is mainly based on *fangxin*, a sense of peaceful mind, rather than achieving scientific safety. (Refer to Chapter 2.1) Their endeavour fosters community-based contact to share knowledge and experience of food-seeking process.

My research has shown that urban residents are attracted to village living. Some families find ways to stay close to the agricultural supply.(Refer to Chapter 4.1) As my research has shown, some vacations in rural areas on the city edge to have short experiences of village life, others abandon urban life and move to a rural area where they can obtain food products locally, still others establish community based farms on urban lots in the city, but these can only be temporary as city land continues to be built on.(Refer to Chapter 4.2) The finding of insecure food supply was also discussed in Chapter 2.2, in which supermarkets source food from the same supplier as the wet market in some cases. Limited land supply for feeding a growing urban population, and restrictions such as master plan, and contaminated land due to previous usage, were also found in giving up village lifestyle. (Refer to Chapter 4.3)

Chapter 1.1 investigates the rapid urban development and growth of Shanghai residents. Most of them who live on the edge of the city have been exchanged with a freshly built environment. Their behaviour was not adapted to the new surroundings. By using methods of observing and mapping, the observational finding indicates the desire with aspects of village lifestyles in highly urbanised areas. As we see in Figures 14, 15, 16 & 17, residents from my Shanghai neighbourhoods have shown a number of examples, such as farming in vacant lots, harvesting bamboo shoots from public parks, and fishing in local urban waterways.

The urbanised food sourcing way was shut down by the city-wide lockdown. During the COVID-19 pandemic in Shanghai, 2022. (Refer to Chapter 6.1) My personal observations and mappings showed that due to the measures applied to each compound, residents had the capacity to organically rebuild the food ways based on the limited social connections. I realised that each community is capable to reform the essential food sourcing in their ways during or after a disaster, such as a pandemic.

Ultimately this research indicates that, while urbanised food-ways seem fixed, the everyday practices of residents that I discovered, show an inclination towards locating food directly from sites of production (such as from small farmers at markets, growing their own in vacant lots or by digging up bamboo shoots in city parks). This reflects a more village based style of food production. In addition, the COVID-19 experience shows flexibility in food-ways and residents live collectively when they need it. In doing so, urban residents gain a greater sense of food safety and greater resilience in terms of food security. There are additional benefits for urban residents in terms of social contact and neighbourhood cohesion, as well as contact with natural processes.

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[103] Wong. *Yes that is a farm in the middle of Auckland*. Stuff. Dec 30 2019.

HIGH RISE BUILDING ADAPTATION

My precedent research has found evidence of contemporary vertical buildings with intentional garden space has been found. An example is the vertical urban farm by Ilimelgo Architects, a multiple-level greenhouse that represents an opportunity to have fresh food and improved quality of nutrition in the city area for its inhabitants. (Refer to Chapter 6.2) In another example, post COVID-19, the architect Koichi Takada rethinks the shift from industrial to natural by designing a mixed-use high rise building that is covered in trees and plants. (Refer to Chapter 6.2)

The French architecture practice, Lacaton&Vassal, applies a transformative approach to architectural projects. (Refer to Chapter 6.2) Renovation saves costs and shortens the disruptive construction duration of their projects compared to reconstruction on the same site. The amount of building material waste and embedded carbon reduce in this way as well. The installation of the free-standing structure comfortably allows residents to live in their units while the new construction going on. Full-height windows on each balcony bring transparent access to the city landscape. The approach shows that high-rise existing residential buildings can be successfully adapted to achieve better living conditions through increased usage of the threshold between interior and exterior. In addition, these extended thresholds potentially foster interaction between residents, increasing community resilience.

The design research has found that roofs, circulation spaces, and the ground floor can also be adapted to support closed ecosystem loops. As the design proposed, the rooftop is utilised to have a composting site, which brings food waste back to soil nutrients. Circulation spaces, in this way, serve as veins in this ecological building body, that transfers materials, products, and wastes up and down. The original mindset of planning the ground floor in the Chinese property market which mainly uses it for the entry hall and the security office has been adapted to communal dining space. This is a centre where residents from the building consume the food and then clean them away. Also, the finding shows that by adding architectural elements, a rain catchment, and pipeline, water flow can be cycled within the building contributing to the internal ecosystem.

My research has found that the combination of residential architecture and nature is not special or unique. Architects have tried different ways to generate greener living. Existing building adaptation makes the progress cost-efficient through saving building materials, shortening the construction period, and having an internally served programme - such as an urban farm in this design research. This reflects that architectural intervention to adjust a building above the intention of maintenance, brings changes in the capacity(more space), the function(extra programme), and the performance of the building(better ventilation and energy efficiency).

ECOLOGICAL MAPPING AS RESEARCH TOOL

Mapping, the cartographical technique navigates urban relations in both spatial and behavioural conditions. Urban mapping releases the ecological imagination of a city. In this design research, the mapping process records the unusual food sourcing observations around the residential compound, and unpacked urban residents continue their village behaviour. In terms of those new urban dwellers, their lives intertwined with the original food-sourcing activities ecologically.

The finding demonstrates the value of this urban mapping of residents' food seeking behaviour has led to the design proposition tested in this thesis - a 'village style' urban farm integrated with high-rise residential living. Identifying one plant - the green bean, was spurred by a real life event, the Covid-19 lockdown in Shanghai, which folds my experience into the thesis design research. Testing the design proposition through a detailed understanding of one food plant led to a consideration of physical, spatial and social relations. Based on the different scales, the ecosystem service shows that a complex ecology is set to embrace regenerative built environments in various connections through design research.

8. Conclusion

This thesis, ***Vertical Green: an urban farm for village living in the city***, has explored, in the context of a developing urban environment in one of Shanghai districts, ***"What are the opportunities for village living and food security in contemporary Shanghai through high-rise building adaptation?"***

Located in Jiading, Shanghai, the thesis design has looked closely at the current urban context by following a methodology of ecological mapping, the thesis investigated this research to develop an architectural result. The design solidifies these ideas and tests urban neighbourhood relationships through this architectural intervention within the residential building.

Rapid urban growth in Shanghai provides healthcare services, hospitals and Chinese medical clinics. The fundamental health intake by food, however, rises safety concerns from family consumers. Products from the end of retail chain are considered as cheaply grown, less nutrition contained, and chemically contaminated. The way of supplying them has risked an uncontrolled matter. Supermarket plays an urbanised role in replacing wet markets which residents traditionally source their *fangxin* (a sense of peace of mind) food.

As Chinese people accept imported food since communicating with foreign countries, rice meals and fresh vegetables formed a traditional dietary intake that has shared proportion with international food types. Some families, most of them from urban China, find ways to stay close to the agricultural supply. They abandon urban life and move to a rural area, where could obtain food products locally, or establish a community-based farm in the urban environment, or travel to a rural farm at the city's edge on a few days' occasion as their swift change from industrially produced food consumption.

The extension of this building design assembles a selected programme of planting, growing, harvesting, food processing and storage, as well as human activities - cooking, dining, chatting and gathering. Through the vertical allocation of those collectives, the building combined proposition of continuing the village behaviour within the current urban residential settings.