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Politecnico di Milano  
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Master in Landscape Architecture  
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Title: Agriculture Metropolitan  
-An Attempt to Retrieve Balance Among Human Settlement, Agricultural System and Water Ecology  
with Urban Agriculture in Shanghai Metropolitan

Supervisor: Boeri Stefano

Xu Yibo, 737271  
Xu Xianya, 737142

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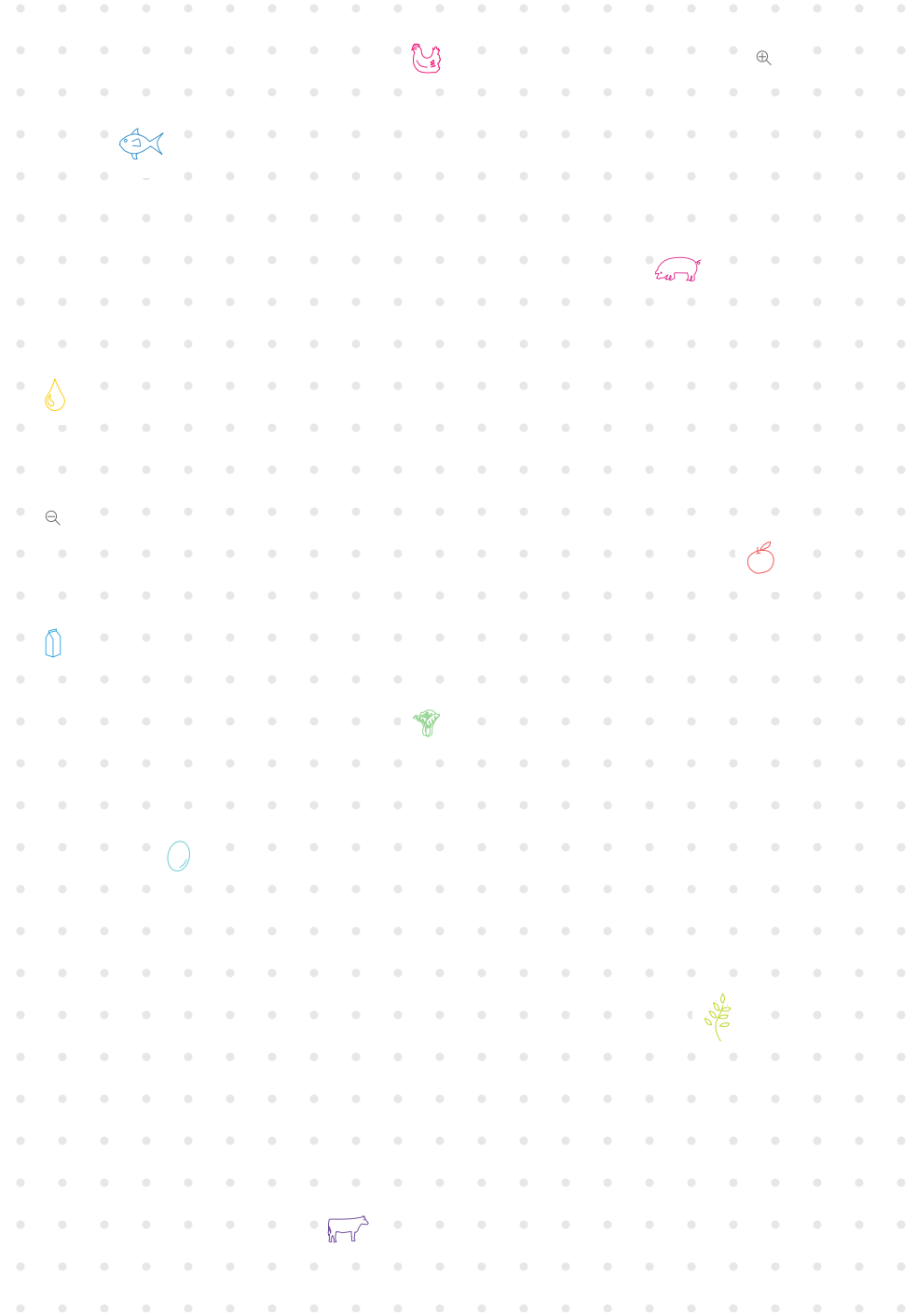
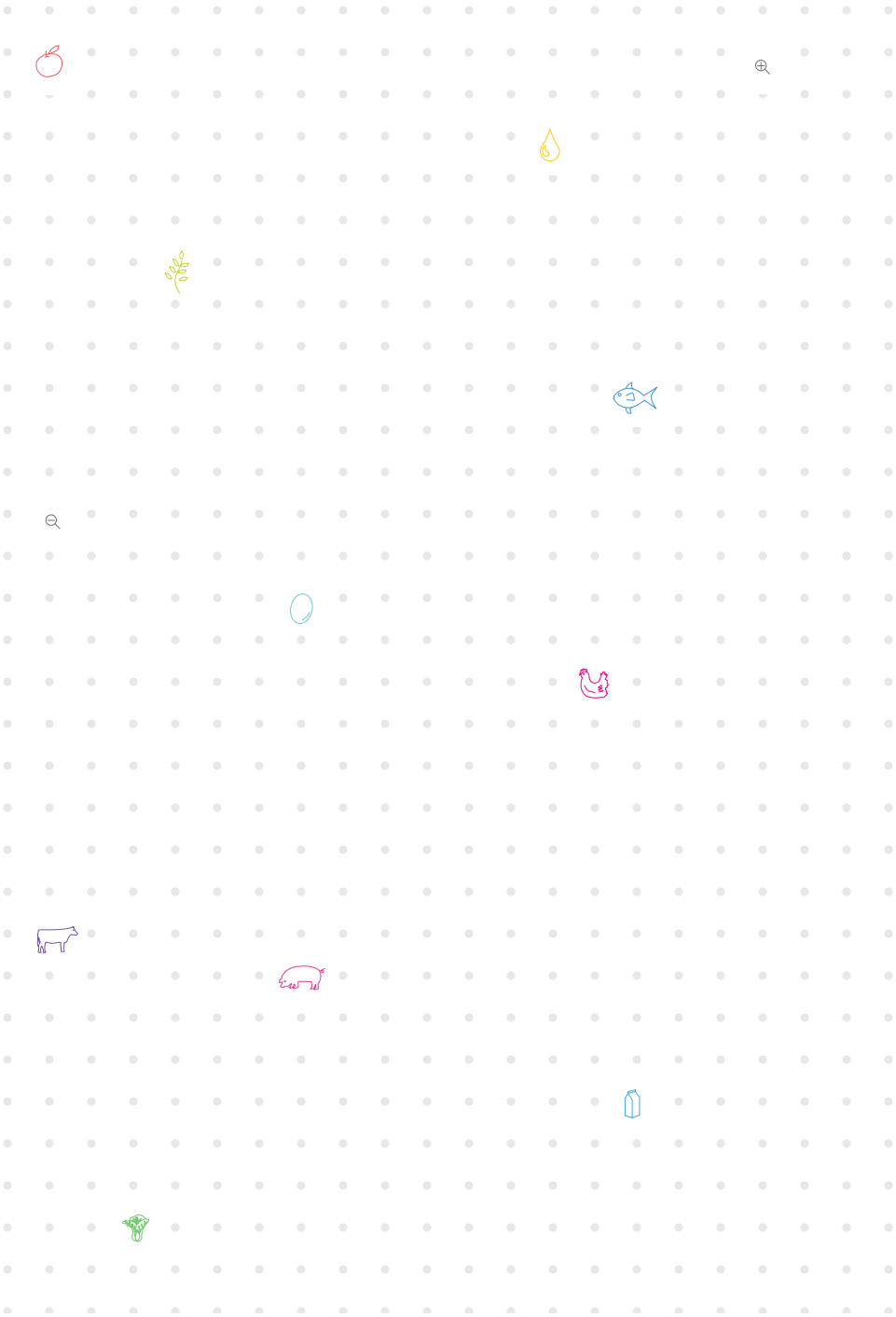
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This paper is about the past, now and future of Shanghai. / **Past** / Two hundred years ago, Shanghai was a small water town surrounded by rich farmlands and dense creeks. The nature granted locals with resources and reciprocally habitants nourished the ground with manures. The indefinitely sustainable loop among human settlement, agricultural system and water ecology created a permanent agricultural society and an original identity of Shanghai, Green. / **Now** / While, as time goes by, Grey dominates in the process of industrialization and urbanization. The rise of Grey and fall of Green opened a pandora's box. The original balance among city, water and agriculture broke up and a vicious cycle emerged. / **Mend** / The sick system need to be mended; The balance among city, water and agriculture will be regained; The original identity Green will be retrieved. In order to achieve these goals, a concept and a tool are introduced. The former, permaculture, provides methodology and strategy for revising the system while the latter, urban agriculture, helps to handle practical problems. We believe the conflicts among city, water and agriculture can be solved by the urban agriculture system. / **Future** / The harmony among human settlement, agricultural system and water ecology will bring better city and better city will provides better life. One day, we will not worry about unhealthy and insufficient food, polluted environments and boring public spaces; One day, our offspring will enjoy the same beautiful sceneries our ancestors used to do; One day, green agriculture and green water will return to Shanghai.

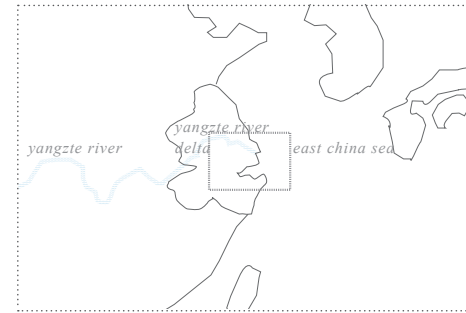
Questa tesi è per il passato, l'ora e il futuro di Shanghai. / **Passato** / Duecento anni fa, Shanghai era una città d'acqua circondata da terreni agricoli ricchi e densi insediamenti. La natura concessa con le risorse locali e reciprocamente abitanti nutrì il terreno con concimi. Il loop all'infinito sostenibile tra insediamenti umani, il sistema agricolo ed ecologia delle acque ha creato una società agricola permanente e di una identità originaria di Shanghai, Verde. / **Ora** / Anche se, col passare del tempo, Grigio domina nel processo di industrializzazione e urbanizzazione. L'ascesa e la caduta di Grey di Green ha aperto un vaso di Pandora. L'equilibrio originario tra città, l'acqua e l'agricoltura si sciolse e un circolo vizioso emerse. / **Riparare** / Il sistema malato ha bisogno di essere riparato; L'equilibrio tra città, l'acqua e l'agricoltura è recuperato, l'identità originale verde sarà recuperata. Al fine di raggiungere questi obiettivi, un concetto e uno strumento vengono introdotti. Il primo, permacultura, fornisce la metodologia e la strategia per la revisione del sistema mentre il secondo, agricoltura urbana, aiuta a gestire i problemi pratici. Crediamo che i conflitti tra città, l'acqua e l'agricoltura può essere risolto dal sistema di agricoltura urbana. / **Futuro** / L'armonia tra gli insediamenti umani, il sistema agricolo ed ecologia delle acque offriranno migliori città e di migliore città si prevede una vita migliore. Un giorno, noi non ci preoccuperemo sugli alimenti insalubri e insufficienti, ambienti inquinati e noiosi spazi pubblici; Un giorno, i nostri figli potranno godere i paesaggi belli i nostri antenati lo stesso utilizzato per fare, un giorno, l'agricoltura e verde acqua verde tornerà a Shanghai.







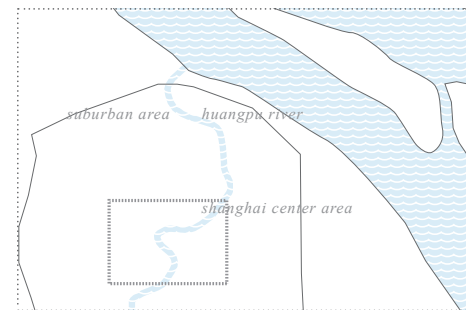
The Satellite Map of China fig.1



The Satellite Map of Yangtze River Delta fig.2



The Satellite Map of Shanghai Metropolitan fig.3



The Satellite Map of Shanghai Central Districts fig.4

'Food is the First Necessity of People' / China used to be the empire of agriculture. The food was the most important issue in any dynasty through the history. However, nowadays compared to the urgent need for economical development, agriculture has lost its previous importance, especially in those developed metropolitans such as Beijing, Guangdong and Shanghai etc. Among them, Shanghai is the very typical one paid too much attention to economy while little to agriculture. / **General Information of Shanghai** / In the national scale, Shanghai situates in the east coast of China, facing Pacific Ocean. The Yangtze River to its north provides most of its fresh water resources. The other important river is Huangpu River , the mother river of Shanghai. It carries fresh water from Taihu Lake and crosses the very heart of the city. Nowadays the whole metropolitan covers an area of 6340.5 square kilometers and holds 20 million habitants. The sands and muds from the upstream of Yangtze river formed the main land of Shanghai as well as the world's largest sand island, the Chongming Island in its north *see fig.1, fig.2, fig.3, fig.4.* / As the leader city of the Yangtze River Delta (including Jiang Su and Zhe Jiang Province), Shanghai becomes one of the most prosperous cities in China, especially in city construction and economic development. During the past decades, 'thanks to' many urban development policies, the central area of Shanghai has expanding largely. Until 2009, the urbanization ration of Shanghai has risen to over 85%. Its successful urban development has been recognized as a miracle and a model for other cities in China. At the same time, Shanghai is labelled as one of the most important international commercial hubs in the far east Asia *see ref.1.*

上海 / 古语云, 民以食为天。但是在如今的中国, 经济的发展牢牢地占据了主动。曾经的农业大国已经改变了其发展的目标。上海是中国最经济最繁荣的城市之一, 同时也是经济改革的先锋。在三十多年经济改革和城市发展的过程中, 上海忽视了农业的重要性。在过去的数十年里, 中心城区的面积已大大地扩张。至二零零九年, 城市化率已经达到了百分之八十五。在城市大扩张的同时, 农业用地渐渐地消失。在城市发展奇迹的背后, 是农业的牺牲。在接下来的文章中, 我们将介绍上海城市与农业发展的过去和现在。在了解历史和当前的问题之后, 希冀通过分析和设计探索其新未来的可能性。我们相信, 城市和农业的和谐发展是人们生活品质提高的前提。



The Satellite Map of Shanghai Downtown in 2009

fig.5

The Downtown of Shanghai in 2009, a City Full of Grey / The downtown region is the very place that represents the rapid urban development of Shanghai. It centers the Bund, Lujia Zui Commercial Center in Pudong Area and the Huangpu River, the mother river of Shanghai. The downtown covers an area around 120 square kilometers. To the north it extends to Hongkou District which used to be the international concession (ruled by Americans and Japanese); To the east it arrives at the Century Park, the biggest green in the downtown; To the south it comes to 2010 EXPO site, the China Pavilion; To the west it ends at Luwan district which was the French Concession. This region has been the very heart of Shanghai throughout its history. / In the satellite map of the downtown *see fig.5*, the downtown area is overlaid with grey patterns, the buildings and infrastructures. They represent the contemporary identity of Shanghai and its triumph of urbanization. While, as a Shanghai local, I have been wondering what my hometown used to be? what is the history of the urbanization and what were the layers behind the concrete?

上海的现状 / 如今的上海由钢筋混凝土铸造。地图中可以清晰的见到，上海市区呈现惨寂的灰色。上海的母亲河，黄浦江，是我们在这张图上可以看到的唯一明显的自然元素。然而，这样的景象早已与原来的上海相差甚远。出于对历史的好奇，对上海原始地域特性的探求，我们不禁会问：在这一层“灰色”下层隐藏了什么？上海在经济飞跃前是个什么模样？它确是全球大炼炉中那些国际大都市中的普通一座？



A Virtual Satellite Map of Shanghai Downtown around 1800

fig.6

The Downtown of Shanghai around 1800, a City Full of Green / After reviewing the related archives and researches *see ref.2*, we succeeded in figuring out the virtual satellite map of the Shanghai downtown around 1800 *see fig.6*. Shanghai was full of farmlands, especially the paddy fields. Besides those fields, water was another important element of Shanghai original landscape. At that time, the whole Yangtze River Delta was covered with millions of creeks and rivers. The nature granted Shanghainese convenient transportation routes and sufficient fresh water. With those advantages, the ancient Shanghainese were able to develop large tracts of farmland. The whole agriculture, social and economical system is called Water Town, which was typical in the Yangtze Delta and still exists in the far suburban areas of Shanghai. / Well, now we know the original vision of Shanghai: it was a water town. The creeks and farmlands shaped the lifestyle of ancient Shanghainese. If it had a original identity, that must be green, the green fields and the green creeks. However, those has extincted in current downtown.

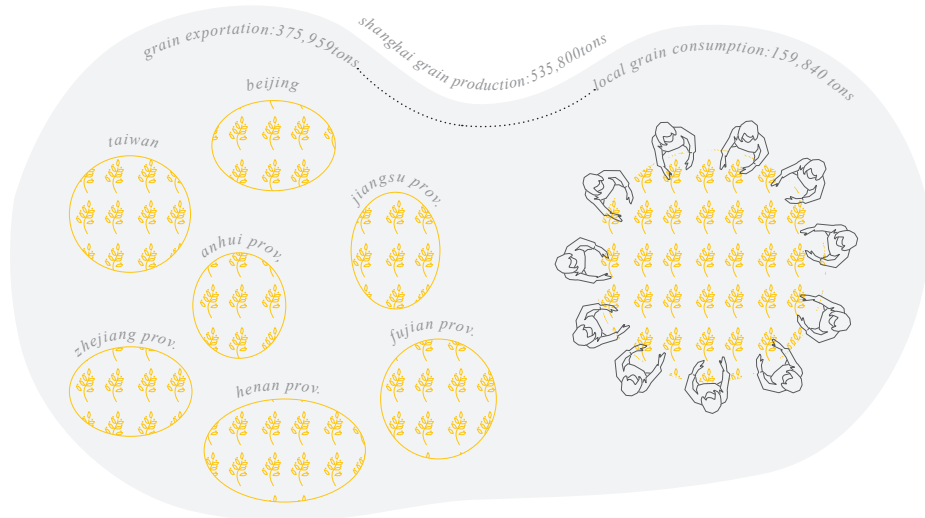
上海的去 / 在阅读了大量的文献和研究成果后，我们尝试着还原上海在开埠前的状态。左图是虚拟的十九世纪初上海卫星地图，除了老城厢以外，基本就是一望无际富饶的农田和四通八达的水网。如果说上海有其与生俱来的秉性的话，那一定是这些“绿”与“蓝”的交织。但遗憾的是，在二个世纪飞速城市化的过程中，灰色的混凝土抹去了曾经的色彩，城市渐渐被剥夺了那时的秉性。如今想必已没有人会将这个国际化大都市与水乡相联系了。

A City of Green, A City of Grains / According to Shanghai Professional Records: Agriculture Records *see ref.3*, in 1391, the population of Shanghai was 532,803. The total production of the grain (mainly rice) per year was over 535,800 tons. Assuming that the average grain consumption of one person at that time was 300 kilograms *see ref.4*, the total consumption of the grain in Shanghai region was around 159,840 tons. The surplus 376,000 tons of grain were exported to other part of China and other big neighbor provinces *see fig.7*. Naturally with the great natural environment, Shanghai used to be the grain production

曾经的粮食基地 / 同时令人惊讶的是，如今的粮食消耗大户曾经是一个富饶的粮食生产基地。据文献记载，约在公元一三九一年，上海区域（按现在行政区域划分）拥有住民约五十三万人，按照当年的人均粮食消耗量来计算，年粮食需求在十六万吨左右。而资料显示，当年全区域约产出五十三万多吨粮食，其中三十七万多吨会送至全国其他地区。从上海通过内河航道可运至浙江，江苏等邻近省市，通过长江可运送至武汉等内陆省市，

center as well as the transportation transit in the east coast of China. It produced 3 times grains more than its habitants needed. / However, unfortunately, the previous big food exporter has changed into a big food importer and put big burden on other provinces. The identity of Shanghai has totally shifted.

通过海运可以输送至北京和福建。到此，我们会疑问是什么因素造就了昔日上海这富饶的鱼米之乡，在繁荣的农业背后她又享有着什么样得天独厚的自然区域风貌和人文背景。



Shanghai Food Consumption and Exportation Situation Around 1400s

fig.7

Three Natural Advantages Helped Shanghai to Be a Food Exporter / Shanghai was born to be a food production center. At least the nature granted three advantages for it. First, the dense water network; Second, the sufficient fresh water supply; Third, the tidal irrigation system. The ancient Shanghainese had learned how to make the best use of them.

绿色的背后：三个自然的因素 / 研究分析后，我们发现上海的繁荣农业离不开当时三个独特的自然因素。首先，曾经四通八达的水网，为上海的农业经济提供了交通资源。其次，充足的淡水资源为上海人口发展和农业灌溉提供水资源。最后，农民趋利避害的运用上海的潮汐，让上海这个临海的区域即能享受潮汐送水的力量又能避免海水倒灌的烦恼。以下便一一叙述这三大自然因素如何赋予上海绿色农业的秉性。

The First Natural Advantage: The Dense Water Network / Shanghai was full of creeks and rivers. As shown in the *fig.8*, the whole metropolitan was covered with dense water network. In general, there are two major arteries, one is Huangpu River, the mother river of Shanghai. The other is Yangzte River. It meets Huangpu River at its estuary and finally runs into East China Sea. In order to use the advantage of dense water network, people built their water towns along the riverside. With the creeks and rivers, the food could be transported from the local farmlands to towns and villages efficiently. With the Yangzte River, the food could be sent to the inner provinces of China. And with East China Sea route, the food could be delivered to Beijing in the north and Fujian in the south. The Huangpu River, the Yangzte River and the East China Sea shaped a chain of water network. This ensured the efficient and safe food transportation as well for other goods *see fig.10 and fig.11*.

第一个因素，四通八达的水网 / 曾经的上海密布着大大小小的河浜水道，其中影响最大的是流经上海北部涌入东海的长江和从太湖流来贯穿市中心的上海母亲河黄浦江。以这两条河流为基础，上海的水路网络延展至四周，她们是当时上海农业经济迅速发展的重要基石。当日上海住民们都依河而居，有河流的地方有人家，从而形成传统的水乡。而且，在当时的技术条件下，便捷的水路运输要比陆上运输更加的快速，安全，经济。通过内河网络，货物和旅客可以往来于周边的省市。通过长江江运，货物和旅客可以溯流而上进入中国内陆。通过东海海运，货物可以南至福建台湾北至天津卫。当然，在拥有天然水网的基础上，水资源本身以及如何利用水资源的能力同样是至关重要的。



Map of Water Network of Shanghai Metropolitan Around 1800s

fig.8



Shanghai Water Resources

fig.9

The Second Natural Advantage: Ample Fresh Water Resources / The water network not only provided routes for the transportation but also granted water for the crops and human livings. The Yangzte River and the Huangpu River provides separately 90% and 10% of the fresh water supply for Shanghai per year *see fig.9, see ref.5*. With huge amounts of fresh water from the nature, Shanghai farmers were able to develop large tracts of agriculture, especially the paddy fields, which produced the main food of Chinese people.

第二个因素，充足的淡水资源 / 当今的上海被称为水质性缺水城市，意指虽然淡水资源充足但水源污染严重从而无法被利用。实际上，工业大发展前上海的淡水资源非常充沛的。根据数据，上海百分之九十的淡水资源来源于长江，剩余百分之十来源于黄浦江。水网不仅给上海带来了运输的便捷，也为其提供了充足的水源。长久以来，稻米一直是上海住民的主要粮食，全境内大部分的粮田都是稻田。因此充足的淡水资源为上海稻田的发展提供了不可或缺的基本资源，也造就了长三角肥沃的土地。



Shanghai Water Transportation Route in Downtown Area Around 1800s

fig.10



Shanghai Water Transportation Route in Metropolitan Area Around 1800s

fig.11



Map of Shanghai Downtown Water Network When High Tides Came

fig.12

**The Third Natural Advantage: The Tidal Power** / Because of special geographical situation, Shanghainese developed a unique irrigation system. It based on the natural power, the tides. The tide of Shanghai is diurnal, which means everyday there are two high tides and two low tides *see ref.6*. When the high tides came, the water (including the fresh water, brackish water and sea water) was pushed into the inner land creeks and lifted up the river level, thus providing the water resource for the Shanghainese *see fig.12*. When the low tides came, water returned to the Yangzte River and East China Sea. Some creeks would dry out because of the low tides *see fig.13*.

第三个因素，自然赋予的潮汐力量 / 在拥有了充足的水源和发达的水网之后，还需要思考的是如何利用这些资源。古代上海住民运用他们的智慧，利用潮汐的自然特性，发明了一套采集淡水资源的方法。众所周知，临海城市都会遇到海水潮汐倒灌的问题，上海也不例外。上海的潮汐属于典型的半日潮，即在一个太阳日内出现两次高潮和两次低潮，前一次高潮和低潮的潮差与后一次高潮和低潮的潮差大致相同，涨潮过程和落潮过程的时间



Map of Shanghai Downtown Water Network When Low Tides Came

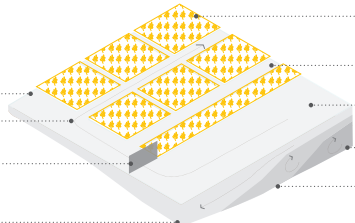
fig.13

**Four Steps to Use the Tides** / In order to made the best use of the tides, Shanghai farmers developed an interesting way to utilize the natural power. The process could be divided into four phases. The ultimate goal was to use the fresh water and block out the brackish and sea water *see ref.7*. / **Phase 1: Welcome the High Tides** / Before the high tides came, the open gates were ready to direct the fresh water inside the fields. The incoming sea water from East China Sea would lift up the fresh water from the Yangzte River and push it into the inner land of Shanghai. The lifted up fresh water would rush into the fields through the open gates for irrigation and human settlement usage. / **Phase 2: Block Out the Salty water** / However, the sea water would merge with the fresh water in the middle layers and form brackish water. After the high tides arrived, the gates were closed to forbid the salty water. The fresh water was saved in the inner land creeks for usage.

也几乎相等。高潮时，海水猛于长江水流，托举着河水涌入内陆，内河中便含有盐水和半盐水。低潮时，河水高于海水，将其推出内陆流回东海。根据这一系列自然现象，上海农民设计了一套水闸用来趋利避害，引淡水拒海水。 / 四个步骤利用潮汐 / 第一步：引潮 / 首先，在高潮来临前打开闸门，海水在涌入内陆的同时会托起河水，被抬高的淡水流过闸口进入稻田水渠之中已备使用。此步骤至关重要，需要了解潮汐的准确时间，若失败了会误将半咸水引入农田造成农作物的损伤和土地的盐碱化。 / 第二步：挡潮 / 当高潮正式出现时，主河道中的水流已基本由半盐水和海水构成，此时要关闭闸门，将有害于作物

Step 01:  
Before The Highest Tides Coming

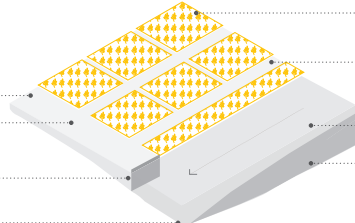
natural creeks  
fresh water coming into rice fields  
open gates let fresh water in  
  
fresh water lifted by the sea water



rice fields  
human made canals for irrigation  
huangpu river  
sea water incoming with high tides  
brackish water mixed water

Step 02:  
The Highest Tides Arrive

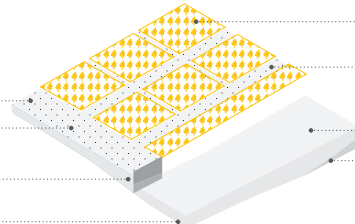
natural creeks  
fresh water contained for irrigation  
close gates block out the brackish water  
brackish water mixed water



rice fields  
human made canals for irrigation  
huangpu river  
sea water entered the river network

Step 03:  
The Tides Fade Away

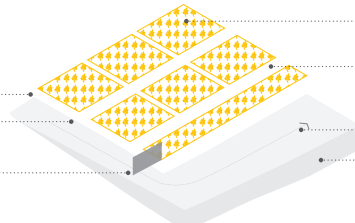
natural creeks  
used water after human usage  
farmlands irrigation  
close gates block out the brackish water  
fresh water coming into island wash away the sea water



rice fields  
human made canals for irrigation  
huangpu river  
brackish water mixed water

Step 02:  
The Lowest Tides

natural creeks  
used water flowing away into huangpu river  
open gates let the polluted water go away



rice fields  
human made canals for irrigation  
huangpu river  
fresh water coming into island wash away the polluted water

Four Phases To Use The Tides

fig.14

Phase 3: Use the Water and Wait for Ebbing / During the break between rise and ebb, farmers would use the captured fresh water as much as possible and dumped the dirties and wastes inside the water network. It was a phase for the human usage. / Phase 4: Wastes Washed Away by the Ebbs / When ebbing came, the water level outside the gates lowered. At that moment farmers would open the gates and let the used water run away together with the ebbs. Thus the whole cycle finished. The whole procedure would happen twice a day to keep the crops irrigated and the human lives going on see fig.14.

The Cycle of Tides / The tides, the

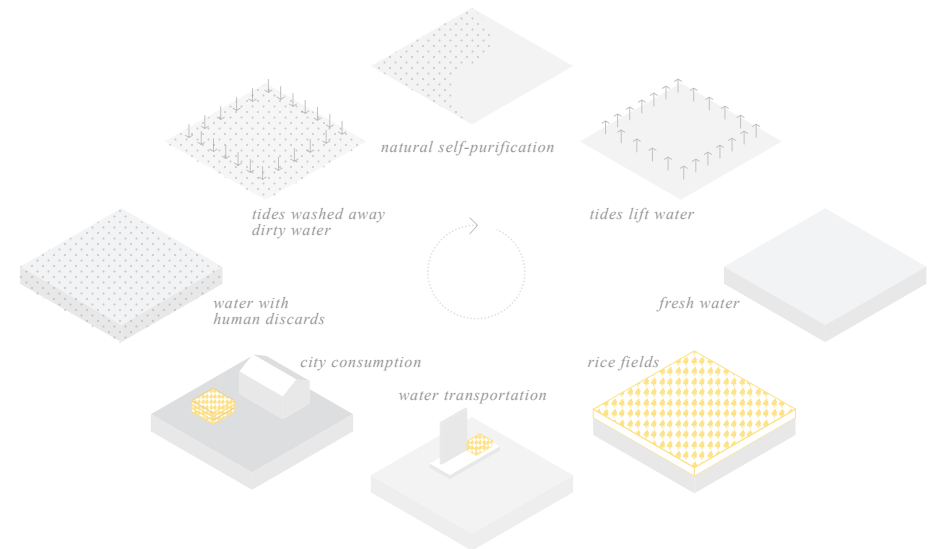


The Cycles of Tides in 24 hours

fig.15

natural phenomenon came every 12 hours see fig.15, provided the essential fresh water for the agriculture system, washed away the dirty water around the human settlement. In general, the whole process could be described

的咸水挡在闸门之外，这样，淡水就被保存在水渠之中以供人们使用。 / 第三步：用潮 / 当淡水涌进后，人们开始抓紧潮汐之间的时间间隔使用淡水资源。农民用来灌溉，居民打水备用，同时将生活垃圾冲入水流下游以待开闸。 / 第四步：退潮 / 当海水退潮，水位下降时，人们打开闸门，已经被使用过的废水，携带着居民们的垃圾冲入自然的河道涌入大海，开始自然降解的过程。同时，人们开始等待下一次的涨潮。当初的上海人民便每天遵循着这潮汐规律，农民利用他们的智慧将自然的力量化为己用，避免了本是灾祸的潮汐倒灌。



Conclusion of The Tidal Irrigation System

fig.16

as following: The tides brought sufficient fresh water into the lands. The farmers used them for irrigation. Then, they transported the productions to the city through the water network. The city grew with food. The polluted water from the city then was washed away by the tides. With the natural self purification the discards of the city became the natural elements again. And the loop started another time see fig.16. / **The Extra Advantage: Manure** / Besides the good natural resources, Chinese developed another important method to keep the arable land rich and health. The key was the manure of the human and livestock. The following two citations from the foreign scholars could best represent its great function in keeping the balance of original agricultural system. 'One of the most remarkable agricultural practices adopted by any civilized people is the centuries-long and well nigh universal conservation and utilization of all human waste in China, turning it to marvelous account in the maintenance of soil fertility and in the production of food. The method to cultivate the crops by Chinese was different from the mineral fertilizers so extensively employed in modern western agriculture, like the extensive use of mineral coal, which had been a physical impossibility to all people alike until within very recent years. In fact, the very long unbroken life

of China and the vast numbers its farmers have been compelled to feed proved the success of the reusing manure as natural fertilizers.' 'In selecting rice as their staple crop; in developing and maintaining their systems of combined irrigation and drainage, notwithstanding they have a large summer rainfall; in their systems of multiple cropping; in their extensive and persistent use of legumes; in their rotations for green manure to maintain the humus of their soils and for composting; and in the almost religious fidelity with which they have returned to their fields every form of waste which can replace plant food removed by the crops, these nations have demonstrated a grasp of essentials and of fundamental principles which may well cause western nations to pause and reflect.' see ref.8. Dr. Arthur Stanley, Health officer of the city of Shanghai, in his annual report for 1899, also wrote: "...While the ultra-civilized Western elaborates destructors for burning garbage at a financial loss and turns sewage into the sea, the Chinaman uses both for manure. He wastes nothing while the sacred duty of agriculture is uppermost in his mind. And in reality recent bacterial work has

人类的回赠，粪便的使用 / 除了自然的三个因素外才，中国人对于自然的尊敬对于整个系统的平衡也起到了非常大的作用。中国人对于人类和牲畜粪便的循环使用使用的土地数千年来反复的耕种成为可能。

不同于西方所使用的化肥，中国农民一直坚持使用人畜粪便进行浇灌，通过自然的过程增加土地的肥力。这样的过程被外国的学者称之为‘永恒农业’，一个一

shown that faecal matter and house refuse are best destroyed by returning them to clean soil, where natural purification takes place. ... the product of an evolution extending from more than a thousand years before the Christian era." see ref.9. Thanks to Franklin Hiram King and Dr.Arthur Stanley, we could obtain information in detail on what Shanghai used to be and how the agriculture, city and water worked together. The advantages were natural resources and the key was the manure. The four together kept the whole social, economical and ecological system working soundly. / **The Perminent Agriculture** / Franklin Hiram King called this endless loop 'Perminent Agriculture', which means an indefinitely sustainable agricultural system see ref.8. This word cuts the point. Ancient Chinese people have been believing in the endless cycle for thousands of years. From the tiniest thing to the universal life, everything could be explained as an endless loop. The agriclutre system was one of the master pieces of the ancient Chinese wisdoms on perminent loop. / **The Harmony** / Now, with deep understanding of the ancient Shanghai agriculture system, we get the whole picture of the perminent agriculture and the balance among water, agriculture and city.

直良性循环自给自足的人与地的和谐系统。在19世纪初，美国农业经济学家 Franklin Hiram King第一次在他的著作中提到了这一概念。这个不同于西方的耕作模式正式中国人一大发明。

Those three built up a perminent and indefinite sustainalbe cycle. To conclude this chapter, we present a ring chart see fig.17 to describe the structure of the original balance among human settlements, agricultural systems and natural ecologies. In the clockwise, the nature provided agriculture with fresh water through tides and convinient water network. And the agriculture granted food for human being through water transportation. Then, the human settlements left the wastes to the water, where natural

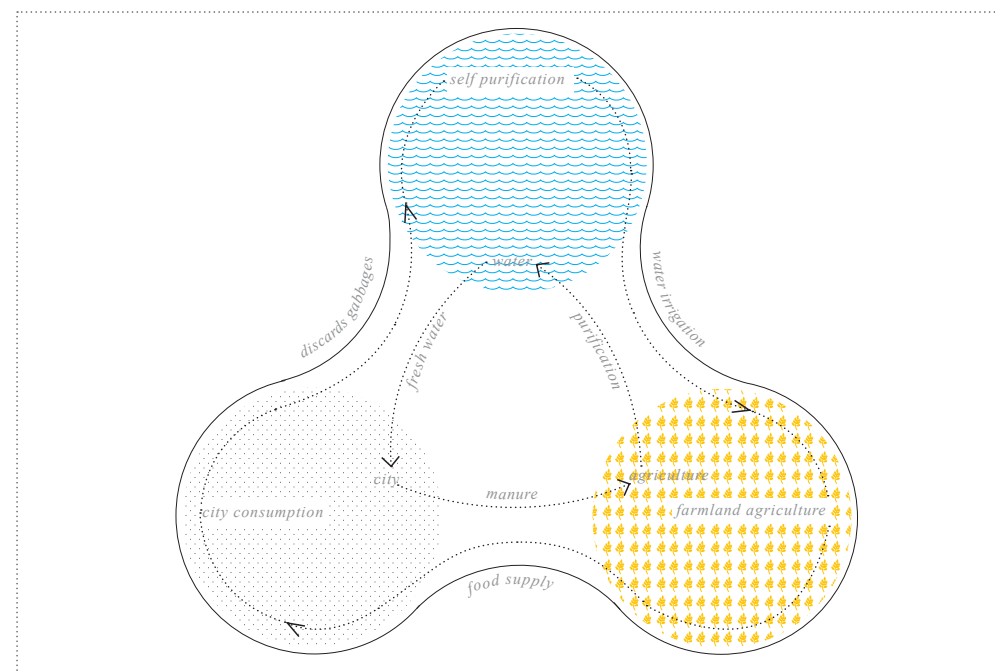
曾经的天人合一 / 古时的上海居民将自己的生活完全的融入到自然循环之中。水，农田，生活形成了一个不停歇的良性循环，互惠互利的同时又互不侵犯。遵循着大自然的力量，便产生了一个和谐的过程。她构建了上海最初始的本质。 / 上海原本的性格 /

self-purification happened. In the counter-clockwise, water provided human settlement with fresh water. The human settlement returned manure as fertilizers to the agricultural system. The agricultural system helped in purifying the water and save it in the underground water layer. The clockwise and counterclockwise together form a loop among human settlements, agricultural system and natural ecologies, which were mutually beneficial.

在了解到上海开埠前真实的场景后，回看如今的上海，过去的绿色变成了如今的灰色。追根溯源，如果说上海有其独特的本质的话，那便是农田与水网的交织，人类与自然的和谐。过去的景象

**The Original Characters of Shanghai** / The original vision of Shanghai emerges. Ancient Shanghainese lived in water towns. People went out by ships, carried cargos by ships and even lived on ships. The water and human wastes created a perminent agriculture. The scenery was full of crop fields, trees and creeks. To conclude, if Shanghai had an identity, it would be the chrods of city, water and agriculture, the green. It could be considered as an indefintely sustainable system.

为我们呈现的是一幅既陌生又熟悉的水乡风情画。赞叹感慨之余，我们也不禁要问，水乡风景画如何演变成了如今绚烂的混凝土大都市？在这二百年间，水，农业和城市之间的和谐是如何打破的？在下一章节中，我们会详细的展现这一个过程。



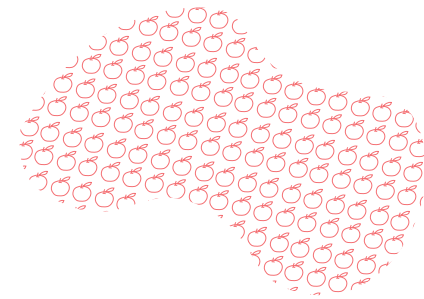
The Indefinitely Sustainable Loop of City, Agriculture, and Water

fig.17





*grain*



*fruit*



Aerial Photo of Shanghai Downtown

fig.18

Where is the Green / When looking at the aerial view photo of Shanghai see fig.18, we see the splendid EXPO site and the dense Pudong commercial center. For a tourist, it is a shocking city. But after knowing what it used to be, we have to ask a bitter question: where is the green and those creeks. Nowadays, the whole city is overlaid by the concretes. The original water town disappeared. We have to say the current identity of Shanghai is 'Generic', like other metropolitans. The good-old thing is lost. As a local, I am eager to know why. In this chapter, we will see through the history to know how green turned into grey. / **Methodology: Study Period and Three Contrasts** / After the first Opium War, Shanghai was assigned as the port for foreign trade. The establishment of the first concession triggered its urban development. It was seemed as the start of Shanghai modern history. Thus, our studies will range from the middle of 19th century till now. Then, the developments of three elements will be analyzed in detail: the human settlements, the agricultural systems and natural ecologies, 二百年变迁 / 航拍图显示上海市中心城区建设已经基本饱和，原本繁荣的农业早已寻不到踪影。在这一章节中，我们将从农业，城市，水系这三元素之间的关系变化入手，展示他们各自在这两百年的发展轨迹。其中包括三组历史发展过程的比较：城市与农业，农业与水系以及水系与城市。通过三组比较，将展示三个曾经形成良性循环的关联元素如何在城市大发展的过程中瓦解。研究的时间跨度将从一八四零至二零一零年。上海这个曾经的渔村，自从十九世纪初被英国殖民者入侵之后，便踏入城市化发展阶段。

especially water environments. As we know, they shaped the endless loop and the original identities of Shanghai. We could understand how Shanghai lost its original identities by following their changes. While, since they are interrelated, it will be better to study their interactions through the history than only individuals. Thus, we will present three pair comparisons to better understand the procedure. They are the contrasts between city and agriculture, between agriculture and water and between water and city. 这近二百年间演绎了这个渔村从“绿”到“灰”的篇章。为涵盖上海最中心和历史最悠久的城区，我们将研究对象区域限制在如今的上海市区，即北至虹口区，原公共租界北界，东至浦东世纪公园，南至世博园区，西至闵行区，原法租界的西边界。



Photo of Typical Paddy Field of Shanghai in 1840s

fig.19

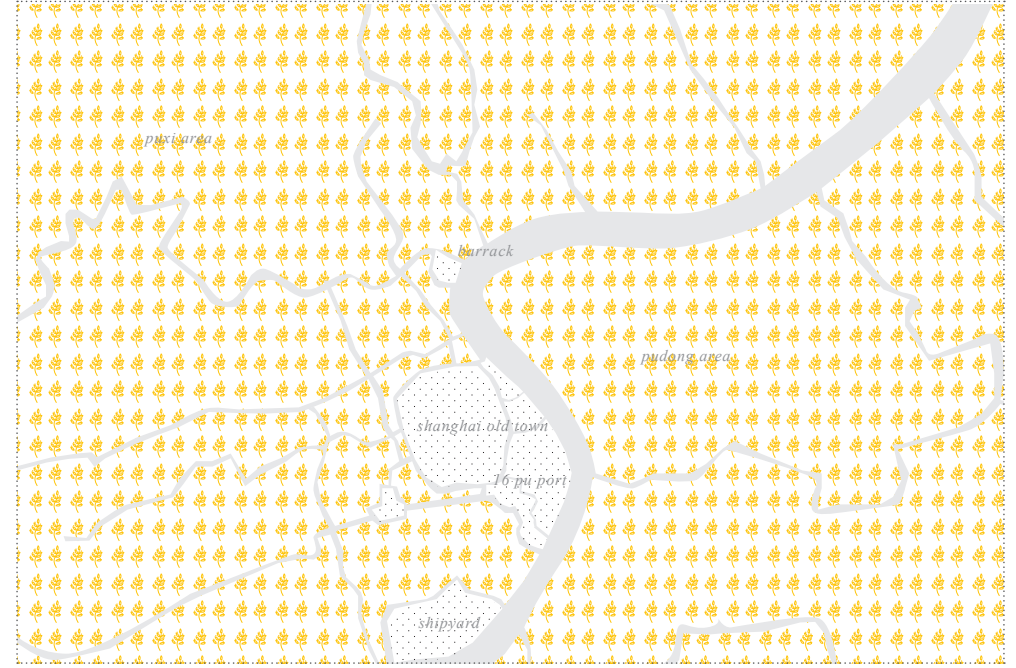
The First Comparison: The Human Settlements vs The Agricultural Systems / The History from 1840s to 2010 / In 1840s, the Great Britain and its East Indian Company used the war to open five ports in order to sell the opium to China. Shanghai was one of the destination for those drugs. While, the invaders brought up the urbanization of this small village. / 1840s: the City / The fig.21 shows the contrast between city and agriculture in 1840s in the downtown Shanghai area see ref.10. Here we could see the ancient Chinese town of Shanghai situated in the riverside of Huangpu River. As a trade city for foreign companies, Shanghai started to establish many ports along Huangpu River. One of the earliest and most famous ports, 16 Pu Port came into existence in the east of the old town. People from all around China attracted by the business opportunities started to immigrate to Shanghai and settled there. This tendency led the first population bloom of the metropolitan and pushed the city towards an international trade center and commercial center.



Photo of Typical Paddy Field of Shanghai in 1880s

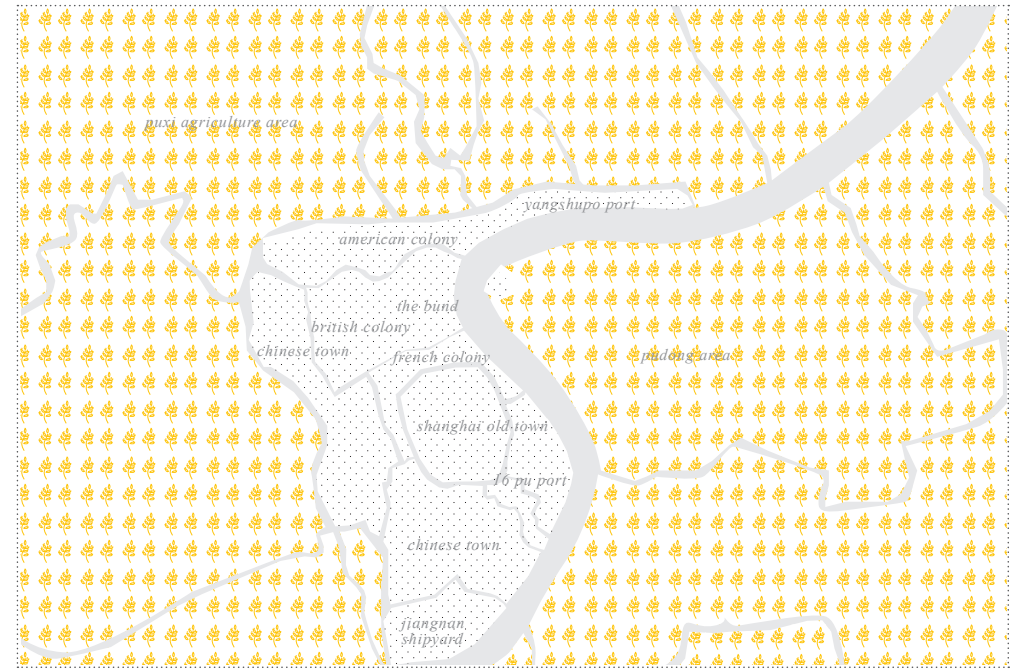
fig.20

1840s: the Agriculture / With the amply water, interlinked network, tidal irrigation techniques and usage of manure, Shanghainese developed large tracts of farmlands. The fig.19 shows the typical paddy field around Shanghai town. The farmer directed the fresh water into the creeks by the lifting machine (the wood equipment in the picture) to irrigate the fields. At that time, agriculture dominated the whole landscape. / 1880s: the City / Protected by four rivers, the land between Yangjin river and Suzhou river was chosen as the British Settlement, which later became the famous Bund. The concessions provided safe shelters for the refugees and the business men during the war periods see ref.11. The development of the Bund port and highly modernized city environment of the foreign concessions further stimulated the urban development of Shanghai see ref.12. It was followed by the French settlement in the north of the old city and the American settlement in the north of Suzhou River see fig.22. / 1930s: the City / In order to build more factories, ports and residences, foreigners grabbed more lands to expand concessions see fig.23. The British concession together with American and Japanese became the international concessions, 城市与农业，一八四零年至二零一零年 / 城市在扩张的过程中不断吞噬农业用地，在两百年历史中，农田逐渐被钢筋混凝土所取代。在这几页里，以每四十年为一个分析的节点，我们将呈现这一过程。此外我们能够发现，城市对于自然的压迫是水系，农业和城市三者循环断裂的开始。



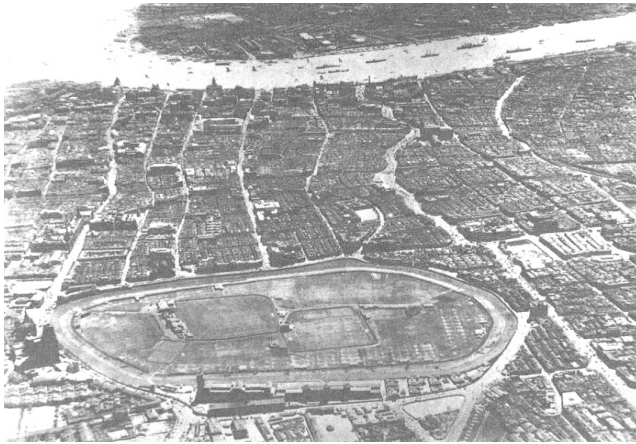
Map of Shanghai Downtown. Comparison of City and Agriculture in 1840s

fig.21



Map of Shanghai Downtown. Comparison of City and Agriculture in 1880s

fig.22



Aerial Photo of Shanghai British Concession and the Bund in 1930s

fig.23



Photo of Crowds in 1960s

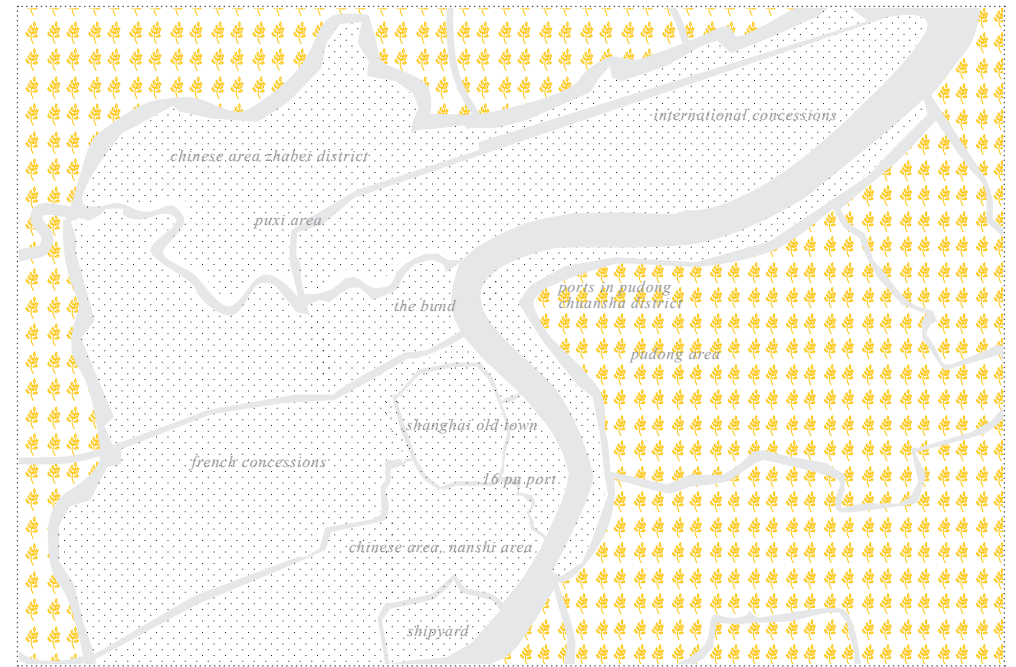
fig.24



Aerial Photo of Pudong Lujiazui International Commercial Center

fig.25

which occupied most lands in the north of Shanghai. The French expanded to the west of Shanghai as for housing and cultural facilities of their own interests. The sprawl of the city was the results of the enlargement of the concessions *see fig.26 and ref.13*. **1930s: the Agriculture** / Besides the urban development, the new rail ways and roads made the local food supply unimportant. Shanghai could import food from much farther places than ever before. The farmlands near the center area became meaningless. / **1960s: the City** / In that era, Shanghai was seen as the factories for the whole China. Thus, more factories were established. The former water town became a generic industrial city. With the population bloom and labor immigration *see fig.24*, Shanghai expanded and occupied several districts from surround provinces. In order to meet the need of accomodations, the previous foreign concessions were transformed mostly into workers community houses. They became the famous living blocks 'Lilong'. While, thanks to inability to cross Huangpu River economically and efficiently, the urban development remained in the west bank. The east bank remained rural *see fig.27 and ref.14*. / **1960s: the agriculture** / In order to feed the huge population, the central minister assigned a lot of farmlands from other provinces to Shanghai. This formed the current territory of the metropolitan *see ref.15*. / **2010: The city** / The biggest step of Shanghai urban sprawl in the previous decades was



Map of Shanghai Downtown.Comparison of City and Agriculture in 1930s

fig.26



Map of Shanghai Downtown.Comparison of City and Agriculture in 1960s

fig.27

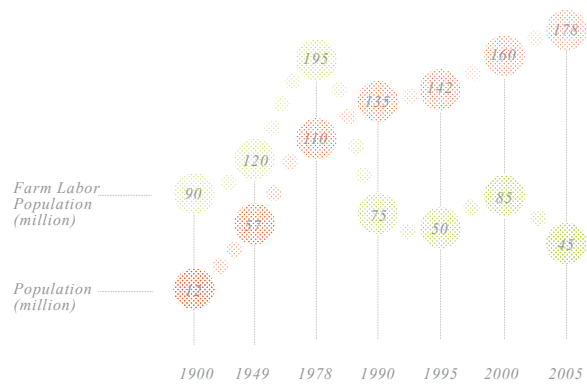


Chart 1: Population VSs Farm Labor Population

fig.28

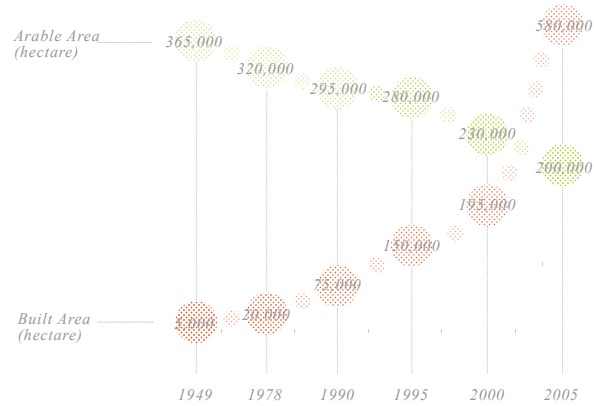


Chart 2: Shanghai Construction Area VS Arable Area

fig.29

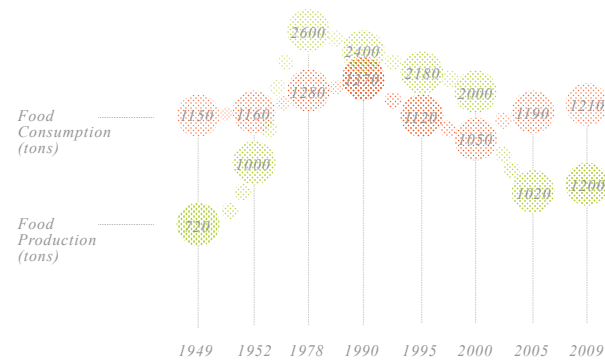


Chart 3: Shanghai Food Consumption VS Food Production

fig.30

the development of Pudong see fig.25. Since the beginning of its development in 1990, Pudong has become an international commercial hub. Currently, the urbanization is over 85%, which will keep rising see ref.16. / 2010: **The agriculture** / The rapid urban development occupied more and more lands from the previous rural areas. Nowadays, the only big tracts of farmlands of Shanghai remained are in Chongming island and Jinshan district. However, these two districts are under new urban developments which will surely shrink. From fig.31 we know, nowadays green has already left the downtown area. / **Conclusion: Three Charts to Show the Comparisons Between City and Agriculture** / Chart 1: Population vs Farm Labor Population / In the past 100 years, the population of Shanghai boosted from 1 million to 200 million. However, the farmer labor population decreased a lot see fig.28. The former is because of the rapid urban development during the past centuries. Especially after the revolution and the establishment of PRC China, Shanghai took a lot of lands from its neighbor provinces as well as their habitants. This added a big number of population to the original locals.

城市与农业的历史数据 / 在浏览了二百年历史后，我们将两者的变迁浓缩至三张数据图表。第一张展现的是百年来上海总人口与农业人口的变化。第二张显示的是建设用地与农业用地的变化。第三张则是粮食消耗与粮食产量的变化。数据图为我们清晰地展现了城市对于农业的压迫。快速的城市化在与农业的斗争中全面胜利。



Map of Shanghai Downtown. Comparison of City and Agriculture in 2000s

fig.31

Also, the unlimited population policy sharply increased the habitants of Shanghai. It was ordinary for a mother to have more than 4 children around the 1950s. After 1980s, China took on economic revolution policy and the one-child policy. Thus, the yearly increase of population was lowered and became stable. However, because of the labor immigration and big base number, the population of Shanghai has been keeping increasing. It is estimated that in 2020 the population will rise up to 25 million see ref.17. However, as for the population in farm, because of the rapid urbanization after 1980s, more and more farmers gave up their lands and jumped into the city and became the new citizens. The peak in 1950s was because of the new population from the newly taken territories and most of their habitants were farmers see ref.18. / **Chart 2: Construction area vs Arable area** / Before 1980s, the construction area of Shanghai increased at a slow ratio. However, after the economic revolution, Shanghai has been rushing to be an international commercial center. The construction sites are everywhere and everyone is zealous in urbanization. Till 2009, over 85% percentages of the land are urbanized. In the other hand, the arable lands were devoured. Even though the government executed several laws to slow down its shrinkage, such as cultivating more arable lands and rearranging the wasted lands, the arable lands of Shanghai has decreased to around 200,000 hectares in 2009 see fig.29 and ref.19. / **Chart 3: Food Consumption vs Food Production** / Here the food indicates the rice, which is the basal food of Shanghaiese. After the establishment of PRC China, though the population increased but the consumption of rice kept stable. This was because of the change of the diets. Nowadays more and more people take meat, eggs or fruits instead of rice as the main food. This reduces the need for rice. In the other hand, with shrinkage of paddy fields, the production of the rice has been decreased continuously from the 1950s. Also, the rearrangement of the agricultural industry around 1990s focused much more attention on the vegetables and meat production than on the rice. The peak in the 1949 was because many lands from other provinces with paddy fields became new part of Shanghai see fig.30 and ref.20. / **Conclusion: The Triumph of City and the Retreat of Agriculture** / Now we understand the interactions and interrelations between city and agriculture. In a word, city captured the arable lands of agriculture.



Photo of Shanghai Ancient Scenery

fig.32

The Second Comparison: The Agricultural Systems vs The Water Ecologies / The History from 1840s to 2010 / The environmental situation is crucial to agriculture development, especially the water resource. Here we will present their interactions through the history. / 1840s: the Agriculture / At that time, the city, agriculture and water stayed in harmony. The fig.32 shows a typical scenery of Shanghai water town. The landscape consisted of agriculture fields, creeks and water towns. Creeks linked the towns and agriculture fields. Habitants used boats to carry on their normal lives. Some people even lived on the boats, called the boat-citizens. 农业与水系，一八四零年至二零一零年 / 在后几页中，我们将展现农业发展与水系变迁的关系，上海是如何从一个充满农田与水道的水乡变成一个混凝土城市。我们仍然以四十年作为一个节点进行分析。原本在上海地图中共生共息的绿色农田和蓝色水道，在两百年发展过程中令人遗憾地渐渐逝去。城市的扩张过程中，上海市中心区的农业和水系一同消失了。这两个互相牵绊的自然元素的弱化成全了另一元素，城市的大扩张。

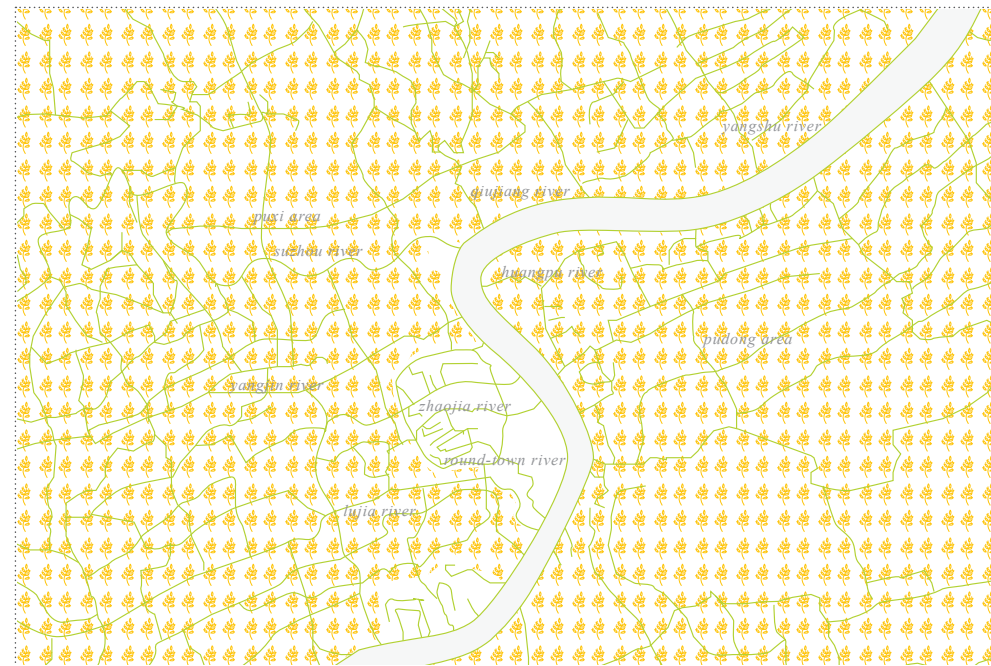


Photo of British Concession

fig.33

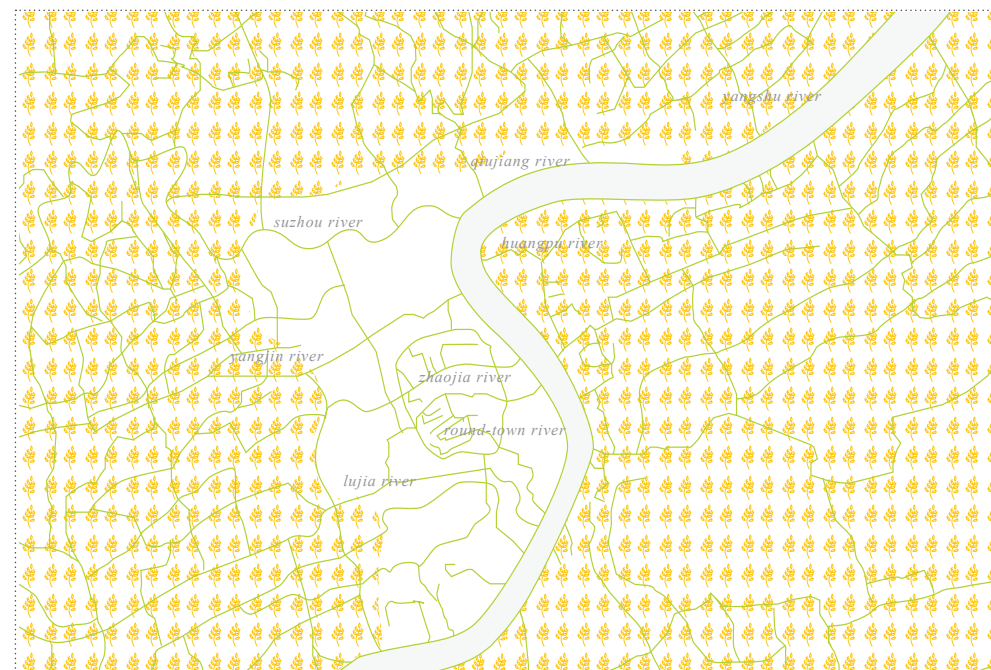
1840s: the Water / These creeks were like small veins covered the whole region of Shanghai. While Huangpu River was the artery that dominated the area. They together formed the water system of ancient Shanghai see fig.34. The convenient and efficient water network granted by the nature provided Shanghai's essential elements to survive. Also, the usage of manure added up the balance between human being and the agriculture. / 1880s: the Agriculture / With the establishment of foreign concessions, more and more farmlands in the central area were occupied by new settlers with their new modern cities. The better paid jobs in the factories, the vision of the healthy, neat and efficient roads and the novel transportation systems such as bikes and cars started to convince Chinese people to give up the old agricultural systems. The traditional agricultural society commenced to collapse. / 1880s: the Water / The retreats of farmlands and the triumph of city development made the creeks in the center less important. While, the destructions of the old rivers at first were strongly against by the natives. Thus, as shown in fig.33 foreigners dealt with the old rivers in their concession by

一八四零年的农业与水系 / 当时农业与水系息息相关，虽然上海殖民地性质已经建立，但是传统的农业经济仍然非常强势。 / 一八八零年的农业与水系 / 此时，殖民地慢慢扩张，市中心发展已开始吞噬部分农田，也令其区域内的水系失去了存在的必要性。臭河浜也随着工业发展渐渐出现。



Map of Shanghai Downtown. Comparison of Agriculture and Water in 1840s

fig.34



Map of Shanghai Downtown. Comparison of Agriculture and Water in 1880s

fig.35

building a side road along the rivers or cover half of the rivers. Fortunately, the original city water network remained healthy since most of the creeks in the central areas such as British, French and American settlements remained intact *see fig.35*. / 1930s: the Agriculture / In the beginning of 20th century, Shanghai became a famous international commercial center in the far east Asia. The urbanization, especially the expanding of the foreign concessions occupied most of the land in the central area *see fig.39*.

Around the center only few people still worked on the agricultural fields. The central region was totally urbanized. / 1930s: the Water / The water network in the center was almost gone. Several reasons could cause this result. The first was loss of the agricultural lands. For farmers water was vital but for city habitants it was just landscape, sometimes even barriers. The real estate development and new infrastructure drove creeks away. Furthermore, the continuous blockages of the creeks created a lot of dead ends. The industrial pollutions and human wastes caused these dead creeks, which lost their self-purification ability, unbearable dirty and smelly.

Thus, not only the developers and foreigners, but also the native citizens pushed the governors to drain out the water *see fig.36*.

一九三零年的农业与水系 / 二十世纪初的上海已经有了国际化大都市的雏形，随着公共租界和法租界的扩张，农业首先被驱赶出，其次，水系渐渐被政府填埋。至此，除了部分主要河浜以外，大部分的水系和农田在市中心基本消失了。城市建设进入了新的阶段。



Photo of Drained Out Creeks

fig.36



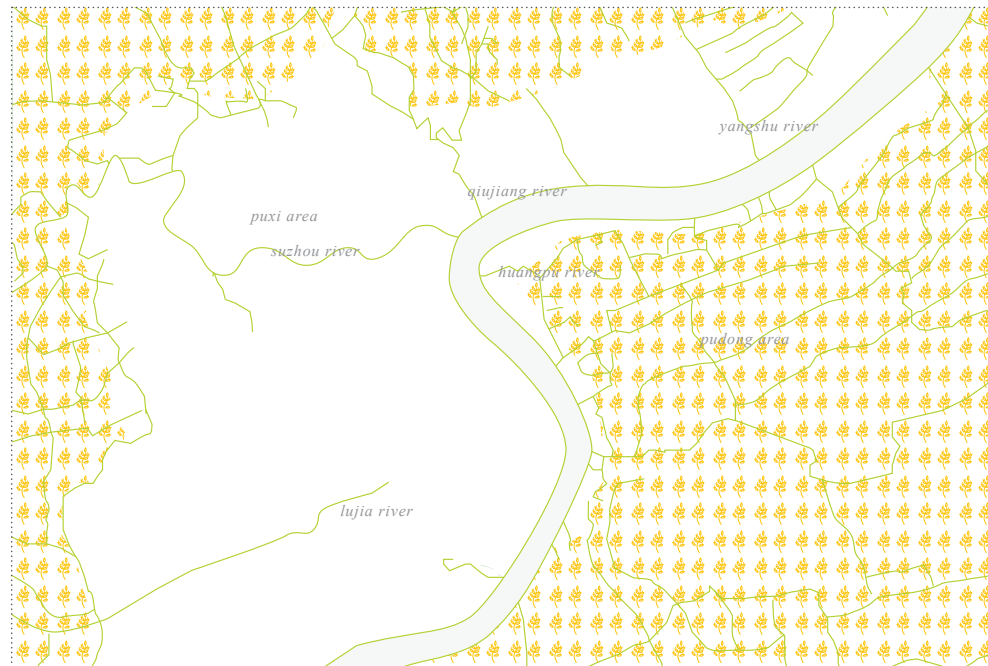
Photo of Polluted Suzhou Creek

fig.37



Photo of The Bund

fig.38



Map of Shanghai Downtown. Comparison of Agriculture and Water in 1930s

fig.39



Map of Shanghai Downtown. Comparison of Agriculture and Water in 1960s.

fig.40

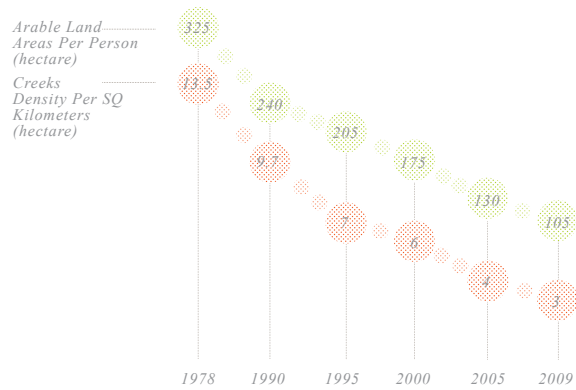


Chart 1: Arable Land Area VS Creek Density

fig.41

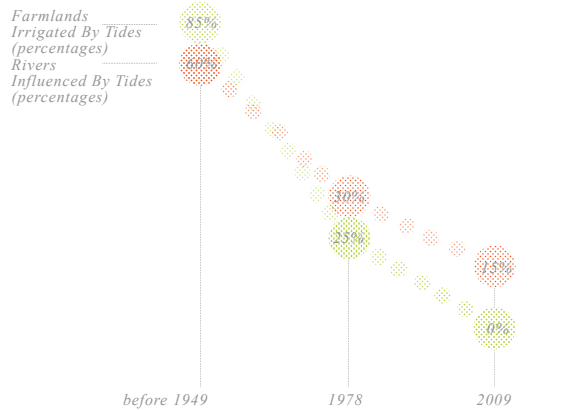


Chart 2: Farmlands Irrigated by The Tides VS The Rivers Influenced by The Tides

fig.42

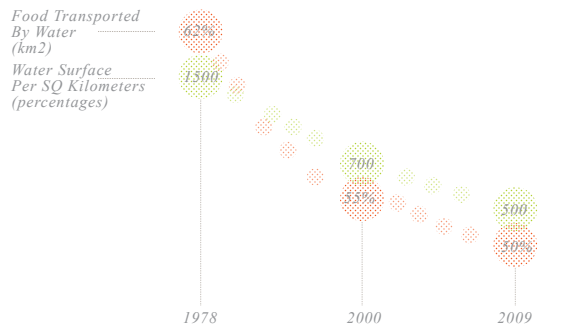


Chart 3: Amounts of Goods Transportated Through The Water VS The Water Surface Area fig.43

/ 1960s: the Agriculture and the Water / Until 1960, most of the creeks in the west bank of center Shanghai disappeared *see fig.40*. The dirty creeks were covered and overlaid by modern roads. In the west bank, only several creeks survived. However, they were heavily polluted by the alongside factories *see fig.37*. However, water network in the east bank of Huangpu River stayed nature thanks to Huangpur River. At that time, the original water town vision and landscape disappeared totally. Ironically, these smelly and dirty rivers became the new label of Shanghai called 'Chou He Bang'. / 2010: the Agriculture and the Water / Nowadays, much more attention is paid to environmental protection and friendly public landscape. The government started a movement to clean the water at the beginning of 1990s 2 billions of euros were used to purge the polluted water and old industrial factories were moved out to the suburban areas *see ref.21*. Nowadays, even though rivers are clean (just visually and aromatically), the demolished water network and the traditional landscape will not come back anymore *see fig.44*. The original natural power, the tides, have become one of the disasters for the Shanghai citizens. In order to prevent the tides, people built super high dams all around the sea coasts and the river side, which further seperated the public and the water *see fig.38*. / Conclusion: Three Charts Show the Comparisons between Agriculture and Water / Chart 1: Arable Land



Map of Shanghai Downtown. Comparison of Agriculture and Water in 2010s

fig.44

Areas vs Creeks Density / In the past 100 years, the arable land areas per person of Shanghai decreased rapidly to 0.0174 hectare per person in 2005. It is far lower than the alarm number of 0.053 given by FAO *see ref.22*. Meanwhile, the density of water of Shanghai decreased rapidly. The urban development destroyed the farmlands as well as their twins, the creeks, which together shaped the original landscape and the identity *see fig.41 and ref.23*. / Chart 2: Farmlands Irrigated by the Tides vs the Rivers Influenced by the Tides / With the less importance of the water, the tidal power has been ignored. Nowadays, no fileds are irrigated by the tidal water. Actually, the tides have become the devils which will bring the floods. For the farmers floods brought the fresh water but for the citizens floods brought great loss. So Shanghai built an intact dam system to defend the tides *see fig.42 and ref.24* / Chart 3: Amounts of Goods Transportated through the Water vs the Water Surface Area / The *fig.43* shows that water has been playing less

一九六零年的农业与水系 / 上个世纪六十年代的上海，工业成为城市的发展重心，农田持续减少，被城市开发，伴随着水系也失去了农业灌溉的作用，在城市化过程中渐渐被掩埋。 / 二零一零年的农业与水系 / 如今，除了苏州河和黄浦江以外，市中心的水网几乎消失殆尽。上海的自然农业秉性已经完全消失。 / 农业与水系的历史数据 / 同样的，农业和水系的相互关系也可以用三张数据图来展现。第一张展现的是耕地面积与水网密度的变化，两者一同在城市大发展的过程中渐渐消失。第二张显示的是农田潮汐灌溉率和河流受潮汐影响率的变化。随着科技的发展，上海所有的郊区农业都由机械灌溉取代潮汐灌溉。

and less importance in the economical factor, especially its transportation function. The loss of the water surface area added to severity of the result *see ref.25*. / The Retreats of the Twins / Water and agriculture could be seen as twins. They rise and fall together in the history. It is amazing to see a water town developing into a metropolitan in one century. However, it is sad to find a beautiful landscape lose its original merits in just one century.

另一方面，随着防汛的建设，几乎所有的河流两岸都建起防汛墙，潮汐已无法进入内城区。第三张显示了货物水运比率和水域面积，随着水网弱化和城市交通发展，上海市区内水运已退出交通网。农业与水系在城市发展的过程渐渐被取代，淘汰，这也预示着原先自然循环的破裂与消失。





Photo of Shanghai British Concession

fig.45

**The Third Comparison: The Agricultural Systems vs The Water Ecologies / The History from 1840s to 2010 /** The urbanization not only devoured the farmlands but also demolished the natural water network. Here we will present the process of the growth of city road system and the decays of old water network through the history. / **1840s: the City /** At that time, the original water network and the traditional water transportation dominated the whole region. There was no need for road transportation. For local people, roads were of low importance since it could not carry away

水系与城市，一八四零年至二零一零年 / 在城市的发展中，水网已经成为了障碍而非原先的城市特性。从早期租界扩张到之后的人口膨胀，水网都扮演着阻碍城市文明的臭河浜和挡路塘的角色。同时，农业的消失也加速了水网的消亡。起初住民并不支持政府填埋水网，但是随着农田的消失以及现代的城市给排水的出现，对于居民来说，河浜已经失去了其原有功能。另一方面，工业污染的排放让城内水网成为传播污染和疾病的载体。上海市区已经不再需要水网，于是水系随着农田远离城市区，城市化发展最终霸占所有土地。

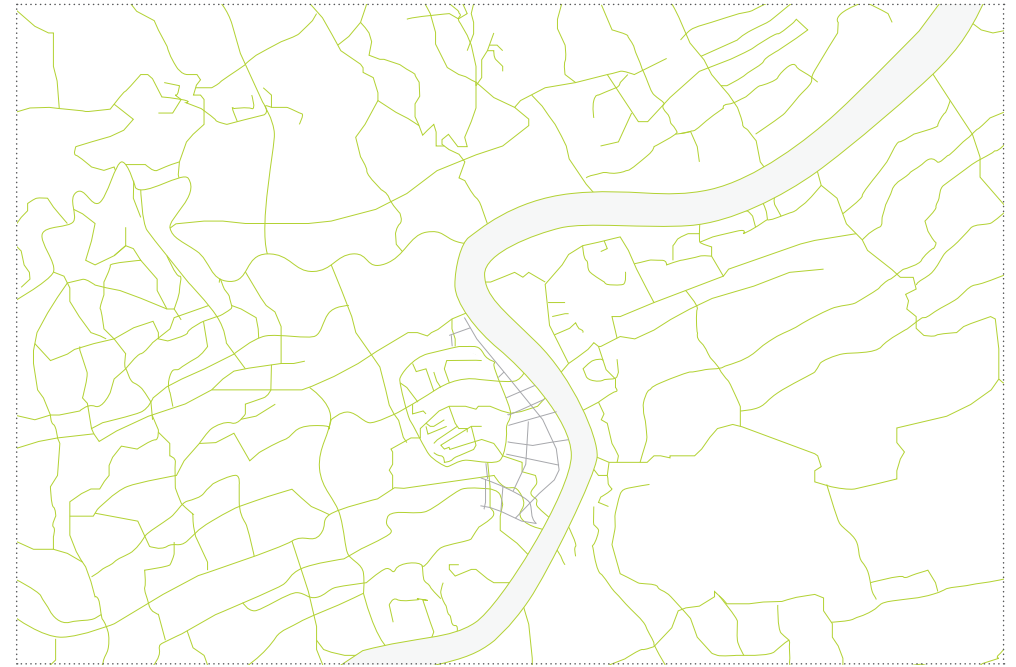


Photo of Shanghai British Concession

fig.46

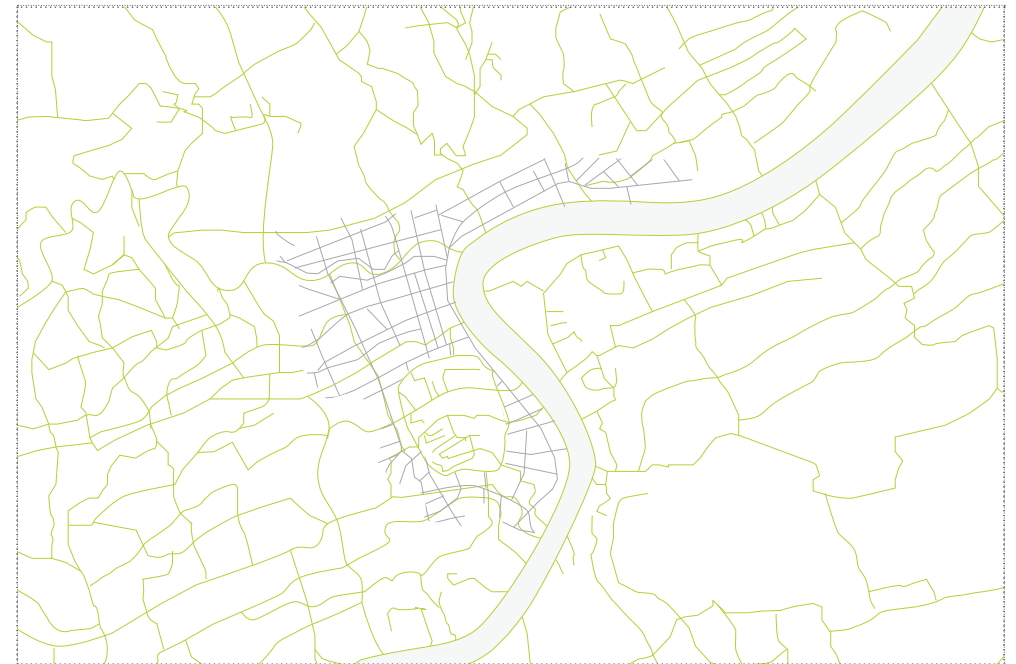
the wastes as what rivers did. Also, the road transportation costed much more than ships did. However, the city expanded a little bit because of the earliest port development. The most important and famous was the flourishing of 16 pu port, which mainly served as the market streets of fishes, vegetables, fruits and livestock *see fig.47.* / **1840s: the Water /** The 1840s were the ages of water. The city roads and urban development had not been triggered yet. The locals paid little attention to the modern roads, though several roads were built in concessions *see fig.45.* Via the natural water network, food and goods could be carried to Shanghai conveniently from other parts of east China via rivers, then exported to north of China via sea. For the inner provinces, people transported the food down the Yangze River and for those surround Shanghai, they used inland water network. / **1880s: the Water /** The foreigners triggered the urbanization and the establishment of the modern city. At first, the water was the merit of Shanghai, which attracted the attention of foreign invaders. However, with further urban development, water was considered as the obstacle. The new idea of modern city consisted of roads and cars but water. Thus, pushed by the real estate companies and foreign colonists, the governors started to

一八四零年的水系与城市 / 最初，上海的城市繁荣正是依靠于其四通八达的水网。在其被开埠为通商口岸后的数十载，大部分的住民仍坚持使用水路通勤。新式公路只存在于早期的租界内，并不普遍。



Map of Shanghai Downtown. Comparison of Water and City in 1840s

fig.47



Map of Shanghai Downtown. Comparison of Water and City in 1880s

fig.48

cover the water with no consideration to the original identity of Shanghai, even inside the old town *see fig.48.* / 1880s: the City / At first, the British planned the roads and blocks for their settlement in the south bank of Suzhou Creek, which is now the Bund. They buried the original creeks and rivers then created modern roads and the sewage systems *see fig.46.* The importation of the idea of the public health and urban environment attracted more and more citizens to follow their methods and aliens to move in, especially to the concessions. This also provided a new way of transportation other than the original water networks. Thus, the demolishment of the water system started. / 1930s: the City / At the beginning of 20th century, the urban area rapidly dominated the central area of Shanghai *see fig.49.* Inspired by the western industrialization, Shanghai imported almost all the elements from the west, the factories, the railways, the new roads, the row houses etc. Among them, the railways and modern roads influenced the original water system most. They absolutely shifted scene of the transportation in Shanghai because they were faster, safer, cheaper and moderner than water transportation especially for the inner land transportation. The current road and rail system was established at that era.

一八八零年的水系与城市 / 随着城市发展，许多农民转而从事城市行业，人们逐渐接受新式公路，水网在城市中的作用被取代。同时城市的扩张需要填埋挡在途中的河滨，失去农业与运输作用的河道自然也得不到原住民的保护。河滨由此便开始逐渐消失。



Photo of Shanghai British Concession

fig.49



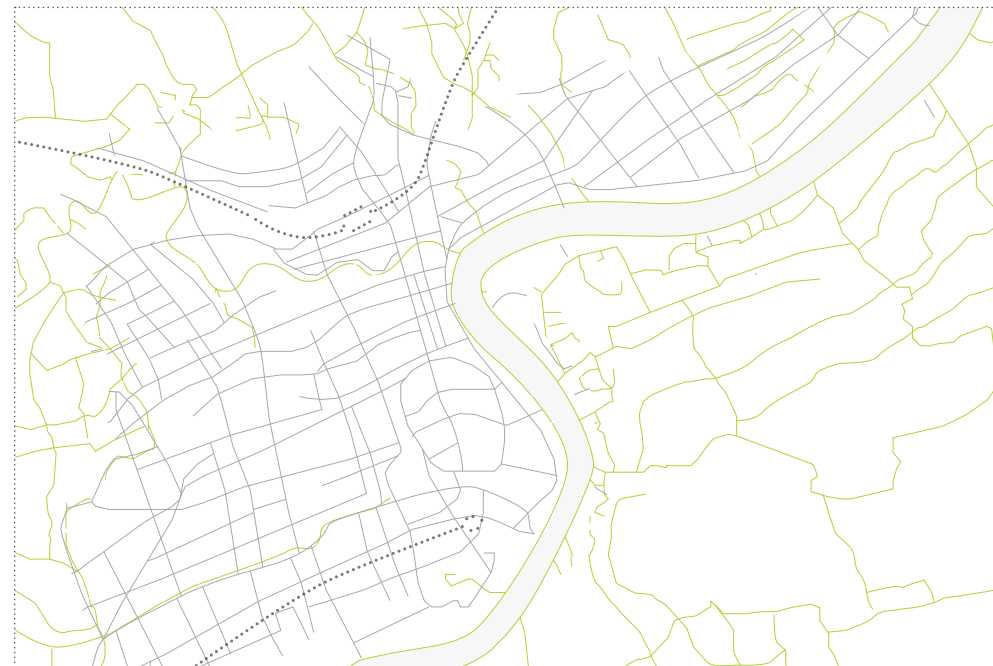
Photo of Shanghai Moderns Roads Around 1960s

fig.50



Photo of Shanghai Contemporary Transportation System

fig.51



Map of Shanghai Downtown. Comparison of Water and City in 1930s

fig.52



Map of Shanghai Downtown. Comparison of Water and City in 1960s

fig.53

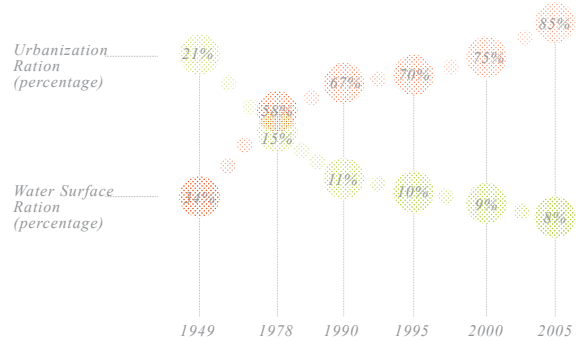


Chart 1: Urbanization Ration VS Water Surface Ration

fig.54

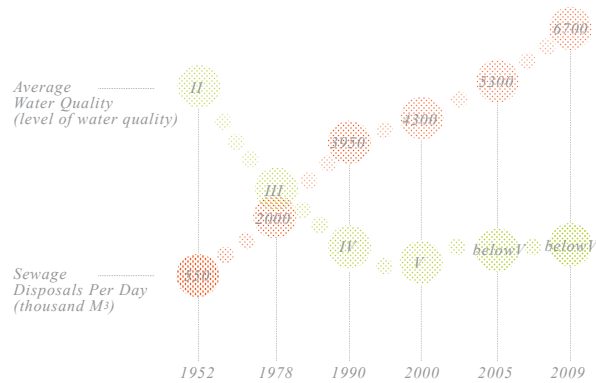


Chart 2: Length of Roads VS That of Creeks

fig.55

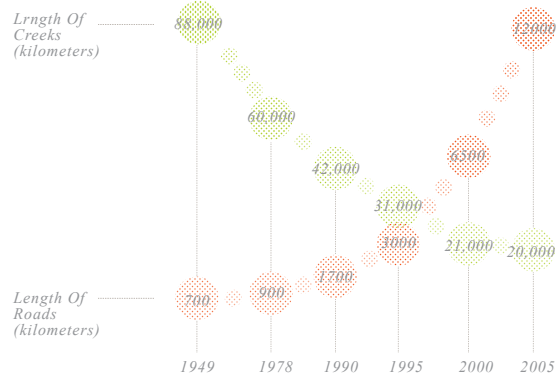


Chart 3: Sewage Disposal VS Water Quality

fig.56

There seems no reason for a modern Shanghai to keep the natural water network. Many new things substituted its functions totally. Water was out of date. Furthermore, the removals paralleled the disappearance of the natural, cultural and architectural heritage of Shanghai. / 1930s: the Water / As an international commercial hub in the far east Asia, economic and urban development were most important. After decades of expanding, by the 1930s, almost no creeks and rivers remained in the central area of Shanghai see fig.52. / 1960s: the City and the Water / After the Liberation War, Chinese Communist Party retrieved the foreign concessions as well as their industries. Then, Shanghai changed its duty. It became the industrial centers providing for the whole country. While, the heavy pollution emitted from those factories further polluted the water environment. The dirty water was disliked by the new generation born in the city. At the same time, more and more rivers were replaced by the road networks in the process of urbanization. In that era, the current road system came to mature see fig.53. People continuously destroyed the remaining creeks and rivers without any consideration of original identities. This added up to the total disappearance of the water system in Shanghai. The fig.50 shows the typical urban road in the city center. The city became neat and organized. However, this could not conceal the bad deeds we did to our precious environment, especially the water ecology.



Map of Shanghai Downtown. Comparison of Water and City in 2010s

fig.57

2010s: the City and the Water / Nowadays, Shanghai has a complex transportation system of three layers, the viaducts for cars and trams, the roads and the metros see fig.51. Currently, 'the Shanghai Metro rapid-transit system and elevated light rail has eleven lines at present and extends to every core urban district as well as neighbouring suburban districts, which is the 9th busiest system worldwide and the largest in the world by length (420 km).' see ref.26. It is clear that no water network

could be found in the center. It disappeared thoroughly see fig.57. / Conclusion: Three Charts Shows the Comparisons between City and Water / Chart 1: Urbanization Ration vs Water Surface Ration / The urbanization ration increased rapidly in the past 50 years. Nowadays it reaches around 85%. However, the increase of the concrete decreased the amount of the water surface area. Now, the water surface area is below 10% see fig.54. / Chart 2: Length of Roads vs that of Creeks / With the urbanization, more and more roads were built. Nowadays, Shanghai habits over 12000 kilometers roads. In the same time, the length of the creeks in Shanghai decreased and finally changed the identity of Shanghai see fig.55. / Chart 3: Sewage Disposal vs Water Quality / With the industrialization and urbanization, the disposals of the city increased radically. The discards caused severe pollution problems in Shanghai. The water quality of Shanghai decreased and now it keeps a level of Five, which is only suitable for agriculture irrigation and industrial produce see fig.56.

一九三零年的水系与城市 / 当时的上海，既拥有全国最先进的公路，还有最发达的铁路网。陆上运输取代了水网的作用。同时，城市的发展早已开始将大量被污染变臭的河浜填满。在市中心区，大多数的河道都已不复存在。 / 一九六零年与现在 / 解放后，

人口的爆炸促使更大规模的城市扩张。至今，在市中心水网系统中只能寻到苏州河和黄浦江的踪迹。 / 水系与城市的历史数据 / 第一张图表展现城市化率与水密度的变化，第二张图表表示道路长度与河道长度的对比，第三张则代表排污量与水质的对比。从这些数据中我们能够直观地感受到水网在城市发展过程中被压制被排挤的过程。当其失去了经济和社会的作用后，人们便毫无顾忌地从城市中大肆删除她们。原本作为上海水乡重要特性的水道也随着农田淡出人们的记忆。



*poultry*



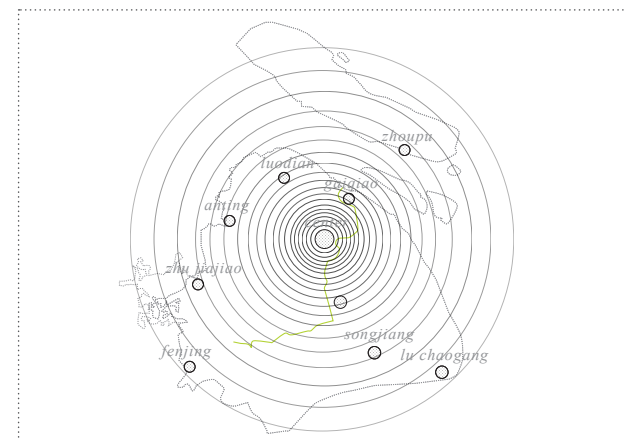
*vegetable*

The Results of Two Centuries' Urban Development / In the previous chapter, we present the interrelations and interactions among three elements, human settlement, agriculture system and water ecology. Each element of the loop is hooked together. Any change could cause dominoes effects. However, during the past centuries, human activities totally changed the loop. In this chapter, we will show detailed information about the current situations of three element. We would like to know the results of our two centuries' activities. / The Situation of Our City / Nowadays, 'Shanghai is the most populous city in China and one of the most populous cities in the world. A global city, Shanghai exerts influence over global commerce, finance, culture, art, fashion, research and entertainment.' *see ref.30*. While, behind those honorable titles there exist many problems. In following pages we will present the problems and the underneath causes of the urban development of Shanghai. / Master Plan of Shanghai / In the past decades, many urban policies were proposed in order to push Shanghai to be an international metropolitan. Of course, most of them were in favor of the urbanization. Here, we will pick one of the typical and recent policy that released by the government. In 2001, in order to accelerate the urbanization

如今的上海 / 二个世纪的飞速发展使上海发生了翻天覆地的变化。在本章中，我们将详细分析城市，农业和水这三个元素在上海的现状。 / 城市的现状 / 上海的城市发展可谓是个奇迹，政府曾颁布许多政策促进城市化。一城九镇规划就是最近其中的一个例子。

ration of Shanghai, the ONE CITY NINE TOWNS planning policy are proposed *see ref.31*. It was written that Shanghai should develop another 9 satellite towns in the suburban area. Those towns are Song Jiang, An Ting, Luo Dian, Zhu Jiajiao, Pu Jiang, Gao Qiao, Zhou Pu, Feng Cheng and Bao Town *see fig.59* Until the end of 2005, the policy had been executed perfectly. Shanghai succeeded

in expanding its urban area to the suburban areas far from the center, which used to be the food production centers. At the 2006, the 11th 5-year Plan continued its precedent's attitude to urban development. However, these policies were just pieces of the whole picture. In a word, the ultimate goal of them is to achieve the total urbanization *see fig.60*. While, the rapid development has caused huge amounts of urban problems.



The Urban Sprawl of Shanghai With 9 New Satellite Towns

fig.59



Photo of Construction Site in Shanghai

fig.60

**The Problems of Urban Development /** The development model Shanghai used in the past decades were very extensive and harsh. It caused problems and misguided other cities of China. Here it is impossible to present every problem. Thus, we will show several issues that relate to agricultural and water system. / **The Low Quality of Urban Spaces and Architecture /** The first problems brought by the fast and extensive urban development is the low quality of the buildings and urban spaces. As for architecture, the most famous and latest example is a resident building that fell down intactly onto the ground. It is said the ignorance of the workers and the developers casued the disaster. It is estimated that the average life span of the buildings in China will be shorter than 25 years *see ref.32*. Besides, the rapid desgin has lowered the aesthetic of the whole city. When looking at those ugly hats of different skyscrapers in the city center you will understand how strange this city is *see ref.33*. Also, because of the ONE CITY NINE TOWNS policy, many villages and towns were built in the remote suburban area. However, the fast and low quality construction and design and the mal-functional policies turn those new towns into ghost villages *see ref.34*. As for infrastructures the conctruction quality is trustable but their spaces are unpleasant. For example, there many unused and wasted spaces under the viaducts *see ref.35*. / **The Social Disorder Caused by High Price of the House /** Another hot issues discussed by the whole society is the unbearable price of houses. If it is converted to Euros or US Dollars, the absolute value is much higher than that of houses in biggest cities in Europe such as Paris, Milan and London. While, compared with the average incomes of Chinese people, the price is an astronomical number. It has already in Shanghai put a huge burden on the normal habitants and caused huge social disorder *see ref.36*. / **The Conflicts Between the Relocation Households and Government /** In order to speed up the urbanization, the government has forced many local residents to move their households to other places. For the farmers, they will lose their lands and become the citizens; For the citizens, they have to buy a new house somewhere else with incredible high prices and leave their old houses destroyed. Because of unsound Chinese laws about the ownership of the lands and properties, those relocation households have no choice but leave. This brought up a lot of nail households who will stick to their homes. However, most would get wounded even killed when they were defending their houses. These conflicts have also raised a lot of revolts in the society *see ref.37*. However, the pressure of the urbanization could not be stopped.

然而，快速的城市化带来了许多问题。首先就是拆迁户与城市执法者的冲突。城市的发展对于建设用地的需求导致了城市化与市民的矛盾，近年来经常为此发生流血事件。其次，快速建设造成了大量的低质量建筑工程以及施工管理，比如震

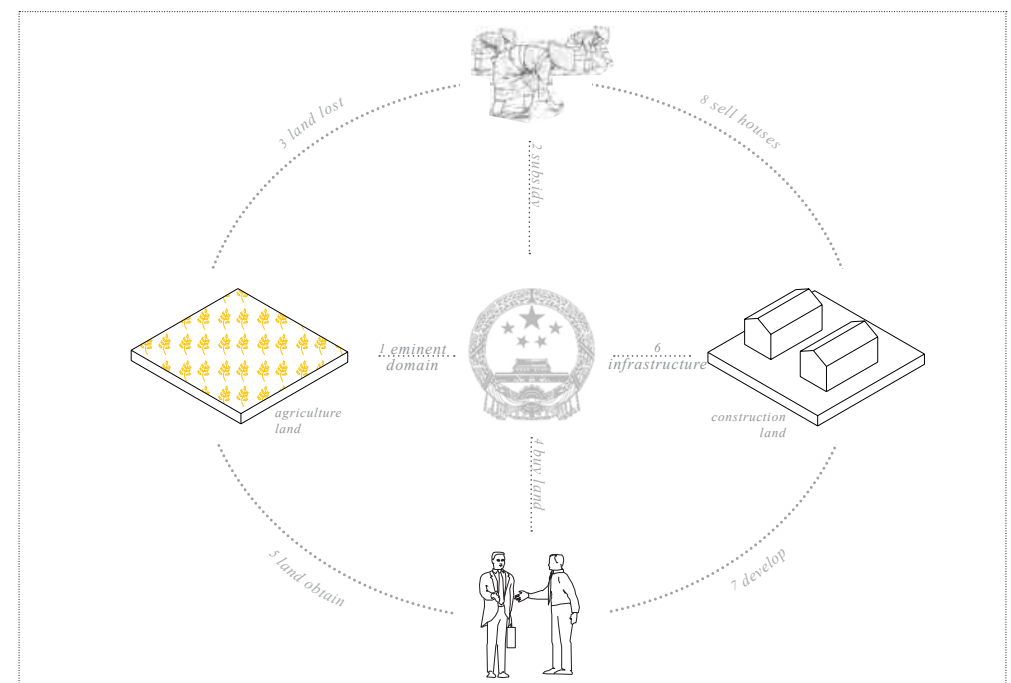
惊全国的莲花河畔楼盘整体倒塌事件。还有上海快速发展，人口压力和热钱进入，炒高了房价。过高的房价让市民不堪忍受，埋下了社会不安定隐患。最后，城市发展过程中市中心历史保护建筑渐渐地消失。如今，

**The Loss of Original Identity /** The last but not least problem that urbanization brought up is the loss of old buildings and old identities. The traditional buildings of Shanghai could be divided into two parts. One is the traditional Chinese wood buildings that has existed for centuries such as the Yu Garden and many old temples *see ref.38*. The other is the houses and buildings built by the foreign colonists in the beginning of 20th century such as Shikumen in Xintiandi *see ref.39*. However, during the past decades, the fast urban development has destroyed most parts of them, especially in the center of Shanghai. Nowadays, the government and the society have realized the importance of these good-old things and start to protect them. It is too late but better than nothing. / **The Driving Forces Behind the Problems /** The above problems are just tips of the iceberg. Here, we will discuss several reasons that might cause these phenomenons. The causes will be discussed from two perspectives, the political & economical factors and social factors. / **Political & Economical Factors /** In China, the political factors always play the most important roles in any kind of activities. In Chinese Constitution, Article 10, ‘For the sake of public interests,

政府已经意识到那些老建筑的重要性，颁布了不少法令来保护，总体而言，城市的大发展带来了诸多社会问题。/ 问题背后的原因 / 如此现状有两方面原因，一是政策与经济发展的驱动，二是社会发展的客观压力。首先，政策法规上对于用地性质

the government could do the Eminent Domain according to the relative laws’ *see ref.40*. Thus, the only way to turn arable land into construction land is eminent domain. However, the law could be either the ultimate weapon to protect the citizens or the passport for the despicable persons. The latter is what has happened in the development of Shanghai. Firstly, in order to build infrastructures and provide lands for the developers, the government takes the land through executive power from the farmers or the relocation households with a low price or subsidy. This is eminent domain. Then the lands will be put into the market and sold at a very high price to the developers. The government gets high profits through this process. In contemporary China, this is the biggest financial income for the local governments. Then, the developers will build the houses. Sometimes in order to lower the costs, the quality could not be ensured. Finally, the developers will sell them at very high prices to the citizens and those farmers. This loop speeds up the urbanization *see fig.61* / **Social Factors /** In the other hand, there are a lot of social pressures pushing the government speed up the urbanization. First, the continuously increasing immigrants have forced the government to build more houses and develop more urban districts and related infrastructures. Currently, the immigrants have occupied over 1/3 of the total population. Second, people want to live in bigger and more comfortable house. The previous generations mostly used to live in a very crowded squattings. According to the municipal statistics, in 1996 the average living areas per person was 8.7 square meters. While in 2007 this number has risen up to more than 16 square meters *see ref.41*. Thirdly, people prefer to have better infrastructures and urban environments. / **Conclusion /** The rapid development caused many problems. What makes it worse is that these results will affect not only people but more on the environments and our food production systems.

改变的定义经常被地方政府和开发商滥用，造成大量国土资源流失。农业用地迅速转变成建设用地。其次，城市的大发展带来了大量的人口。人们首要需求便是住房。这从一方面推动了市政府的大力城市开发建设。同时，对于环境要求的提高也促使政府进行大量的城市基础设施建设。城市的发展是多方面的原因促成，而其带来的问题不仅仅直接影响到人们生活，还影响了我们的农业和水域，间接加重了问题的严重性。整体来看，城市化进程是上海原先自然循环系统破裂的导火线。



The Loop Among The Local Government, Developer, Citizens and Farmers.

fig.61



Photo of Pollution of Huangpu River

fig.62



Photo of Suzhou Creeks Full of Water Hyacinths

fig.63



Photo of Floods of Shanghai

fig.64

The Situation of Our Water / In the past two centuries, the decays of the water system could be observed apparently. In general, the deterioration happened from two aspects, the quantity of the creeks and rivers and the quality of water. As presented in the previous chapter, the amount of the water surface and the total water density have decreased sharply. Here we will present several problems that have relations to the city and the agriculture. / **The Water Pollution** / The polluted even toxic water will not only kill the agriculture but also human being. In Shanghai, especially the city center, the water pollution is the bitter by-products of the past decades' rapid development *see fig.62*. According to the statistics, only 1% of the surface water resources in Shanghai metropolitan could be used directly for drinking. The proportion of the Low-V water occupies 68.6% of the total water resource *see ref.42*. That is the reason why Shanghai is in list of the cities that will have severe water shortage in the future by UN *see ref.43*. Everyday, over 80% of Shanghai citizens have to drink the polluted water though it is processed by the waterworks. In the other hand, the affects of polluted water on agriculture are chronic, implicit and even fatal.

水环境的现状 / 联合国已将上海被列为未来最可能发生水源危机的几大城市之一。实际上，我们并不缺水，缺少的是干净的水源。根据数据统计，上海百分之七十左右的水源常年处于III等到V等劣质之间，能够直接饮用的II等水只占不到百分之一，因此，上海被称之为水质性缺水城市。黄浦江，上海的母亲河，



Map of the Flood Control Walls and Sea Dams

fig.65

In this process, the bioaccumulation will do the jobs. It carries toxic elements from the irrigation water to our mouths via agriculture. Also, the water pollution will reduce the biodiversity and cause the collapse of bio system. In *fig.63* it shows the frequents of Shanghai, the water hyacinth. Even though it could clear the industrial waste water and the polluted water in Huangpu River, it is an invader of the current bio system and should be eliminated. / **The Flood** / Another big problem brought by the water is the flood happens every summer *see fig.64*. Before, the tides provided

Shanghai and their paddy field with the fresh water and now they bring disasters. In summer, high tides together with typhoons push Huangpu River to a high level. Taking the average altitude of Shanghai is around 3.7 meters, if there is no sea dams and flood control walls, the center of Shanghai will be immersed in the East China Sea *see fig.65*. Huge amount of money was invested to build protective infrastructures. The current average height of the dams



Photo of Flood Control Wall Along Suzhou Creek

fig.66

其水质常年处于V等劣质。此外，上海每年在夏季都会遭受台风的袭击，届时防汛系统将会受到台风和高潮联合冲击。历史上记载有上海多次损失惨重的洪涝灾害。为了防止洪灾的再次发生，上海在沿海区域和内河都加建了极高的海塘和防汛墙。在有效防洪的同时也使人们与水完全的隔离开来。任何戏水的活动都被禁止。

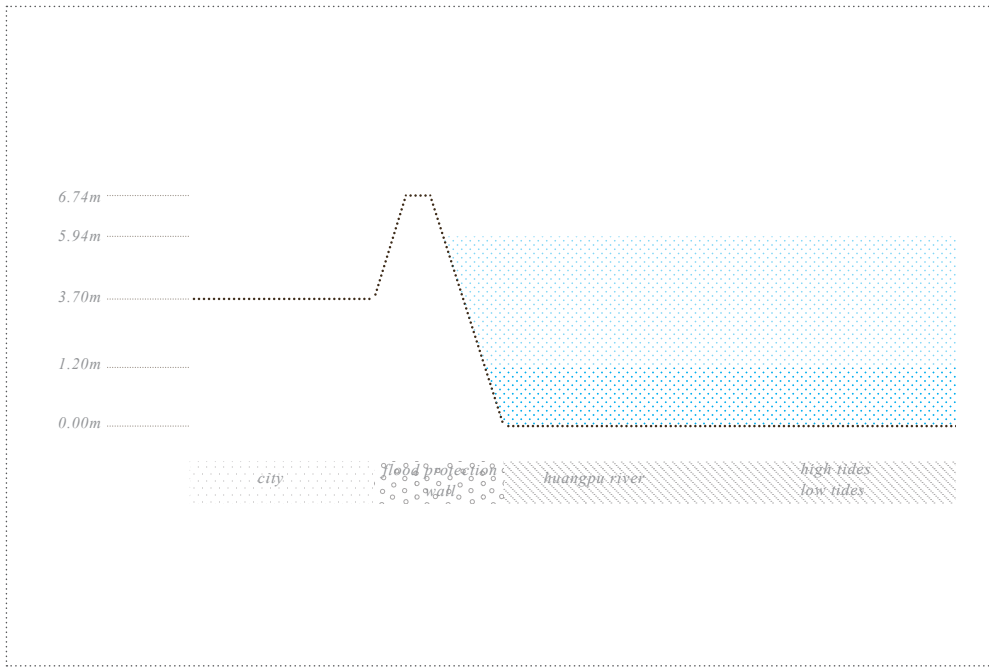


Illustration of The Section of Floor Control Wall

fig.67

and flood control walls are around 7 meters. In *fig.67* it shows the positions of the sea dams and flood control walls *see ref.44*. / **The Walls Between Citizens and Water** / Every coin has two faces. The walls help us to prevent the flood but keep us away from the nature. Nowadays, no one is allowed to swim in the those left rivers. In *fig.66* the photo shows the typical relations between Shanghainese and water. In the other hand, the walls also cut the relations between water and agriculture. Just decades ago, many paddy fields in Shanghai



Photo of Yangshan Deep Water Port

fig.68

suburban area were still irrigated by the tides. With the introduction of filling machines, currently almost no agricultural fields are using the tides *see ref.24*. / **The Driving Forces Behind the Problems** / Those problems are caused by two parts, the political & economical factors and social factors. / **Political & Economical Factors** / Actually, Chinese government started to concern the environmental problems such as water pollution only several years 水环境现状背后的原因 / 首先, 从经济角度上, 随着上海海运航道的外移, 如新建设的洋山深水港, 使上海的内河航运渐渐地失去了地位。因此, 水网在市中心的存在也失去了运输经济价值。其次, 城市的发展不断地推动着人们占有更多的建设土地, 河流很快便成为侵占的对象, 被道路或楼房所替代。

ago. Nowadays, more and more scholars, technicians and governors pay attention to the importance of water. But in the aspect of economical contribution, inner land creeks and rivers will play no important role. Shanghai has moved all the industries out of Huangpu River. There are almost no water goods transportation routes in the center of Shanghai. In *fig.68*, it shows the new Yangshan Deep Water Port in the south of Shanghai metropolitan, which makes Shanghai the biggest port in the world. / **Social Factors** / Since the flood has caused many inconveniences to the residents *see fig.69*, Shanghainese have been in favor of the flood control walls. Also, the famous smelly creeks in Shanghai has influenced the attitudes of our generations a lot *see fig.70*. Water is discriminated. Sometimes before the government started to cover the creeks the citizens would do it by themselves. As a result, Shanghainese has not swimmied in their mother river for decades. / **Conclusion** / The decays of water during the development are due to the irresponsible activities of human being. The final bitterness will come to Shanghainese themselves: The high costs of water purification, the water shortage, the unpleasant riverside spaces and most miserable, unable to swim in mother river *see fig.71*. 从社会角度来看, 城市发展进程中导致河浜的发臭, 已使上海市民对曾经的城中水系毫无留恋。尽管多年的治理, 河浜内生态系统有复苏的迹象, 但人与河的关系早已被隔离。同时, 城市不断对于水域的污染和频发的水体生态问题让人们对于那些旧时河道总是带有一份警戒之心。总之, 城市化过程使我们与母亲河之间的关系已经非常脆弱。



Photo of Flood in Shanghai City Center in 2009

fig.69



Photo of Polluted Water in Suzhou Creek

fig.70



Photo of People Swimming

fig.71



**The Situation of Our Agriculture /**  
The final element we discuss is the most important issue, the current situation of agricultural system of Shanghai. In the past, the fresh water and the human manure together created a permanent agriculture. However, nowadays the situation has totally changed. Firstly, the introduction of chemical fertilizers destroyed the indefinitely sustainable system *see fig.73*. The lands become less productive and more toxic. While the previous precious wastes of

human settlements are poured into the natural system and deteriorate the water. Then, the polluted water carries those toxic elements to our agricultural fields. A vicious circle established. However, the most dangerous thing to Shanghainese is not the safety of their food but the potential shortage because of the lack of enough arable lands for food production. Everyday Shanghai needs

to import huge amount of food from other provinces or abroad to feed its habitants *see fig.72*. In the following pages, we will discuss in detail the current situation of food in Shanghai. Firstly, we will present the locations and amounts of food production. Then food consumption and diets of Shanghainese will be shown. With those statistics, we will know exactly the shortage or surplus of food. At last, we will present the economical, political and social factors behind. / **The Land Use of Shanghai Metropolitan /** In *fig.74*, we presents the current land usage of Shanghai metropolitan. However, since we will discuss the problem of agriculture, only three elements are considered, the arable lands, the built areas and the undeveloped spaces. It is clear that the urban sprawl of Shanghai has extended to the remote suburban area. With the establishment of some satellite towns, this process speeds up and occupies more arable lands. The undeveloped areas are mostly natural protection areas such as Dongtan National Park in the east of Chongming Island. / **The Location of Food Production Centers /** The following pages we show the exact locations of the food production centers and their productions. Currently Shanghai has 7 types of food production.

农业的现状 / 农业的现状主要存在污染严重和供应危机这机两大问题。城市和水体的污染直接导致了食品生产的不安全。同时，城市对于农田的大量侵蚀使得上海长期处于依靠外界补给的状态。在后面研究与叙述中，我们将详细地从食品的产地，产量，消耗等各方面分析上海农业的现状。

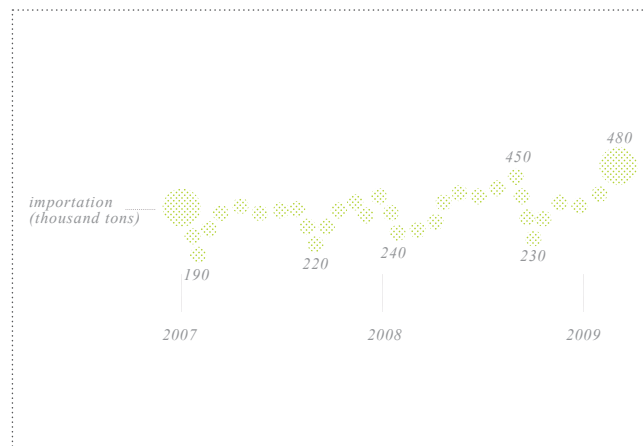


Chart of Shanghai Food Importation

fig.72



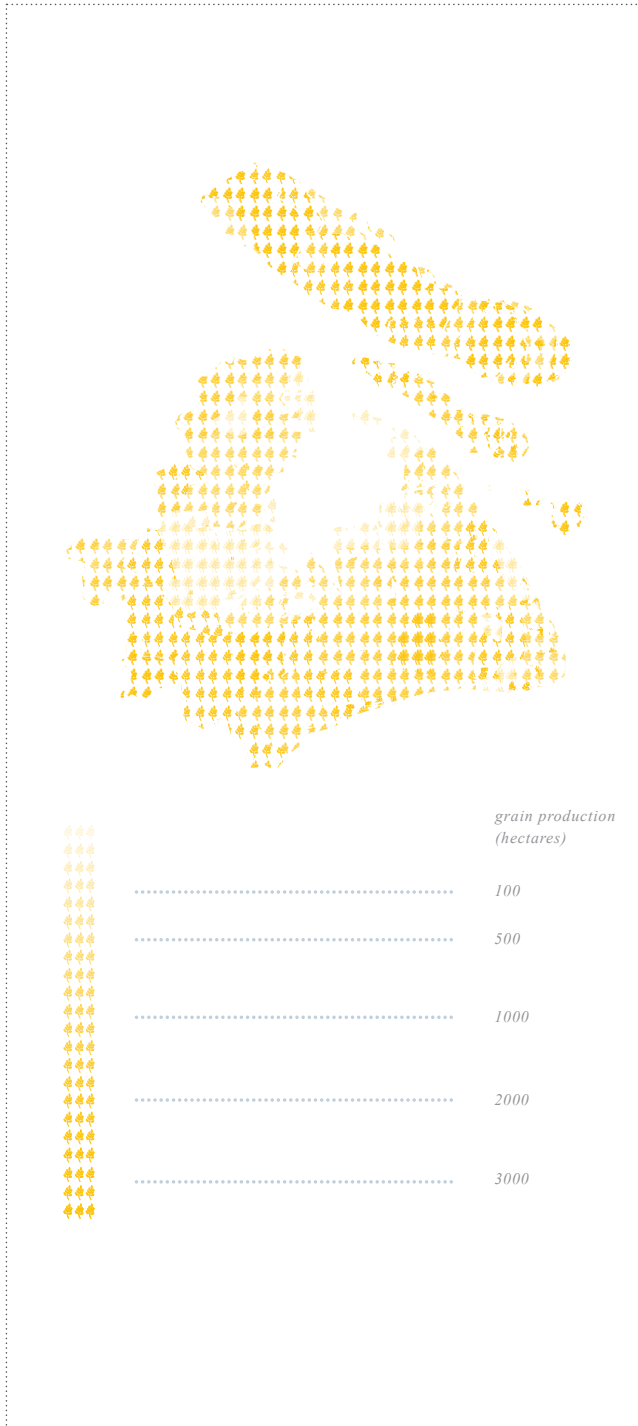
Photo of Chemical Fertilizers

fig.73



The Land Use of Shanghai Metropolitan

fig.74



Map of Locations and Amounts of Grain Production

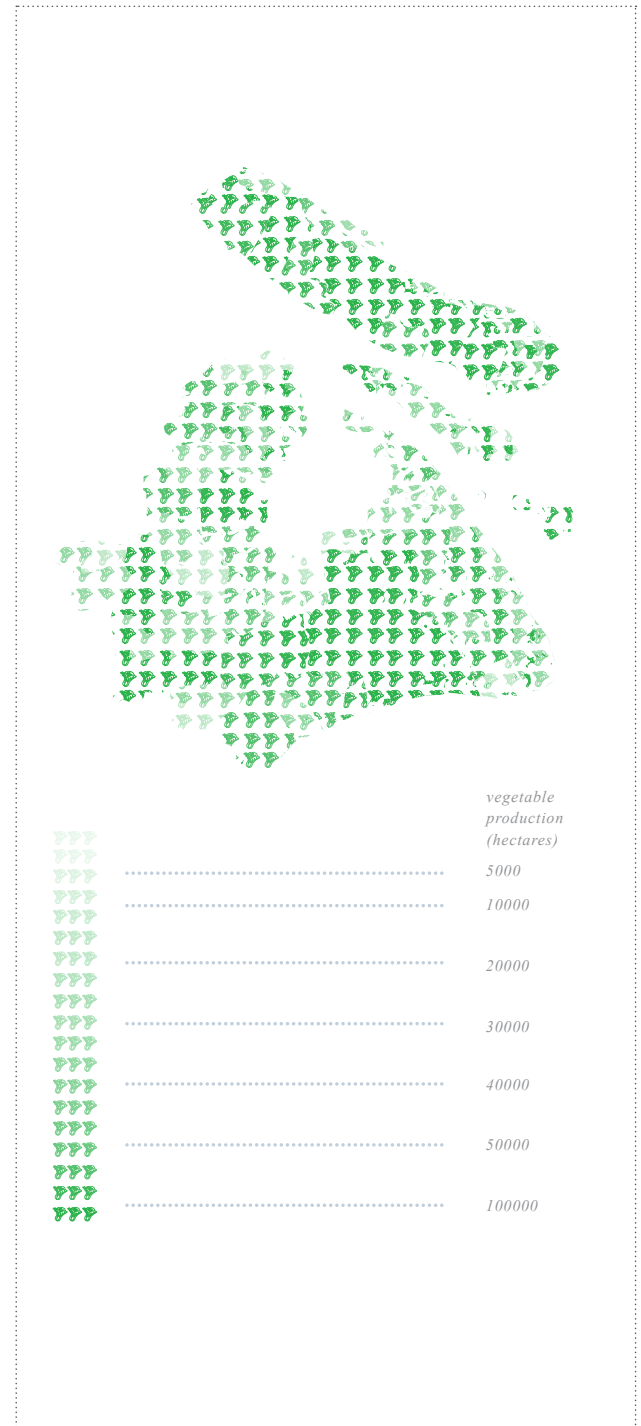
fig.75

**Locations 01: The location of Grain Production in Shanghai /** The Shanghainese have been eating rice for thousand of years. Until now, the bread is still not accepted by the habitants. Thus, the grain here mainly refers to the paddy rice. As we discussed before, Shanghai used to be the paddy rice produce center. By now, only part of it is on rice production. The *fig.75* shows the amount and locations of sown areas for grain. From 1992, the arable land areas for grain production decreased rapidly. Nowadays, six out of eighteen districts still remain the grain fields. They are Chongming District, Jin Shan District, Pudong District, Fen Xian, Qing Pu and Song Jiang District. In district such as Min Hang and Baoshan there is no grain farmland anymore. In general, the grain production is moved to the far sub urban areas *see ref.46*. Till 2009, total production of grains decreased to 1,156,000 tons *see ref.47*

农业生产基地一，上海粮食生产地点 / 第一个，也是最重要的食品生产基地就是粮食产地。上海住民自古以来都以稻米为主食，米饭牢牢地占据了上海人的餐桌。因此，上海的粮田主要以产优质稻田为主。自1992年以来，上海的稻田面积随着城市发展渐渐消失。2009年，粮食的生产总量下降到每年115万吨。根据国家政策，这些粮食只能满足上海大都市圈外郊区农民的口粮需求。如今，只有六个区还存有粮田，其中包括了崇明区，金山区，浦东区，奉贤区，青浦区和松江区，城市近郊区，比如闵行区 and 宝山区，已经基本没有稻田产地。从图中可知，现在最重要的产地在于崇明区以及西南部的青浦区。

**Locations 02: The location of Vegetable Production in Shanghai /** In 1991, Shanghai started a movement which is called 'Vegetable Basket Project' in order to meet the need of the increasing population since the fresh and high quality of vegetales had been in shortage for decades. This hugely increased the number of vegetable production centers. Up till now, over 50% of the arable lands in the near suburban district are used to grow vegetables. Most are grown in the green houses with advanced techniques. The ratio of arable lands used for these green houses in Baoshan ,Pudong and Minhang district is separately 66%, 61% and 52%. The *fig.76* shows the mapping of the vegetable production in Shanghai metropolitan *see ref.48*. Vegetable production in Shanghai is up to 4,100,000 tons in 2009, which is four times the production of the grains. The surplus vegetables could bring the foreign currencies if they are very processed.

农业生产基地二，上海蔬菜生产地点 / 另一个重要的粮食生产部门即是蔬菜生产。一九九一年，上海政府启动了一个粮食生产政策‘菜篮子工程’，其目标在于为市民提供新鲜优质的本地蔬菜。在那以后，上海的大棚蔬菜生产渐渐地占据了所有粮食生产的大半江山。如今，在近郊区的农田中，百分之五十以上都是用来种植蔬菜。特别在宝山区，浦东区以及闵行区这个比率高达百分之六十左右。二零零九年，上海蔬菜产量达到四千一百万吨，这一数量远远超过了全市所需，多余的部分被加工后出口国外。从图中可以知晓，大多数的蔬菜产区都集中在了上海的近郊区，方便为市中心市民每天提供新鲜高质量的蔬菜产品。



Map of Locations and Amounts of Vegetable Production

fig.76



fruit production  
(hectares)



500  
1000  
2000  
3000  
5000  
10000  
50000

Map of Locations and Amounts of Fruit Production

fig.77

Locations 03: The location of Fruit Production in Shanghai / After many vegetable production centers were built up around 1990, in 1992, most of the fruit production farms were moved from near suburban area to the far suburban district such as Chongming and Nanhui District (currently part of Pudong District). Changxing and Hengsha Islands are mainly for orange production. Nanhui District and Fenxian District are for peach production. Jiading District for grape production. Songjiang District is for pear production etc. Also, every year the governors will organize several festivals on the theme of fruits, such as 'Nanhui Orange Festival' etc. Besides water melon is taken as the main fruit production by most of the suburban districts because of its high profits and popularity. Nanhui, Jinshan and Chongming Districts rank the top three in water melon production. In Nanhui, 16% of arable lands are used for it see fig.77 and ref.49.

农业生产基地三，上海水果生产地点 / 自1990年建立了大量蔬菜种植基地后。1992年起上海从近郊起建立水果种植点，并逐渐向如崇明区，南汇区等远郊扩散。橘子种植主要集中在长兴岛和横沙岛，南汇区和奉贤区主要产桃子，嘉定区产葡萄，松江区主产梨。同时，政府每年都会以水果为主题展开文化宣传活动，如“南汇橘子节”等。除此以外，由于上海人对于西瓜的热衷以及西瓜本身的高利润，多数郊区的水果产业以西瓜为主。南汇区，金山区和崇明区是产量排名前三的上海西瓜种植区。在南汇区，16%的可种植土地都被用来种植西瓜。

Locations 04: The location of Pig Meat Production in Shanghai / The pork is hugely welcomed in Shanghai and all through China. In the past, most of the pig farms were near the city center. However, because of its sounds, smells and the high pollutions to the environment, Shanghai government decided to remove them. After 1990s, most of the pig production centers were moved out of the near suburban area to the far suburban districts such as South of Pudong, Fenxian, Jinshan and Qingpu in the past decades. In the fig.78 it maps the location and production of the number of pigs. In 2009 the amount of pigs production in Shanghai is 2,580,000. This equals to 297,000 tons of pork meat. However, there is no production center for the lamb and beef in Shanghai. They are imported from other provinces. However, the pig production in Shanghai used to be 'famous' for the usage of harmful artificial hormones. Now, by law it is illegal to use them anymore see ref.50.

农业生产基地四，上海生猪养殖地点 / 上海的肉食供应以猪肉为主。过去，大部分的生猪农场和屠宰场都位于城市近郊。但是，与植物农产品生产不同的地方在于，动物养殖对于城市周边环境的影响较大。随着城市的扩张以及人们对于环境要求的提高，生猪的农庄渐渐转移到了城市远郊。在上个世纪九十年，大多数的生猪农场被移到了浦东，奉贤，金山和青浦区。根据上海统计数据，二零零九年上海生猪出栏是二百五十八万头，相当于二十九万吨猪肉供应。另一方面，在上海基本没有肉牛和肉羊养殖场。并且根据十一五计划，未来的畜牧业将会渐渐外迁至其他省市以构建都市良好环境。



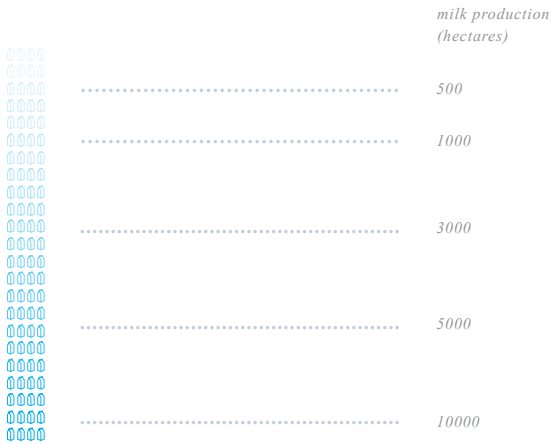
pigs production  
(hectares)



5000  
10000  
20000  
30000  
40000  
50000

Map of Locations and Amounts of Pig Production

fig.78



Map of Locations and Amounts of Milk (Cow Farms) Production

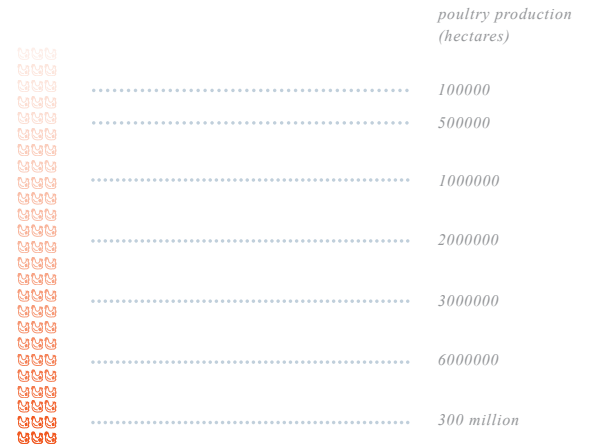
fig.79

Locations 05: The location of Milk Production in Shanghai / In the past, milk is very precious for the habitants. Nowadays, with the development of the techniques, the massive production of milk becomes possible. In the south west of Shanghai, the Jinshan District, there situates the biggest and most advanced massive milk production center. It is built and invested by the Guang Ming Comapny and the Shanghai government. In the *fig.79* the map shows the amount of milk production in Shanghai. In 2009, the total milk production is 233,000 tons. However, every year Shanghai has to import much more milks. From later 1990s, Shanghai started to build milk production center in other provinces of China. Nowadays, since the high pollution to the environment, cow farms are restricted to only several far suburban area, such as the Guang Ming Center as we mentioned above *see ref.51*.

农业生产基地五，上海奶牛农场地地点 / 同生猪养殖相似，上海的奶牛农场最先分布在近郊的各个区县之中。随着技术的发展，集约化的生产的推广运用，养殖中心也渐渐向远郊移动，比如最新的光明乳业在金山区远郊建立的大型集约的牛奶生产基地。同时市政府对于大都市环境质量提升的要求也促使大部分的奶牛农场外移。根据上海统计局数据，二零零九上海牛奶总产量在二十三万吨。但这些数量仍不能满足上海人口需求。一方面，上海每年需要从国外进口大量的牛奶，另一方面，上海在其他临近省市不断的新建奶牛养殖场。近年来的假奶粉事件使人们对于本地奶业生产的食品安全提出了更高的要求。

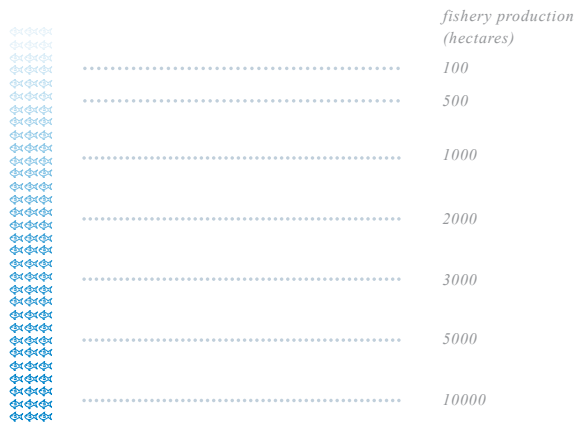
Locations 06: The location of Poultry Production in Shanghai / In order to create an international metropolitan, the Shanghai government paid more and more attention to the environment of the whole region. Thus, any industry that causes heavy pollutions will be shut down or moved out. The poultry production is the one that make heavy pressure to the environment. So, in the past decades, most of the farms were moved out of the centers to the far suburban area such as Pudong and Fenxian area. The previous poultry center such as Baoshan district is currently for fruit and vegetable production. In *fig.80* shows the location and amount of poultry production in Shanghai. In 2009, the total poultry production is 111,000 tons. It is clear that most of the farmers were moved to the border of Shanghai. Probably in the future there will be no poultry farms. Actually nowadays Shanghai imports thousands of tons frozen poultry from North America every day *see ref.52*.

农业生产基地六，上海家禽生产地点 / 上海政府在改善城市环境的过程中首先要清除的就是高污染的家禽产业，因此，早在上个世纪九十年代，大量的家禽农场就已经移向外郊，比如浦东及奉贤区。曾经的家禽生产近郊区，比如宝山区，已经成为了水果和蔬菜的产地。二零零九年，上海都市圈一共生产了11万吨的禽肉。这些产量达不到上海全年的消耗量，因此，每年上海从北美进口大量肉鸡。而在十一五计划中要求，在未来的五年时间中，上海要尽量的减少家禽的产地。如果按此计划实施，将来上海将从国外进口更多的冷冻肉鸡。但是随之而来的食品安全，包括数量以及质量的忧患，对于上海未来的食品体系存在隐患。



Map of Locations and Amounts of Poultry Production

fig.80



Map of Locations and Amounts of Fishery Production

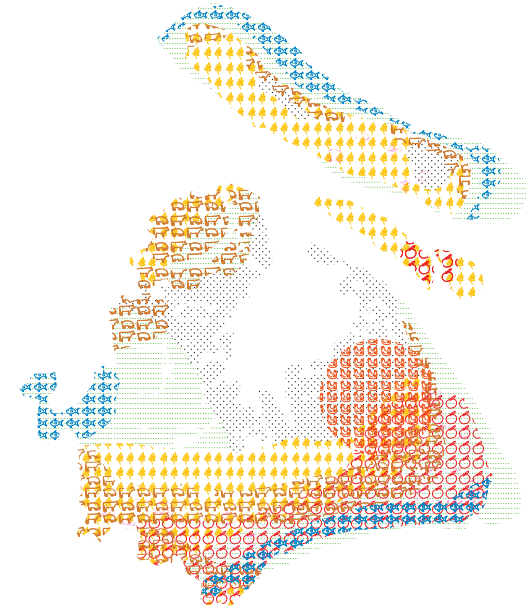
fig.81

**Locations 07: The location of Fishery Production in Shanghai /** The ancient Shanghainese mostly fed on the rice and the fishes. The geography provides enough water surface for the fishery, not only in fresh water but also in sea water. The map *fig.81* shows the location and amount of fishery production (only the breed aquatics) in Shanghai. The total fishery production is 173,000 tons. The fishery breeding production is located mostly in three places near the water resoures. In the north, Chongmin District is mainly for crab production. This is mostly combined with paddy rice production since the crabs could be breed in the field. In the south west, Qingpu District is mainly for shrimps production since it is near the Dianshan Lake. In the south east, Pudong District is mainly for sea shrimps production since that area is facing the East China Sea. However, nowadays most of the sea food is imported *see ref.53*.

**农业生产基地七，上海水产品生产地点 /** 上海地处江口与海边，自古渔业就发达。充足的淡水与海水资源为上海提供了渔业发展的充足自然资源。但是随着污染的不断严重，上海的海水和淡水捕捞业的产量和质量大幅下降。整个大都市圈水产的中心偏向于人工养殖。根据图示可见，在西南青浦区，借淀山湖优势水产主要以淡水虾养殖为主。在上海北部的崇明区，借助稻田混合养殖技术，养殖以稻田养蟹为主。在浦东东南面海处，主要以海水养虾为主。根据上海统计局数据，二零零九年淡水养殖的产量达到十七万吨。但这样的数量并不能满足人们的需求，因此，每年上海会从世界各地进口大量的生鲜水产。

**Locations: The location Overview /** In general, the agriculture land in Shanghai could be divided into 3 main areas, the greenhouse agriculture area (the green house) which is for vegetable production, the grain fields which is for grain production and the multiply food production area which is for other food production such as livestock and fruit. Inside these three areas, there scatter fruit production centers, cow farms, livestock farms, poultry farms, breed aquatics centers and water melon production centers. The first area is around the city center, providing sufficient and fresh vegetables for the habitants. The second area is located at the place with continuous and intact fields, providing grain products. The third area is in the far suburban area, providing other food for the city center. In a word, the food production location is almost stable. The structure accurately reflects the laws and policies the government released *see fig.82 and ref.54*.

**上海农产品生产产地分布总结 /** 在展示了上海七大粮食生产位置后，我们将对整体布局进行一个总结。上海的农业生产区分成三个部分，第一部分是近郊区的大棚装置种植区，其中大部分是在菜篮子工程之后建立，主要为大都市区提供新鲜蔬菜，比如近郊的宝山区，闵行区 and 浦东区；第二部分是中郊的粮食生产区，主要是优质的粮田，比如青浦区和北部的崇明区；第三部分是在远郊的多元副食品生产区，水果，家禽，畜牧等生产基地都聚集在此。这个起步于上个世纪九十年代的农业生产布置现在已经基本成型。在了解了不同粮食生产的位置后，我们可以在今后的设计改进中有的放矢的进行重构，以达到上海大都会粮食的自给自足。



Overview Map of Locations and Amounts of All Food Production

fig.82

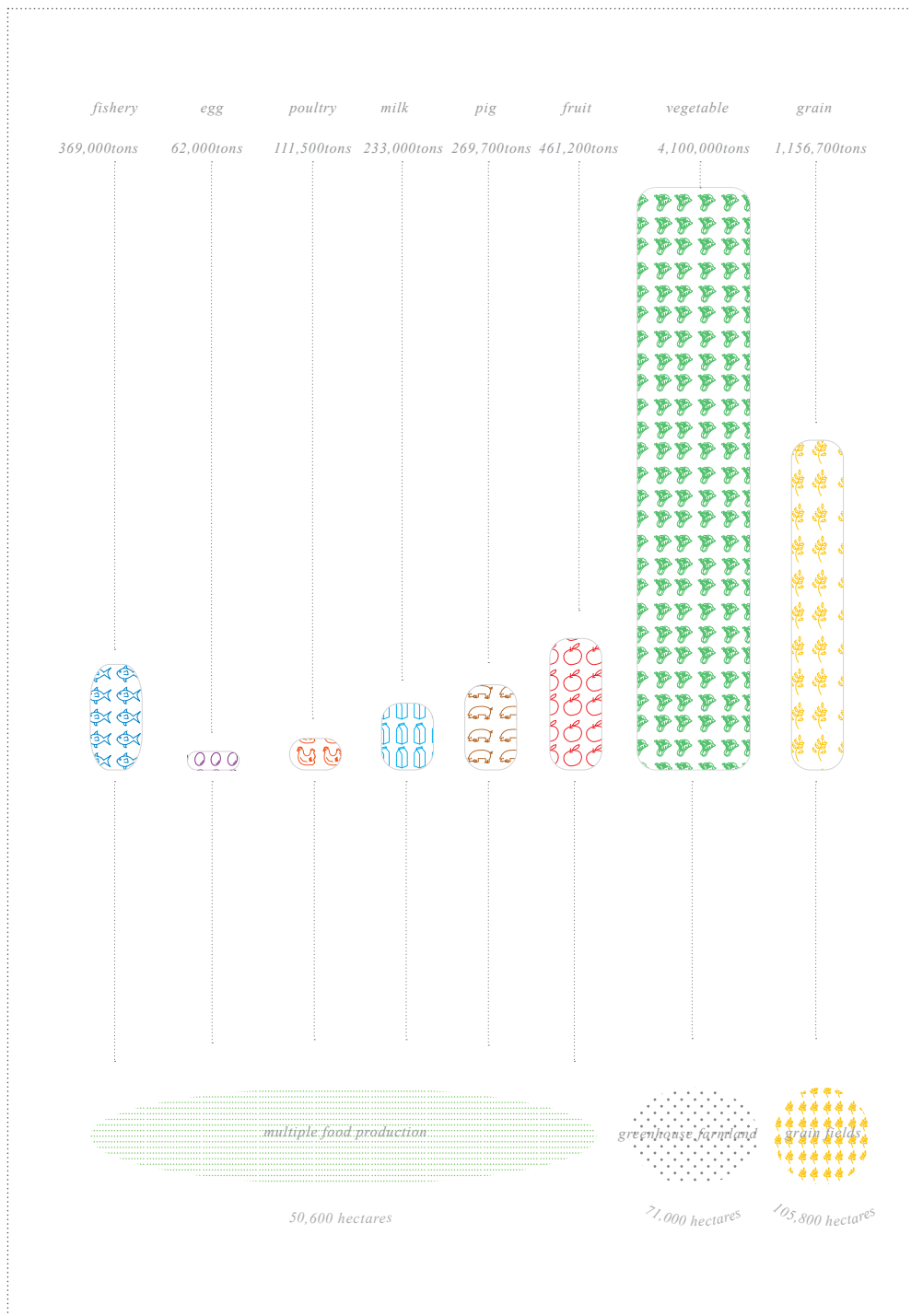


Illustration of Overview of Food Production and Its Lands

fig.83

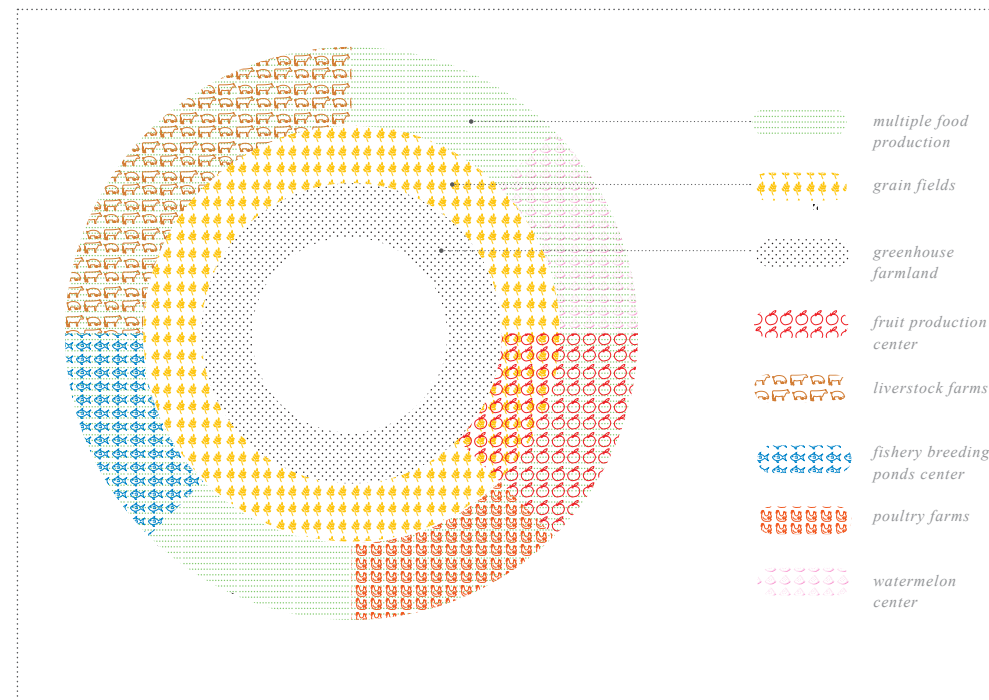


Illustration of Concept of Shanghai Food Production System

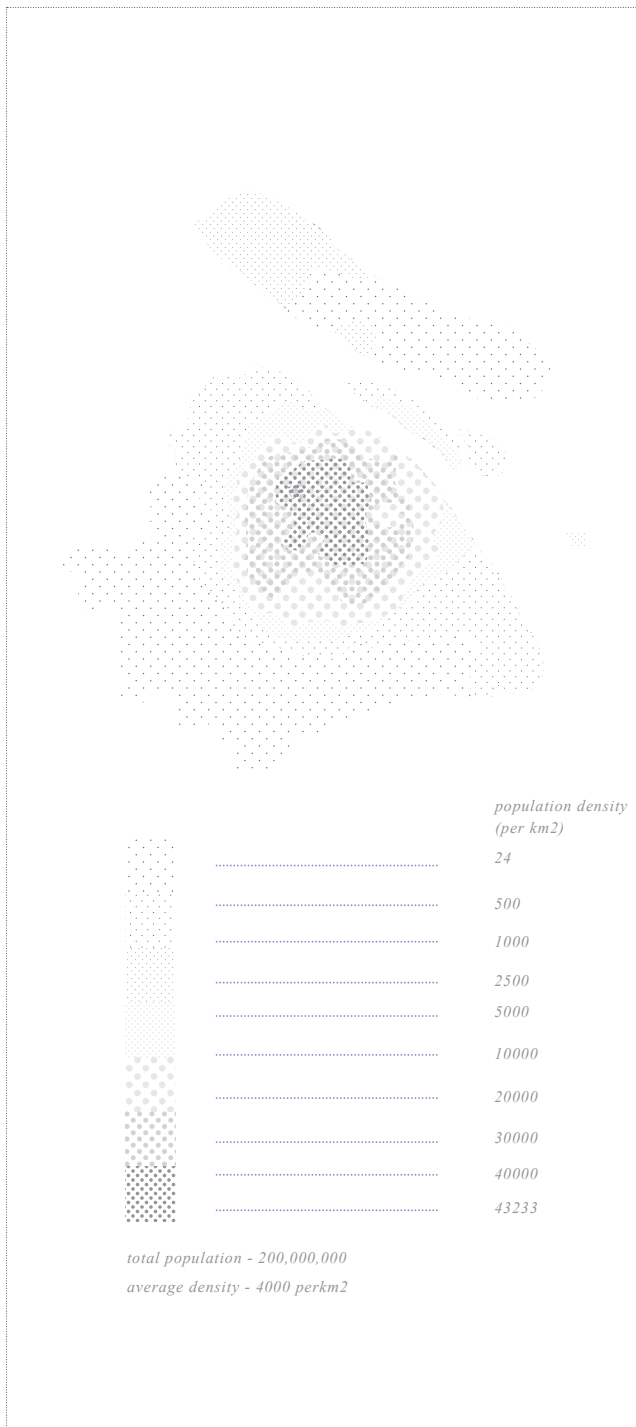
fig.84

The Arable Land Areas and the Production Amounts / After understanding the locations and amounts of each food, here we present the overview of the statistics in fig.83. In general, Shanghai food production could be divided into three parts see ref.55. First, the grain fields, which occupy 105,800 hectares, produce 1156.7 thousand tons of grains in 2009. Second, the green house farmlands, which occupy 71,000 hectares, produce 4100 thousand tons of vegetables in 2009. Third, the multiple food production areas, which occupy 50,600 hectares, provide 369 thousand tons of fishery, 62 thousand tons of eggs, 111.5 thousand tons of poultry, 233 thousand tons of milk (include dairy products), 296.7 thousand tons of pork meat and 461.2 thousand tons of fruits in 2009 see ref.56. / The Summary of Shanghai Food Production System / In order to make it subtract and easy to remember, we make a ring chart to explain the current food production location see fig.84. The white

上海农业的产量 / 根据以上的数据我们总结了上海农业的生产地分布以及相应的产量。总体来说，在二零零九年十万亩的粮田为全市提供了115.6万吨的粮食。中郊七万公顷的大棚农业产出了410万吨的蔬菜。远郊5万公顷农田提供了37万吨的渔产，6万吨的鸡蛋，11万吨的家禽，23万吨的牛奶，包括奶制品，29万吨的猪肉和46万吨的水果。总共23万多公顷的农田提供了355万吨的食品，并构建了上海目前的食物结构。 / 农业结构的环形图示 / 为了更好的总结上海大都市圈粮食生产结构，我们用一个环形的图标示意。中心的白色是市

void in the middle is the city center. The first ring, the yellow, is the near suburban area, where urban and rural merging. Here Shanghai has big centers for green house farmlands, which is mainly for vegetable production and several centers for fruits. The second ring, the green, is the middle suburban area. Here Shanghai has fields for grains, mainly paddy rice. All the other food production centers situate in the far suburban area inside (the third ring) the

区，没有农业生产的地域。外围是近郊的设备农场蔬菜生产基地。接着向外是中郊的粮食生产基地，以优质稻田为主和远郊的多元副食品生产区，包括水果，畜牧和水产。上海现在中心发散的农业分布是其城市发展政策和农业政策指导下的结果。



Map of Shanghai Population Distribution

fig.85

multiple food production area. The ring structure shows the current situation clearly. It is a stable system and well modified according to the laws and policies released by the government. / **Food Consumption: How much Food Shanghai Eat** / The previous pages tell us the number of food Shanghai produces and the locations. In the following pages, we will look at the statistics on how much food Shanghai habitants consume. Afterwards, we will get the idea that how much food is in shortage or surplus. / **Preliminary Information 01: The Population and Density** / How much food is consumed is mainly based on how many mouths we have. In the *fig.85* we present the distribution map of Shanghai population. The Shanghai metropolitan has around 190 million habitants in 2008. About 160 million permanent residents and 30 million temporary residents. The average population density of Shanghai is around 4000 persons *see ref.57*. However, many people are discussing whether the central government should let the big cities like Shanghai accept more immigrants from other provinces.

上海粮食消耗状况 / 在了解了上海的食品生产现状后，我们将继续展示上海的粮食消耗现状。只有当消耗低于生产时，上海的食品安全才是能够保证的。 / 上海的人口现状 / 统计粮食消耗的前提是清楚掌握人口总数。根据上海统计局二零零九年的统计，上海拥有近1900万人口，其中1600万是上海常住人口，剩余的300万多为外来务工人员，流动性大。市中心区的人口面积高于4000人每平方公里。根据上海政府的最新计划，未来的上海将放开

Thus, in the future years, the population could rise up to 220 million in 2020 year and 280 million in 2030 year *see ref.17*. **Preliminary Information 02: The Diets of Shanghai** / The second thing to know is what kind of food Shanghai people eat. In the past centuries, most of the Shanghai people have been living on rice. But in the past decades, with the development of the food industries, more kinds of food are accessible to normal family. So the diet of Shanghai people has changed a

lot. In the *fig.86* we show the types of the food Shanghai habitants consumes and its proportion in 2005 *see ref.85*. The top three popular food are vegetable, fruit and grain. The plantation food occupies around 60% and the animal food occupies 40%. The policy of 'Basket of Vegetables' might hugely increase the consumption of vegetables. Also, the ancient eating habits influence the diets even though animal food is sufficient.

With this diet, we could calculate out the total food consumption of Shanghai per year. Also, we need to know how much food Shanghai eat per year. As estimated, Shanghai people will eat over 400 kilograms per year per person in 2010. The number will increase largely in the future *see ref.59*. The diet, the population and the personal food consumption together with food production statistics could tell us the exact numbers and kinds of Shanghai food shortage and surplus.

户籍制度，届时，更多的移民将涌入上海。预计在2020年，上海人口将攀升到2200万人，至2030年，人口将攀升至2800万人。 / 上海人的饮食结构 / 要知道最后整体的食品消耗量，还需要知道上海人平时主要吃什么，吃多少，有什么饮食的分类。根据二零零五年上海统计局的数据显示，尽管大米一直作为上海人的主食，但随着副食品工业的发展和人民生活品质的不断提高，上海人的餐桌上逐渐显现出多样性，米饭的消耗量在近三十年来不断下降。如今，蔬菜和水果则分别占据了头两位，分别为百分之三十和百分之二十，而米饭只占百分之十七多。同时，植物类粮食仍然高于动物类粮食，分别为百分之六十和百分之四十。饮食结构的变化将深刻影响到人们粮食总消耗的变化。根据统计数据显示，上海人均每年消耗的粮食总量在400公斤左右。至此，根据人数，人均消耗及饮食结构，各种粮食的年总消耗可以算出。

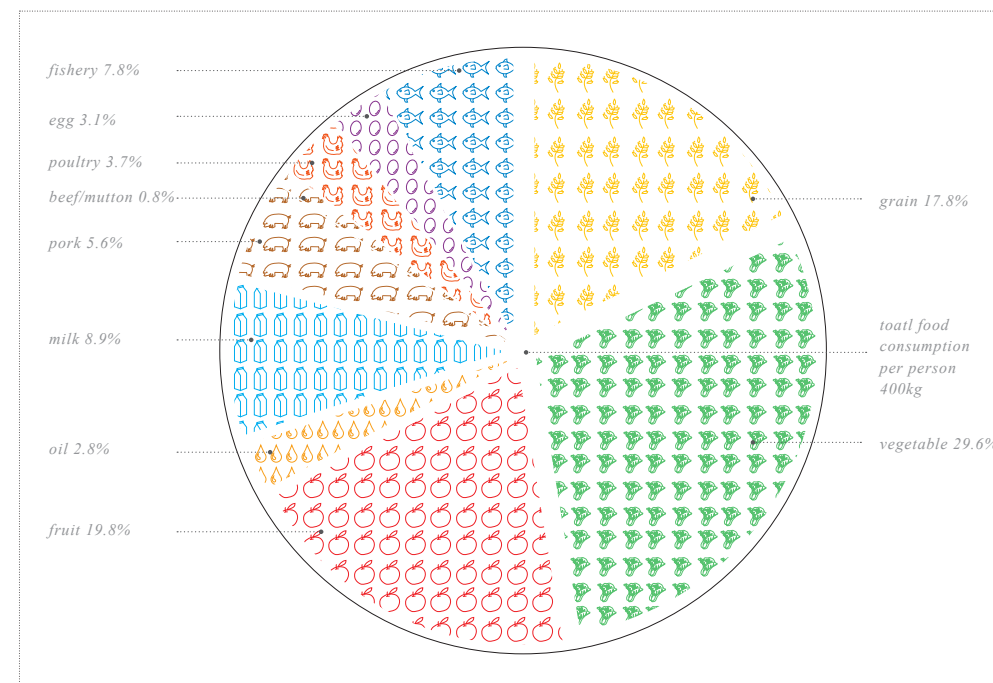


Chart of Diets of Shanghai

fig.86

Calculation, the Amount and Kind of Food Shanghainese Eat Per Year / With the population, the diet and the total food consumption per person per year, we could calculate out the consumption amount for different kind of food. In total, in 2009, Shanghai consumed over 7,520,000 tons of food. Vegetables, fruits and grains rank the first three, with separately 2230 thousand tons, 1490 thousand tons and 1340 thousand tons. The consumption of fishery is 590 thousand tons, that of egg is 230 thousand tons, that of poultry is 280 thousand ton, that of beef&mutton is 60 thousand tons, that of pork is 420 thousand ton, that of milk is 670 thousand tons and that of oil is 210 thousand tons *see fig.87*. However, this will definitely increase largely in the future. According to the estimation, in 2020 the average consumption of food of Shanghai per person per year will arrives 442 kilogram and 460 kilogram in 2030 *see ref.59*. With these numbers, compared with the production

各类食品年消耗总量 / 根据人均消耗量, 人口以及饮食结构, 我们可以计算出在二零零九年, 上海总共消耗了752万吨食品。蔬菜, 水果和稻谷名列前三位, 分别达到223万吨, 149万吨和134万吨。其余的如, 渔业的消耗量在59万吨, 蛋类消耗23万吨, 家禽在28万吨, 牛羊肉6万吨, 猪肉42万吨, 奶类67万吨以及食用油21万吨。然而, 消耗量在未来还会不断提高。据预测, 2020年及2030年上海人居粮食消耗年均将达到442公斤及460公斤。再考虑到人口的增长, 未来的消耗必定大量增长。在了解了各种食品消耗后, 我们可以知道推测上海食品产出的不均衡发展, 为我们后一章的食品生产基地的重新布置, 设计中提供依据。



Illustration of Shanghai Food Consumption: The Amount and Kind

fig.87

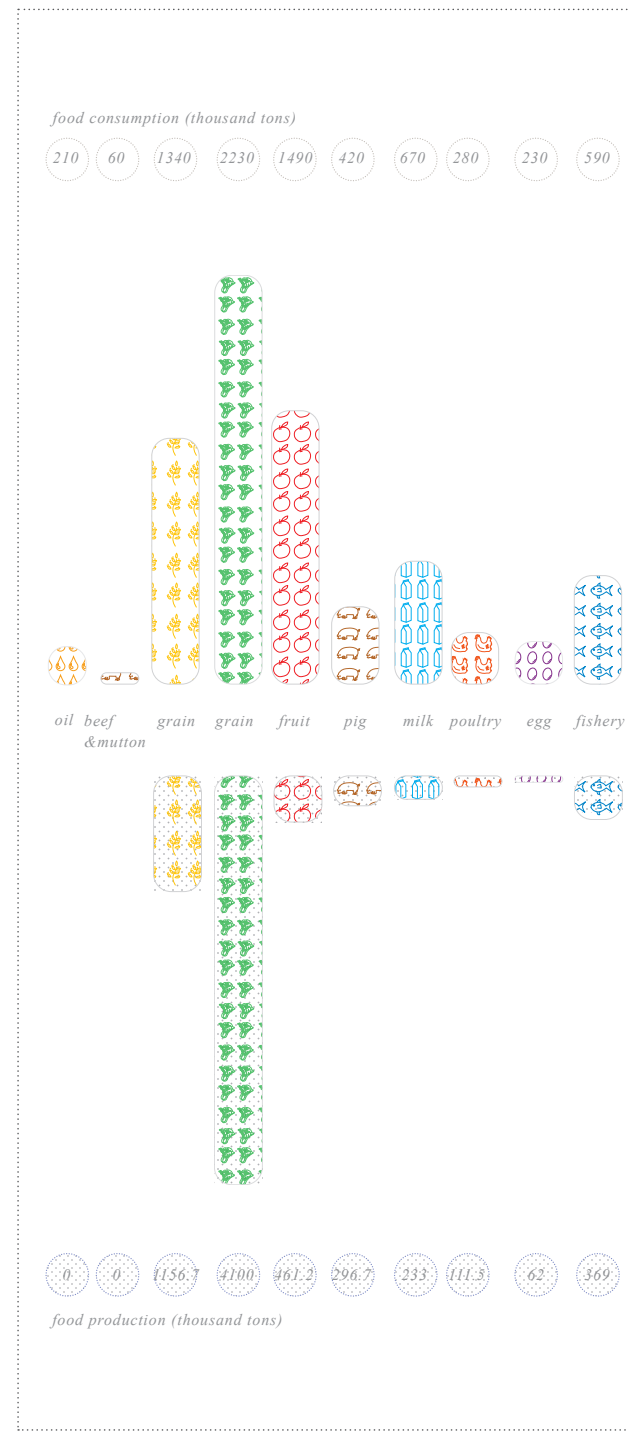


Illustration of Comparison Between Food Consumption and Production

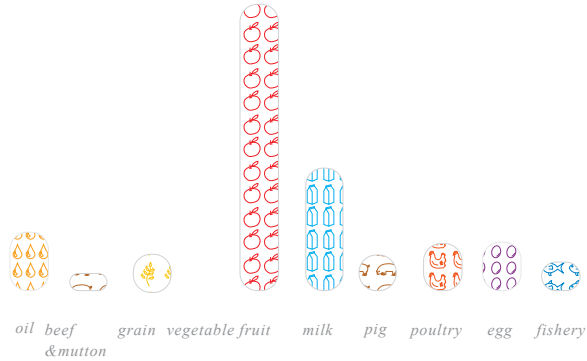
fig.88

of food, we could understand the weakness and the strength. / Comparison: Consumption vs Production / With the comparison between the food production and the food consumption, we see the situations of the current food system *see fig.88*. First, Shanghai does not produce beef and mutton. All of them need to be imported from other provinces of China or abroad. Second, the vegetable production is much higher than its consumption. However, most of the foreign currency Shanghai gets from food exportation is by selling the processed vegetables. Third, all the other food supplies are in shortage. Most are far lower than their consumption. With this chart, the current structure of the Shanghai food production system is clear. Vegetable production is in surplus however other food is in shortage. This provides us the basic statistical information for further analysis as well as proposals and solutions to offset the errors.

粮食生产对比粮食消耗 / 当我们把上海食品生产的图表与上海粮食消耗的图表对比来看, 上海食品的结构性问题非常清楚。首先, 蔬菜生产一枝独秀, 其产量大于并且远远大于蔬菜的消耗。其次, 其他所有的食品生产都达不到市民的消费。并且其中的食用油与牛羊肉生产在上海都几乎已经没有了生产基地。因此, 整体食品的生产结构存在严重偏颇。追其原因有三, 第一, 政策上对于农业的忽视, 使所有的食品产量都下降。第二, 菜篮子工程对于蔬菜产业的强势支持是蔬菜生产直线上升。第三, 畜牧业对于环境的污染使上海迁移出了大部分的牛羊肉产量, 同时, 家禽牧场及奶牛场在都市圈中也渐渐失去空间。



food shortage 2,503.2 thousand tons



oil beef & mutton grain vegetable fruit milk pig poultry egg fishery



1864.1

food surplus 1,864.1 thousand tons

Illustration of Shanghai Food Shortage and Surplus

fig.89

**The Amount of the Shortage and Surplus** / In the *fig.89*, we present the amount of the food shortage and surplus. Altogether, in 2009 the shortage of the food in Shanghai is 2,503,200 tons. It includes 103,100 tons of fishery, 172,200 tons of egg, 168,000 tons of poultry, 60,400 tons of beef and mutton, 126,300 tons of pork, 439,300 tons of milk, 211,500 tons of oils, 1,034,500 tons of fruits and 187,900 tons of grains. However, only the vegetables are in surplus with 1,864,100 tons. There might be several reasons cause this result. First, the policy of the 'Vegetables Basket Project' transformed arable lands into the greenhouse farmlands. Then this largely increased the production of vegetables. Second, the high pollution of the livestock reduced the number of poultry production. And it is the same situation for the cow farms and the related milk and dairy productions. Third, many Shanghainese eat a lot of fruits. However, there are not so many arable lands for the fruit production. / **Shanghai could not** 食品的缺失与食品安全 / 二零零九, 上海食品总缺口达到了250万吨。其中渔产品缺口10万吨(包括野生海产品), 鸡蛋缺口17万吨, 16万吨家禽肉缺口, 6万吨的牛羊肉缺口, 12万吨猪肉缺口, 44万吨奶制品缺口, 21万吨食用油缺口, 103万吨水果和18万吨的谷物缺口。在食品多产部分, 仅仅只有蔬菜生产, 其产量多余高达了186万吨。因此, 上海的食品生产极其不平衡, 只有蔬菜生产一枝独秀, 其他全部缺失。 / **既成事实, 上海食品安全危机** / 依上可知, 上海已经跌入了食品危机的泥潭。零九年755万吨的消耗与492万吨的产量, 意味着每年百分之三十五以上

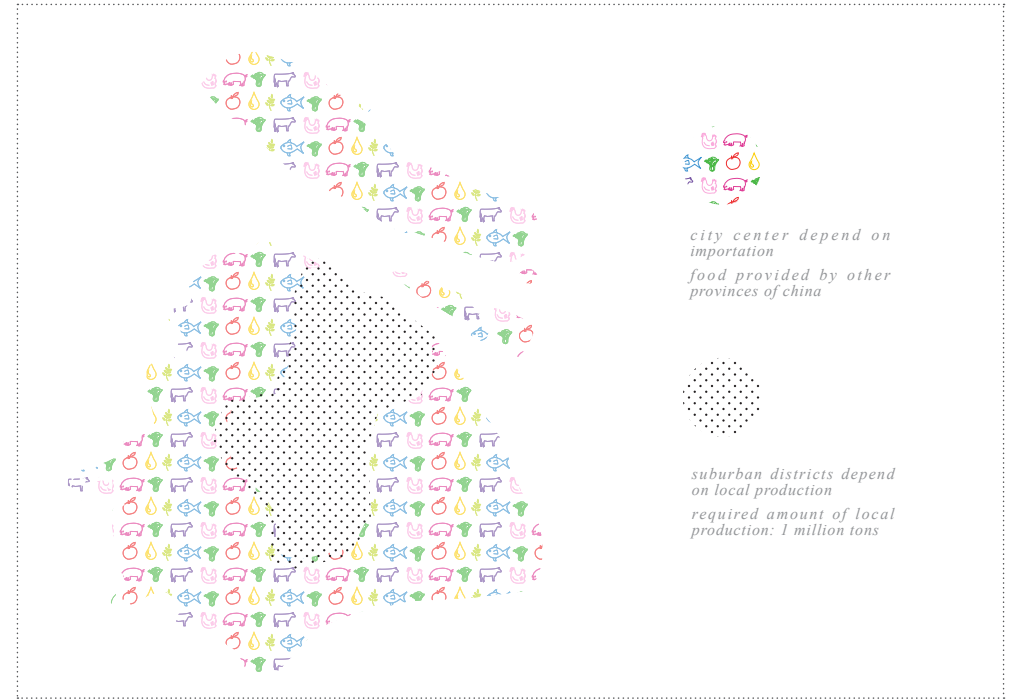


Illustration of Requirements of Amount For Food Production

fig.90

**Provide Enough Food for its Habitants** / Now, we know the fact that Shanghai consumes 7,553,800 tons of food in 2009. However, the food supply centers in Shanghai could only provide 4,926,000 tons of food. This means around 2,627,800 tons of food need to be imported in 2009. That means almost 35% of the food supply in Shanghai is dependent on other provinces and other countries *see fig.90*. If the food chain breaks, over 50 million population will be in danger. This will cause big

social, economical and political disorder. These kind of disasters might come one day. In the past decades, the flood and the snow calamity have been so frequent that the food supply of Shanghai has been cut for several times. Then, the price of the food rised up to triple times and the social disorder followed. Also, the importation food could bring more severe problems such as the alien diseases and low quality

of food. But when we look at the current food system in Shanghai, it is a pity to find that there is no more place for potential arable land. The government is still keeping transforming the farmlands into the construction lands. Furthermore, with more and more immigrants entering metropolitan, the gap between the supply and consumption will become bigger and bigger. In a word, if we keep the same policies and planning, Shanghai will be dependent forever.

的食品供应需要从其他地方进口。然而, 一旦在供应链中的任何一个环节出现差错, 食品供应便会出现问题, 上海将有超过500万人陷入饥荒。随之而来的物价上扬, 社会动荡, 民众不满甚至可能的政局不稳, 都是我们政府需要不容忽视的。美国前国务卿基辛格曾说过, 控制了石油, 就控制了国家; 控制了粮食, 就控制了人民, 阐释的正是食品安全的重要性。如今危机已经时隐时现。首先是运输通道的危机, 一旦航运或陆运被自然灾害或者政治事件或者战争影响, 上海将被隔离, 无法自给自足, 其次是外部

食品基地供应问题, 一旦自然灾害影响上海外部的粮食基地产量, 供应将形成危机, 比如今年中国的旱灾和雪灾。最后是食品安全问题, 异地生产的食品安全无法监控, 近年来连续的食品质量问题使人心惶惶, 造成了食品使用的不安全感。

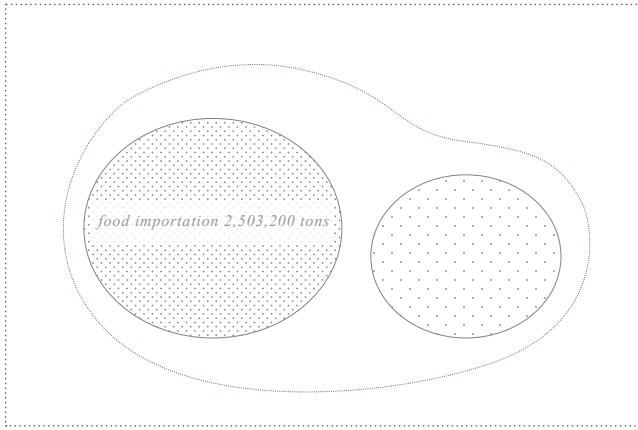


Illustration of Shanghai Current Food Situation: Dependent

fig.91

**The Driving Forces Behind the Current Food Situation / The Political Factors** / The food policy of Shanghai is assigned firstly from the central government in Beijing. Every year Shanghai must product at least 1 million tons of grains, which will meet the need of the suburban population of Shanghai *see ref.60*. This means the population habiting in the center should depend on the importation food. The basic requirement of the for food production released by the central government is listed in *fig.91*. Current policy is to ensure the vegetables supplyment and reduce the livestock, which is of high pollution to the urban environment.

**背后的政策法规因素** / 在城市化发展中另一个重要问题是如何将农业用地转换为建设用地。根据国家宪法第十条，在涉及到公共利益和国家利益时，政府有权将农业用地转换为建设用地。这条法令实际上使农业用地已不受保护。所谓公共利益的含糊定义很容易被开发商和地方政府滥用从而征用珍贵的农业用地。从而大规模的不合理开发成为城市发展重要一部分。土地政策的滥用和法律层面上加速了农田的消逝和城市化的进程。

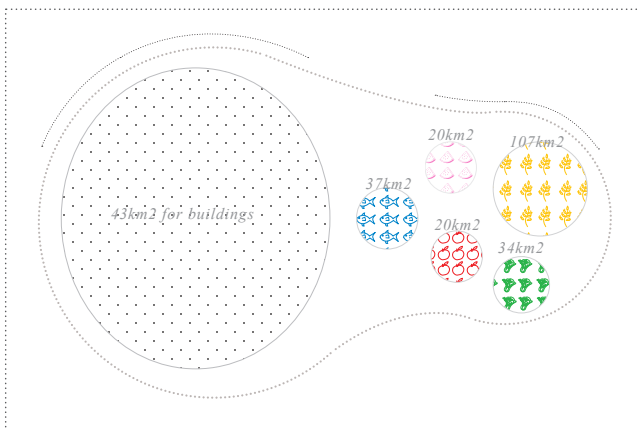


Illustration of Requirements of Areas for Food Production

fig.92

**The Minimum Requirements of the Areas of Arable Lands** / According to the Outline of the Eleventh Five-year Plan for National Economic and Social Development, Shanghai need to keep at least 107,000 hectares for grain production, 34,000 hectares for vegetables production, 20,000 hectares for water melon production, 20,000 hectares for other fruits, 37,000 hectares for fishery breeding, and very few lands for liverstocks. It means that by law Shanghai has to keep at least 216,700 hectares of arable lands. In 2009, the actual number of arable lands is around 240,000 hectares *see fig.92 and ref.61*. Thus, the government has the right to continue the urbanization until touching the limits of the arable land area. The above articles clearly explained the current policies on food production. It is a pity that by law Shanghai is not necessary to produce enough food for its habitants. The urbanization will continuously eliminate the arable land in the suburban area.

最至关重要的政策在于上海市政府如何看待食品的作用。根据上海市人民政府发布的第十一个五年计划，上海在未来的五年中必须要确保10.4万公顷粮田，3.4万公顷蔬菜基地，2万公顷的西瓜场地，3.7万公顷的渔产养殖。总共的要求需要保有农田21.67万公顷。而根据二零零九年的统计数据，上海全境仍然保有24万公顷的农业用地。这意味着在未来的五年内，还将有部分农田转变为建设用地。同时，根据政策要求，上海的粮食生产只要求保证周边农户的自给自足，这也意味着从政策上来说，中心区的市民的口粮需要从外地进口。

**Anti-Agriculture Policies / After reviewing those policies, we could figure out that Shanghai government has no intention to keep food supply self-sufficiency. The urban development policy pushes the border of the city larger and larger. The urbanization is the main force to transform the arable lands into construction lands. / The Current Solutions to Food Shortage / By law the government does not have the responsibility to support the food supply for the whole population. In order to fill the gaps between the production and consumption, Shanghai has built up lots of food production centers all around China from 20 years ago. Huge amounts of arable lands in the other provinces are specially for Shanghai. For example, in 2010 Shanghai holds the EXPO, huge amounts of food are needed during these 5 months. Most of the food production centers such as those in Shandong, Sizhuan and Fujian around China have worked hard to meet the needs of Shanghai. In a word, the solution is to be dependent *see ref.62*.**

**政策导向，轻视农业** / 以上的上海城市政策都与农业的发展息息相关。大都市圈的卫星城区和城市化建设导致了农业用地的消逝。土地政策法规被地方政府和开发商的滥，使农民与农田不再得到保护。而在最至关重要的粮食政策上，上海市政府放弃了本地供应的可能性，只要求周边农民食品达到自给自足，市中心区千万人的食品供应全部依靠外界补给。与此同时，对于耕地面积的要求还在不断地减少。 / **政策引导下的危机** / 如今上海已无自给自足的循环。粮食不安全性是多年重经济城市建设轻农业的政策导向之必然结果。对于农业，我们从政策上就已经落后了。

**The Economical Factors: The Insignificance of Agriculture** / From the economical factor, we find that agriculture plays insignificant role. Here we will present its GDP and several other economical factors *see fig.94*. / **Agriculture GDP** / Agriculture used to be very important for the national economy before 19th century, the era we explained before. After decades of urbanization, agriculture GDP of Shanghai had already lowered to around 10% of the total GDP in 1949. From the in 1978's economic revolution, under the rapid development of Chinese economy, though the net GDP growth of agriculture comes up to 30 times, it currently only occupies less than 1% of the total Shanghai GDP *see fig.93 and ref.63*. It is clear the importance of agriculture to the economy is the lowest in the history. Considering this, it is easy to understand why the policies of government put so little attention to the agriculture. However, the GDP is not enough to show the rank of agriculture. It has other functions need to be discussed.

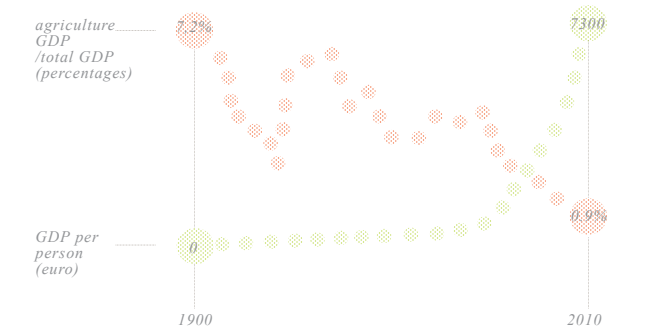


Chart of GDP of Agriculture in the History and the ration of it in the total GDP

fig.93

**Other Four Functions** / The agriculture GDP just shows the general situation of the food industry in Shanghai. However, in order to deeply understand the agriculture situation, we will review other four aspects. They are about how many jobs it creates, how many products it produces, how many foreign currencies it brings and how many incomes it gives to the farmers.

**农业经济对于上海的作用** / 在了解了基本的政策之后，我们开始分析农业在上海经济中的实际现状。为下一步的改善设计提供数据寄出。 / **农业的GDP** / 自从上海开埠以后，农业在上海经济中的作用就不断减小，在建国之时，其只占全市国民生产总值的百分之十。在经过了六十年的发展之后，虽然农业GDP的净增长达到三十倍以上，但是其只占现在GDP总值的百分之一以下。从经济角度来说，农业所带来的利益对于上海来说几乎无足轻重。 / **另外四个经济作用** / 除了GDP外，我们将继续显示另外四个重要的经济作用。第一是农业创造的就业岗位，第二是农业产品的产出，第三是农业

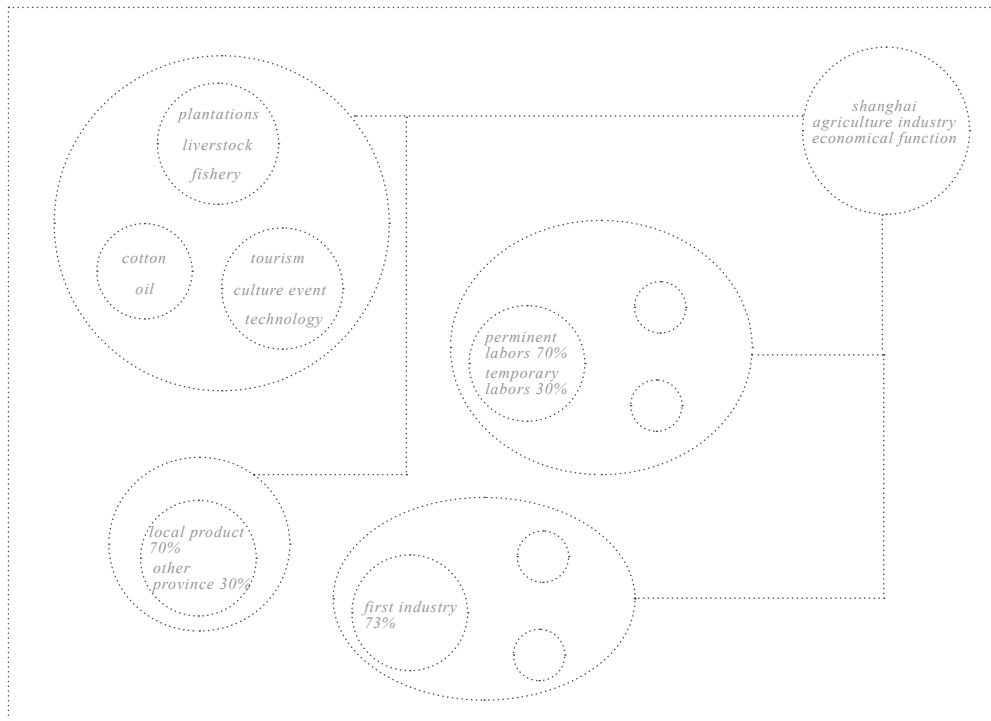


Illustration of Structure of Shanghai Agricultural Economy

fig.94

**Jobs Created by Agriculture** / Other than GDP, the job positions agriculture creates are crucial. It influences the social harmony and reflects the ability of the government. As shown in the fig.95, with the rapid urban development, less and less people have been working on 1st industry. Up to 2009, the proportion of labors on agriculture production

is around 7.1%. Furthermore, inside these 7.1% only 30% labors are real farmers. Other 70% of this 7.1% are temporary workers who are working in the city center and

产品带来的外汇，第四是农业对于农民收入的影响。通过研究这四个经济功能，我们能更全面的了解农业在当今上海经济发展中的作用。/ 农业的就业岗位 / 就业率直接关系社会的稳定和谐。至二零零九年，全上海从事第一产业的人数只占百分之七，然后，再这百分之七中，只有百分之三十是固定从事农业活动，而其他的百分之七十是游走于农村与城市之间的临时工，也就是农民工，平时他们在城市中打工，农忙时，他们会回到农村帮助农务。从中可以发现，真正一直参与农业的从业人员只占总人口的百分之三不到。在就业率的贡献上，农业的作用非常

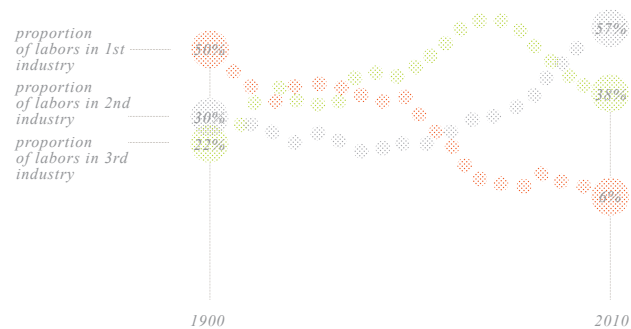


Chart of the Proportions of the 1st, 2nd and 3rd Industries

fig.95

come back to do farm works during the busy harvest periods. They are so called the famous ' Farm Worker' in contemporary Chinese society. So, the final amount of jobs agriculture created is lower than 2.5% of the total labors in Shanghai. Nowadays, most of the jobs are on the 3rd industry such as commercials and services and 2nd industry such as steel industry and car industry. In the suburban area, many farmers lost their lands and forced to be the fake farmers who worked in the city center. The agriculture industry could not provide so many opportunities for them see ref.65. / **Food Produced by Agriculture** / The main function of the food is to provide for the citizens. As we present above, the types and amounts are simplified in the fig.96. However, not like other functions, this one seems to be of the least importance in Shanghai. Currently everyone focuses on money. Thus, the economical factors in some sense influence even the structure of food production. For example, in order to get foreign currency,

有限。/ 农业的粮食供应 / 农业最重要的作用是生产农产品。根据统计，在二零零九，上海的大都市圈生产了3百多万吨的粮食。具体的数量以及类别都在图例中显示。乍看一下数量巨大，而实际上其并不能满足所有上海居民的粮食消耗需求。并且，在随后的章节中我们将详细得分析上海粮食生产在结构上缺陷从而寻求解决粮食安全的隐患。/ 农业的外汇收入 / 上海每年的出口创汇在GDP中占了很大的比例。根据数据统计，二零零九年，农产品的出口外汇收入占了全部出口收入的百分之六。但是，这些出口的农产品中并不是全部来源于上海本地的粮食生产，其中高于百分之六十的被出口的农产品来源

more vegetables are produced. The consumption and the detailed food production situation has been discussed in the previous texts. / **Foreign Currency Brought by Agriculture** / Agriculture could make money by exportation. After the establishment of PRC China, food exportation used to be one of the most important financial support for the city. Nowadays, the agriculture products exportation value occupies less than 10% of the total exportation value see fig.97. It is not so important as other industries. Furthermore, inside these 6% exports, over 60% of the

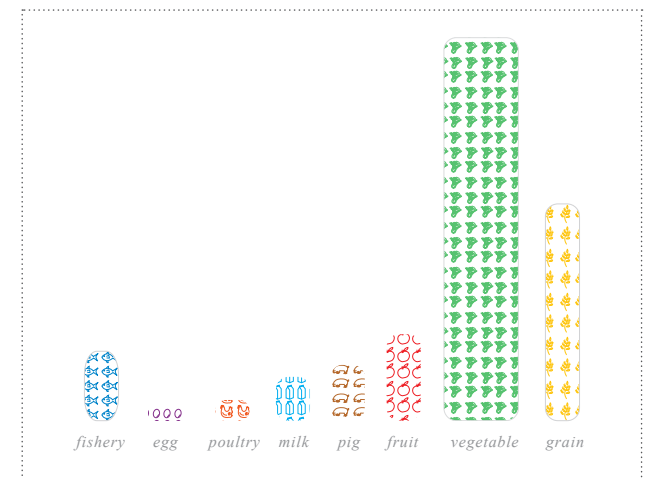


Illustration of Simplified Chart of Shanghai Food Production

fig.96

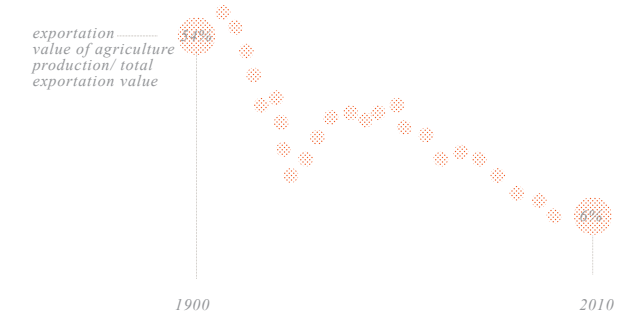


Chart of The Agriculture Exportation Value of Shanghai

fig.97

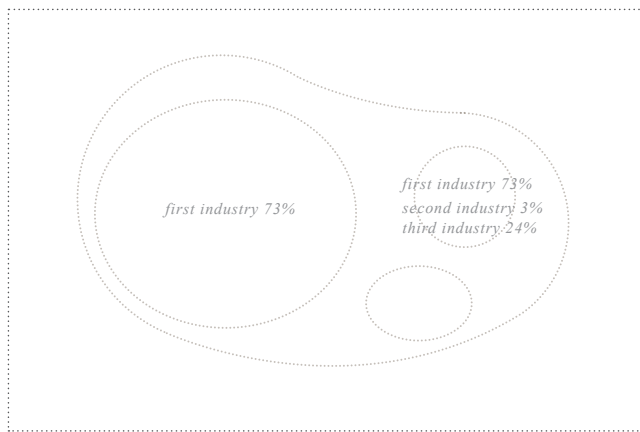


Chart of the Proportions of the 1st, 2nd and 3rd Industries Illustration

fig.98

products are bought from the other provinces. Shanghai is just a second hand seller. That means, only 1/3 of the exports were produced in metropolitan. So, if Shanghai could not import raw food from other provinces, the agriculture products only creates 3% of the total exportation value, which is very little *see ref.67*. / **Farmer Incomes Provided by Agriculture** / From the perspective of the farmers, the money they earn is the criteria to judge the balance of the agriculture industry. Normally, the income of a farmer in Shanghai consists of three parts, the salary (mostly non agriculture income), family business (mostly agriculture income) and others (legacy, etc). With the urban development, nowadays 80% of the income are from salaries and only 10% from the family business. Inside this 10% the income of 1st industry occupies 73%. Thus the final proportionation of first industry of total income for a farm family is only 7.1%. The works in the city, even though how cheap it is, is much profitable than selling the agriculture products in the Shanghai suburban area *see fig.98 and ref.65*. / **Agriculture Economy, The Insignificant Element of Shanghai** / After reviewing the GDP, jobs, products, foreign currencies and the farmer incomes, we could conclude that the agriculture plays the least

农业对农民收入的影响 / 农业对于城市来说是有有机组成的一部分，然而对于从事农业生产的人民来说，最重要的就是从事农业能为自己的生活带来多少的收入，能为自己创造多少的利润。根据数据统计，上海市农民家庭收入主要来自于三个方面，第一个方面是薪水收入，主要是非农业的工作收入包括打工及其他经营内容，第二个方面是家庭产业，主要就是指农产品的生产销售带来的收入，第三种主要是指遗产等其他收入。

二零零九年，根据上海统计局数据，上海郊区农户百分之八十以上的收入来自于工资收入，也就是农民工在城市中打工以及其他非农业经营所带来的收入，而农业生产的收入只占了百分之十。/ **农业经济在上海经济中的低地位** / 在研究了GDP，就业率，农产品产量，外汇收入以及农民收入这几个因素之后，我们发现，农业在上海的经济地位非常之低，对经济的作用

important role in the field of economy in Shanghai. There is no wonder why the governors will not take the food industry so serious. Compared to the urban development, the profits it brings could be omitted. Here, money talks and the agriculture lost its previous crucial rank. / **Conclusion: Food Shortage, the Inevitable Result** / We have reviewed the the current food supply and consumption as well as agricultural policies and economies behind. The result is bitter. Shanghai will not able to feed itself forever in current policies. The food will be in shortage if the supply from outside is cut. On the contrary, it seems that most of the policies are against its independence. The urban development policy encourages the local government to push the urbanization which could devour the arable lands. According to the Outlines of 11th Five-year National and Economical Development, Shanghai only needs to keep around 21,000 hectares for arable lands. By estimation, with those lands it could only produce less than half of Shanghai food requirements. Furthermore, the low incomes and job opportunities

几乎微乎其微。这种现状很容易使政府渐渐地放弃了对于农业生产的重视，加剧了经济不平衡的现状。/ **总结，不可避免的粮食危机** / 在本章中，我们先后介绍了上海粮食状况，其中包括城市发展政策及农业政策，农业的经济效益，农产品的产量和产地以及上海市民的饮食结构和年食品消耗量。最后的结果如上文所提，上海百分之三十五的食品需要进口。所以，如今的食物安全

push the farmers to abandon their precious farmlands and enter the city to be temporary workers. The low profitable function of the agriculture makes it least important to the economical growth of Shanghai, not only ignored by the government but also by the farmers themselves. The vicious loop starts. / **Food Safety, A Chain Disaster** / If dependent, Shanghai will always be in danger. The disorder of society caused by lack of food will shock the stability of the political situation of China, which the government is afraid of. While, this is likely to happen. The snow calamity and the flood every year have already challenged the food logistic system of Shanghai. Furthermore, if the natural disasters influence the food production center in the other provinces, especially those fields for Shanghai food supply, the government has to buy much more expensive food from other resources. For example, the drought happened in the spring of 2010 has already raised the food prices nationally. Also, a dependent city could suffer a lot from the food insafety (the low quality of the food). For the local food it is possible for the government to examine and check the quality.

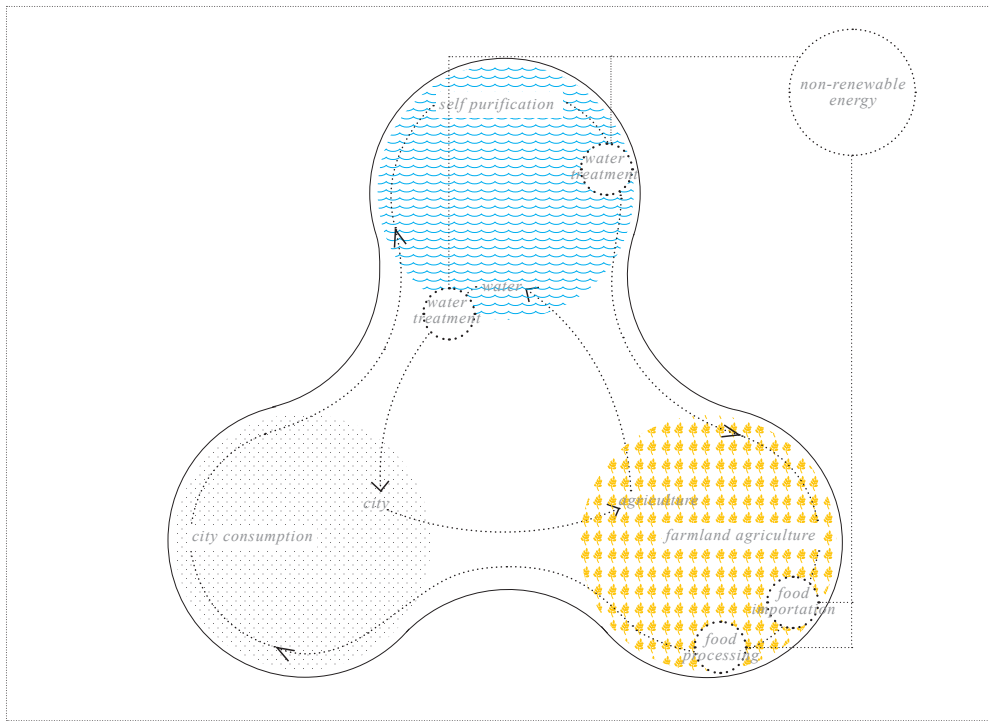
问题是种种因素连环作用后的必然结果。从城市政策开始，都市圈的扩张使农田渐渐退出，而土地政策的滥用则加速了农业用地变成建设用地的过程。同时，农业其自身并不突出的经济作用，包括就业率，外汇收入，农民收入等，使其在上海的经济地位不断下降，影响了政府对于农业政策的制定。这两者之间互相影响最后演变成如今的现状。在最后分析了上海的粮食产量结构以及产地信息后，

However, for the food produced thousands kilometers away, it is impossible to ensure its quality. Also, through the transportation, there is a possibility that the food goes bad. Nowadays, the healthy problems caused by bad food have already happened throughout China. The harmful food was transported from other provinces to Shanghai such as the toxic milk, the toxic eggs, the toxic pork meat, etc. This crazy situation has forced the people to be extremely cautious when they are picking the food in the market. / **Conclusion: The Discord** / In the previous chapters, we browse the history of Shanghai development of the three elements: water, city and agriculture. The original harmony, the imbalanced development and the bitter reality tell us that Shanghai is not what it was. The city overwhelms the other two aspects and droven them out of Shanghai. The loop of the indefinitely sustainable system collapsed. The triangular balance among water, city and agriculture broke up.

我们知道，上海的粮食生产结构失衡，只重蔬菜生产一点而轻视了其它。同时，在耕地严重缺失和城市不断扩张的情况下，现有上海农产品已经不可能满足不断增加的人口需求。自然循环的断裂 / 在回顾了上海上个世纪的城市，农业和水系发展之后，我们遗憾的发现到，他们之间本来自然循环，相辅相成的关系已经消失了。城市的大扩

Nowadays, in order to keep the system working, people have to use extra resources which are non-renewable *see fig.99*. In the counter-clockwise, the city uses the chemical fertilizers, pollutes the agricultural lands as well as devours them. Then, the agriculture carries those poisons into the natural system. Finally, the polluted water does harm to the human society. In the clockwise, the human settlements pour wastes inside the natural system. The nature provides pulluted water for the agriculture irrigation. Finally, the agriculture produces unhealthy and insufficient food for the human settlement. In this vicious cycle, the original mutually beneficial elements are hurting each other. One thing is clear that it is the human being that broke the loop first. Naturally, in the end we are the victims of our own deeds. The nature has been punishing us in many ways. / **The loss of the identity** / Without the help of agriculture and water, even though Shanghai has become a new metropolitan in far east Asia, it loses its original identities. Nowadays, Shanghai has become more and more generic and boring: wide streets, huge concrete

张伴随而来的是水系与农业的消逝。如今，在市中心区，蓝色与绿色已难以寻觅了。/ **上海性格缺失** / 随之而来的是城市性格的缺失，放眼上海的城市发展规划，很难找出属于这座城市特性。所谓的国际化和全球化带给我们的千篇一律的城市景观。在放弃了蓝绿交织的自然秉性后，上海已然迷失。/ **危险的连锁反应** / 最令人担忧的，是城市在发展过程中对于农业的忽视。民以食为天，



Imbalance Between Water, City and Agriculture Illustration: The Current Imbalanced System Among Water, City and Agriculture.

fig.99

and steel buildings. The green is gone and the water is covered. For our offsprings, the collective memories of what Shanghai was will totally get lost. Grey will dominate. / **Food Shortage, Controlled by Others** / As Henry Kissinger said, 'Control oil and you control nations, control food and you control the people', after the continuously demolishing of the agriculture, Shanghai food supply is half dependent, in another word, controlled by the others. The rapid and flourishing urban development have brought us a new city for the 20th century

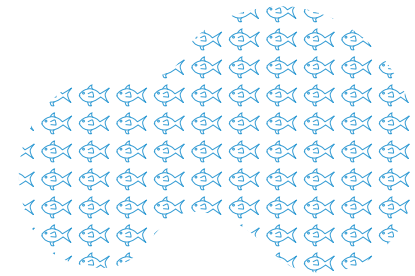
而经济飞速发展的上海似乎已然忘记了这一点。在下一章，我们将探寻上海农业发展的权益之路。/ 上海的未来 / 上海的未来何去何从，食品安全犹如达摩斯达克之剑悬于人们头上。在后面的几章中，

but put us into a deadlock that we might not provide the most basic requirements for our people. / **What the future of Shanghai will be** / However, we still have the chance to offset the mistakes we made. As discussed above, Shanghai used to be green and full of water. Is it possible to retake the agriculture and water back into the city? Is it possible to make the metropolitan to produce enough food for its inhabitants? In order to achieve this goal, we need to modify

我们将根据现有的数据研究，寻求一种改变上海农业生产结构的方法。首先一点在于，我们对于上海未来的目标是什么？需要达到什么样的水准才能消除食品

a lot of things include the policies, plannings and urban designs. In a word, something must be changed. In the following chapters, we will try to make proposals for Shanghai , from the perspectives of policies, urban plannings and urban designs, to achieve the permanent agriculture we used to have in ancient times, to regain the balance of the food supply and food consumption, to retrieve the original indefinitely sustainable loop among city, water and agriculture and to find the new identities that show homage to what Shanghai used to be.

的安全危机？如何才能在现有的农业用地条件下，重新调整粮食生产结构，为上海不停增加的人口提供安全足够的食物？在下一章节中，我们将提出目标以及相关的理论基础。



fishery

**We are Paying Debts** / The imbalance of the human settlements, agricultural systems and the natural ecologies were the results of our extensive development. We are paying debts now. Our environments are killing us. For years Shanghai ranks first in China in the number of lung cancer patients, probably because of air pollution. And our food is poisoning us. People are haunted by the toxic milk, pork and plantations from time to time. Furthermore, we lost green, the greeneries and the water space. The trees and greens have disappeared for years. Even though we have remedied this as much as we can, the average possess per person of green space of Shanghai is still small. And the water disappeared. Even if some survived, they are separated thoroughly from the habitants by walls. For decades, Shanghainese have not swimmied in their own mother river. It is possible that our next generation will forget this feature forever. / **Recall the Memories** / However, Shanghai was not like what it is now. The balance among the three created an indefinitely sustainable system. The sky was blue, the water was green and the food was sufficient. Human being took what they need from the nature and gave back what the nature needs. If possible, we would

现状：危机 / 城市，农业与水三元素间关系的破裂为我们带来了一个危机潜伏的现状。城市的扩张引起的社会问题，水污染造成的健康问题，农产品被污染和食品安全问题等都在警示着我们，我们必须对其有所行动，不可坐而不视了。/ 愿望：回忆过去 / 曾经的上海处于‘永恒的农业’良性循环中，她保持着人类与自然之间的和谐共存。

like to recall those sweet memories. / **The Permaculture: The Modern Practice of Endless Loop between Human and Nature** / Many precedents have thought about retrieving the balance. As we mentioned in the first chapter, Franklin Hiram King was the first in the history to define this process. Later, this loop was called Permaculture, the portmanteau of the permanent agriculture, *see ref.68*. / **The Definition of Permaculture** / 'Permaculture is an approach to designing human settlements and agricultural systems that mimic the relationships found in natural ecologies. Permaculture is sustainable land use design. This is based on ecological and biological principles, often using patterns that occur in nature to maximise effect and minimise work. Permaculture aims to create stable, productive systems that provide for human needs, harmoniously integrating the land with its inhabitants. The ecological processes of plants, animals, their nutrient cycles, climatic factors and weather cycles are all part of the picture. Inhabitants' needs are provided for

人们使用人畜肥给农作物施肥，与现在大量农业化肥相比，大量的减少了排入自然的废物。同样，自然回馈人们洁净的水源，肥沃的土地和优质的环境。三者之间的良性循环保障了人们宜居的环境。/ 目标：现代的‘永恒农业’—朴门 / 面对工业化和城市化，人们显然已经无法回到当初

using proven technologies for food, energy, shelter and infrastructure. Elements in a system are viewed in relationship to other elements, where the outputs of one element become the inputs of another. Within a Permaculture system, work is minimised, “wastes” become resources, productivity and yields increase, and environments are restored. Permaculture principles can be applied to any environment, at any scale from dense urban settlements to individual homes, from farms to entire regions.' *see ref.68*. / **The Intention of Permaculture** / 'The intent is that, by training individuals in a core set of design principles, those individuals can design their own environments and build increasingly self-sufficient human settlements, ones that reduce society's reliance on industrial systems of production and distribution Mollison identified as fundamentally and systematically destroying Earth's ecosystems.' *see ref.69*. Now we find that the idea and intent of permaculture is very the same as what we want in Shanghai, that is to retrieve the balance among city, agriculture and water and create a self-sufficient human settlements. Besides, the flexible scales of

“永恒的农业”于是人们提出了另一个源于中国传统永恒农业，却有别与它，基于现代大环境下的概念‘朴门’。她是一种可持续发展的土地利用设计。通过模拟自然中各个元素之间的互相联系，创造一个可以满足人们需求的稳定生产系统，和谐地联系起一个区域内住民和自然环境。其关键不仅在于各个元素，更在于元素之

permaculture will enable us to apply it in the policies, urban plannings and urban designs. Thus, we would like to borrow this concept to better describe and aid our proposals for modification. While, before using it, let us present its historical development and the precedent practitioners. / **History of Permaculture** / '...the method was scientifically developed by Australians Bill Mollison and David Holmgren and their associates during the 1970s in a series of publications. Franklin Hiram King coined the term permanent agriculture in his classic book from 1911, *Farmers of Forty Centuries: Or Permanent Agriculture in China, Korea and Japan*. In this context, permanent agriculture is understood as agriculture that can be sustained indefinitely. In 1929, Joseph Russell Smith took up the term as the subtitle for *Tree Crops: A Permanent Agriculture*, see ref.70 a book in which he summed up his long experience experimenting with fruits and nuts as crops for human food and animal feed. A revised and updated edition was published in 1950 see ref.71. Smith observed, "Forest -- field -- plow -- desert -- that is the cycle of the hills under most plow agricultures... When we develop an agriculture that fits this land, it will become an almost endless vista of green, crop-yielding trees." ref.72

Smith 间的相互关系。/ **朴门的历史** / 朴门第一次出现是在美国农业经济学家 Franklin Hiram King 1911 年的著作“四千年的农民中：中国韩国日本的‘永恒农业’”中。实际上，朴门便是“永恒的”“农业”这两个英文字汇连接并用。在 Franklin 眼中，永恒的农业是可持续不衰的农法。在 1970 年代中期，澳

洲生态学家 Bill Mollison 与 David Holmgren 为了解决快速扩张而高破坏性的工业化农业产生的问题，开始构思发展一种稳固的农业系统。他们认为，工业化的农业毒害土地、水源、减损生物多样性，并且毁灭了数十亿公吨的肥沃土壤，随之而

on the keyline principle.' see ref.74. / **The Practitioners on Permaculture** / 'In permaculture, practitioners learn from the working systems of nature to plan to fix the damaged landscapes of human agricultural and city systems. This thinking applies to the design of a kitchen tool as easily to the re-design of a farm. Permaculture practitioners apply it to everything deemed necessary to build a sustainable future. Commonly, "Initiatives ... tend to evolve from strategies that focus on efficiency (for example, more accurate and controlled uses of inputs and minimization of waste) to substitution (for example, from more to less disruptive interventions, such as from biocides to more specific biological controls and other more benign alternatives) to redesign (fundamental changes in the design and management of the operation) (Hill & MacRae 1995, Hill et al. 1999)." "Permaculture is about helping people make redesign choices: setting new goals and a shift in thinking that affects not only their home but their actions in the workplace, borrowings and investments" (A Sampson-Kelly and Michel Fanton 1991). Examples include the design and employment of complex transport solutions, optimum use of natural resources such as sunlight, and

来的是自然对人类社会的惩罚。在 1978 年的著作“Permaculture One”中，他们提出了‘朴门’这个概念。这个词汇最初本意即是指“永恒的农业”，但是随后迅速扩大到“永恒系统”的意涵，因为一个能真正维持永续的系统，必然涵盖各种社会方面。/ **朴门的案例**

"radical design of information-rich, multi-storey polyculture systems" (Mollison & Slay 1991). "This progression generally involves a shift in the nature of one's dependence — from relying primarily on universal, purchased, imported, technology-based interventions to more specific locally available knowledge and skill-based ones. This usually eventually also involves fundamental shifts in world-views, senses of meaning, and associated lifestyles (Hill 1991)." "My experience is that although efficiency and substitution initiatives can make significant contributions to sustainability over the short term, much greater longer-term improvements can only be achieved by redesign that steps need to be taken at the outset to ensure that efficiency and substitution strategies can serve as stepping stones and not barriers to redesign..." (Hill 2000) ' see ref.75 / **Other Theories About the Self-sufficient Human Settlements** / Besides the idea of permaculture, there are some other theories that take on the idea of self-sufficiency. / **Autarky** / 'Autarky is the quality of being self-sufficient. Usually the term is applied to political states or their economic policies. Autarky exists whenever an entity can survive or continue its activities without external assistance. Autarky is not necessarily economic. For example, a military autarky would be a state

朴门的实践者，以运作良好的自然系统为范本，致力于修补受损的人类农业与都市系统。这样的想法可被广泛应用，例如从厨房工具的设计，到农园改造。朴门实践者，将这想法落实在创造可持续未来所必须的一切事物上。通常“各种创新发明……往往从注重效率的策略演变而来，（更准确



Photo of Propaganda Poster of Autarky

fig.100

that could defend itself without help from another country. Autarky can be said to be the policy of a state or other entity when it seeks to be self-sufficient as a whole, but also can be limited to a narrow field such as possession of a key raw material.' see ref.76. Forexample, in the scale of a country there was the economical autarky run by Mussolini see ref.77. He wanted to turn Italy into a self-sufficient autarky, instituting high barriers on trade with most countries except Germany. However, the weakness of it is called diseconomies of scale, which indicates a situation that the autarky does not have certain the raw materials, 地控制各种输入，并减少废物产量），接着发展出替代策略（逐渐降低人为干扰中的危害程度；从使用杀虫剂转为生物防治技术，或其他更健康的作法），到最后重新设计（从根本上改变系统的组成与管理方式） (Hill & MacRae 1995, Hill et al. 1999) "

such as oil, it needs so that it costs a lot to produce certain products that related to that kind of raw material see ref.77. / **Autonomous Buildings** / 'An autonomous building is a building designed to be operated independently from infrastructural support services such as the electric power grid, gas grid, municipal water systems, sewage treatment systems, storm drains, communication services, and in some cases, public roads' see ref.78. From the Dymaxion houses see fig.101 by Buckminster Fuller in 1930s to ING's Amsterdam headquarters see fig.102 by Meyer & Van Schooten in 2000s, many designers and groups have participated this movement, such as New Alchemists, Mike Reynolds, Ken Yeang 其他的理论 / 另一些关于自我循环系统设计的理论包括了自治国和自主建筑。一个是从国家的尺度保证全部经济活动不需要外界支援的自给自足钻钻台。另一个则是从建筑的尺度，着手于建筑能源的自给自足。其中都有我们可以学习的地方，比如政府作用的体现与物理环境的合理利用。

and William McDonough. However, it is impossible to attain the total self-sufficiency of everything. For example, eliminating dependence on the electrical grid is relatively simple but growing all necessary food is a more demanding and time-consuming proposition *see ref.78* / **Experience Learnt from the Precedents and Other Theories** / The precedents of permaculture teaches us a lot about how to retrieve balance. First issue is to define the scales of the problem: To what extent we want to modify. It could range

from a household to a community, even a city and region. The scale will influence the methods and techniques. Second, we need to know our goal. Some will only focus on the self-sufficiency of the food; Some on the self-sufficiency of the energy; Some on the whole system among human, agriculture and nature. This will help us to find the right strategy. Third, we must find the key point that could modify the whole system.



Photo of Dymaxion Houses By Buckminster Fuller

fig.101

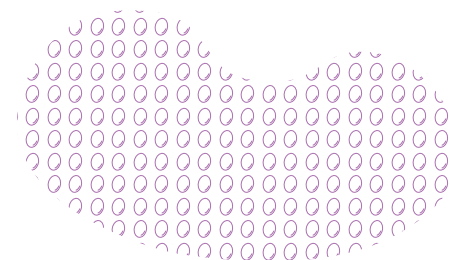


Photo of ING Amsterdam Headquarters By Meyer & Van Schooten

fig.102

Since we will insert something in an existing system, we must find the key issue that could turn the system into a new one without breaking the livings of the inhabitants. Finally, the techniques are quite important. It will help us to find more solutions that make things easier. / **The Methodology of Permaculture** / Well, here we will start to use the idea of permaculture to modify our issues. First, we need to learn from its methodology. It is divided into four steps: 'Modern permaculture is a system design tool. It is a way of: Firstly, looking at a whole system or problem; Secondly, observing how the parts relate; Thirdly, planning to mend sick systems by applying ideas learned from long-term sustainable working systems; Fourthly, seeing connections between key parts.' *see ref.80*. It is clear that interrelations among the elements are crucial. In the following chapters, we will try to apply the methodology of permaculture to the situation of Shanghai, to make a self-sufficient city and to retrieve the original mutually beneficial cycle among the human settlements, agricultural systems and the natural ecologies, and finally to regain the original identities.

朴门的方法论 / 现代的朴门也是一套整体的设计工具，它包含：1.从整体的角度看待某个系统或问题；2.观察各局部之间如何被连结；3.从长期而永续运作的系统中，撷取可借用的想法，而对运作不佳的系统，规划改善方法；4.找出最关键的连结。在下一个章节中，我们将详细的讨论如何利用朴门的概念修改上海的现状，争取重新找回永恒的系统。



egg



**Apply Permaculture to Shanghai** / In this chapter, we will try to use the idea of permaculture to modify the current situations of Shanghai. Our final goal is to retrieve the original balance among the human settlements, the agricultural systems and the natural ecologies. As we discussed above, here four strategies will be used: Firstly, looking at a whole system or problem; Secondly, observing how the parts relate; Thirdly, planning to mend sick systems by applying ideas learned from long-term sustainable working systems; Fourthly, seeing connections between key parts. We will explain how to use them in detail. / **First Phase: Looking at the Whole System** / Actually, in the previous chapters we have already presented the whole system and the problems. We define the system of Shanghai as a cycle of three basic elements. They work together to influence our livings. They are the objectives that we will try to modify. / **Second Phase: Observing How the Parts Relate** / In this phase we must focus on the interrelations among different basic elements. Actually, the three elements just show the facial results. The relations are the real driving forces underneath the appearance.

策略的第一步，整体问题分析，上海的朴门 / 城市的过度扩张使整个系统基本断裂，人们通过非自然的不可持续手段使农业和自然继续为城市发展所服务。我们的目标是通过朴门的概念和方法，让上海不仅找回原本永恒的农业，同时也让整个城市，农业和自然的转换达到良性的循环。 / 第二步：观察各元素之间如何联系 / 在上文中我们已经分析了三个元素所组成的系统现存的问题。然而，三个元素

In order to understand the relations, we propose three pairs of comparisons as in chapter 2: City vs Agriculture, Agriculture vs Water and Water vs City. Through them we hope to find the key issues that control the whole system, which could be modified later by our new proposals. / **The Conflicts Between City and Agriculture** / Shanghai urban development has eliminated lots of arable lands. Many farmers have to turn into citizens harshly. Also, the unlimited usage of the chemical fertilizers reduces the quality of the lands and poisons the agriculture. In the other hand, the less arable lands provide less food for the habitants. The food shortage and insecurity will certainly cause big crisis in Shanghai. Also, the toxic food have already raised huge disorder in the society. To summarize, in order to remedy the conflicts of these two, we need to stick to two important issues, the food shortage and the food insafety. / **The Conflict Between Agriculture and Water** / The water to irrigate the agriculture

的现状只是系统循环的结果，想要改善这种现状恶性循环的症结还在于三元素之间的联系。因此，第二步需要认真分析城市，农业和水之间的相互矛盾症结。首先，我们将分析城市与农业之间的相互矛盾。她们的矛盾分城市对农业的损害和农业反馈给城市的危机两方面。大量化肥的使用使农业用地渐渐受到损伤，贫瘠的土地不断盐碱化最后不得不被放弃。同时城市发展大大吞噬了农业用地，上海周边的农田渐渐地减少了。农产品的质量也随之降低，甚至产生了许多食品安全的恶性事件，造成了无法弥补的伤害。另外，急剧减少的农田面积已使上海不足以为自己的居民提供足够的食物，每天都需要从外省市或者国外进口大量的食物。其次，是农业与水的矛盾，由于化肥的使用，农业污染成为水污染的一大来源，反之，污染的水源在灌溉的过程中继续毒害土壤和农作物。最后，是城市

has been polluted. This further causes the toxic food. In the other hand, the usage of fertilizers forces the plantations to pour the toxic wastes back into the water system. The vicious mutual relation forms. In order to stop this bad loop, we must consider a method to stop the mutual pollution between the water and the agriculture. / **The Conflicts Between Water and City** / Now, Shanghai could only get polluted water from its rivers. This will cause big burden on the waterworks and cost a lot on purification. In the other hand, the city pours lots of wastes into Huangpu River every day and adds up to the pollution. Thus, in order to repair the relations, we need to find a way that clean the water and reduce the wastes. / **Conclusion: The Conflicts Among three Elements** / Now, we need to find a way to solve these conflicts. It should be a generic and multiple beneficial method. It should also cover the issues of the city, the water and the agriculture at the same time. Furthermore, it should combine the broken cycle system again and turn it into a new indefinitely sustainable system. Eventually, it needs to help us regain the original identities.

Third Phase: Planning to Mend Sick Systems to Attain Permaculture / In the third step we propose a popular method to solve these problems, the urban agriculture. Our hypothesis is that as a tool, the urban agriculture could help us to finally retrieve the indefinitely sustainable cycle among the human settlements, the agricultural system and the natural ecologies. / **Our Tool: Urban Agriculture (UPA)** / The Food and Agriculture Organization of the United Nations (FAO), has defined urban agriculture as: "An industry that produces, processes and markets food and fuel, largely in response to the daily demand of consumers within a town, city, or metropolis, on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods, using and reusing natural resources and urban wastes to yield a diversity of crops and livestock." *see ref.81*. Other definitions are 'Urban agriculture is the practice of cultivating, processing and distributing food in, or around (peri-urban), a village, town or city.'*see ref.82*. Urban agriculture in addition can also involve animal husbandry, aquaculture, agro-forestry and horticulture. These activities also occur in peri-urban areas as well.*see ref.83* Urban farming is generally

practiced for income-earning or food-producing activities though in some communities the main impetus is recreation and relaxation *see ref.84*. Urban agriculture contributes to food security and food safety in two ways: first, it increases the amount of food available to people living in cities, and, second, it allows fresh vegetables and fruits and meat products to be made available to urban consumers. A common and efficient form of urban agriculture is the biointensive method. Because urban agriculture promotes energy-saving local food production, urban and peri-urban agriculture are generally seen as sustainable practices *see ref.85*. / **The Benefits of Urban Agriculture** / 'The benefits that UPA brings along to cities that implement this practice are numerous. The transformation of cities from only consumers of food to generators of agricultural products contributes to sustainability, improved health, and poverty alleviation. UPA assists to close the open loop system in urban areas characterized by the importation of food from

rural zones and the exportation of waste to regions outside the city or town. Wastewater and organic solid waste can be transformed into resources for growing agriculture products: the former can be used for irrigation, the latter as fertilizer. Vacant urban areas can be used for agriculture production. Other natural resources can be conserved. The use of wastewater for irrigation increases the availability of freshwater for drinking and household consumption. UPA can help to preserve bioregional ecologies from being transformed into cropland. Urban agriculture saves energy (e.g. energy consumed in transporting food from rural to urban areas). Local production of food also allows savings in transportation costs, storage, and in product loss, what results in food cost reduction. UPA improves the quality of the urban environment through greening and thus, a reduction in pollution.' *see ref.86* / **Health Improvement** / Urban agriculture also makes of the city a healthier place to live by improving the quality of the environment. UPA is a very efficient tool to fight against hunger and malnutrition since it facilitates the access to food by an impoverished sector of the urban population.

**How Urban Agriculture Solve the Conflicts** / Now we know what urban agriculture is. In the following pages we will prove that it is the right key to solve the conflicts among three elements. / **Solve the Conflict Between City and Agriculture: The Food Insecurity of Shanghai** / Since so many provinces will provide food for Shanghai, it is like a spoiled boy unlike to produce food by itself. Actually, many metropolitans such as Beijing, Guangdong, they are all dependent on other provinces. However, this will finally meet a limitation. The closer to the peak the worse the social, economical and political states will be. It is the critical moment to change our attitudes to the agriculture and rethink our policies. Thus, here we propose our idea of Shanghai food policy: Shanghai must feed Shanghai by itself. / **The Introduction of Self-sufficiency** / In order to express the idea more accurate, we introduce a term called 'self-sufficiency'. In the wikipedia, it refers to 'the state of not requiring any outside aid, support, or interaction, for survival; it is therefore a type of personal or collective autonomy'. While, there are two aspects that limit the definition of self-sufficiency. The first aspect is the scale, it means how large is this activity covers *see ref.87*.

For example, it could range from a country to a small household. The second aspect is the goal. It decides what is the final objective of this self-sufficiency. For example, it could be about military forces, economics or food supplies. The scale and the goal of the practice determines the limited forms of self-sufficiency. As for Shanghai, the scale is limited to the whole region of Shanghai metropolitan and the goal is limited to the food problems. / **The Key to Mend the Conflict Between City and Agriculture: Food Self-sufficiency** / Shanghai food self-sufficiency could be explained as: Shanghai metropolitan region does not require any outside aid, support, or interaction, for food supply; it is therefore a type of collective autonomy that provide sufficient and healthy food for its habitants. So, our goal to solve the conflict between city and agriculture is very clear and basic: To ensure that every Shanghainese is able to get enough and healthy food, so called 'Food Security'. In the commonly used definition from the UN's Food and Agriculture Organization (FAO),

food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. *see ref.88* / **Status Quo, Food Insecurity** / However, with current policies and situations, food security of Shanghai is and will be in danger. In the future, more and more people will move into urban area. By 2015, the population of Shanghai will rise to 25 million. To feed a city of this size, at least 15000 tons of food must be produced each day. However, with the current arable lands and the government policies, it is impossible to finish the task by Shanghai itself. Importation of food is inevitable. However, it is very dangerous for Shanghai to depend largely on other provinces. We could imagine three results that could happen for a dependent Shanghai. First, the natural disasters could cut off supply for Shanghai and actually this happens almost every year. The snow, the drought and the flood together attacks the agricultural lands everywhere in China. In 2010, food shortage caused by the spring drought becomes so serious that the Chairman

与水的矛盾，上海每天都会向黄浦江内排放大量的城市污水，同理，污染的水源也不断的向城市发起攻击，危害人们的健康。/ 第三步，从长期而永恒运作的系统中，撷取可借用的想法，而对运作不佳的系统，规划改善方法 / 在了解了上海的水，城市和农业三元素之间相互伤害的关系后，我们将以恢复上海原有平衡循环状态为目标，使用可持续方

法，寻找修补目前状况的方法。我们引入一个修补工具尝试为我们解决现在三元素间的矛盾。 / **都市农业** / 我们希望通过在上海的市中心区引入农业生产，提高上海农产品产量的同时修补各个元素之间不平衡关系。“都市农业”的概念是五、六十年代由美国的一些经济学家首先提出来的。

都市农业是指地处都市及其延伸地带，紧密依托并服务于都市的农业。它是大都市中、都市郊区和大都市经济圈以内，以适应现代化都市生存与发展需要而形成的现代农业。都市农业是以生态绿色农业、观光休闲农业、市场创汇农业、高科技现代农业为标志，以农业高科技武装的园艺化、设施化、

工厂化生产为主要手段，以大都市市场需求为导向，融生产性、生活性和生态性于一体，高质高效和可持续发展相结合的现代农业。 / **利用都市农业解决三元素之间的矛盾** / 我们将进一步分析如何利用都市农业缓和，解决城市，农业和水三者之间的互相矛盾。 / **城市与农业之间的矛盾** / 城市的扩张大量的吞噬农

业用地，这个过程最终导致了上海食品安全问题。 / **上海的食品安全问题** / 根据世界粮食组织的定义，食品安全包括两个方面，一是数量的安全，二是质量的安全。而上海在这两个方面都存在着严重缺陷。首先，根据上文的介绍，上海现在超过一半左右的食物需要

从外部进口，但这就意味着，不可预测的灾难或者变化都会影响到上海的食物链。零九年的雪灾堵塞运输线，一零年的旱灾使全国粮食大歉收，还有每年的洪涝灾害，都会使全国主要的粮食生产省市蒙受巨大损失，于是上海内靠外部城市供给的食品紧缺。随之而来的食品价格增长更是令

Hu Jintao has mentioned the importance of the food security for several times just in half a year. Second, under current speed of Chinese urbanization, one day those fields for Shanghai food supply will turn into urban area and there will be no places anymore. With the shrinkage of the arable lands, the food shortage will or might have already happened in China. Furthermore, not only Shanghai, but also other metropolises in China are expanding. This

means Shanghainese will compete with other people to get enough food from certain 'food production centers' in China. Well, following seller's market could make the situation worse. The prices of food in big metropolises will get higher and higher, as what has already happened in Shanghai *see fig.105*. All could cause the social disorder and distrust of the central government. / **The Limits to Growth** /

Actually, scholars, politicians and public have gradually felt the advent of food insecurity. But as we presented, not a lot of arable lands remain. Even though many strict laws are put on protecting the agriculture, investors and some corrupt governors keep transforming precious green into grey. Someone might propose an idea to continue building more farms in other provinces, such as in Shandong Province, which provides most of the rice for Shanghai. However, this will only delay the tragedies and should be stopped. One day Shanghai will find no more lands in other provinces to grow its food. It is the time for us to find some other sustainable ways to deal with our food supply. In the famous book 'The Limits to Growth', the writers predicted that economic growth could not continue indefinitely because of the limited availability of natural resources *see ref.89*. And the resources of arable lands in the whole China are limited. With the potential urbanization of those developing countries, less and less land could be used for agriculture. / **Key Issues Behind the Conflicts: Agriculture Policy** / There are several reasons cause the current situation

市民不安。根据最新数据，一零年初仅六个月上海食品价格已平均增长了七个百分点。因此，上海的食品现状无论在数量还是质量上都不安全。每次灾难的发生都必定会造成不同程度的社会动荡，我们认识到，食品安全问题已经不是一个经济问题，而是一个关系到国家和政权稳定的政治问题。基于此，

of agriculture policy. First, there is no more land could be developed into arable lands. Second, the agriculture brings little money to not only the government but also the farmer. Economically it is not important. They prevent the government from making Shanghai self sufficient. Thus, in the policies, Shanghai does not need to produce enough food and Shanghai only needs to keep 216,000 hectares of arable lands, which is much less than enough. However, we should

change the policies. The change starts from our attitudes. / **Revise Identity of Agriculture: Economy or National Security** / First, we must know the real identity of agriculture. For a long time, the whole Shanghai has been putting too much attention on the economy. The GDP rules everything and guides the policies. In this circumstance, the less profitable lessprofitable agriculture certainly

is overlooked. But actually, agriculture is not only something about the economy but also the politics. It is the critical to the national security and social harmony. In some sense, it is much more important than the economy, an element deciding 200 million population's lives. Thus, in the first policy change, we would like to propose that, agriculture should be considered as a matter prior to the economy. The so called agriculture economy is only valid when the food supply is ensured. So, in the next step, we will talk about the removal of the surplus food production center and use the spared lands to produce the food that is in shortage. / **UPA: The Key to Food Self-sufficiency** / However, after study of the current agriculture system, we know it is impossible to feed Shanghai by itself with such little arable lands in the suburban area. The UPA could help us to find more lands inside the city *see fig.106*. Despite the future crazy gene techniques that could largely improve the productivity, urban agriculture could be the best way to retrieve the food self-sufficiency. / **Insert UPA: Relocate the Food Production Systems** / Before we start, we need to know how much food

我们提出了让上海粮食自给自足的概念。 / 自给自足的上海 / 也就是，希望上海能够通过自己的资源生产出其市民所需求的所有食物。只让人民最基本的前提，粮食有保障，上海才能继续大胆的发展。而都市农业是城市食品达到自给自足的重要手段。 / 利用都市农业来达到上海食品供应的自给自足 / 在后面几页中，我们将在

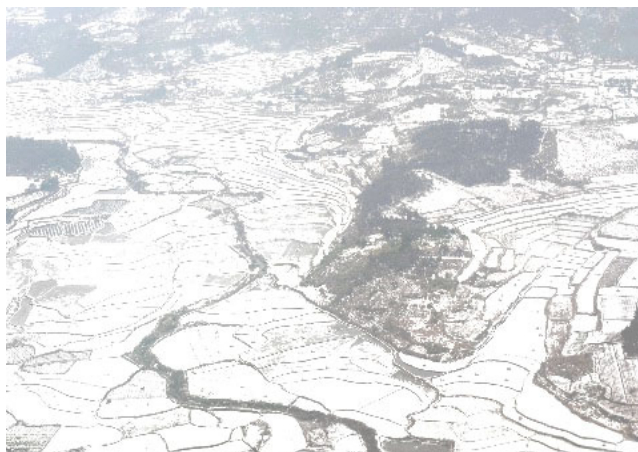


Photo of Drought Arable Land in Yunnan Province, 2010

fig.103



Photo of Snow Disaster, 2009

fig.104

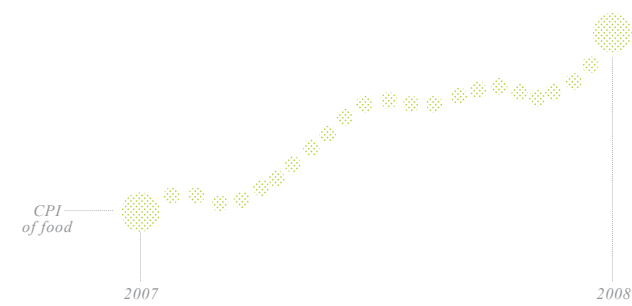
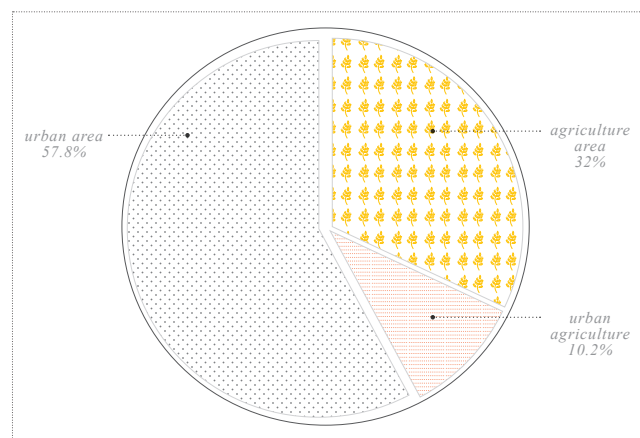


Chart of Shanghai CPI Index

fig.105



Possible Idea of Turning Urban Area into Food Production Centers

fig.106

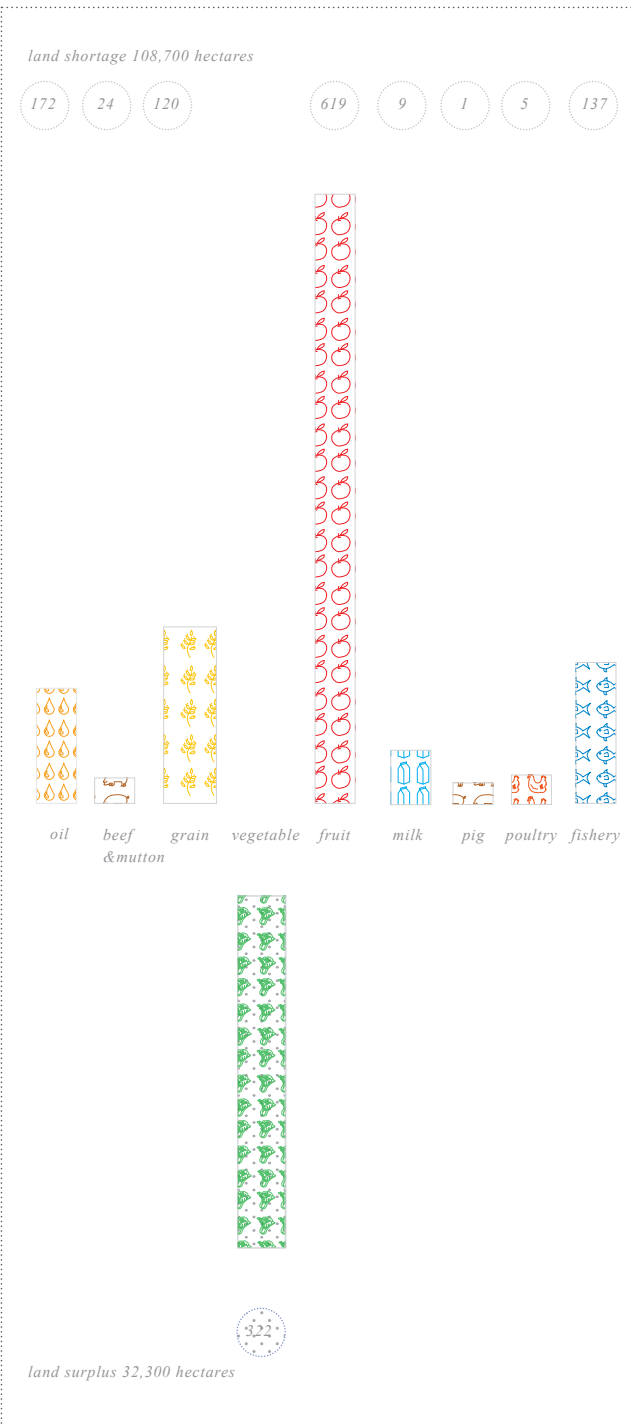


Illustration: The Land Surplus and Shortage To Attain Self-sufficiency of Shanghai fig.107

is in shortage and how many more lands we need to get self sufficient. According to the statistics, all the food production except that of vegetable is not enough. The surplus of vegetable is mainly for the exportation, which bring in the foreign currency. / **Remove the Surplus Vegetables, Save Lands for Other Food** / However, according to the current economical situation of Shanghai and the urgent important of food security, this extra income is not necessary any more. In order to save more lands for other food production, we propose to reduce the food production centers for the vegetables. This could be the first spare land we get to produce those kinds of food that are in shortage. / **The Land Shortage** / With the current productivity of food in Shanghai, we could get the final land shortage, that is 108,700 hectares see fig.107. That means we need another 1/7 of Shanghai total area to fill the gap. However, the positive aspect is that we could transform the surplus vegetables lands for other production and build urban agriculture inside the city centers. Our hope is based on these two spare lands. With inserting the urban agriculture into those lands we could finally achieve

上海市区内寻找可利用的空间进行粮食生产，然而在此之前，需对现有农产品生产用地进行清算。首先，我们要了解目前生产盈余和缺失。如左图所示，蔬菜产量远超需求。由于农业的重要地位，我们不应该考虑多余出口所带来的经济利益，而应腾出蔬菜种植的剩余空间来优先满足食品缺口。因此，这部分用地将



Illustration: Find The Right Food Production To Insert Into Urban Area fig.108

the goal of food self-sufficiency. / **Land Transformation: Our Spare Lands** / Now, we have two parts of 'spare lands' to fill the shortage of food. First is the surplus land inside the greenhouse farmlands. The other part is the urban agriculture lands inside the city center, which will be designed in detail in the later chapter. Thus, it is important to decide which food production could be put in the surplus land or city center according to the diet of Shanghainese

被拿出来重新分配。从目前的耕地量来看，光靠现有的土地无法生产出足够的食品。我们需要从建成的城市中寻找更多的空间来生产食品。都市农业在技术与概念上已有一定成熟度，这使在城市中生产粮食的想法成为了可能。事实上，在上海市中心充满着大量未被充分开发利用的公共空间。这些将是都市农业进入上海适宜的突破口。 / 放入城市

see fig.108. / **Criteria to Find the Right Food for UPA** / Considering the sustainability, environmental impacts and the economy, three criteria are figured out to help us categorize the food production. Besides the food that could be produced in the far suburban area, most of the shortage will be put inside urban center, it is important to do is to find the right crops that suits the centers.

的农业种类 / 引入都市农业首要解决的是，何种食品生产可以放入城市中。为了选取正确的产品，我们给出三个评价标准。首先是这种产品的污染性。在城市中的农产品应该尽量的减少对于周边居民和环境的污染。因此，畜牧业，家禽养殖和奶牛场首先被淘汰，而蔬菜，水果和

The first is that this kind of crop should be of low pollution level. Since each production could cause pollutions to the environment. Such as livestock farms, poultry farms and cow farms, even though the mass production factory helps reducing the emissions, it is still not welcomed by the neighbors. The second criteria is the profitability. The more profitable the better it is to put inside the city. Since the investment of

粮食种植都可列入考虑范围。其次的评价标准在于农产品的生产集约性。在城市中的可再利用空间毕竟有限，我们需要种植在一定空间中产量最大的农产品，以最集约化使用珍贵的城市农业空间。因此，集约化较高的蔬菜和水果生产可考虑放入城市之中，而水产养殖及畜牧业其集约性低，不宜引入。最后一个评价标准

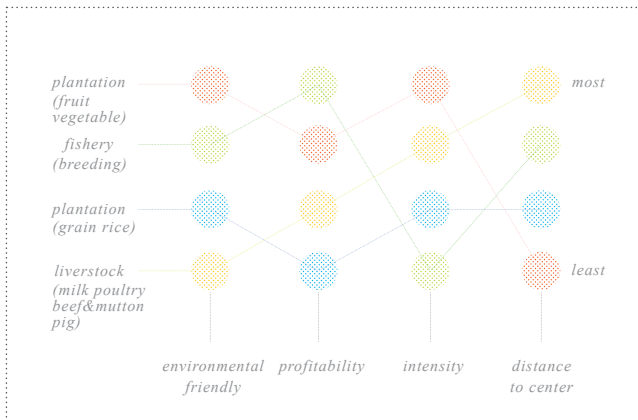


Illustration: The Final Decision of The Selected Food Production in City

fig.109

the infrastructure and the value of lands inside the city are high, only the high profitable food production could help the government and the investors to get back the initial investment. The third criterias is the technical intensity. The more intensive the food production is the

在于未来可能的经济回报。虽然我们在讨论农业时将其的政治影响力放在第一位，但是为了尽量少的减少政府开支，在可以选择的情况下，经济性仍需要考虑。经济效益最高的种类依次为渔产养殖，水果以及畜牧业。/ 总结，都市农业生产的食品品种 / 根据以上环境保护，集约生产和经济效益三方面评价，我们决定在上海的城市中心引入蔬菜和水果生产。这个选择将会带来环境，经济，政治和产量的综合效益的提升。

less space it will occupy. For urban agriculture in Shanghai, we need to find the most intensive crops production mode so that they could be installed and inserted in those spaces that are not in use or change some spaces into mix-usage. / **The Final Selection, The Table of Criteria** / In the table fig.110, we could know that the production of the vegetables and fruits are the most suitable food production that could be inserted into the city center. They rank the top two in the profitability, environmental friendliness and the intensity. So, in the following redistribution of the food production, we will put all the other food production in

the far and middle suburban area and input the fruit and vegetable production to the city center see fig.109. This is the first step to modify the original food production structure. / **The Scheme for the Relocation** / So, in fig.111 it shows the strategy we will use to relocate and redistribute the food production system in Shanghai. In total, we could get 32,300 hectares of arable land in the suburban areas from the removal of surplus vegetable production center. With these lands, the shortage of the food production like livestock, fishery and dairy production could be filled. Furthermore, the shortage of the fruits and the vegetables will be moved into the urban area as the urban agriculture. In order to achieve this, inside the city, we need to find another 64,422 hectares of lands to produce the fruits and vegetables. This is hard but not impossible. Until now, the new food distribution system is set up. With the idea of the priority of food production, we reduce the surplus and input new food centers in and out of the city center to make Shanghai self-sufficient.

重新定位的策略 / 在右边的图表中，我们详细地阐释了改变上海农业整体结构的策略。首先，通过腾出多余的蔬菜生产基地，我们可以获得3万多公顷的原蔬菜农田。然后，将这些农田改建为畜牧业，家禽业，奶业等上海缺失的农业基地以保证这些农产品的自给自足。同时，蔬菜和水果的产量缺失我们将通过城市中心都市农业生产来补足。据估算若按照现在的亩产，需在城市中寻找6万4千公顷土地来产水果和蔬菜以保证自给自足。但如果通过现代无土栽培和集约培养技术，在城市中心所需的实际土地面积将大大降低，而对种植体积会有一定要求，这也符合城市可利用空间纵向多于地表平面的现状。

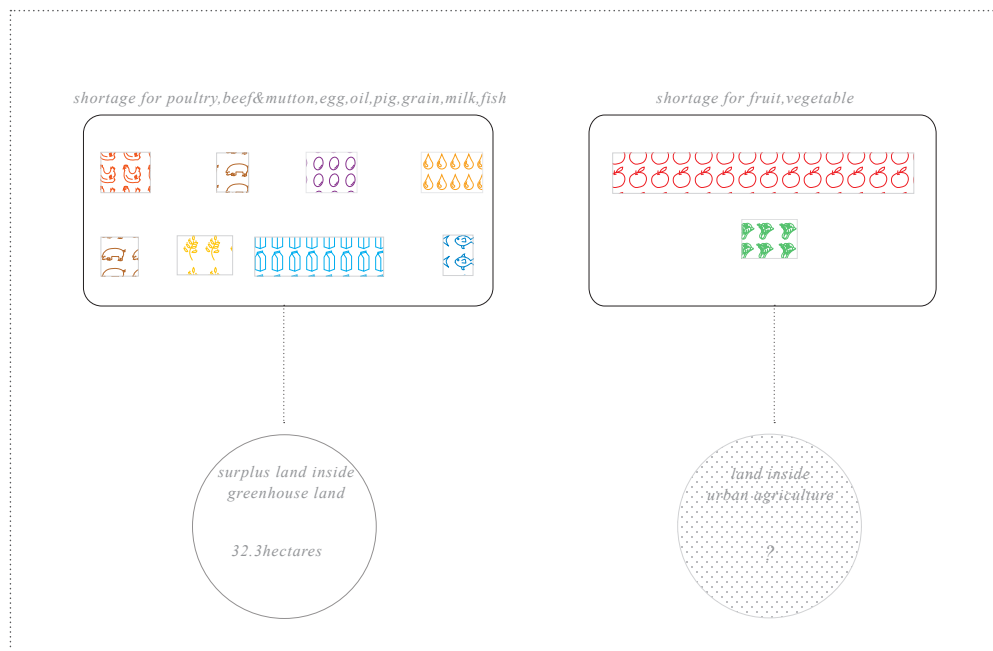


Illustration: The Table of Three Criteria To Select The Right Food in UPA

fig.110

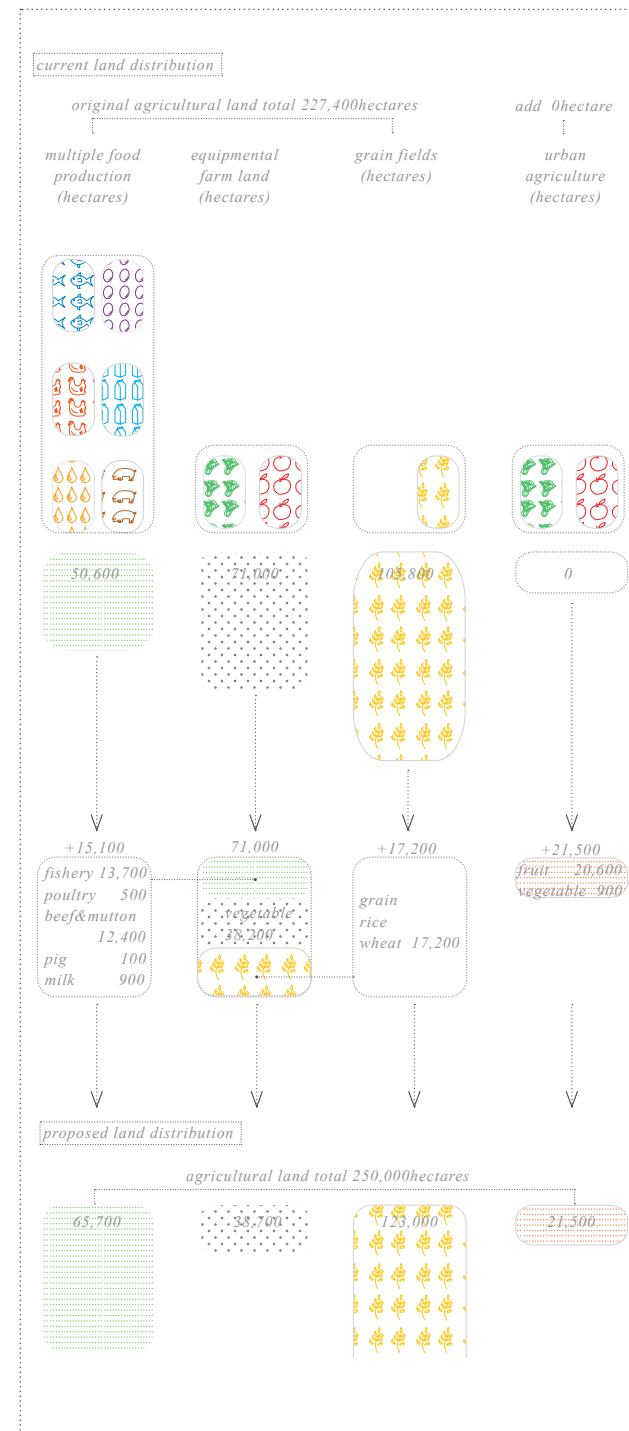


Illustration: The Scheme to Relocate the Food Production Locations

fig.111

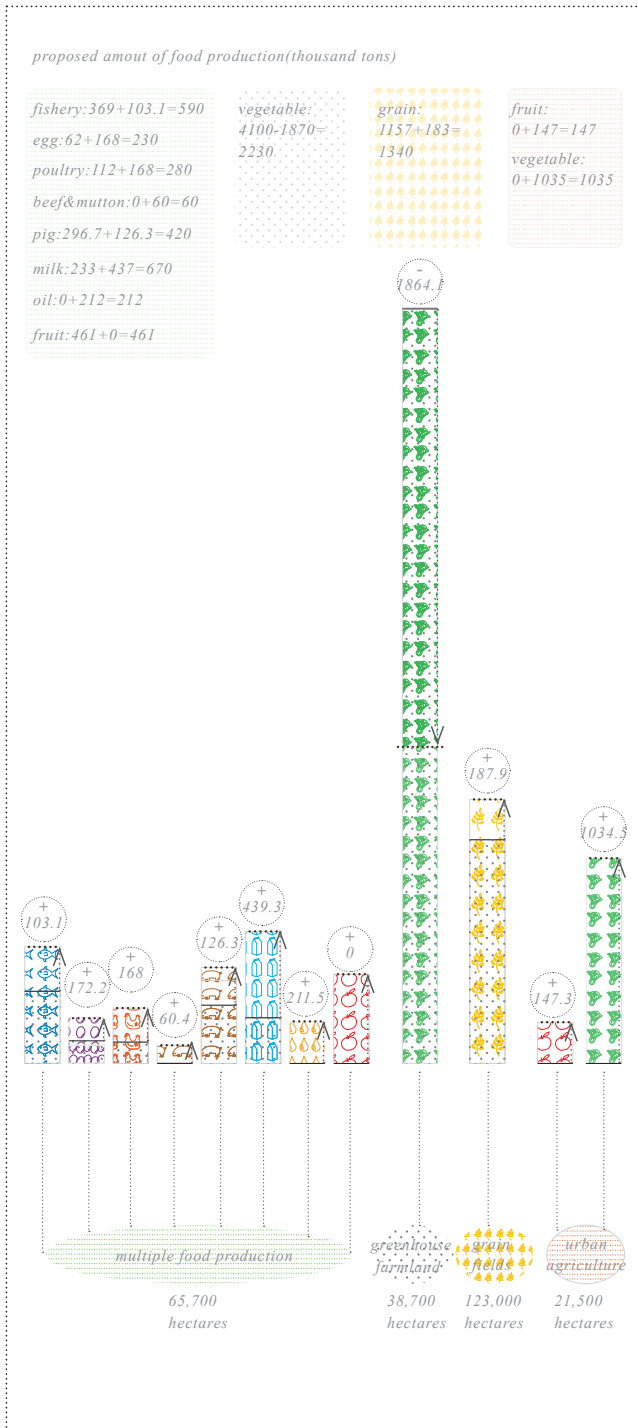


Illustration: The Amounts of Food Production After Relocation

fig.112

**The New Food Production Amount and the Distribution /** In the scheme *fig.112*, we could clearly understand the amounts of the food production supposed to increase and decrease after the modification. The multiple food production will occupy more lands and of course produce more food in fishery, egg, poultry, beef, pork, dairy products and oils. In the far suburban area several big fruit production centers will work as it does now. In the near suburban area, the equipmental farmlands will produce vegetables as before. However, the surplus production will be cut and the spared lands will be used for multiple food production and the grain production. For the grain production, it is a must to keep the 100% supply since it is the main food for Shanghaiese. Thus, the new structure is set. And with this change, the total amounts of the food production will be bigger than the total consumption of the food. This will make Shanghai food supply self-sufficient.

调整后的粮食产量及耕地面积 / 如左图总结, 上海原本的三大粮食生产区将增加为四大产区, 包括远郊多元副食品粮食生产区, 中郊粮食生产区, 近郊大棚蔬菜生产区和新增的市中心都市农业生产区。在面积分配上, 部分的近郊大棚蔬菜生产区将让位给其他上海缺失食品生产, 比如畜牧业, 水产养殖业, 奶业和粮食生产, 而新开辟的都市农业生产区将主要负责集约化, 无污染, 高经济效益的蔬菜和水果生产。在左表中显示了调整之前的生产产量和调整增加或减少的产量以及最后预计的产量。在此番调整之后, 上海的年粮食产量及其种类将满足上海的年消耗量, 真正达到了自给自足。

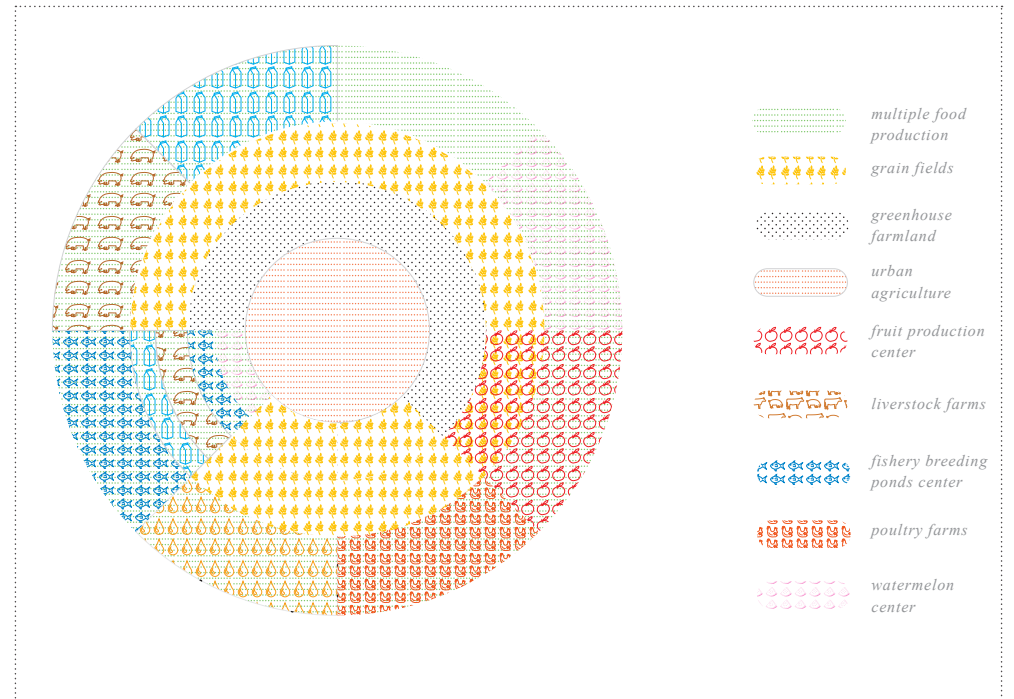


Illustration: The Conceptual Ring Chart of The New Master Plan

fig.113

**The New Concept for the Masterplan /** Now we could jump into the real design of the master plan. Here first we need to modify the conceptual ring chart of the Shanghai metropolitan food production system as we figured out in the previous pages. In general, our modification will keep the original ring structure because firstly it has already become mature and secondly we do not want a sharp and harsh change. So, here are the steps. The first step is to transform part of the equipmental

调整后的概念环状图 / 通过以上的分析, 我们阐释了改变农业生产结构的策略。随之要解决的问题是如何将概念策略落实为设计。我们将分三步走。首先, 我们基于原有的结构概念环图, 生成了新的概念环图: 最中心的城市区域将

farmlands into grain fields to keep the basic food security of the main food of Shanghaiese. This happens in the south west. The second step is to decrease the amount of green house farmlands in the near suburban area and therefore transform those lands into the multiple farmlands to increase the food production such as livestock and fishery. The third step is to move parts of vegetable and fruit production

转变为都市农业生产区, 提供蔬菜和水果。第一环仍然是近郊蔬菜生产区, 但其尺度将减小, 并且西南部部分区域将转化为粮食生产基地作为中郊粮田的延续。第二环是中郊的粮食区域,

from the green house farmlands into the city center, creating the urban agriculture area as shown in the chart *fig.113*. However, the amount of the lands and productions of this part are unknown. This issue will be discussed in detail in the next pages. Thus, the final conceptual ring chart is done. The whole structure is good to keep the same. Otherwise it will be super hard to persuade the governors to accept the idea since huge modification costs a lot.

并且扩大以保证最重要稻米的供应。第三环是远郊的多元副食品基地, 其面积将延伸入第一环, 填补原本缺失的食品生产量。根据这张环图, 我们可以清晰看到重组后上海的农产品生产结构, 达成上海粮食自给自足的最终目标。

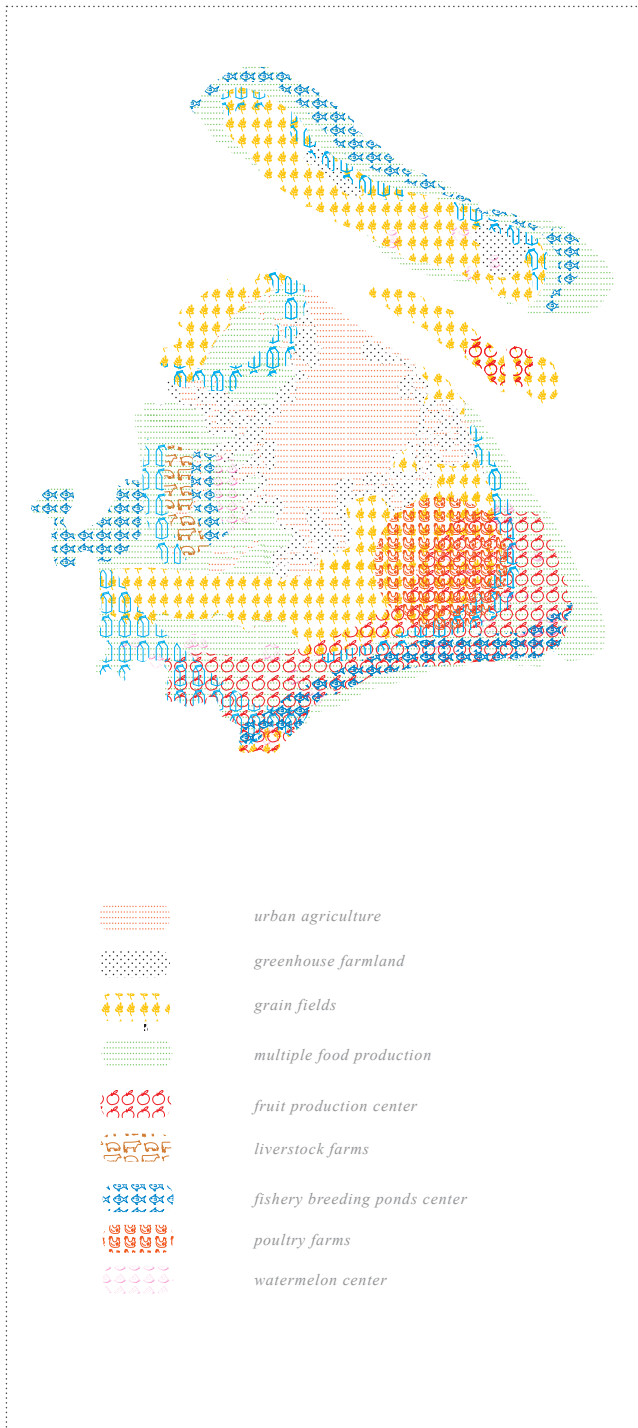


Illustration: The New Master Plan of Shanghai Food Production System

fig.114

**The Urban Agriculture in New Master Plan** / Here we propose our final modification of the master plan, the one that combines the traditional agriculture in suburban area and new urban agriculture in the City Center *see fig.114*. The details of the changes are listed below: The grain fields in the middle suburban area in the south west will extend to the north east, occupy part of green house farmland to create larger continuous fields in order to increase the grain food supply and ensure the basic main food supply. In the west, the multiple farmlands will extend to the east to create more farms and centers for livestock and fishery. This reduces part of the green house farmlands area. In the center, the urban agriculture will bring in the fruits and vegetables production. And this part will be presented in the following pages, which will include the urban design and architecture design. Also, the urban agriculture part is key to realize the dream of bring back the green identity back into the center of

融入都市农业后的总平设计 / 最后，我们提出了关于上海农产品生产布局的总体设计。如左图，在新的总平面中，中心城区加入了都市农业，西南部的粮食基地将向东北部延伸，而远郊的多元副食品生产基地将向中心延伸。原本已被抛弃的畜牧业也会回到中郊与远郊。总体而言，通过引入都市农业和重组农业生产结构完全可能达到上海食品自给自足的目标。在下面的几页中，我们将详细阐述都市农业在上海市中心生产的可能性及其未来的展望。同时，结合旧时上海的绿蓝交织的画面，重焕人们记忆中上海那份独特的秉性。

Shanghai since it will gradually change the landscape and the vision of our current city spaces. / **Solve the Conflict Between City and Agriculture: The Food Insafety of Shanghai** / As we present above, the presence of low quality food, sometimes even poisoned, has been one of the biggest social and economical problems in China. It is a big issue for the government to provide qualified food for the habitants. The urban agriculture could be a solution. Firstly, with UPA, food will be produced locally. This will largely reduce the transportation time. Thus, the habitants could enjoy fresher food. Also, it is much easier for Shanghai government to control the local food process and production centers. Thirdly, with the soilless techniques that usually used in urban agriculture, the plantations will grow in a carefully controlled circumstance. As we know, the pollution of plantation comes from two parts, the air and the soil. The controlled soilless culture green house could solve these two problems. / **Solve the Conflict Between Agriculture and Water: The**



Photo: Controlled Green House of Soilless Culture

fig.115

**Mutual Pollution** / The pollution wil kill us slowly and indirectly. When the farmers use the polluted water to irrigate the agriculture, the toxic elements in the water will be absorbed. Through bioaccumulation, these agriculture will poison us gradually *see ref.90*. While, we could use soilless culture to clean the water before we use it. Actually, there are many plantations that could clean the industrial polluted water. / **Use Soilless Culture to Clean the Water** / For example, the water hyacinth is extremely tolerant of, and has a high capacity for, the uptake of heavy metals, including Cd, Cr, Co, Ni, Pb and Hg, which could make it suitable for the biocleaning of industrial wastewater. In addition to heavy metals, Eichhornia crassipes can also remove other toxins, such as cyanide, which is environmentally beneficial in areas that have endured gold mining operations. Water hyacinth is also observed to

treatment cells of living technology. Their root zones are superb micro-sites for bacterial communities enhance nitrification in waste water *see ref.91*. Besides it, oenanthe decumbens, Ipomoea aquatica Forsk and Lolium Multiflorum Lam could also clean the water *see ref.92-93*. With this technique, we could use soilless culture not only produce but also clean. In the other hand, the soilless culture will reduce the wastes that agriculture produces during the production. This will relieve the pollution pressure. / **Solve the Conflict Between Water and City** / The human settlements pour a lot of wastes into the water and water punishes us with the pollution. However, the UPA could help to reduce the mutual damage. Firstly, some part of the wastes could used for the soilless culture. For example, the basic soil could made of human wastes. Also, before sending to the polluted waterworks, some part of waste water could be cleaned by soilless culture first. In the other hand, we could clean the polluted water with soilless culture before we use it.

食品的安全 / 在解决食品数量问题后，都市农业还可以提高食品生产的质量。首先，本地食物将大大减少搬运时带来的损失。另外，本地食物可能更好的监管，保证质量。 / 农业与水之间的矛盾 / 利用无土栽培技术，都市农业可以净化污染的水源。同样的，农业废水也可以通过都市农业进行净化后再排入自然界之中。这样就能切断相互污染的链条。 / 水与城市之间的矛盾 / 同样，城市与水之间的相互污染关系也可由无土栽培的植物净化功能得到一定程度缓解。综上，都市农业的引入是缓解三元素之间对立矛盾关系的关键。

**The New System After Modification**  
 / After inserting urban agriculture into the city, we hope Shanghai could retrieve its original indefinitely sustainable cycle. In the *fig.116*, we propose a new cycle chart. It is the revised version of the current imbalance cycle. With the UPA, we hope most of the conflicts among three elements could be solved. In the clockwise, via soilless culture purification, agriculture could get cleaner irrigation water from the natural system. This could help farmers to produce healthier food. Then, with UPA, Shanghai could produce sufficient

food for its habitants. Also, the UPA could ensure the food safety. The previous toxic food will be eliminated. Then, part of the city wastes will be recycled by the soilless culture and some waste water will be cleaned by it. In the counter-clockwise, the natural system could provide better water resources for our human settlements. With UPA, our city will be in harmony with agriculture. And the wastes of human will be used again in soilless culture. Then, the waste water of agriculture will be cleaned by some plantations.

With the UPA, our hypothesis could come true. It relinks the originally broken elements in a sustainable way. Furthermore, with UPA, our city could have more diversity and possibly, retrieve the original identities, the greens. Thus, food will be sufficient and safe, water will be clean and the city will be more beautiful. In the following chapter, we will design the buildings, facilities and equipments of UPA inside the Shanghai center. We would like to improve our environment not only in the statistics but also in the visual aspects.

新的循环 / 通过朴门四个步骤的修改，首先我们遵循了原有的三个元素的循环关系。其次我们分析了他们之间互相的矛盾。随后，我们引入了都市农业这个工具来弥补三个元素间的矛盾。我们希望得到一个新的循环：都市农业净化水源，灌溉农业。传统农业和都市农业一起为上海提供足以自给自足的食物来源。而城市污水又可送回都市农业进行处理后排放入自然。而自然资源通过都市农业也可城市提供更洁净和经济的水源，同时，城市将尽量为都市农业提供空间，减少化肥的使用。最后，无土栽培技术又会大量减少农业污水，降低对自然的压力。至此，一个新的循环产生了。在下一章中，我们将设计都市农业的空间可能性。

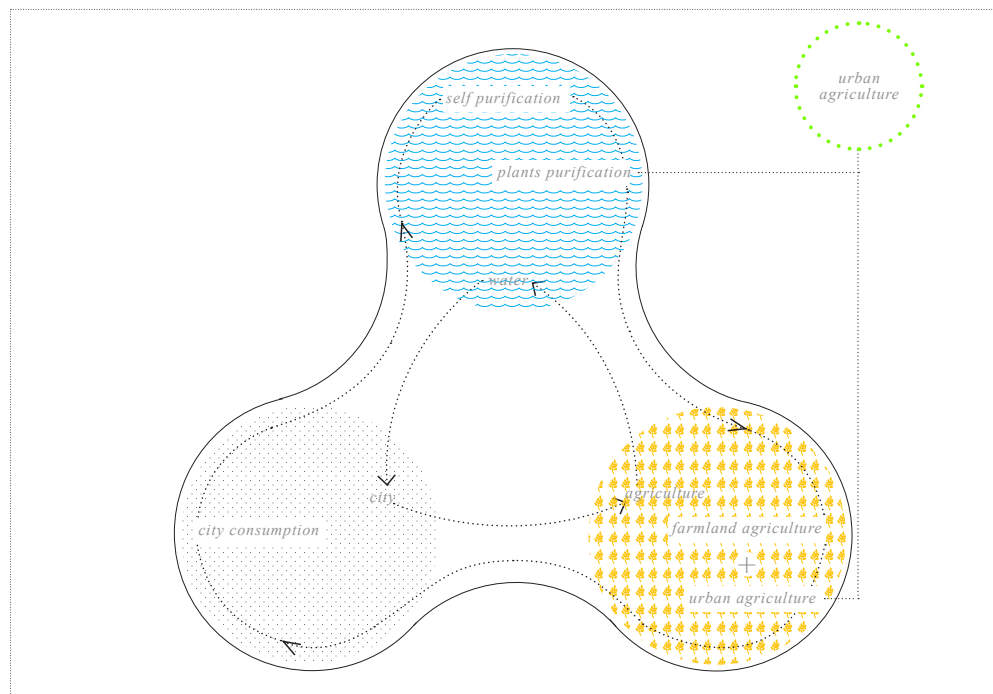
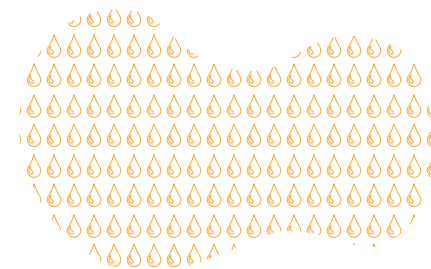


Illustration: New Balance Among The Human Settlement, Agricultural System and Water Ecology With the Help of Urban Agriculture

fig.116



oil



**Design Part** / In this chapter, we will come down to the earth and realize the modern permaculture for Shanghai. The previous chapters provide us the clear idea of what we need and what we will design: the urban agriculture system inside Shanghai metropolitan. However, before designing, we need to know the basic parameters of our design tools, the soilless culture equipment system. With the production center, we will introduce another system that supplies the water for the soilless culture centers. These two systems will form our final urban agriculture system in Shanghai. / **Part One: Soilless Culture / Spaces Requirements of the Soilless Culture** / At first, we need to know how soilless culture works. Through technical documents *see ref.94, ref.95 and ref.96*, we get the details of soilless culture equipments, which could help to design the exact spaces in the city center. In general, the soilless culture could be put in the places without sunlights. It could be packed inside many layers. However, it needs to stay in a controlled

environment instead of being open to the city ambience. In *fig.118* there is a typical 9m by 9m soilless culture centers. The enclosed rooms will provide the stable temperature, clean airs and essential nutrient liquids for the plants. The workers will walk among the shelves to operate the products. Between the layers of the shelves, the plants situate together on the soilless basement. The nutrient liquids are provided through the pipes and the lights are given by the artificial lights above the plants. / **The Productivity** / Soilless culture has many advantages such as: No soil is needed; The water stays in the system and can be reused- thus, lower water costs; It is possible to control the nutrition levels in their entirety- thus, lower nutrition costs; No nutrition pollution is released into the environment because of the controlled system; Pests and diseases are easier to get

rid of than in soil because of the container's mobility. However, inside these the most important feature is its stable and high yields *see ref.97*; Currently, the most advanced soilless culture in China has 3 times of the original productivity in vegetable and fruits productions. Currently, the productivities of vegetable and fruit are separately 57.75 tons per hectare and 16.72 tons per hectare. The future soilless culture productivity will rise up to 173.24 tons per hectare and 50.17 tons per hectare. As we know from the previous pages, the shortage of the vegetables in Shanghai is 147,300 tons and that of fruits is 1,034,500 tons. Divided by the soilless culture productivities, the land shortage in Shanghai is 850 hectares for the vegetable production and 20,620 hectares for the fruit production. Altogether it is 21,500 hectares *see fig.117*. With the above information, the following task for us is to find those lands inside the concrete forest in the center of Shanghai to produce sufficient food.

设计部分 / 在本章中，我们将详细设计上海市中心的都市农业。 / **无土栽培技术** / 首先，我们需要知道都市农业所需要的空间要求。为了满足无土栽培技术。我们首先提供九米乘九米无土栽培空间，接着，无土栽培需要可以控制的室内环境，同时，层叠的种植方式可以最大限度的利用空间。资料显示，上海先进的无土栽培技术可以三倍于普通农业的产量。因此，我们只要在城市中找到相当于21500公顷的空间就可以达成上海农业自给自足的目标。 / **绿色回归** / 合理的设计和布置无土栽培房将会为城市提供更多的绿色背景，为上海带回绿色。

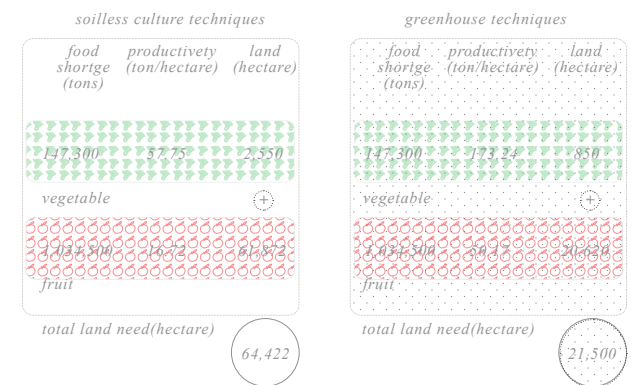


Illustration: The Comparison of Land Shortage

fig.117

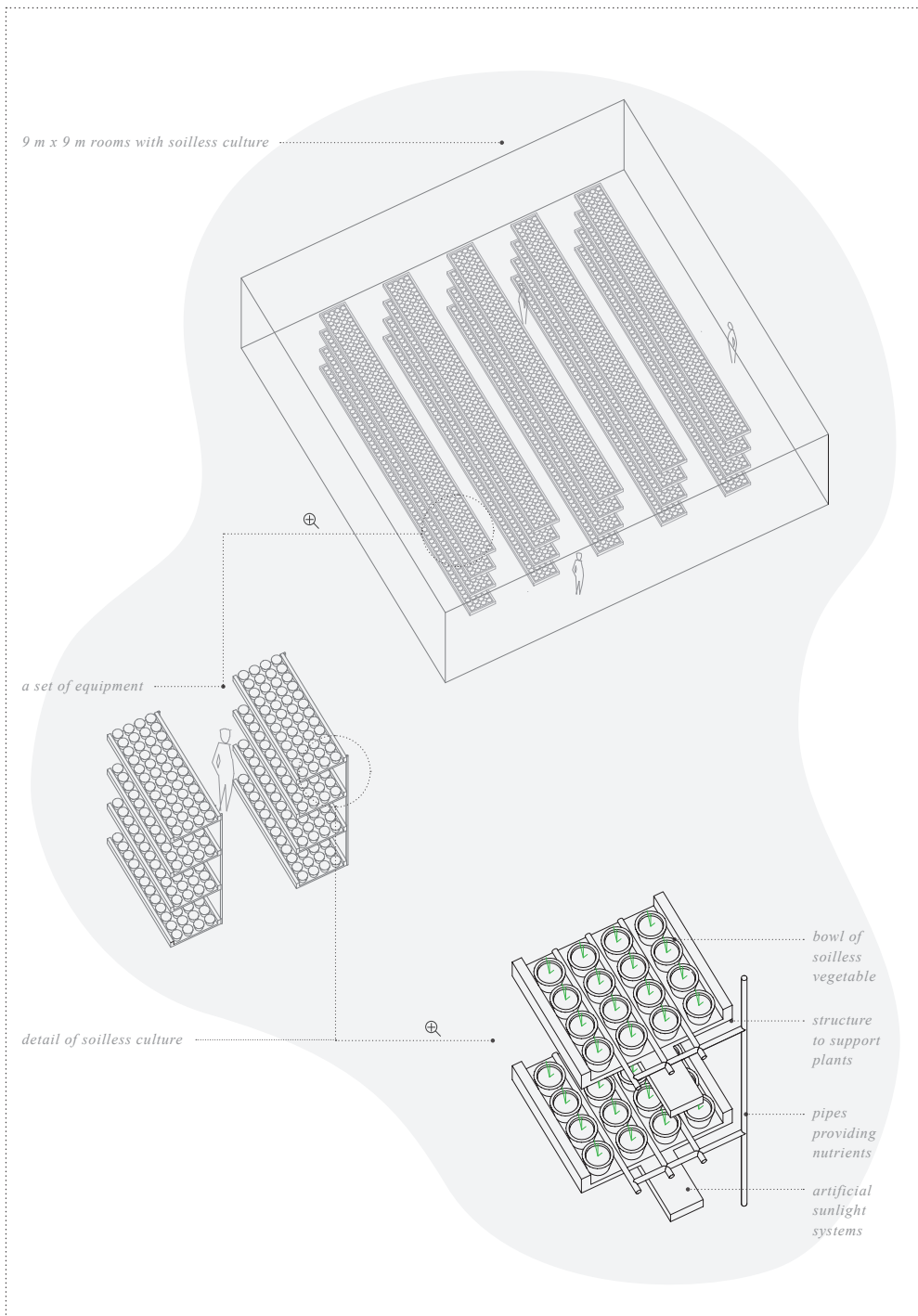


Illustration: Techniques of Soilless Culture For Fruit or Vegetable Production

fig.118



Map: The Heights of Rise and Ebb of Huangpu River

fig.119

**Part One: Supply Pipes** / As we presented in the previous chapter, there two key roles of urban agriculture. One is to produce sufficient food for Shanghai; The other is to clean the polluted water for human settlement, agriculture system and natural ecologies. Thus, we need to supply our soilless culture centers with the natural water from Huangpu River. While, there are many ways to do it. We have several criteria. First, it will use renewable energy. If we create a new system that consumes more energies, our efforts will

都市农业供水网 / 如上文所提，都市农业的无土栽培技术也可用于净化水。因此，我们需要将黄浦江水引如城市中进行净化。 / 空中水渠 / 我们为上海的都市农业设计了一套供水系统，我们称之为空中水渠。她将直接把黄浦江水输入城市中。

be in vain. Second, it should improve the environments of Shanghai city center. Since this system will not only supply the water for soilless culture, it also change the urban spaces somehow. Third, it needs to present

the identity of Shanghai. As part of the infrastructure, it could be another landmarks or labels of Shanghai. Thus, we propose a pipe system which links our mother river to the soilless culture centers inside Shanghai. Of course, we will try to reuse



Photo: The Over Ground Pipes As Landscape in Berlin

fig.120

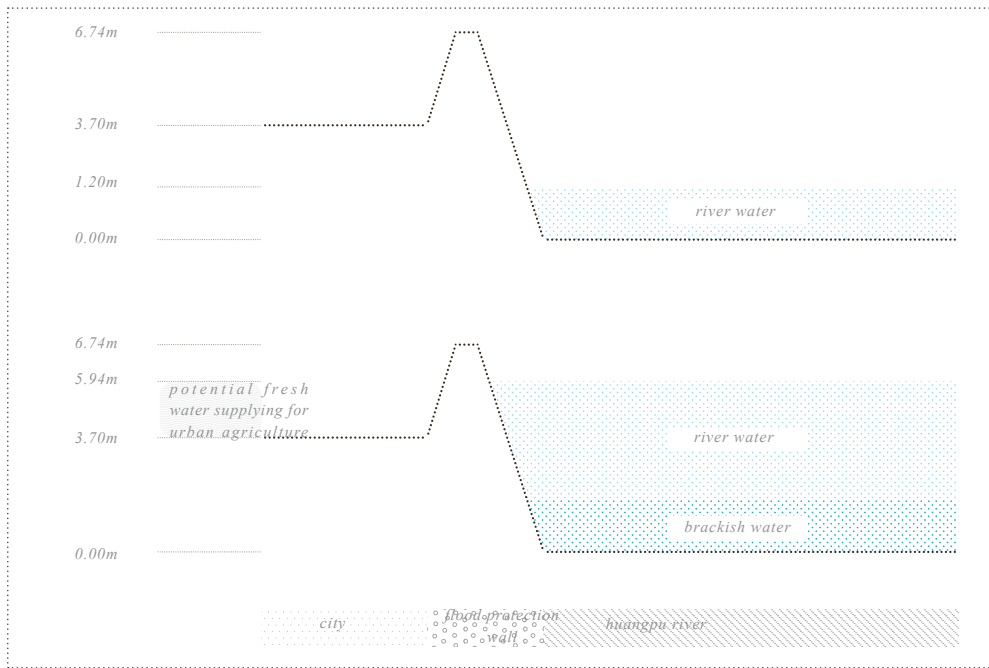


Illustration: Section of Typical Flood Control Wall in Shanghai

fig.121

the tidal power to support the system. / Reuse Natural Tidal Power to Run the System / Nowadays, the rivers are blocked by the flood control walls. It is because that every year there are around 100 days that the river level will be over the average Shanghai altitude *see fig.119*. This bad news is a good news to our system. This means each year we have 100 days that the system could be filled with natural water by the tides. At the same time, we will build the turbine electricity generators in the pipes. When the tides rise and fall, the pipes could produce energies and save them for those days that

潮汐的再次利用 / 水管的输水将使用潮汐的能量。上海每年潮汐高度超过4米的天数在100天左右。这意味着我们在这100天内可以利用潮汐自然的力量将黄浦

tidal level is lower than the height of pipes. / The Improvement of the Urban Spaces / Actually, this is old idea. There are many case studies in European cities. Those flying pipes over the street not only carry waters but also create special and attractive urban spaces *see fig.120*. / The Retrievement of The Original Identity of Shanghai / As we know, Shanghai had two identities, the immense agriculture fields and dense water networks. With the soilless culture,

江水引入栽培室内，进入到无土栽培中心后进行净化，之后可送入农业生产或者城市输水管。/ 上海城市性格的回归 / 同无土栽培一样，空中水渠也帮助上海寻回原本性格。都市农业直接引入了曾经在城市中的农业和绿色，而水渠则用隐晦的手法引入水的元素。我们希望都市农业能够在生产足够农产品同时，唤起人们对老上海城市乘性的记忆。

we could help Shanghai to retrieve the green scenery inside the city center. However, the other identity, the water is not so easy to recover. The original creeks have expanded to three layers viaducts, roads and metros. With the pipe system, we propose an subtle way to realize the retrieval inside the center. Even though it does not look like river, it works the same. It is a metaphor, showing homage to the original identity. They will be the new creeks and rivers flying in our urban spaces. With the green soilless culture, they will become modern permaculture of Shanghai.

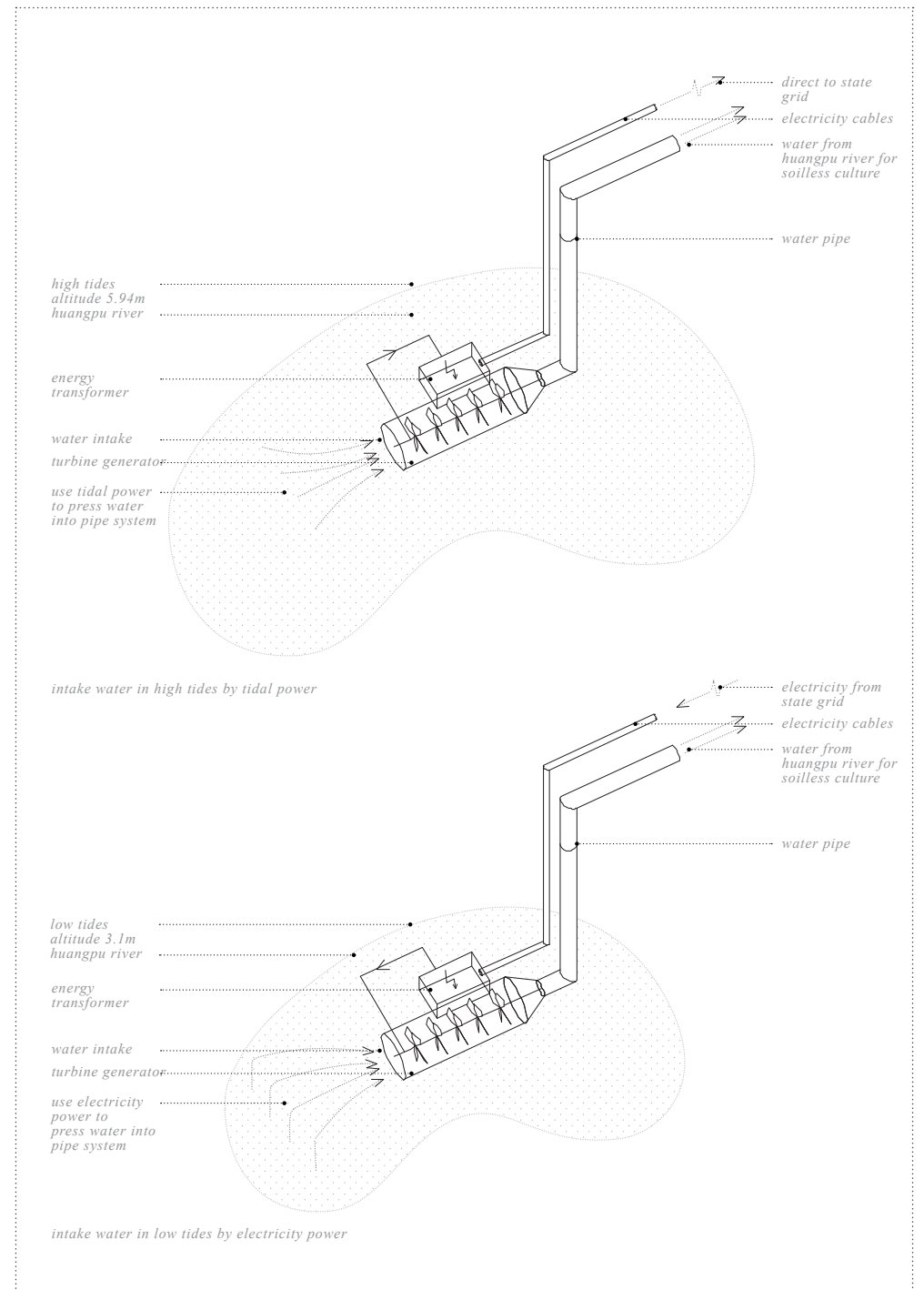


Illustration: The Techniques of The Intakes of Pipe System

fig.122

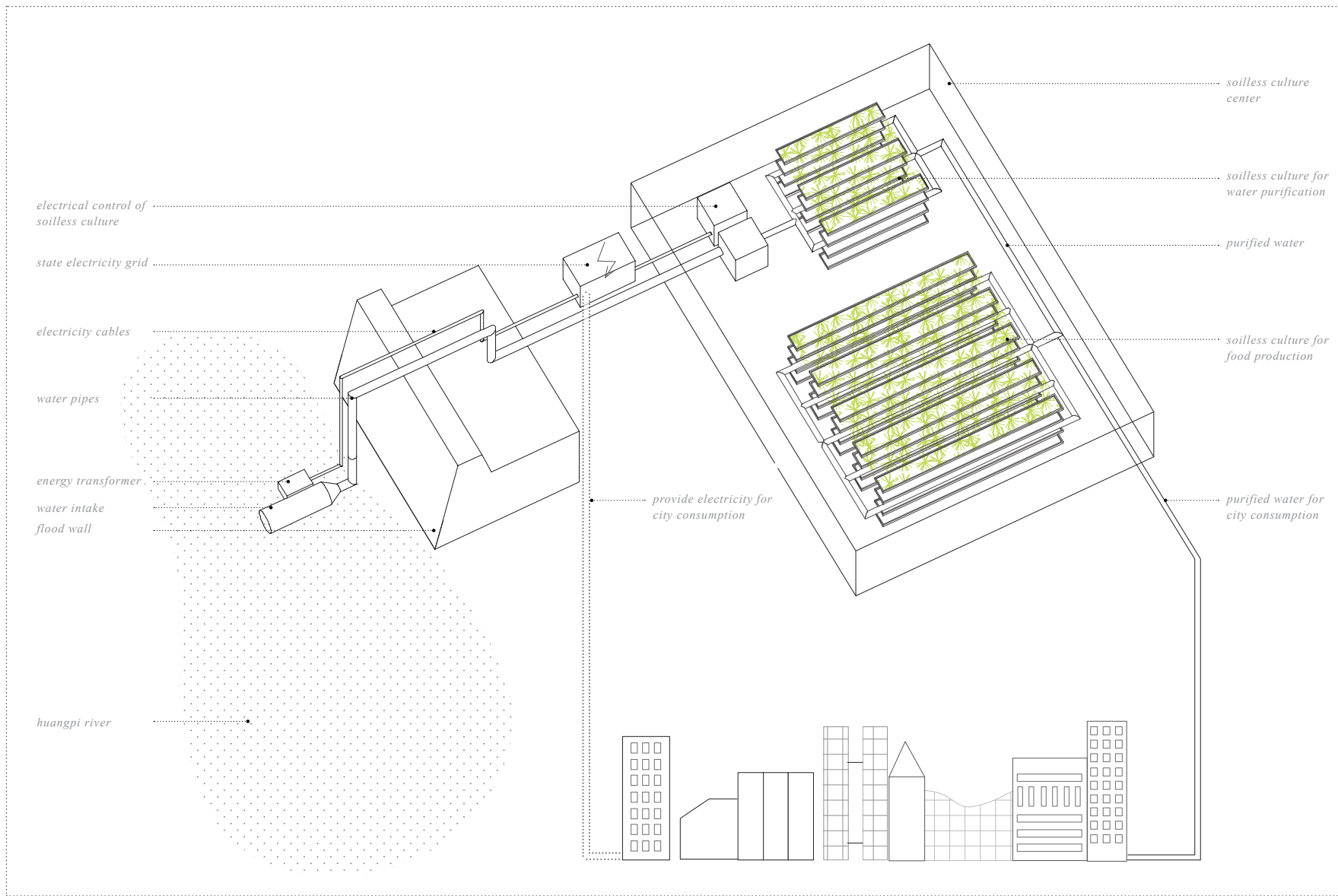


Illustration: The Whole System of Shanghai Urban Agriculture

**The Whole System of Urban Agriculture in Shanghai** / In *fig.123*, it shows the final system of urban agriculture. It includes two parts, the soilless culture centers and the water supply pipe systems. When the tidal level is higher than the pipes, the water from Huangpu River will be pressed into the city center for soilless culture production system. The rise and fall of the tides will produce electricity for future use when the tidal level is low *see fig.121-122*. While, the soilless culture system will collect the polluted water to the purification center where cleaning plantations situate. After being cleaned, part of the water will come to the edible plantation production center. The other will come inside the city water supply system. They together forms the new landmarks for Shanghai. Furthermore, they are the keys to retrieve the original cycle in a new modern permaculture system. Now, we know the techniques to realize the UPA. Then, we will start to pick the lands inside Shanghai for UPA.

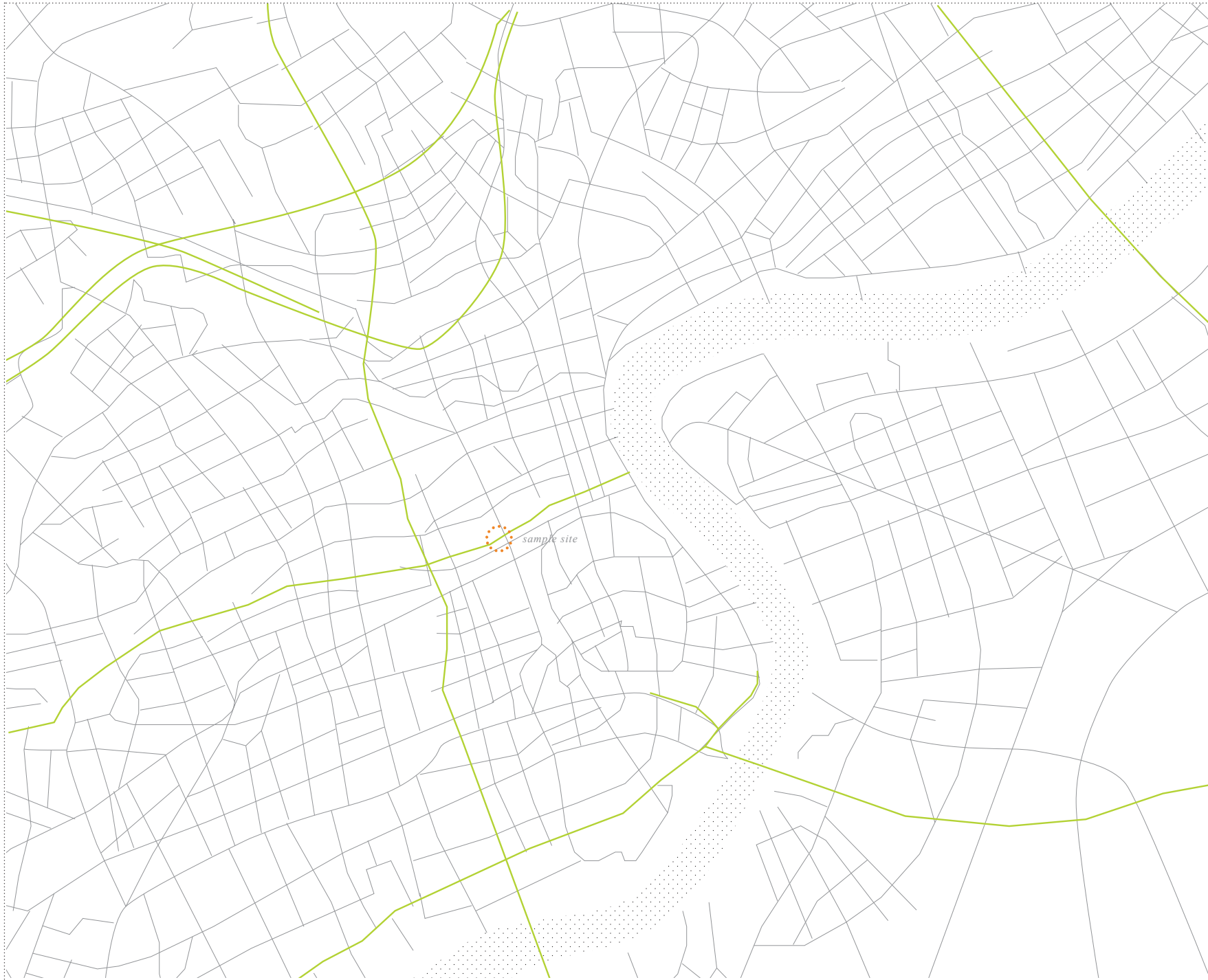
**Three Principals to Select the Sites** / As an addition to the current environment, the new soilless culture production centers should be carefully placed. Here we will

propose three principals that help us to find the right place to grow the food. The first criteria is not to delete the original structures and elements. Since most of the lands in the city are occupied and in use, it will cause big mess and new problems to the citizens if we replace a certain building with our new structures. A new design is supposed to cause as few problems as possible. The second criteria is to check to whom the structures and lands belong. In China, it will be much easier to add or change something in a public building or place. With the agreement of the top executors such as mayor, the public facilities will be changed. While, for those buildings that rent by the private, it is a tricky task to persuade them to accept something new and public inserted into their places. The final criteria is to build something to improve the environment, not worsen. The urban agriculture should do multiple benefits to the city. By three principals, we choose three places inside the city center to build the soilless culture production centers. They are the spaces under the viaducts, the spaces on the roofs and the spaces in the public parks and greeneries. In the following pages, we will present the details design of the soilless culture centers in these spaces.

fig.123

选址的三原则 / 在清楚了都市农业的技术要求后, 我们将在市区中选择恰当的区域空间。为选择适当的地点, 我们提出三个原则, 第一, 不损坏现有的建筑或者设施, 第二, 只利用公共用地中的闲置空间, 不征用私人用地, 第三, 提升现有

环境质量, 为上海市民提供更具多样的城市空间。因此, 我们在上海市中心内找到了三类适宜用地, 一是上海高架下弃置无定义空间, 二是公共建筑的屋顶空间, 三是公园和城市绿地中的部分空间。在下面几页中, 我们将详细阐释这几种空间与都市农业的结合方式。

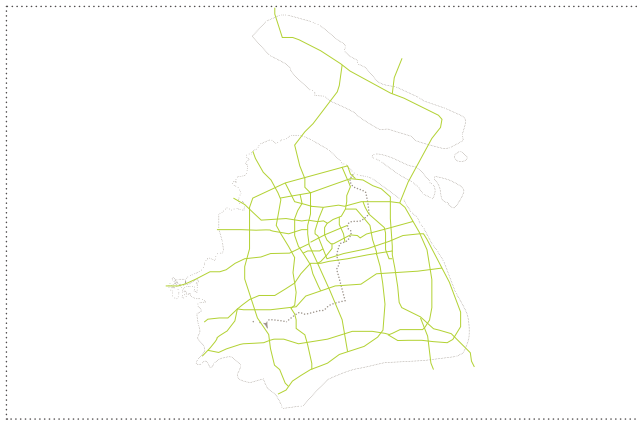


Map: The Viaducts Spaces in City Center

fig.124

The First Site to Build the Urban Agriculture. Spaces Under the Viaduct / According to the three principals, the first site we choose is the space under the viaduct. Firstly, it is public. All the viaducts and roads in China are invested by the government. They are public properties and operable by the Shanghai executors. Secondly, it is free. The usage of the spaces under the viaduct has already been discussed by many scholars. Here, no agreement is made. Currently, they are places for the homeless, for the temporary parking and for the storage. Thirdly, the new soilless culture centers will improve the environment under the viaducts. The well controlled building and the green scenery inside will provide much better views for the citizens than the current grey and dark unused spaces. According to the statistics *see ref.102*, the total length of the viaducts in Shanghai is around 80 kilometers and this number will increase hugely in the future. In the *fig.125*, we point out all the viaducts in the region of Shanghai metropolitan. They are the arteries of the city, linking the outside and inside. In the *fig.124*, we map the their exact locations in the city center of

第一选址，高架下的弃置空间 / 上海的高架长久以来一直是大都市的一大标识。然而，其下部的空间常被市民诟病。我们希望通过引入都市农业，合理利用起高架下部的空间，最大限度的提升其空间利用率的同时，为上海的城市环境提供更多的绿色，为上海市区的居民生产更多的本地蔬菜水果。如左图所示为上海市中心现有的高架分布。



Map: The Viaducts Spaces in Shanghai Metropolitan

fig.125



Illustration: Table of Calculation on The Spaces Viaduct Provide for Food Production fig.126

Shanghai. It is clear that they cross the very heart of the city and form the continuous landmarks. Actually, the first impression of many aliens on Shanghai is the amazing space under the interweaved viaducts. And our urban agriculture projects will be placed in this map, the heart of Shanghai. / **The Areas and Productions Provided by Viaducts** / After mapping the location, here we would like to know the exact numbers. How many areas viaducts could provide and how much food could be produced? As we know, the total length of viaducts are 110 kilometer. Taking that the average width of them are 30 meters and the average height is 12 meters, the total footprint of viaducts will be 5 square kilometers and the average floors of the soilless culture centers underneath will be 4 storeys. However, the viaducts in the center occupy 40 percentage of the total length. So, the final estimated area in the center is around 2,000 hectares. With productivity of vegetables and fruits, the possible production of them is separately 346,480 tons per year and 100,340 tons per year see fig.126. Even though it does not cover all the food shortage, it at least remedies the shortage of the vegetables.

高架提供的空间面积及预测食品生产量 / 上海的高架总长在八十公里，在未来的几年内仍会增加，如果按照平均桥面宽度30米，平均净高12米来计算，上海的高架下可利用总面积可以达到八千公顷。由于我们所改造的区域只限与城市中心区，因此，可以利用的面积约二千公顷。通过无土栽培技术，这些空间可以为我们提供大约35万吨的蔬菜或者10万吨的水果。

**The Selected Samples of the Viaduct** / In order to express our vision of the spaces clearly, we will propose a sample project. So, in the fig.127, a typical viaduct in the center is selected. The site is in the south of the People's Square, which is the very heart of Shanghai. It is called Yan'An Viaduct. Previously it was a natural creek and the boundry among the British Concession, the French Concession and the old Shanghai Town. After 200 years, it becomes one of the very first viaducts in Shanghai and the most important artery that links the west districts to the east districts. Here we pick a span of the viaduct, which is 30 meters, and its related environments, such as the buildings around and the roads underneath. The photo fig.128 shows its condition. It is a typical view of all the spaces under the viaducts. They are negative spaces, with unused and blocked places underneath and the buildings on the road side have to face the boring grey concrete. No one will use it and this causes a big waste. In the following pages, we will try to create a new structure to make the best use of the spaces, to provide the fresh local food with a soilless culture center and to improve the environment with greenery.

案例设计，延安路高架与云南路交界口 / 为了详细的展示对于上海未来远景的展望，我们选取延安路高架某段作为案例设计。延安路高架作为上海最早的高架道之一，连接东西城，位置重要。然而其下部空间常年来处于废置状态，成为市中心的整体环境的一个瑕疵。我们将在这个空间中插入无土栽培蔬果基地，为城市提供绿色的同时为民众生产更多新鲜食品。



Satellite Map: The Sample Site, Part of Yan'An Viaduct

fig.127



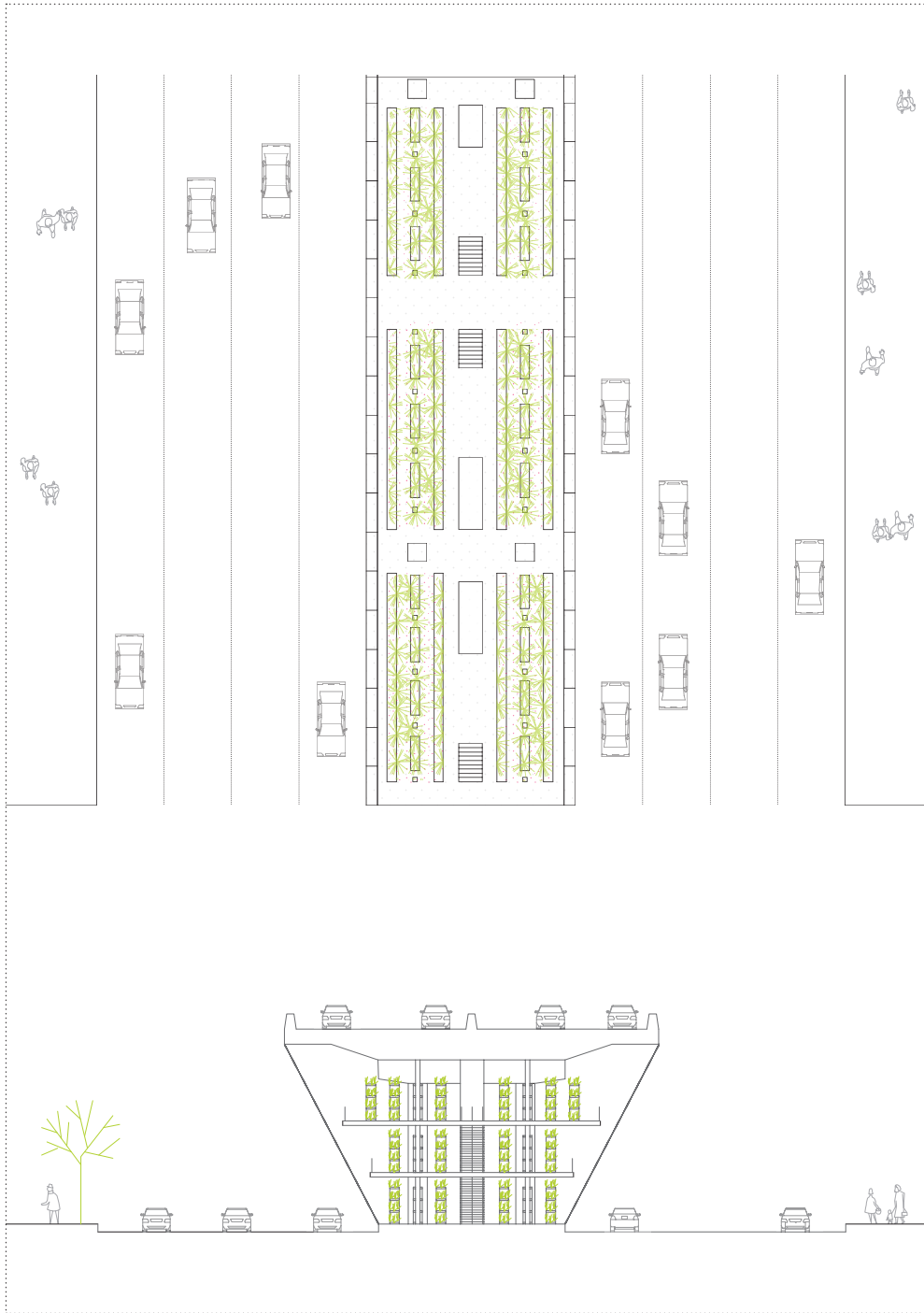
Photo: The Sample Site, Road Under Yan'An Viaduct

fig.128



Photo: The Aerial View of Viaducts of Shanghai

fig.129



Up: Ground Floor Plan of Soiless Culture Center Under the Viaducts  
Down: Cross Section of Soiless Culture Center Under the Viaducts

fig.130



Up: Part of Yan'an Viaduct in the Center of Shanghai  
Down: Soiless Culture Production Center Under the Viaduct

fig.131



Photomontage: The New Vision of The Spaces Under the Yan'An Viaduct

fig.132

The New Vision of the Spaces Under the Yan'An Viaduct / After modification, the total vision of the spaces under the viaducts will be changed. The unused spaces will be covered with a new, neat and intensive structure. Inside there are  
 改变后的延安路高架，司机视角 / 新的设计将呈倒梯形，最大限度的利用高架下部空间，同时利用高度分多层集约化生产

soilless cultures that provide local fresh food for the residents. Furthermore, the scenery the building creates is like a new greenery along the road. The buildings will not any more face the boring grey but a dynamic green.  
 无土栽培的蔬菜水果。其通透的玻璃空间既能隔绝外部污染源保证内部的无污染生产又为城市增添了新的绿色背景。





Photomontage: *The New Vision of The Spaces, Birdview of The Joints*

fig.133

The New Vision of the Spaces, Birdview of the Joints / If we view the viaducts from a higher perspective, the scenery will be more amazing. The original grey phenomenon will be changed. The green structure will continuously change the viaducts, bird's-eye view overall effect / Soilless cultivation base added, adding green to the city, originally abandoned, the dim bottom space is renewed vitality.

affect the viaducts, turning them into positive spaces in the city center. And with the help of the advanced soilless culture, we could produce a big amount of food in those compact and efficient production centers. The new city environment it constructs will change the impression of Shanghai for citizens and tourists. The viaducts will no longer give people a dim industrial feeling, she will become a part of the city's vitality.



Map: The Roofs Spaces Could Be Used in City Center134

fig.134

The Second Site to Build the Urban Agriculture. Spaces On the Roof / According to the three principals, the second site we choose is the space on the roof. Firstly, it should be the roofs of the public facilities. Considering the right of the usage, it is much more tricky to build something on the private facilities than on the public ones. While, with public roofs, the government could do whatever they want, efficiently and thoroughly. Secondly, it is free. Nowadays, there are many roof gardens in Shanghai. We just need to change these non-functional greenery into functional greenery. They could provide the scenery, the sustainable effect and the agricultural products at the same time. Thirdly, the new soilless culture centers on the roof will improve the environment of the whole city. Imagine one morning you open the window, the scenery is full of green instead of grey. The top of the buildings are uniform as a whole and dynamic inside. Also, it provides same sustainable function as the roof garden does. According to the statistics *see ref.103*, there are two kinds of places in the city could be put a roof soilless culture centers. They are public buildings

第二选址，公共建筑的屋顶空间 / 从任何角度鸟瞰上海，在感受其高楼凌厉繁华的同时还有夹杂着那种大都市灰暗。上海的屋顶一直以来是展现多样性的舞台，但是如今的情况似乎已经矫枉过正。我们将通过改变城市中心大量公共建筑的屋顶空间，在创造新的无土栽培基地的同时为城市上层空间增添绿色，既统一城市面貌又尝试着找回上海的那一抹绿意。

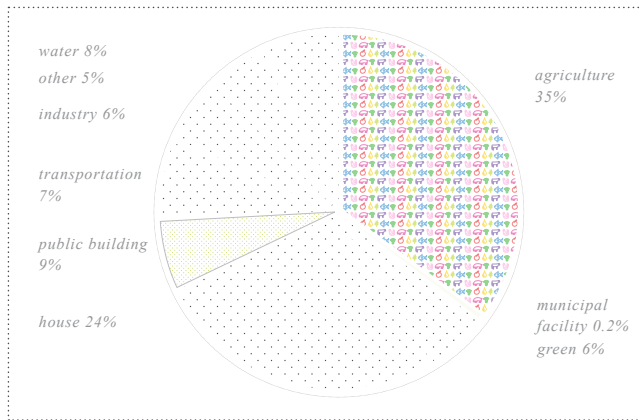


Chart: The Land Usage of Shanghai

fig.135



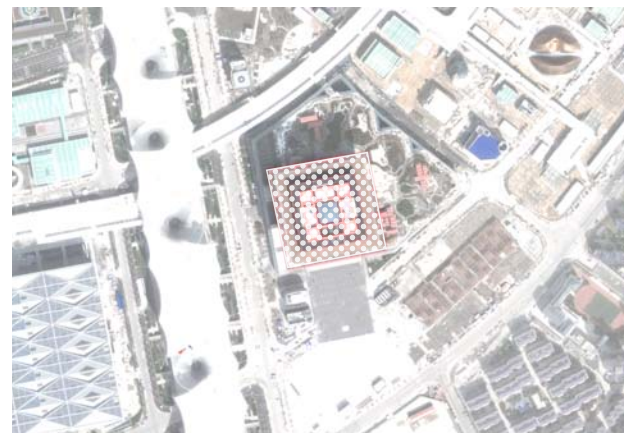
Illustration: The Table of Calculation of the Spaces Roofs Provide for Food Production fig.136

and municipal facilities. As shown in *fig.135*, the public buildings occupy 9% and the municipal facilities occupy 0.2% of the total Shanghai metropolitan area. However, we will only think about those areas in the city center. With the above statistics, the roof areas of the public places are mapped in the *fig.134*. Since most of the important municipal facilities and public buildings such as libraries, cultural centers and bureaus are in the center, we have a lot of spaces for food production. / **The Areas and Productions Provided by Roofs/** After mapping the location, here we would like to know the exact numbers. How many areas roofs could provide and how much food could be produced? According to the statistics *see fig.136*, the footprint of the roof in the city center is around 29,699 hectares. Considering the productivity of the vegetables and fruits, the productions are separately 5,127,900 tons and 1,485,000 tons. They provide huge amounts of food productions which largely exceed the current food shortage. Thus, it will not only provide sufficient food for Shanghai but also give potential spaces to meet the future need of the increasing population.

公共建筑屋顶提供的空间面积及预测的食品生产量 / 总体来看, 上海公共建筑的面积占了总面积的百分之九。但是在此我们只考虑市中心的部分。根据计算, 上海中心总的公共建筑屋顶面积大约在3万公顷左右, 如果按照一层高度计算, 在无土栽培技术下, 这些空间可以产出513万吨的蔬菜或者148万吨的水果。这将远远的高出了上海现在实际的食物缺失。

**The Selected Samples of the Roof** / In order to express our vision of the spaces clearly, we will propose a sample project. Here we choose the biggest public buildings ever in the history of Shanghai, the China Pavilion of Shanghai EXPO 2010 *see fig.137*. Because of its special forms, which resembling the shape of the traditional Chinese building structure, it provides an enormous area on its roof. Nowadays it serves as a big roof garden. However, we would like to transform it into a soilless culture center after EXPO *see fig.138*. It will provide huge amounts of food for the local people but also create a new scenery. Also, it is a metaphor of an addition to the theme of the EXPO, 'Better City, Better Life'. A metropolitan like Shanghai should never leave the agriculture behind. Without food, there is neither city nor life. Furthermore, we will create a new overview of the center to express our idea of a new green city. Currently, the birdview shows a dense and grey city, full of skyscrapers *see fig.139*. We could see the Bund, the People's Park and the Pudong Lu Jiazui Commercial Center. However, in the future, with the roof soilless centers, it will change its identity. It is a big step to turn from green to grey.

案例设计, 上海世博会中国馆的屋顶 / 为了详细的展示对于上海未来远景的展望, 我们选取了上海市中心最大的公共建筑, 上海世博会中国馆作为改造的案例。在会后, 我们希望将顶部的屋顶花园转换为屋顶无土栽培生产基地。在产出本地食物, 增加绿色的同时, 更希望传达一个关于世博会主题的另一理解: 城市, 一旦离开了农业, 未必能是人民的生活更加美好。



Satellite Map: The Sample Site, Roof of China Pavilion

fig.137



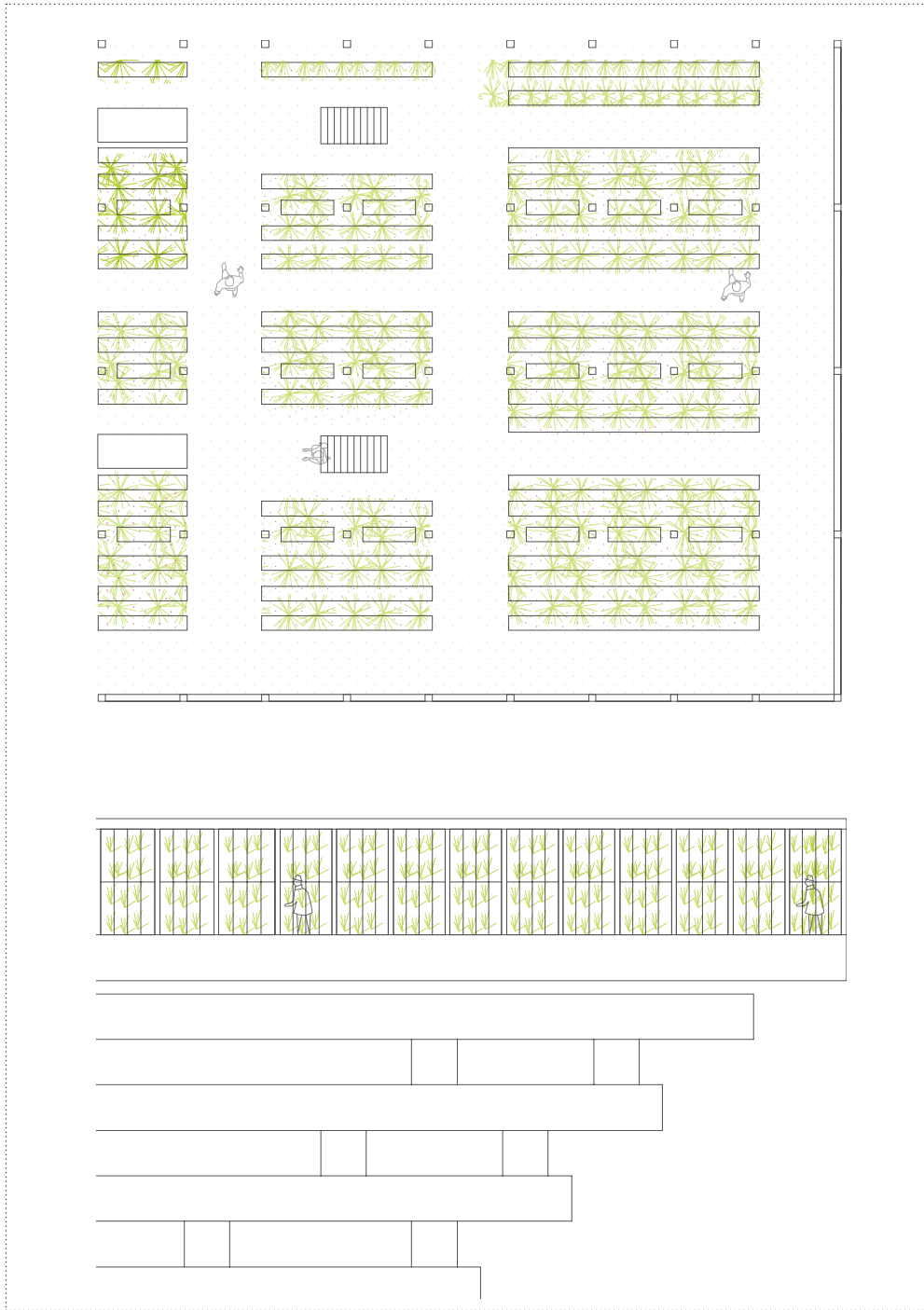
Photo: The Sample Site, China Pavilion

fig.138



Photo: The Aerial View of Roofs of Shanghai City Center

fig.139



Up: Ground Floor Plan of Soiless Culture Center On the China Pavilion  
Down: South Elevation of Soiless Culture Center on the China Pavilion

fig.140



Up: Soiless Culture Production Center On the China Pavilion  
Down: Details of Soiless Culture Production Center

fig.141



Photomontage: The New Vision of The Spaces On The Roof, China Pavilion

fig.142

The New Vision of the Spaces On the Roof, China Pavilion / The roof spaces on China Pavilion render us a great opportunity to produce local and fresh food inside the EXPO site. The final design will not  
改变后的世博会中国馆屋顶 / 中国馆独特的造型和庞大的体积为我们提供了大面积的屋顶平台，而且，充足的阳光

affect the original functions. The roof garden will be transformed into a roof soilless culture center. Also, if possible, we would like to apply this concept onto all the other buildings in the EXPO site.  
也为蔬菜水果生产提供了宝贵的自然条件。我们坚信，城市与农业的和谐发展才能让人们的生活更加美好

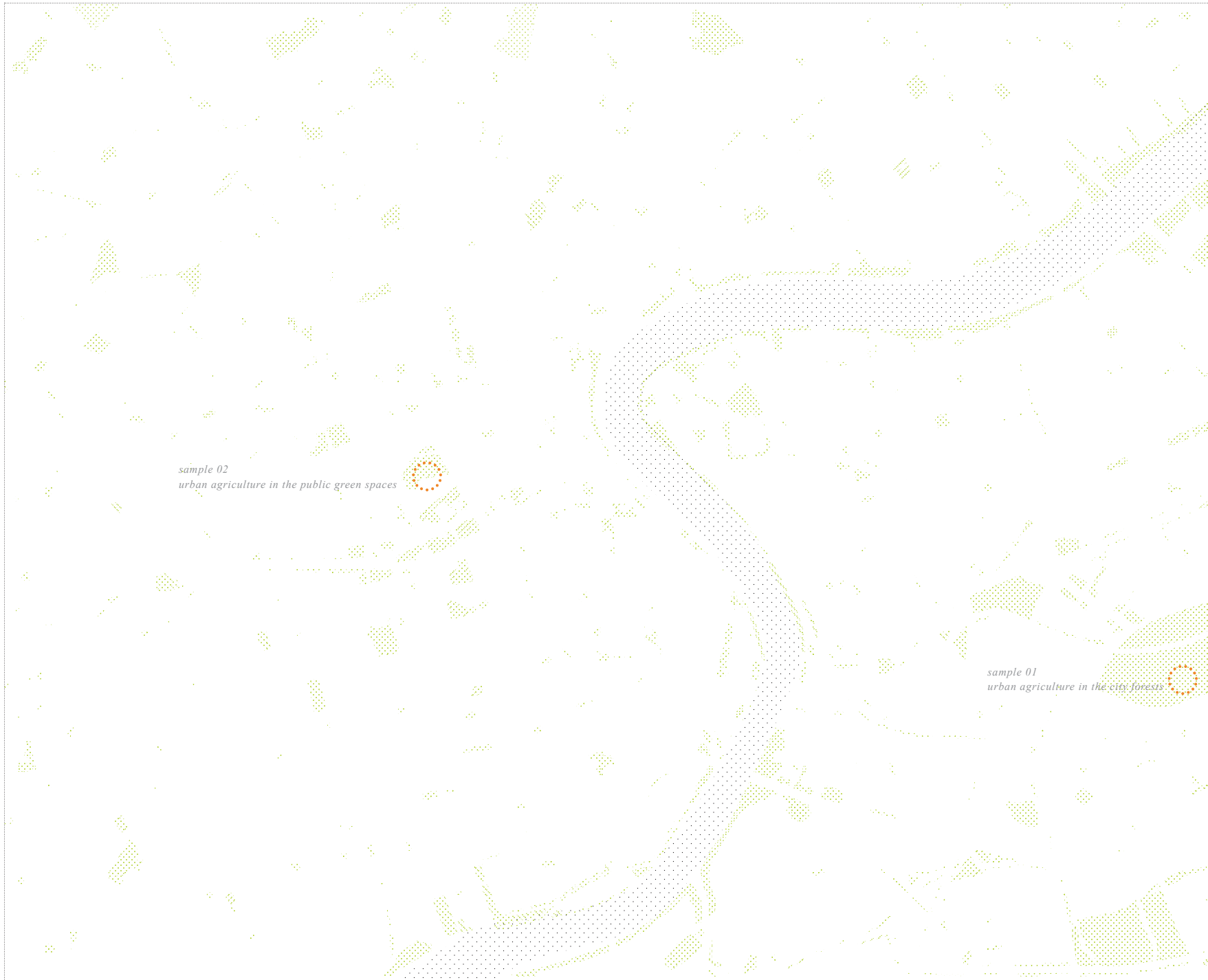


Photomontage: The New Vision of The Spaces On The Roof, The City Center

fig.143

The New Vision of the Spaces On the Roof, The City Center / After modification, the city center of Shanghai will keep its diversity but in a more uniform way. The green roof top of the public buildings will utilize efficiently all  
改变后的上海市中心鸟瞰 / 一旦我们讲农业搬上城市屋顶，上海的风格立刻改变了。当人们早晨起来打开窗户，映入眼帘的是一片片

the spaces, provide food for the residents in the city center, create green scenery and increase the thermal ability of the buildings. With these new features, the feeling of Shanghai will be changed. The grey is changing to green.  
的绿色。大片的屋顶暖棚为城市提供农产品的同时，增加了建筑的热工效应，改善了城市景观，更为上海找回了失去的绿色。



Map: The Spaces in City Public Greens

fig.144

The Third Site to Build the Urban Agriculture. Spaces in the Public Greenery / According to the three principals, the third site we choose is the space in the public greenery. Firstly, it is public. All the public parks and greeneries in the city center are invested and owned by the government. Thus, the executors could modify them freely. Secondling, most of the public green spaces are free. In China, the public green is not accessible to the citizens. People could see the grass but could not step onto it. That is the reason why every greenery will have fences surrounding it. However, if combining the soilless culture with these untouchable greens, we could create a new green spaces not only for viewing but also for food production. Inside the public green spaces, there are two types of spaces we could make use of. The first type is the urban forest, which could usually be found in the big parks. The second type is the open green space in the city center. They are normally the small scattered plots with low shrubs and big lawns alongside the roads and public buildings. In *fig.144* we point out the position of the public green spaces in the center of Shanghai.

第三选址，城市绿地和公园森林 / 上海在九十年代以后大量建设城市绿地和公园。然而，其中的很多部分都是只能看不能进。这是造成了非常大的资源浪费。我们将选取城市中的部分绿地进行改造设计，争取在为人们增加更多绿色的同时，最大限度的利用空间生产农产品。同样，部分的城市森林也为我们提供了一些特殊的空间进行粮食生产。

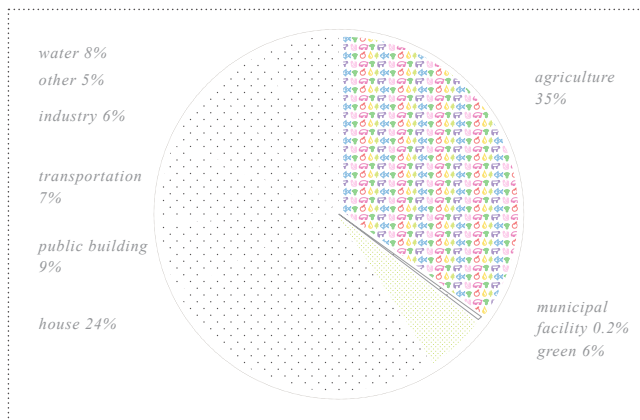


Chart: The Land Usage of Shanghai

fig.145



Illustration: The Table of Calculation of the Spaces Green Provide for Food Production fig.146

Compared to the roofs, there are fewer spaces from public greenery. According to the statistics, the green spaces of the total Shanghai metropolitan areas occupy 6% see fig.145. Considering the ration of the city center, the actual greenery spaces we will use in the heart of Shanghai is only about 3%. / The Areas and Productions Provided by Public Green Spaces / The total footprint of the public greeneries in the city center is around 19,200 hectares, including the forests and the lawns. With the soilless culture productivities, those areas could provide about 3,326,000 tons of vegetables and 963,200 tons of fruits per year see fig.146. However, the real amount could be lower than estimated since even though the total amount is high, some of the public green spaces could not be utilized. For example, some greeneries along the roads are too small and too narrow; some are too close to the high pollution industries and some are too difficult to access. etc. But anyway, it still much exceeds the amounts of the viaducts provide. And considering all the three spaces, we have already found enough places not only for the current Shanghai but also for the future.

城市绿地和公园森林提供的空间面积及预测的食品生产量 / 上海的绿地面积占了总面积的百分之六，这一数值在未来还会持续增加。然而，实际上可以利用的整块绿地并不很多，再考虑到都市农业限定在市中心区域的因素，最后可以为我们所用的城市森林和绿地很少。当然，其产量数值仍远远高于高架所提供的区域，甚至高于目前上海食品缺失的数量。

The Selected Samples of the Public Green Space in the Forests / Nowadays, it is super hard to find a big plot of forests in the center of Shanghai. However, several forests still exist. They locate in those big public greeneries and parks, such as Yanzhong Green Space in the center, Century Park in Pudong District, Forest Park in Yangpu District and Luxun Park in Hongkou District, etc. Here we will take the poplar forest in the Century Park as an example of the combination of soilless culture center and green see fig.147-149. As shown in the photo, the current scenery is beautiful. In order to keep and improve the environment, we will propose a floating box inside this forest. The ultimate goal is to merge the structure with the nature as well as produce certain amount of products for the local residents. Thus, the box will be hanged 600 millimeters above the ground, leaving the earth untouched. Furthermore, all the trees located inside the plot of the center will be specially treated. Two holes in the top and bottom of the building will ensure that the structure does no harm to trees. From the exterior, it is a pure and simple box reflecting the environment. From the interior, it is a soilless culture center meeting the occasional nature.

案例设计，世纪公园杨树森林的利用 / 为了详细的展示对于上海未来远景的展望，我们选取了一块典型的城市公园森林区域，世纪公园东南侧的杨树林。在此，我们会设计一个纯净悬浮的盒子，最小程度地影响自然环境但是最大可能利用土地，在生产出本土新鲜的蔬菜水果的同时保持人造环境与自然环境的和谐共处。这个设计同时也适用于上海其他的公园森林，比如杨浦的森林公园。



Satellite Map: The Sample Site, The Forest in Century Park

fig.147



Photo: The Sample Site, The Forest in Century Park 1

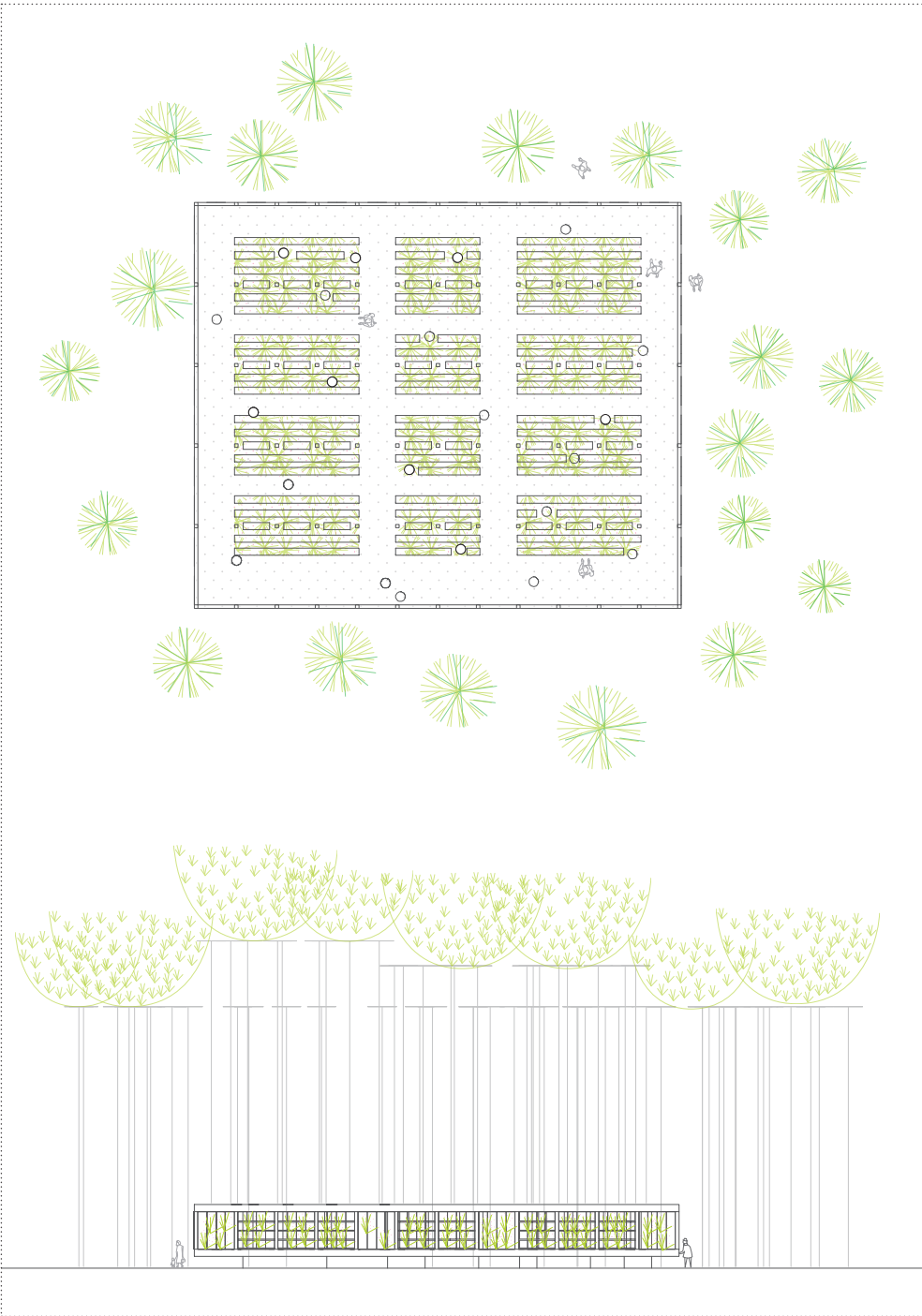
fig.148



Photo: The Sample Site, The Forest in Century Park 2

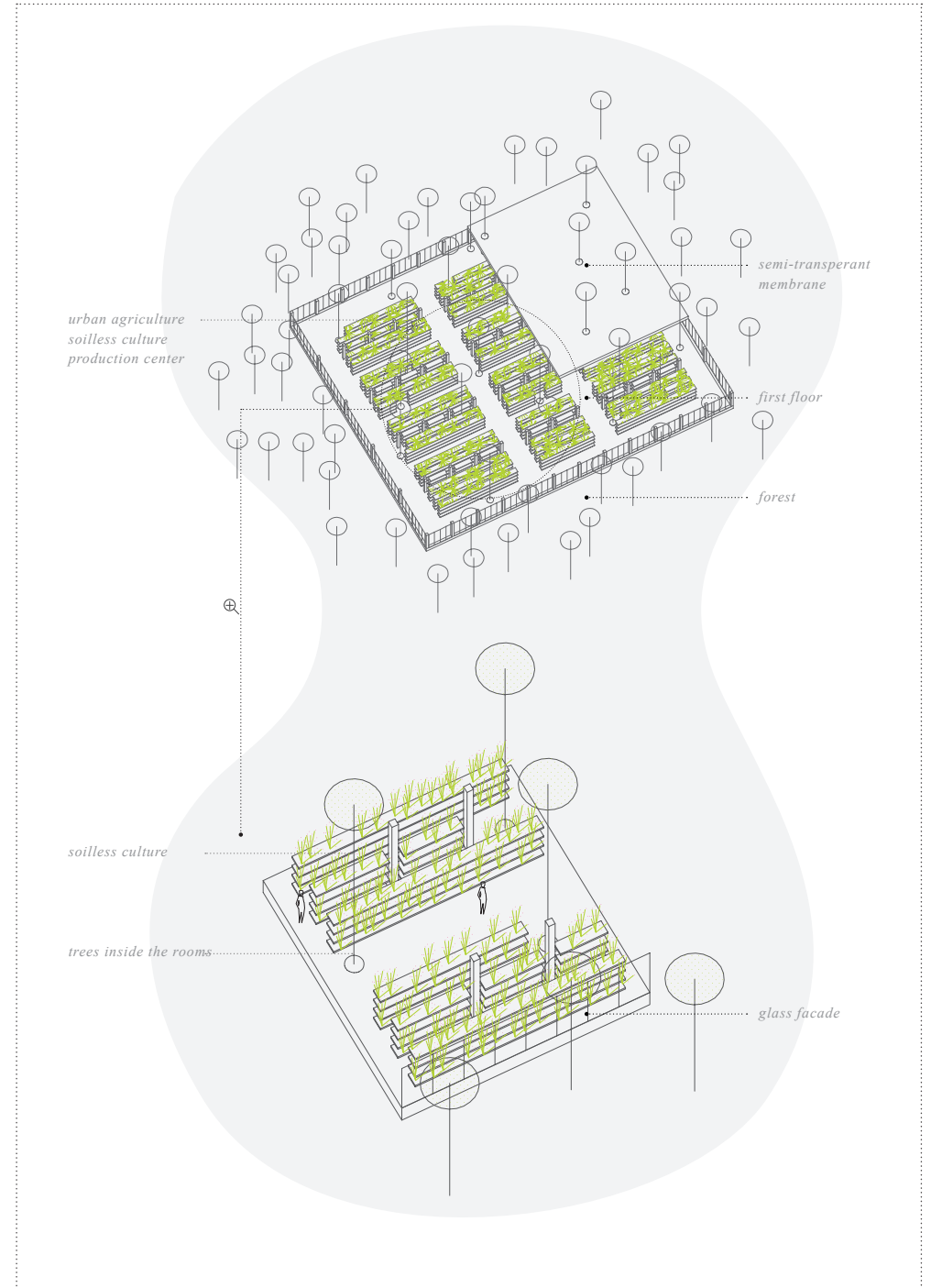
fig.149





Up: Ground Floor Plan of Soiless Culture Center in the Forest  
Down: South Elevation of Soiless Culture Center in the Forest

fig.150



Up: Soiless Culture Production Center On the China Pavilion  
Down: Details of Soiless Culture Production Center

fig.151



Photomontage: The New Vision of The Spaces in The Public Green, Forest in Big Parks

fig.152

The New Vision of the Spaces in the Public Green, Forest in Big Parks / From the exterior, we would like to reduce the impact of the box to the minimum. Thus, a pure and simple white box is proposed. The glass

公园森林中的无土栽培房，外景 / 设计的宗旨在于减小对于原有环境的影响。无土栽培房的立面将适用玻璃，在映射环境的

reflects the environment. The floating box ensures that the earth is untouched. And it creates a harmony between the human made structure and the nature. This type could be applied in every forest in the city center.

同时隐藏自身。而且，整个建筑将悬浮在土层之上，不触及原来的土壤和植被，不影响周边的环境。



Photomontage: The New Vision of The Spaces In The Public Green, Interior

fig.153

The New Vision of the Spaces In the Public Green, Interior / The interior space of the box also stick to the principal that no nature should be destroyed. Thus, we open two holes in the top and bottom where the trees

公园森林中的无土栽培房，内景 / 从内部看，设计仍然遵循着不破坏环境的宗旨。当有树木与建筑交叉时，我们将在建筑上下打开适当空

intersect with the structure. Also, in order to merge with the nature and intake the sunlight, we will use the semi-transparent membrane as the roof. The soft light together with the shadows of the nature will penetrate inside.

间，保证树木的正常生长。建筑的顶层将使用透光的膜，为室内提供温和的阳光，减少人工照明的使用同时使室内的景观连贯性。



Satellite Map: The Sample Site, The Public Lawn in People's Square

fig.154

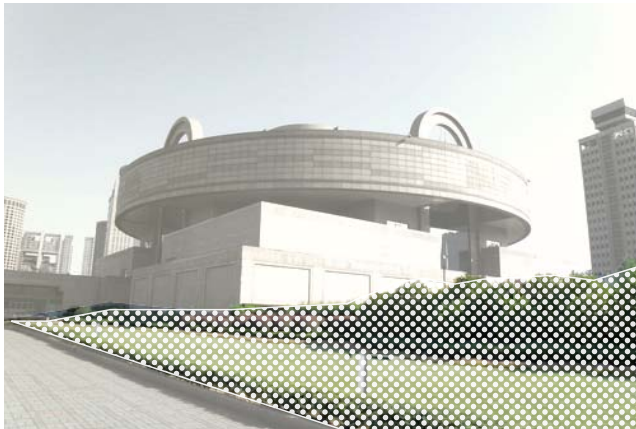


Photo: The Sample Site, The Public Lawn in People's Square 1

fig.155

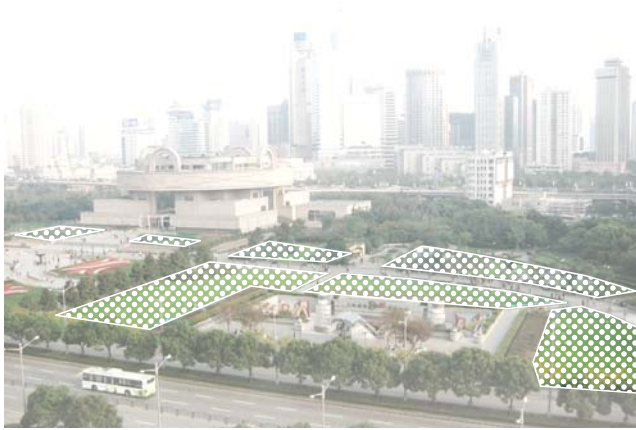


Photo: The Sample Site, The Public Lawn in People's Square 2

fig.156

The Selected Samples of the Public Green Space along the Roads and Public Buildings / Besides the forests in the big parks, most of the public green spaces in Shanghai center are those small plots with low shrubs and big areas of lawns. However, they could only be seen not be touched. Not like western public space, Shanghai citizens are not allowed to picnic or lay down on those public lawns, which are isolated by iron fences. In a word, the public greens alongside the roads are scenery, or background. It could be seen as an image. While, if so, it will be a big waste of space. Here, we will propose a combination between the public green spaces and the soilless culture centers. Those small boxes will occupy part of those lawns inside the fences. They will create more local fresh food for the residents, increase the greenery and diversity of that public green plot and furthermore, utilize that land to the biggest extent. In fig.154-156 they show a typical public space in Shanghai, the lawns in People's Square. People are only allowed to use the pavements and no one could step onto the grass. Here, we will propose our soilless culture to make the best use of the space.

案例设计，人民公园广场绿地的无土栽培房 / 除了部分城市公园的森林外，大部分的城市绿地都安插在不同的位置，零碎地分散着。在此我们选取其中较典型的例子，上海人民广场的中心绿地进行设计。这些绿地被围栏保护着，只能看不能进入，如果我们将无土栽培房融入其中，将会更好的利用绿地，增加城市的活力的同时提供更多的蔬果生产。

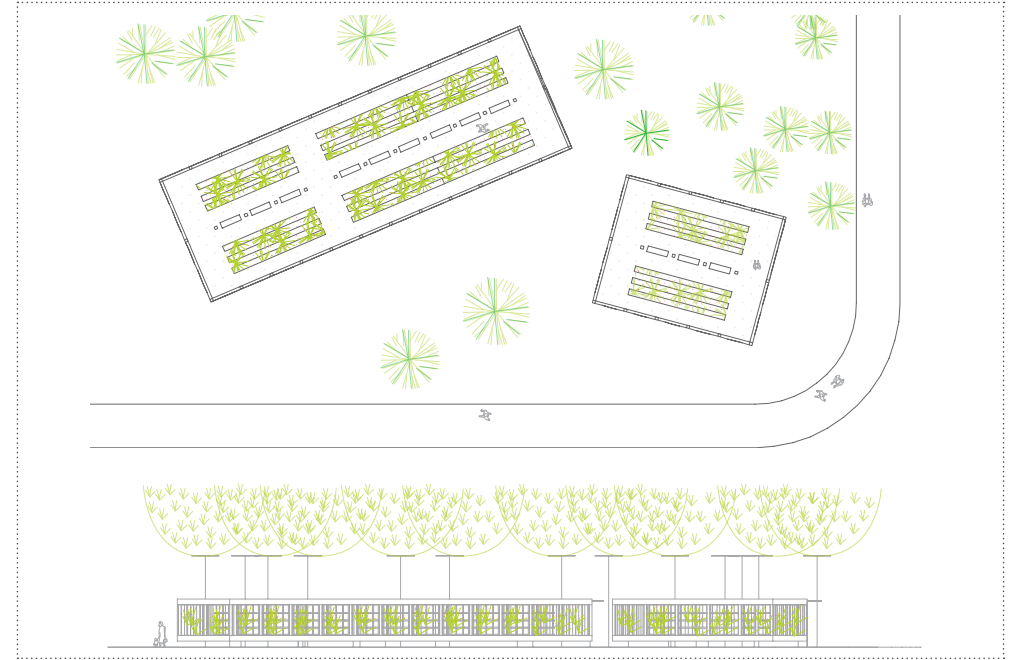


Illustration: The Plan of The Soilless Centers In the Public Lawn in People's Square

fig.157

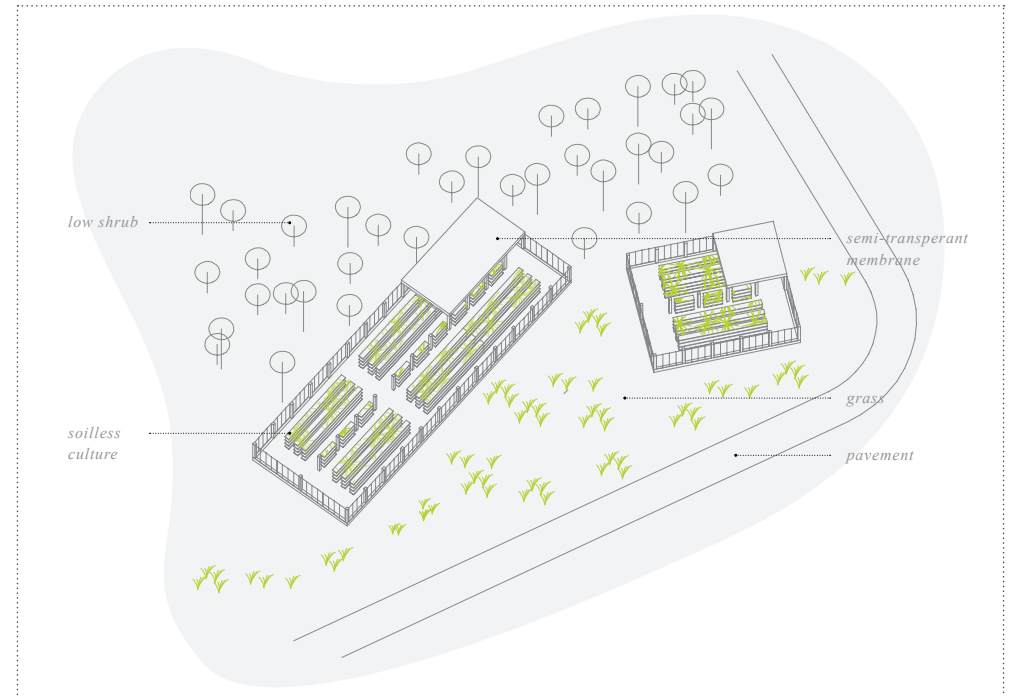


Illustration: The Isometric of The Soilless Centers In The Public Lawn in People's Square

fig.158



Photomontage: The New Vision of The Spaces In The Public Green, Lawns and Low Shrubs Alongside The Roads and Public Buildings

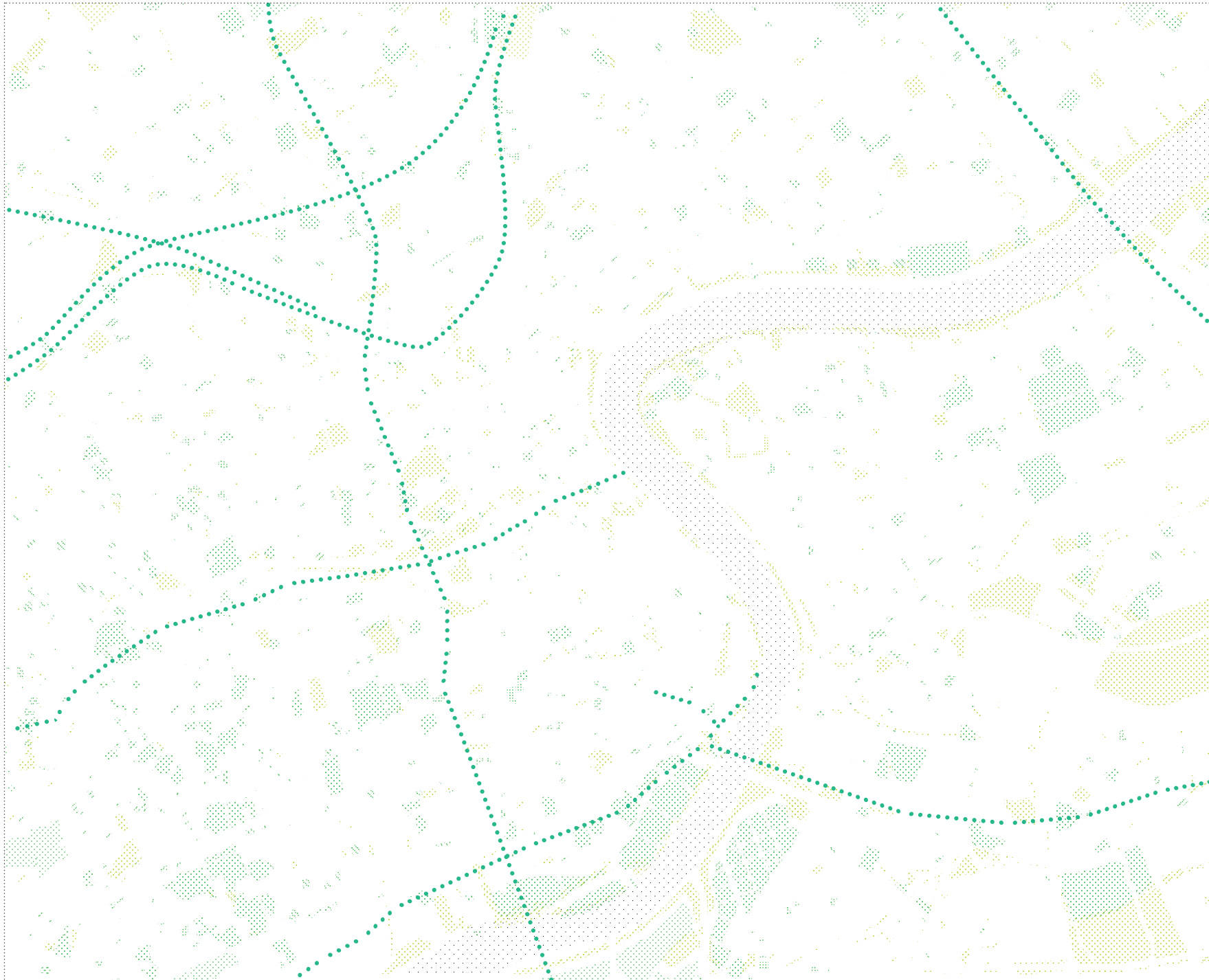
fig.159

The New Vision of the Spaces In the Public Green, Lawns and Low Shrubs Alongside the Roads and Public Buildings / The birdview of the future People's Square tells us, the new soilless centers will not only create more

人民广场中心绿地无土栽培房，鸟瞰图 / 当我们利用了上这些绿地后，整个环境将会极大地提升。果园和蔬菜园中丰富多采的农作物

food but also increase the diversity of the public space. Also, those buildings are floating, leaving the underneath lawns and earth untouched. They are the new landmarks of the public space in the center of Shanghai.

将改变上海市民对于城市以及农业的看法。他们在享受更多绿色的同时将能品尝到种在自己身边的新鲜食物。



Map: Summary of The Potential Spaces For Urban Agriculture in The City Center

fig.160

The Summary of the Potential Spaces for Urban Agriculture / Now we could present the *fig.160* to show the capacity of Shanghai to intake the urban agriculture. All of those spaces are public and able to be modified by the municipal government. If our proposals were admitted by the mayors, under the current construction speed of Shanghai, the city landscape would be changed in years. According to the final summary of the statistics *see fig.161*, Shanghai could have 50,800 hectares of land for UPA. With these areas, we could 2,548,600 tons of fruits or 8,800,600 tons of vegetables. Those amounts are largely exceed the current consumption. However, we could take them as the potential areas for future use. It is estimated above that in the following decades Shanghai will intake more and more immigrants and the food consumption will increase sharply. With these spare lands, it is possible for use to keep the self-sufficiency of the food not only in current era but also in the far future. Furthermore, if these three principals could be changed, the mentioned three places will be only part of the whole picture. For example, if the modifications

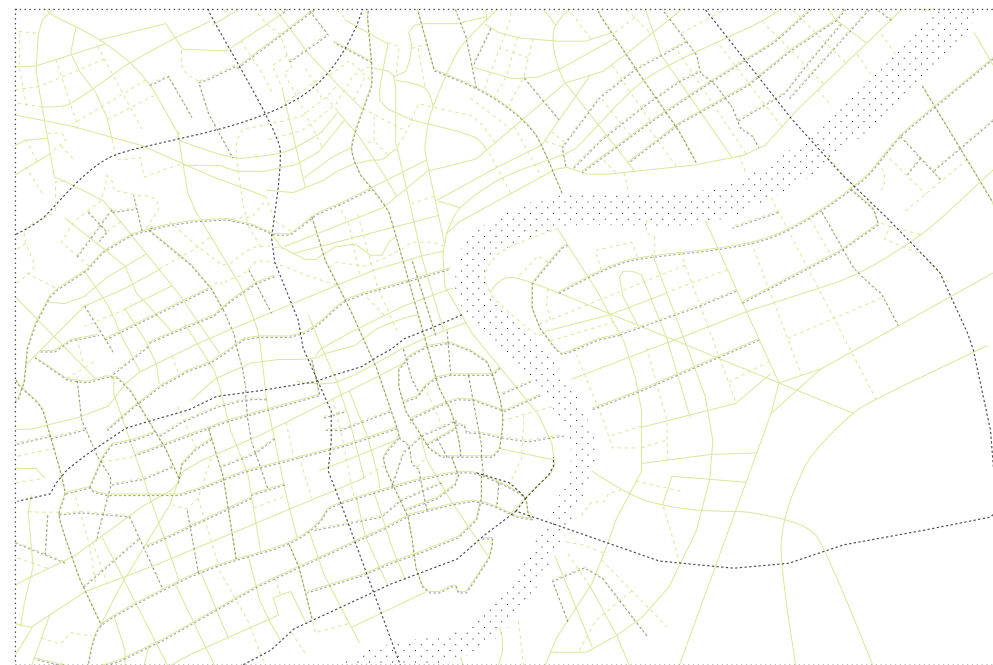
选址总结，三个新天地 / 当我们将所有可以利用的空间在上海市中心标识出来后，我们意识到了城市的潜力。倘若真正能利用这么多土地，上海的农产品将不需要再从外部进口。而且，这些新区域在生产食品的同时，也为城市添加了更多的绿色和活力。城市让生活更美好，而城市的定义究竟是什么。我们认为，农业理应包括在其中。

of other private plots are allowed, there will be much more spaces for us to produce food. Or if the new techniques are invented, probably every body could grow their food in the sitting room. Thus, with the idea of inserting the agriculture inside the city, we open a new door to the future and the food shortage will never threaten us anymore. / **The Retrievement of the First Identity, The Green** / In a word, these green spaces not only provide the beautiful scenery for the citizens but also produce fresh local food. Furthermore, it is the first time after two centuries that Shanghai retrieves its original identity, the green, in a contemporary context. / **We will retrieve the Second Identity, the Water** / However, the potential lands scatter all over the city. Also, they need water from the Huangpu River. Then, we get the opportunity to introduce the new pipe system. We hope the new system could link all the scattered UPA centers and work as the original water networks in the city center. With these two new elements of UPA, we are looking forward a new Shanghai with the balance of city, agriculture and water. While, here we need to decide the exact positions of the pipes and their water intakes on Huangpu River.

都市农业，食品自给自足的保证 / 当计算了这些空间可以带来的产量之后，我们欣喜地发现不仅现在，在将来的很长一段时间上海食品都能够保持自给自足的水准。都市农业的应用为城市提供了新的定义。 / 上海的新形象，绿色的回归 / 上海将会重新找回丢失的秉性，绿色。这绿色并不仅仅是狭义的绿化，而是更加实在，更加珍贵的农业的绿色。都市农业，让上海的绿色回归。



Illustration: Summary Tables of Calculation of All Spaces For Food Production fig.161



Map: The Map of The Roads That Used To Be Water Network

fig.162

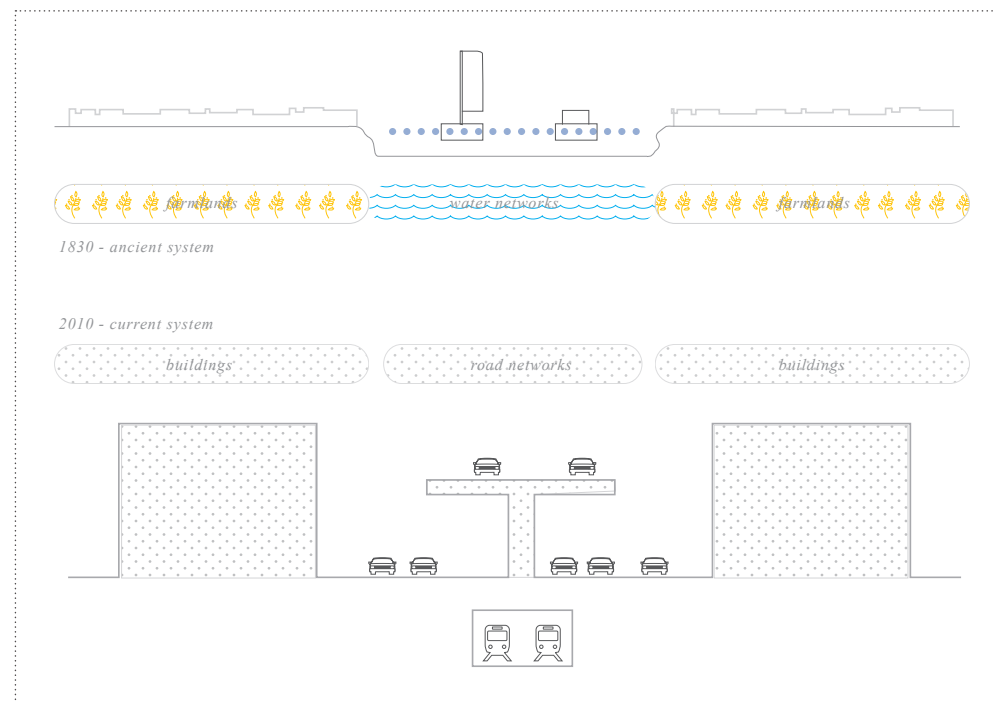


Illustration: Concept of Homage To Original Landscape

fig.163

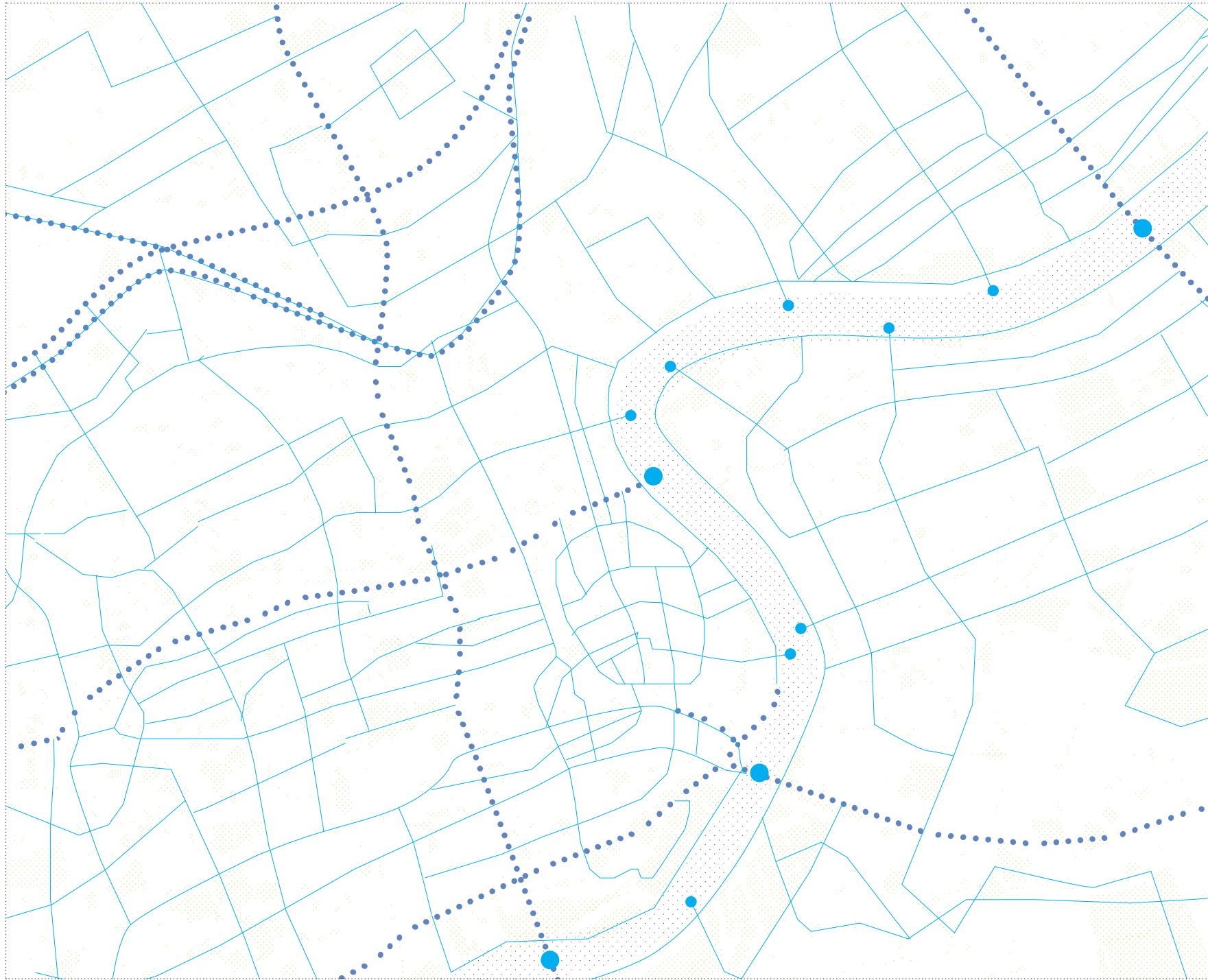


Illustration: The Location of Pipes and Their Intakes As Well As The Potential Spaces For UPA

fig.164

The Principal to Find the Places for Pipes / As we all know, there are many roads in Shanghai that used to be the rivers and creeks. So, it will be a homage to the history of Shanghai if we could place the pipes along those roads. As shown in *fig.162*, the original system, the agriculture, the water and the ships have changed to the buildings, the roads and the cars. We will retrieve the old identity by putting the water pipes along those ancient water networks. Thus, our first principal to put the pipes is to run along the history of Shanghai. In the *fig.163* we shows the map of those roads that were creeks. Well, the pipes need to provide water for the soilless culture centers under the viaducts, on the roofs and in the public greeneries. Thus, we need to put the pipes at the places that closest to all the soilless culture centers. Another issue is where should us pump in the water from the Huangpu River. Since most of the pipes will follow the ancient water networks that link to the Huangpu River, the intakes of those pipes will situate at the places where those ancient rivers and creeks met Huangpu River. In *fig.164*, we present the soilless centers and the pipes together.

空中水渠的选址 / 为了表示对上海原有自然水网的尊敬，我们将把水管沿着填埋原本河道而形成的道路布置，同时，考虑到输送效率，水管将尽可能的靠近无土栽培中心。另外，水管在黄浦江的人水口也将按照原来水道入黄浦江的位置布置。在左图中，我们展示了市中心的无土栽培中心以及空中水渠的位置。水渠将扮演当年的水网，联系着整个区域，为农业供给灌溉。





Photomontage: The New Vision in The Bund

The New Vision in the Bund / With the new system, the water and green will come back to the city center. As shown above, the new pipes will introduce the Huangpu River into the city center, becoming the new landscape.

外滩新貌 / 上图展示的是融入新系统后的外滩。水管将成为城市景观的一部分，将黄浦江水重新引入城市之中，输送

fig.165

The roof gardens on the public buildings could be seen from the Bund. On the Huangpu River, the ferry could be modified into movable water soilless culture centers, providing as well as purifying water.

水源至远处的屋顶和近处的公共绿化。在江上，我们可以将无土栽培实验室和浦江游轮结合起来，成为上海外滩的新景点。



The New Vision in the Nanjing Road. The Commercial Walk Street

fig.166

The New Vision in the Nanjing Road. The Commercial Walk Street / Nanjing Road used to be part of water network of Shanghai. Now, we introduce the new water the green system back to it.

改造后的南京东路步行街 / 南京路作为原英租界的核心区，曾经也是上海水系中重要一部分。当水和农业

The roof gardens, the public greens and the water pipes in the scenery create a new landscape of the city. People could enjoy the city life as well as the original identities.

再次回到她的区域内时，便创造了一个新的城市景观。农业和自然的水源融入进高密度的城市文明。



Photomontage □ The New Vision in Xintiandi. The Traditional Shikumen Commercial Walk Street

fig.167

The New Vision in Xintiandi. The Traditional Shikumen Commercial Walk Street / Shikumen Xintiandi is one of the most popular tourist attractions in Shanghai. Here we will merge the green改造后的新天地步行街 / 历史上有农业和水, 再建石库门。然而如今, 我们将融合这两个上海的历史元素

and blue elements with the historical buildings. The pipes carry the water from Huangpu River inside the old districts. They not only provide citizens more diversities but also present a new identity. 在新天地的商业步行街中引入黄浦江的水和城市农业。她们的融合为上海提供了新的城市景观。



*The Future of Shanghai*

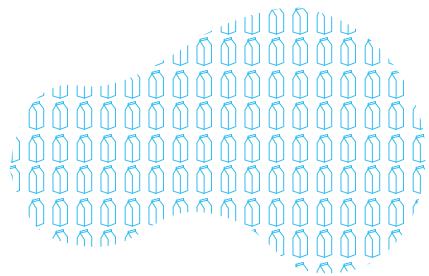
*fig.168*

**The Future of Shanghai** / By introducing the water and agriculture back into the city with urban agriculture, we change the scenery of Shanghai center totally. The green will identify itself in the center,

上海的未来 / 我们再次引入农业和水系后，上海的城市景观改变了。绿色再次在城市中被点亮。未来的上海

not only on the roofs but also under the viaducts. They come back finally. Now, Shanghai will retrieve the old identity, regain the self-sufficiency and achieve the balance among three elements.

在为自己的市民提供足够的食品的同时，将找回其早已逝去的景象：农业，城市与水的和谐共存。

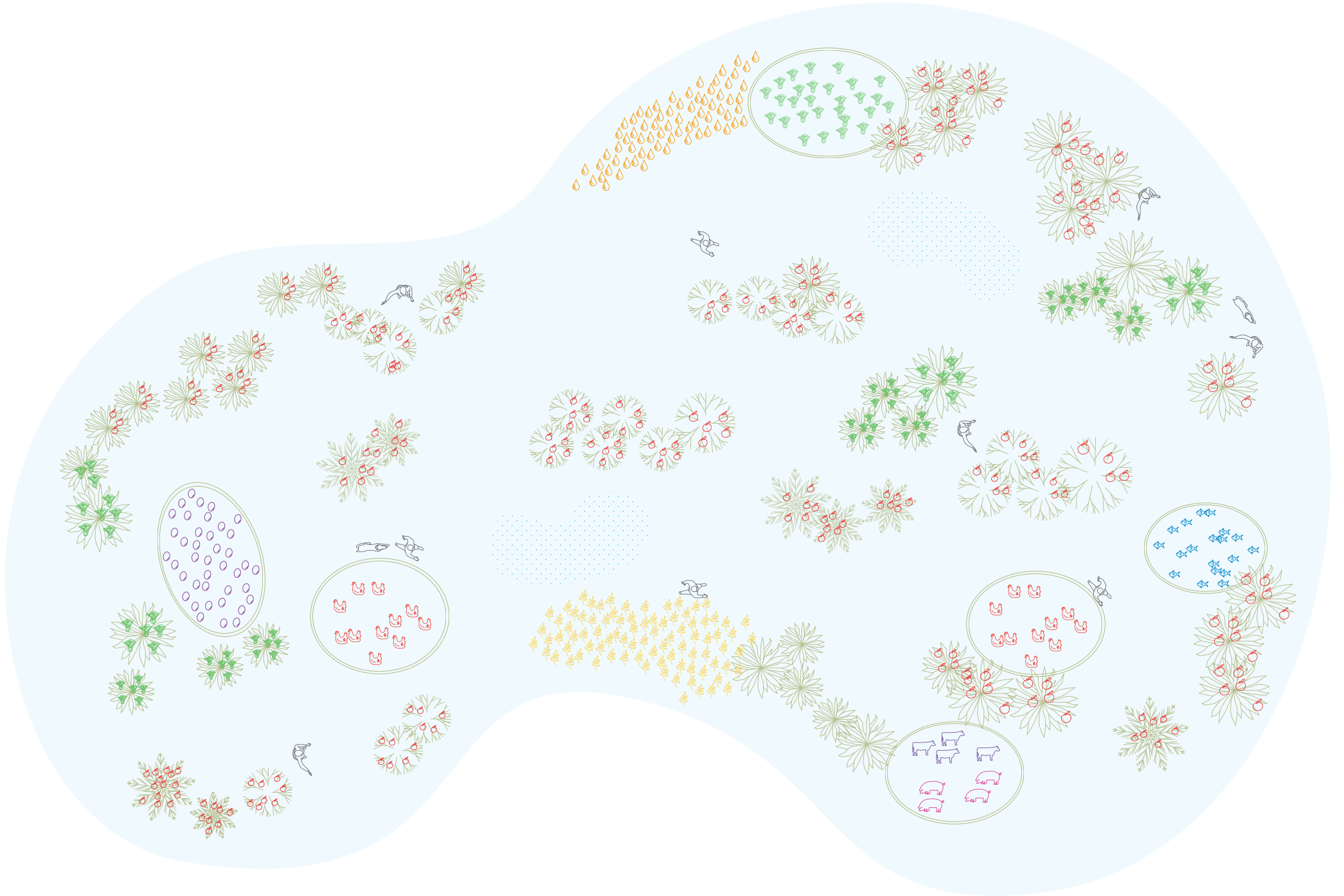


*milk*



*pig*

Here we propose Shanghai Manifesto for future. / **Article 1** / One day, Shanghai will keep the balance among human settlement, agricultural system and natural ecology. The new balance will retrieve the original indefinitely sustainable life style for all the habitants. / **Article 2** / One day, city and agriculture will stay in harmony. They will merge. City will provide spaces for agriculture and agriculture will provide enough food for city. / **Article 3** / One day, agriculture and water will be beneficial to each other. The nature will provide agriculture with clean and fresh water while agriculture will not pollute our water system anymore. / **Article 4** / One day, water and city will not harm each other. The water will come back to city, providing clean resources as well as beautiful landscapes. The city will not pollute and devour the water and provide spaces for its existence. / **Article 5** / One day, the balance will bring Shanghai the real self-sufficiency on food supply. We will not anymore depend on other people. / **Article 6** / One day, our local food will provide the thorough safe food for habitants. No more toxic or unhealthy food will exist. / **Article 7** / One day, we will eliminate the pollutions emitted to our nature and reciprocally the nature will not do damage to us anymore. / **Article 8** / One day, the green scenery of agriculture will come back to city, providing us with local food and beauty. / **Article 9** / One day, the water will return to city, Shanghainese could enjoy it, drink it and swim in it again. / **Article 10** / One day, we will retrieve the original identities of Shanghai, return the good-old memory to the habitants and show our best homage to Shanghai's history. / Yibo Xu & Xianya Xu. Oct. 2010



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