

Working Paper 4

City Profile Hangzhou

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List of abbreviations and acronyms

HSR	High Speed Rail
NDRC	Chinese national Development and Reform Commission
XPCC	Xinjiang Production and Construction Corps
PCU	Passenger Car Units
NBT	Normal Bus Transit
HEDA	Hangzhou Economic and Development Area

1. Introduction

This document introduces the city of Hangzhou in order to establish a basis for later research activities and development projects. This document starts with descriptions at a region/provincial level in chapter two. It explores available materials and review relevant literature coming either from the Chinese sources or international development research. It also covers the city's history, role, climate, natural resources, among others. In chapter three, the document goes into an overall city level. It dives in more details about the city itself and the space contained by its municipal borders. This chapter firstly provides an introduction to the city from an administrative perspective before it focuses on the economic sectors such as economic development and activities, foreign trade and investment, income and social security, to assess the economic role of the city in the country. Then, it discusses topics about the social aspects to shed the light on the characteristics of life-quality and associated aspects of its citizens in terms of culture, civil affairs, education and health. To understand the spatial planning and allocation of the main functions of the city, the following parts of this chapter focus on the land-use conditions and explore the composition of land from a formal perspective. This step is key for later research proposals that are relevant to optimising land-uses in the city. It could also show the Chinese concepts of land distribution and structure of terms that define the different types of land. Then, this chapter reviews the city's development on transport and infrastructure. As an economically developed city in China, Hangzhou has a comprehensive transport network and the most advanced infrastructure system. It requires, therefore, a deeper examination and research activities that are beyond the limitations of this document. The final section of this chapter reviews the leading development plans such as the 13th Five-Year Plan, Overall Master Plan, and Comprehensive land use planning of Hangzhou (2006-2020), which is essential to highlight the formal vision for the future development of the city. More importantly, it presents the most relevant planning instruments that regulate and control the planning and implementation of development projects in the city. Since these instruments are legally binding, all later research and development suggestions should fall in line with the planning directives of these instruments. It is necessary to examine these plans to localise later research activities and development measure in the city.

Due to the sheer geographic volume of Chinese municipalities, which can be overwhelming, it makes sense to focus on smaller municipal entities, such as districts, to maintain the scope of research projects. In this respect, chapter four of the document brings the district of Yuhang under focus, as it has a considerable potential for the research activities. Yuhang has an economic and technological development zone that combines many interesting elements and major land-uses that can represent the wider urban and infrastructure conditions of the city. This zone grants the district with special rights, which can enhance urban and infrastructure development measures and proposed implementations in terms of the economic, social and environmental aspects. In a similar manner to the reviews at the city level, this chapter also explores the district's history, climate, role, society, economy, among others, to bring the research even closer to the urban conditions and local settings of the district. Then, chapter five goes deeply to the urban development aspects, such as land-use and transport. Finally, the Yuhang Development Strategy Plan 2015-2030 is explored to provide the required background for later specified project's proposals and development measures.

2. Regional/Provincial Level

Hangzhou is located in East China, the northern part of Zhejiang province, and the southern end of the Beijing-Hangzhou Grand Canal. It is a central city in the Shanghai-Jiaxing-Hangzhou G60 Science and Technology Innovation Corridor, an internationally E-commerce Center. There are many cultural and historical sites and a large number of natural landscape relics in Hangzhou. In this chapter, we will provide an overview of this city.

2.1 Geographical Location inside China

Hangzhou is a sub-provincial city located east of the People's Republic of China and is the capital city of Zhejiang province. Situated at the juncture of 29°11' - 30°34 'North and 118°29' – 120°37' East, Hangzhou is the crossing point of the extension of the Silk Road Economic Belt and 21st Century Maritime Silk Road. Under the City of Hangzhou jurisdiction, there are ten urban districts: Shangcheng, Xiacheng, Jiangan, Gongshu, Xihu, Binjiang, Xiaoshan, Yuhang, Fuyang, and Lin'an, one county-level city of Jiande, and two counties of Tonglu and Chuan'an. The city covers a total area of 16,596 square kilometers, of which the urban part takes up approximately 8000 square kilometers.

Located in the Yangtze River Delta, 65.6% of Hangzhou territory is surrounded by mountains, and plains account for 26.4%, which is mainly found in the northeast. And the remaining 8% is surrounded by rivers, lakes, and reservoirs. The Xin'an River Reservoir (also known as Qiandao Lake), the largest reservoir on China's southern coast, is located in Hangzhou. Hangzhou also has the longest artificial canal in the world, the Jingjiang canal. Its forest coverage reached 65%, ranking in the first among the nation's provincial capitals (Hangzhou Government, 2018j).



Figure 1. Hangzhou Location in China

Source: Global Urbanisation Research Team, FRA-UAS (2020), based on: openstreetmap.org

2.2 Climate

Hangzhou enjoys a subtropical monsoon climate, with distinct seasons, ample sunlight, and rainfall. The annual average temperature in the urban area is 18.3°C, and the total rainfall is 1442 mm for 2017. The total sunshine is 1818 hours for the whole year, 296 hours more than the previous year. An extremely high temperature of 42.2°C is recorded on July 24 in Tonglu County, and the lowest temperature of -5.5°C occurred in the district of Lin'an, on January 21 (Hangzhou Government, 2018j).

2.3 History

Ranking among the seven ancient capitals in China, Hangzhou is one of the birthplaces of Chinese civilization. Marco Polo, the 13th-century Italian traveler, called it “the most graceful and splendid city of the world.” The excavation of the Kuahu Bridge site demonstrates human activities existed here as early as 8000 years ago. First set up as a county in the Qin Dynasty (222 BC), it has a history of over 2200 years. In the 9th Year of Sui Emperor Kaihuang (589AD), the old Qiantang County was abolished and replaced by Hangzhou (Hang prefecture), marking the first appearance of its current name. Hangzhou was chosen by two dynasties — Wuyue state in the Five Dynasties (907-978 AD) and the Southern Song (1138-1279 AD) as the capital city. In the first year of Republic of China (1912), the former Qiantang and Renhe Counties were merged into Hangxian County. In 1927, the urban part of Hang prefecture and its neighboring areas were grouped into Hangzhou City. On May 3, 1949, Hangzhou was liberated, and a new era in its history of development began (Hangzhou Government, 2018h).

2.4 Role of the City in the Regional and National Context

Hangzhou is the capital of Zhejiang Province, a sub-provincial city, and the core city of the Hangzhou metropolitan area. It is the provincial economic, cultural, scientific and educational center, and the central city in Yangtze River Delta. It plays a significant role in the regional and national development.



Figure 2. Geographical Map of Hangzhou with Administrative Divisions
Source: Global Urbanisation Research Team FRA-UAS (2020), based on: Google Maps and openstreetmap.org

2.4.1 City Along Jing–Hang Grand Canal

As a trunk line of the Grand Canal, Jing-Hang Grand Canal was listed on the World Heritage List in 2014. It starts from Beijing in the north and reaches Hangzhou in the south. It flows through Beijing, Tianjin,

Hebei, Shandong, Jiangsu, and Zhejiang provinces, and connects the Haihe River, the Yellow River, the Huaihe River, the Yangtze River, and the Qiantang River, with a total length of 1,794 kilometers. The canal has played an essential role in the economic and cultural development and communication between the north and south of China, especially in the development of industry and agriculture along the route (The Grand Canal Hangzhou, 2020).

2.4.2 Urban Regional Agglomerations

Hangzhou is the Hangzhou Metropolitan Area's core city, the economic, cultural, scientific, and educational center of Zhejiang province, and one of the central cities of the Yangtze River Delta Urban Agglomerations. Hangzhou government has made great efforts to strengthen bonds with the surrounding area. In 2007, Hangzhou Metropolitan Circle was jointly established by Hangzhou, Huzhou, Jiaxing, and Shaoxing and, in 2019, enlarged to include Quzhou and Huangshan. By the end of 2019, the Circle covers an administrative area of 54 thousand square kilometers with a permanent population of 26.92 million and a GDP of 3.2038 trillion yuan, increasing 7%. This Metropolitan Circle, taking Hangzhou as the center, focuses on sharing planning, communication, market, industry, branding, environment, and other social resources, targeting to build a world-class metropolis circle with an international reputation (Hangzhou Government, 2018g).

Yangtze River Delta Urban Agglomeration takes Shanghai as the center, and Nanjing, Hangzhou, Hefei as sub-centers, involving 27 cities and covering around 225,000 square kilometers. It is an urbanized area with the most developed economy and the highest degree of urban agglomeration in China. The Yangtze River Delta is one of the most active regions in China's economic development. With only 2.1% of China's land area, it produces a quarter of China's total economic output and more than a quarter of its industrial added value and is regarded as the most developed region in China. The area possesses ample scientific and technological resources. The annual research and development expenditure and the number of useful invention patents account for about one-third of the whole country. New technologies such as big data, cloud computing, the Internet of Things, and artificial intelligence are integrated with traditional industries. The scale of integrated circuit and software information service industry in this area accounts for about 1/2 and 1/3 of the country, respectively, and several internationally competitive innovation communities and industrial clusters have been formed in the fields of electronic information, biomedicine, high-end equipment, new energy, and new materials (State Council of People's Republic of China, 2019).

2.5 Key Physical Features/Characteristics of the Region

Hangzhou is located in the south of the Yangtze River Delta, the western end of Hangzhou Bay, the lower reaches of the Qiantang River, and the southern end of the Beijing-Hangzhou Grand Canal. Due to its special location, it has some unique physical regional characteristics.

2.5.1 Terrain and Waterbodies

Hangzhou is located on the southern edge of the Yangtze River Delta and the Qiantang River Basin, with complex and diverse terrain. The western part of Hangzhou belongs to western Zhejiang's hilly area, and the main mountains include Tianmu Mountain. The eastern part belongs to the North Zhejiang Plain, with low and flat terrain, dense river networks, lush lakes, with the typical characteristics of a "water town in the south of the Yangtze River".

Hangzhou has a natural environment with rivers, lakes, and mountains. The hills and mountains of the city account for 65.6% of the total area, plains account for 26.4%, rivers, lakes, and reservoirs account for 8%. The World's longest artificial canal—the Beijing-Hangzhou Grand Canal and the Qiantang River, famous for large tidal surges, pass through the city (Zhejiang Online, 2010).

2.5.2 Natural Resources

There are many kinds of organisms in Hangzhou. There are 13 species of national first-class protected animals, 55 species of second-class protected animals, and 13 species of second-class protected plants. The city's average forest coverage rate is 62.8%. Mineral resources include large and medium-sized non-metallic and metal deposits. Lin'an Changhua produces a kind of bloodstone, rare in the world, a treasure in the collection of stone and seals stone. Hangzhou has 2 national-level scenic spots-West Lake Scenic Area, "Two Rivers and One Lake" (Fuchun River-Xin'an River-Qiandao Lake) scenic spots; 2 national nature reserves-Tianmu Mountain, Qingliangfeng Nature Reserve; 5 countries Forest Park-Qiandao Lake, Daqi Mountain, Wuchao Mountain, Fuchun River and Qingshan Lake Forest Park; a national tourist resort-Zhejiang National Tourism Resort; the first national wetland in China-Xixi National Wetland Park (Zhejiang Online, 2010).

3. Overall City Level

Due to its beautiful scenery, Hangzhou is known as "paradise on earth". Hangzhou benefited from the convenience of the Beijing-Hangzhou Canal and trade ports, as well as its own developed silk and grain industries, and was once an important commercial distribution centre in history. Later, relying on the Shanghai-Hangzhou Railway and other railway lines as well as Shanghai's import and export trade, the light industry developed rapidly. In recent years, driven by high-tech companies such as Alibaba, the Internet economy has become a new economic growth point for Hangzhou. In this part, an analysis of the city's demography, socio-economic development, foreign trade, living standards, culture, education, and urban development will be provided.

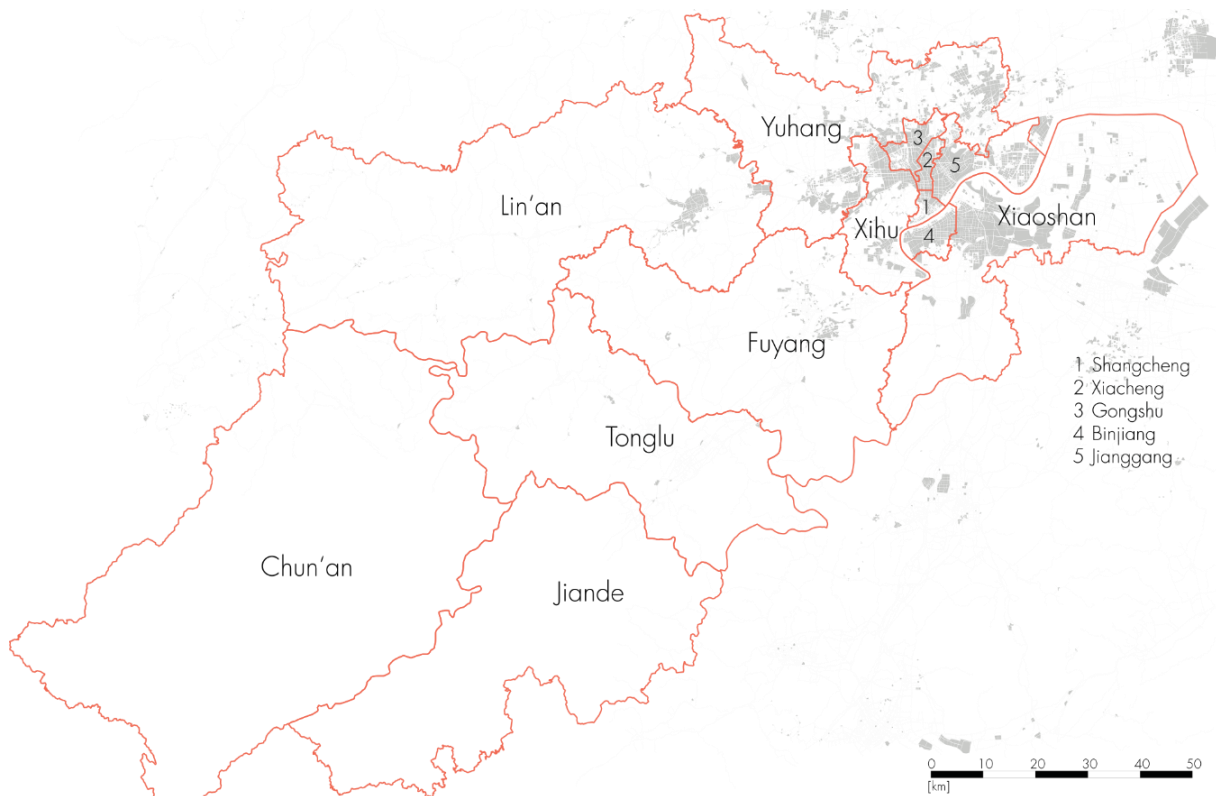


Figure 3. Administrative Borders of Hangzhou

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: openstreetmap.org

3.1 Administrative Borders

In this section, an overview of Hangzhou’s administrative borders will be provided, specifically the classification of districts and some statistical information about demography.

3.1.1 Classification of Districts

In 2014, the Fuyang County of Hangzhou City was abolished, and the Fuyang District of Hangzhou City was established. Seven new streets, 25 communities, seven revoked towns, one community, and seven administrative villages were newly constructed. By the end of the year, within the municipal administrative area, there were nine municipal districts, two county-level cities, two counties, 75 towns, 23 townships, 92 subdistrict offices, 1030 communities, 36 residential areas, and administrative 2044 villages (Hangzhou Government, 2016).

3.1.2 Demography

According to the population census in 2008, the population of long-term residents reached 7.966 million, of which 5.5236 million was in urban districts, accounting for 69.34% of the total. The city's population density is 480 people per square km. Among all the residents, the population aged from 0 to 14 years old was 987800, accounting for 12.4% of the total population; the population aging from 15 to 59 years old reached 6.1099 million, making up 76.7% and the population aged over 65 years old was 868,300, which occupied 10.9%. The average life expectancy was 79.74 years old (77.44 years for males and 82.25 years for females), which is equivalent to developed countries' level.

By the end of 2008, the compulsory education enrolment rate in Hangzhou reached 100 percent, the high school enrolled was 98.7%, and a higher gross enrolment rate reached 51.9%. As an economic-developed area in China, the scale of employment in Hangzhou has also expanded. By the end of 2008, there was a total of 5.6916 million employees in the city, which witnessed an increase of 0.3607 million than the previous year; the registered urban unemployment rate was 3.02 at the end of this year (Hangzhou Government, 2015a).

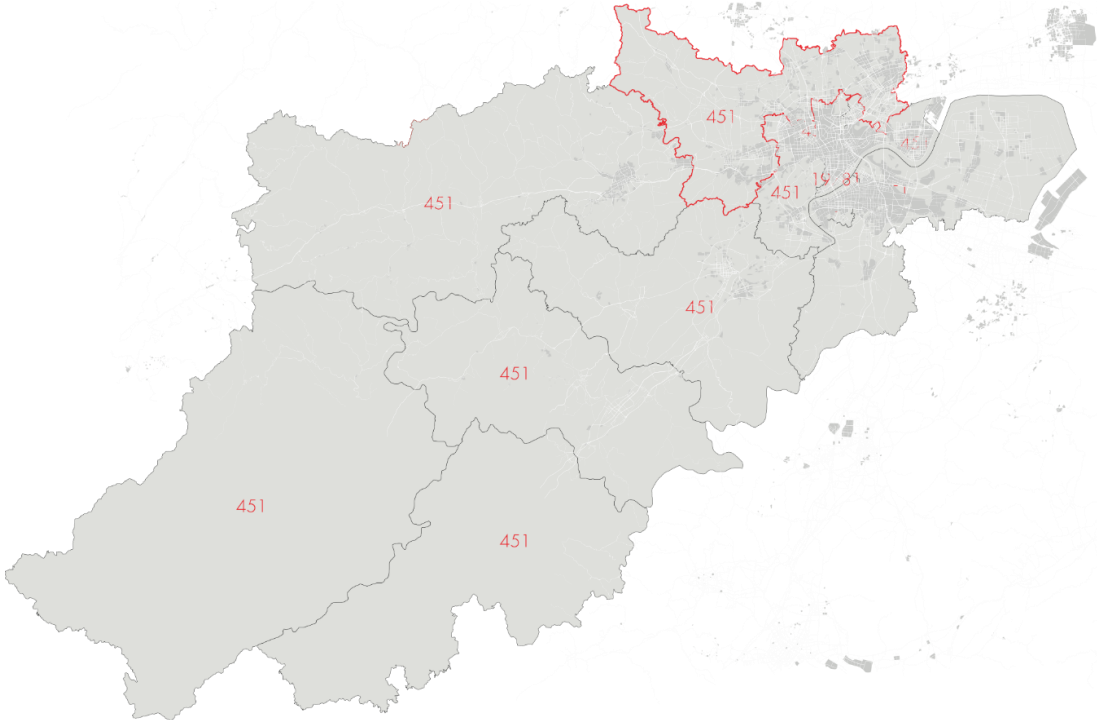


Figure 4. Demographics map of Hangzhou
Source: Global Urbanisation Research Team FRA-UAS (2020), based on: openstreetmap.org

3.2 Economic Development and Activities

The economic growth in Hangzhou is steady. In 2017, Hangzhou's GDP reached 1.2556 trillion yuan, at a growth rate of 8.0%, and this number is 1.1% higher than the national average and 0.2% higher than the provincial average. The permanent resident capita GDP reached 134,607 yuan. The fiscal revenue reached 292.1 billion yuan, increasing 14.2% than the previous year, of which general public budget revenue accounted for 156.7 billion yuan, rising 17.4%. 90.4% of the generally available budget revenue is contributed by taxation, ranking the top among all Chinese sub-provincial cities. General public spending amounts to 154.1 billion yuan, which increased by 9.7% (Hangzhou Government, 2018c).

In 2017, Hangzhou ranked 4th among Chinese provincial capital cities in terms of economic aggregates, and the town is listed among Top Ten Cities of World Impact, China's Top Ten Creative Cities, China's Top Ten Smart Cities. Hangzhou has been crowned for 14 consecutive years with the honour of Happiest Cities in China. It is among the top three of The Most Attractive Chinese Cities for Foreigners. The city also takes first place in terms of attractiveness for overseas students (Hangzhou Government, 2018c).

In 2017, Hangzhou achieved further optimisation in industry structure and the primary, secondary, tertiary industry contributed an added value of 31.2, 438.7, and 785.7 billion yuan, with an increase of 1.9%, 5.3%, and 10.0%, respectively. The proportion of tertiary industry had grown by 1.7% over the last year. Hangzhou had proposed three new economic sectors, i.e., new industries, new commercial activities, and new business models. In 2017, these economic sectors yielded an added value of 425.1 billion yuan, which showed an increase of 20.4% and accounted for 33.9% of the city's GDP. The information economy played a leading role in Hangzhou's economic transformation, creating an added value of 321.6 billion yuan and contributing to over 50% of its GDP growth. The e-commerce, mobile Internet, digital content sectors grew by 36.6%, 35% and 28.5% respective (Hangzhou Government, 2018c).

In 2017, the city's import and export of goods reached 508.5 billion, show an increase of 13.3%. Aggregate social consumer goods retail sales and fixed assets investment reached 571.1 billion yuan and 585.7 billion yuan, respectively, increasing 10.5% and 1.4%. The private economy also displayed renewed vitality, with an added value of 756.1-billion-yuan, accounting for 60.2% of the city's GDP. There are 44 privately owned firms in the list of China's Top 500 Private enterprises, which enables Hangzhou to be ranked in first place in term of the number of qualifiers (Hangzhou Government, 2018c).

3.2.1 Hangzhou Economic & Technological Development Area

Hangzhou Economic & Technological Development Area (HEDA) is a state-level development area approved by the Chinese State Council in April 1993. There are over 700 foreign-invested enterprises from 40 countries and regions, and the investment projects from Fortune 500 accounts for one-third of the city's total. In 2017, HEDA achieved a GDP of 65.2 billion yuan, and the fiscal revenue amounts to 13.4 billion yuan, increasing 5.6% (Hangzhou Government, 2018f).

3.2.2 Foreign Trade and Investment

In 2017, Hangzhou's foreign trade continued to prosper, with the revenue of import and export reaching 508.5 billion yuan, 13.3% and 4.6% higher than the past year. Export contributed to 345.6 billion yuan, increasing 4.3% and export to "Belt and Road Initiative" countries reached 104.9 billion yuan, taking up 30.4% of the total. Trade-in service amounts to 161.9 billion yuan. The city attracted 42 major foreign investment projects of over USD 100 billion and received 208 investment projects from 120 enterprises of the Fortune 500. The overseas investment by local firms reached USD 2.36 billion (Hangzhou Government, 2018e).

3.3 Socio-Economic Development

In this section, an introduction of socio-economic development will be provided. The focus is on aspects in income, social security, education, culture, public health and civil affairs.

3.3.1 Income and Social security

In 2017, the income of Hangzhou residents continued the increasing trend. The disposable income for urban and rural dwellers reached 56,276 and 30,397 yuan, respectively, which increased by 7.8% and 8.9%. After deducting price inflation, the actual increase was 5.2% and 6.2%, respectively. At the end of the year, the total bank deposit balance amounted to 867.1 billion yuan, and the average deposit reached 92,957 yuan per person. The average living expenditure is 38,179 yuan for urban residents and 21,983 yuan for rural residents, at a growth rate of 7.0% and 6.9%, respectively. The average housing area reached 36.4 square meter per person for urban residents and 70.9 square meter for rural residents (Hangzhou Government, 2018l).

During 2017, Hangzhou continued upgrading in social security and achieved 100% in its national insurance registration rate. The population participating in basic social pension insurance and basic social, medical insurance reached 7.17 and 9.54 million. The urban minimum wage standard is 2,010 yuan, and the minimum living guarantee is 917 yuan per person per month. The minimum living guarantee for the Lin'an district and the three counties is 734-780 yuan per person per month. In Hangzhou, the number of residents enjoying standard minimum living guarantee reached 22000 in an urban area and 101000 rural area, respectively (Hangzhou Government, 2018l).

3.3.2 Education

In 2017, Hangzhou continued to optimise its educational resource allocation. By the end of the year, there are 960 kindergartens, with 336,000 pupils, and the three-year preschool kindergarten enrolment rate reached 98.9%. The number of primary schools reached 458, with a total of 560,000 pupils. There are 251 middle schools, 80 regular high schools, and 37 independent secondary vocational schools (not including technical schools or adult technical secondary schools), with 225,000, 113,000, and 64,000 students. The number of higher education institutions reached 39, with 484,000 students in total. The gross enrolment rate for higher education achieves 63.26%, at a growth rate of 1.03% comparing to the previous year (Hangzhou Government, 2018d).

3.3.3 Culture

Hangzhou has an excellent cultural atmosphere. Famous activities, including the West Lake Book-reading Festival, the Qiantang River International Cultural Festival, the Southern Song Cultural Festival, the Grand Canal Culture Festival, and Kuahu Bridge Culture Festival, attract millions of local people and tourists every year. Hangzhou now boasts four entries on the Representative List of the Intangible Cultural Heritage of Humanity, 44 Representative items of National Intangible Cultural heritage, and 553 provincial and city-level Intangible Cultural heritage.

Hangzhou boasts 14 available archives and 14 libraries, and its comprehensive cultural centres all meet required high standards. It has 126 theatres and 12 music halls. Its film projection units provide 2.06 million screenings, which served a total of 38.2 million people/times and generated 1.27-billion-yuan revenue in 2017 (Hangzhou Government, 2018b).

3.3.4 Public Health

As a developed area in China, Hangzhou boasts excellent medical resources. By the end of 2017, the number of medical and health institutions reached 4933, of which 302 are hospitals. There were 76,000 beds in total and 110,000 professional health personnel, including 42,000 licensed (assistant) medical practitioners. A total of 128.70 million patients/times received diagnosis and treatment, showing an increase of 5.8% than the last year (Hangzhou Government, 2018k).

3.3.5 Civil Affairs

By the end of 2017, Hangzhou completed the reform of nursing care for senior people and successfully constructed the “15-minute nursing care circle” in urban areas and the “20-minute nursing care circle” in rural areas. It possessed 302 aged nursing institutions, which provided a total of 72,000 beds and served 22,000 people. Fifty-nine thousand disabled citizens received a basic life guarantee. There was a total of 59,000 welfare enterprises, employing 10,131 disabled residents. The revenue of welfare lottery sales amounted to 2.82 billion yuan (Hangzhou Government, 2018a).

3.4 Urban Development

Hangzhou has experienced significant changes in the past few decades. This section will discuss how the city has developed and how the city layout has changed. Besides, it will provide an overview of the land-use in Hangzhou City.

3.4.1 City Growth

The following maps demonstrate how the city is developed since 1963. It is clear from the map that the city expanded around its physical centre during the period from 1963 to 1990. In the following decade, the eastern part of Hangzhou was developed. From 2000 to 2019, the city was growing along the river to the east and the south, with the size increasing approximately by three times. From 2019, the development is planned to the north and the south, as illustrated in the figure 6.

3.4.2 City Centres

The following map attempts to visualise the planned centres of Hangzhou. As depicted, there are two main city centres, in terms of economy and commerce, located near the physical centre of the area. Simultaneously, several subcentres are planned around. These subcentres are mainly the centre of Hangzhou’s central districts. Six third-grade centres are planned, most of which are located in the Xihu district. Furthermore, many fourth-grade centres are planned in Yuhang district in the northwest and Xiaoshan district in the east.

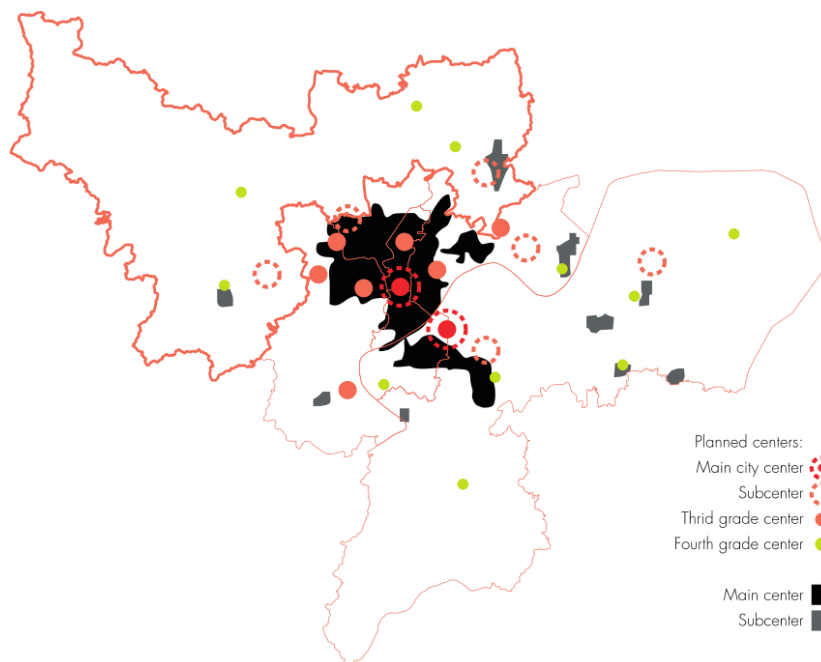


Figure 5. City Centres of Hangzhou

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: [openstreetmap.org](https://www.openstreetmap.org), <https://www.mdpi.com/2072-4292/11/15/1821> and https://link.springer.com/chapter/10.1007/978-3-642-30529-0_12

City Profile: Hangzhou
China



Figure 6. City Growth in Hangzhou since 1963 until Today

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: openstreetmap.org and <https://www.mdpi.com/2071-1050/9/5/855/htm>

3.5 Land-uses

The prominent land-use type in Hangzhou was a forest, taking up approximately 67% of the region's total land area, which was increasing due to the large-scale afforestation activities. Farmland decreased from 21.64% in 1990 to 20.82% while the proportion of land used for construction increased slightly from 2.77% in 1990 to 3.16% in 2000. Grassland, water area, and unused land remained stable during the decade from 1990 to 2000. According to the analysis of Tian Yuan etc., the probability of farmland and water area transferring to construction land was comparatively higher than other land use types, while unused land, grass, and farmland had a high probability of transferring to the forest area (Cristóvão et al., 2012).

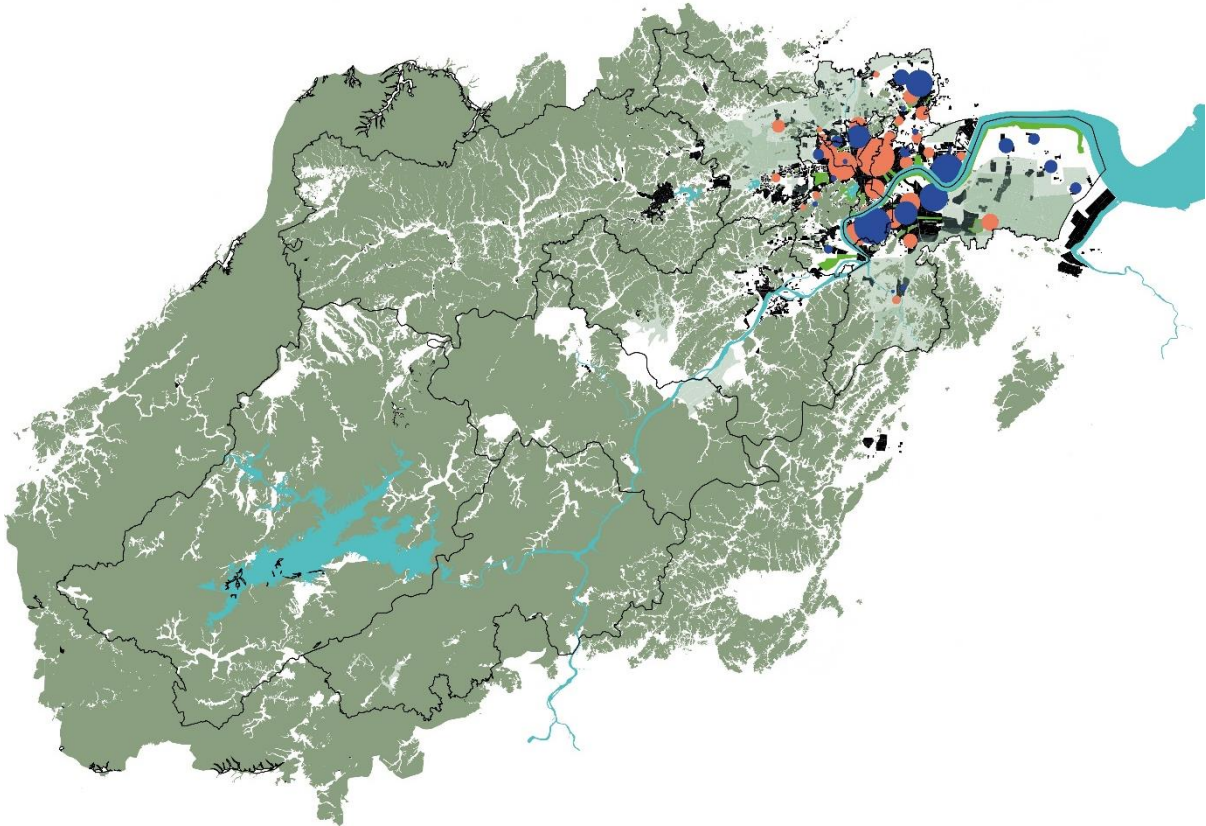


Figure 7. Land-uses Map of Hangzhou

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: [openstreetmap.org](https://www.sciencedirect.com/science/article/abs/pii/S0264275115000827) and <https://www.sciencedirect.com/science/article/abs/pii/S0264275115000827>

3.5.1 Constructed Land/Built Environment

The focus of the predominant constructed built environment consists mainly of residential and industrial patterns in the built environment and large agricultural fields in the northern and southern bounds of the city, as depicted in Figure 8.

3.5.2 Industry

By 2018, the annual industrial added value was 416 billion yuan, showing an increase of 6.3%. The added value of high-tech industries, strategic emerging industries, and equipment manufacturing industries increased by 10.8%, 13.1%, and 9.3%. The output rate of new products increased from 37.7% last year to 38.8%. The production and sales rate of industrial products was 98.4%. Industrial enterprises above the designated size realised profits of 97.4 billion yuan, showing an increase of 1.2% (Hangzhou Government, 2019b). From the Figure 9, it is clear that the industry is concentrated in the north region and along the river.

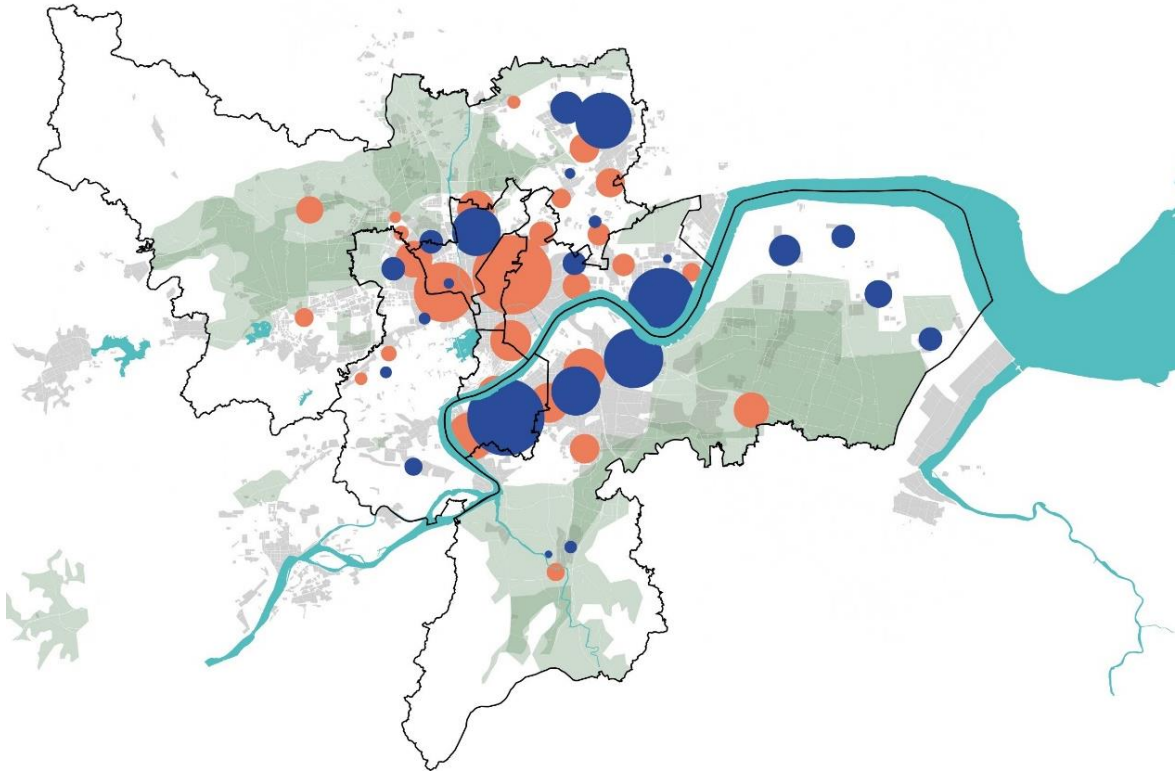


Figure 8. Constructed Land/Built Environment Concentrations in Hangzhou

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: [openstreetmap.org](https://www.sciencedirect.com/science/article/abs/pii/S0264275115000827) and <https://www.sciencedirect.com/science/article/abs/pii/S0264275115000827>

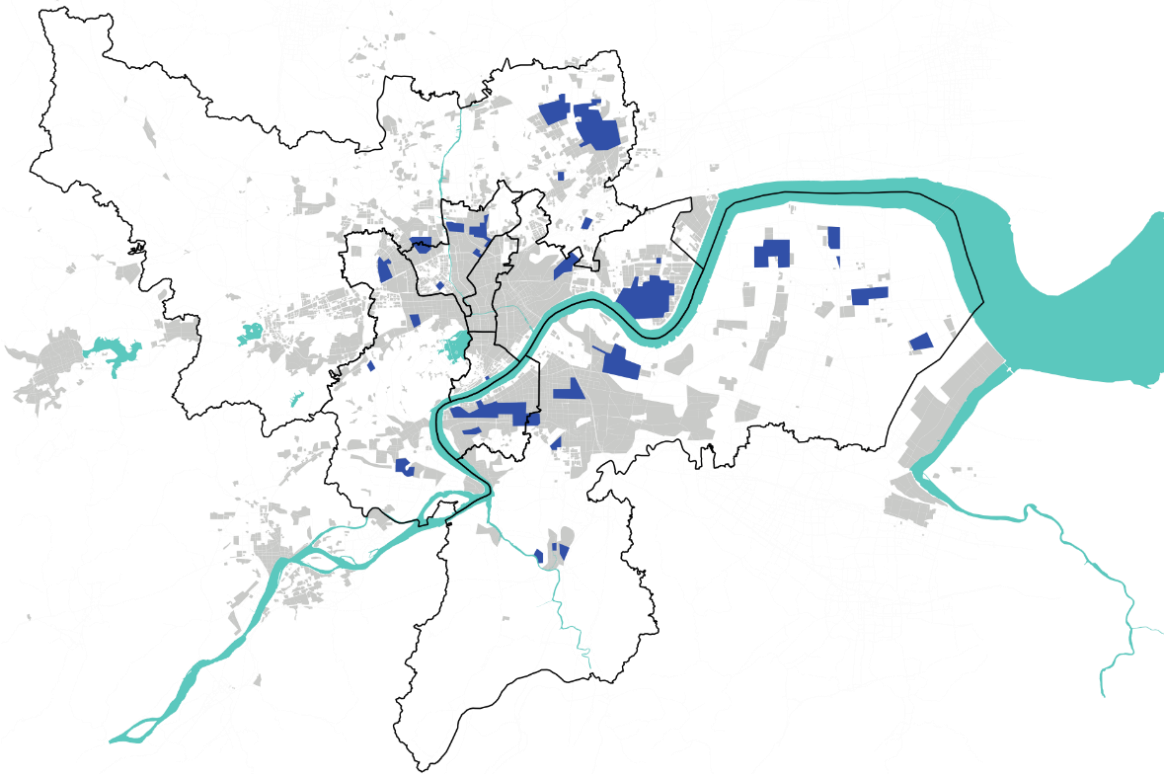


Figure 9. Location of Industries in Hangzhou

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: [Google Maps](https://www.sciencedirect.com/science/article/abs/pii/S0264275115000827), [openstreetmap.org](https://www.sciencedirect.com/science/article/abs/pii/S0264275115000827) and <https://www.sciencedirect.com/science/article/abs/pii/S0264275115000827>

3.5.3 Residence

At the end of 2018, the city's permanent population was 9.806 million, showing an increase of 338,000 over the end of the previous year. There is a 7.59 million urban population, accounting for 77.4% of the total, increasing 0.6% over 2017. The birth rate was 11.3‰, and the natural growth rate was 6.2‰. The city's registered population was 7.741 million, with a birth rate of 12.4‰ and a natural growth rate of 6.3‰ (Hangzhou Government, 2016). The residential are located in city centres and the area along the river, as depicted in the Figure 10.

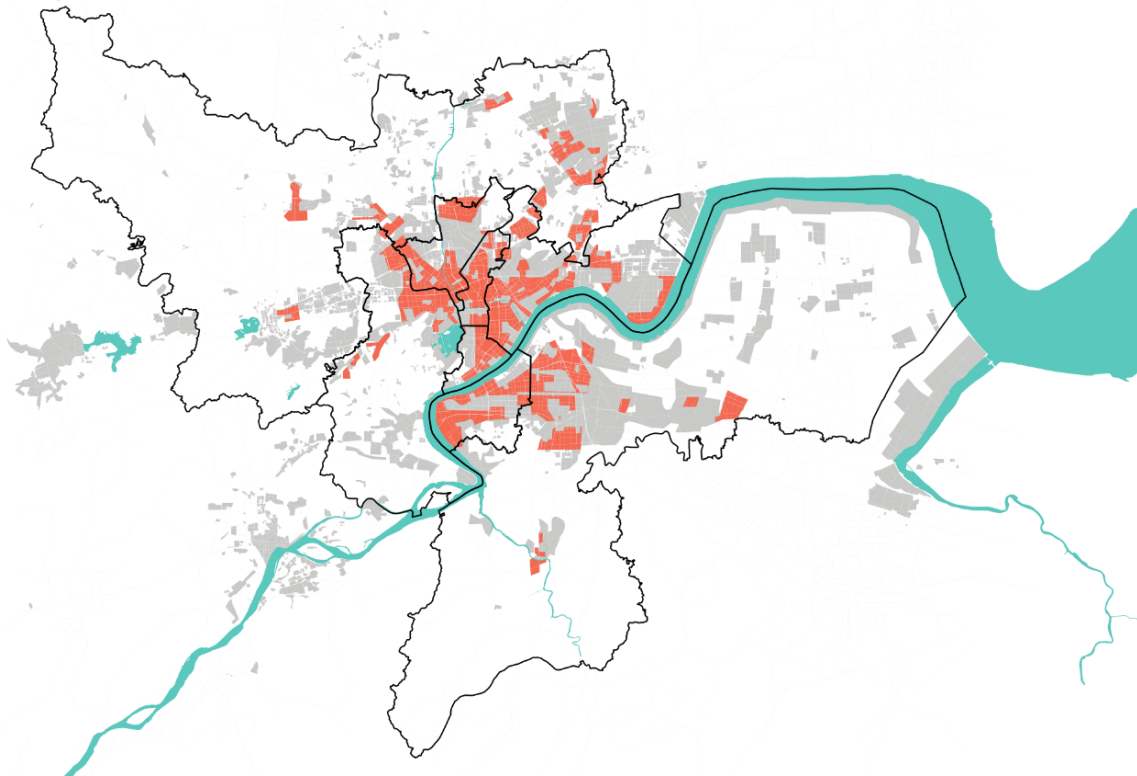


Figure 10. Location of Residential Areas in Hangzhou

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: Google maps and openstreetmap.org

3.5.4 Agriculture

Figure 11 demonstrates the proportion of land used for agriculture. In 2018, the total amount of cultivated land and protected area of basic farmland accounted for a large proportion, with 39.5% and 33.3% respectively. Garden area took up for 19% and the rest 8.2% was occupied by pasture area.

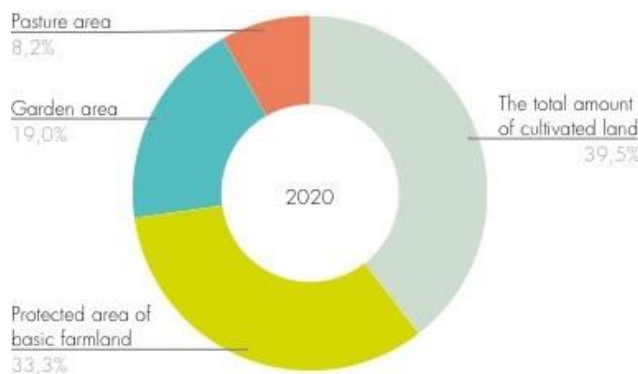


Figure 11. Proportion of Land-used for Agriculture in Hangzhou

Source: Global Urbanisation Research Team FRA-UAS (2020)

3.5.5 Green Spaces

At the end of 2018, there were 22,097 hectares of garden green space in the urban built-up area, the per capita park green space area in the metropolitan area reached 13.58 square meters, and the green coverage rate of the built-up area was 40.3% (Hangzhou Government, 2019b).

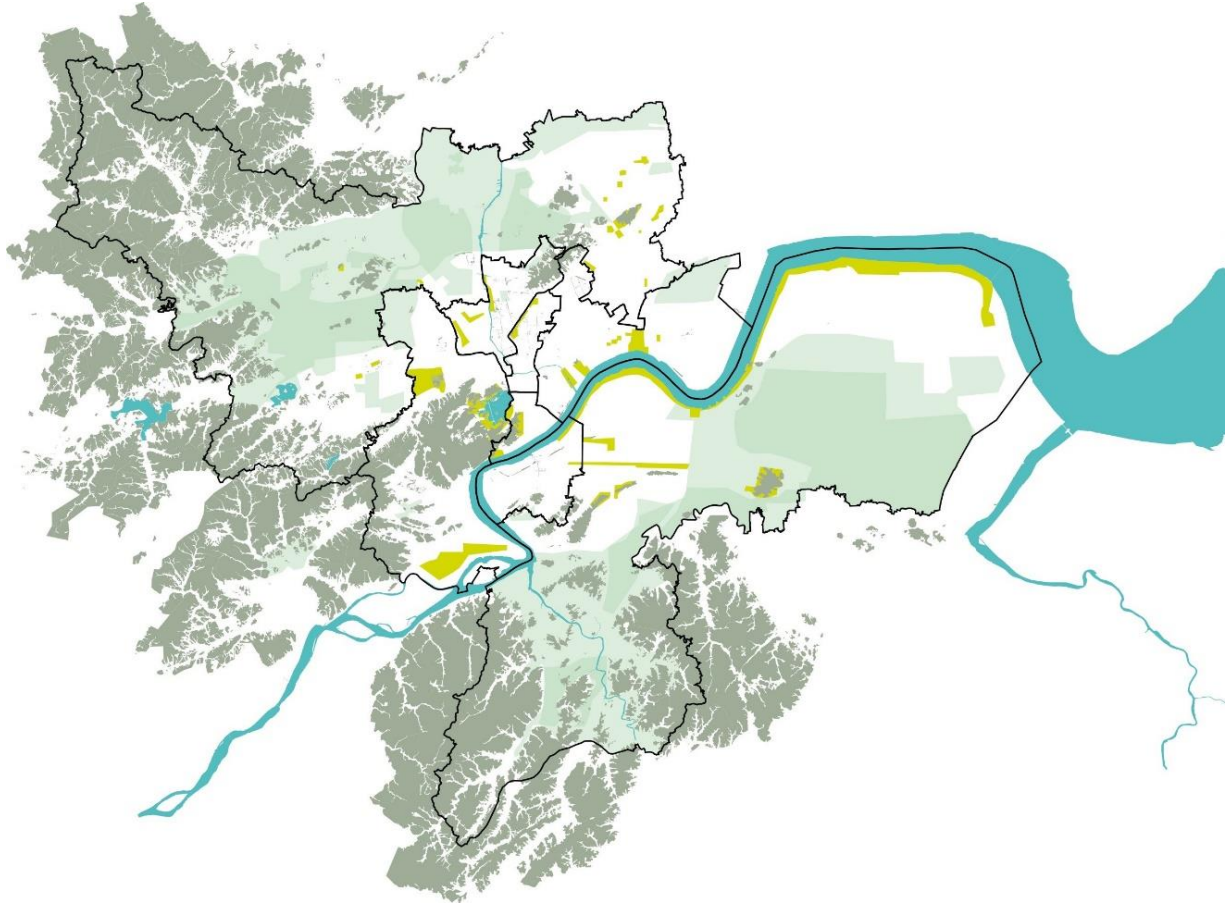


Figure 12. Natural and Constructed Green Spaces in Hangzhou

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: [openstreetmap.org](https://www.openstreetmap.org)

3.6 Mobility and Transport

Hangzhou is a metropolitan with a comprehensive transportation network. The traffic system is composed of land transportation, water transportation, air transportation, and other systems. Hangzhou is the center of the expressway network in Zhejiang Province, one of the main transportation hubs in East China, and an important gateway connecting Shanghai and South China. In this section, details of the transport system will be analyzed

3.6.1 Road Network

Hangzhou is the hub of 5 expressways (Shanghai-Hangzhou-Ningbo Expressway, Hangzhou-Nanjing Expressway, Hangzhou-Jinhua-Quzhou Expressway, Hangzhou-Thousand Island Lake Expressway, and Hangzhou-Huangshan Expressway) and 11 national and provincial highways. It has formed a network of expressways and particular highways with complete facilities (Hangzhou Government, 2018i).



Figure 13. Road Network of Hangzhou

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: openstreetmap.org

3.6.2 Public Transport

The main public transport in Hangzhou City includes aviation, railroad, metro, bus system, and water transport. This part will provide an overview of these main transport methods.

Aviation

Hangzhou Xiaoshan International Airport is a crucial trunk line airport in China. Its passenger throughput and freight and post throughput are both among the top 10 in China. By the end of 2018, there were a total of 193 airlines, of which 38 international or district airlines to Tokyo, Osaka, Bangkok, Singapore, Seoul, Pusan, and HK and Macao (Hangzhou Government, 2018i).

Railway and Metro

Hangzhou is one of China's railway network's critical points and is a crucial railway hub in southeast China. It connects three important railway lines of the country, i.e., Shanghai-Kunming Railway, Hangzhou-Xuancheng (Anhui Province) Railway, and Hangzhou-Ningbo Railway (Hangzhou Government, 2018i).

Bus System

The bus system is an integral part of public transport in Hangzhou and has a history of nearly 100 years. Hangzhou Public Transport Group operates the bus system in Hangzhou. By 2020, Hangzhou has a total of 1101 bus lines, covering an urban area as well as outskirts. The number of buses has reached 10384, with more than 24500 employees (Hangzhou public transport group, 2020).



Figure 14. Road System and Metro Lines in Hangzhou

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: [openstreetmap.org](https://www.openstreetmap.org)

Water Transport

Hangzhou has taken good advantage of its geographical advantage and constructed good water transportation facilities. The famous Beijing-Hangzhou Grand Canal has been connected to the Qiantang River. It has completed a water network construction connecting itself to rivers, lakes, and seas in other parts of China.

In 1996, Hangzhou established the urban river regeneration project, and the 5th phase, which began in 2008, was focusing on the green water transport system. This system aims to provide convenient transport and improve the ecological environment and provide guidance for urban river areas to take advantage of their geographic advantage to develop more sustainably. The system consists of three parts: water bus system, transfer system and slow-transport system along rivers (Yiqin et al., 2009).

3.6.3 Cycling as A Non-Motorised Mobility

In April 2008, Hangzhou Public Transport Group and Hangzhou Public Transport Advertising Agency found Hangzhou Public Bicycle Traffic Service & Development Co, Ltd with RMB 5,000,000. It aims to promote a green transport concept, expand the scale of public transport services, and reduce private cars' use. On 1st May 2018, the public bicycle system in Hangzhou was officially put into operation. The first 2500 bikes were placed in 61 service points. Citizens depend on a self-help system and citizens to pay, borrow, and return the bicycles, and this service provides great convenience to their mobility. By the end of 2010, more than 2100 service points had been put into operation, with more than 50,000 bikes available. In June 2011, the average quantity of the leased cycles per day exceeded 150,000. Public bikes have been an essential way for transportation in Hangzhou (Kang & Chen, 2012).

3.7 Infrastructure Development

The government of Hangzhou is committed to promoting the development of infrastructure, to create a better living and investment environment. In this section, several key aspects regarding infrastructure construction, including water management, energy consumption, and waste disposal, will be discussed.

3.7.1 Water

There are 4 large reservoirs and 14 medium reservoirs in the city. At the end of 2019, the total water storage capacity was 14.482 billion cubic metres, including 14.315 billion cubic metres in large reservoirs and 167 million cubic metres in medium reservoirs. Full storage capacity decreased by 270 million cubic metres compared with the end of last year. In 2019, the city's total water supply was 3.096 billion cubic metres, showing a decrease of 151 million cubic metres from the previous year. The per capita annual water consumption for daily life was 53.9 cubic metres, and the water resources utilisation rate was 16.5% (Hangzhou forestry water conservancy bureau, 2020).

3.7.2 Wastewater

By the end of 2019, Hangzhou had built 49 sewage treatment plants, with a sewage treatment capacity of 3,084,500 tons per day. According to Measures of Hangzhou Municipality on Drainage Management, the city implements the rainwater and sewage diversion system. The municipal administrative department of urban management and the county (city) drainage department, in cooperation with the urban and rural planning departments, is responsible for preparing urban drainage and sewage treatment plans for the respective administrative areas. The plans clarify drainage standards, drainage volume, drainage mode, scale, layout, and construction timing of drainage facilities, sewage and sludge treatment and utilisation measures, and rainwater collection and utilisation measures.

Groundwater discharged in the construction process of foundation and excavation should be released into the rainwater pipe network after reaching the environmental quality standard. Air-conditioning condensate produced in public buildings and industrial production, water from landscape water bodies, and water exchange in swimming pools should be discharged into rainwater pipe network. Enterprises and institutions engaged in industrial, construction, catering, medical and other activities, individual industrial and commercial households that discharge sewage to urban public drainage facilities should apply to the local district/county (city) drainage authorities for a permit for sewage discharge into the drainage pipe network. Enterprises and individuals engaged in catering, motor vehicle cleaning and maintenance, construction, building materials manufacturing, beauty salons, and so on have a responsibility for the pre-treatment of pollutants in water before releasing. Sewage pre-treatment facilities such as oil-water separation devices, mud and sand sedimentation tanks, and hair collection devices are supposed to be used to decrease water pollution (Hangzhou Government, 2019a).

3.7.3 Energy

In 2014, the Hangzhou government issued the Administrative Measures on the Development and Utilisation of Renewable Energy, targeting to promote the development and utilisation of renewable energy. The focus is to increase energy supply, improve energy structure, ensure energy security, protect the environment, and achieve sustainable economic and social development. The government actively supports constructing a megawatt distributed photovoltaic power generation system on the roofs of large public buildings such as industrial plants, commercial complexes, and professional markets in urban areas. It also provides supportive policies for constructing small distributed photovoltaic power generation systems on the roofs of buildings such as schools, hospitals, hotels, parties, and government organs, and scientific research departments. The use of ground source (water source) heat pump technology is encouraged and supported in large-scale farms, facility agricultural bases, urban complexes, large hotels and shopping malls, large public buildings, villas, and high-grade residential quarters.

As one of the clean energy sources, biogas energy is encouraged in large-scale farms (breeding areas), slaughterhouses, breweries, sewage plants, and villages. The government is making significant efforts to use energy crops, agricultural and forestry wastes, and kitchen wastes to develop biomass fuels. Clean and environmentally friendly advanced power generation technology is also the focus of the government to establish (Hangzhou Government, 2015b).

3.7.4 Solid Waste Management

In 2018, the output of industrial solid waste in our city was 5,802,400 tons, with the rate of safe and harmless disposal reaching 99.42%. Fuyang, Yuhang, and Dajiangdong districts produced 4,163,400 tons of solid waste, accounting for 71.75% of the total. The amount of industrial hazardous waste reached 540,900 tons, 80% of which was produced in Dajiangdong district, Fuyang District, and Yuhang district. In 2018, there were more than 5,000 hospitals, township health centers, community health service centers, medical clinics, and other health and medical institutions in the city, with a medical waste output of 29,900 tons, an increase of 5.65% over the previous year. Dadi Weikang Medical Environmental Protection Company was responsible for crushing, disinfection, and incineration of these medical wastes, with a safe and harmless disposal rate of 100%. In 2018, the city produced 4,204,600 tons of domestic waste, which was disposed of by landfill and incineration, with the percentage of harmless disposal of 100%.

Hangzhou government is committed to promoting the comprehensive utilisation of hazardous wastes. In 2018, 3 sets of facilities for complete utilisation of unsafe wastes was constructed, with an additional, extensive utilisation capacity of 243,000 tons. At present, 28 sets of facilities for disposing of hazardous waste have been built in the city. There are 43 enterprises with a certificate to dispose of harmful waste in the city, of which Zhejiang Ecological Environment Department issues 42. Hangzhou Ecological Environment Bureau issued the certificate to the remaining two. Hangzhou Lijia Environmental Protection Service Company have both certifications (Hangzhou Municipal Ecology and Environment Bureau, 2019).

3.8 Formal Development Plan and Visions

By the end of 2050, Hangzhou would become a prosperous modern city with a thrived economy, high-level education, right ecological environment, comprehensive transport network, flourished tourism, and optimised layout and industry structure. The permanent resident population of urban areas is expected to increase to 8.8 million, and the social and ecological standards will keep pace with developed countries.

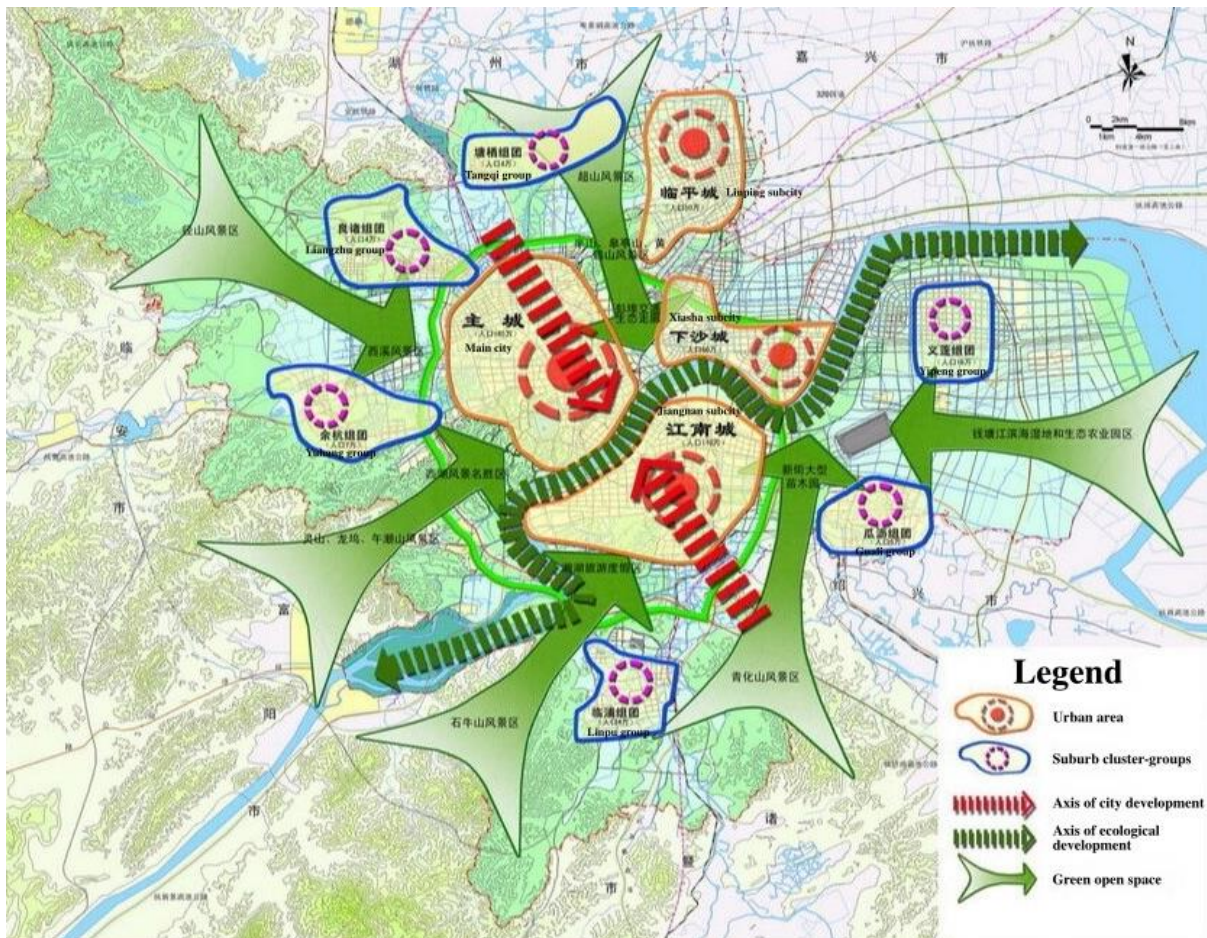


Figure 15. Hangzhou Master Plan - Map of Structural Layout
Source: (Hangzhou planning Bureau, 2015)

3.8.1 Overall Master Plan

The final overall master plan (1981-2000), approved by the state council on 16th May 1983, played an essential role in facilitating urban development and promoting economic and social development. To meet the new-around development requirements, the Hangzhou government started a new urban plan in August 1993. On 9th May 2002, the Outline of Overall Urban Plan of Hangzhou (2001~2020) was reviewed by experts from the Ministry of Construction. By September, the Overall Urban Plan of Hangzhou (2001-2020) was finished and given to The People's Government of Zhejiang. In February 2003, it was passed through at the Joint Conference of Zhejiang Province Urban Plan Examination and was reported to the provincial government. In June, it was examined by the local government's executive meeting and submitted to the State Council for approval. In May 2005, experts from the Ministry of Construction examined the achievement of the Urban Plan. On 20th January 2006, some suggestions for modification were proposed in the 31st Session of the Urban Plan Department Joint Conference. In August 2006, the revised plan was submitted to the Ministry of Construction, and on 4th December, it passed through in the 111th executive meeting of the Ministry of Construction. On 16th February 2007, it was officially approved by State Council (Hangzhou planning Bureau, 2015).

This plan is divided into three periods; the short period is from 2001 to 2010, and the long-term period is from 2011 to 2020. The long-term outlook is up to the year 2050. This plan sets Hangzhou's goal into a modern city full of local characteristics and a prosperous economy, harmonious society, comprehensive facilities, and an eco-friendly environment. According to this plan, the critical priority of construction is to speed up the clustered old urban area's transformation and the construction of

economic housing, public houses, residential resettlement houses, and college students' apartments. This has significant implications in the improvement of the living conditions of citizens, especially for those low-income families. According to the regulations in the Overall Planning of West Lake Scenic Area, the city should continue to promote the improvement of the ecological environment and the protection of environmental resources (Hangzhou planning Bureau, 2015). The following points present the major topics as discussed in the planning document.

Layout Structure

The land area in the downtown area is 256.53 square kilometres and is expected to be controlled within 305 square kilometres in the short-term period and 370 square kilometres in the long-term period. According to the master plan, “one main city, three sub-cities, double cores, double axes, six groups, and six eco-belts” will be formed. The central city consists of Shangcheng district, Xiacheng district, Xihu district, Gongshu district, and Janggan district, the centre of politics, economy, education, science, and culture tourism of Zhejiang province. The three sub-cities include Jiangnan, Linping, and Xiasha, which are integrated areas used for living, administration, education, entertainment, technology, tourism, and commercial finance. The urban spatial development strategy is developing middle and the south regions for business and residence and north areas for industry, storage, and logistics. The transport and municipal facilities will be concentrated in the east area while the west region is used for education, research, and residence. Six cluster-groups will be formed and divided into north and south areas. North areas include Tangqi, Liangzhu, and Yuhang groups, while south areas include Yipeng, Guali, and Linpu groups. The groups aim to construct multiple fully functional areas with modern facilities, an excellent ecological environment, and balanced socio-ecological resources. Six eco-belts refer to the green open space between groups and the downtown area, including mountains, green land, and river. Dual cores are the Lakeside area and Wulin Square area, which are defined as the service centre of tourism and commerce of Hangzhou, and Riverside area, which is a new centre combined with the north coast of Qiantang River New City and south coast of Qiantang River Century City. Double axes include the east-west axis, the urban eco-axis with Qiantang River as the centre, and the north-south axis, which is an urban development axis with the central city and Jiangnan sub city as the centre (Hangzhou planning Bureau, 2015).

Urban System

The Urban system of Hangzhou is set up by one central city in an urban area, five counties, 18 local central towns, and 60 average towns. Depending on the central city as its core, central towns as its backbones, this system is expected to be an open, effective, balanced, and sustainable competitive urban system in the future. In 2005, the number of registered urban residents was 6.6045 million, and this number is expected to reach 7.15 million in the short-term period and 8.2 million in the long-term period. The urbanisation level reached 62.1%, and this figure is expected to increase to 70% in the short-time period and 84% in the long-term period (Hangzhou planning Bureau, 2015).

Urban Green System

To develop international tourism and ecological city, Hangzhou has proposed an urban green system, in which green belts are designed along rivers, streams, and roads. It aims to balance the distribution of green lands in the residential, factory, and school areas, promote vertical forestation and roof plantation, and increase plant diversity. The urban green system combines the natural ecological characteristics of Hangzhou. It proposes a fundamental framework for urban ecology, in which four suburban forest parks, multiple protection areas, and green transportation corridors will be constructed. The goal is to form an ecological landscape green system that has “two rings (inner and outer rings), two axes (Qiantang River and the Grand Canal), and six eco-belts” (Hangzhou planning Bureau, 2015).

Urban Traffic

The master plan proposes to form a modern public transport system by integrating multiple transport methods, including rail, trams, buses, and other transport vehicles. By 2020, the public transport network will contain five rail transit lines with a total length of 171 kilometres, and by 2050, the number will increase to ten with a full distance of 284 kilometres. An urban fast transport network, containing "one ring, three vertical and five lateral expressways" will be formed to connect every city cluster. "Three vertical expressways" mainly refer to the north-south roads, and "five lateral expressways" are composed of west-east roads". The "one ring" represents the 123-kilometre highways, which are designed to diverge the traffic flow and mitigate traffic problems brought by the cross-boundary vehicles.

Hangzhou also plans to promote external transport development, and a "one hour and a half" metropolitan road traffic circle will be formed by constructing the ring road and 17 outgoing roads. This network circle will significantly promote Hangzhou's connection to its surrounding cities such as Shanghai, Nanjing, Ningbo, and so on. Taking advantage of the geological characteristics, Hangzhou will continue improving its trunk water shipping network, raising Qiantang River's traffic capacity to level 4, reforming the Beijing-Hangzhou Grand Canal, and setting up the second channel of the Grand Canal in the east of Jiubao. In addition, the future capacity of Hangzhou Xiaoshan international airport is expected to increase to 30,000,000 passengers per year (Hangzhou planning Bureau, 2015)

Urban Infrastructure

The master plan involves projects in water supply, sewage, river treatment and rainwater, environmental sanitation facilities, energy, and post and telecommunications, radio, and television for urban infrastructure. The water supply project aims to integrate urban and rural water supply and establish a reliable and safe water system. The maximum daily capacity of the water supply increases to 3,500,000 cubic metres. The sewage project involves the construction of a system for collecting, conveying, handling, and discharging urban sewage. This project has significant implications in the control of water pollutants and improving water quality. The river treatment and rainwater project aim to form a rainwater discharging system, which will enhance the city's capacity for flood draining, turning rivers into green corridors of the town. In contrast, the environmental sanitation facilities project aims to decrease the contamination and improve the utilisation of urban domestic. Besides, the energy project proposes the construction of a modern electricity grid with adequate capacity, advanced equipment, high automation, flexible scheduling, and safe operation. The aims include optimizing the structure of fuel gas sources, speeding up the construction of a pipeline of gas supply, and improving the distribution, storage, supply, and service assurance. The post and telecommunications, radio and television project suggest the necessity to construct a more comprehensive communication network system, boost the ability of mail transit and handling, and improve the current cable radio and television network (Hangzhou planning Bureau, 2015).

3.8.2 13th Five-Year Plan

During the 12th five-year period (2010-2015), Hangzhou had accomplished outstanding achievements in economy, society, technology, and city competitiveness. The GDP increase generated by third-party industry accounted for 58.2%, and the service industry had become the main driving force of economic development. Efforts had been made on the integration of Xiaoshan, Yuhang, and Fuyang districts with urban districts and the construction of a new dynamic urban economic circle. The income of urban and rural residents increased at a steady pace, and the basic public infrastructure and public service system were enhanced. Hangzhou also gained the opportunity to hold the G20 Summit Conference in 2016 and the Asian Games in 2022 and the construction of an international E-commerce experimental area, which were considered great chances for boosting city image promoting economic development. However, the problems presented include the pressure of economic transformation, lack of innovative capability, the systematic constraints on developing creative industries, imbalanced development between urban and rural areas, insufficient internationalisation, aging population, limited resources,

and inadequate infrastructure. There are also some challenges in the maintenance of public safety and security (Hangzhou Government, 2016).

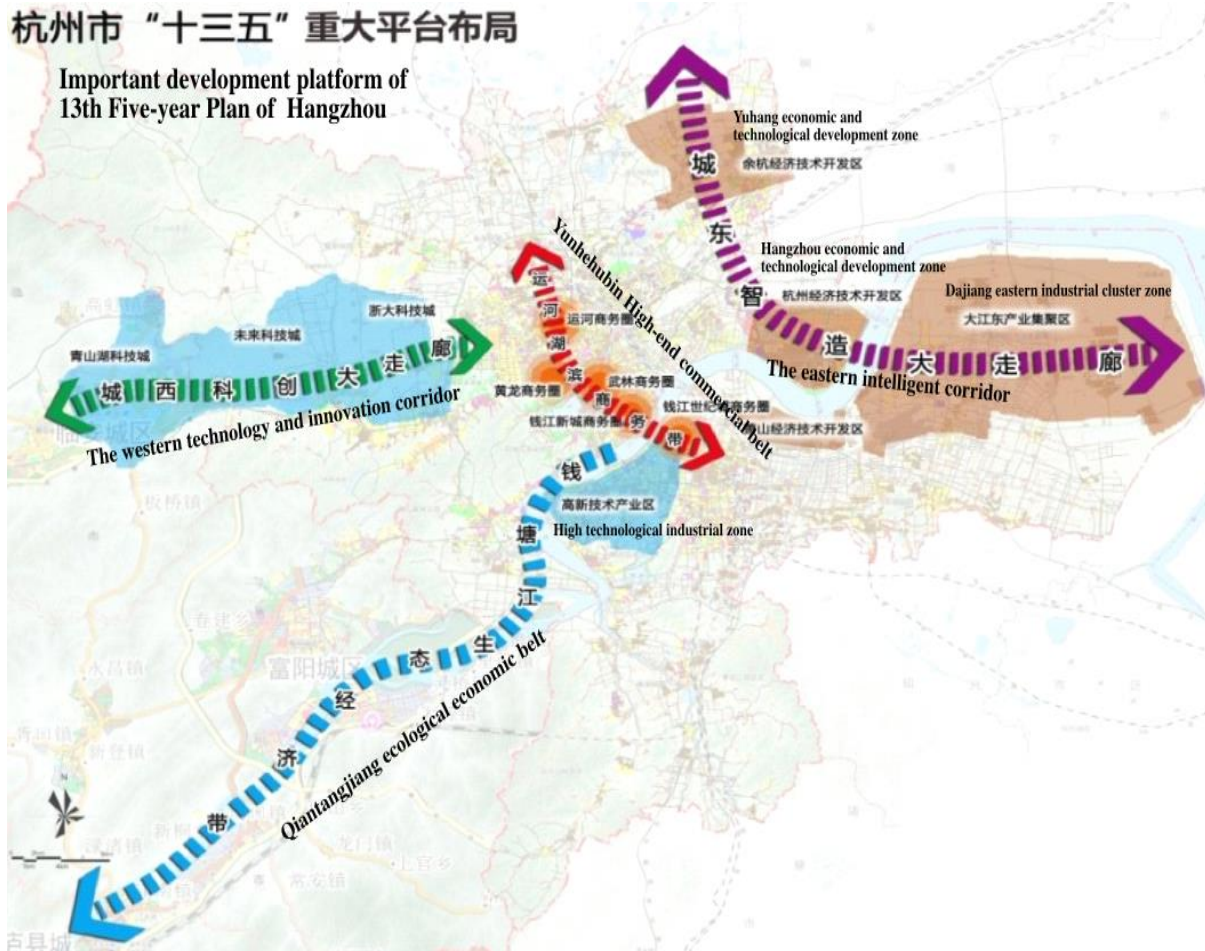


Figure 16. Important Development Corridors of the 13th Five-year Plan of Hangzhou
Source: (Hangzhou Government, 2016)

Reviews and Objectives

According to the 13th five-year Municipal economic and social development Plan of Hangzhou (2016-2020), the general objective is to construct a leading affluent society in China and lay a solid foundation for building a famous city with an international reputation. The economy should continue keeping a rapidly growing rate, with the GDP increase higher than 7.5%. Efforts should be made to construct an innovative and competitive city, with the rise in high-tech industries accounting for more than 50% of the total industry growth. Expenditure on research and experiment will increase from 3% to 3.5%. In the aspects of ecology and energy, measures will be taken to control the consumption of energy, water resources, construction land, and the release of carbon to increase efficiency and decrease contamination. By the end of 2020, the ecological environment will be improved significantly, with the water quality of rivers improved, and the concentration of particles (PM 2.5) decreased significantly. In addition, efforts will be made to increase urban and rural residents' income and eliminate the discrepancy. The goal is to increase 850,000 new employment positions and keep the unemployment rate below 5%. The government of Hangzhou will develop a series of efficient public service standards, optimizing market resources and improving the capacity of city management (Hangzhou Government, 2016).

The Construction of a New Industrial System

The development plan emphasises the upgrade of the industrial structure by constructing a new industrial system, which depends on the information economy, the modern service industry, advanced manufacturing, and urban agriculture as its basis. A new model of "1+6" industrial cluster will be developed, which regards information technology as its foundation to construct an international E-commerce centre and make efforts to accelerate the development of six domains including culture and filming, tourism and leisure, finance and service, health, fashion design, and equipment manufacturing industry.

The government plans to provide an open platform, encouraging benign competition, and promoting the development of the intelligence-intensive service industry. The action should consider the requirement of residents and make efforts to improve citizens' living standards. The government will accelerate the experimental reform in the service industry, enhancing monitoring systems to ensure supply and expand consumption. Priorities will be put into business conferences, tourism and leisure, financial services, E-commerce, and medicine, to enlarge the scale of international trade. The government encourages enterprises to improve their creativity, adopting innovative management strategies to boost brand reputation. For those districts with a comparatively low GDP but with abundant resources in the tourism and culture industry, the Hangzhou government encourages ecological tourism, health services, and senior caring services.

Hangzhou is committed to increasing its city competitiveness by improving manufacturing. More efforts will be put into traditional core industries, including automobiles, biomedicine, computer numerical control machines, integrated circuits, and strategic emerging industries, including robots, 3D printing, and aerospace engineering. Hangzhou will provide policy support to smart manufacturing, customisation, collaborative production, and other new production modes and business models. The government will strengthen supervision and establish a series of uniform manufacturing standards to improve product quality effectively.

Hangzhou will continue to develop modern agriculture and construct function-partitioned production areas to produce vegetables, fruits, aquaculture, and stock farming. The target is to ensure a balanced and continuous supply of agricultural products all-year round. The government will continue to put efforts to improve infrastructure and promote water-efficient irrigation. One priority of modern agriculture is integrating current technology in agricultural production, achieving the precise control of production processes, and the digitalisation of agricultural resource management. Intelligent and automotive facilities and equipment will be popularised to increase productivity, and the Circular Agriculture strategy will be adopted to reduce contamination.

The government will be continuing to focus on supply-side structural reform. Concrete and practical steps will be taken to cut overcapacity, further reducing steel production capacity and suspending or eliminating coal-fired power generation capacity. Targeted policies will be made to cut excess urban real estate inventory, and deleveraging should be nurtured in an active and prudent way. The government will take multiple measures to cut costs, such as abolishing or suspending administrative charges paid by enterprises to the central government, lowering the share paid by enterprises for contributions to social security, to inject new forces for the development of enterprises (Hangzhou Government, 2016) (Hangzhou Government, 2010).

The Promotion of Integration of Urban and Rural Areas

By constructing a new layout structure of "one district, two corridors, two belts, two ports, and two characteristics," Hangzhou will accelerate the integrated development of urban and rural areas and improve the city competitiveness. "One district" is referred to as the national innovative demonstration zone, which will perform the function of promoting the industrialisation of technology. "Two corridors" include the western technology and innovation corridor and the intelligent eastern corridor. Famous universities, including Zhejiang University, Hangzhou Normal University, Zhejiang University of Agriculture and Farming, are located in the western technology and innovation corridor. By taking advantage of such excellent educational resources, Hangzhou strives to construct an

energetic zone for attracting employees with high-technology expertise and competitiveness. The intelligent eastern corridor covers Linjiang national high-tech zone, Xiaoshan technological development zone, Hangzhou economic and technological development zone, and Qianjiang smart city, Yuhang economic and technological development zone. Supported by Yangtze Delta Region Institute of Tsinghua University and Hangzhou Science and Technology Park of Chinese Academy of Sciences, the government will construct a manufacturing industry's demonstration area. Several smart towns, such as Qiantang intelligent manufacturing town, Xiaoshan robotic town, Yuhang eco-automobile town, and Xiasha medical town, will be constructed to promote relevant industries' development.

"Two belts," including Yunhehubin High-end commercial belt and Qiantangjiang ecological, economic belt, are two retail centres Hangzhou government will construct. By developing the high-end commercial service industry, financial service industry, and fashion design and tourism industry, Yunhehubin High-end commercial belt aims to build a commercial harmonious and living community. Qiantangjiang ecological, economic belt targets commercial service, tourism and leisure, culture and innovation, health, information economics, intelligent manufacturing, high-tech industries, and the green ecological industry.

"Two ports" refers to Qiantangjiang commercial port and Hangzhou airport economic zone. Qiantangjiang Commercial port is thriving to be the regional commercial centre, national centre of wealth management, and the national centre of new commercial services. Taking advantage of its geological locations, Hangzhou airport economic zone is orientated as the centre of regional logistics and aviation economics.

"Two characteristics" refers to the construction of a characteristic town and an industrial park. By integrating high technology and science into traditional Chinese industries (tee production, silk production, and traditional Chinese herbal medicine, etc.), the town aims to improve employment and promote the tourism industry and cultural protection. The industrial park will adopt a cross-region collaborative strategy and benefit-sharing mechanism to realise the win-win situation.

Hangzhou government will endeavour to promote the integration of urban and rural areas and provide education and training to people migrating from rural areas to help them adapt to urban life. Efforts will be put on an experimental upgrading reform of Hangzhou urban economic zone, which will adopt a coordinated development system and explore an innovative regional cooperation strategy. To construct a dynamic and competitive urban agglomeration, the government of Hangzhou will initiate a support policy to assist the establishment of free trade zone and deepen the strategic collaboration with Shanghai Zhangjiang National Innovation Demonstration Zone and Sunan National Innovation Demonstration Zone (Hangzhou Government, 2016).

The Improvement of City Administrative Efficiency

Hangzhou government will continue to enhance its administrative efficiency and create a better place for people to live. Priorities will be put in the aspects of transportation, urban planning, environment, and network infrastructure. Hangzhou will strengthen the building of a comprehensive transport infrastructure network, and reinforce the connectivity of multiple modes of transport, advancing modern logistics and securing comprehensive transport services. The reconstruction and upgrading of Hangzhou Southern Railway Station will be carried out, and a new railway station is planned to be built in the western region. Public transport will be improved, and residents are encouraged to use environmentally friendly transport methods. The government will make efforts to improve transportation management efficiency and provide more convenience to the disabled. To control the number of private vehicles and alleviate traffic congestion, the government will continue to implement limiting the utilisation of private cars. Hangzhou will accelerate the construction of transport infrastructure and carry out a three-year plan of "no congestion in the west." The road network structure will be adjusted and form a new rapid network of "two rings, four vertical lines, five horizontal lines, nine extensions, and two connections." Parking facilities will be upgraded to

accommodate increasing vehicles and enhance parking services. The previously congested areas will be renovated, with more underpasses, sidewalks, and cycleways constructed, in order to encourage environment-friendly commuting. The public transport system, including light rail, underground, taxi, bus, and public bicycle, will be enhanced to increase city commuting's convenience and comfortableness.

In the following five years, Hangzhou will actively promote shantytowns' renovation in the urban areas and dismantle unapproved or dangerous buildings. The dismantled regions will be replaced by green land to improve the living environment. Residents are encouraged to live in suburb new-constructed areas. The clothing wholesale market, China products market, and building material market, located in an urban area, will be moved to the suburb area. The planning of underground space will be conducted, targeting to construct an "underground city," which performs the commercial centre's functions, underground transportation hub, and air-raid shelters. The undercover area should be connected with the above-ground buildings to increase the efficiency of space utilisation.

Hangzhou will strive to deal with pollution and create a better ecological environment. Regulations on the disposal of sewage will be strictly implemented to eliminate water contamination of rivers. Efforts will be made to ensure water safety, especially in rural areas, and measures will be taken to prevent contaminated water from flowing to the Qiantang River and Shaoxi River. By the end of 2020, the Hangzhou government will complete the Qianshui Lake project's infrastructure construction and the extension of the Xianlin reservoir and the Xianghu reservoir. Hangzhou government is always committed to prevent haze and improve air quality. The release of polluted gas from factories, vehicles, catering industry will be strictly controlled. Alternative resources are encouraged to use to eliminate the emission of greenhouse gas. The government advocates using environmentally friendly commuting methods and will promote the popularisation of mobiles that run on renewable resources. The government will increase investment in the construction of user-friendly infrastructure to increase waste classification and recycling and provide more education to raise public awareness of environmental protection. The waste classification project will start from the urban centre and then extend to the suburbs to decrease the average waste by 6% and increase waste recycling to 60% by the end of 2020.

Hangzhou government will optimise the structure of energy consumption and strictly control the consumption quantity of coal. Focusing on manufacturing, the service industry, construction, and transport, the government will take measures to increase alternative resource utilisation.

Centralised heating will be promoted in the industrial park and industry-intensive area. Mobiles running on renewable energy will be encouraged, and relevant infrastructure will be constructed. By the end of 2020, coal consumption is expected to decrease to less than 35% of the total energy, and the consumption of non-fossil energy is planned to increase to 12%. The government will increase investment in the exploration, research, and utilisation of renewable resources, making Hangzhou a regional energy centre.

Hangzhou will improve the broadband and promote the scaling application of IPv6, aiming to achieve the full coverage of internet signal, and the free Wi-Fi service in the public area. The government will provide a supportive policy to promote the development of emerging technologies, such as the Internet of Things (IoT), Big Data, cloud computing, artificial intelligence (AI), and robotics, aiming to build a leading smart city (Hangzhou Government, 2016).

Hangzhou as the Model of Ecological China

With the goal of national ecological demonstration zone, Hangzhou will attach great emphasis on the protection of the ecological environment in the course of development. In Chunan county, Jiande sub-city, Linan county, and Fuyang district, areas of 200 metres above the sea level will be constructed as natural reserves, with soil and forests being protected. By the end of 2020, the soil erosion caused by human factor is expected to be effectively controlled, and the area suffering from soil erosion is projected to decrease to less than 6%.

A multi-level ecological corridor will be constructed along Xinan River, Fuchun River, Tianmu Stream, Beijing-Hangzhou Canal and Puyang River. The government will further promote the “urban green” campaign, increase the area of green land, and create a better living environment. Efforts will also be made on the protection of wetland, forest parks and water resources, to increase ecological diversity. Endangered wildlife and plants will be preserved and plans of construction of biodiversity conservation demonstration areas will be formulated.

The government of Hangzhou is committed to popularizing energy-efficient technology and commercial strategies, and actively conduct energy consumption monitoring on enterprises, to increase energy efficiency, decreasing emission and controlling energy consumption. The government will continue to take measures to optimize energy structure, and encourage the utilization of renewable energy, and environmentally friendly construction materials to decrease emissions of significant pollutants.

The government will improve meteorological disaster warning plans and emergency response mechanism and provide the public with more opportunities to increase knowledge about climate change. The meteorological monitoring system will be enhanced, with the information being shared instantly. More efforts will be put on the research and monitoring of the ecological environment, as well as the forecasting of major meteorological disaster (Hangzhou Government, 2016).

The Construction of a Well-Off Society

Focusing on the improvement of people’s living standards, the government will enhance public service standards and expand the coverage of high-quality service resources. Priorities will be given on education, medical service, culture and sport, pension services, employment, health care and housing security and financial support will be provided to ensure the supply of public goods. Efforts will be made to decrease the discrepancy between urban and rural areas, and residents in Xiaoshan, Yuhang, and Fuyang districts should enjoy the same resources as people in the metropolitan region.

To improve food and drug safety, the government will enhance the food and drug risk warning mechanism, strengthen supervision in schools and surrounding areas, enhance food safety inspection and testing, and increase the application of traceable electronic technology. By the end of 2020, Hangzhou will complete a national food safety city pilot project, with the percentage of public satisfaction on food safety achieving higher than 70%.

The government will optimise the allocation of medical resources and push forward the renovation and reconstruction of the Provincial Women’s Hospital, the Municipal Seventh People’s Hospital, Zhejiang Hospital, and Dajiang Eastern Hospital. The goal is to form a 20-minute service circle that allows the public to receive medical service conveniently. Hangzhou government will improve the service system for the aged in urban and rural areas and push forward the construction of several relevant facilities such as Dajiang eastern district service centre, Binjiang senior nursing home, Xiaoshan Health Care centre, etc., and adjust the medical resources. By 2020, there will be 50 beds for the aged per thousand older adults, with a nursing bed ratio of higher than 60%. The average life span is expected to reach 82 years old.

For the improvement of the employment rate, the government will formulate a new version of a supportive employment policy. It will provide free vocational training to people who do not have sufficient diploma and lack skills. By 2020, 850,000 new employment opportunities will be provided, and the unemployment rate will be controlled within 5%. The government will reallocate the educational resources and promote balanced development in urban and rural areas. By the end of 2020, standard high-quality teaching resources will reach 95% in compulsory education and 90% in high schools.

Hangzhou will continue to expand the provision of low-cost housing and accelerate the renovation of old buildings. There will be 200,000 affordable houses being provided to satisfy the needs of low-income families and newly-employed workers. The government will continue to take measures to increase the coverage of public health and old-age insurance, with the percentage reaching 95% and

98% respectively by 2020 (Local History Compilation Committee of Yuhang District of Hangzhou City, 2018).

Besides, a number of cultural projects and sports projects will be implemented. Zhejiang Cultural Center, China Cartoon Museum, Hangzhou Art Museum will be renovated, and public cultural services will achieve standardisation, equalisation, socialisation, and digitisation by 2020. The government will increase investment in sports facilities to encourage the public to participate in physical activities actively. By 2020, the average area for people to do sports will be 2 square metres per person, and the percentage of people actively doing sports is expected to account for 42% (Hangzhou Government, 2016).

3.8.3 Comprehensive land-use planning of Hangzhou (2006-2020)

Hangzhou is located in the southern part of the Yangtze River Delta, the western end of Hangzhou Bay, and the Qiantang River's lower reaches. As the capital of Zhejiang province, it is the political, scientific, educational, and cultural centre and one of the country's 15 deputy provincial cities. The State Council has designated it a national critical scenic tourist city and a famous historical and cultural city. Hangzhou consists of eight urban districts (Shangcheng, Xiacheng, Jianggan, Gongshu, West Lake, Binjiang, Xiaoshan, and Yuhang), three county-level cities (Fuyang, Linan, and Jiande), and two counties (Tonglu and Chuanan). At the end of 2005, the city had a resident population of 7.5863 million, with a GDP of 294.265 billion yuan, a GDP per capita of 37,456 yuan, and total fiscal revenue of 52.079 billion yuan. The city's total land area is 1,684,075 hectares, of which 1,399,515 hectares are agricultural land, occupying 83.10% of the total. The construction land covers an area of 130 641 hectares, taking up 7.75%, and unused land is 153,920 hectares, accounting for 9.14% (Hangzhou Government, 2010).

The last round of Hangzhou's overall land use planning was based on the result of the 1996 land use investigation. The Hangzhou's comprehensive land use planning (1997-2000) was compiled from 1997 and implemented with the State Council's approval in 1999. The implementation of the plan has played a vital role in promoting social and economic development and ensuring ecological construction. The urban and rural landscape has undergone tremendous changes. However, with the improvement of Hangzhou's development circumstance, the contradiction between the actual demand for land and the planned supply has become more prominent. The situation of the protection of cultivated land has become more severe. Economic globalisation, upgraded industrial structure, and transformed growth mode are the internal driving forces for the adjustment of land use structure. The government must change the land-use model and innovate the land resource allocation mechanism. After the new round of urban master plan's approval and implementation, the contradiction with the current spatial layout of the overall land use plan has become increasingly prominent. With the introduction of new macro-strategic objectives such as the country's 1.8 billion cultivated land red line, cultivated land protection and development are facing new and higher requirements. To better carry out the critical mission of scientific development concept, to make the protection of cultivated land more strict and standardised, to ensure the development more sustainable, a new round of "Hangzhou City Land Use Master Plan(2006-2020)" has been prepared by "Land Management Law of the People's Republic of China" and other laws and regulations, national and provincial land use master plans, provincial and municipal national economic and social development plans, and relevant land-use policies (Hangzhou Government, 2010). The following points presents the major topics as discussed in the planning document.

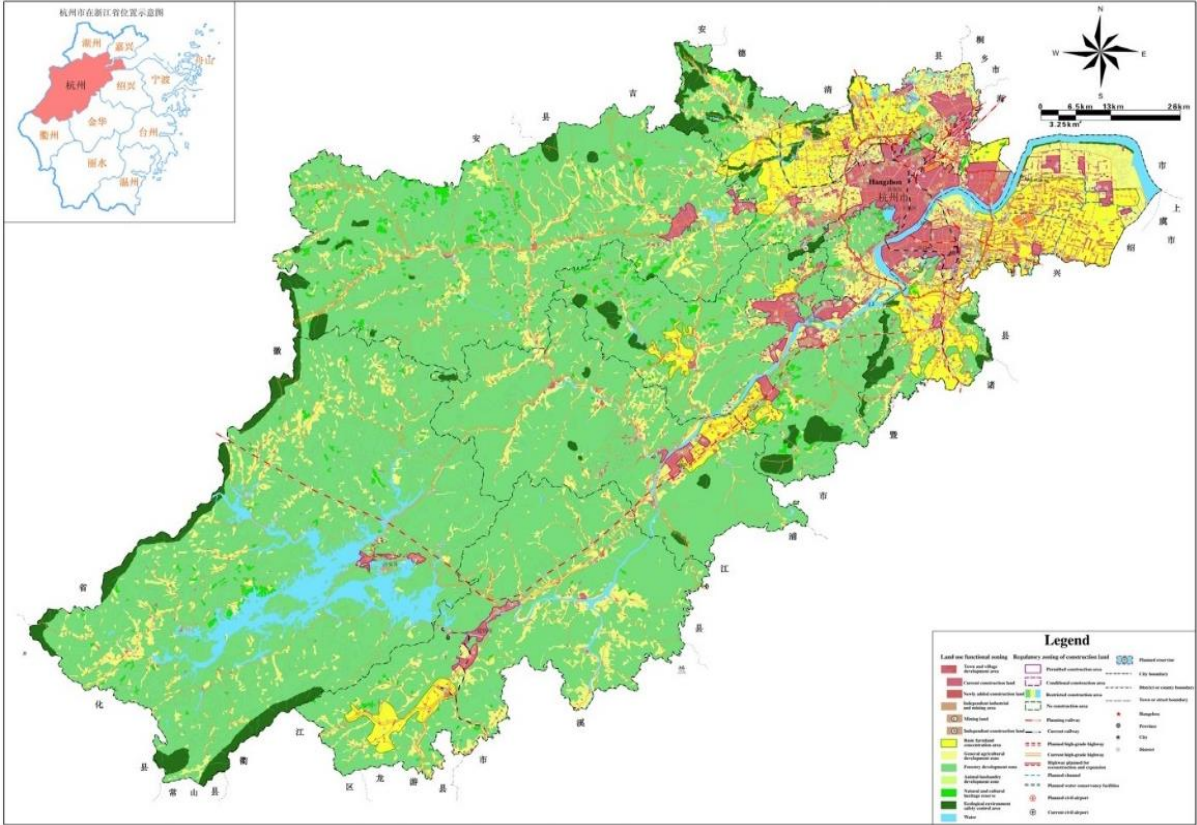


Figure 17. Comprehensive Land-use Plan of Hangzhou
Source: (Hangzhou Government, 2010)

Strategic Emphasis and Land-use

To adjust Hangzhou’s urban land use pattern from the “West Lake era” to the “Qiantang River era” and improve Hangzhou’s image as a modern city, the government will promote the development and construction of land for new towns and urban complexes, accelerate the pace from “building a district” to “building a city”, and realised the strategy of urban land use along and across rivers. The government will strive to expand industrial space, improve industrial development, drive group urbanisation, and effectively enhance the intensive and efficient use of urban construction land.

Relying on reasonable landscape ecological function zoning, high-standard landscape planning, and construction control, and practical landscape purification and beautification system, Hangzhou will make efforts to promote the construction of a harmonious “mountain — water — city — forest — field” landscape pattern and push forward the protection and construction of 6 ecological zones in combination with the objective requirements of the environmental city construction planning. The 6 ecological belts are northwest ecological belt, southwest ecological belt, south ecological belt, southeast ecological belt, east ecological belt, and north environmental belt. The belts cover Hangzhou urban area and upstream Qiantang River water source protection area, with a total planning area of 2151 square kilometres. The Hangzhou metropolitan area covers 2097 square kilometres of parts of 8 urban areas (including Qiantang River water surface and other major water bodies). The water source protection area covers 54 square kilometres of water source protection areas in Fuyang city (the riverside areas of Yushan, Lishan, Lingqiao, Fuyang, and other towns). In accordance with the coordinated development of large, medium, and small cities, the scale and function of land use in the 5 counties (cities) of Fuyang, Linan, Tonglu, Jiande, and Chunan will be upgraded in an attempt to make them new regional centres on which the metropolis depends. Comprehensive plans for land use, industrial development, transport, housing, and other areas, as well as local economic and social development plans, will be formulated to continuously strengthen the guiding and regulating role of land use in regional development (Hangzhou Government, 2010).

Guidelines for Land-use

All decisions and actions related to land use shall be based on the overall land-use planning. Any unit or individual using land and carrying out various construction activities in the planning area must conform to the land use planning. The use of every inch of land should be part of the approved plan. Infrastructure land, land for people's livelihood, and economic development and industrial land encouraged by the state are given priority and fully guaranteed. The space for land use should be continuously optimised and integrated. Decentralised and inefficient land use is supposed to be effectively curbed to achieve significant improvement in the efficiency and profit of urban land use.

The land use should meet the requirements of environmental capacity. On the premise of maintaining a good ecosystem, the population size is managed and controlled by the existing resources and ecological carrying capacity. The city area's total population should not exceed 12.3 million. The urban area's total population should not exceed 8.8 million, and the per capita urban construction land should remain between 100 and 112 square metres. With supply constraints and demand guidance, regional land use will be effectively coordinated. Large, medium and small cities will be developed in a balanced way, and competitive industrial land of different scales will be reasonably guaranteed.

The government will continue taking measures to protect the high-quality cultivated land in the water network year and valley plain, high-quality early land and garden plot in the low back gentle slope (altitude < 250 metres, city-level < 15), national and provincial scenic tourist land, and environmentally sensitive ecological land. Utilising land-use control, we will focus on protecting the green open space between city groups. Comprehensive development of land in urbanised areas will be carried out to improve land-use efficiency for urban development.

Real-time monitoring of land use within the expansion boundary of urban construction land will be carried out, and control will be strictly carried out in accordance with the land use planning within the expansion boundary to ensure that the planned expansion boundary of urban construction land is legally binding as the boundary of urban growth. Land use pays more attention to public interest elements such as health, safety, convenience, efficiency, coordination, environment, landscape, and aesthetics (Hangzhou Government, 2010).

Major Regulation Indicators

Hangzhou will strictly control the full scale of construction land and effectively protect cultivated land and bare farmland. By 2020, the total scale of construction land in the whole city will be controlled by 167987 hectares, including 126,900 hectares for urban and rural construction land and 89,180 hectares for industrial and mining land. The total amount of cultivated land is 221,707 hectares, and the protected area of bare farmland is 18,673 hectares.

The scale of new construction land will be controlled, and the government will take measures to strictly control the occupation of arable land by new construction land. By 2020, the total amount of new construction land in the city will not exceed 28,238 hectares. The cultivated land area is no more than 8,869 hectares, and the rehabilitated cultivated land should reach 8,869 hectares.

Efforts will be made to increase industrial and mining land output in cities and towns, improve the living environment, and strictly control the per capita industrial and mining land in cities and towns. By 2020, the per capita industrial and mining land in cities and towns will be contained within 112 square metres, and the land consumption of secondary and tertiary industries will drop from 46.75 square metres in 2005 to 32.17 square metres in 2010 and a further drop to 17.16 square metres in 2020 (Hangzhou Government, 2010).

The following tables demonstrate the changes of some statistical information regarding land-use, including construction land-use, agricultural land-use, incremental land and newly added construction land.

Construction land use of Hangzhou (hectares)			
	2005	2010	2020
Total area of construction land	184,714	198,619	204,450
The area of urban and rural construction land	107,004	114,361	126,900
The area of industrial and mining land	61,434	65,798	81,516
The area of transportation, water conservancy and other construction land	77,710	84,258	77,550

Table 1. Construction Land-uses of Hangzhou (hectares)
Source: (Hangzhou Government, 2010)

Agricultural land use of Hangzhou (hectares)			
	2005	2010	2020
The total amount of cultivated land	220,639	226,000	221,707
Protected area of basic farmland	198,576	186,673	186,673
Garden area	110,548	102,454	106,893
Forest land area	1,010,220	1,008,050	1,007,123
Pasture area	46	46	46

Table 2. Agricultural Land-uses of Hangzhou (hectares)
Source: (Hangzhou Government, 2010)

Incremental land for different uses (hectares)			
	2005	2010	2020
Total amount of newly added construction land	–	13,461	28,238
The area of newly added agricultural land	–	10,769	24,323
The area of newly added cultivated land		8,869	21,333
Reorganizing, reclaiming, developing and supplementing cultivated land	–	8,869	26,569

Table 3. Incremental Lands for Different Uses (hectares)
Source: (Hangzhou Government, 2010)

			Land use for constr. in 2005	Land use for constr. in 2020	Newly added constr. land	The occup. of agricultural land		The occup. of unexploited land
						Area	The occup. of cultiv. land	
land use in urban and rural area	Total amount of land use in urban and rural area		107004	126900	25166	21465	18826	3701
	Land use of mine in urban and rural area	Total amount	61434	81516	24157	20808	18250	3349
		Urban and rural	51214	76191	23385	20305	17809	3080
		Independent mine	10220	5325	772	503	441	269
	Residence in rural area		45570	45384	1009	657	576	352
Infrastructure	Total		74652	74194	2774	2664	2336	110
	Transportation		14362	14839	2129	2072	1818	57
	Water conservancy		60290	59355	644	591	519	53
Construction land use for other purposes	Total		3058	3356	298	194	170	104
	Land use for special purposes		3058	3356	298	194	170	104
Total			184714	204450	28238	24323	21333	3915

Table 4. Newly Added Construction Land in Hangzhou (hectares)
Source: (Hangzhou Government, 2010)

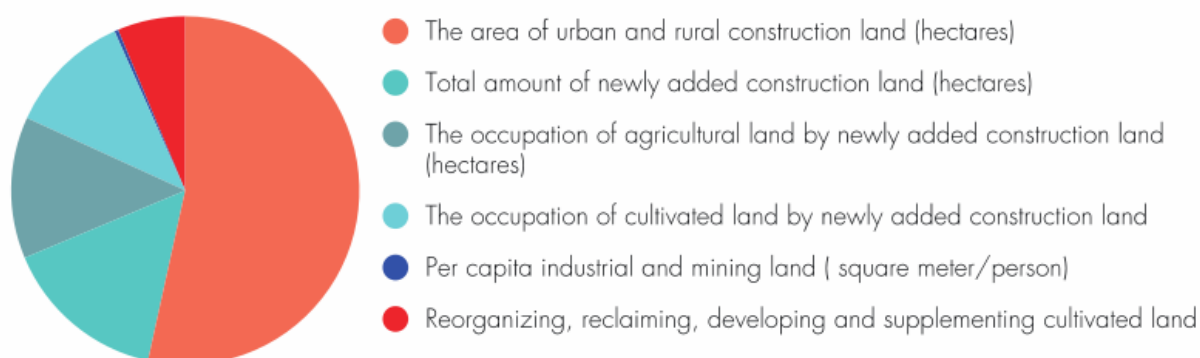


Figure 18. Land-uses of Hangzhou
Source: Global Urbanisation Research Team FRA-UAS (2020)

In the figure above, it is clear that a large proportion of Hangzhou land is used for urban and rural construction. The total amount of newly added construction land and agricultural land take up similar proportion. Only a very insignificant is for industrial and mining land.

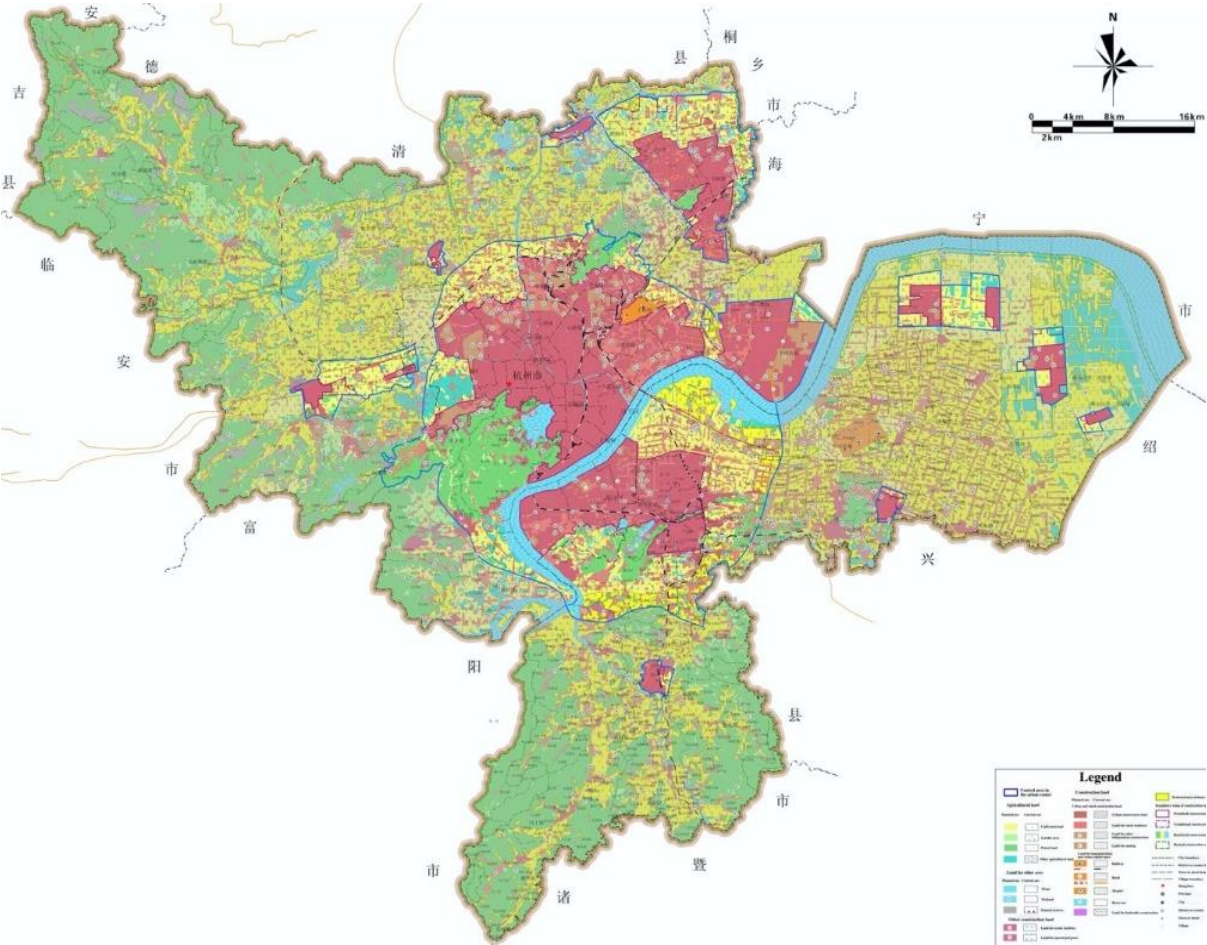


Figure 19. Comprehensive Land-use Planning of Urban Areas of Hangzhou
Source: (Hangzhou Government, 2010)

Land-use Functional Zoning

According to the requirements of the overall planning of regional land use, and according to the differentiated characteristics of land resources and socio-economic development conditions and levels in each region, the city area is divided into 6 lands use functional areas: primary farmland concentration areas, general agricultural development areas, town and village development areas, independent industrial and mining areas, ecological and environmental safety control areas, and natural and cultural heritage conservation areas.

Eight basic farmland concentration areas are designated in this plan: Fuyang eastern district zone, Fuyang western district zone, Jiande district zone, Tonglu district zone, Yuhang district zone, Xiasha district zone, Xiaoshan eastern district zone, and Xiaoshan southern district zone. The area is 154,033 hectares, accounting for 9% of the total land area. The general agricultural development areas are mainly distributed in available villages and towns in the city and areas where planting is concentrated, with an area of 369,000 hectares, accounting for 20% of the total land area. Town and village development areas are mainly distributed in urban areas, urban areas of 5 counties (cities), central towns, general villages and towns, and central villages, whose size is 113,900 hectares, accounting for 7% of the total land area. The independent industrial and mining sites consist mainly of quarries, which are distributed in mountainous regions such as Jiande, Linan, and Fuyang.

They cover about 13000 hectares, accounting for 1% of the total land area. The ecological and environmental safety control areas are mainly distributed in Linan, Tonglu, Jiande, Chunan, other rivers and lakes, important water source protection areas, and areas with relatively dense geological hazards 911382 hectares, and accounting for 52% of the total land area. Nature and cultural heritage conservation areas are mainly distributed in the Three Rivers and Two Lakes Basin, with an area of 188404 hectares, accounting for 11% of the total land area (Hangzhou Government, 2010).

Adjustment of Land-use Structure

Land-uses are conceived to accommodate adjustments with regard to construction land, urban, rural and infrastructure construction land, urban and rural residence land and cultivated and other agricultural land, as in the following points:

The structural adjustment of construction land

Considering the needs of economic and social development, the carrying capacity of regional resources and environment, as well as the requirements of economic and intensive utilization, the plan will increase the construction land area from 130,641 hectares in 2005 to 167,987 hectares in 2020, accounting for 7.76% to 9.98% of the total land area. New construction land should avoid land in ecologically sensitive areas. Priority is given to land for significant infrastructure projects such as transport, water conservancy and energy, land for people's livelihood, land for new rural construction, and land for advanced manufacturing and modern service projects (Hangzhou Government, 2010).

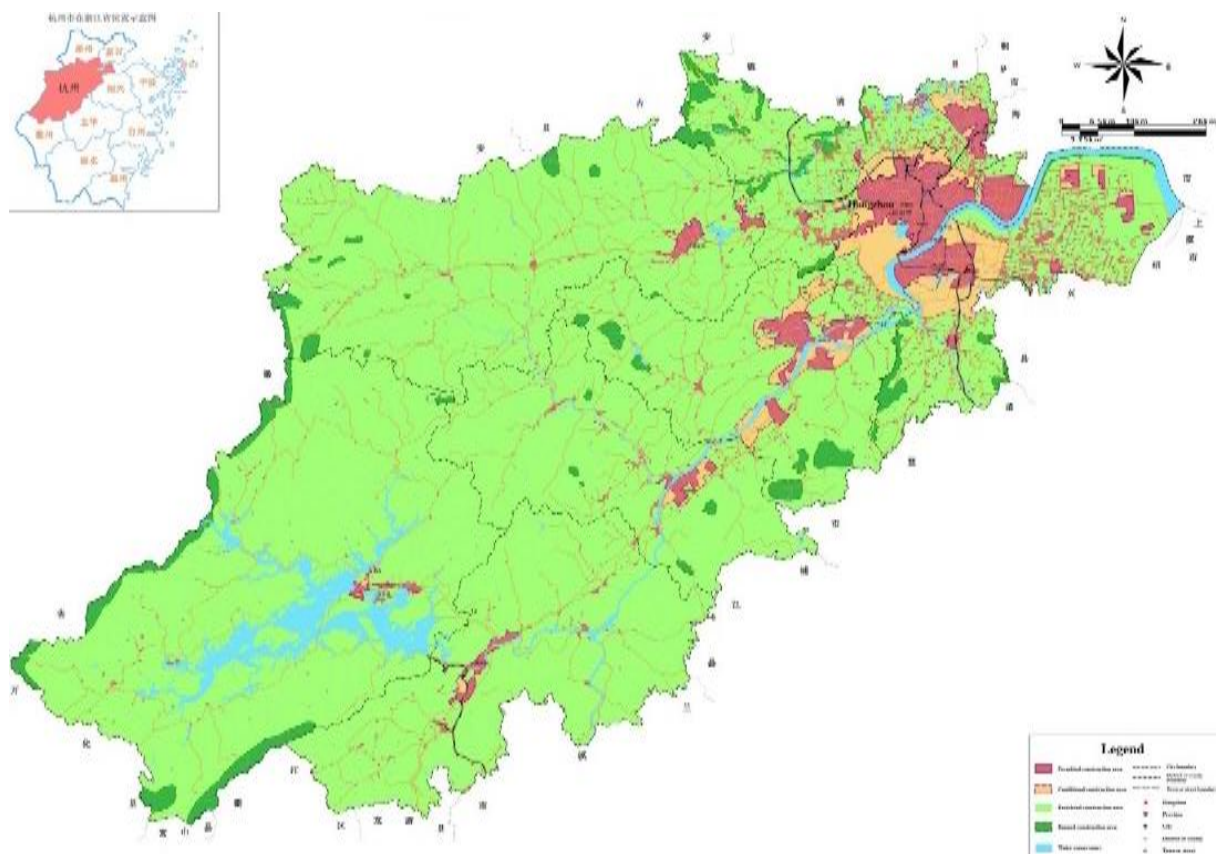


Figure 20. Regulatory Zoning of Construction Land in Hangzhou
Source: (Hangzhou Government, 2010)

Urban and rural construction land and infrastructure land adjustment

According to the development and layout of regional infrastructure, the government will strive to coordinate the needs of various departments in the road, railway, water transport, pipelines, and aviation, and plan to increase the scale of land use for transportation, water conservancy, and other purposes from 23,636 hectares in 2005 to 41,087 hectares in 2020, with the proportion rising from 1.40% to 2.44% of the total land area. Land for transport should focus on comprehensive transport construction, further speed up the construction of roads, waterways, railways, stations, and modern logistics, and build a modern transportation hub connecting the Yangtze River Delta region. Land for water conservancy facilities is mainly used for flood control, drainage projects, and urban and rural drinking water projects, with the aim of enhancing the city's ability of water conservancy and serving social and economic development (Hangzhou Government, 2010).

Structural adjustment of urban land and rural residence land

Considering the impact of urban population gathering capacity, urbanisation development level, rural population quantity, changes in rural production and lifestyle on land demand, as well as the influence of implementation of the policy that links urban construction land increase with rural residential land decrease, the government will increase urban land use from 51214 hectares in 2005 to 76191 hectares in 2020, accounting for 3.04% to 4.52% of the total land area. Rural residential area land use is expected to decrease from 45,570 hectares in 2005 to 37,720 hectares in 2020, accounting for 2.71% to 2.24% of the total. The newly added urban land is mainly used for the construction of central urban areas, counties (cities), urban areas, central towns, and general villages and towns. By the principle of "industrial concentration, population concentration, and intensive land use," the government will focus on constructing industrial clusters, actively developing advanced manufacturing, modern service industries, and high-tech industries, and thus improving urban competitiveness and industrial competitiveness (Hangzhou Government, 2010).

Structural adjustment of cultivated land and other agricultural land

On the premise of strictly implementing the task of protecting cultivated land and basic farmland, the structure of cultivated land and other agricultural lands will be adjusted following the market demand for farm products, ecological construction, and environmental protection requirements. Cultivated land will remain stable during the planning period, at 221,707 hectares by 2020. The area of basic farmland will remain unchanged at 186,673 hectares by 2020, but the productivity is expected to be improved during the planning period. The size of garden plots is planned to be decreased from 109,586 hectares in 2005 to 97,549 hectares in 2020, and the area of forest lands is expected to fall from 1,009,897 hectares in 2005 to 1,004,897 hectares in 2020. On the premise of protecting and improving the ecological environment of the earth, barren hills, slopes, abandoned beaches should be effectively used (Hangzhou Government, 2010).

In summary, Hangzhou government has implemented many supportive policies and development plans in the aspects of economy, society, land-use, agriculture, education, culture and so on. This section has discussed three important plans: Overall Masterplan (2000-2020), 13th Five-year Plan, and Comprehensive Land-use Planning of Hangzhou (2006-2020). The Overall Masterplan provides strategic guidance in the planning of layout structure, urban system, green system, traffic, infrastructure, and so on. The 13th Five-year Plan, in line with the National 13th Five-year Plan, establishes the development objectives and strategies. It aims to construct Hangzhou into a modern city with an innovative industrial system, an effective administrative system, and an excellent ecological environment. The Comprehensive Land-use Planning of Hangzhou (2006-2020) provides a quantitative guidance of urban development. All of them play an important role in the development of Hangzhou City.

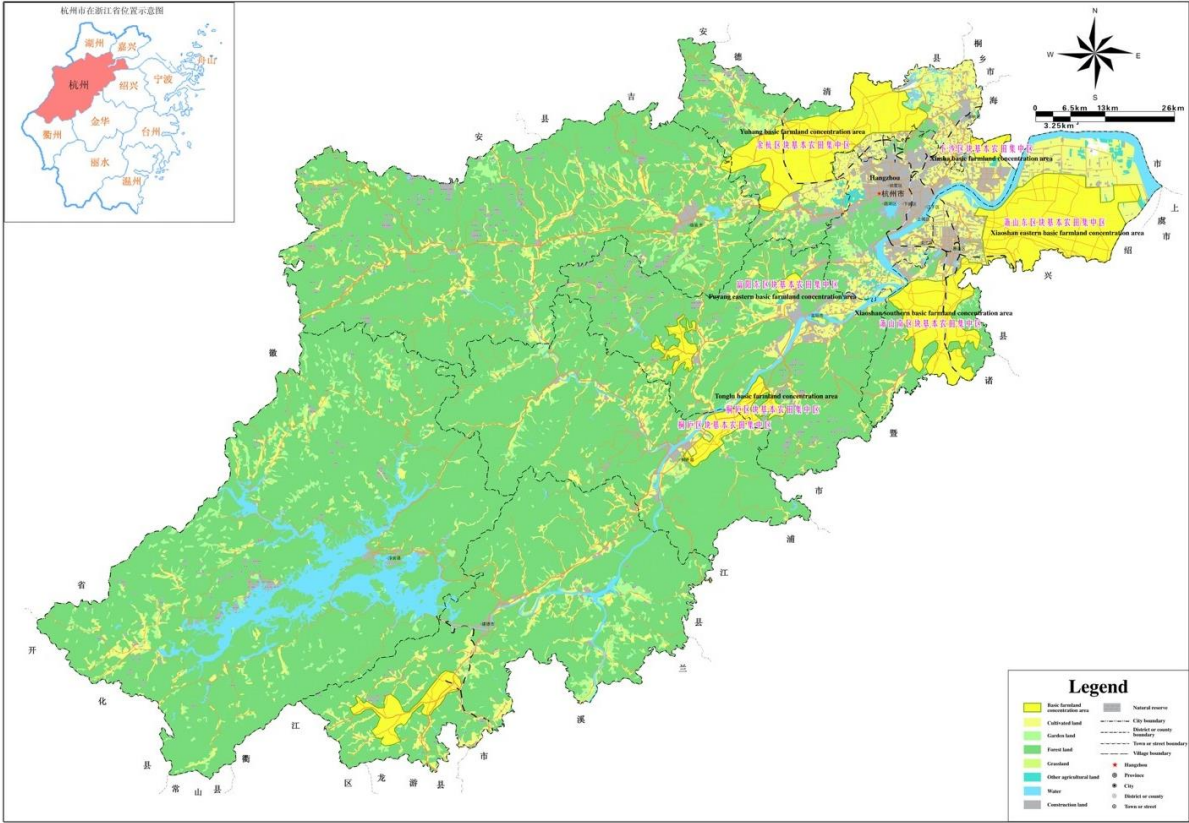


Figure 21. Basic Farmland Protection Plan of Hangzhou
Source: (Hangzhou Government, 2010)

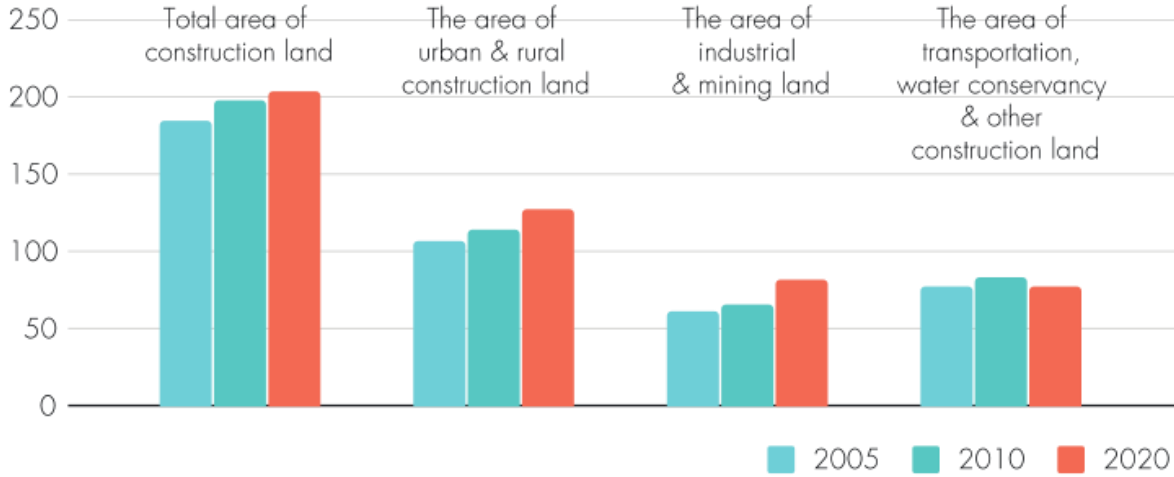


Figure 22. Construction Land-uses of Hangzhou.
Source: Global Urbanisation Research Team FRA-UAS (2020)

4. Yuhang District

Yuhang District is located in the east, west and north of Hangzhou City, Zhejiang Province, at the southern end of the Hangjiahu Plain and the Beijing-Hangzhou Grand Canal. It is the center of the Yangtze River Delta and the historical site of the ancient city of Liangzhu. In this chapter, we will provide a detailed introduction of the district's key characteristics.

4.1 Location and Administrative Borders

Yuhang district is located in Hangzhou-Jiaxing-Huzhou Plain and is in the north of Zhejiang. It is in the centre of the Yangtze River Delta and the south end of the Grand Canal from Beijing to Hangzhou. It is about 63 kilometres long from east to west and 30 kilometres wide from north to south. The district is bounded on the east by Haining City, on the northeast by Tongduo City, on the north by Deqing County, on the northwest by Anji County, on the west by Linan District, and the southwest by Fuyang District (Local History Compilation Committee of Yuhang District of Hangzhou City, 2018).

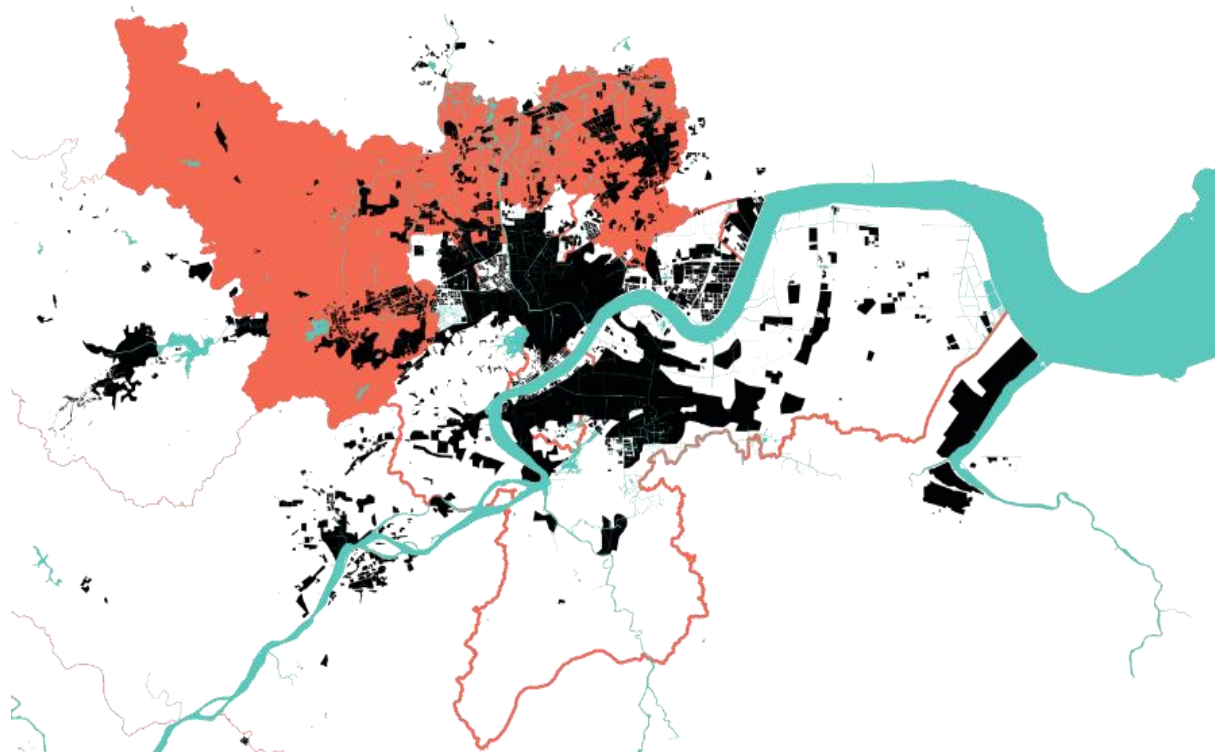


Figure 23. Map of Yuhan

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: [openstreetmap.org](https://www.openstreetmap.org)

4.2 History

The name of Yuhang has been recorded in the history books during the Spring and Autumn Period time, which is about from 770 BC to 476 BC. It belongs to state Wu and state Yue's territory and belongs to state Chu in the middle of the Warring States Period. During the Southern Song Dynasty, Yuhang, as a capital city, became the most economically and culturally developed region in the country. Yuhang is the birthplace of Liangzhu culture, the dawn of Chinese civilization. With 5,000 years of "Liangzhu Culture," 2000 years of "Canal Culture," and 1,000 years of "Jingshan Tee Culture," it is the hometown of Shen Kuo, a great scientist of the Northern Song Dynasty, and Zhang Taiyan, a pioneer of modern democratic revolution. Su Dongpo, a famous poet of the Northern Song Dynasty, and Wu Changshuo, a master of contemporary epigraphy and painting, all lived there. In particular, Liangzhu's ancient city's discovery in 2007 pushed Hangzhou's construction of a city 3,000 years ago (Local History Compilation Committee of Yuhang District of Hangzhou City, 2018).

4.3 Role of the District within the City

Yuhang District is located in the east, west, and north of Hangzhou, Zhejiang Province. It is the centre of the Yangtze River Delta and the site of Liangzhu Ancient City, a "holy place of Chinese civilization" (Local History Compilation Committee of Yuhang District of Hangzhou City, 2018). In October 2019, it became the 7th in the Top 100 Areas of Comprehensive Strength in China and was named as the Top 100 Areas of Investment Potential, Top 100 Areas of Green Development, Top 100 Areas of Science and Technology Innovation, and Top 100 Areas of New Urbanisation Quality in 2019. In history, Yuhang was famous for its developed agriculture. Still, since the implementation of reform and opening-up policy, Yuhang District's economy has undergone significant adjustments, and the industrial economy has become the main body of fiscal revenue and employment. In recent years, Yuhang District relies on key industrial platforms such as Hangzhou Future Science and Technology City, Yuhang Economic and Technological Development Zone, Linping New City, Liangzhu New City, Qianjiang Economic Development Zone to build a large number of characteristic towns such as Dream Town, Mengqi Town, Yishang Town, and Artificial Intelligence Town. The economic level has developed rapidly, ranking seventh place among the top 100 competitive districts in China in 2017. Yuhang Economic and Technological Development Zone is the essential base for industrial development in Hangzhou. It possesses the provincial high-tech industrial park, the only biomedical high-tech industrial park, and the first intelligent manufacturing demonstration base in Zhejiang province (Local History Compilation Committee of Yuhang District of Hangzhou City, 2018).

4.4 Features of the District

This section analyzes the specific features of Yuhang District in the aspects of terrain and climate.

4.4.1 Terrain

Yuhang District spans the 2 stratigraphic divisions of Qiantang River and Hangzhou-Jiaxing-Huzhou Plain in northern Zhejiang. According to its macroscopic structural features, the region can be roughly divided into western mountainous and hilly areas and bare eastern areas. The landform in the territory is divided into 4 types: mountain, hill, direct, and mudflat. The northwest and southwest of the site are subordinate to Tianmu Mountain and the Qianligang Mountains' eastern foot. The northeast is a plain connected by rivers, mainly distributed in the Beijing-Hangzhou grand canal basin, while the southeast is a mudflat with a deep soil layer (Local History Compilation Committee of Yuhang District of Hangzhou City, 2018).

4.4.2 Climate

Yuhang District is located in the monsoon climate zone of the northern subtropical area. It has long winter and summer and shorter spring and autumn. The climate is warm and humid, with distinct seasons, sufficient light and rainfall. The average annual temperature in 2017 is 18.1°C, and the annual precipitation is 1432.2 mm. The climate is characterised by moderate weather, with frequent alternation of warm and cold air, so it is suitable for cropping. Due to sufficient rain and sunshine in the same season, Yuhang is especially ideal for the production of leaf and stem crops, melons, and fruits (Local History Compilation Committee of Yuhang District of Hangzhou City, 2018).

4.5 Economy and Socio-Economic Development

In recent years, Yuhang District has showed a vivid development trend. In this part, a statistical analysis regarding its economy and socio-economic development will be provided, including aspects of agriculture, construction, industry, transportation, finance, real estate, business, tourism, income and social benefits.

4.5.1 Statistical Information

According to the Statistical Report on Civil Economic and Social Development in Yuhang District of Hangzhou City in 2018, the region's GDP in 2018 reached 231.245 billion yuan, showing an increase of 11.2% over the last year. The increase rate is higher than the national average of 6.6%, the provincial average of 7.1%, and the city average of 6.7%. The region's GDP per capita was 216,200 yuan, increasing 5.3%. The household GDP per capita is US\$ 32,000. For the composition of GDP, the primary industry's added value was 5.046 billion yuan, with an increase of 1.7%. The secondary industry's added value was 62.968 billion yuan, with the growth rate reaching 5.9%. The added value of the tertiary industry was 163.230 billion yuan, increasing 13.6%. The region's industrial structures were adjusted from 2.5: 28.8: 68.7 last year for the primary, secondary and tertiary industries to 2.2: 27.2: 70.6 in 2018. The proportion of tertiary industry experienced an increase of 1.9% over the previous year. The region's information economy (smart economy) industry's added value reached 134.087 billion yuan, increasing 20.3% and accounting for 58.0% of GDP.

In 2018, the total fiscal revenue was 62.386 billion yuan, and the local general public budget revenue was 33.638 billion yuan, increasing 23.8% and 20.1%, respectively. Tax revenue accounted for 93.4% of the local fiscal revenue, of which personal income tax, VAT (value-added tax), enterprise income tax, and domestic VAT increased by 17.6%, 14.8%, 49.1%, and 18.3%, respectively. The fiscal budget expenditure for the whole year was 34.254 billion yuan, growing 26.7%. The budget expenditure on people's livelihood was 25.1-billion-yuan, accounting for 73.3% of the fiscal budget expenditure, showing an increase of 26.2%. The spending on urban and rural communities, medical and health care, science and technology, job security, and education increased by 59.3%, 12.5%, 29.6%, 5.4%, and 26.6% respectively.

By the end of 2018, the whole region's registered population was 1,098,600, an increase of 58,100 over the end of the previous year. The total number of households at the end of the year was 315,200, showing a rise of 21,000 than the last year. The total number of new-born population in the year was 12,871, with a birth rate of 12.03‰ and a natural population growth rate of 6.66‰. In the whole year, a total of 38,176 workers were employed in the urban area. The government had helped 11,025 unemployed people in urban to find new jobs. The registered urban unemployment rate was 1.59%. In 2018, the region recruited over 3,400 employees with overseas higher-education background, and there was a total of 27,100 new college graduates with a bachelor's degree or above (Yuhang Government, 2019).

Agriculture and the Construction of Rural Area

In 2018, the region's agricultural added value reached 5.241 billion yuan, increasing 2.0%. The total output value of agriculture reached 7.996 billion yuan, with a growth of 3.1%. The output value for forestry, animal husbandry, and fishery reached 0.776 billion, 0.374 billion, and 1.854 billion yuan, respectively, increasing 2.8%, 8.7%, and 15.5%. The output value of the planting industry was 4.456 billion yuan, decreasing by 2.2%. The government made great efforts to push forward the construction of 125 beautiful villages, creating 4 provincial-level beautiful countryside demonstration towns, 9 featured villages, and 13 3A scenic villages (Yuhang Government, 2019).

Industry and Construction

In 2018, the region's industrial added value reached 43.140 billion yuan, increasing 7.0%. The electricity consumption for the industry was 5.208 billion kilowatt-hours, growing 3.7%. Large-scale industries' added value reached 27.840 billion yuan, with an increase of 9.0%, accounting for 64.5% of the total. The output value rate of new products in large-scale industries was 45.7%, rising 1.5% compared to the previous year. The added value of the equipment manufacturing industry reached 22.545 billion yuan, increasing 8.2%. The added value of strategic emerging industries was 13.743 billion yuan, which grew 7.6%. The primary business income reached 179.738 billion yuan in the whole year, with a growth of 11.6%, while the total profit was 10.521 billion yuan, showing a slight decrease of 0.9%.

The construction industry's added value in the whole region reached 4.304-billion-yuan, accounting for 1.9% of GDP. By the end of 2018, there were 427 construction enterprises in the district. A total of 433 construction permits were issued in 2018. Throughout the year, the district dealt with 433 safety supervision and registration of construction projects, 433 quality supervision and registration projects, and 360 construction examination projects (Yuhang Government, 2019).

Transport and Tourism

In 2018, 21.27 million tons of cargo were handled by inland river ports in Yuhang, and 7.38 million tons of freight were transported by water. The government of Yuhang made a great effort on the optimisation of the bus in the western villages and towns, and Liangzhu, opening 12 new routes and optimizing 49 routes. By the end of the year, there were a total of 1,352 buses and 209 operating lines (including one airport line). Public bicycles were available 24 hours a day, and the total number of bicycle service points arrived at 668, with 17,500 bikes available. In 2018, the number of domestic and foreign tourists arrived at 21.341 million, showing an increase of 13.1% over the previous year. The total tourism revenue reached 23.476 billion yuan, growing 16.0%. By the end of 2018, there were a total of 14 Grade A scenic spots in the whole region, 7 of which were above Grade 4A. There were 12 star-rated hotels, including 4 hotels above 4 stars and 2 hotels with particular cultural themes. Xiaogucheng Village and Shangougou Village had been successfully graded as the first batch of provincial 3A scenic spot villages (Yuhang Government, 2019).

Finance

In 2018, the region's financial sector gained an added value of 5.606 billion yuan, increasing 6.0% over the last year. By the end of the year, the balance of local and foreign currency deposits in the region was 310.907 billion yuan, with an increase of 14.5%. The balance of local and foreign currency loans was 206.671 billion yuan, with a growth rate of 13.2%. In 2018, the region's NPL (non-performing loan) balance was 1.235 billion yuan, showing a decrease of 639 million yuan compared with the beginning of the year. The NPL ratio was 0.6%, decreasing 0.43%. In 2018, there were a total of 22 listed enterprises in the whole region (including three overseas), and Tiandi Digital was listed on the Growth Enterprise Market of Shenzhen Stock Exchange on April 27 (Yuhang Government, 2019).

Real-estate

In 2018, investment in real estate development increased by 10.3%. A total of 5.571 million square meters of commercial housing were sold in the whole year, with a decrease rate of 9.5% compared to last year, and the average transaction price was 17,834.82 yuan/square metre, increasing 9.9%. Among them, 43,149 residential units were sold, with a total area of 4,871,000 square metres. The average price was 16,560 yuan/square metre, growing by 2.4%. Non-residential transactions arrived at 604,000 square metres, rising 44.8%, and the average transaction price was 16,378 yuan/square metre, increasing 10.1% over the last year (Yuhang Government, 2019).

Business and Trade

In 2018, the retail sales of social consumer goods in the whole region reached 51.579, which increased by 10.4%. The online retail sales of goods amounted to 12.129 billion yuan, growing 121.7%. The added value of the e-commerce industry reached 119.223 billion yuan in the whole year, with an increase of 21%. The consumption of cosmetics, alcohol and tobacco, clothing and shoes, electronic publications, and audio-visual products all showed a significant increase, with the growth rate reaching 130.7%, 53.6%, 49.1%, and 21%, respectively.

Throughout the whole year, the total import and export volume arrived at 46.243 billion yuan, increasing 17.0%, of which 4,813 billion yuan was imported, rising 62.5%. Exports reached 41.430 billion yuan, growing 13.3%. The export of mechanical and electrical products and high-tech products increased by 13.0% and 14.2%, respectively. The exports to the United States, the European Union, countries along the "the belt and road initiative" route, and BRICS countries increased by 14.3%, 12.5%, 15.9%, and 16.6%. In 2018, the region received a foreign investment of 1.055 billion US dollars.

Investment from Zhejiang Merchants Returning Project reached 18.9 billion Yuan (Yuhang Government, 2019).

Health Care

By the end of 2018, 675 medical and health institutions of all kinds in the region, including 7 hospitals and 20 community health service centres. The medical institutions in the area provided 6,113 beds, of which 2947 were in hospitals. There were 6,815 health technicians in hospitals and community health service centres, including 2,496 medical practitioners and 2,787 registered nurses, increasing 5.8%, 6.3%, and 5.9%. Throughout the year, a total of 429,200 individuals gained service from family doctors (Yuhang Government, 2019).

Income and Social Security

In 2018, urban and rural residents' per capita disposable income was 62,819 yuan and 37,691 yuan, increasing 8.8% and 9.7%, respectively. The income gap ratio between urban and rural residents was narrowed to 1.67. In the whole year, the per capita living expenditure of urban residents and rural residents was 41,585 yuan and 30,059 yuan, growing 8.5% and 8.2%, respectively.

By the end of the year, the number of people covered by basic old-age insurance, basic medical insurance, industrial injury insurance, maternity insurance, and unemployment insurance in the whole region reached 860,000, 804,700, 744,800, 562,660, and 604,400 respectively, representing a net increase of 95,300, 88,300, 134,900, 65,300 and 107,500 respectively compared with last year (Yuhang Government, 2019).

Energy, Environment and Public Safety

In 2018, the amount of water for sale was 178 million tons, with the qualified rate of 100%. The amount of treated sewage was 102 million tons. The whole society used 10.559 billion kilowatt-hours of electricity in the entire year, showing an increase of 13.9%, of which 5.208 billion kilowatt-hours were used by industry, growing 3.7%. Urban and rural residents used 2.401 billion kilowatt-hours of electricity, increasing by 21.5%. In 2018, the government made great efforts to deepen water control projects' implementation and shut down 166 enterprises (production lines) with backward production capacity and potential pollution hazards. It phased out 2006 diesel vehicles that were below national III standards. Two coal-fired thermal power plants, Chongxian Thermal Power Plant and Hailian Thermal Power Plant were shut down. The PM2.5 in the whole region was 42 micrograms/cubic meter, showing a decrease of 2.3% than the previous year. In 2018, 71 accidents occurred in Yuhang, decreasing 22% compared with the last year. The number of deaths was 68, falling 26.1% (Yuhang Government, 2019).

4.6 Demography

Yuhang District now has jurisdiction over 14 streets, including Qiao Si, Canal, Chongxian, Renhe, Liangzhu, Xianlin, Yuhang, Cangqian, Zhongtai, Linping, Donghu, Nanyuan, Xingqiao and Wuchang, and six towns including Tangqi, Jingshan, Pingke, Huangpu, Hongniao and Baizhang. The district government is located in Linping Street. By the end of 2017, there were 183 villages and 172 communities. The household registration population is 1,040,500, showing an increase of 55,900. A total of 583,100 people were from cities and towns, accounting for 56%. The number of new-born babies was 14,055 in 2017, with an annual birth rate of 13.82% and a natural population growth rate of 7.93% (Local History Compilation Committee of Yuhang District of Hangzhou City, 2018).

5. Urban development of Yuhang

5.1 Land-use

The General Land Use Planning of Yuhang District of Hangzhou (2006-2020) has provided the control indications of all land within the administrative jurisdiction of Yuhang District, with a total land area of 122,824 hectares. The planning period is from 2006 to 2020, and the base year for planning adjustment and improvement is 2013 (Hangzhou Daily News, 2015).

According to the General Land Use Planning of Yuhang District of Hangzhou (2006-2020), by 2020, the amount of cultivated land should be controlled within 37067 hectares, the basic farmland protection area should be controlled within 30847 hectares. The amount of urban and rural construction land should be controlled within 24,500 hectares, and the per capita urban industrial and mining land should be controlled within 130 square metres. The value-added land for the tertiary industry is expected within 28.80 square metres (Hangzhou Daily News, 2015).

5.1.1 Industry

In history, Yuhang was a famous land of fish and rice and the home of silk and was recognised for its developed agriculture. However, since the reform and opening up, the economy of Yuhang District has undergone significant adjustments, and the industrial economy has become the main body of the national economy, the main body of fiscal revenue, and the main body of labour and employment. Information technology, modern equipment industry and intelligent industry are the key of industrial development of Yuhang District.

Specific types of industries

Yuhang District encourages enterprises to improve information management, strengthen the interconnection and interoperability of information management systems and machinery and equipment, and use big data, cloud computing, and other technologies to realise the production process. The government will create a batch of intelligent manufacturing model workshops and model factories to guide comprehensive digitisation and smart management. How to seize new opportunities and reshape new power in the post-industrial era has become the focus of enterprises' attention to achieve leapfrog development. Nowadays, more and more manufacturing companies are consciously responding to "smart" manufacturing. More and more science and technology parks are implementing smart management of the Internet of Things. The industry is grafting the "Internet" to achieve leapfrog development. Simultaneously, Yuhang is accelerating equipment manufacturing, biomedicine, and fabric industries through the information economy (Hangzhou Daily News, 2015).

Selected companies

Under government policy, many enterprises in Yuhang focus on smart manufacturing. In 2015, Huali Group's "Smart Meter Intelligent Manufacturing New Model" was listed as a unique smart manufacturing project by the Ministry of Industry and Information Technology. Chunfeng Power Hetieliu Clutch was listed as a provincial-level "100-Enterprise Equipment Optimization and Improvement Project" demonstration enterprise. Boss Group was rated as an "Informatisation Integration Management System Implementation Pilot" and Hangzhou Informatisation Demonstration Enterprise by the Ministry of Industry and Information Technology.

Based on the current production and construction project with an annual output of 2.25 million kitchen appliances, Boss Electric invested 130 million yuan in implementing a particular project for intelligent production improvement. By constructing the most extensive single, smart logistics storage system in the industry, industrialisation is driven by information. Promote modernisation, promote the complete application of information technology in all aspects of the enterprise, and realize full monitoring of production and logistics processes.

Relying on the construction of Zhejiang Biomedical High-tech Zone, Betta, Minsheng, Xinghui Tianli, Tianyuan Pharmaceutical, and other vital enterprises focus on the core issues of drug development, production, distribution, and traceability, trying to accelerate the drug production management system, product life cycle management. They have established a complete drug safety assurance and traceability system to realize the digitalisation of various types of information such as trials, raw materials, production, processes, drug use, customer behaviour, etc. Besides, they have built big data platforms and decision-making assistance systems to assist in developing and researching new drugs (Hangzhou Daily News, 2015).

5.1.2 Residence

Yuhang District has a competitive residence market. In terms of residence price, Yuhang District can be said to be the sector with the most volatile price fluctuations. It is due to its sizeable administrative area and future development potential. For example, the future science and technology city has always been a relatively high-profile sector, and many new developers in Hangzhou prefer the future science and technology city. By 14 August 2015, there were 3,100 commercial housing units available for sale in the Future Technology City, with a saleable area of 367,332.22 square metres. The average transaction price was basically maintained at 13,000-14,000 yuan/square metre this year. In terms of product types, they are relatively affluent, from villa townhouses to residential and hotel-style apartments, and their selling points are more diverse (Youth Times, 2015).

The Yuhang government provides a comprehensive low-rent housing security system. Since the implementation of the low-rent housing system, Yuhang District has provided 3 ways to protect families with housing difficulties in our district through monetary subsidies, physical rent allocation, and rent reduction. Up to now, Yuhang District has accumulatively guaranteed more than 1,436 families with housing difficulties (Hangzhou Online, 2019).

5.1.3 Agriculture

The Yuhang District of Hangzhou City, adjacent to the East Tiaoxi River, is not only the birthplace of 5 thousand years of farming culture but also the pioneer of modern agricultural development. Yuhang District adheres to the development direction of "efficient, ecological, and refined" agriculture. It has focused on building 133 agricultural parks over 500 acres (including 95 over 1,000 acres). Relying on hundreds of thousands of acres of agricultural parks, Yuhang achieved an agricultural added value of 5.224-billion-yuan last year, and its grain production reached "four consecutive increases."

Yuhang has become one of the 6 provinces and the only one of the first batch of "dual pilot" areas to integrate and develop rural industries in Hangzhou. Yuhang focuses on cultivating and building a collection of demonstration sites for the integration of agricultural production, ecological sightseeing, leisure and vacation, education and culture, and leisure business. For example, Yuhang Dajingshan National Rural Industrial Convergence Development Demonstration Park, the provincial agricultural industry cluster and the provincial modern agricultural park "three parks joint creation" work is progressing in an orderly manner, and strive to become the province's leading and first-class nationwide by 2019 Provincial modern agricultural park (Local History Compilation Committee of Yuhang District of Hangzhou City, 2018).

5.1.4 Green Spaces

In recent years, combined with the construction of "large garden" and "three global areas," Yuhang City has created many distinctive and livelihood greening such as East Lake Park and Pocket Park through particular projects such as organic renewal of Linping City. The project has realised that residents of Yuhang can enjoy open green space and parks within 200 metres on average. In the villages of Yuhang, 7 forest construction projects have been launched. The construction target of "forest villages" and "one village with ten thousand trees" will bring more than 6,000 acres of green area to

benefit the countryside. In 2019, Yuhang was awarded the only "National Model County for Greening" in the province (Local History Compilation Committee of Yuhang District of Hangzhou City, 2018).

5.2 Mobility and Transport

Yuhang District has convenient transport. A road network covering towns (streets), trunks and branches throughout the district has been formed. Common modes of transport include roads, railways, buses, subways, shared bicycles, etc.

5.2.1 Road Network

In the whole year of 2017, the number of passengers (times) transported by road reached 139.7 million. Two high-speed rails (Shanghai-Hangzhou high-speed rail, Hangzhou-Ningbo high-speed rail), 2 railways (Shanghai-Hangzhou, Xuanhang), 2 national highways (320, 104 national highway), 7 Expressways (Shanghai-Hangzhou Expressway, Hangzhou-Ningbo Expressway, Hangzhou-Huizhou Expressway, Ring Expressway, Hangzhou-Pudong Expressway, Shenjia-Shanghai-Hangzhou Expressway, Hangchang Expressway), 2 main rivers (Dongtiao River, Beijing-Hangzhou Grand Canal) and 5 provincial highways (Provincial highways 01, 02, 04, 09, 15), closely link Yuhang with major cities in the Yangtze River Delta. The existing public transport in and close to Yuhang is depicted in Figure 24.

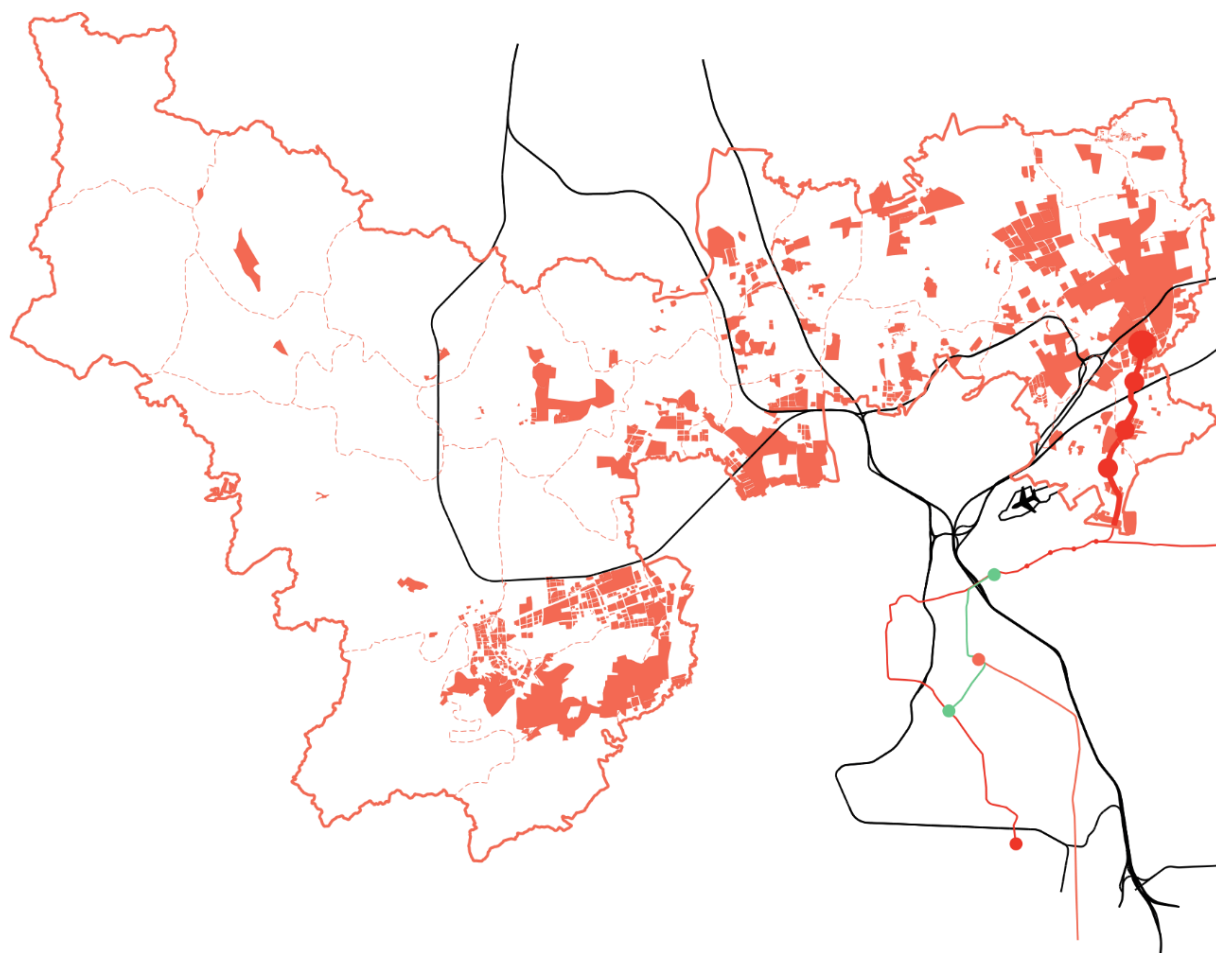


Figure 24. Map of Existing Public Transport (Metro Lines) in and Close to Yuhang
Source: Global Urbanisation Research Team FRA-UAS (2020), based on: openstreetmap.org

5.2.2 Public Transport

The government of Yuhang actively promoted the optimisation of the bus in the western villages and towns and Liangzhu. A total of 10 new lines were constructed, and 20 lines were optimised. By the end of the year, there were 1,309 buses in operation and 201 operating lines (including one airport line).

Public shared bicycles are available 24 hours a day, with 620 bicycle service points and 17,500 public bikes available. The number of rents reached 13.8 million person-times throughout the year (Local History Compilation Committee of Yuhang District of Hangzhou City, 2018).

Bus System

The bus System of Yuhang is operated by Hangzhou Yuhang Public Transport Company, established on January 1, 2008. The company has more than 3,000 employees, 1,457 operating vehicles, and 216 operating lines, with a total length of more than 3,700 kilometres in one way. The bus line covers all towns, streets, and administrative villages in Yuhang, realising the "village-to-village bus connection" in Yuhang District (Hangzhou Public Traffic Yuhang Company, 2020b).

Railway and Metro

Yuhang Station is the third-class passenger station under the jurisdiction of China Railway Shanghai Bureau Group Co, Ltd., and the intermediate station of the Shanghai-Kunming high-speed railway. By 2010, Yuhang Station had an area of 13,000 square metres. The platform was 513 meters long. Yuhang Station makes the life of the people in Yuhang District more convenient and promotes the integration between Yuhang and the Yangtze River Delta (China News, 2010).

By 2017, there had been two metro lines available in Yuhang, and Line 5 was under construction. The government of Yuhang plans to build an east-west expressway to link up several vital platforms such as Linping Venture City, Liangzhu Cultural City, and Future Science and Technology City. By the end of 2020, there will be 6 metro lines constructed to connect Yuhang with the city centre (Zhejiang News, 2017).

Cycling as a Non-motorised Form of Mobility

To accelerate traffic jams and construct an environmentally friendly city, Yuhang provides public-sharing bicycle services, operated by Hangzhou Yuhang public bike service company. By 2015, It has established 710 service points and provided 20,000 available bicycles. The daily rent of Yuhang public bicycles had exceeded 60,400 vehicles (Hangzhou Public Traffic Yuhang Company, 2020a).

5.3 Yuhang Development Strategy Plan 2015-2030

Relying on our district's advantageous location, dynamic economy, and distinctive culture, Yuhang district aims to build a high-quality metropolitan new area and it has initiated a development strategy plan for the period from 2015 to 2030.

5.3.1 Guidelines and Targets

Relying on our district's advantageous location, dynamic economy, and distinctive culture, Yuhang district aims to build a high-quality metropolitan new area. Taking reform and innovation as the driving force, the government is committed to providing supportive policies to optimise land use space, attract talents, invigorating industries, and promote development. It will realise urban development transformation through environmental reconstruction, functional reconstruction, Industrial structure transformation, human resource transformation, and regional governance transformation. Linping Pioneer City-Yishang Town, Future Science and Technology City-Dream Town, Liangzhu Cultural City-Mengxi Town are taken as the future development projects (Yuhang Government, 2015).

5.3.2 Development Plans

Yuhang should seize the opportunities of provinces and cities to build characteristic towns and create national independent innovation demonstration zones. A more high-quality and superior innovation and entrepreneurship system should be made to stimulate innovation's vitality and promote the industrialization of innovation achievements. Yuhang should take advantage of Alibaba's brand and platform advantages, initiate a new round of technological revolution and industrial transformation.

Focuses should be given on the Internet of things, and intelligent applications, aiming to take the top place in Zhejiang's information economy.

In urban and rural development, a point-axis system should be formed following the overall requirements of new urbanisation and beautiful rural construction. The target is to construct a ring-layered story of land space development patterns. The government has to accelerate urban and rural development, stimulating a new tourism business pattern with domestic and foreign influence. Following the idea of "connecting dots into lines, connecting lines, overall advancement, and clustering", the government will create many beautiful rural boutique highlights with unique themes such as leisure, tourism, culture, creativity, industry, etc., based on the landscape and pastoral scenery.

With a deep understanding of the supporting role of talents as the primary resource for industrial development, Yuhang will adopt human-oriented development plans. The government will provide high-end supporting facilities for culture, education, and medical care, optimising the overall environment for business, government, and services. The goal is to attract more talents and improve district competitiveness (Yuhang Government, 2015).

5.3.3 Security System

The government will strengthen the implementation of the social governance model of strategic planning to improve management efficiency and enhance law enforcement. A complete work process with implementation, supervision, and feedback will be established. The government will remove the departmental barriers and form a new integrated, institutionalised, standardised, and efficient government work system (Yuhang Government, 2015).

6. Conclusion

This city profile has discussed many aspects of Hangzhou City and Yuhang District, including geographical location, history, climate, economic and social development, urban development, land uses, transportation, infrastructure development as well as formal development plans. It is fair to conclude that Hangzhou is a typical coastal city in China with a developed economy. Yuhang District, as a newly-emerging economic and technologic district in Hangzhou, has great developmental potential.

Located in the east coastal area of China, Hangzhou is the Hangzhou Metropolitan Area's core city, the economic, cultural, scientific, and educational center of Zhejiang province, and one of the central cities of the Yangtze River Delta Urban Agglomerations. It has a subtropical monsoon climate, with distinct seasons, ample sunlight, and rainfall. There are many cultural and historical sites in Hangzhou, and a large number of natural and human landscape relics in and around West Lake, making it an attractive tourism destination for tourists.

The economy of Hangzhou is increasing at a steady pace. In 2017, Hangzhou's GDP reached 1.2556 trillion yuan, at a growth rate of 8.0%. Hangzhou achieved further optimization in industry structure and the primary, secondary, tertiary industry contributed an added value of 31.2, 438.7, and 785.7 billion yuan, with an increase of 1.9%, 5.3%, and 10.0%, respectively. It ranked 4th among Chinese provincial capital cities in terms of economic aggregates. The prosperous economic development trend makes Hangzhou an attractive place of foreign investment.

Hangzhou government is committed to promote social development and improve people's living standards. It continues upgrading its social security system and achieved 100% in its national insurance registration rate. The government has taken effective measure to increase the educational resources and guarantee educational quality. Simultaneously, it spends a large proportion of budget in the improvement of public health system and construction of nursing home.

Since 1963, the urban development of Hangzhou is fast, with the size increasing approximately by three times. It has developed two main city centers, in terms of economy and commerce, which are

located near the physical center of the area. Most of the constructed land has been used for residence and industry. High-tech industries, strategic emerging industries, and equipment manufacturing industries have showed obvious growth trend. In addition, Hangzhou city planning attaches great emphasis on green spaces and the green coverage rate of the built-up area reached 40.3% by 2018.

Hangzhou government is also committed to promote the development of transportation and infrastructure. It has formed a network of expressways and particular highways with complete facilities. The urban public transportation network is developed, with a comprehensive network of metro, bus system, water transportation and public-sharing bicycle system. Hangzhou Xiaoshan International Airport, as a crucial trunk line airport in China, ranks always among top 10 in China in terms of passenger throughput and freight throughput.

Hangzhou government attaches great emphasis on the improvement of ecological environment. It has implemented Measures of Hangzhou Municipality on Drainage Management to deal with wastewater. The government aims to construct an energy-saving society and encourages the use of renewable resources. The government has made significant efforts to use energy crops, agricultural and forestry wastes, and kitchen wastes to develop biomass fuels. It also focuses on the promotion of clean and environmentally friendly advanced power generation technology.

In order to promote the development, Hangzhou government has implemented many supportive policies and development plans in the aspects of economy, society, land-use, agriculture, education, culture and so on. The research focuses on three important plans: Overall Masterplan (2000-2020), 13th Five-year Plan, and Comprehensive Land-use Planning of Hangzhou (2006-2020). The Overall Masterplan provides strategic guidance in the planning of layout structure, urban system, green system, traffic, infrastructure, and so on. The 13th Five-year Plan, in line with the National 13th Five-year Plan, establishes the development objectives and strategic plans. It aims to construct Hangzhou into a modern city with an innovative industrial system, an effective administrative system, and an excellent ecological environment. The Comprehensive Land-use Planning of Hangzhou (2006-2020) provides specific development objectives in terms of the land-uses. It provides a quantitative guidance of urban development.

Yuhang District is the center of the Yangtze River Delta and the site of Liangzhu Ancient City. As a new-emerging district of Hangzhou, it has developed rapidly in recent years. In 2017, Yuhang ranked seventh place among the top 100 competitive districts in China. Yuhang District now has jurisdiction over 14 streets, and the household registration population is 1,040,500. The climate is moderate, with sufficient rain and sunshine. It is especially ideal for the agricultural production and suitable for living.

In history, Yuhang was famous for its fish and rice industry, and agricultural was always the supporting industry. However, the economy structure of Yuhang District has undergone significant adjustments since 1949. The priority of economy has gradually transformed to the manufacturing and high-tech industry. Nowadays, an increasing number of manufacturing companies are consciously responding to "smart" manufacturing.

Until now, Yuhang District has established a convenient transportation network, with multiple transport methods, including road network, railway, bus, metro, and the public-bicycle sharing service. Socio-economical aspects, including real estate, foreign trade, health care, income and social security, public safety, all shows a growing trend. Yuhang is government always tries to provide best living security to improve citizens' living conditions. It has established a low-rent housing security system to assist residence in need. It has initiated policies, such as shutting down coal-fired thermal power plants, increase green spaces, to improve the living environment. More medical resources and educational resources have been provided to citizens, which is also a good indicator of social development.

In terms of district development, Yuhang District has initiated a strategy plan for the period of 2015-2030. This plan suggests to form a point-axis system following the overall requirements of new urbanization and beautiful rural construction. The government will make every effort to accelerate urban and rural development, stimulate economic growth, and promote the formation of a new

tourism business pattern with domestic and foreign influence. An integrated and standardized government administrative system will be established with effective implementation, supervision, and feedback mechanism. All of these measures aim to build a high-quality metropolitan new area.

In conclusion, this study provides a detailed and comprehensive analysis of various aspects of Hangzhou City and Yuhang District. It can be viewed as a starting point of other deeper urban development research.

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