

Working Paper 3

City Profile Urumqi

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List of Abbreviations and Acronyms

HSR	High Speed Rail
NDRC	Chinese national Development and Reform Commission
XGCC	Xinjiang Production and Construction Corps
PCU	Passenger Car Units
NBT	Normal Bus Transit
UETD	Urumqi Economic and Technological Development

1. Introduction

This document introduces the city of Urumqi in order to establish a basis for later research activities and development projects. It 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, infrastructure, trade routes, natural resources, among others to better understand the local planning environment. 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 overview of 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, health and income. 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 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 leading development plans such as the 13th Five-Year Plan, Urumqi Master Plan for Land-use 2006-2020 and Urumqi City Main Functional Area Planning 2015-2020. This is in order to reveal the future development of the city from a formal perspective. 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, however, to examine these plans even deeper, so that later research activities and development measure can be better set in the local context of the city.

Due to the sheer geographic size 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 five of this document brings the district of Toutunhe under focus, as it has a considerable potential for the research activities. Toutunhe 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 visits 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, it goes deeply to the urban development aspects, such as land-use and transport. Finally, the plans of development are also explored to provide the required background for later and more specified project's proposals and development measures.

2. Regional/Provincial Level

Urumqi is located in Northwest China and is the capital of the Xinjiang Uygur Autonomous Region. It is an important central city in Northwest China and an international trade centre facing Central Asia and West Asia. In this chapter, we will provide an overview of Urumqi, including information in aspects of geographic location, climate, history, and region characteristics.

2.1 Geographical Location inside China

Urumqi is the capital city of the Xinjiang Uygur Autonomous Province in the far northwest of the People's Republic of China. The neighbouring countries of the Xinjiang Province are India, Pakistan, Afghanistan, Tajikistan, Kyrgyzstan, Kazakhstan, Russia, and Mongolia. The border with India and Pakistan lies in the controversial Kashmir region. The borderline of the autonomous area of 5,600 km

corresponds to a quarter of the total Chinese borderline. Within China, Xinjiang borders the provinces of Gansu and Qinghai and the Tibet Autonomous Region. Xinjiang is subdivided into four cities, five administrative districts, and five autonomous districts. Besides, nine of the 23 cities in the district are under the direct control of the government of the Autonomous Region. They are managed by it in cooperation with the Xinjiang (Bingtuan) Production and Development Corps. Urumqi is the capital of the Xinjiang Uygur Autonomous Region(Government of Xinjiang Uygur Autonomous Region of China, 2019). Urumqi is located in the middle of a territory of a diverse topographical nature. To the North, the city is edged by the Oasis Green Belt. Beyond the belt and the North, the Gurbantüggüt Desert formulates the centre of the Junggar Basin. To the South, the city is edged by the Dabancheng corridor that is shaped by the mountainous ridges and geological trenches of the Eastern Tian Shan, to the southeast, and Western Tian Shan, to the southwest of Urumqi (RECAST Urumqi, 2014, p. 15).



Figure 1. Urumqi’s Location in China

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

2.2 Climate

Urumqi is located in the central part of Eurasia in the mid-temperate zone arid continental climate zone. The city is in the deep of a locked land, which is more than 2,000 km away from the closest shore or access to ocean. Therefore, Urumqi has an arid continental climate with great temperature differences in the span of one day between the day and night times, which generates extreme weather conditions such as extreme regional warming and cooling effects. The city is very hot in summer and very cold in winter (The World Bank, 2015). In fact, the temperature can drop to -40°C in winter and can move up to +40°C in summer. The very cold winters in Urumqi area are strongly determined by a very stable cold Siberian high, which enters the Junggar Basin from the North and North West. Therefore, changes in wind direction can mark extremely sharp cuts in temperatures (RECAST Urumqi, 2014, p. 18).

Although there is less rain fall with uneven distribution in seasons and big evaporation capacity and the inversion layer happens in winter. The wind mostly comes from the northwest in the city by the Tian Shan Mountain. In winter, it is more the calm wind weather and at night there is the south wind, and on daytime it is the north wind. Gale happens mostly in spring and autumn. The frequency of temperature inversion is relatively high for the whole year. Especially in winter its evident character is strong, thick, long duration and low elevation of mixing layer. Altogether, the atmospheric diffusion condition in Urumqi is not ideal, plus the dry weather and less rainfall, Urumqi is more vulnerable to air pollution, especially in long duration of winter (The World Bank, 2015, p. 45).

The climate is characterized with distinct seasons, spring is dry and windy, summer is hot with less rainfall, autumn is mild and cool, and winter is cold with less snow. Days with calm wind and temperature inversion is prevailing in winter, leading to a very poor condition for the dispersion of the atmospheric pollutants. The annual average temperature is 6.1°C (Environmental Protection Centre of Xinjiang Uygur Autonomous Region, 2015)

Due to the mountains on the east and west sides of the city (e.g., Bogda Peak, Karatag Mountain, Dongshan and Karaza Mountains, West Mountain, Tengel Mountain, etc.) in addition to the farmlands in the northern part of the city as well as to the wetlands downstream of the Urumqi River, an ecological culvert is formed around the city. This is in combination with an ecological green wedge that separates the built-up areas of the city through the wedge-shaped green space that penetrates the city through the northern ecological culvert belt. Both are seen to form an ecological buffer zone and ventilation corridor in the northern part of the city (Urumqi Development and Reform Commission, 2013, p. 37).

Currently, there is no plan for air pollution control in Urumqi. The government, however, has put forward the need to strengthen air pollution prevention and control in Urumqi, which includes the target of developing the public traffic system as the main traffic transportation body, combining other traffic approaches, and actively push the construction of sidewalk and bicycle lane, finally to realize the integrated urban traffic system. And preferentially develop the BRT with large traffic capacity on order to develop the green traffic system, optimize the urban functional layout and improve the urban traffic road plan in order to reduce the air pollutant emission in Urumqi (The World Bank, 2015, p. 55).

In winter, the formulation of an inversion layers of dust particles above the ground that are very much enriched is seen to be a major challenge that causes an extreme danger for the health of Urumqi's inhabitants (RECAST Urumqi, 2014, p. 21).

As a mitigating measure, Urumqi raised 12.1 billion Yuan to replace coal with gas in all 20 coal-heating facilities in the central urban area (the annual reduction of sulphur dioxide emission was 60,000 tons, of smoke-dust 20,000 tons, of nitrogen oxide 10,000 tons) (Hangzhou Government, 2010). Annual average precipitation is 277.6 mm, and evaporation is 2266.0 mm (Environmental Protection Centre of Xinjiang Uygur Autonomous Region, 2015). Since the 1950s, Xinjiang's glaciers have retreated by 21% to 27% due to global warming. Tianshan Glacier No. 1, originating from Urumqi River, is the largest glacier near a major city in China, but has already split into two smaller glaciers (Schmitz, 2019).

2.3 History

In history, Urumqi was already a central hub on the historical "Silk Road" during China's Tang dynasty and developed its reputation as a leading cultural and commercial centre during the Qing dynasty in the 19th century. Along the basins, traders crossed the highly continental Central Asia areas, thereby forming the so-called "Silk Road." Urumqi had been especially predestined to become a major city along this famous trading route, especially because of the most remarkable geological trench in the Tian Shan ridge marking a morphological cut of more than 2,000m between its eastern and western shoulders separating the Eastern from the Western Tian Shan. Urumqi connected the Silk Road trade along the southern rim of Junggar Basin with that along the Tarim Basin and has a geostrategic position of control at the Dabancheng corridor (RECAST Urumqi, 2014).

This figure shows the main travel corridors in relation to the location of Urumqi on the historical “Silk Road”. Thus far, the historical importance of Urumqi’s location on the Dabancheng corridor continues to be very relevant due to a variety of reasons including ones that relate still to logistical qualities, as the city continues to allow the transportation of huge masses of goods and to interconnect the people of Xinjiang living mostly in the Junggar Basin and the Tarim Basin to the north and south of the Tian Shan Ridge (RECAST Urumqi, 2014). The western region is characterized by a long tradition of agriculture and animal husbandry production, multi-ethnic cultural heritage, as well as by the beauty of natural scenery. Urumqi, on this basis, has become a famous historical and cultural centre in both national and international contexts. Since the 1990s, it could be noticed that Urumqi has witnessed a significant economic development. The city currently serves as a regional transportation node and a cultural, scientific and political centre for the Xinjiang Province as well as a hub for international trading. With an estimated population of 3.5 million in 2015, Urumqi is considered to be the second-largest city in China's north-western interior as well as the largest city in Central Asia in terms of population (Urumqi Government, 2020).

More recently, the city of Urumqi is experiencing a rapid urbanisation and economic growth. However, the sustainable development of the city is facing an unprecedented pressure on its urban infrastructure and service provision (Environmental Protection Centre of Xinjiang Uygur Autonomous Region, 2015).

Ethnicity	Percentage in Urumqi	Percentage in Xinjiang
Chinese Han	75,3	40,5
Uyghur	12,8	45,9
Chinese Hui	8,0	4,5
Kazakhs	2,3	6,5
Others <i>(Manchu, Mongol, Xibe, Russian, Tu, Kyrgyz, Uzbek, Zhuang, Tatar, Tibetan, ...)</i>	1,6	2,6

Figure 2. Ethnic Proportions in the City and Region
Source: (RECAST Urumqi, 2014)

2.4 Role of the City in the Regional and National Context

Urumqi is located in the centre of the Tianshan North Loop Economic Zone, one of the national key economic zones. Facing Southwest Asia, the economic zone is adjacent to the Kashkar Economic Zone and Khorgos Economic zone with easy access to the New Euro-Asia Continental Bridge. It's an important business platform between Xinjiang and Central Southwest Asia (Xinjiang China Daily, 2017a).

2.4.1 Important Location in the Northwest of China

Urumqi is considered to be the most important metropolis in north-western China. A quick review of the national map can reveal the importance of Urumqi’s location. On the regional level, the city functions as the capital of its region providing a hub for trade and traffic. The city connects all other urban agglomerations in the region with a wider network of cities at the national level of the republic, which is an essential feature of Urumqi’s location, keeping in mind the vast distance between the region and the rest of the country. Also, beyond the national level, Urumqi is seen to serve as an international hub for trade and traffic that connects China and the region of Xinjiang with its eight neighbouring countries as well as a geostrategic gateway to the West. The city, therefore, has invested

heavily in building roads, transportation networks and traffic infrastructure in order to improve connectivity on the regional, national and international levels.

2.4.2 National Infrastructure of Roads and Railways

Urumqi is connected with three important national main roads. One runs through the province of Xinjiang (interstate highway 216), the other heads to Shanghai (interstate highway 312) and the third connects the country with the Pakistani borders (interstate highway 314). Also, railways play an important role as they provide vital connections reaching Kashgar to the south, Kazakhstan and Europe to the west and Beijing to the east. The Beijing and Lanxin lines are considered to be part of the Trans-Eurasian Continental Railway, which runs from Rotterdam via the Alatau Pass over the Kazakh border then Urumqi all the way to Lanzhou and Lianyungang. There is also a high-speed line that links Urumqi with Xining and Lanzhou. In addition, the Airport of Urumqi “Diwopu” is connected with Hong Kong, Macau, South Korea and nations of the former Soviet Republic. It also provides the possibility to connect with a network of domestic flights throughout China. The significance of the connection to other metropolises in the rest of the republic with regard to the remote location of Urumqi can be illustrated in the network of high-speed trains.

It could be said that the High-Speed Rail (HSR) network in China plays an essential role in connecting the major cities of the country, keeping in mind its vast geography. It could be noted that the HSR is planned following the official hierarchies of municipal administration. However, the concept seems also to follow an urban hierarchy of demographic and economic importance. This means that the HSR seems to prioritize certain routes and transportation corridors that connect major urban agglomerations where an extremely high concentration of population as well as of social and economic activities is accommodated. The goal of the HSR is to fulfil the different transportation needs of the major transportation corridors and to reduce travel times. It also helps consolidate the political power as it links the national capital representing the central government with the provincial capitals across the country. To conclude, the HSR system in China is planned at the national level to match the hierarchical transport corridors, which are determined by political, demographic, and economic hierarchies of the country (Sun, 2016).

2.4.3 Trade Routes

Xinjiang's economy has grown at double-digit rates over the last ten years and the standard of living rose perceptibly. In 2019, the Xinjiang Autonomous Region generated a GDP of 341 billion Yuan, with an increase of 6.5%. The average disposable income of residents in urban areas was 42667 Yuan, but the disposable income for people in rural areas was only 21448 Yuan (Urumqi Government, 2020).

Oil and sugar refineries, steelworks, and chemical factories are among the most important industries in the region, and Cement and textiles are also produced. At the end of the 19th century, the region was known for the production of salt, soda, borax, gold, jade, and coal. In recent years, large oil and gas deposits have been found, particularly in the middle of the Taklamakan Desert and its margins, which are now being developed and exploited. In this context, Karamay and Aksu are strongly influenced by oil mining. The west-east gas pipeline to Shanghai runs from here. In 2005, the oil and gas sector accounted for 60% of Xinjiang's economic power and Xinjiang also has large coal reserves. In total, one fifth and so the biggest of China's coal, gas and oil reserves are located in Xinjiang (reserves of raw materials of 2.2 trillion tons of coal, 10.3 trillion cubic meters of natural gas, and 20.9 billion tons of oil) (Ruhe, 1973).

As an example of the importance of the energy sector in Xinjiang province, the Chinese largest energy group CNPC is planning to invest more than 22 billion US dollars in Xinjiang for the largest refinery and chemical processing base in north-western China as well as the largest oil and gas import channel in the country (Robert L. Wallack, 2018).

Also, Xinjiang is known for agriculture. The grazing land mostly for sheep is in the north of the region, where there is more rainfall, and mountain pastures throughout the region. Since the 1970s, a large

number of fishponds for aquaculture have been built. The climate in Xinjiang is suitable for fruits (e.g., Hami melons, Turpan raisins and tomatoes). It is also suitable for the development of sugar industry (Xinjiang China Travel, 2018). From an economic point of view, it could be said that Urumqi as well as the whole province of Xinjiang is very important due to its strategic location at the centre of the Asia-Europe trade route, which has been further enforced in the “One Belt, One Road” initiative of the national government. This initiative was launched in 2013 with the goal to revive the old trade routes known as the Silk Road and expand the network to connect it with other trade routes and major seaports. The initiative, therefore, required major international investments by the contributing countries to be allocated to constructing roads and related infrastructure. It has been seen to be an enhancement measure for international economic cooperation.

The initiative “One Belt, One Road” has turned Xinjiang into a gateway to the West, where Urumqi plays a significant role in the context of the New Silk Road. For the main trade route from Asia over the Middle East to Europe and Africa, Urumqi has become a central geostrategic transportation hub. In Urumqi, up to 3,600 tons of cargo are handled every day making Urumqi one of the largest logistics centres among the countries along the New Silk Road. In 2018, the transport time of the China-Europe freight trains has been reduced from 22 days to 15 days and Central Asia from 66 hours to 44. There are monthly meetings with the Kazakh railway transport for coordination and consultations with more than 200 companies. The logistic centre in Urumqi provides an important platform for logistics and coordination (Xinhua, 2018).

The Beijing-Urumqi highway is also a part of the New Silk Road. In less than 10 years, China has built a new highway, which extends about 2,768 km from Beijing to Urumqi. In 2017, 700 freight trains began their journey from Urumqi to Europe and, in 2018, around 1,400 trains are expected to travel west (Kidwai, 2018).

Urumqi is primarily planning to become a transportation hub. The Urumqi Airport is expected to be expanded by 2030 with the construction of two additional runways. The expanded airport is expected to handle 750,000 tons of cargo and 63 million passengers per year. In the meantime, the Chinese National Development and Reform Commission (NDRC) expects throughput at the airport to reach 550,000 tons of freight per year by 2025. This is seen to respond to the city's rapid growth and provide a central air cargo hub for the New Silk Road. In addition to the airport, other modes of transportation connecting China with Europe are considered essential. For instance, the Sino-Euro Cargo Railway Project connects Urumqi with seventeen countries stretching from Asia, such as Kazakhstan, to Germany and Spain (Toczauer, 2018).

Close to Urumqi, there is an essential logistic park providing a major rail interchange. This is where trains are assembled for domestic, cross-border (eight countries), and European shipments. This is the main railway line in the region. Even if the case indicates that these railway shipments are more expensive than sea freight, they remain a considerably faster alternative. The facility is planned to expand its capacity to facilitate the transportation of 10 million tons of goods per year (Robert L. Wallack, 2018).

Besides, the Chinese government is currently building a port in Gwadar, Pakistan, to export Xinjiang's products. The province will be connected with this port, which further enhances the importance of Xinjiang and contributes to the acceleration of its economic development (The State Council of The People's Republic of China, 2016).

2.5 Key Physical Features and Characteristics of the Region

Xinjiang is located in the northwest part of China and is far away from the ocean. It is surrounded by high mountains, and the ocean currents are not easily reachable. Therefore, it has a typical temperate continental climate. Due to its location, Xinjiang has very special geographic characteristics.

2.5.1 Terrain

Urumqi lies at about 900 meters above sea level in the foothills of a high mountain range of the Tian Shan Mountains, whose peaks exceed an altitude of 5,000 meters in the immediate adjacency of the city and rise above 7,000 meters to the southwest. The Tian Shan Mountain Ranges cross Central Asia from east to west formulating a massive barrier of 2,500 km long that is aligned with the Silk Road. It causes air masses to overcome the large height differences when crossing the Tian Shan Ridges from north to south resulting in a cooling effect. This effect is related to the rise of air masses, which leads to condensation and precipitation in the process. This generates enough water to sustain brooks, rivers and groundwater bodies and enables a permanent settlement in this highly continental area (RECAST Urumqi, 2014).

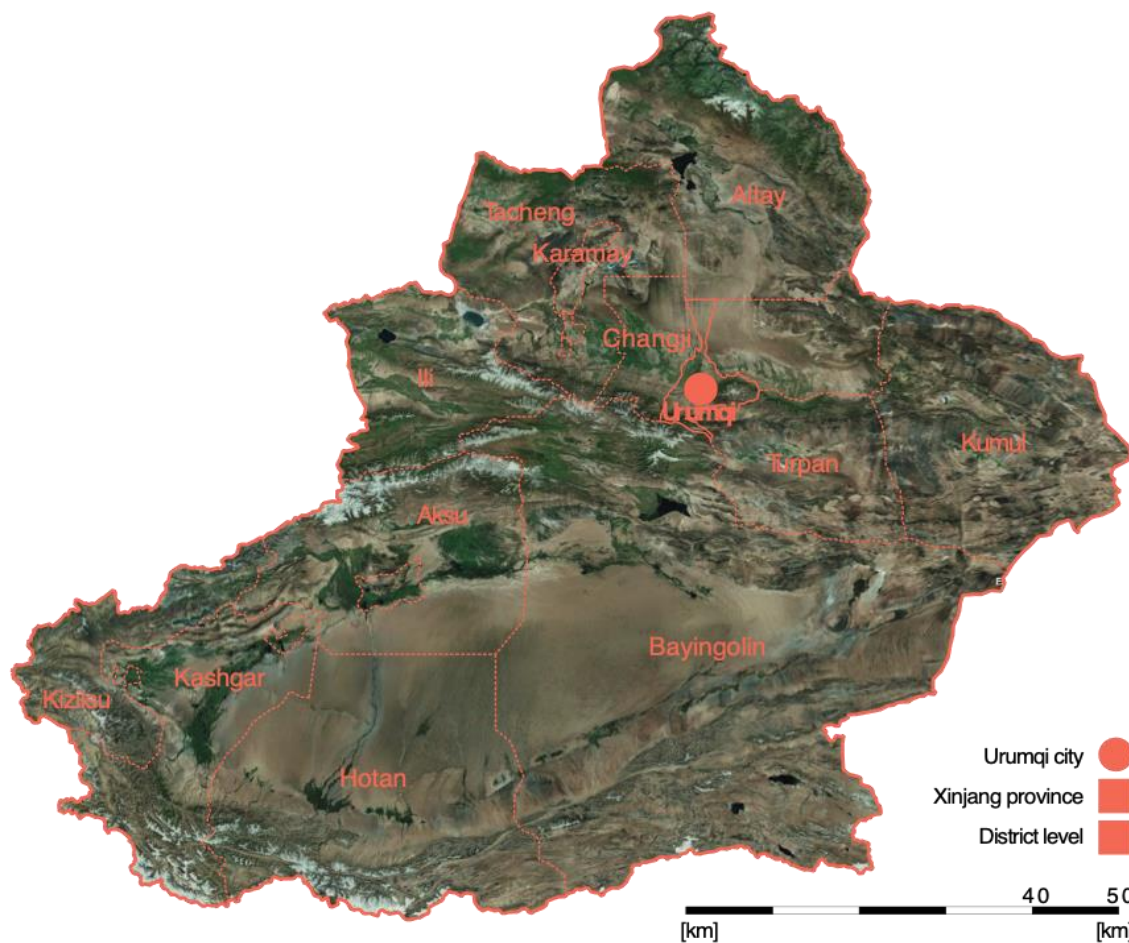


Figure 3. Terrain of Xinjiang Province

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

2.5.2 Geomorphology and Soil Types

The main type of soil in Urumqi is the desert grey soil, which is formed during the formation of the alluvial plain flooded by the Urumqi River. This type of soil, therefore, is of a deep, thick and slightly salinized nature, which allows short, small and sparse drought-enduring plants to grow, especially in the surrounding areas of the city due to constructions and urban development, as distributed vegetation with a covering rate of about 10% (The World Bank, 2015, p. 46).

The settlement area of the city is embraced by hills on three sides and has a wide alluvial fan plain in the north. The south-eastern part of Urumqi City is higher than the north-western with an elevation ranging from 680m to 920m. The northern area is a low hill with ridge net shape and swales between

low hills. The southern area forms a terrace stretching along the right bank of the Urumqi River and flood plain (The World Bank, 2015).

2.5.3 Natural Resources

There are various characteristic landscape types, such as the Tengel and Bogda high and middle high mountains, the Chaiwobao Daban valley, the southern edge of the desert area of Gulbandungut, Urumqi River alluvial wetlands (Urumqi Development and Reform Commission, 2013). In the periphery of Urumqi, there are also many locations of attractive nature and beautiful scenery. This is in addition to other locations that are protected for nature and environment preservation. The vast Tianshan Forest Park, for instance, is about 20 km away from the city centre, the Bai Yang Ditch Scenic Area is 40 km away towards the southwest, the Tianchi Alpine Lake is about 45 km away to the east and the Miao'er Ditch Forest Park is similarly in a close range to the city.

Urumqi is relatively rich with regard to forest resources, especially in Bogda Mountain, Tengel Mountain Area and Tianshan Valley. In Chaiwoba-Dabancheng Valley, Hills and Toutunhe River, Urumqi River alluvial wetland is mostly grassland. In Gobi Desert, there are many fields along Toutunhe River and Urumqi River alluvial wetlands. However, due to regional drought, scarcity of rain and water-shortages, land reclamation rate, land resources and urban development space in the Gobi Desert is very limited. This leaves a large area of the northern desert even more susceptible to mechanisms of desertification. Therefore, the ecological conditions of the desert, including a large proportion of the stated grassland, are expected to get worse (Urumqi Development and Reform Commission, 2013).

Along the entire northern slope of the Tian Shan ridge, groundwater rises at the lower ends of the mountain pediments forming a series of oases. These, in return, formulate and help sustain a green belt that is typically developed along the narrow zones of transition between the high mountain areas of Central Asia and their inter-mountainous basins. The green belt is mainly generated by spring-water horizons which are nourished by infiltrated water from precipitation along the Northern slopes of the Tian Shan and which is further reinforced by small rivers which also originate from Tian Shan (RECAST Urumqi, 2014).

The Municipal People's Government of Urumqi states that it will effectively maintain the ecological protection space pattern of the city's "four districts, four corridors and four cores". The four zones are the Mountain Forest Ecological Area, Hilly Forest Grassland Ecological Zone, Oasis Agricultural Ecological Zone, Desert Ecological Zone. The four ecological corridors are the Toutunhe River, Urumqi River, Shuimogouhe River and Baiyanghe. The four cores are the Tianshan Glacier Area, Bogda Peak Reserve, Urumqi River Downstream Lake Area, Ulapo Reservoir - Chaiwobao Reservoir - Salt Lake Area and other important ecological protection areas (Hangzhou Government, 2010). It also states that it will build a well-established and diverse urban green space system, improve the city's ecological conservation capacity and enhance the quality of the environment. By 2015, 89 key construction projects for garden green space will be implemented, and by the end of 2020, the coverage rate of greening in urban built-up areas should exceed 37% of the total area (Urumqi Development and Reform Commission, 2013).

2.5.4 Condition of Water Resources

The city of Urumqi is surrounded by deserts, i.e., the Gurbantünggüt Desert in the north and the Taklamakan Desert in the south. Water, therefore, is a scarce resource. Water in Urumqi is supplied particularly by glacial meltwater coming from the Tian Shan Mountains. A number of small rivers flow from the snow-capped Tian Shan mountains including the main range of the Tian Shan in south of the city (Urumqi County) as well as the Bogda Shan east of the city (Dabancheng District). A network consisting of thousands of miles of canals, reservoirs, and underground tunnels called "Karez", redistribute the water throughout the extensively irrigated area along the foothills of the mountain range. It comprises an ancient irrigation system built 2,000 years ago. There are 20,000 glaciers in Xinjiang, nearly half of all the glaciers in China (Schmitz, 2019).

Due to the cultivation of Urumqi, the water demand exceeded the natural supply. In order to alleviate the water shortage and to meet a constantly growing demand for water, water reservoirs were built. These reservoirs are redistributed via a network of canals. Above all, however, it is pursued to extract an ever-larger part of the groundwater from aquifers below the city. To date, approximately 89% of the available surface runoff has been used on site. In addition, around 50 % of Urumqi's water supply already has to be extracted from groundwater resources. It is no surprise that falling groundwater levels have been reported throughout the region. The fact that these reports can be found not only in the press, but also in official statements by the authorities, which points out the seriousness of these concerns (RECAST Urumqi, 2014).



Figure 4. Water distribution of Xinjiang Province

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

Surface Water

There are five water systems in Urumqi, which are the Urumqi River, Toutun River, Chaiwobao Water System, Debauching Water System and Dongshan Water System. The Urumqi River is a seasonal stream, which originates from the Tian Shan No. 1 Glacier, flowing out of the mountain pass, then meeting the Nanshan Nine Streams, flowing through the plains of pluvial-flood, urban area and north plain and finally reaching the Mengjin Reservoir in the area of Miquan. The total flow path is 160 km with an annual runoff of 1.820 - 2.906 hundred million cubic meters. The catchment area is 924 km². After it flows into the urban area, it becomes the Heping Channel (The World Bank, 2015).

Urumqi Municipal People's Government planned major projects for water conservation and land-use arrangements. A total of 8,794 hectares of new construction land for water conservation facilities will be arranged, of which 6,500 hectares of construction land for key water conservation projects will be allocated, accounting for 74% of the dedicated lands. In this context, many projects for water supply

have been addressed. This includes projects such as the Louzhuangzi Water Plant, the Nanjiao Water Purification Plant, expansion of Ganquanbao Water Plant and new construction projects, the expansion of the Xishan Water Plant and the Water Reservoir Project. Besides, there are several drainage development measures including a new and expanded sewage treatment plants, such as in Midong District, in Xishan District, in Hedong, in Nanshan, in Sanping New District, in Xinhua, in Yanhu, in Ganquanbao Industrial Zone and in the surrounding areas of the city. Among on Toutun River there are a new sewage treatment plant, a new water plant and new reclaimed water treatment facilities. In addition, there are engineering projects to develop the water reservoirs including the Daxigou Reservoir, Aksu Reservoir, Heihogou Reservoir, Gaoyazi Reservoir, Zhaobizi Reservoir and projects for water resources protection and development as well as soil and wetland protection. As special development measures, there are also flood and drought prevention projects regarding the Urumqi River, Chaiwobao Lake, Ulabo Reservoir, Hongyanchi Reservoir and Urumqi Hetan Road Flood Drainage Canal, Heping Canal and Midong District Gumudi River and the Laolong River stretching to Dongdao Haizi (Urumqi Development and Reform Commission, 2013).

Underground Water

Protection policies of water sources indicate a strict set of regulations in accordance with the law. Illegal constructions, projects and sewage disposal in areas that are designated as a drinking water source protection are strictly prohibited by law. They also articulate the importance of environmental supervision of drinking water sources, mitigation of environmental safety hazards, monitoring of water quality monitoring, prevention of environmental risk and emergency warning, and ensuring the safety of drinking water. The protection areas of water sources include Ulapo, Toutunhe, Zhaobishan Reservoir as well as other 500 smaller reservoirs. This is in addition to Santunbei-Yanerwo, Bayizha, Xishan, Railway Special Supply, Ganhezi, Chaixi, Chabei, Xinhua, Dabancheng District, Shuimo River, Urumqi Petrochemical, Bayi Steel and other groundwater as well as surface water source protection areas (Urumqi Development and Reform Commission, 2015).

2.5.5 Soil and Water Conservation

Soil and water conservation areas are located in the ecologically sensitive regions in the foothills' hilly forest and grassland. The town of Aksu, for instance, hosts a significant function of soil and water conservation. Grazing in areas with severe soil erosion such as low mountains and front mountains in the southern and eastern Tianshan Mountains is strictly prohibited. Similarly, it is strictly forbidden to excavate desert vegetation and destroy forests to maintain the natural ecological balance. The Urumqi City Main Functional Area Planning (2015-2020) suggests various measures that can help conserve soil and water. These measures include comprehensive management of small watersheds, control of soil erosion caused by human factors, and restoration of degraded vegetation. They also have an Implementation of ecological control projects such as sand control in areas with high wind and sand hazards such as the Gurbantunggut Desert and the Dabancheng Valley in the north and the ban of excessive grazing, mining as well as land reclamation. Other measures such as confining the main sand source areas, rationalizing water resource usage, ensuring the quality of ecological water, restoring the grassland vegetation, and improving the regional ecosystem's ability to prevent desertification. In this context, there are already measures of wind-proofing and sand-fixing in the area located in the northern Gurbantunggut Desert and the Gobi Desert Area, and the Toli Township of Urumqi County (Urumqi Development and Reform Commission, 2015).

3. Overall City Level

By 2019, Urumqi has seven districts, with a total area of 14216.3 square kilometres, and an urban population of 2,615,700. The urbanization rate reached 74.61% (Hangzhou Government, 2010). In this chapter, we will focus on the administrative division of Urumqi and provide an introduction of main districts of the city.



Figure 5. Administrative Borders of Urumqi

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

3.1 Administrative Borders

Urumqi has seven districts and one county. Respectively, these are the Tianshan District, Saybag District, Xinshi District, Toutunhe District, Shuimogou District, Dabancheng District, Midong District and the Urumqi County. The total area of Urumqi is about 1,400 km² including an urban built-up area of 368.4 km².

To the east, Urumqi shares its administrative borders with Turpan City along the line from Qiakemaketa to Daheyang. To the west, the Toutun River forms a more natural border between Urumqi and Changji City. To the south, Urumqi shares its administrative borders with the Nanshan Mining area of Gelatagekezileyi. Towards the Southeast, Urumqi is bordered by the Tuokexun County along the line of Weirluoke east of Alagou. The south of Xiazhege No.3 ridge line adjoins the Suo County. The southwest adjoins Jing County. The Bogeda ridge as the border in the north divides the Urumqi with Jimusaer County and Fukang County (The World Bank, 2015, p. 46).

3.1.1 Classification of Districts

Tianshan's central district forms the centre of politics, economy, culture, and finance in Urumqi. It hosts central national offices and institutions such as Xinjiang Production and Construction Corps (XPCC), the Communist Party in Xinjiang, the army, and Xinjiang Government Office. Up to 2012, there were a total of 12 sub-district offices in Tianshan District. The district is also home to 44 minorities such as the Uygur, Hui, Kazak, Mongols, Kyrgyz, etc. The areas defined as public and green spaces constitute about 28% of the total area of the district.

The Saybag District has convenient traffic and mobility conditions as well as an advanced basis for services and communication. In recent years, the district has significantly promoted the tertiary industry. It has also invested in secondary industry and adjusted the development of the primary industry. The integration of the regional economy and non-public economies has also been strengthened, which pushed the district's economy to become one of the most prosperous trading areas in Urumqi.

The Xinshi District is one of the central districts in Urumqi. As indicated by the name, it is a newly developed district. Two industrial parks and 500 governmental branches are located here. The community also hosts 20 scientific research institutions (e.g., CAS Xinjiang Branch, Xinjiang Academy of Social Sciences, Xinjiang Finance University, etc.) in addition to 33 colleges of a variety of scientific fields. With a strong presence of business and science, the district can be seen as a high-tech area. This is in addition to the Urumqi Airport in the district, the most significant goods distributing centre in Xinjiang.

Shuimogou District is one of the four central districts in Urumqi, locating 900 public institutions, including different Urumqi Government branches, gyms, museums, libraries, etc. The district is characterized by the Nanhu People Square and Hongshan Hill representing the symbol of Urumqi. The district combines the natural scenery and cultural landscape together. It is also the centre of Urumqi's politics and culture.

The Toutunhe District is located in the northwest of Urumqi, hosting 3,800 registered companies, including 588 key enterprises and 126 big companies with a particular scale, 40 foreign companies, and 17 companies listed in the world's top 500, and 30 companies listed in the domestic top 500. The future development plans for Urumqi state an ambition to build the most significant "seven bases" in northwest China: the biggest wind power production base, the most significant metallurgical industrial base, the new automobile and machinery production base, the biggest food and beverage production base, the Xinjiang intelligent commercial base, the Asia and Europe export-import logistics base, the Asia and Europe IT base (The World Bank, 2015).

3.1.2 Demography

In 2010, the total population of the whole administrative metropolitan area of Urumqi is 3.53 million (Statistical Bureau of Urumqi 2015 p. 57). The city of Urumqi has been inhabited by different ethnic groups of different origins for thousands of years. Buddhist Tibetans and Mongolian Junggar peoples have left their mark even before Turkish-Muslim Uygur populated the place. The Han Chinese have been increasingly populating the area in the recent decades (RECAST Urumqi, 2014). Urumqi, therefore, has the most complex composition of ethnic groups in China. There are 49 ethnic groups including the Uygur, Han, Hui, Kazak and Mongols among the others. The ethnic minorities represent 27.4% of the total population. The Uygur and Hui are the leading minorities in terms of population. The Uygur, in this context, represent 47.11% of the ethnic minorities, while the Hui comes second representing 36.75% (The World Bank, 2015). The Uygur mainly settle in Tianshan, Saybag and Toutunhe Districts. The Xinshi and Shuimogou districts host mainly the Han inhabitants. The Hui minority lives mainly in the Midong District (The World Bank, 2015).

In 2018, the registered population of Urumqi was 2,222,600, including 2,003,700 in urban area and 218,900 in rural area. The urbanization rate of registered population is 90.2%. The annual birth rate

of registered population is 11.99‰, the death rate is 8.63‰, and the natural growth rate is 3.36‰ (Urumqi Government, 2019).

3.2 Economic Development and Activities

According to the index of Gross Domestic Product (GDP), industrial added value, total retail sales of consumer goods and the fiscal revenue, it is clear that Urumqi plays a significant role for the economic development in the Xinjiang Region. In this part, we will provide a detailed analysis of its economic development and foreign investments (The World Bank, 2015).

3.2.1 Economy Overview

Since the reform and the new policies of “opening-up” were carried out by the government, especially the strategy of developing the west, Urumqi has experienced a rapid economic growth and become a rising agglomeration of industry and commerce. Urumqi’s “Comprehensive Economy Strength” was ranked 24th among the top 50 Chinese cities. Before that, it was also rated as one of the “Superior Forty Cities of China in Investment and Environment” in 1992. The files from the State Statistics Bureau reveal that Urumqi occupies the 6th place among other 31 Chinese cities of second category among the top 50 of the “China Society and Economy Strength”. In 2000, the city managed to achieve the economic development target of tripling its Gross Domestic Product of the 1980’s. According to the statistical data in recent years, the GDP of Urumqi occupied around one fifth of Xinjiang Uygur Autonomous Region. The major per-person-economic measurements, such as per capita GDP, Fiscal Revenue, Total Retail Sales of Consumer Goods, per capita Disposable Income of Residents, etc., have placed Urumqi in the Chinese forefront of the 10 big cities in the west of the country (The World Bank, 2015).

The GDP of Urumqi was 341.32 billion yuan (RMB) and was 94 thousand Yuan (RMB) per capita in 2019 (Urumqi Government, 2020). This means that Urumqi still has a relatively low GDP. However, a 15-year period of Urumqi’s developing GDP per capita manifests a remarkable increase of almost 9-fold.

3.2.2 Foreign Trade and Investment

Xinjiang is bordered by eight neighbouring countries by land, with 17 first-class ports and ten second-class ports along the border. Urumqi is not only the largest commodity distribution centre in Xinjiang but also an important import and export trade distribution centre in Central Asia and has become an essential platform for world investors to explore the Central Asian market. Urumqi, relying on eight neighbouring countries, has built nearly 200 commodity trading markets, including 32 with an annual turnover exceeding 100 million yuan and 10 with an annual turnover exceeding 1 billion yuan, forming a multi-level and multi-channel trade network.

In 2018, there were 513 investment projects in Urumqi, 344 of which were newly built, with 159.581 billion yuan invested from other provinces, showing an increase of 55.9%. 20 foreign-invested enterprises were newly established, and the contracted foreign investment amount was 164.86 million US dollars, an increase of 31 times (Urumqi Government, 2019).

3.3 Socio-Economic Development

Urumqi is a multi-ethnic area. Due to its special geographic location and multiple cultures, its social and economic development is full of challenges. However, since the establishment of Xinjiang Production and Construction Corps in 1954, Urumqi has achieved great progress in the development of the economy and society.

3.3.1 Income and Social Security

The World Bank has conducted a study and examined a selected sample of the population to determine the socio-economic situation of the city. Looking at incomes, it could be seen that the respondents

whose income is below 20 thousand Yuan per year account only for 16.7% of the total sample. The farmers who earned below 5 thousand Yuan per year accounted for 17% of the total number of the examined farmers. It should be noted that part of the farmers' income, in this study, is not manifested in the form of cash since most of them consumed self-produced products. In other words, if the income of the examined farmers was only based on the cash they earn, it would have seemed even lower.

Based on the generated data, the highest proportions with regard to different occupations are the incomes of: enterprise workers, 40-60 thousand Yuan per year, accounting for 30.2%; Farmers, 20-30 thousand Yuan per year, accounting for 20.2%; officers and clerks in public institutions and enterprises, 40-60 thousand Yuan per year, accounting for 27.2%; individual households and private entrepreneurs, 40-60 thousand Yuan per year, accounting for 25.5%; company employees, 30-40 and 40-60 thousand Yuan per year, each accounting for 26.7%; temporary workers, 30-40 thousand Yuan per year, accounting for 26.9%; the unemployed, 20-30 thousand Yuan per year, accounting for 20.2%; the emeritus and retired, 20-30 thousand Yuan per year, accounting for 29.9%; housewives, 20-30 thousand Yuan per year, accounting for 37.3%; students, 10-20 Yuan per year, accounting for 27.8%. In comparison with the income of enterprise workers, it could be stated that the income of the officers and clerks in public institutions and enterprises, individual households, private entrepreneurs, emeritus and retired has witnessed an increase of 10% in the recent years resulting in a higher overall residents' income. People whose income is about 30-60 thousand Yuan per year, in this sense, account for a majority of 44.7% of the examined sample (Urumqi Integrated City Transport Project Research Centre, 2015)

Based on the same World Bank study, the surveys indicate that the examined households have different levels of income and thus having different living standards. The layering disparity between poverty and affluence has reflected on society. The questionnaire indicated that most families are low-income families, accounting for 47.2%. The middle-income families accounted for 46.1% and 4.2% still lived under the poverty line. Different ethnical groups showed similar attitudes about their economic status and living standards. 5.3% of the investigated Kazak families thought they are high-income families due to their life quality. 10.% of them indicated that they are low-income. The majority evaluated themselves as middle-income families. Other ethnicities such as the Han, Uygur, and Hui people had a similar feeling of their families' income, with 45% falling into the low-income and middle-income groups (Urumqi Integrated City Transport Project Research Centre, 2015).

Employment and social security work were strengthened continuously. The number of employed people has increased to 84.5 thousand. The rate of the registered urban unemployment was 3.43%. About 99 thousand people completed various training courses to enhance their occupational skills. Further, the city has built 50 new sites for "One Stop Employment Service Hall". There were 4.12 million town workers are already insured by the "Five Insurances Program". The rates of social pension insurance for urban residents went up to 87.9%, and the new type of rural social pension insurance rate went up to 94.6%. Per capita basic old-age pension for retirees from enterprises was also increased to 1936 Yuan a month, and the minimum wage for town workers went up to 1140 Yuan a month. The social security subsidies and living allowance of public welfare jobs personnel was up by 361 Yuan a month. Under the dynamic management, people who were supposed to receive the subsistence allowances were ensured to gain them. Urban and rural standards were increased three times in one year; 97.42 million Yuan for subsistence allowance and 90.78 million Yuan for all kinds of special funds were distributed accordingly. The housing security system was improved further. In 2012, 4.8 billion Yuan were invested to build 10662 sets of new housings, renovate 22 projects of shantytowns, and finish 9 municipal infrastructure programs of the 22 projects in the aspects of roads and water supply and drainage etc. The construction of affordable housing was reinforced, and 4552 sets of public rental housings, 5072 sets of low-rent housings, and 2544 sets of economy applicable housings were built (Urumqi Integrated City Transport Project Research Centre, 2015).

3.3.2 Education

At the end of 2012, the number of students in the city was 659.9 thousand. This includes 136 thousand students studied in 18 regular institutions of higher education, 88.2 thousand students studied in the regular secondary vocational schools, 168.9 thousand studied in the ordinary senior and high schools, 200.2 thousand students studied in the primary schools, 66.1 thousand students studied in the kindergartens and finally 5 hundred students studied in the special education schools (The World Bank, 2015).

3.3.3 Culture

Urumqi is an important town on the New North Road of the ancient Silk Road in history. It is the economic and cultural exchange centre between the East and the West. It is characterized by openness and enthusiasm and is the most dynamic city in Central Asia. As a multicultural centre, more than a dozen ethnic groups have flourished here. By the end of 2018, there were ten cultural centres, seven public libraries, and two museums in Urumqi. There were 87 municipal cultural industry demonstration bases, eight distinct cultural blocks, and four cultural industry demonstration parks. To celebrate the 40th anniversary of the Reform and Opening-up policy, 20 literary and artistic works were created. In the whole year, 20,000 cultural cards were issued, and more than 300 cultural performances were held. The government had built 50 Peking Opera demonstration schools and successfully held the first youth drama competition (Urumqi Government, 2019).

3.3.4 Public Health

Various social undertakings of Urumqi have developed roundly. In 2012, 41 community health service centres were extended sufficiently engaging in food and drug safety and cracking down on illegal practices medicine rectification activities (The World Bank, 2015).

3.3.5 Civil Affairs

By the end of 2018, there were 1,773 medical and health institutions in Urumqi, including 130 hospitals, 1607 primary medical and health institutions, 29 professional public health institutions and centres for disease prevention and control, and 7 other health institutions. There were 39,700 health technicians, showing an increase of 3.0%. There were 32,200 beds in health institutions, increasing 4.4%, 28,500 of which were in hospitals. In 2018, Urumqi had 39 nursing homes and 382 indoor gymnasiums. More than 800 communities (villages) had completed the construction of public sports facilities (Urumqi Government, 2019).

3.3.6 Housing Stock

The following table gives at first an overview of the households in the Toutunhe District by 2012. It is clear from the table that a large proportion of housing stock was in Tianshan district, New urban district and Shanyibake district. In sharp contrast, the amount of household in Dabancheng district was only 14630, less than one tenth of that of Tianshan district. This indirectly implies the level of economic development as well as living environment.

District	Household	Population	Gender	
			Man	Woman
Tianshan district	185369	576246	289959	286287
Shanyibake district	176600	537548	273209	264339
New urban district	183311	556204	294903	261301
shuimogou district	98287	301441	161095	140346
Toutunhe district	81644	230230	122815	107415
Dabancheng district	14630	42170	22553	19617
Midong district	96792	274332	141844	132488
Urumqi County	20875	59862	29732	30130
Total	857508	2578033	1336110	1241923

Figure 6. House Stock and Population in Different Districts
 Source: (The World Bank, 2015)

3.4 Urban Development

During the period from 1963 to 2019, Urumqi has witnessed a continuous trend of urban expansions along its major corridors stretching its urban structure to cover more built up. According to the master plan, this trend will continue with a clear focus to concentrate development in the north-eastern part of the city, especially in the Toutunhe District. The following part will provide a detailed explanation of the urban development.

3.4.1 City Growth

The city development since 1963 is shown in Figure 7. The development seems to expand in all directions, along the major corridors. Most of the growth seems to take place in the north inside the Midong District, which is almost twice the size of Changji, the neighbouring city to the northwest.

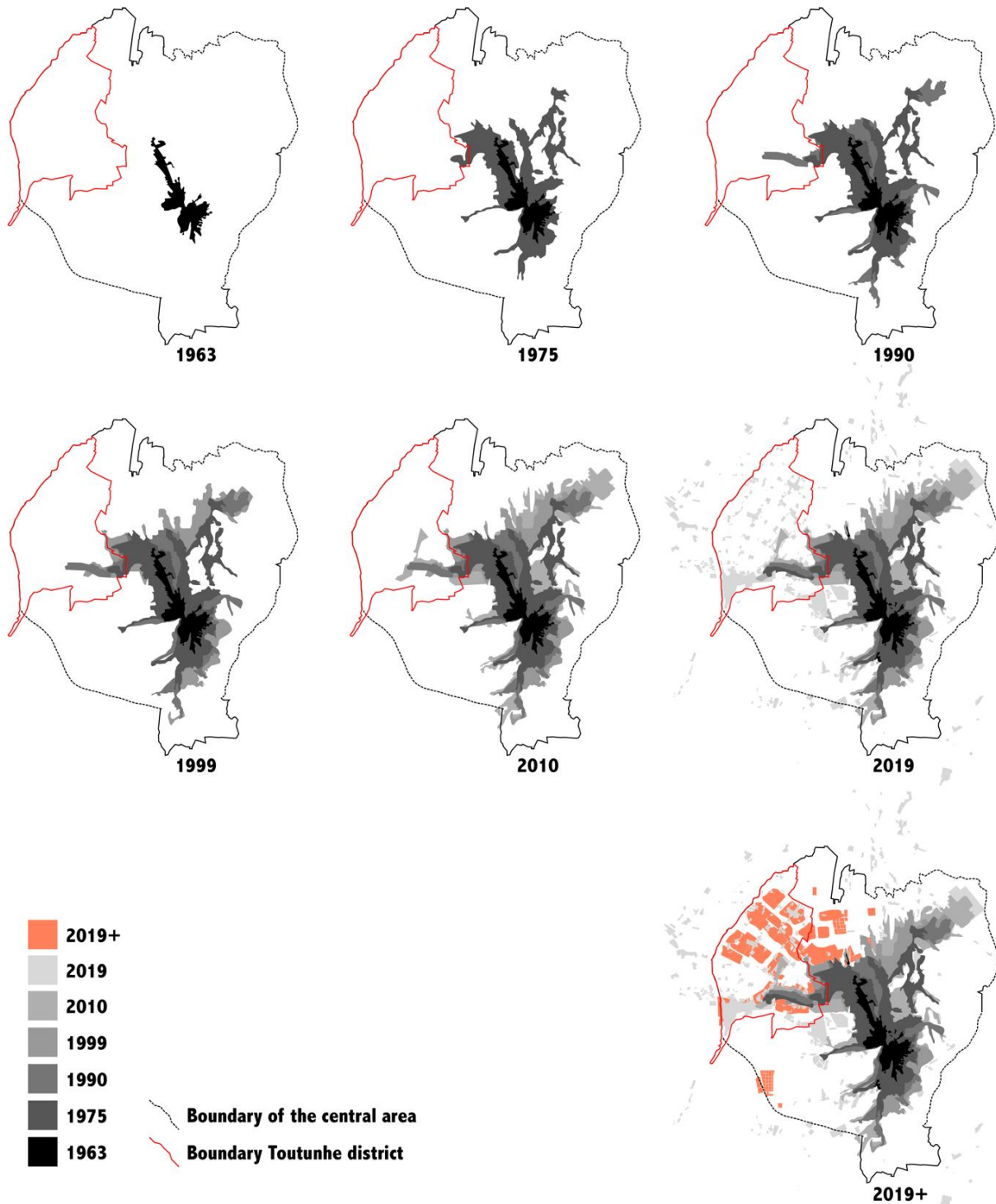


Figure 7. Urumqi City Growth.

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: openstreetmap.org, www.link.springer.com/article/10.1007/s11625-009-0096-y and Urumqi City Master Plan 2009-2020

3.4.2 City Centres

By 2020, the permanent population of Urumqi City is expected to reach 4.75 million, and the permanent population of the central city will reach 4.1 million.

The central urban area will adopt a "multi-centre, cluster-style" spatial layout structure, relying on the surrounding mountains and urban agricultural landscape belts to form a land layout form of "one axis, two centres, two districts seven clusters." The "one axis" is precisely the axis of urban space expansion,

which is to rely on the central longitudinal trunk road to form an urban space expansion axis, connecting the old city and the new city, as well as the regional development corridor. The axis will connect multiple public service centres to strengthen the accumulation and promotion of urban service functions. It is the central development axis for Urumqi to achieve spatial expansion, drive the development of Wuchang's urban area, and enhance regional radiation.

"Double Heart" means that by 2020, Urumqi will build two urban centres located in the north and south, respectively. After completion, the southern centre will focus on its functions as a government and financial centre in Xinjiang and vigorously improve the tourism services by constructing urban recreational business districts. At the same time, the northern centre will mainly develop administrative, conference, and sports functions. In the surrounding areas of the two main metropolitan areas in the north and south of the capital, the city will combine seven outstanding groups including Midong Group, Airport Group, High-speed Railway Group, Exhibition Group, Bayi Steel Group, Sanping Group, and Xishan Group. Each city group will have a specialized function (Urumqi Government, 2016).

3.5 Land-uses

The total land area of the whole administrative metropolitan area is 13,788 km² including the built-up area of 412 km². The government of Urumqi has issued a land-use plan for 2006 to 2020 for the purpose of maintaining a harmonious and safe land ecological environment. In this plan, "Urumqi Master Plan for Land-uses (2006-2020)", the total land area of Urumqi was estimated to be 10,667 km². Agriculture had the biggest share of land-uses as the plan dedicated 9,839 km², accounting for 92.2% of the total area, for agricultural purposes. Land dedicated for construction came next with 505 km², accounting for 4.7% of the total area. Other uses of land accounted for 3.1% of the total area (Urumqi Government, 2013).

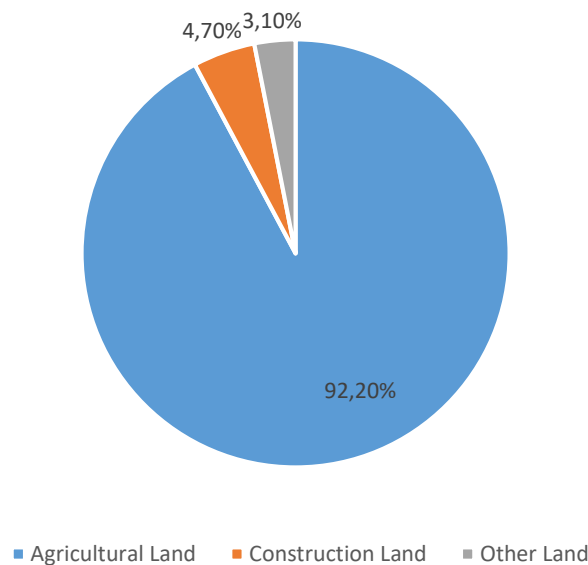


Figure 8. Major Land-uses in Urumqi, Source: Global Urbanisation Research Team FRA-UAS (2020)

The construction land is divided into urban and rural construction land, transportation, water conservation and other land-use. The two types of construction land formulate the built-up area that accounts for 3.4%. Urban construction land covers an area of 153 km². Rural construction land area occupies 141 km². Mining and independent construction land covers an area of 73 km². The transportation, water conservancy and other types of occupancy cover an area of 49 km². These types include tourism facilities, military security, religious temples and cemeteries. The agricultural and arable land area is 816 km², accounting for 7.6% of the total land area. The green space is 17 km² accounting for 0.2% of the total area. The forest land area is 624 km², accounting for 5.8% of the total

area. The grassland area is 8372 km², accounting for 78.5% of the total area. Other types of agricultural land cover an area of 10 km², accounting for 0.1% of the total area. The waters surfaces cover 67 km², accounting for 0.6% of the total area. The natural reserves cover an area of 256 km², accounting for 2.4% of the total area. There are special land-use characteristics. The major land occupancies can be categorised in geographic terms. Here, three main forms can be identified: (1) land resources, in the northwest arid areas and plain oasis area, which are mainly agricultural, (2) urban and rural construction land and (3) natural monuments such as the mountains, Gobi Desert, and desertification land, which are mostly considered as forested land, grassland and natural reserves (Urumqi municipal people's government 2013 pp. 5-7).

3.5.1 Constructed Land/Built Environment

In Urumqi, the constructed land is mainly used for industry, residence and green spaces. This part will discuss the land-use in this aspect.

Industry

Urumqi encourages to develop the industry and in the Master Plan of Land Use (2006-2020), the land area designated for the development of wind power and other energy bases, heavy chemical industry, and building materials industry is 4600 hectares. The land is used for production and is located in industry-intensive area (Urumqi Government, 2013).

Residence

In order to regulate the land use activities in the central city area, Urumqi implemented the policy of land use control, and the land can be divided into the allowable construction area, the conditional construction area, the restricted construction area and the forbidden construction area. During the period of 2005-2020, the area for the allowable construction area covers an area of 51,900 hectares. The residential land in the zone should give priority to the needs of urban economically affordable housing to guarantee the construction of infrastructure and public facilities. The government restricts the proportion of low-density high-end residential land and encourages the potential of the distributed land (Urumqi Government, 2013).

Green Spaces

In the central city, the system of green spaces is divided into three levels, namely, ecological green space, urban green space and attached green space. Ecological green space including scenic tourist areas, natural country parks, water conservation areas, coal mining areas green space, urban farmland, desert mountain greening and other different types, should be classified and planned to strictly control the development and construction of various behaviours, to protect ecological functions. Urban green space includes urban public green space and production protection green space.

Planning open spaces within the city is seen to consider three levels of design. These are the location of the space, taking into account the distribution of green spaces within the city, the connectivity of the green spaces, taking into account the overall spatial coverage and the network of green spaces, and the quality of the space taking into account the role and functions hosted by the green spaces. These considerations are seen to be referred to in the concept of "point, line and area" of the green space development in Urumqi (Urumqi Development and Reform Commission, 2013, p. 31).

Urban public green space is divided into city-level parks, district-level parks, residential parks and waterfront public green space. In 2020, the total amount of planned urban public green space is 40.09 Km² accounting for 8.24% of the urban construction land, and the total amount of new public green space is 18.13 Km². It is planned to add 29 Xinshi parks, including 3 city-level parks, 11 district-level parks, 12 residential parks, 3 special parks, other development plans along the river and the major city roads, setting up 11 new open spaces and renovating the six existing parks. In this context, greening the waterfronts of the city is considered to be a great potential. Development measures such as the rectification and greening of the existing water system as well as transforming the waterfronts into a

green-belt-type waterfront that function as a public green space. Controlling the Heping Canal, the Shuimogou and Gumudi Rivers is an important development measure.

Street green spaces are also seen to be a great potential to increase the proportions of green spaces in the city. In this context, it is addressed that roads on both sides should integrate well with the green spaces of the adjacent residence to open up these spaces and increase accessibility of these spaces as well as the attractiveness of the city’s roads. In this sense, the new, 20 meters wide and fast-ring-road of the city, served with a 10 meters wide side trunk road can be transformed into a green belt. Providing such a development model of a “street garden”, in combination with the layout of the residential districts of the city can provide 5,000 - 20,000 square meters of green spaces, for each district.

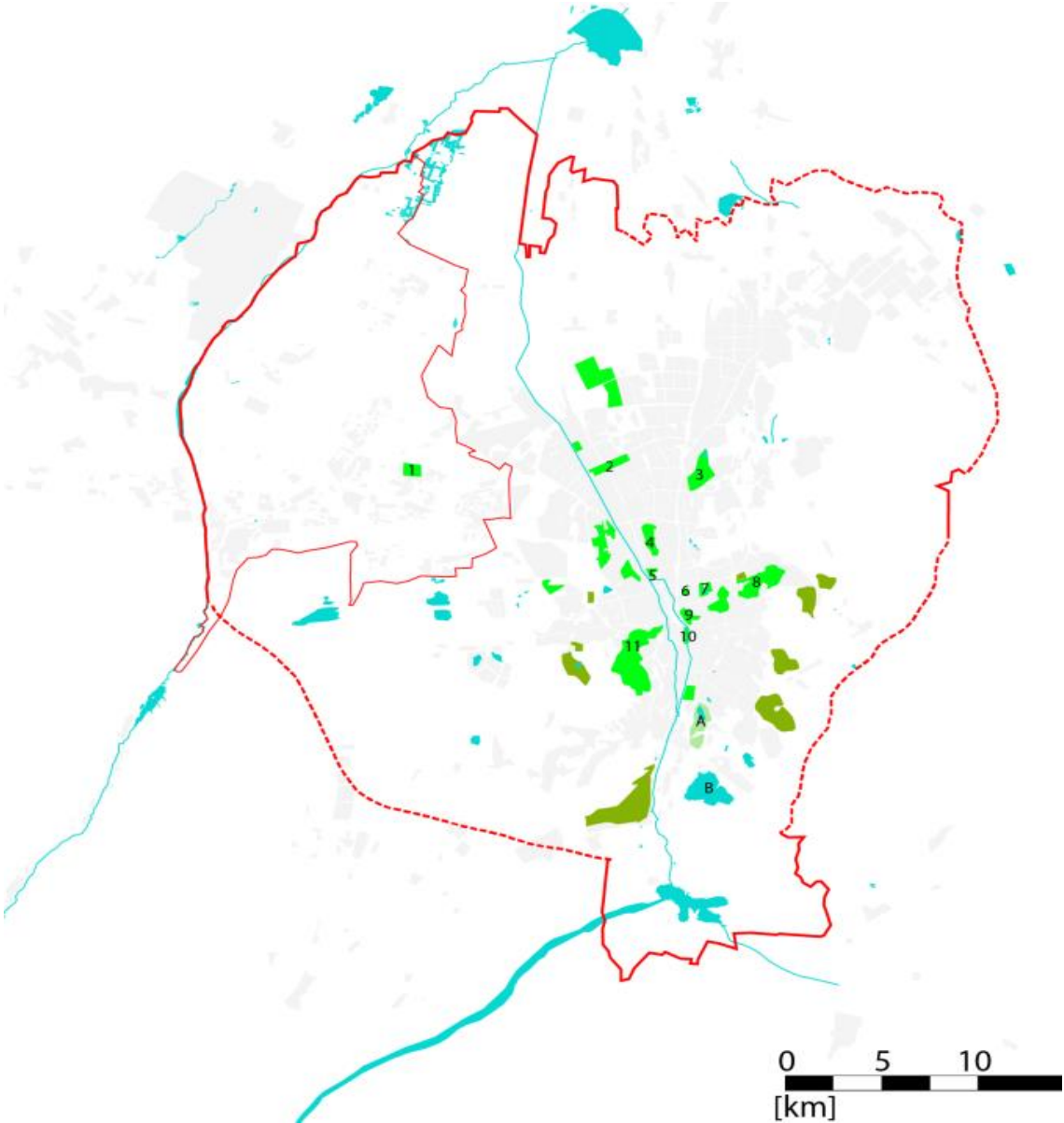


Figure 9. Green Spaces of Urumqi

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: openstreetmap.org and Google Maps and Urumqi City Master Plan 2014-2020

The 2020 layout of protected green spaces consolidates a total amount of 22.99 km² of planned urban production areas and protected green spaces, which accounts for 4.61% of urban construction land. In addition, green spaces dedicated for urban production are mainly located in the central urban construction land perimeter, in combination with the lands surrounding the city highway, country

parks, ecological forests and other ecological green belt initiatives (Environmental Protection Centre of Xinjiang Uygur Autonomous Region, 2015, p. 2).

The total area of green spaces, in this context, is then 10.47Km², accounting for 2.1% of urban construction land. Urban green spaces are divided into health protection belt, railway protection belt, city proper facilities protection belt and some other types to fulfil the corresponding control standards as well as to conform to the boundaries and regulations of the various types of green spaces in the city (Environmental Protection Centre of Xinjiang Uygur Autonomous Region, 2015, p. 2).

3.5.2 Agriculture

Most of the land in Urumqi was taken up by agricultural land, accounting for 92.2% of the total. The agricultural land can be divided into five types: the cultivated land, the garden land, the forest land, the pastureland and the other. The largest proportion was the pasture area, and it took up 837,200 hectares, accounting for the total area 78.5% of the total area. The cultivated land and forest area were 81,600 hectares and 62,400 hectares, respectively. The garden area and other agricultural land only accounted for 0.3% of the total (Urumqi Government, 2013).

3.6 Mobility and Transport

Urumqi, under the pressure of rapid urbanisation growth, is facing considerable challenges with regard to the provision of public transport. This has led to the emergence of severe traffic congestions along with a multitude of environmental problems (The World Bank, 2015, p. 55). According to the Urumqi Urban Development Masterplan 2012 - 2020, considerable change is planned to be made regarding urban spaces and functions of land. In this context, the plan seeks to improve the city's traffic condition as it proposes a significant construction of traffic infrastructure such as roads, BRT and railways. The target is to develop the public transport system and introduce it as the main body of Urumqi's mobility. This is in combination with the development of other mobility approaches including the construction of sufficient sidewalks as well as bicycle lanes. This is seen to help achieve an integrated system of urban mobility (Urumqi Development and Reform Commission, 2013, p. 57).

Referring to the Masterplan for Land-use 2006 – 2020, a sum of 23,024 hectares of additional land was dedicated for the construction and further development of transport and mobility infrastructures as well as for related facilities. For instance, the plan suggests major constructions of railway, urban rail transit, highway as well as an airport development. In this context, there are 16 railway projects to be constructed, such as the construction of Lan-Xin Railway Second Double Line, Urumqi New Passenger Station, Urumqi West to Urumqi North Rail as well as other construction projects including the Contact Line. All constructions are meant to be achieved in the addressed planning period allocating about 11,734 hectares for the preliminary arrangements of the development. Also, the plan stresses the need to speed up the construction of rail transit allocating 800 hectares to expand the urban rail transit lines to cover the city's north-south main axis and connect it properly with the new passenger station and the international airport.

During the planning period, the plan proposes a sum of 24 highway projects to be constructed throughout the city allocating 9,840 hectares of land for this purpose. The goal is to connect Urumqi with a variety of places as well as with neighbouring states and to link the national highway with the provincial ones. In these projects, priority is given to the construction of an inner ring, central ring and outer high-speed ring. Airport development, according to the plan, proceeds with the implementation of the fourth phase of the expansion project. This includes the construction of a second runway as well as of an international airport logistics centre. The plan, therefore, dedicates 1,620 hectares for the airport development adding 650 more hectares to the current lands occupied by the airport (Urumqi Development and Reform Commission, 2015, p. 11).

Based on the goal of supporting the role of Urumqi as a capital of the Xinjiang Region, the plan sets the city to be a regional comprehensive transportation hub that is essential for Xinjiang, China and Central

Asia promoting regional development and accelerating international transportation of goods and passengers.

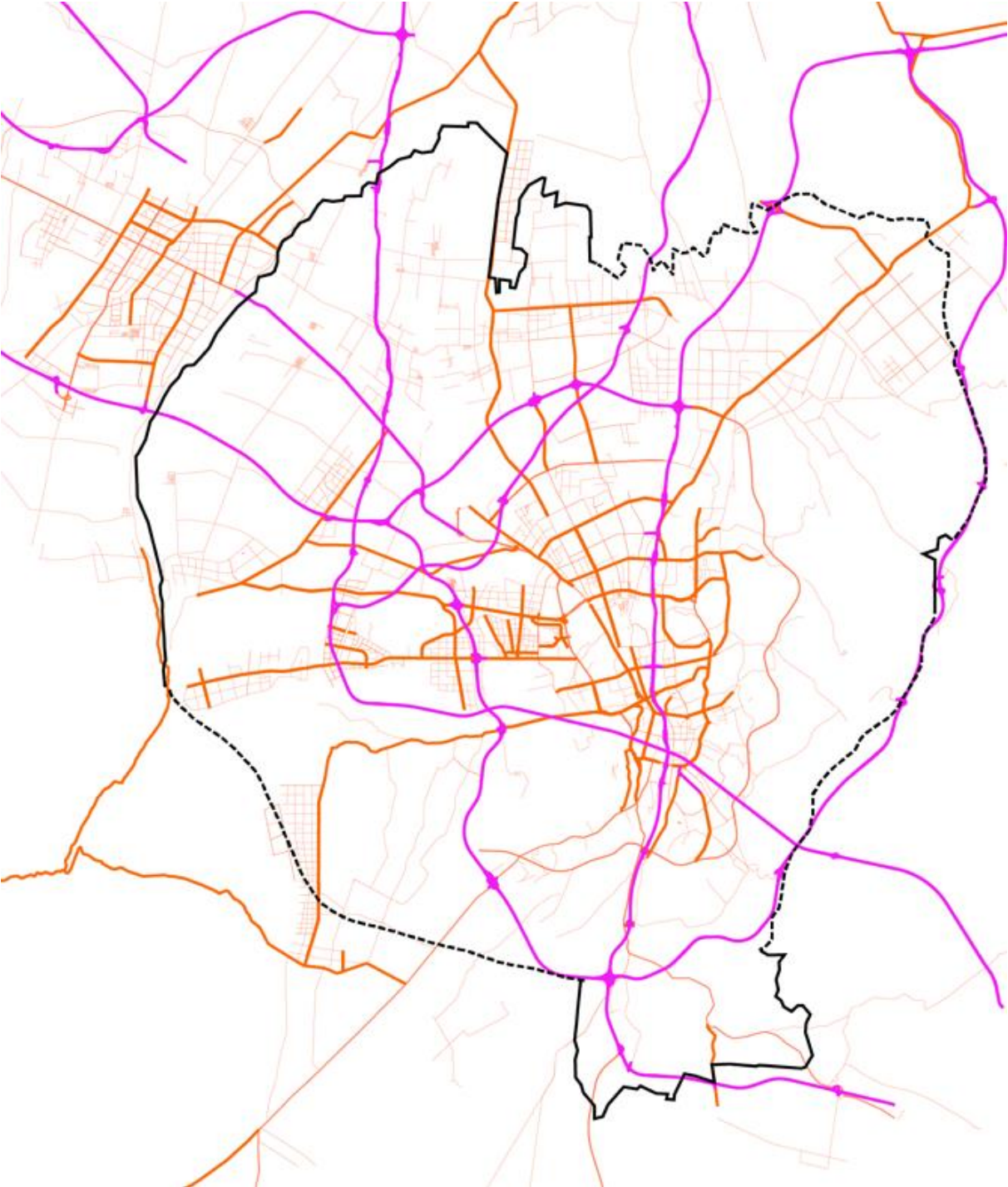


Figure 10. Existing Street Network

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

Further, the plan suggests an improvement of the condition of domestic roads within the city as well as the accessibility to the regional roads. In this context, it suggests a faster implementation of the concept of the three rings. It proposes an improvement of the structure of urban mobility by combining the development and construction of urban areas, increasing the network density of roads, accelerating the construction of the urban rail transit and promoting an integrated model of urban mobility. These measures include the construction of Wuchangshi Expressway Network System and

the improvement of the urban intercity railway network. They include the establishment of a high-speed railway connection linking Xinjiang with Central Asia and linking Urumqi with the main cities in Xinjiang. Therefore, the construction of the high-speed railway station in Urumqi, together with the development of its surrounding area is meant to connect the road systems with the high-speed rail in a convenient manner. Connecting the railways, i.e., high speed and urban transit, as well as the road systems with the airport can increase its importance to be the hub for air transport and mobility connecting western China, central Asia and Europe. The plan also suggests an acceleration of the construction of the Eurasian Continental Bridge and introduces it as an international gateway to Central and Western Asia (The World Bank, 2015, p. 54).

The city has developed an intelligent system to control and monitor traffic and mobility within the city. In this context, mobility models and data bases have been built up jointly by municipal construction committee, urban management committee and traffic transportation management committee. This is in relation to traffic guidance, traffic violation management, bus dispatching and command centre, taxi dispatching and command centre, parking lots monitoring and public transportation management (Urumqi Integrated City Transport Project Research Centre, 2015, p. 19).

3.6.1 Road Network

Recently, the Outer Ring Road of Urumqi was put into service. In 2012, a sum of 3 billion Yuan was invested into the urban construction, and the first phase construction of the Tianzi Road, which was accomplished in 198 days improving the overall transportation capacity of the city by 30%. Another investment of about 50 billion Yuan was dedicated to build a number of key infrastructure projects. This investment includes the development of 24 domestic roads, such as the second stage of the Exhibition Road, the North Exhibition Road, the Beijing Road and the north Main Road of the city. In this regard 24 “Dingzi-Roads” and “Duantou-Roads” were built, 600 galleries were improved and 5 new mechanical parking garages as well as 53 parking lots were completed, which effectively relieved the condition of traffic congestion and parking problems. Recently, the Outer Ring Road was put into service. Also, this investment included the construction of a subway line that was officially launched (Urumqi Municipal Bureau of Statistics, 2015, p. 60).

The numbers of private cars, station wagons, RVs and company cars (not taxis) in Urumqi are around 41,399 vehicles (Urumqi Municipal Bureau of Statistics, 2015, p. 20). The total length of the road network comprising all roads including residential roads is 2,783 km. The total length of express road network comprising all expressways, freeways and toll-ways is 192 km (Urumqi Integrated City Transport Project Research Centre, 2015, p. 19).

3.6.2 Public Transport

The main public transport in Urumqi City includes aviation, railroad, metro, bus system. As an inland city, water transport is not available now. This part will provide an overview of these main transport methods.

Aviation

As one of the five gateway airports in China, Urumqi Airport serves 141 domestic and international airlines, of which there are 105 domestic and regional airlines and 28 international airlines, flying to 52 domestic cities, 31 international cities, and 21 foreign countries (Urumqi Integrated City Transport Project Research Centre, 2015, p. 19).

Railway and Metro

After the completion of the Lanzhou-Xinjiang and the southern Xinjiang railway projects, the function of the Urumqi Railway Station as the distribution centre of air passengers and cargoes for the inland and Central Asia has increased greatly, strengthening its position in the whole region. The station is located conveniently to integrate well with three national highways that run through the city, the entire Xinjiang, the country, and neighbouring countries (Urumqi Municipal Bureau of Statistics, 2015)

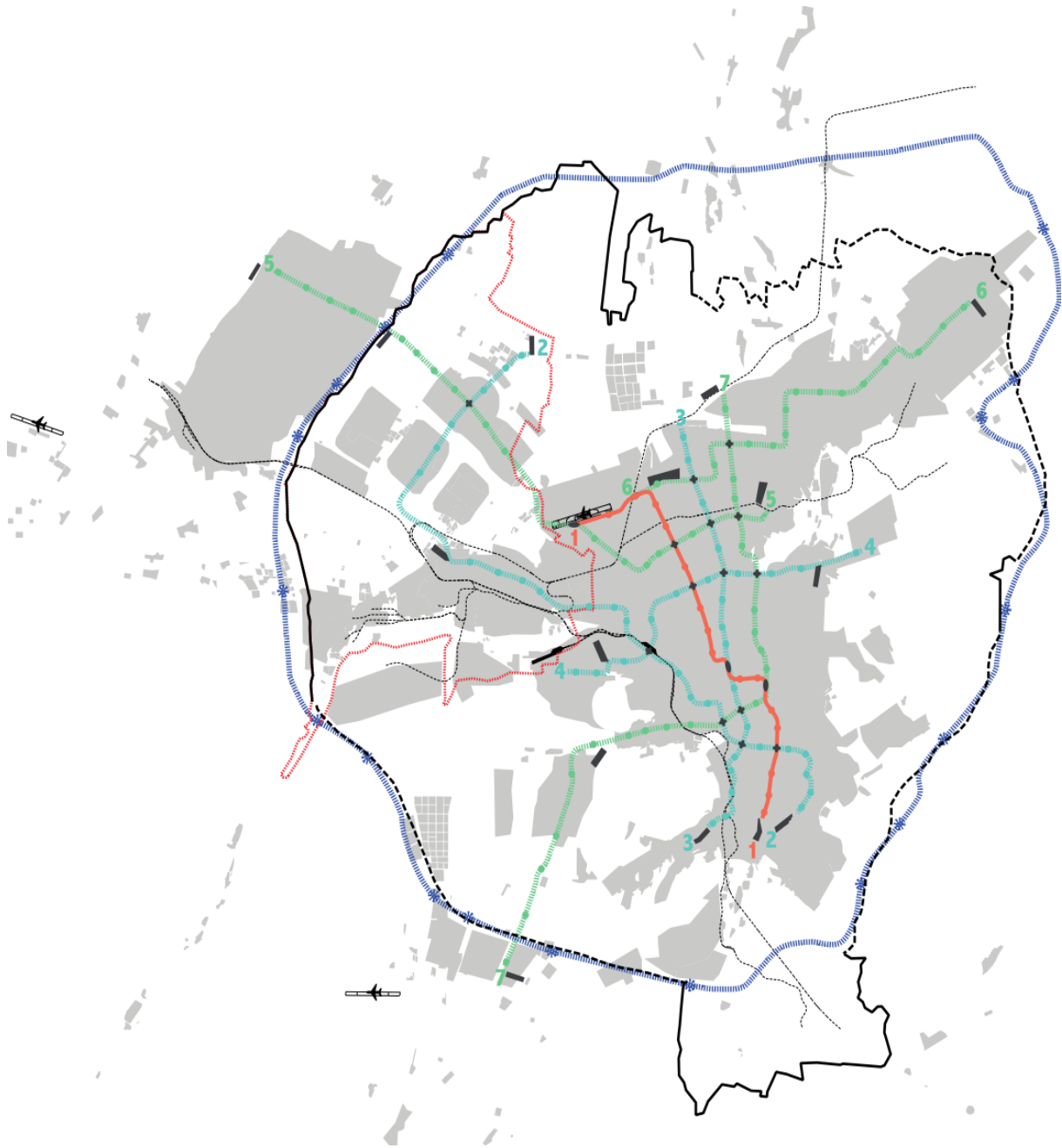


Figure 11. Existing Railroad and Metro

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: openstreetmap.org, <http://ditudaquan.com/map/987.html> and Urumqi City Master Plan 2009-2020

Bus System

According to Urumqi Municipal Bureau of Statistics, there is an annual sum of 1145.65 million public bus boarding. Based on the same statistics, the states that there are 3,914 buses in Urumqi, which equals to 4,228 Passenger Car Units (PCU) (Statistics Bureau of Urumqi Economic and Technological Development Zone (Toutunhe District), 2019). The per capita PCU for per hundred thousand people is 16. On the one hand, this indicator seems to exceed the stated national standard of 11 PCU per hundred thousand people that is set for megacities. On the other hand, however, it falls short on fulfilling the local requirement of 18 PCU per hundred thousand people. In terms of infrastructure, there are 1,884 bus stations in Urumqi, including the 288 open, harbour-shaped bus stations, 227 closed harbour-shaped bus stations and 1,369 non-harbour-shaped bus stations. Among all stations, 116 BRT stations and 165 Normal Bus Transit (NBT) stations are equipped with bus shelters. While the

minimum distance between stations is 292 meters, the maximum reaches a total of 1,980 meters suggesting an average of 587 meters. This average is considered to be superior to common standard values. On average, the bus station coverage rate can reach 49%, within a radius of 300 meters. The rate improves to 77.4% in a radius of 500 meters. Both values do not reach the international standards that addresses a rate of more than 50%, in the first case and 90%, in the second (The World Bank, 2015, p. 58).

There is a clear tendency to further develop the Normal Bus Transit (NBT) sector of the city. It is planned, therefore, to develop and build 22 bus depots in Urumqi, including Toutunhe Depot, Kaiqu Depot, Xishan Depot, Nanjiao Depot, Shangshahe Depot, Midong Depot, Shuimogou Depot, Six Markets Depot, Qidaowan Depot, Henanzhuang & Sigong Depots, Liyuan Parking Lots, Sangongxiang PMP, Fruit Market PMP, Wuyi Farm PMP, Sanping Farm PMP, Tougongxiang PMP, Xinhua South Road PMP, Yingbin Road PMP, Liudao Wan PMP, Wangjialiand PMP, Ergong High Speed Railway PMP. The Urumqi Public Traffic Development Plan (Year 2012 - 2020), however, identifies both Sangong and Midong bus parking and maintenance projects as a part of the improvement of the Bus Rapid Transit (BRT) network in the city. In this context, 7 BRT lines and 2 branches with the total length of 150.8 km will be developed to be the BRT traffic network with the total length of 118 km. In addition to infrastructure development, the plan also addresses the development of an intelligent traffic system for transport management and dispatching. In general, these development projects are seen to comply with the National Traffic Development Plan (Urumqi Evening News, 2017)

Water Transport

Urumqi is a typical inland city causing transportation to mainly depend on aviation, railway, metro, and bus system. No water transport has been developed so far.

3.6.3 Cycling as A Non-Motorised Mobility

The public bicycle is a government-led project for benefiting people. In 2014, the Economic Development Zone (Toutunhe District) was selected as the experimental area for public bicycle, and nearly 60 bicycle rental stations were built, with a total investment of over 10 million yuan. By 2017, 1,200 bicycles had been invested, basically covering the densely populated areas and the total number of people using public bicycles had exceeded 130,000. From 2016, Urumqi started to implement the plan of the Urumqi Downtown Slow Travel System Plan (2016-2020). According to the plan, a ring network of a slow travel system would be created in Urumqi. The system depends on the bus and public bicycle, covering 513 square kilometres. A few years later, the auxiliary slow-moving corridor, combined with the urban landscape, green space, and tourism system, can help improve the living environment and provide great convenience to the public (Hangzhou Government, 2010; Urumqi Government, 2019).

3.7 Infrastructure Development

The government of Urumqi is committed to the development of infrastructure, to provide citizens with a better living environment. Effective measures have been taken in the aspects of water infrastructure, waste disposal, and energy use.

3.7.1 Water

In 2018, 75% of the key monitored rivers, lakes, and reservoirs in Urumqi achieved excellence in terms of water quality. The water quality of Wulabo and Hongyanchi Reservoirs remained above Class II. In 2018, six sewage treatment plants and one recycled water treatment plant were newly built. The sewage treatment rate reached 98.3% (Urumqi Development and Reform Commission, 2013).

3.7.2 Wastewater

The Master Plan for Land-use 2006 -2020 is indicated to secure sufficient construction land for water conservation projects. It supports the "12th Five-Year Plan" to permit the Louzhuangzi Water Plant and other water supply projects. This is in addition to the construction of new sewage treatment plants and other drainage projects, flood control and drought relief, people's livelihood water conservation projects, the completion of High Cliff Reservoir, Daxigou Reservoir, Wood Nest Lake Water Rehydration and other key water conservation projects. It also addresses the construction of water conservation storage projects in mountainous areas, speeding up the pace of water-saving transformation of irrigation areas and comprehensively solving the problem of drinking water safety for farmers and herdsmen. By 2006-2020, the master plan dedicates 8794 hectares of new land for the construction of water conservancy facilities (Urumqi Development and Reform Commission, 2013).

3.7.3 Energy

Relying on the advantages of renewable resources, it is the aim of the Master Plan for Land-use 2006 - 2020 to accelerate the development of wind power, solar photovoltaic as well as new energy industries. Urumqi, in this sense, is seen to provide the country with wind power and to demonstrate a model of the possible scales and applications of new energy approaches for the future. According to the Plan of Wind Farm Project in Dabancheng Wind Zone of Xinjiang, it is planned to increase the construction of wind power turbines in the Wind Zone. Wind power installation scale in the wind zone in 2015 reached more than 2.7 million kilowatts. It is planned to reach 10 million kilowatts in 2020. The manufacturing capacity of wind power is planned to facilitate the production of 19 million kilowatts, which requires a large-scale wind power equipment industry that could also serve the international market. It is also planned to develop the solar photovoltaic industry, to support the construction of single-crystal silicon and polysilicon projects, to promote the construction of solar power stations and to formulate a complete chain of photovoltaic industry (Ministry of Commerce of the People's Republic of China, 2012).

3.7.4 Solid Waste Management

The disposal method of domestic waste in Urumqi was mainly sanitary landfills, which posed a serious threat to the surrounding groundwater and soil, especially hazardous wastes such as medical waste and electronic waste, causing serious pollution to the air, soil, and surface water in Urumqi. To effectively dispose of all kinds of solid wastes and utilize recycled resources, the Master Plan of Garbage Disposal and Recycling in Urumqi was issued in 2012. The plan provides a scientific basis for waste disposal in Urumqi in the future. According to the plan, Dapugou Solid Waste Comprehensive Treatment Plant was constructed in 2012 and taken as a demonstration park of the solid waste recycling economy. There are 15 sub-projects in the solid waste recycling economy demonstration park, including domestic waste incineration power plant, kitchen waste treatment plant, medical waste treatment plant, landfill gas power plant, and electronic waste treatment plant (The State Council of The People's Republic of China, 2016).

3.8 Formal Development Plan and Visions

To promote social and economic development, the government of Urumqi has implemented many plans. In this part, three main development plans are presented. The 13th Five-Year Plan for National Economic and Social Development of the People's Republic of China (referred to as the "13th Five-Year Plan" or the 13th Five-Year Plan) is the plan formulated by the central government of People's Republic of China, aiming to promote the development of economy and society. The plan clarifies the government's work priorities and provides a grand blueprint for China's economic and social development during the period from 2016 to 2020 (Urumqi Development and Reform Commission, 2013).

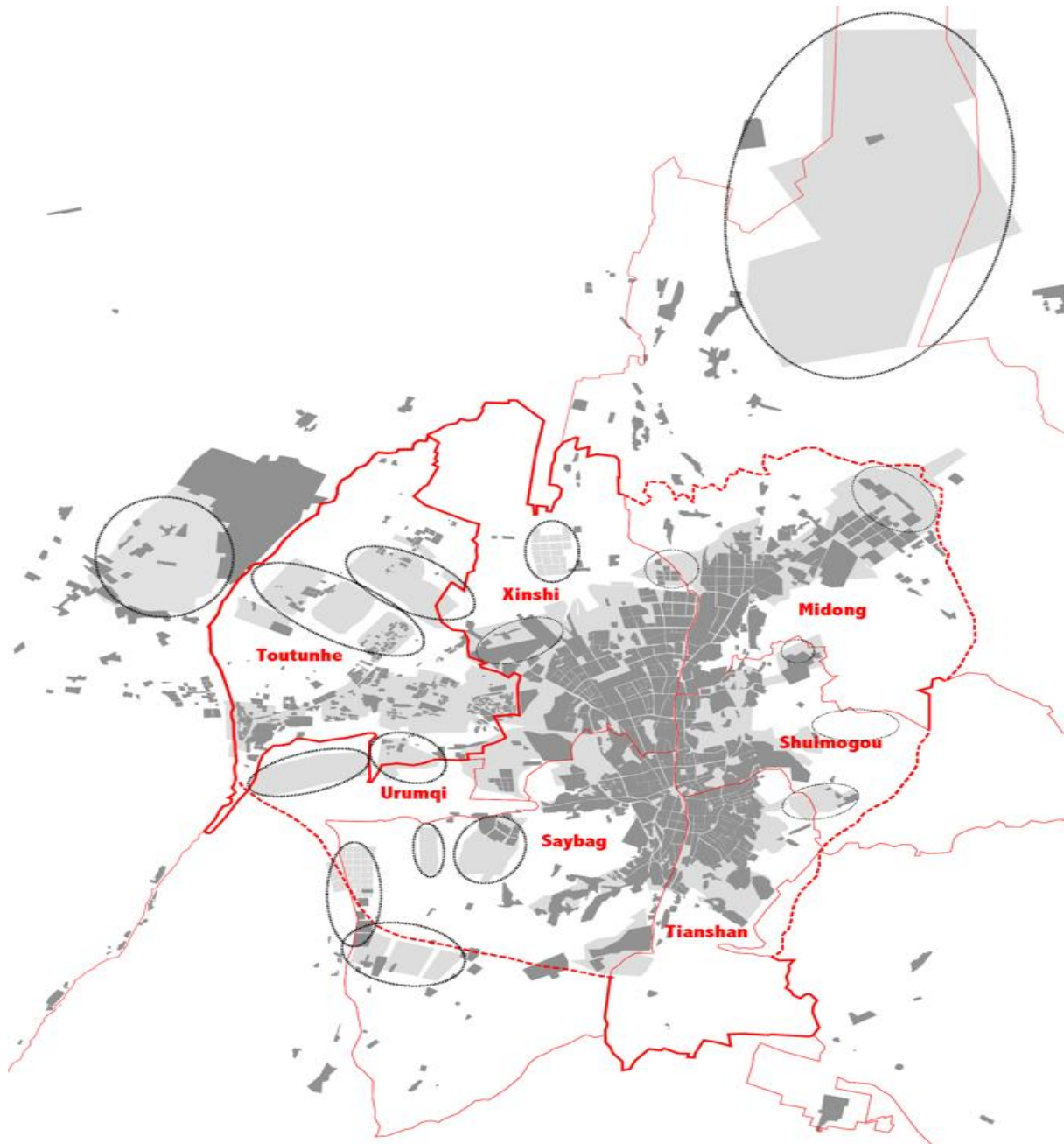


Figure 12. Development Planning of Urumqi

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: openstreetmap.org and Urumqi City Master Plan 2009-2020

It is shared by people of all ethnic groups and regarded as the guideline for development by different levels of local government. Urumqi Masterplan for land use 2006-2020 is formulated by the government of Urumqi, aiming to promote the protection and sustainable utilization of land resources (Urumqi Development and Reform Commission, 2015). It proposes an environmentally friendly land use mode and attach great emphasis on the importance of maintaining a harmonious and safe land ecological environment. Urumqi City Main Functional Area Planning 2015-2020 is a more detailed local plan, which clarifies the functional orientation for each district, attempting to solve the problem between limited development space and expanding demand (The State Council of The People's Republic of China, 2016).

3.8.1 13th Five-Year Plan

The Five-Year Plan refers to the Outline of the Five-Year Plan for National Economic and Social Development of the People's Republic of China. It is an important part of China's national economic plan and is a long-term plan. It is mainly for the planning of the major national construction projects and the distribution of national financial budget. It set goals and directions for the development of the national economy. The 13th Five-Year plan was officially released on March 17th, 2016.

General Objectives

According to the 13th Five-year plan, the central government of China keeps focusing on the development of the economy, society, science, technology, modern agriculture, education, and industry. The economy is expected to maintain medium and high-speed growth, with the GDP and the per capita income of urban and rural residents doubled compared with those in 2010. Underdeveloped areas are given propriorities to get rid of poverty and people's living standards are expected to be improved significantly. Policies are issued to encourage consumption and the industry will move towards the middle and high-end levels. More measures are taken to develop modern agriculture and improve the ecological environment (The State Council of The People's Republic of China, 2016).

The New Institutional Mechanism of the Economic Development

The 13th Five-Year Plan acknowledges the leading role of economic system reform and proposes to form a new institutional mechanism that is conducive for economic development. The government plans to adhere to public ownership as the basis and simultaneously encourages the development of multiple ownership economies. Relevant laws and policies are issued to regulate the market. The government will vigorously promote the reform of state-owned enterprises, improve the management system of various state-owned assets, actively and steadily develop the mixed-ownership economy, and support the development of the non-public economy. The plan proposes to speed up the formation of a unified, open, and orderly market system and establish a fair competition guarantee mechanism, to break the geographical isolation and industry monopoly. Such measures aim to help to eliminate the market barriers, maintain fair competition, and promote the free and orderly flow and equal exchange of goods.

The government proposes to deepen the reform of the administrative management system and speed up the transformation of government functions. It determines to continue to promote decentralization, integrate management and optimize services, improve administrative efficiency, and stimulate market vitality and social creativity. This policy aims to promote decentralization, improve the efficiency of government supervision, and optimize government services.

According to the plan outline, it is necessary to speed up the financial system reform, improve the financial institutions and market system, aiming to promote the healthy development of the capital market and improve the monetary policy mechanism. More measures are taken to improve the efficiency of financial services to the real economy and the ability to support economic transformation, which effectively prevents and resolves financial risks (The State Council of The People's Republic of China, 2016).

The plan acknowledges the importance of macro-control of government in the development of the economy. It encourages to improve the macro-control system and innovate macro-control methods. More attention is given to adjust industrial structure, to improve employment, and to stabilize commodity prices. The government is committed to creating a stable macro-economic environment for structural reform. It is necessary to strengthen the guiding role of planning strategy, improve regulation and control methods and enrich policy tools, improve policy formulation and decision-making mechanism, to deepen the reform of investment and financing system (The State Council of The People's Republic of China, 2016).

Promotion of Modern Agriculture

The plan points out that agriculture is the foundation for building a well-off society in an all-round way and realizing modernization. It is necessary to speed up the transformation of agricultural development mode and build a modern agricultural industrial system, production system, and management system, to improve agricultural quality, efficiency, and competitiveness. The goal is to achieve agricultural modernization with high output, safe products, resource conservation, and environmental friendliness.

The plan proposes to build a modern agricultural management system based on household management of farmers, and supported by social service, to improve the comprehensive benefits of agriculture. The government encourages the integration of agricultural technology in agricultural production, to improve modern agricultural science and technology innovation, accelerate agricultural mechanization. It helps to develop smart agriculture and improve the level of agricultural productivity.

According to the plan, more emphasis is given to improve the agricultural support and protection system, aiming at increasing farmers' income and realizing sustainable agricultural development. The government will continue to increase investment in agriculture, enhance the pricing and storage system of agricultural products, and innovate rural financial services (The State Council of The People's Republic of China, 2016)

Optimization of Modern Industrial System

The plan emphasizes the importance of structural adjustment of industry. Supportive policies are given to revitalize the real economy, promote supply-side structural reform, cultivate and expand emerging industries, transform and upgrade traditional industries, and accelerate the construction of a new modern industrial system with strong innovation capability and excellent quality service.

Adhere to the belief that manufacturing is the driving force of social and economic development, the government will implement the policy of Made in China 2025, focusing on improving the innovation and basic capabilities of the manufacturing industry. It is committed to promoting the development of the manufacturing industry towards high-end, intelligent, green, and service, and cultivate new competitive advantages of the manufacturing industry. Measures are taken to promote the transformation and upgrading of traditional industries, strengthen the construction of quality brands, actively and steadily resolve overcapacity, and reduce the cost of enterprises in the real economy (The State Council of The People's Republic of China, 2016).

Construction of a Modern Infrastructure Network

The government plans to enhance infrastructure construction and speed up the improvement of the infrastructure network. It is necessary to promote an integrated transportation system with domestic and international channels, improve transportation services, and increase the coverage rate of modern transportation facilities. The plan attaches great emphasis on the optimization and upgrading of energy structure, encouraging to build a modern energy storage and transportation network, and thus actively building a smart energy system. In areas with ample water resources, it is necessary to speed up the improvement of water conservancy infrastructure network, promote the scientific development, rational allocation, and economical use and efficient use of water resources. More measures should be taken to comprehensively enhance the security of water transportation (The State Council of The People's Republic of China, 2016)

Promotion of Urbanisation

In the aspect of city planning, more measures are implemented to promote urbanization, and urban agglomeration is regarded as the main form of future city planning. The plan emphasizes speeding up the reform of the household registration system and encourages promote more people to integrate into cities and towns. It proposes to optimize the layout and form of urbanisation and speed up the construction of a "two horizontal and three vertical" urbanization strategic pattern with the land bridge passage and the Yangtze River passage as the horizontal axis, and the coastal, Beijing-Harbin-Beijing-Guangzhou and Baokun passages as the vertical axis. Large-sized, medium-sized and small-sized cities

and small towns should be reasonably distributed and developed in a coordinated manner. The government is committed to accelerating the construction and development of urban agglomerations. Central cities should play the role of driving force to accelerate the development of small and medium-sized cities and characteristic towns (The State Council of The People's Republic of China, 2016).

Promotion of Coordinated Regional Development

Based on the overall strategy of regional development, a vertical and horizontal economic axis belt is planned to be developed, which will shape a new pattern of regional coordinated development with fair resource distribution of resources and effective basic public services. This development is guided by the coordinated development plan of Beijing-Tianjin-Hebei and the development of the Yangtze River Economic Belt. A comprehensive and innovative development mechanism is conducted to develop the backward western region and revitalize the northeast. The developed eastern region and central region should play a leading role in innovating regional development policy, promoting regional coordination, striving to narrow the regional development gap.

Adhere to the strategic orientation of ecological priority and green development, the restoration of the ecological environment of the Yangtze River is put in the first place. The goal is to promote the coordinated development of the upper, middle, and lower reaches of the Yangtze. A pioneering demonstration zone will be constructed to encourage China's ecological civilization construction. The government is planned to build a green ecological corridor along the Yangtze River, build a high-quality comprehensive three-dimensional traffic corridor, and optimize the layout of towns and industries along the Yangtze River.

Supportive politics should be implemented to encourage the development and construction of the ethnic minority areas, frontier areas, and deprived areas. Talent support programs are supposed to be conducted in remote and poor areas, and frontier ethnic minority areas to accelerate economic development and significantly improve people's lives (The State Council of The People's Republic of China, 2016).

Improvement of the Ecological Environment

The plan proposes to promote the economical and intensive use of resources, establish a resource concept of economical and intensive recycling, promote the fundamental transformation of resource utilization methods, strengthen the whole process of economic management, and greatly improve the comprehensive benefits of resource utilization. The government will comprehensively promote energy conservation, encourage the construction of a water-saving society, and strengthen the economical and intensive use of land. A mechanism for efficient use of resources is supposed to be established to conserve natural resources and improve resource utilization efficiency.

The plans noted that it is important to strengthen ecological protection and restoration, build ecological corridors and biodiversity protection networks, thus comprehensively enhancing the stability of various natural ecosystems, and building a solid ecological security barrier. Besides, It is necessary to actively respond to global climate change, control carbon emissions, implement emission reduction programs, enhance the ability to adapt to climate change (Urumqi Development and Reform Commission, 2013).

3.8.2 Urumqi Master Plan for Land-use 2006-2020

Adhering to the policy of protecting resources and ensuring development, Urumqi masterplan for land use clarifies the land use strategy during the period from 2006 to 2020. It focuses on the protection of arable land, optimizing the allocation of land for urban and rural development. It is an important guidance for the land use and regional development.

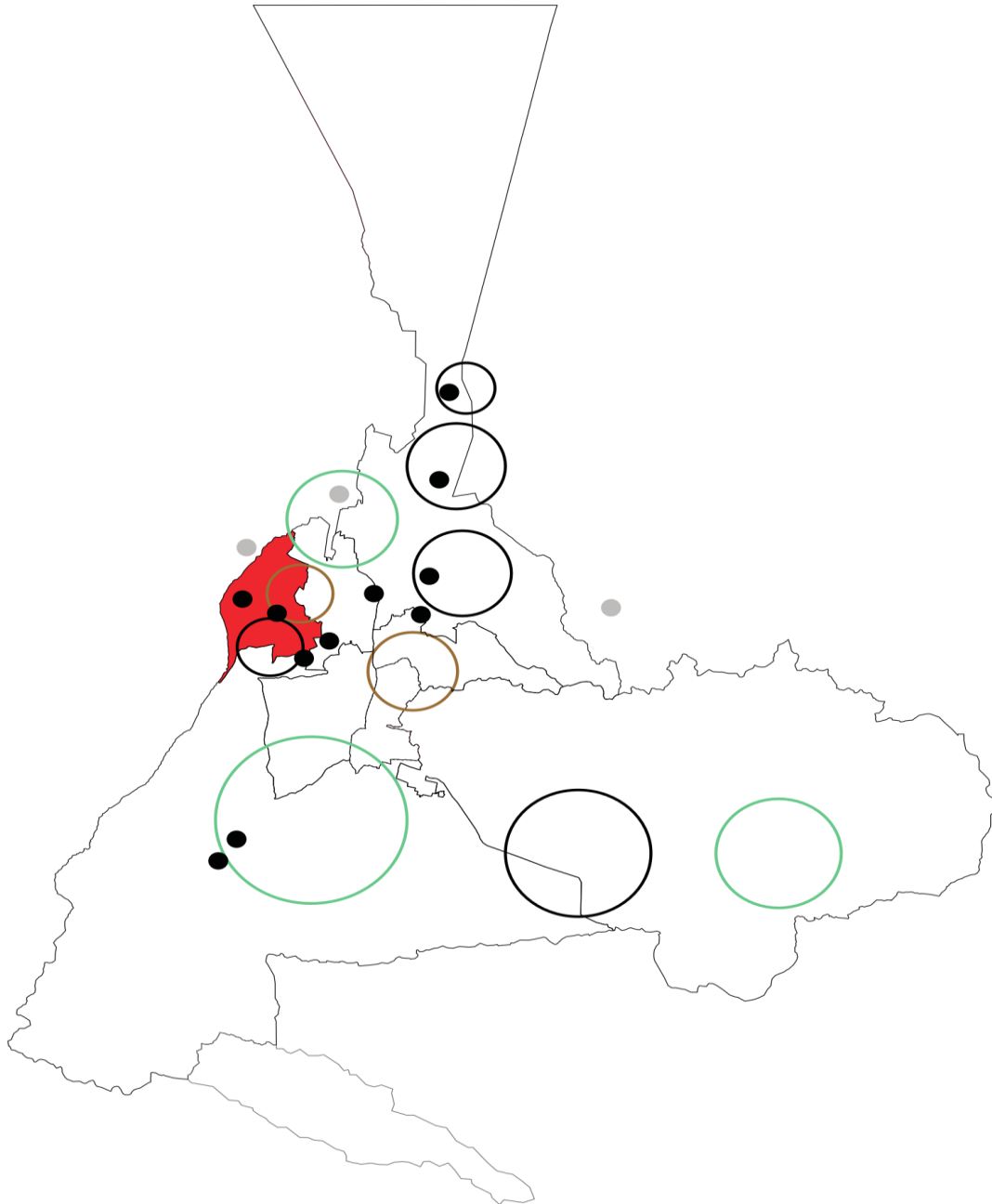


Figure 13. Major Areas of Planning

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: openstreetmap.org and Urumqi City Master Plan 2009-2020

Principles and Objectives

To promote the protection and sustainable utilization of land resources, the Urumqi Master plan for land use (2006-2020) is developed. The plan encourages environmentally friendly land use mode and gives priority to maintaining a harmonious and safe land ecological environment. It focuses on developing modern agriculture and animal husbandry and promoting the construction of high-standard basic farmland. It reasonably distributes construction land and provides standards for land distributions for urban construction, people's livelihood projects, new Industry development, and infrastructure construction. Besides, the plan emphasizes the importance of the protection of historical and cultural heritage. It encourages the optimization of land use structure and layout, to enhance the effectiveness of land use (Urumqi Development and Reform Commission, 2013).

The Area of Planning and Construction

In 2005, about 1.95 million people were living in the central city, with 258 square kilometres of construction land and 132.3 square meters of construction land per capita. In 2012, the population in the central city increased to 2.92 million and the area of construction land was 358 square kilometres. It is projected that in 2020, the population of the central city will be within 4 million, the scale of construction land will be within 519 square kilometres. The area in the plan includes Tianshan District, Saybag District, Xinshi (High-tech Zone), Toutunhe District (Economic development zone), Shuimogou district, Gumudi town, Lucaogou township, Tiechanggou town in Midong District, and the northern part of Banxiang in Salda, Urumqi county (Urumqi Development and Reform Commission, 2013).

Key Infrastructure Projects and Land-use Arrangement

During the period of the plan, a total of 23,024 hectares of land is planned for the construction of transportation facilities and Urumqi Xinke Station. The government will speed up the construction of rail transit, to cover the north-to-south main axis of the city and passenger corridor. 800 hectares of new land will be used for recent construction. During the planning period, there are about 24 key highway projects to be built in the whole city, and the land used for key highway projects is about 9,840 hectares. The priority is given to the construction of national expressway and provincial trunk highway projects between Urumqi and other provinces. The inner ring expressway and central ring expressway are also the focus of road construction.

According to the plan, Urumqi Diwobao International Airport will start the construction of the second runway as well as the fourth expansion project. A new international airport logistics centre is planned to be constructed. The construction land of Diwobao International Airport will then reach 1620 hectares, 650 hectares of which is expanded in this plan (Urumqi Development and Reform Commission, 2015).

During the planning period, a total of 8,794 hectares of land is allocated for new water conservancy facilities, including reservoirs, recycled water treatment facilities, water resources protection, and utilization projects, and wetland protection projects (Urumqi Development and Reform Commission, 2015).

3.8.3 Urumqi City Main Functional Area Planning 2015-2020

Urumqi City Main Functional Area Planning (2015-2020) determines the functional orientation for each district and clarifies the development objectives, which is conducive to solving the contradiction between limited development space and expanding demand. In key development zones, a spatial development pattern of "two axes, one city, one district, and two groups" is planned to be constructed, while in the ecological protection areas and forbidden development zones, a spatial pattern of "four districts, four corridors, and one ring" is expected to be built. The plan is established in order to improve the spatial allocation efficiency of industrialization and urbanization. At the same time, it provides guidance for the construction of industrial clusters in order to promote the development of relevant industries. According to the plan, different areas are oriented to different developmental objectives. The southern mountainous areas and agricultural areas will focus on developing eco-tourism, ecological science, and technology, agriculture, forestry, and animal husbandry. In the south of the central city, the promotion of the tertiary industry, such as commercial services, entertainment, and leisure, tourism services, will be the priority. This area will also be used to promote the economic and trade cooperation between Asia and Europe. The north part of the central city will be used to develop the modern service industry, logistics industry, financial industry, and information industry. A new comprehensive industrial development area will be built there.

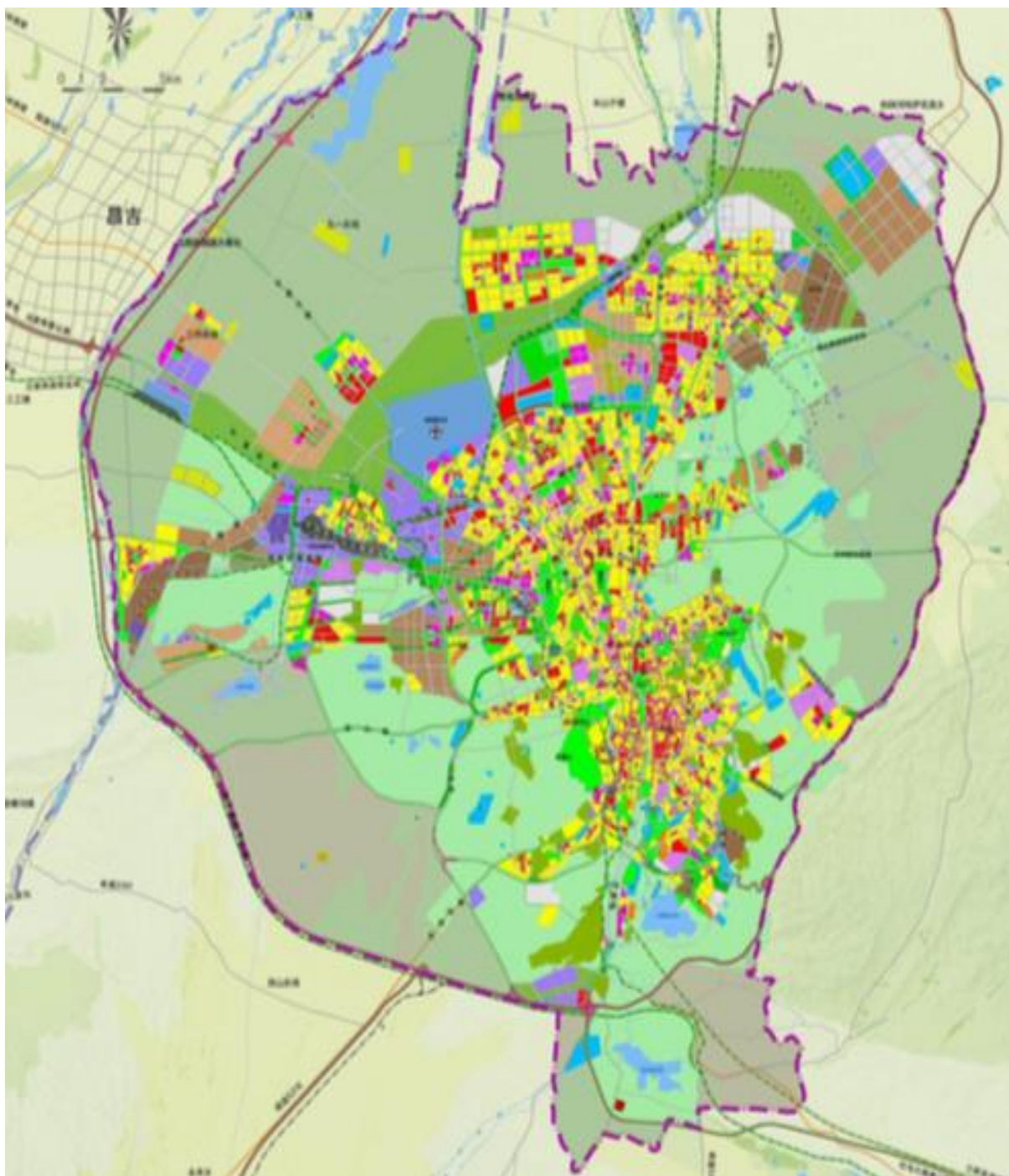


Figure 14. Master Planning of Land-uses
Source: (The World Bank, 2015)

The industrial park in the Economic and Technological Development Zone (Toutunhe District) will focus on promoting the industrial clusters of wind power equipment manufacturing, automobile equipment manufacturing, engineering machinery equipment manufacturing and agricultural machinery equipment manufacturing. The goal is to build an advanced manufacturing base in western China. High-tech Industrial Development district is built to promote high-tech industrial clusters, with supportive policies in the domain of bio-pharmaceutical and electronic information. Ganquanbao Economic and Technological Development Zone will promote new energy and high-tech industrial clusters, aiming to become a strategic emerging industrial base in the autonomous region of China.

The exhibition area will vigorously promote the development of exhibition economy, business finance, and other industry, attempting to construct a modern service industry base. Chengnan Economic and

Trade Cooperation Zone will accelerate the industrial agglomeration in the fields of Asia-Europe economic and trade cooperation and international logistics. Nanshan Tourism Base will take advantages of its tourism resources and strive to develop the eco-tourism industry, agriculture, forestry and animal husbandry, and other relevant industries (Urumqi Development and Reform Commission, 2015).

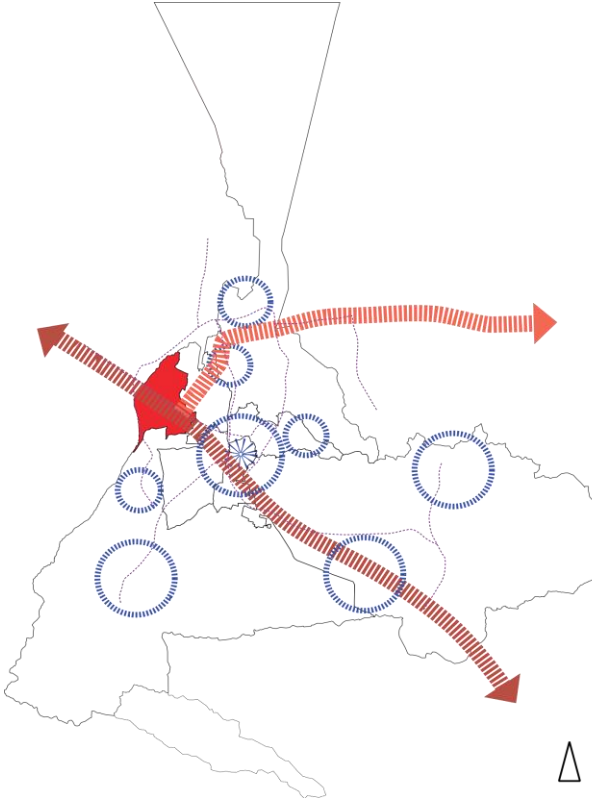


Figure 15. Tourism Development
 Source: Global Urbanisation Research Team
 FRA-UAS (2020), based on: openstreetmap.org
 and Urumqi City Master Plan 2009-2020

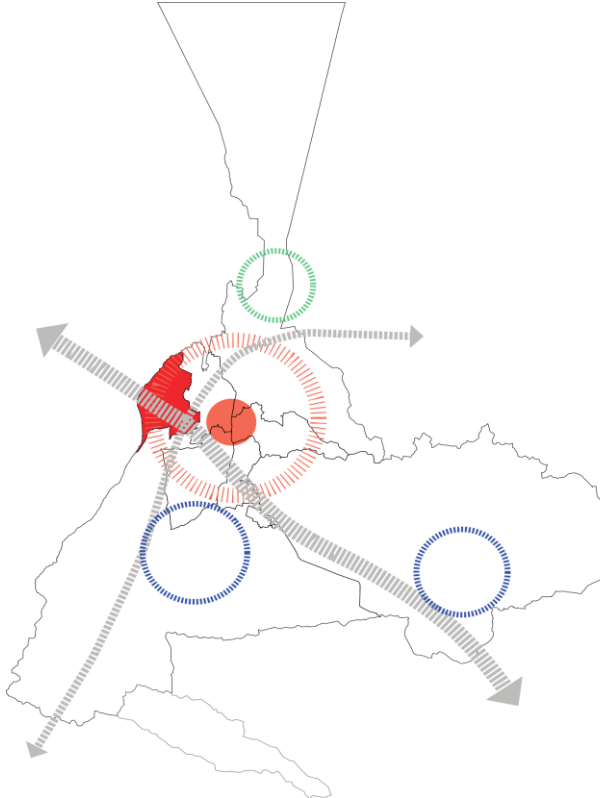


Figure 16. Perspective flows
 Source: Global Urbanisation Research Team
 FRA-UAS (2020), based on: openstreetmap.org
 and Urumqi City Master Plan 2009-2020

4. Toutunhe District

Toutunhe District is located in the northwest of Urumqi. Established in 1961, Toutunhe is an important industrial district of Urumqi. The Urumqi Economic and Technological Development Zone, conterminous to Toutunhe District, was founded in 1992 based on a development policy issued by the Chinese central government, the State Council, the Xinjiang Uygur Autonomous Region and the Municipality of Urumqi. In January of 2011, Xinjiang government decided to combine the Urumqi economic and technological development zone with Toutunhe District. After combination, the district is named Toutunhe District. The Urumqi Economic and Technological Development Zone has entered an era of rapid economic development. Actually, an innovation pilot zone and an upgrading of the area’s economic structure are planned (The World Bank, 2015). This section will provide an overview of different aspects of the Toutunhe District.

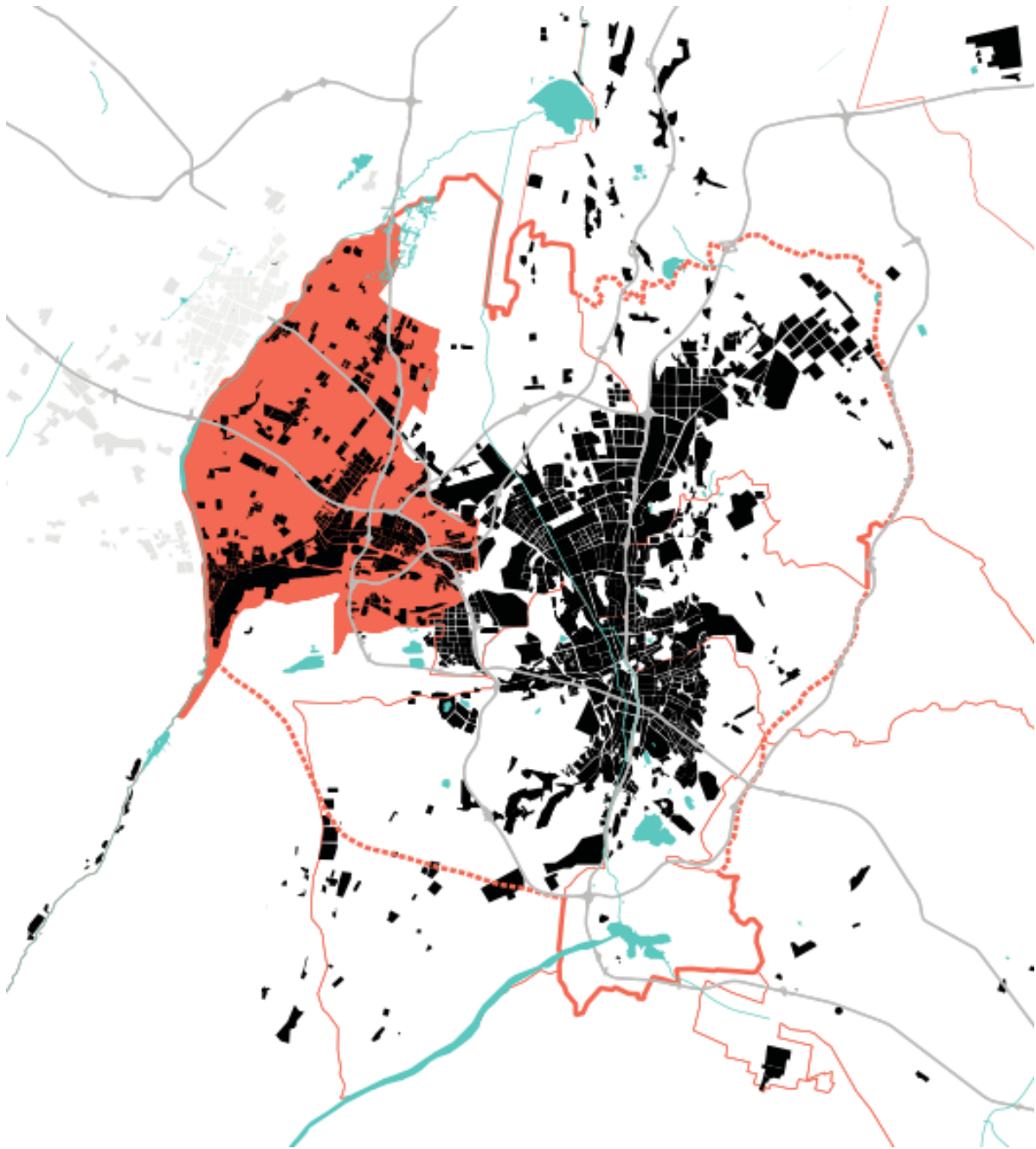


Figure 17. Map of Toutunhe District

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

4.1 Location and Administrative Borders

The total area of the district is about 480 km² including a built-up area of about 133 km². In the east, it adjoins Urumqi high speed railway hubs. In the north it is neighbouring the Urumqi Airport. The district also accommodates the biggest goods storage and transportation station in Xinjiang as well as the container distribution hubs that is under construction. (The World Bank, 2015) The highway of Urumqi-Changji and Urumqi-Kuitun go through the district serving traffic and mobility. The district features the Nanshan Mountain Pasture area measuring 100 km². Until 2012, there are totally 9 sub-district offices, 1 village and 69 community resident committees in the district, where 29 minorities live, such as Han, Uygur, Hui, Kazak, among others (The World Bank, 2015).

4.2 History

The Toutunhe belonged to Urumqi county, which was a large area of desert and only a few residences. After 1949, the troops stationed in Xinjiang set up the Bayi Iron and Steel Plant in Toutunhe. In July 1956, Toutunhe town was established in Urumqi. In 1961, Toutunhe town changed its urban status into the Toutunhe District. In 2000, the Toutunhe District had jurisdiction over four streets: Toutunhe street, West Railway Station street, Wangjiagou street, and Wuchang Road street. In January 2011, the national Urumqi Economic and Technological Development Zone, established in 1994, and Toutunhe District, established in 1961, were merged to become the Urumqi Economic and Technological Development Zone (The World Bank, 2015).

4.3 Role of the District within the City

Toutunhe shall be at the vanguard of a new future for industrialization and economic development in Urumqi and the Xinjiang Autonomous Region. As a national economic and technological development zone and national export processing zone, UETD shall enjoy the advantages of the export-oriented economy. Being a second-class port, protective tariff logistics centre, export control warehouse and a public protective tariff warehouse, the zone is also home to new Xinjiang software parks, Xinjiang overseas returnees' career-building park, university technology industrial park, post-doctoral research station and an occupational training base. The UETD zone is near the Urumqi International Airport, railway station, freight terminal and high-speed train transportation hub. Thus, it enjoys importing and exporting advantages (Xinjiang China Daily, 2017c). By the end of 2016, there were about 600 major companies in the zone. The metallurgical industry, wind power industry and the food and beverages industry have become UETD's three-pillar industries (Xinjiang China Daily, 2017b). Besides, according to the industrial relevance with the surrounding cities, the production space forms a different development pattern of the East Wing and the West Wing. In the scope of West Wing, it is the "Original Development Zone Phase II-104 Regiment Cooperation Zone-Toutunhe Industrial Park-Bagang Group-Sanping Industrial Zone" which links Changji's export-oriented advanced manufacturing development wing. Under the background of integration between economical, development zone and local political zone, integration between military and city, and U-Chang economic integration, we will give full play to the advantages of industrial base and portal functions, increase regional spatial integration, clarify the first strategy of industrial "system", and create advanced manufacturing demonstration zones and the export processing base will lead the development of new industrialization in the economic belt of Urumqi and the northern slope of the Tianshan Mountains (Xinjiang China Daily, 2017b).

The second stage of development of the Urumqi Economic and Technological Development Zone is to optimize the zone's infrastructures. The construction of the zone's extended area is scheduled to be completed in three years. The optimized first stage of the economic zone and the west railway station provides easy access for living, studying, and entertaining in the economic development zone. The UETD adopted a series of policies to attract technological innovations and intellectual property rights protection. Four national and autonomous technology research centres, 13 company R&D centres, academic service centre, and one post-doctorate station have been constructed. The innovative economic development zone is praised as the "national wind power high-tech industrial base" and "national intellectual property rights pilot park" (The World Bank, 2015). The government will strive to strengthen urban construction and management to optimize industrial development, land-use, biological construction, rural, and urban development plans. It will put forward the infrastructure construction and barren mountain reforestation plans. Simultaneously, it proposes to adopt an innovative management system and draw experience of advanced cities to improve the district's management level. Improve people's welfare to invest more in improving people's welfare and raising their living standards is also the focus of government work. As Toutunhe District is a multi-ethnic area, the government will foster the unity of varied ethnic groups living in the region to keep the stability of the society for the better economic development of the UETD (Urumqi Development and Reform Commission, 2013).

The State Council approved the Toutunhe District (UETD) as the main body, including export processing zone, Toutunhe Industrial Park and the first and second Taidi Industrial Zone, relying on the port and close to the regional transport hub conditions, focusing on the development of China-West Asia-oriented, external business services, export processing, and container logistics, and productive services. During the planning period, the area's land use and the Development Land in the district were integrated into the scale of the development of the central urban area (Urumqi Economic and Technological Development Zone (Toutunhe District), 2018b).

4.4 Features of the District

This section focuses on the terrain and climate of Toutunhe District and discusses its unique geographic and climate features.

4.4.1 Terrain

Toutunhe District is high in the south and low in the north. The terrain is flat, with an altitude of 751 meters at the south end and 697 meters at the north end. The north-south slope is 17‰, and the east-west slope is 3‰ (Urumqi Economic and Technological Development Zone (Toutunhe District), 2018a).

4.4.2 Climate

Toutunhe region is a typical continental dry climate in the middle temperate zone, with an annual average temperature of 2.8~13.0°C and annual average humidity of 58%. The frost-free period lasts for 176 days and the maximum depth of frozen soil is 162 cm. The annual average precipitation is 236 mm, the recorded highest temperature is 42.1°C, and the recorded lowest temperature is -41.5°C (Statistics Bureau of Urumqi Economic and Technological Development Zone (Toutunhe District), 2019).

4.5 Economy and Socio-Economic Development

Toutunhe has achieved considerable progress in the development of economy and society. In this part, statistical information and enterprises development have been analysed to show how the commerce, society and economy have developed in the district.

4.5.1 Statistical Information

By the end of 2018, the annual GDP reached 47.64 billion yuan, showing an increase of 7.6% over the previous year, of which the added value of the primary industry, secondary industry and third industry was 0.72 billion yuan, 18.23 billion yuan and 28.69 billion yuan respectively, increasing 0.7%, 1.9%, and 11.5%. The total output value of the construction industry was 14.78 billion yuan, falling 28.8% compared to the previous year. The construction area of building houses was 6.6 million square meters, increasing 20.8%. In 2018, the investment in fixed assets increased by 11% over the previous year, among which investment in infrastructure decreased by 20.2%. Investment in real estate was 15.5 billion yuan, increasing 3.9%. A total of 1.008 million square meters' commercial housing was sold, decreasing 25.9%, with the sales reaching 9.03 billion yuan. The total retail sales of social consumer goods reached 8.66 billion yuan in the whole year, an increase of 6% over the previous year. The total import and export volume reached 3.3 billion dollars, rising 19% over the previous year. Among them, the value of exporting and importing was 2.73 billion dollars and 570 million dollars respectively. Kazakhstan, Tajikistan, Kyrgyzstan, and other Central Asian countries were the primarily targeted countries of importing, accounting for 80% of the import and export trade volume. In addition to the above markets, the trade market has also expanded to the United States, Europe, Japan, and South Korea, and other regions. There were more than 40 kinds of trading products, including building materials, consumer goods, food, machinery and equipment. 48 investment promotion projects were implemented throughout the year, with a total investment value of 56.16 billion yuan (Statistics Bureau of Urumqi Economic and Technological Development Zone (Toutunhe District), 2019).

4.5.2 Companies

There are 18 Fortune 500 companies and 40 "Enterprise Top 500" enterprises in China that have investment projects in Toutunhe District, including Goldwind Science & Technology Co Ltd (China's largest wind power equipment manufacturing enterprise), Baosteel Group's Xinjiang Bayi Iron & Steel Coca-Cola Co, Master Kong, Conch Profiles, CNPC Group Western Drilling Engineering and Hongyun Honghe Tobacco Group (Xinjiang China Daily, 2017a).

4.6 Demography

By the end of 2016, 320,000 people were living in 84 separate communities in the economic development zone (The World Bank, 2015). The total population is 23.02 hundred thousand people, among which the hundred thousand people are ethnic minorities occupy 22.5% of the total population. The 1,074 persons received subsistence allowances (Urumqi Municipal Bureau of Statistics, 2015, p. 36).

5. Urban Development of Toutunhe District

Toutunhe is a district that is characterised by its peculiar spatial morphological structure, which are reflected in the layout and pattern of the land-uses. In general, there are mainly large undeveloped open spaces with a high proportion of green and agricultural areas as well as small areas whose concrete use is not yet present or recognizable. Open spaces occur mainly in a very large area towards the north as well as towards the west of Changji. In this large section, individual settlement areas are also scattered, usually with a relatively uniform block structure in use either for residential, commercial or industrial purposes. Presumably, if the district was not conceived as a planned city from the start, which is also suggested by the partly scattered settlement areas, a pattern of isolated geometric forms can still be discernible.

In relation to the industrial and commercial areas in the district, the proportion of the residential areas seems to be relatively balanced. Urban blocks range between residential and industrial buildings. The presence of mixed and multifunctional land-uses is limited. The considerably spacious urban blocks accommodating residential and industrial uses seem to dominate the morphological structure of the district. Within each spatial block, constructions are usually allocated in the form of rows. This stretched form is very common, especially for the residential buildings that usually range in height between 10 and 12 stories. The residential areas are mostly mono-functional providing no other land-uses. Due to the size of the blocks, their population density is considered to be extremely high, in comparison with European standards. Open spaces in Toutunhe are predominantly occupied by agriculture and open green land, some of which are designated to serve as green axes or green corridors. In addition, the Toutunhe district has smaller isolated green spaces such as the "Toutunhe Park", mostly located between the urban blocks.

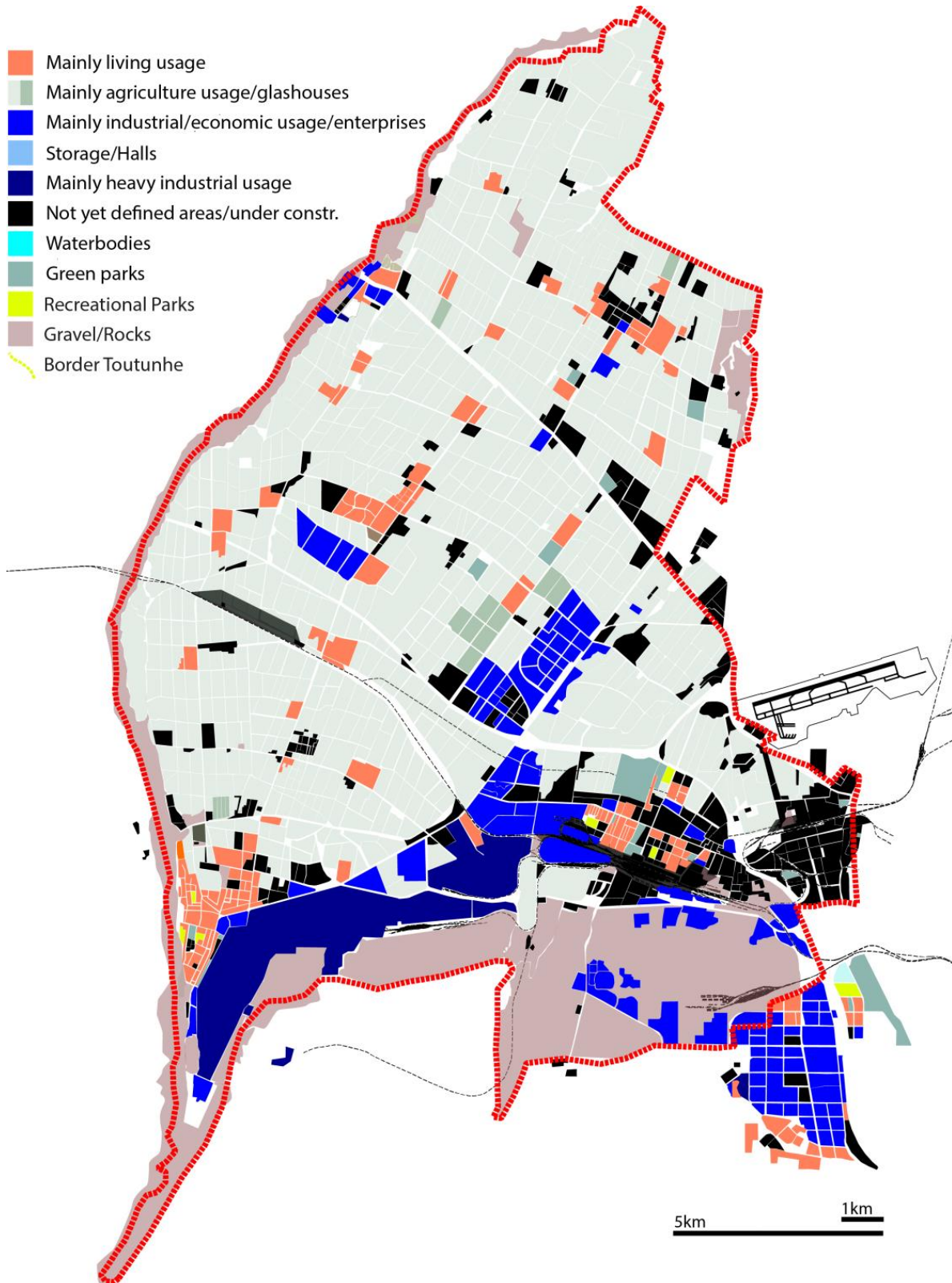


Figure 18. General Land-uses of the Toutunhe District

Source: The Global Urbanisation Research Group of the FRA-UAS, based on openstreetmap.org, Google Maps and Baidu Maps

It seems recognisable that the entire district is currently undergoing a dynamic transformation process. The main development in the district is indicated to take place along the axis leading towards Changji in the northwest. In line with the intended official plans, the development should be seen in the

district's contexts of economic development as well as inter-spatial functions contributing to the New Silk Road initiative. For the Toutunhe district, the future possibilities and conceivable alternative development paths should take into account the correspondence with the supra-local economic development objectives. At the moment, Toutunhe is experiencing an ambivalent situation which can present an opportunity for sustainable and more resilient urban planning, apart from the difficulties of the large-scale mono-functional land-uses and the required logistics of the international role the district is perceived to play.

5.1 Land-use

The following points show more details regarding the land-uses dedicated for certain sectors.

5.1.1 Industry

There are 3,800 registered companies in Toutunhe, including 588 key enterprises and 126 big companies with certain scale, 40 foreign companies, and 17 companies listed among world top 500, and 30 companies listed in the domestic top 500. Supporting industries in Toutunhe are metallurgy, wind farm, food and beverage. Motor vehicle production, machineries production, New building materials and the Logistics are leading industries in this district (The World Bank, 2015).

The government also encourages the development of new industries, including like coal chemical industry, IT, and biological medicine. The government aims to construct this district as a new industry demonstration zone. It plans to build seven bases as biggest wind power facilities production base, the biggest food and beverage production base in China, the biggest metallurgical industrial base in northwest of China, the new automobile and machinery production base in northwest of China. Also, the Xinjiang intelligent commercial base, the Asia and Europe export-import logistics base, the Asia and Europe IT base, will be constructed here. In 2012, the regional GDP of Toutunhe reached 34.004 billion RMB with year-on-year growth of 32.3%, and the fiscal revenue reached 4.717 billion RMB with year-on-year growth of 27.5%. The total retail sale of consumer goods achieved 2.74 billion RMB and the average annual net income of Farmers and herdsmen was 10380 RMB in this year (The World Bank, 2015).

Many large companies have invested in UETD and an advanced industrial cluster system has been established. The industrial cluster covers many domains, including wind power equipment production, metallurgical industry, food and beverage processing industry, mechanical equipment production industry, and automobile manufacturing industry (Xinjiang China Daily, 2017a).

Large companies include Goldwind Science & Technology Co Ltd (China's largest wind power equipment manufacturing enterprise), Baosteel Group's Xinjiang Bayi Iron & Steel Coca-Cola Co, Master Kong, Conch Profiles, CNPC Group Western Drilling Engineering and Hongyun Honghe Tobacco Group (Xinjiang China Daily, 2017c).

In the southwestern area of the Toutunhe District, there seems to be a special focus on heavy industry. Due to the recognizable structures, there are probably smelting plants and possibly structures of refineries as well as maybe power plants. About 10 km further north there is a large logistics centre with a large railway station and loading stations and three other but smaller logistics centres in the southeast, about 3 km south of the airport, another about 1,5 km south of "Toutunhe Park" and another in the South of "Wangjiagou Residential District".

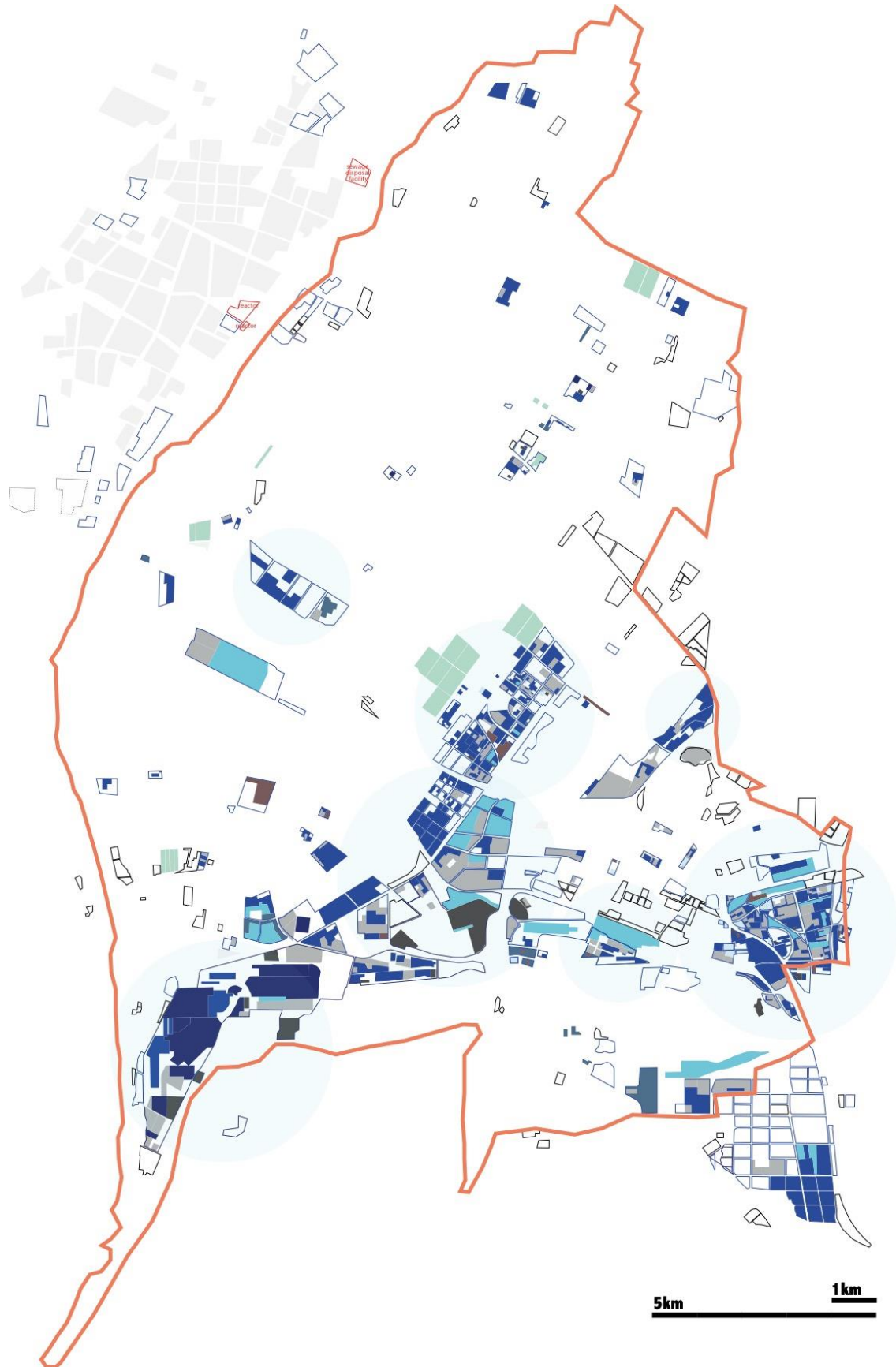


Figure 19. Industries of Toutunhe District

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

5.1.2 Residence

At the end of the year, the district had a permanent population of 358,000. According to the 2018 Public Security Annual Report, the district had a registered population of 196,000 at the end of the year, including 191,000 urban residents and 5,000 rural residents (The 12th Division of Xinjiang Production and Construction Corps, 2020).

Most of the houses in Toutunhe District are buildings with 10-12 floors. In recent years, there have been many new high-rise residential buildings. During the 13th Five-Year Plan period, the government actively renovated shanty towns, built corresponding resettlement houses, and built a batch of community office houses, community health service centres, cultural activity centres, property houses, public service facilities such as kindergartens, schools, markets, parking garages, garbage stations, etc.

5.1.3 Agriculture

Toutunhe Farm is located 24 kilometres from the western suburbs of Urumqi. It is about 9-12 kilometres long from east to west, and 3.5-13 kilometres wide from north to south. It is adjacent to West Railway Station, Wangjiagou Oil Depot and Equipment Depot in the east, Wugang Highway and Baosteel Group Bayi Iron and Steel Company in the south, Toutun River Natural Centre Flow Line in the west, and across the river from Sangong Township, Changji City. The total area of the farm is 4147.21 hectares, of which arable land 1209.43 hectares, garden land 1269.6 hectares, woodland 299.14 hectares, grassland 56.69 hectares, urban village and industrial and mining land 748.07 hectares, 186.28 hectares for transportation, 76.14 hectares for water and water conservancy facilities, and 301.86 hectares for other land.

Under the leadership of the Party Committee of the Military Division, Toutunhe Farm used its own advantages, seized opportunities, and took multiple measures to accelerate urbanization. At present, the system and mechanism of the audience are gradually optimized, and the overall strength and stability maintenance capabilities have been significantly enhanced. In 2019, it is expected to achieve a GDP growth of 8%. Fixed asset investment achieved 258 million yuan, and total retail sales of consumer goods reached 86.06 million yuan, an increase of 10%. 3.032 billion yuan of investment was in place, showing an increase 329%. (The World Bank, 2015, p. 50).

5.1.4 Green Spaces

Apart from the largest share of green areas in the north, which should also be seen in the context of open land providing green axes or green corridors, there is a repeated presence of isolated green areas, usually located between the urban blocks. Such spaces are mainly found in the southeast, one area in the far east and one area in the district's centre, in addition to the "Toutunhe Park".

Some residential blocks seem to integrate areas of previous natural forests, presumably remaining from pre-development times. Such areas appear in smaller proportions in the middle sections of the district and in bigger proportions in the southwest, north and south connecting with the green corridor running to the north. Other green spaces exist in the form of sports facilities and green squares. Moreover, within the residential blocks, lawns are more often seen or assumed to be present.

5.2 Mobility and Transport

Toutunhe has developed a convenient road network with the surrounding areas. The traffic system appears to be strong suggesting a prospect of further large-scale development in the direction of Changji. Currently, the district is provided by numerous roads. In particular, there are 2 very distinctive expressways that cross Toutunhe from southeast to northwest. In addition, provincial roads, including highways and county roads, run over longer distances in the southern parts of the district providing a relatively fine-meshed road network integrating four main bridges over the Toutunhe River. Public transport in district includes buses and railways. The bus system, however, dominates with more obvious structures incorporating numerous bus stops. Public transport is also planned to be further

expanded, especially in line with the district development along the axis towards Changji. Toutunhe is also to be connected to Urumqi's metro network in the future. One railway line running through the district from southeast to northwest can be noted, which is probably used primarily for freight traffic serving two massive logistics stations.

5.2.1 Road Network

Currently, the road network is convenient in Toutunhe. There are especially two very distinctive expressways, which cross the area from southeast to northwest: The S112 "Wuchang Expressway" and G 30 "Lianhua Expressway", with eight lanes each. In addition, there are provincial roads or highways such as the S107, six lanes, coming southeast from Xinshi District towards the western direction and the S104, six lanes, which mainly runs from southwest to northwest, and the S114, six lanes, which also runs southwest-northwest in the direction of the airport. In addition, there are county roads such as the X128 or X475, with only 2 lanes left, which run over somewhat longer distances in the district and serve to further connect the road system in the district. Altogether, four main bridges over the river Tontunhe lead to the neighbouring city of Changji. One is in southwest on-road X128. Another is between the two expressways. Another two are on each: the S112 "Wuchang Expressway" and G 30 "Lianhua Expressway". Incidentally, there is a toll station on the G 30 "Lianhua Expressway", just before the city of Changji.

5.2.2 Public Transport

This part provides an overview of the public transport in Toutunhe District. Common public transport methods include bus, railway and metro.



Figure 20. Public Transport of Toutunhe District

Source: Global Urbanisation Research Team FRA-UAS (2020), based on: openstreetmap.org, Google Maps and Urumqi City Master Plan 2009-2020

Buses

In 2013, a total of 5.07 million yuan was invested in Toutunhe to strengthen the construction public bus system. 2 new bus terminal stations (a total of 26,000 square metres) was constructed, 145 bus stops were renovated, and more than 160 bus stop signs were replaced by new ones. By the end of the year, a total of 30 bus lines, 283 bus stops with 750 buses have been in operation in this area, which guaranteed the needs of residents in the area (Li, 2013).

Railway and Metro

Toutunhe is currently not connected to the metro network. However, the plans show that metro will cover this district in the future. The bus stops that can be seen in Google Maps are probably only public bus stops.

A railway line runs through the district from east-southeast to west-northwest. It can be assumed that it is mainly used for freight transport. South of the G 30 "Lianhua Expressway" along the Annangong Road, there is a logistics station. Another logistics station seems to be located in southeast.

5.2.3 Cycling as a non-motorised form of mobility

In 2014, Toutunhe District was selected as the experimental area for public bicycles and a total of over 10 million yuan was invested. Nearly 60 bicycle rental stations were constructed. By 2017, 1,200 bicycles had been put in use, basically covering the densely populated areas, and the total number of people using public bicycles had exceeded 130,000 (Urumqi Economic and Technological Development Zone (Toutunhe District), 2012).

5.3 Plans of Development

On August 25, 1994, the State Council approved the first phase of development, with an area of 4.3 square kilometres, starting from Taiyuan Road in the east, reaching Wuchang First Class Highway in the west, and being bounded by Henan Road and Yingbin Road in the north and south respectively. On November 5, 1998, Urumqi Municipal People's Government approved 2.03 square kilometres of land for the North New District. Later, due to the expansion of the airport, the land area was adjusted to 1.90 square kilometres. On August 30, 2001, Xinjiang Uygur Autonomous Region approved the second-phase development area of 9.87 square kilometres.

On March 29, 2006, Xinjiang Uygur Autonomous Region approved the development of a second-phase extension area of 5.25 square kilometres, which is located in the area of Equestrian Mountain in the west of Urumqi, on the south side of the second-phase land of Urumqi Economic and Technological Development Zone, bordering the Lanzhou-Xinjiang Railway Double Line in the north, as well as the 104th Regiment Farmland in the west.

On June 4, 2007, Urumqi Municipal People's Government and Xinjiang Production and Construction Corps approved the total land development area of 70 square kilometres in the cooperation zone of the 12th Division of the Corps. The first development area is 15.1 square kilometres.

In June 2010, the Tenth Plenary Session of the Ninth Urumqi Municipal Committee put forward the preliminary concept of the integration of the development zone and Toutunhe District. On January 2, 2011, the Municipal Party Committee of the autonomous region announced the leading group of the party and government in the development zone (Toutunhe District), which marked the official start of the integration of district and government. After the integration of district and government, the planned area of the development zone (Toutunhe District) expanded to 480 square kilometres, which provides sufficient space for resource integration and industrial agglomeration and is conducive to optimizing the regional functional layout.

On September 15th, 2012, the General Office of the State Council officially sent a reply to the People's Government of the Autonomous Region and the Ministry of Commerce, agreeing to expand the Urumqi Economic and Technological Development Zone and continuing to implement the current national economic and technological development zone policy. After the expansion of the

development zone, the planned area reaches 15.66 square kilometres and was divided into eight blocks. It covered 4.28 square kilometres in the first phase of the development, 0.94 square kilometres in the North New District, 6.06 square kilometres in the second phase (excluding export processing zones), 4.02 square kilometres in the core area of high-speed rail (excluding the east of Satellite Road) and 0.36 square kilometres in the east of high-speed railway station.

Expanding Urumqi Economic and Technological Development Zone is supposed to help to absorb new projects, optimize the industrial structure, thus further enhancing the comprehensive competitiveness. By relying on the transportation advantages of Urumqi International Airport and railway, the Urumqi Economic and Technological Development Zone aims to build the largest logistics centre and headquarters based in Xinjiang. Since 2017, the district is expected to make progress on constructing an innovation pilot zone, promoting further transformation and upgrading of the area's economic structure (Urumqi Economic and Technological Development Zone (Toutunhe District), 2012).

6. Conclusion

In this study, a detailed analysis of Urumqi City and Toutunhe Districted is provided. It covers many aspects, including history, geography, climate, natural resources, administration, demography, economic development, social-economic development, urban development, land-uses, transportation, infrastructure, and so on. Besides, by analysing the development plans, this research provides a discussion about the development policies and strategies of Urumqi. Although Urumqi is located in the western part of China, which is a comparatively backward area compared with the coastal area in China, it has great development potential. In recent years, both the central and the local governments have also provided many supportive policies to promote its development.

Urumqi is the capital city of the Xinjiang Uygur Autonomous Province in the far northwest of the People's Republic of China. It is a typical inland city, which is surrounded by deserts. The city is more than 2,000 km away from the closest shore, and therefore it has an arid continental climate with great temperature differences between the daytime and the night. The unique climate makes it a very suitable place to grow agricultural products, especially some fruits, such as Hami melon. In history, Urumqi was a central hub on the historical "Silk Road", which was an important route used for trading in the 19th century. Since the 1990s, Urumqi has witnessed significant economic development. The city currently serves as a regional transportation node and a cultural, scientific, and political centre for the Xinjiang Province. The total area of Urumqi is about 1,400 km² including an urban built-up area of 368.4 km². It has seven districts and one county. In 2018, the registered population of Urumqi was 2,222,600, including 2,003,700 in urban area and 218,900 in rural area. The GDP of Urumqi was 341.32 billion yuan (RMB) and was 94 thousand Yuan (RMB) per capita in 2019. Although the GDP is still relatively low, it has demonstrated a nine-fold increase within the past 15-year period. The city has witnessed a continuous trend of urban expansions along its major corridors since 1963. According to the master plan, the central urban area will continue with a clear focus to concentrate development in the north-eastern part of the city, especially in the Toutunhe District. A "multi-centre, cluster-style" spatial layout structure plan will be adopted, which relies on the surrounding mountains and urban agricultural landscape belts to form a land layout form of "one axis, two centres, two districts seven clusters". Urumqi has formed a comprehensive transportation network, with road, aviation, rail, metro, and bus. Besides, citizens can rely on bicycles to commute. An intelligent system to control and monitor traffic and mobility has been developed and put into use within the city. However, under the pressure of rapid urbanization growth, is facing considerable challenges about the provision of public transport. This has led to the emergence of severe traffic congestions and environmental problems.

It is noticeable that the government of Urumqi has injected an enormous financial budget into the construction and improvement of public infrastructure. By 2006-2020, the master plan dedicates 8794 hectares of new land for the construction of water conservancy facilities. Simultaneously, the

government is committed to improving the ecological environment of the city. Renewable resources are encouraged. Waste disposal has gradually changed from landfills to more environmentally friendly approaches. In the aspect of city development strategy, this study focuses on three important development plans: the 13th Five-Year Plan, Urumqi Masterplan for land use 2006-2020, and Urumqi City Main Functional Area Planning 2015-2020. In line with the 13th Five-Year Plan, which was formulated by the central government of the People's Republic of China, the government of Urumqi clarifies the government's work priorities and specifies measures taken to promote the economic and social development during the period from 2016 to 2020. The Urumqi Masterplan for land use 2006-2020 specifies land distributions for urban construction, people's livelihood projects, new Industry development, and infrastructure construction. The Urumqi City Main Functional Area Planning 2015-2020 determines the functional orientation for each district and clarifies the development objectives. It helps to solve the contradiction between limited development space and expanding demand.

After the discussion of the development of Urumqi City, this research focuses on an important economic and industrial district of Urumqi: Toutunhe District. Toutunhe is located in the northwest of Urumqi and is established in 1961. The administrative division area for the district is about 480 km². By the end of 2018, the annual GDP of Toutunhe reached 47.64 billion yuan, showing an increase of 7.6% over the previous year. According to the 2018 Public Security Annual Report, the district had a registered population of 196,000 at the end of the year, including 191,000 urban residents and 5,000 rural residents. The largest proportion of land in Toutunhe has been occupied by agriculture, reaching 92.2%. Land dedicated to construction accounts for 4.7% and other land accounts for 3.1% of the total area. By 2015, there are 3,800 registered companies, including 17 companies listed among the world's top 500, and 30 companies listed in the domestic top 500. The district plans to absorb new projects, optimize the industrial structure, thus further enhancing the comprehensive competitiveness. Toutunhe has also formed a convenient public transportation network with the road, rail, and bus. It is currently not connected to the metro network. However, the plans show that the district will be developed soon. The Toutunhe District is near the Urumqi International Airport, railway station, freight terminal, and high-speed train transportation hub. Therefore, it is an important centre for importing and exporting. By 2017, 18 companies listed in "Fortune 500" and 40 companies listed in "China Top 500 Enterprise" had investment projects in the Toutunhe District.

In conclusion, the policy of "One Belt, One Road" has brought many great developmental opportunities for Xinjiang Province. Urumqi, as the capital of Xinjiang Province, is developing at a rapid speed. It is not only Xinjiang's largest commercial service industry and industrial manufacturing centre but also a distribution centre for import and export trade open to the west. Toutunhe District, as an emerging economic and technological development zone, plays an important role in the overall regional development of Urumqi. The government expects to construct Toutunhe District to become an innovation pilot zone, which is beneficial for the area's economic structure optimization and social development.

Bibliography

- Environmental Protection Centre of Xinjiang Uygur Autonomous Region. (2015). *Executive Summary Of Environmental and Social Impact Assessment Urumqi Urban Transport Improvement Project II*. June.
- Government of Xinjiang Uygur Autonomous Region of China. (2019). *About Xinjiang.pdf*. en.xinjiang.gov.cn/xj_yw/c100075/common_list_detail.shtml
- Hangzhou Government. (2010). *Comprehensive land use planning of Hangzhou (2006-2020)* 杭州市土地利用总体规划 (2006-2020).

- Kidwai, F. (2018). Xinjiang Rides High on Belt and Road Initiative. In *China Daily*. <https://doi.org/http://www.chinadaily.com.cn/a/201808/08/WS5b6a649ba310add14f384a0c.html>
- Ministry of Commerce of the People's Republic of China. (2012). *Urumqi's first garbage disposal master plan was issued: Dapugou will build a circular economy zone* (乌鲁木齐首个垃圾处理总体规划出台 大浦沟将建循环经济区). <http://www.mofcom.gov.cn/aarticle/resume/n/201207/20120708223024.html>
- RECAST Urumqi. (2014). *RECAST Urumqi- Meeting the Resource Efficiency Environment : Urumqi as a Model City for Central Asia*. 1–76.
- Robert L. Wallack. (2018). Urumqi “new city” construction is modernizing ancient silk road in China. *American Journal of Transportation*, 673, 20–23. <https://www.ajot.com/premium/ajot-urumqi-new-city-construction-is-modernizing-ancient-silk-road-in-china>
- Ruhe, C. H. W. (1973). BP Statistical Review of World Energy. *JAMA: The Journal of the American Medical Association*, 225(3), 299–306. <https://doi.org/10.1001/jama.1973.03220300055017>
- Schmitz, R. (2019). *Scientists Are Watching China 's Glaciers Disappear : Parallels : NPR Scientists Are Watching China 's Glaciers Disappear : Parallels : NPR Scientists Are Watching China 's Glaciers Disappear : Parallels : NPR*. 1, 6–11.
- Statistics Bureau of Urumqi Economic and Technological Development Zone (Toutunhe District). (2019). *Statistical Report on National Economic and Social Development of Urumqi Economic and Technological Development Zone (Toutunhe District) in 2018* (乌鲁木齐经济技术开发区(头屯河区) 2018年国民经济和社会发展统计公报). <http://www.uetd.gov.cn/contents/102/22444.html>
- Sun, H. (2016). Study on the correlation between the hierarchical urban system and high-speed railway network planning in China. *Frontiers of Architectural Research*, 5(3), 301–318. <https://doi.org/10.1016/j.foar.2016.04.003>
- The State Council of The People's Republic of China. (2016). *The Thirteenth Five-Year Plan for National Economic and Social Development of the People's Republic of China*.
- The World Bank. (2015). *Urumqi Urban Transport Project (II) EA Report*. li.
- Toczauer, C. (2018). *China approves \$6 billion expansion of growing Urumqi airport hub.pdf*. 2–3.
- Urumqi Development and Reform Commission. (2013). *Urumqi Master plan for land use (2006-2020)*.
- Urumqi Development and Reform Commission. (2015). *Urumqi City Main Functional Area Planning (2015-2020)*. http://wjw.jl.gov.cn/hjdczl/zcgz/201708/t20170821_3425858.html
- Urumqi Economic and Technological Development Zone (Toutunhe District). (2018a). *Natural geography* (自然地理). http://www.uetd.gov.cn/html/xj/ZRDL23247/List/list_0.htm
- Urumqi Economic and Technological Development Zone (Toutunhe District). (2018b). *Regional overview* (区域概况). http://www.uetd.gov.cn/html/xj/ZRDL23247/List/list_0.htm
- Urumqi Evening News. (2017). *Urumqi: bike-sharing helps “urban green transportation”* (乌鲁木齐：共享单车助力“城市绿色交通”). Xinhua News. http://m.xinhuanet.com/2017-08/22/c_1121518294.htm
- Urumqi Government. (2013). *Master plan of Land use of Urumqi in 2006-2020*(乌鲁木齐土地规划2006-2020).
- Urumqi Government. (2016). *In the next 5 years, Urumqi will build two urban centres* (未来5年乌鲁木齐市将打造两个城市中心). <http://www.urumqi.gov.cn/znsx/jdxw/jrsf/262931.htm>

Urumqi Government. (2019). *Statistical Report on National Economy and Social Development of Urumqi in 2018 (2018年乌鲁木齐市国民经济和社会发展统计公报)*. <http://www.wlmq.gov.cn/fjbm/tjj/tjgb/437659.htm>

Urumqi Government. (2020). *Statistical Report on National Economy and Social Development of Urumqi in 2019 (2019年乌鲁木齐市国民经济和社会发展统计公报)*. <https://www.xinjiang.gov.cn/xinjiang/xjyw/202006/d22a4bd999d3497f9fc30d7f63ac802e.shtm>
|

Urumqi Integrated City Transport Project Research Centre. (2015). *SFG1110 Social Assessment Report of Urumqi Urban Transportation Improvement Project II*.

Urumqi Municipal Bureau of Statistics. (2015). *Urumqi Statistical Yearbook*. <http://tjj.urumqi.gov.cn/tjsj/312836.htm>

Xinhua. (2018). Xinjiang Becomes Logistics Hub of Belt and Road. In *China Daily*. <https://doi.org/http://www.chinadaily.com.cn/a/201808/12/WS5b6f8e9ca310add14f385424.html>

Xinjiang China Daily. (2017a). *About UETD.pdf*. https://xinjiang.chinadaily.com.cn/urumqi_toutunhe/2017-02/16/content_13124213.htm

Xinjiang China Daily. (2017b). *History and development plan of UETD.pdf*. https://xinjiang.chinadaily.com.cn/urumqi_toutunhe/2017-02/17/content_28242250.htm

Xinjiang China Daily. (2017c). *UETD's investment advantages and future goals.pdf*. https://xinjiang.chinadaily.com.cn/urumqi_toutunhe/2017-02/16/content_13191361.htm

Xinjiang China Travel. (2018). *Xinjiang Fruits.pdf*. <https://www.china-silkroad-travel.com/xinjiang-travel/xinjiang-fruits.html>