Mongolia
Data Collection Survey on Development of New Ulaanbaatar International Airport Surrounding Area

Final Report

February 2022

Japan International Cooperation Agency (JICA)

Almec Corporation
CTI Engineering International Co., Ltd.
Oriental Consultants Global Co., Ltd.

IM
JR
22-041

Mongolia
Data Collection Survey on Development of New Ulaanbaatar International Airport Surrounding Area

Final Report

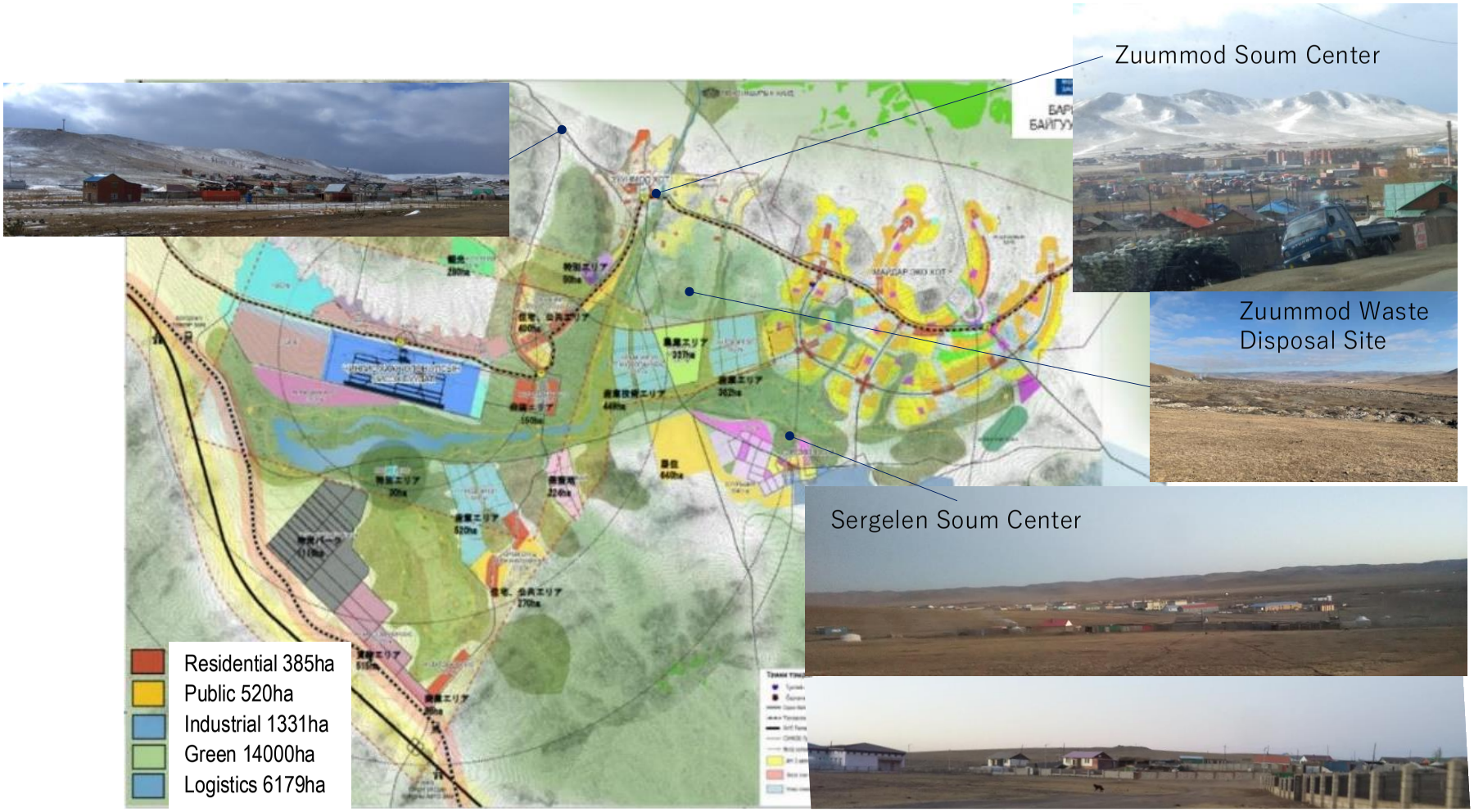
February 2022

Japan International Cooperation Agency (JICA)

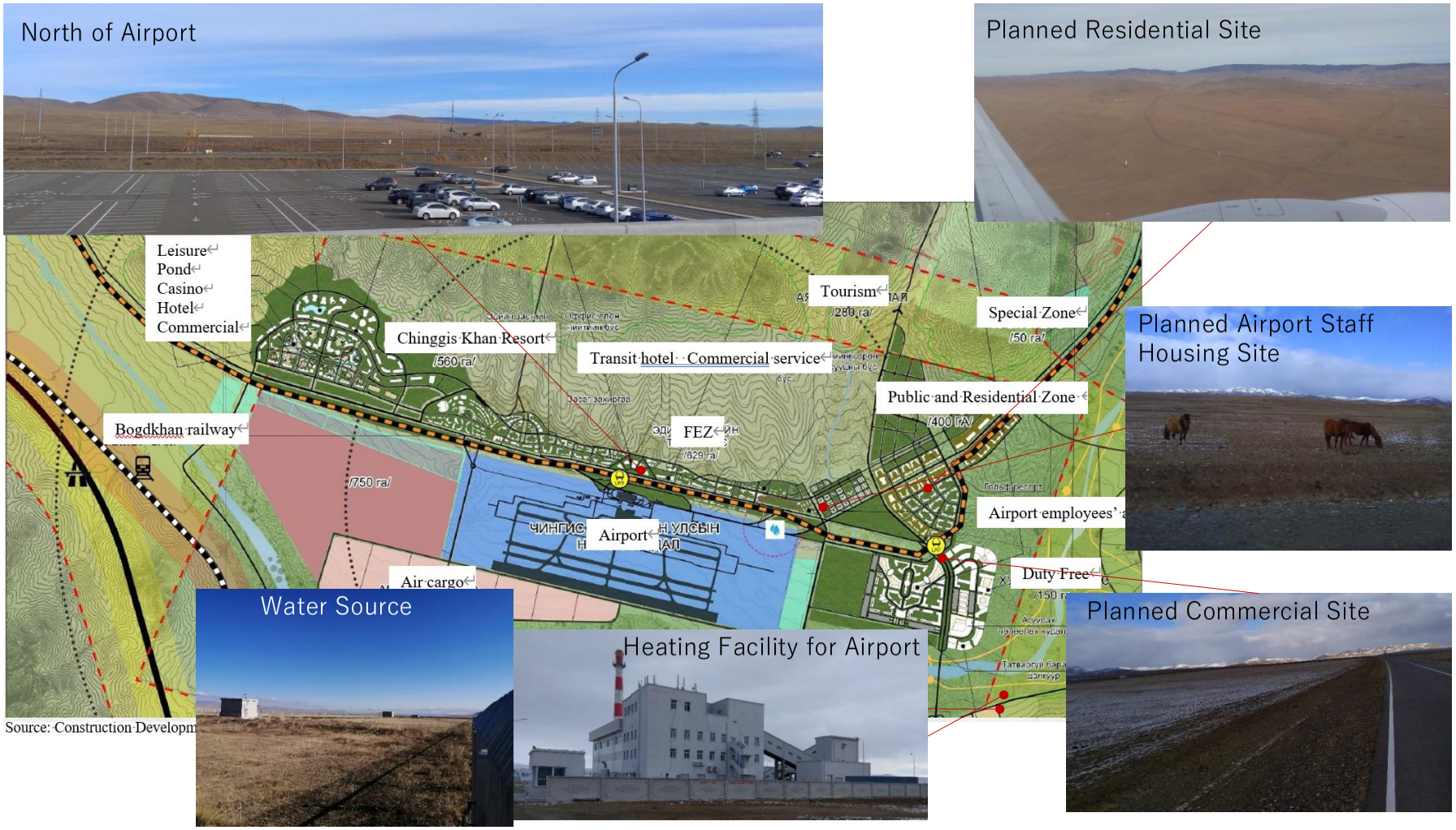
Almec Corporation
CTI Engineering International Co., Ltd.
Oriental Consultants Global Co., Ltd.

Exchange rate（February 2022 JICA rate）

Currency	Rate
American Dollar (USD1 = ¥)	115.262
Mongol Tugrik（MNT = ¥）	0.04399



Current Situation of Khushig Valley



Source: Construction Developm

Current Situation of New Zuunmod

Table of Contents

Tables

Figures

Abbreviation

ADB	Asian Development Bank
AH	Asian Highway
CAAM	Civil Aviation Authority of Mongolia
CDC	Construction Development Center
CHPP	Combined Heat and Power Plants t
EBRD	European Bank for Reconstruction and Development
FDI	Foreign Direct Investment
F/S	Feasibility Study
FZ	Free Zone
FEZ	Free Economic Zone
FTZ	Free Trade Zone
HOB	Heat-Only Boiler
ICT	Information and Communication Technology
JICA	Japan International Cooperation Agency
KDI	Korean Development Institute
MCUD	Ministry of Construction and Urban Development
MICE	Meeting, Incentive, Conference/Convention, Event/Exhibition
MoET	Ministry of Environment and Tourism
MP	Master Plan
MRTD	Ministry of Road and Transport Development
NOSK	Capital city Housing Corporation
NUBIA	New Ulaanbaatar International Airport
PIP	Public Investment Program
PPP	Public Private Partnership
SEZ	Special Economic Zone
SSZ	Strategic Special Zone
TEU	Twenty-foot container Equivalent Unit
TOSK	State Housing Corporation
UBMP2020	Ulaanbaatar City Master Plan 2020
UBMP2040	Ulaanbaatar City Master Plan 2040
UBLC	Ulaanbaatar Logistics Center
UBTZ	Ulaanbaatar Railways
UPRI	Urban Planning Research Institute
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

1. The Study Outline

1.1. Study Background

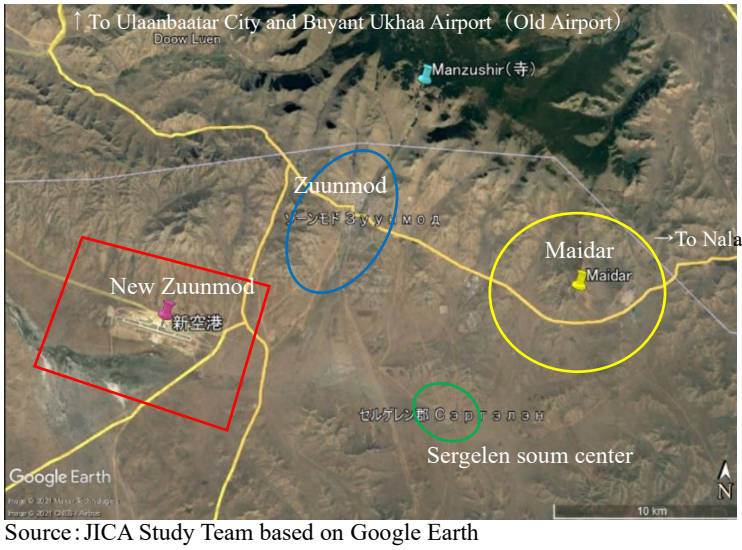
With the recent economic growth that Mongolia has experienced before the Covid-19 pandemic, the number of passengers at the international airport in the city of Ulaanbaatar rapidly increased from 955,867 in 2015 to 1,621,571 in 2019. It is estimated by the New Ulaanbaatar International Airport (NUBIA) LLC, the operator of the new international airport (Chinggis Khaan International Airport), to reach 2,157,577 passengers in 2030.

The Japan International Corporation Agency (JICA) supported the Mongolian government with the yen loan projects, entitled "New Ulaanbaatar International Airport Construction Project I and II," and a technical cooperation "New Ulaanbaatar International Airport Human Resource Development and Operation and Maintenance Capacity Improvement Project." The new airport, located 50km away from the Ulaanbaatar City center, opened on 4 July 2021.

The population of Ulaanbaatar City, which accounts for 48% of the population of Mongolia (2020), has increased to 1,597,290 in 2020 by an average of 1.037 times per year since 1993, higher than the national average of 1.016 times per year. In 2009, the Mongolian government formulated a master plan for a new airport satellite city with a population of 100,000. Subsequently, the Ulaanbaatar City government, with the support of JICA, formulated the "Ulaanbaatar City Master Plan 2020 (hereinafter referred to as UBMP2020)" in 2013 to address urban problems such as air pollution and traffic congestion due to the concentration of population and industry in Ulaanbaatar. The development policy including satellite cities around the new airport has been presented. "Ulaanbaatar City Master Plan 2040 (hereinafter referred to as UBMP2040)", currently formulated by the Ulaanbaatar Municipal Government, also follows the satellite city concept.

Based on these policies, "the City Master Plan for the New International Airport (the Aero City MP)" was formulated and approved by the Cabinet in January 2019. From May to October of the same year, the Korea Development Institute (KDI) analyzed the development issues and reviewed the Aero City MP and its implementation methods.

In May 2020, the government decided to develop New Zuunmod [1], the city around the new airport, and Maidar City through Parliament Decree No. 55 (revised in 2021 by Resolution No. 68). In 2021, the Ministry of Construction and Urban Development (MCUD) initiated the development of Khushig Valley in the southern part of Bogd Mountain (Mt. Bogd), covering New Zuunmod, Maidar, Zuunmod and Sergelen soum, in an integrated manner.



Source：JICA Study Team based on Google Earth

Figure 1-1 Khushig Valley

From December 2019 to February 2020, JICA conducted the "Data Collection Survey on Development Possibility of New Ulaanbaatar International Airport Satellite City in

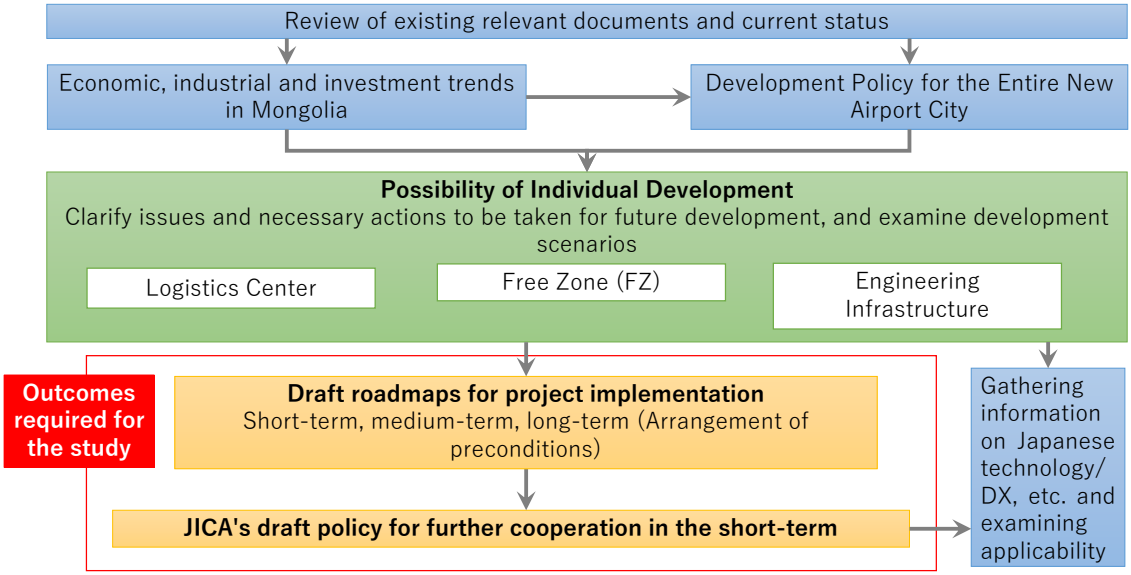
[1] The name of the city around the Chinggis Khaan International Airport changed from Aero City to New Zuunmod.

Mongolia (hereinafter referred to as the "Previous Basic Study")" to gather initial information on the Aero City MP and the KDI review. The results of the Previous Basic Study showed that these plans have some issues regarding the appropriateness and feasibility of the urban development scale, which require further examination. The reason for this is that Incheon Airport in Korea was used as a success case for Mongolia to follow. However, the number of passengers and the volume of cargo at Incheon Airport and Chinggis Khaan International Airport are completely different from each other. On the other hand, the Previous Basic Study confirmed that the development potential of the logistics hub and the free zone (FZ) both located around the airport is expected to be high considering the location of New Zuunmod near the airport. At the same time, the development of basic urban infrastructure, including electricity, water supply, sewerage, waste management, and hearting, is a short term issue that needs to be addressed.

By collecting and analyzing information on these key issues and exchanging opinions with the Mongolian side, this study has achieved the objective described in Section 1.2.

1.2. Study Objective

The purpose of this study is to review the urban development plan around the new airport and to identify the issues and necessary measures to develop the logistics centers and FZ, as well as the basic infrastructure in the target area, in the short and medium term. The study also aims to clarify the roadmaps of the development and to propose JICA's cooperation policy for New Zuunmod development.



Source: JICA Study Team

Figure 1-1 Study Framework

1.3. Study's Target Area

The study's target area is the new airport city, named New Zuunmod (previously called Aero City). It is in the south of Mt. Bogd and is about 50 km from the center of Ulaanbaatar City, the capital of Mongolia (see Figure 1-2). New Zuunmod is approximately 12,000 ha in size and is designated as a special zone. Of this size, the Ministry of Road and Transport Development (MRTD) has jurisdiction over the southern 2,400 ha, which is allocated for transportation-related facilities including the airport, while MCUD has jurisdiction over the remaining 9,600 ha.

Source: Photos and texts added by the JICA Study Team, based on figure from the Aero City MP

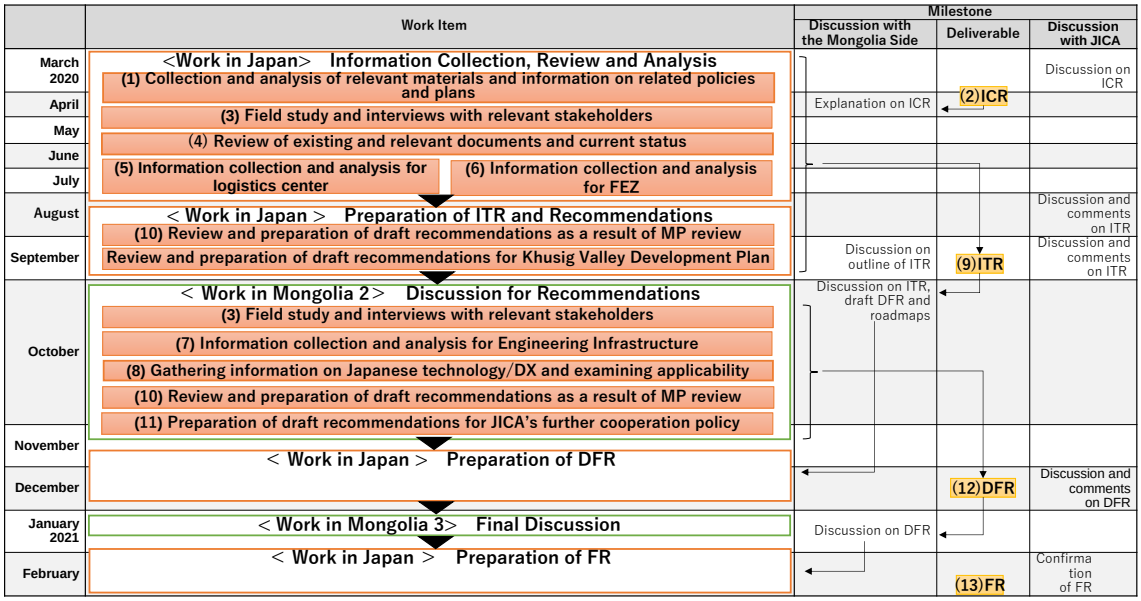
Figure 1-2 Location Map of New Airport City (Aero City / New Zuunmod) and its Surrounding Areas

1.4. Study Period

The study has been implemented from March 2021 up to February 2022.

1.5. Study Workflow

Figure 1-3 shows the workflow of the study.



Note: ICR - Inception Report, ITR – Interim Report, DFR – Draft Final Report, FR – Final Report
Source: JICA Study Team

Figure 1-3 Study Workflow

As mentioned in Section 1.1, it was assumed in the beginning that this study would review the Aero City MP. However, after the study started, the JICA Study Team found that the plan was changed into the comprehensive development plan of new cities in Khushig Valley (Khushig Valley Comprehensive Plan) that planning area be expanded to cover cities in the entire Khushig Valley and to develop it as a whole. In the process, the plan for New Zuunmod, which is part of Khushig Valley, was revised (see Figure 1-4). Therefore, the JICA Study Team was required to consider how to develop New Zuunmod in the first stage, while considering the development of the whole Khushig Valley.

Source: JICA Study Team

Figure 1-4 Changes to the Study Condition due to Changes in the Mongolian Plan

1.6. Study Team

Expertise	Japanese Consultant	Mongolian Consultant
1. Team Leader / Urban Development 1	SASAKI Rieko	S. Namjilmaa
2. Deputy Team Leader / Urban Development 2	OIKAWA Ryuichi	
3. Transportation / Logistics Planning	ISHII Shinichi	E. Erdenechimeg
4. Industry / Free Economic Zone (FEZ)	MASUDA Kastuya	K. Gansukh
5. Public Private Partnership (PPP) / Economic Analysis 1	SHIMOMURA Nobuko	D. Bayarsaikhan
6. Public Private Partnership (PPP) / Economic Analysis 2	TSUCHIYA Rie	
7. Investment Demand Survey/Investment Promotion	ISHIDA Masayuki	
8. Engineering Infrastructure (Communication)	MATSUMOTO Tomoyuki	N. Purevdagva
9. Engineering Infrastructure (Electricity)	TACHINO Sumio	A. Amarbayar
10. Engineering Infrastructure (Water and Sewage)	HASHIMOTO Yuuichi	B. Ankhtuya
11. Engineering Infrastructure (Heating/ Waste Treatment)	MIYOSHI Hirohumi	Y. Erdenebat
Secretary / Translator / Interpreter / Project Coordinator	-	B. Bayartsetseg N. Onon

2. Higher Policies and Existing Plans affecting New Zuunmod

2.1. Higher Policy

This section summarizes the policies affecting New Zuunmod. From the policies reviewed (see Table 2-1), the Long-term Vision 2050 (Vision 2050) serves as the fundamental policy, and the Mongolian government has consistently based on its major directions on it. Meanwhile, there is no policy yet on the development of Khushig Valley.

Vision 2050 aims to "create tourism, cultural services and industries with the characteristics of our country, and become a transportation, logistics and international hub of Northeast Asia" in Ulaanbaatar City (Objective 9.5). This policy plans to disperse the concentration of factories, enterprises, and universities that are adversely affecting the environment and to develop Ulaanbaatar City as a passenger and cargo transportation hub in Northeast Asia through the international airport. For this purpose, the following are planned for New Zuunmod:

- Start construction by 2024;
- Develop infrastructure/utility facilities and housing in the decade up to 2030;
- Provide a good living environment with access to medical and educational services;
- Develop towns and cities with respect for the natural environment;
- Promote industrial and urban development using the most advanced technologies, including information and communications technology (ICT); and
- Provide high-speed public transportation access to Ulaanbaatar and to wider logistics area (Mt. Bogd Circle).

Based on the planned division of urban functions of satellite cities of Ulaanbaatar City, New Zuunmod is planned to accommodate an FZ and become a logistics hub functioning as an inland port surrounding the international airport.

Table 2-1 Government Policies on the Development of New Zuunmod

<table>
<tr><th>Policy</th><th>Content</th></tr>
<tr><td>Long-term Vision 2050</td><td>Vision 2050 is the highest national policy. Chapter 9 on Ulaanbaatar and satellite cities addresses the policies on the creation of a people-centered city, application of environment-focused solutions and planning-based urban development. New Zuunmod is one of the satellite cities. Particularly, Objective 9.5 aims to develop satellite cities that will become centers for logistics and international relations in Northeast Asia with tourism and services that use ethnic cultures as resources. After the 2020 opening of the new airport, the development goals are set in three 10-year phases, as shown below. Additionally, Objective 8.1 addresses the establishment of FZs and logistics centers around the international airport.
<table>
<tr><th>Stage 1 (2020–2030)</th><th>Stage 2 (2031–2040)</th><th>Stage 3 (2041–2050)</th></tr>
<tr><td>Create new investment opportunities and expand production regions.</td><td>Intensify economic diversification with proper human settlement system.</td><td>Promote internationally competitive rapid development.</td></tr>
<tr><td>1. Implement a multi-center city structure, commence construction of new satellite cities (New Zuunmod and Maidar) and proceed gradually to building their engineering infrastructure networks and housing.</td><td>1. Introduce high-tech industries in the Ulaanbaatar region and set up an internationally competitive FZ.
2. Open branches of multinational corporations and international organizations.</td><td>1. Decentralize Ulaanbaatar by diversifying and developing satellite towns and villages for trade, services, culture, education, agriculture, food, light industry, transportation logistics and tourism, and</td></tr>
</table>
</td></tr>
</table>

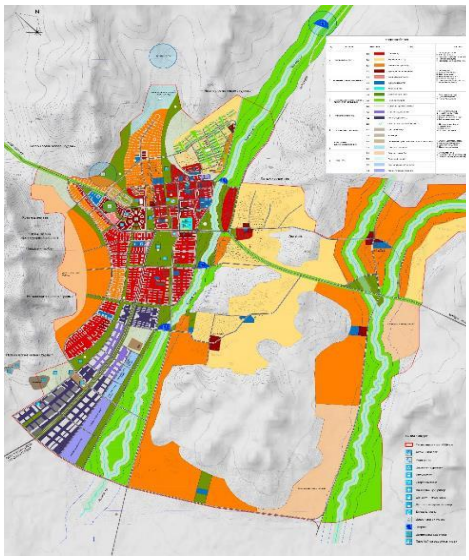
	2. Intensify efforts to make the capital city a Northeast Asian hub for passenger and cargo transportation and commission the new international airport in Ulaanbaatar. 3. Establish tourism complexes along the highway, bypassing cities and villages, and open a Mongolian brand shopping center. 4. Plan industrial zones in each sector and develop satellite cities as clusters. 5. Develop high-tech and knowledge-based industries.	3. Increase production and services infused with new technologies and innovations in satellite towns and villages. 4. Diversify some universities and institutes by specialization and sector and relocate them to campuses in satellite cities. 5. Relocate enterprises and business entities having negative impact on Ulaanbaatar to satellite cities in line with an integrated policy and planning.	increasing jobs. 2. Host world-class festivals of culture and art. 3. Become a recognized cultural and scientific center in Northeast Asia. 4. Establish an international information and data center, taking advantage of the country's geographic location. 5. Open new foreign trade opportunities and create new trade networks by economically integrating with friendly cities.
Five-years National Development Policy 2021-2025	Based on the Vision 2050, Objective 9.5 aims to intensively develop New Zuunmod to be a passenger and logistics transportation hub in Northeast Asia, including the development of basic infrastructure and housing.		
Long-term Vision 2050 Action Plan 2021-2030	9.5.2. Intensify the construction of new satellite cities (New Zuunmod and Maidar) and proceed gradually to building their engineering networks and housing. 9.5.3. Intensify the construction of a new city of New Zuunmod to be built next to the international airport in Khushig Valley. 9.5.4. Fully commission the new international airport in Ulaanbaatar and establish a Northeast Asian hub for passenger and cargo transportation.		
Government Action Plan 2020-2024	As one of items in 3.7 on construction and urban development, formulate the development plan and phased development.		
Public Investment Program (PIP)	PIP, which is one of the attachments of Vision 2050, lists New Zuunmod and Bogdkhan railway as the projects which require feasibility studies (F/S) or detailed studies.		
100 Mega Projects	Lists the state's 100 priority projects. Bogdkhan railway is ranked 32nd out of 50 projects for economic expansion and New Zuunmod is 43rd.		
National Comprehensive Plan	New Zuunmod is proposed to be developed as a special economic zone (SEZ) to initiate economic and export diversification and as a satellite city strengthen the capital. It is also positioned to be a modern processing and logistics base.		
Ulaanbaatar Master Plan 2040 (Draft)	Ulaanbaatar City plans to include New Zuunmod and Maidar expanding the city boundary. The future (2040) population will likely reach 2.2 million, of which 600,000 are envisioned to live in more than 10 satellite cities, including New Zuunmod and Maidar. New Zuunmod is planned to be built as an air logistics and distribution centers and expected to have a population of 34,000 and 15,000 jobs.		
Ulaanbaatar City Action Plan 2020-2040	Proposes changes in the boundaries of New Zuunmod and Maidar, new satellite cities, in collaboration with the central administration in charge (Section 8.1.1).		
Ulaanbaatar City Five-years Development Policy 2021-2025	Changes the boundaries of New Zuunmod and Maidar, new satellite cities, and carries out the first phase of construction (Section 6.2.1.3).		
Tuv Aimag (Aimag) Socio-economic Development Policy - Development Caravan- Tuv Aimak* 2024	The construction of the new airport has been used as an opportunity to promote the manufacturing and processing industry with the aim of providing competitive products to foreign markets and the construction of FZs, a solar power plant, a regional transportation center, a paved road between the airport and Zuunmod, an archaeological museum linked to tourism, and a police station.		

Note: * The title follows the original document.
Source: JICA Study Team

2.2. Development Plans affecting New Zuunmod

2.2.1. Zuunmod Development Masterplan 2020–2030

Tuv aimag formulated the "Zuunmod Urban Development Masterplan 2020–2030" for its capital (Phase 1: 2014-2020 and Phase 2: 2020-2030). The population is estimated to be 70,000 in 2030. Tuv aimag intends to update its masterplan in line with the Khushig Valley development which MCUD is currently preparing. The Zuunmod Masterplan 2020–2030 plans to expand the city, as shown in Figure 2-1.



Source: Zuunmod Development Master Plan 2020-2030

Figure 2-1 Zuunmod Development Master Plan 2030

2.2.2. Sergelen Soum Master Plan 2020–2030 (Draft)

The center of Sergelen soum is located 12 km south of Zuunmod. The plan targets the year 2030 and covers a total area of 3,865.7 ha. The population in 2020 was 2,028, and the population in 2030 is estimated at 2,700 and 3,500 in 2040.

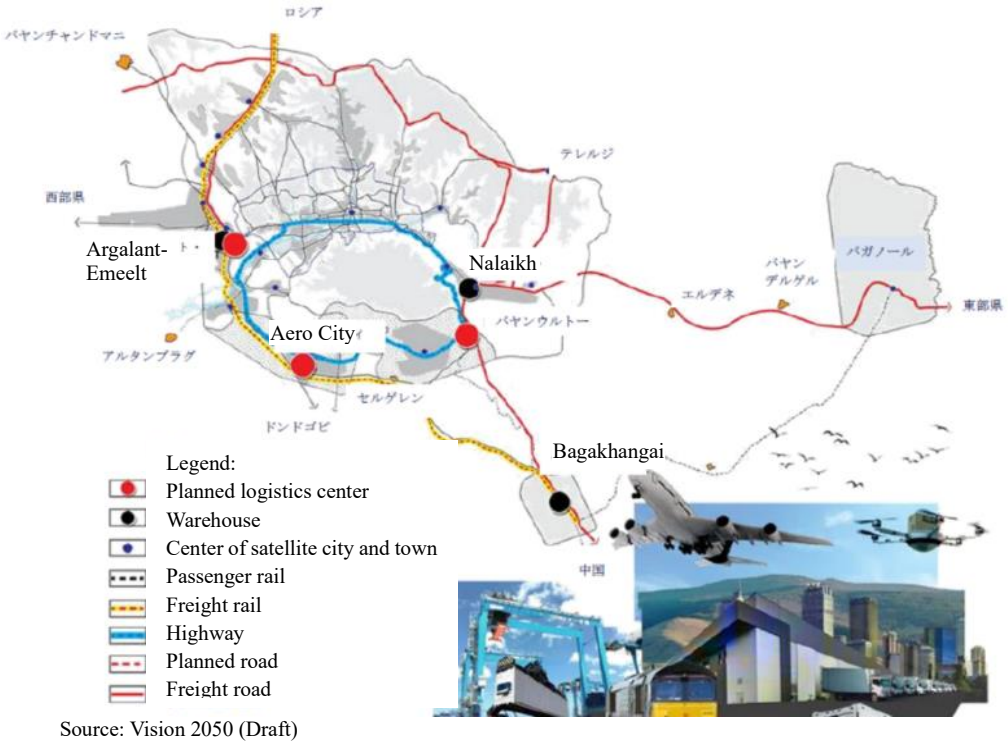
The main industry in Sergelen soum is pastoralism, with 47% of the households involved. There are 222 ha of fodder plants, 160 ha of cereals, 44.2 ha of potatoes and 18.36 ha of vegetables. In the future, the plan is to set up an industrial zone with medium-sized factories and warehouses, including a milk processing plant with refrigeration, a meat and by-products processing plant, a primary processing plant for leather, wool and cashmere, as well as a fertilizer plant and a sewing factory.

In the soum center, utility infrastructure for water, heating, drainage, wastewater, and communication have been provided by each building and are not interconnected to form an area-wide network, and most of the households live in *khashaa*, land surrounded by fences. The master plan being prepared envisages the construction of 100 housing units by 2030 and another 100 by 2040 in areas where private companies can build private flats with small factories and housing for young households, taking into account the possibility of young households with children in Ulaanbaatar moving to the area to avoid air pollution.

2.3. Industrial Development

2.3.1. Logistics Centers in Ulaanbaatar

In Vision 2050 and UBMP2040, logistics centers are planned to be located in New Zuunmod, Nalaikh and Argalant-Emeelt (shown in red circles in Figure 2-2), while large multi-purpose warehouses are planned for Argalant-Emeelt, Bagakhangai, and Nalaikh (shown in black circles in Figure 2-2) and delivery centers in nine locations in Ulaanbaatar City. The PIP 2021-2025 includes projects on setting up distribution centers in the western and eastern parts of the city, and they need funding and design. One of the large transportation companies in Mongolia, Tuushin, is about to implement a 130-ha development in Nalaikh.



Source: Vision 2050 (Draft)

Figure 2-2 Logistics Center Development Plan

2.3.2. Industrial and Technological Parks in Ulaanbaatar

In addition to the New Zuunmod FZ, industrial and technological parks are planned, i.e., a building materials industrial park in Nalaikh, a leather industrial park in Argalant-Emeelt[2], and industrial parks in Bagakhangai and Baganuur.

2.3.3. Industrial Development around Zuunmod

Cultural and Creative Industries Complex Center: Based on Vision 2050, the creative industries have become one of the main industrial sectors in the country to develop. The Ministry of Culture has secured 10 ha of land in Khonkhor for a facility to promote the film industry. Yet, it is envisaged that 50-100 ha will be required for the construction of around 14 film-related facilities, including studios. The ministry has expressed interest in the possibility of developing these facilities in Khushig Valley.

Zuunmod Information Technology Industrial Park: In the south of Zuunmod, private companies have planned an industrial park with an area of 6 ha and a workforce of 1,120 people to manufacture electronic equipment, electronic components, and photovoltaic panels. The land has been approved by Tuv aimag.

Seoul National University Global Campus: A working group has been set up between Tuv aimag and Seoul National University and discussions are underway to establish this campus, although the site has not been decided yet.

2.4. Residential Area Development

2.4.1. Residential Area Development in Ulaanbaatar

There are various government-led residential area developments in Ulaanbaatar, which are expected to supply more than 37,000 units. Those developments include sub-center projects

[2] The Mongolia government announced the leather industrial park project will be implemented in Darkhan City, so the plan in Argalant-Emeelt becomes unclear.

to develop 10,000 units by NOSK (Capital City Housing Corporation) through an Asian Development Bank (ADB) loan, Eco Yarmag 1 (1,860 units by TOSK (State Housing Corporation)), Nogoonnuur (1,008 units by TOSK through a Chinese grant), Solongo 1&2 (5,002 units by TOSK through a Korean loan), Bayangol rental housing (2,007 units by TOSK through Korea Export-Import (EXIM) bank), and Zaluus 1 (approximately 6,000 units by TOSK and NOSK). In addition to the above projects, the city reconstructs old apartments, and there are plans to build a total of 8,000 flats.

2.4.2. Yarmag Area Development

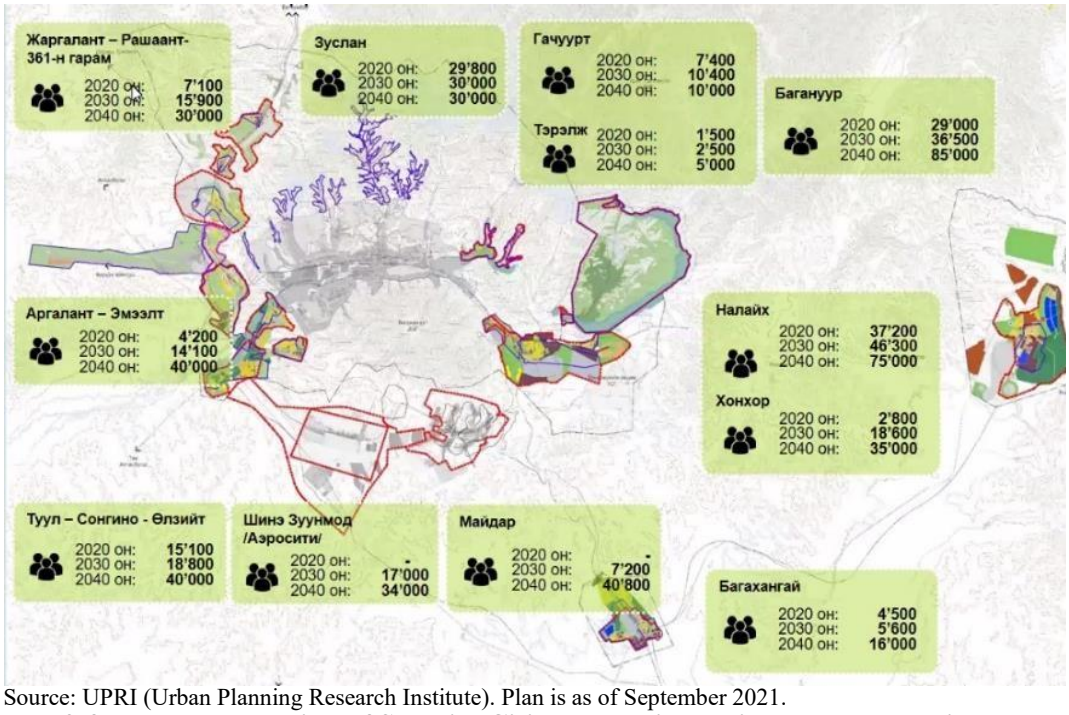
Besides the above mentioned residential area developments, Yarmag area, adjacent of the old airport (Buyant Ukhaa International Airport), is planned to become a residential neighborhood, covering an area of 4,400 ha. It will have a population of 223,000 and 57,000 households, according to the detailed area plan approved in 2011 by the Ulaanbaatar City Urban Planning Department. In accordance with the detailed plan, all the land in Yarmag has been privatized, and commercial facilities and high-rise flats have been built along the main road connecting the Buyant Ukhaa International Airport to Ulaanbaatar City.

The Ulaanbaatar Municipality has constructed a road south of the east-west arterial road, and private development on the south side of the arterial road is progressing, while the detailed plan revision is being considered. The Ulaanbaatar City Five-years Development Policy 2021-2025 includes a revision of the detailed area plan of Yarmag and its implementation (9.2.1). The PIP 2021-2025 also includes an updated detailed area plan as a project requiring F/S and detailed planning.

Yarmag will have a significant impact on the development of New Zuunmod as many airport staff commute from Yarmag, and it is a new property development site and nearest to New Zuunmod.

2.4.3. Satellite City Development

Besides the residential development in the six central districts of Ulaanbaatar mentioned in Section 2.4.1 and 2.4.2, Vision 2050 and UBMP2040 plan to develop more than 10 satellite cities, including New Zuunmod and Maidar.



Source: UPRI (Urban Planning Research Institute). Plan is as of September 2021.

Figure 2-3 Future Population of Satellite Cities and Neighboring Towns and Villages as indicated in UBMP2040

2.4.4. Zuunmod

Two apartment projects are implemented in Zuunmod to enable the employees of the new airport to buy housing at reasonable prices: Manzushri Palace (ongoing construction of 1,000 units with a kindergarten for 100 children and a school for 940 pupils on a 12.6 ha site) and 2,000 units (planned 2,140 units with a kindergarten for 150 children, a school for 940 pupils and commercial facilities on a 16.2 ha land).

2.4.5. Maidar

Maidar, which is planned to be one of the satellite cities of Ulaanbaatar City along with the New Zuunmod in Khushig Valley, was planned by MCUD in 2015. Yet, the plan has not yet been approved, and a resolution was passed by the Cabinet that a comprehensive urban development assessment needs to be conducted to determine the feasibility of developing Maidar.

As for the progress of Maidar, according to the information in the 100 mega projects list, Ulaanbaatar City has already acquired the development site as the national special land. A comprehensive urban development assessment was conducted by MCUD, and water source exploration and environmental assessment were conducted by the Ministry of Environment and Tourism (MoET). In addition, a study is underway as part of a new urban water management project (F/S) (soft loan of USD40 million) by EXIM Bank of Korea. The challenges include the need to establish new administrative districts, determine boundaries, develop road networks and infrastructure, prepare blueprints, and secure financial resources for construction work.

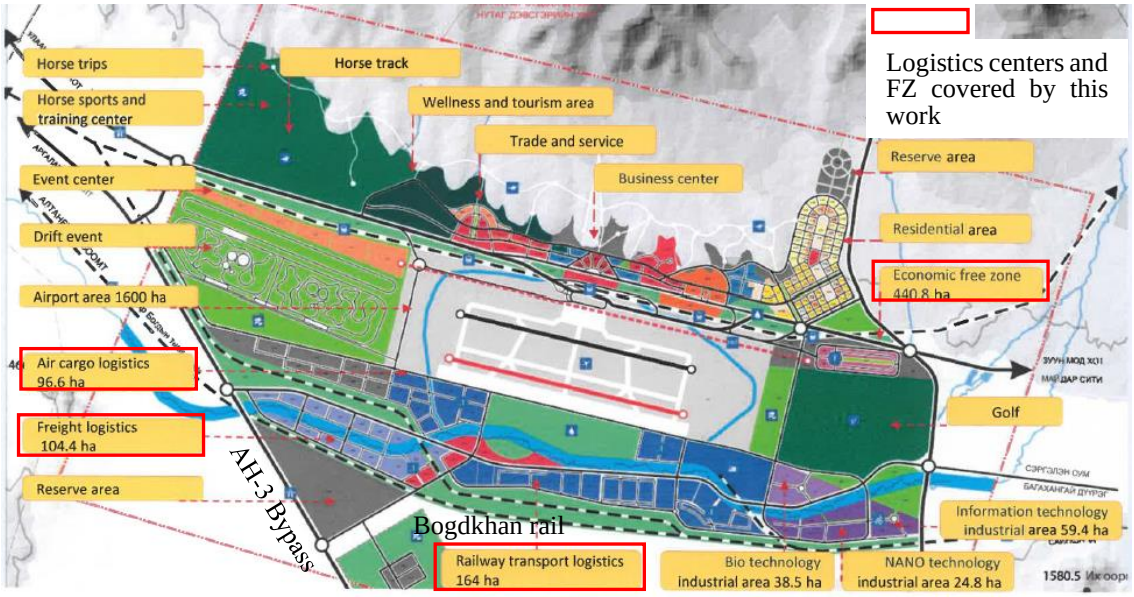
2.5. New Zuunmod Development Plans and Related Development Plans

2.5.1. Aero City Master Plan

The Aero City MP was approved by the Cabinet of Ministers in January 2019. The MP followed the concept of Aerotropolis[3]. In the proposed division of industrial functions in the surrounding areas, Ulaanbaatar City's center was positioned as the administrative and economic center, and Zuunmod as an industrial technology park, as well as a transportation and logistics hub.

The Aero City MP had five goals: 1) to be a nomadic city, 2) to be a smart city, 3) to develop a high-tech, innovative industrial zone, 4) to be a free economic zone, and 5) to be a logistics hub. To achieve these goals, it planned to build commercial facilities (such as trade and services), financial and business centers, tourism and recreational facilities (such as golf courses and parks), residential development and support facilities (such as hospitals). It also planned to build aviation, railway and road logistics areas, a free economic zone, and high-tech industrial areas such as biotechnology, nano and information and technology (IT).

[3] A new urban form where cities are built around airports speedily connecting time-sensitive suppliers, manufacturers, distributors, and business people to distant customers, clients, and marketplaces. (https://aerotropolis.com/)



Source: Report on Information Collection and Confirmation Study on the Development Potential of the New Ulaanbaatar International Airport Satellite City, Mongolia, with additions by the JICA Study Team.

Figure 2-4 Aero City Master Plan

The Aero City MP was planned for a population of 34,119 residents; 21,000 public facility users; and 14,881 workers. Table 2-2 shows the summary of the infrastructure plan of the Aero City MP.

Table 2-2 Infrastructure Planned in the Aero City MP

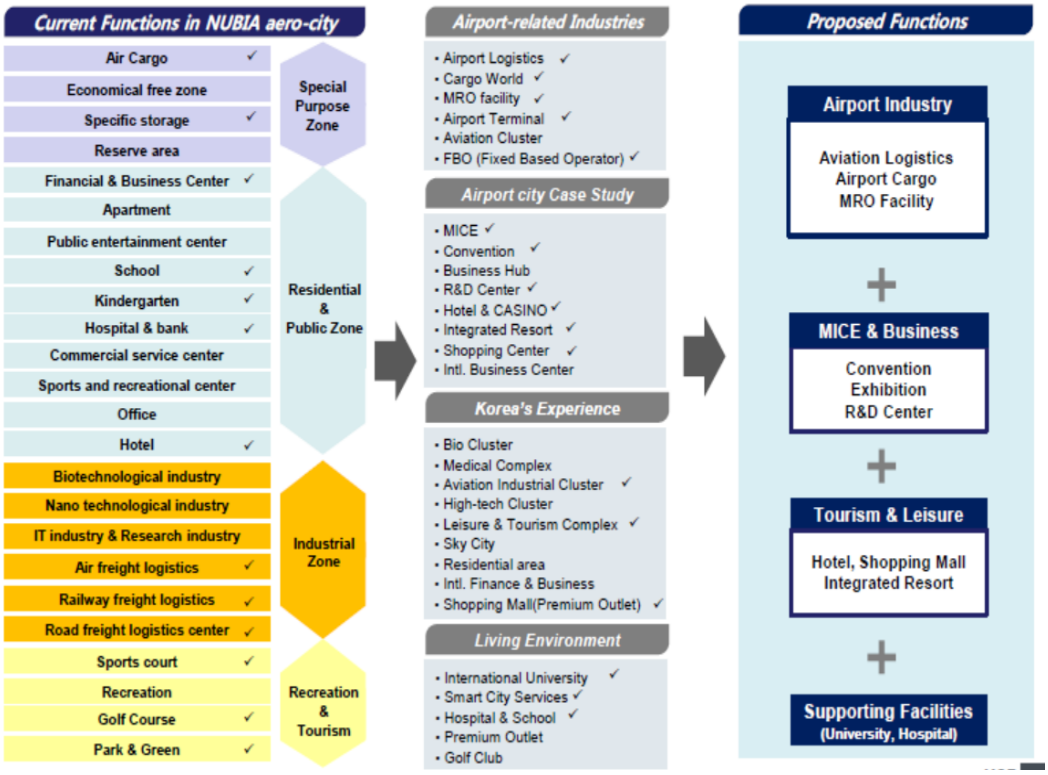
Area	Users	Area (ha)	Electricity (kW)	Heating (Gcal/h)	Water (m^3/day)
Housing	Middle-rise	36.46	8,558.89	30.28	7,506.2
	Low-rise	51.61	4,091.40	22.98	
	Social infrastructure facility		2,530.06	–	
Public space	1. Administrative facilities, 2. banks and financial centers, 3. hotels, 4. offices, 5. commercial centers, 6. theaters, 7. museums, 8. restaurants, 9. sports halls, 10. leisure facilities	350.39	5,060.12	62.10	105.2
Industry	Bio-tech factories	38.54	14,303.82	59.40	2,058.7
	Nano-tech factories	24.88			
	IT related factories	59.41			
Logistics	Air cargo center	96.59	10,727.86	—	(35.88)
	Road cargo center	104.41			(35.21)
	Rail cargo center	167.67			(22.64)
Infrastructure, and traffic facility	Infrastructure	61.6	3,575.95	—	
	Transportation	840.4			
Greenery and leisure	Greening facilities with restricted uses	281.1	1,787.98	—	
	Special-purpose green facilities	342.4			(240.00)
	Parks	1475.8			(156.03)
Special use	Airport area	1254.7	—	11.60	(3.04)
	FZ	64.98	3,575.95		
	Special warehouse area	18.98	1,787.98		
	Reserve area	427.04			
Others	—	—	—	—	967.0
Total		5,696.96	56,000.00	186.36	10,637.2

Source: Prepared by the JICA Study Team based on the translation of the Aero City MP Vol.2

2.5.2. 2018/19 KSP Policy Consultation Report: Development of Smart Aero-city Adjacent to the New Ulaanbaatar International Airport (NUBIA) in Mongolia

From May to October 2019, the Korea Development Institute (KDI) analyzed the development issues of the Aero City MP and reviewed its implementation methodology. The KDI study positions New Zuunmod to drive the economy by providing key industrial and visitor facilities and a livable environment. It considers Aerotropolis as an economic driver with its major industrial facilities, visitor attraction facilities, and a livable environment, with the development concept of competitiveness, attractiveness, and livability. In the future, New Zuunmod will be the center of economic activities and a transportation hub being linked to satellite cities and SEZs.

New Zuunmod will house logistics facilities (such as air cargo warehouses), industrial facilities (such as maintenance, repair and overhaul (MRO) facilities and high-tech parks), research facilities (such as research and development (R&D) centers), and business and tourism facilities (such as MICE (Meeting, Incentive, Conference/Convention, Event/Exhibition)). KDI also proposes shopping centers, integrated resorts, and life support facilities such as universities and hospitals. Regarding project implementation measures, the report only summarizes the status of the real estate market and possible investment institutions including Public-private Partnerships (PPP).



Source: 2018/19 KPS Policy Consultation Report - Development of Smart Aero City Adjacent to the New Ulaanbaatar International Airport (NUBIA) in Mongolia

Figure 2-5 Proposed Features of the Aero City

2.5.3. JICA's Data Collection Survey on Development Possibility of New Ulaanbaatar International Airport Satellite City in Mongolia

The Previous Basic Study also reviewed the Aero City MP and related documents in view of the prevailing development issues. It proposed the following to be carried out with JICA's cooperation: support for the development of New Zuunmod, support for the formulation of a tourism development and promotion plan based on the new airport, and construction of

an air cargo center, a sewage treatment plant, a recycled-water plant, a sludge treatment facility, a waste treatment facility, and a solar power plant.

2.5.4. Khushig Valley Comprehensive Plan

MCUD has decided to develop a comprehensive urban development plan for Khushig Valley (Khushig Valley Comprehensive Plan) by connecting the New Zuunmod, Zuunmod City, Maidar and Sergelen Soum Center with shared infrastructure. A draft plan is currently being prepared.

The concept of the comprehensive plan was explained by the Minister of MCUD at the regular meeting of the Cabinet on 30 June 2021, and the following instruction were issued:

- For the Minister of MCUD: Based on the concept of the Khushig Valley Comprehensive Plan, prepare a draft development plan and present it to the Cabinet within the third quarter of 2021.
- For the Minister of MCUD: Obtain special purpose land in Altanbulag and Sergelen soums, Tuv aimag, for the development of the new satellite city and implementation of national scale construction and infrastructure projects.
- For the Minister of Energy: Facilitate the completion of the thermal power plant to be built in Zuunmod with a soft loan from Korea EXIM Bank and the expansion of the Zuunmod sub-station to be implemented with state funds as a source of power and heat for the new satellite cities.
- For the Ministers of MCUD and Finance: Prepare and submit to the Cabinet a housing development project proposal.

According to MCUD, Khushig Valley will be a transportation (air, rail, and road) hub for Northeast Asia and an economic growth area with a population of 150,000-200,000 by 2040 through the implementation of large-scale national and international projects such as a new international airport, Bogdkhan railway, and AH-3 (Asian Highway No.3) bypass. These large-scale projects will be accompanied by the construction of an FZ, logistics centers, and 20,000 housing units, creating a total of 60,000-70,000 jobs and promoting domestic and foreign investment, which is expected to expand Mongolia's GDP and economy by 10-15%. This comprehensive development of Khushig Valley is expected to reduce the concentration of population in the capital city of Ulaanbaatar; create jobs in tourism, industry, and logistics; and contribute to the social and economic development of Tuv aimag, the capital city, and the country.

Land acquisition is underway to secure 19,000 ha of land in Khushig Valley for special purposes. Besides, following lands are acquired by the government: 12,084.9 ha around the new airport through Cabinet Decree No. 140 of 2010 and No. 154 of 2016 for the establishment of New Zuunmod; and 12,000 ha for the “Maidar City” project in Sergelen soum, Tuv aimag, through Cabinet Decree No. 273 of 2018.

The four urban areas in the Khushig Valley development concept are described below:

New Zuunmod	As a city around the new international airport, modern “smart” city with eco-friendly and green infrastructure where an FZ, a logistics hub for North Asia, and the latest technology innovation cluster will be developed. The planned population is 34,000.
Zuunmod	It will be an administrative center and a major city in the central region, connecting New Zuunmod, Maidar City and Sergelen soum center. Large-scale projects are planned for Zuunmod, including the “Agro-Industrial Technology Park,” “Information and Communication Technology Industrial Park,” “Mongolian National Museum and Research Institute of Archaeology and Anthropology,” “Integrated Cultural, Buddhist, and Tourism Facilities of Manzushri Temple,” and “Integrated Cashmere Initial Processing Factory.” It is expected to develop as a center of Mongolian national identity, history, anthropology, religion, culture and education,

	a cluster of food and light industry, and a logistics center. According to the Zuunmod development masterplan, the combined population of Zuunmod and New Zuunmod is expected to reach 70,000 by 2030.
Maidar City	Maidar City is designed to reflect the religion, culture, and customs of Mongolia, and is planned as an eco-city with consideration for green development to promote tourism through smart civil engineering infrastructure based on the latest technology. With an area of 110,000 ha and a population of 280,000-300,000, it is planned to have universities, museums, temples, tourism and a film village. Construction work of a statue of Maidar (Maitreya Bodhisattva) with a height of 54 m, which is 75 times larger than the 72 cm high statue of Maidar (Maitreya Bodhisattva) made in the 17th century by Zanabazar, the First Enlightened One, and a stupa with a height of 108 m has started.
Center of Sergelen soum	Since most of the Khushig Valley development will take place on the land of Sergelen soum, the center of Sergelen soum will be the most affected area. Therefore, a master plan for the development of central Sergelen soum has been prepared to ensure to harmonize with the Khushig Valley development. Sergelen soum center will be a model of modern, green, and compact city development, taking advantage of its location around a new international city.

Source: /mcud.gov.mn/g/778/

The Aero City MP approved in 2019 will be revised based on the upcoming the Khushig Valley Comprehensive Plan. However, the revision has not been scheduled yet.

The next figures show the draft Khushig Valley Comprehensive Plan as of September 2021. These were shared by the Construction Development Center (CDC) which drafted the plan under MCUD's supervision. Based on the draft, this JICA study was conducted.

New Zuunmod

10.900 Households
34.000 Population

Zuunmod City

20.000 Households
68.000 Population

Maidar City

13.000 Households
40.800 Population

Sergelen Soum

1.100 Households
3.500 Population

Хүн амын тооцоолол инженерийн дэд бүтцийн эх үүсвэрийн тооцоололыг томсгосон байдлаар тооцсон. Цаашид бүсчлэлийн төлөвлөлттэй уялдан эх үүсвэрийн хүчин чадлыг нарийвчлан тооцоолно.

Source: CDC as of September 2021

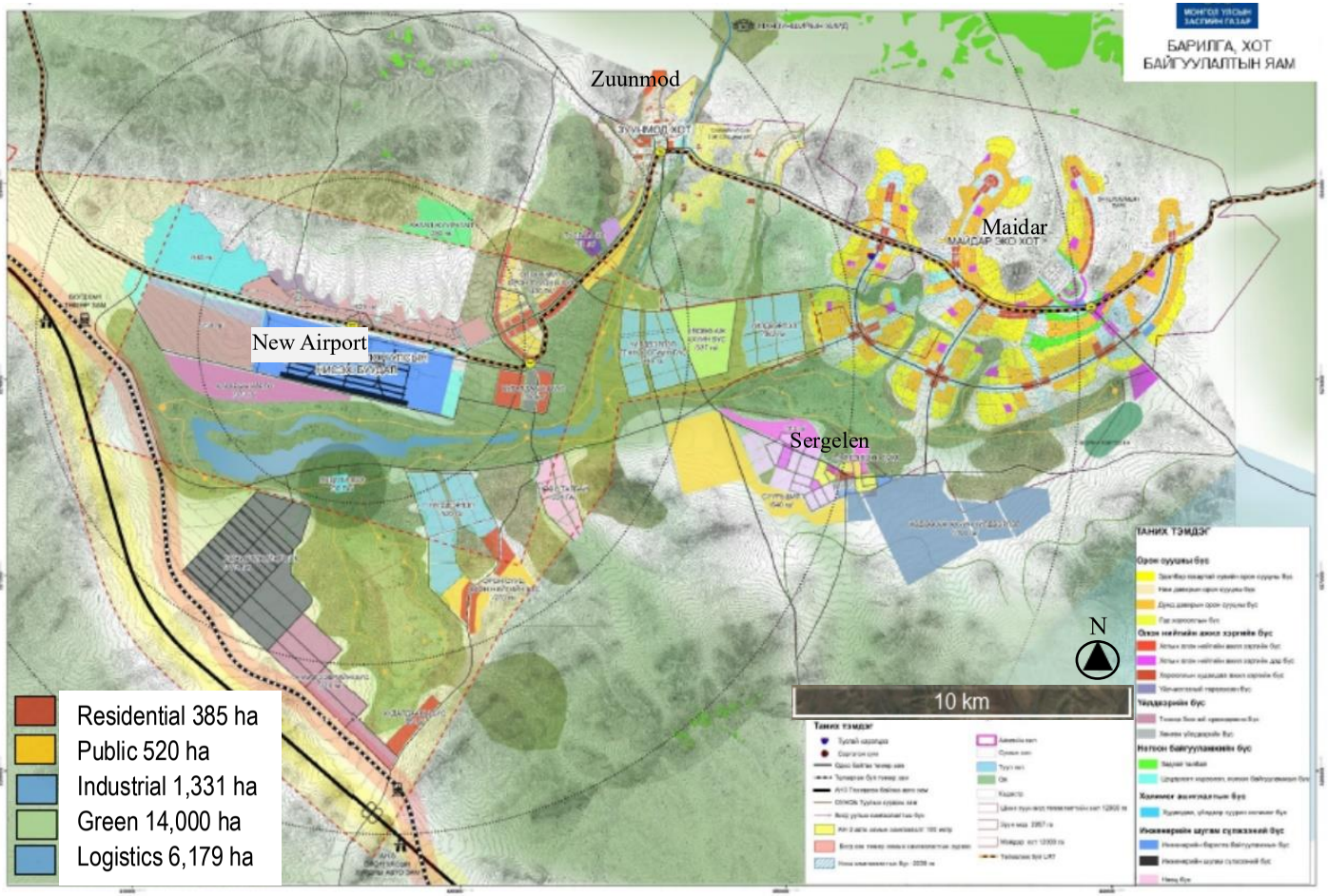
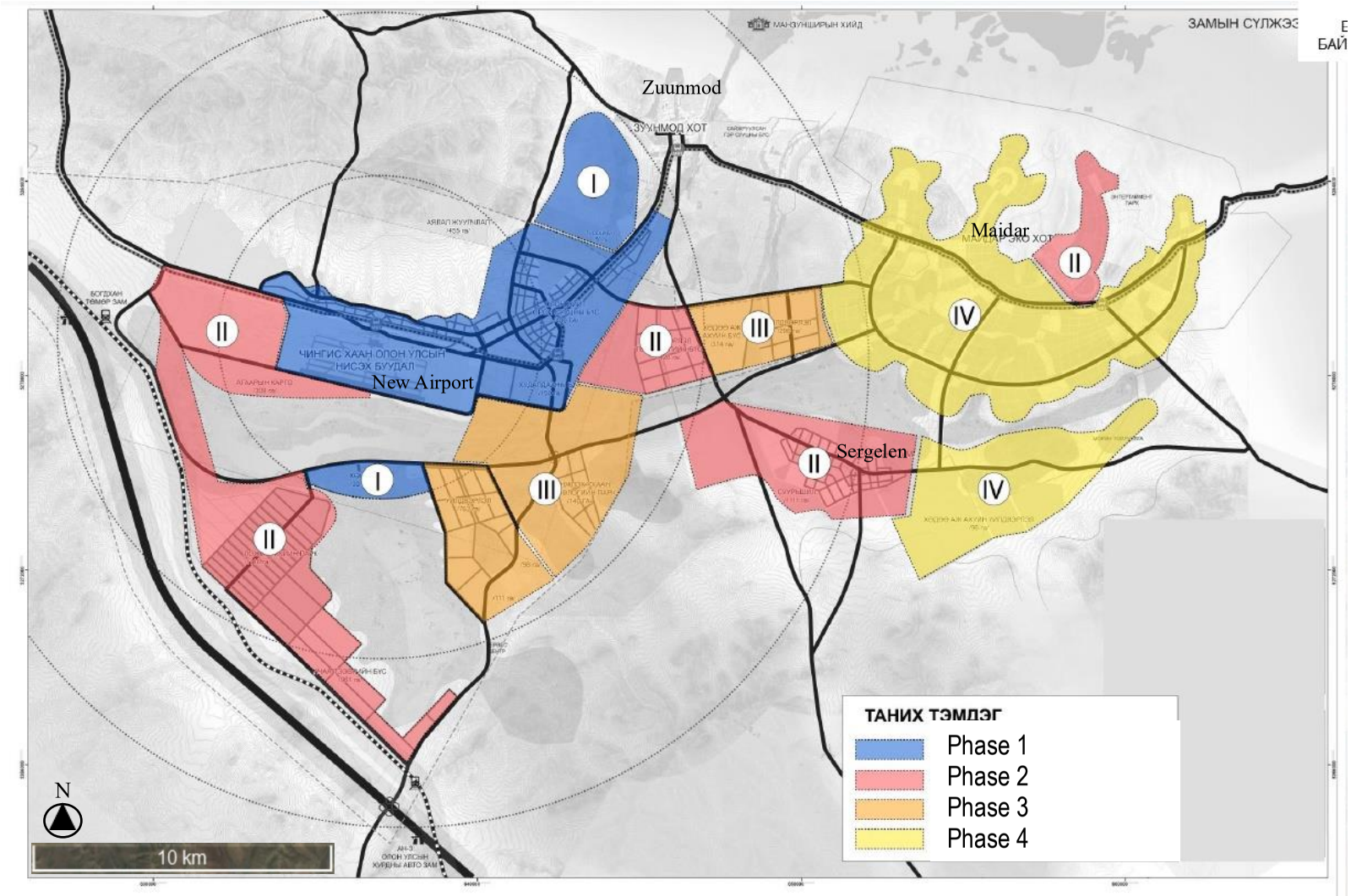
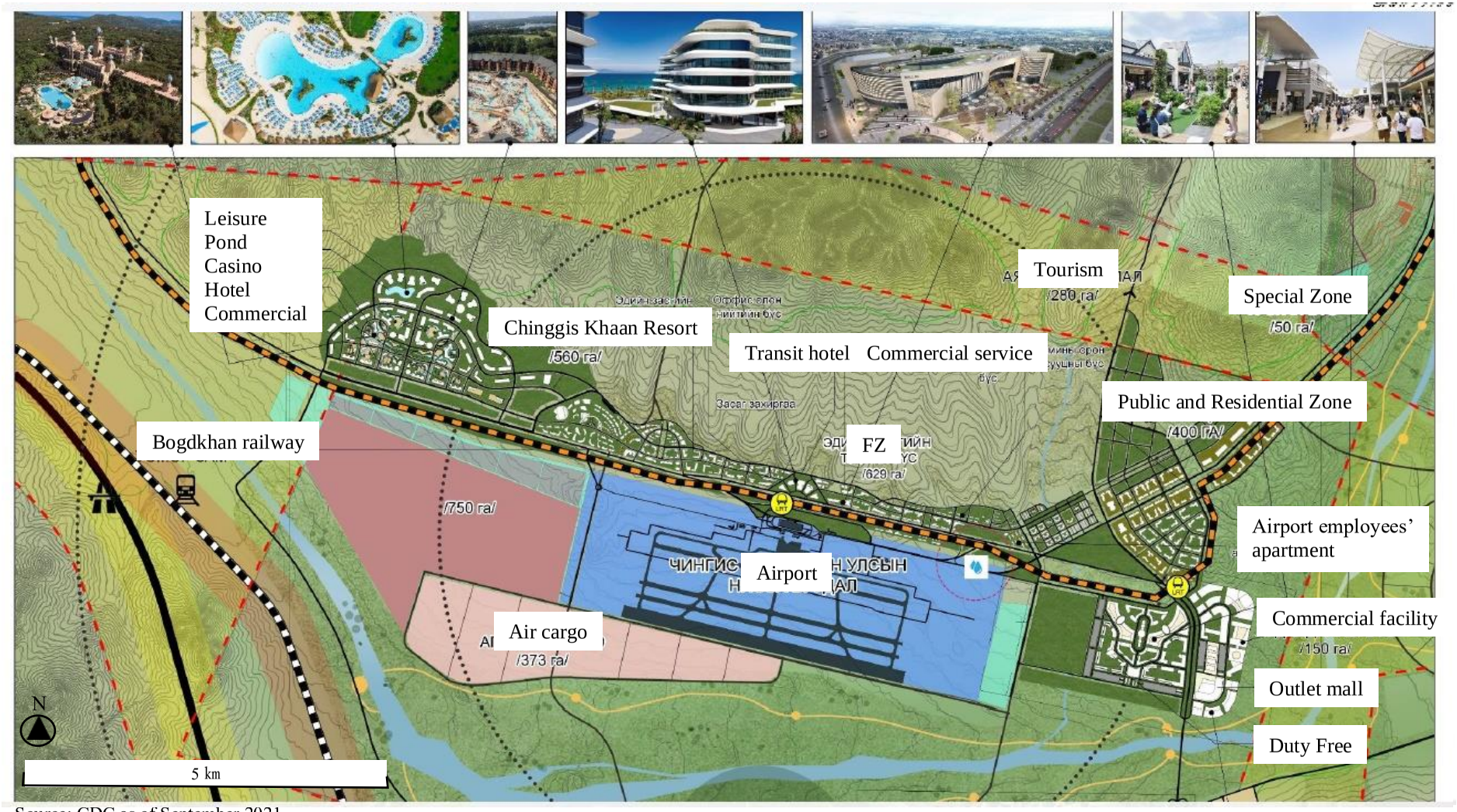


Figure 2-6 Initial Proposal of the Khushig Valley Comprehensive Plan



Source: CDC as of September 2021

Figure 2-7 Initial Proposal of the Khushig Valley Development Phasing



Source: CDC as of September 2021

Figure 2-8 Initial Proposal of the Khushig Valley Development Phase 1 Area

2.5.5. Detailed Area Plan

Based on Parliament Decree No. 55 issued in May 2020, CDC under MCUD, which prepared the Aero City MP, has conducted three studies, i.e., infrastructure resource study (by Ulaanbaatar City Urban Planning and Research Institute: UPRI), logistics center F/S (by UPRI), and detailed plan for the residential, commercial and industrial area (by Next Step, a design firm).

Due to the preparation of the aforementioned Khushig Valley development initiative and changes in the plans of the Aero City MP approved in 2019, the planning works have been delayed and the detailed information on each study has not been shared.

(1) Logistics Center Feasibility Study

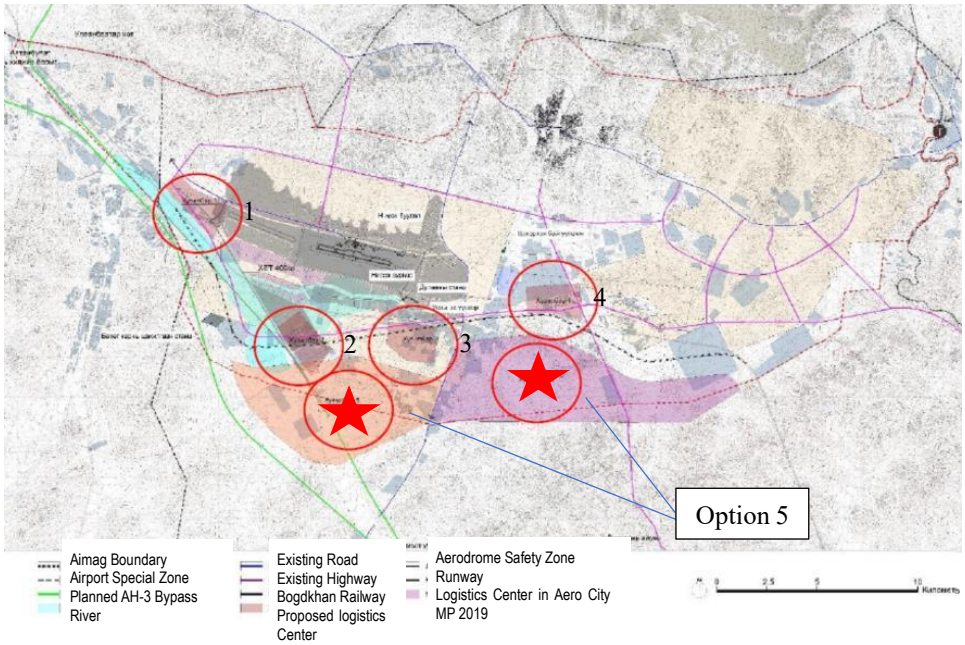
The Urban Planning Research Institute (UPRI) studies the feasibility of logistics centers. The ICR as of June 2021, assessed the location of the proposed logistics center in the Aero City MP as ineligible from the comprehensive perspectives of environment, socio-economic, infrastructure development, and spatial development including construction. As an alternative, five options were proposed as shown in Table 2-3 and Figure 2-9. Approximately 3,000 ha located to the south, marked with an asterisk, was selected. The reasons for selecting the location are as follows:

- Close to the railway
- Located within 100 km from the cargo demand
- Availability of space for logistics processing
- Proximity to labor/residential area (20-30 minutes by bus from the aimag or soum centers)
- Can be connected to civil infrastructure
- Low risk of extreme weather events
- Close to or connected to road network
- Can build large scale warehouses that are inexpensive and allow for long term storage

Table 2-3 Candidate Locations of the Logistics Center

	Location	Size (ha)	Advantage	Disadvantage
1	West-North of New Zuunmod	400	Close to Ulaanbaatar City, AH-3 bypass, residential area	The area is too small to expand. It falls in the landing zone. Land expropriation cost: moderate
2	South of the location in the MP	400	Within the premises defined by the MP. No eminent domain costs.	Straddles railway line. Wetland. Away from AH-3 bypass.
3	Southeast of the location in the MP	400	Within the premises defined by the MP. No eminent domain costs.	Overlaps with the MP's High Tech and Biotech zones. Straddles the railway line.
4	Between New Zuunmod and Sergelen Soum	400	Locate in the middle of towns	It is in the landing zone. Land expropriation costs are the highest.
5	South and Southeast of New Zuunmod and South of the railway	3,000	Close to AH-3 bypass and Bogdkhan railway. Large land available for construction of warehouses.	Requires some expropriation costs. Outside the MP-defined site. Preparatory works required due to slope.

Source: UPRI



Source: UPRI

Figure 2-9 Candidate Locations of the Logistics Center

2.5.6. Bogdkhan Railway

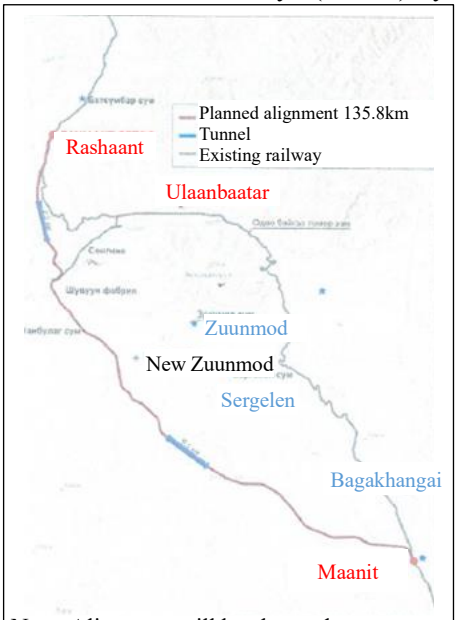
The Bogdkhan railway bypass project has been in long consideration to alleviate traffic congestion in Ulaanbaatar City. The bypass project, which aims to support the capital's plan to create a logistics hub together with a new railway station, was further concretized when the loan agreement for the new airport construction project was made in 2008.

In 2014, MRTD (previously the Ministry of Road and Transportation) and Russian Railways Joint Stock Company agreed to improve the Ulaanbaatar Railways (UBTZ) by constructing a 170-km rail between Mandal and Bagakhangai since they each have a 50% stock share.

ADB funded a Technical Assistance (TA) for a route alignment study in 2017. Results of the TA showed an optimum route of 166 km, including 15 km of tunnels, 60 km of improvement of existing line, and construction of stations around the new airport, at a cost of USD847 million.

Since the cost estimate largely exceeded the initial financing package, MRTD is conducting a review of the alignment. As for the Mongolian side, the Cabinet of Ministers decided on 4 August 2021 to grant a special permit to Tavan Tolgoi Railway LLC to lay the foundation of Bogdkhan railway.

In the Cabinet report of 12 August 2021, the Minister of MRTD explained the plan to construct a 135.8 km long line between Rashaant and Maanit stations with six junctions, three stations, and two tunnels of 9.1-km and 7.5-km lengths. Construction will start in 2022 and is expected to



Note: Alignment will be changed.
Source: Tavan Tolgoi Railway LLC

Figure 2-10 Tentative Alignment of Bogdkhan Railway

be completed in 2025.

Tavan Tolgoi Railway LLC has been commissioned to conduct an alignment design study to connect Rashaant to Maanit via New Zuunmod, and this is scheduled to be completed by March 2022 (see Figure 2-10). For locations other than Rashaant, Maanit, and the New Zuunmod, the ADB-proposed alignment will be changed to avoid land expropriation.

Meanwhile, ADB has started the project preparation TA work in July 2021. According to the consultant of the project, they are only providing advice on the plan being prepared by the Mongolian side.

2.5.7. Asian Highway No.3 Bypass

AH-3 is an international highway route in Mongolia that cross borders in Russia (Sukhbaatar) and China (Zamyn-Uud) via Ulaanbaatar City, similar to the alignment of the UBTZ's mainline. Presently, ADB and the European Bank for Reconstruction and Development (EBRD) assist in road improvement and widening to a 4-lane wide and 204-km long carriageway between Ulaanbaatar City and Darkhan City, the second-largest city in Mongolia. The ADB's section is under construction while the EBRD's section is under tender for selecting contractors.

The Mongolian government has an idea to develop AH-3 bypass newly to run near the new airport, but its implementation plan has not been prepared. The work is expected to start when the Bogdkhan railway is developed.

2.5.8. Airport Officer Housing (600 Units) Development

The Civil Aviation Authority of Mongolia (CAAM) has planned to build 10 four-story buildings with 60 flats each (in total 600 units), a kindergarten for 150 pupils, and a clinic as the first phase of the housing development for airport staff. All infrastructures are intended to be connected to the airport, but NUBIA LLC has said that no infrastructure facilities can allow to use. In addition to the problem on the infrastructure connection, the project has been halted due to the lack of budget for the design work.

Source: CAAM

Figure 2-11 Plan on Airport Staff Housing (600 units)
(left: layout plan and right: water supply and sewerage plan)

2.5.9. ADB Satellite City Development Study

In 2019 ADB conducted an initial study to examine the potential of developing satellite cities in Ulaanbaatar. Based on the case studies of other countries on satellite cities and the current situation of Ulaanbaatar, including infrastructure development, economy and finance, the study recommended a development vision and development priorities. New Zuunmod was one of the satellite cities considered in the study.

The study was completed, but the report has not yet been finalized and made public. Based on the results of the study, ADB officials believe that the development of sub-centers in Ulaanbaatar City has a higher priority than the development of satellite cities.

2.6. Demand Forecast for Chinggis Khaan Airport

The new airport's design conditions in the examination report are shown in Table 2-4, and the quantitative effects are shown in Table 2-5.

Table 2-4 Demand Forecast for the New Ulaanbaatar International Airport

(Unit: passengers)

Item	2009	2014	2019	2024
Total demand forecast for international and domestic passengers	682,000	1,101,000	1,651,000	2,339,000

Source: SAPROF ※As of 2009, demand forecast for Buyant Ukhaa airport

Table 2-5 Quantitative Effect Operation / Effect Index

Index	Standard Value (Actual value as of 2005)	Target Value (2019) 【2 years after completion】
Lowest month takeoff and landing possibility rate (%)	73	98
Annual passengers (of which international) (10 thousand)	47 (34)	165 (138)
Annual foreign passengers (10 thousand)	11	45
Departures and arrivals per year (of which international) (frequency)	7,593 (3,546)	22,200 (14,500)
Delay/cancellation due to weather (%)	2.3	0.5

※ The annual passengers and foreign passengers are the total of departures and arrivals.
Source: Project review report

Table 2-6 summarizes the airport usage for the past five years; the number of passengers in 2020 decreased significantly due to the impact of COVID-19. NUBIA LLC's estimates assume recovery from the impacts of COVID-19 in 2024 and a return to the 2019 level.

Table 2-6 Use of Ulaanbaatar International Airport

(Unit: Thousand people)

	2016	**2017**	**2018**	**2019**	**2020**
Total number of international passengers	790.5	927	1,020.9	1,188.2	161.8
Total number of domestic passengers	232.6	325.1	401.6	433.4	285.67
Total Passengers	1,023	1,252	1,422.5	1,621.6	447.48

Source: National Statistics Office (NSO), (www.1212.m)

2.7. Review of the Airport Safety Regulation Zones

The airport safety regulation zones used in the Aero City MP were approved by the CAAM Director Order A/254 of 2010. However, the zones did not meet the requirements of the airfield design and planning standards and regulations, including the runway end safety zone requirements and the "Airfield Requirements" technical document approved by the Director General of CAAM and the Convention of International Civil Aviation (commonly known as the Chicago Convention) Doc 7300. Therefore, the sites of Safety Zones A and B and Obstacle Limitation Zones of the new airport were determined by MRTD and indicated in Ministerial Decree No. A/131 dated 16 July 2020 and entitled as "Aerodrome Planning and Operation" technical document. In the regulation of Safety Zone A, residential construction is prohibited within a radius of 4 km, and in Zone B food processing factories, for instance, are prohibited within a radius of 15 km. In addition, there is an altitude restriction of 45 m within the restricted zone, except for civil aviation facilities.

However, due to the inability of New Zuunmod development and other regional airports to comply with the regulation, such as the planned residential construction within a radius of 3 km in the Aero City MP, the scope of the regulation was reviewed again by MRTD. As a result, it issued Ministerial Decree No. A56 of 21 April 2021, which states that the radius

of Zone A remains at 3 km, while Zone B was changed to 8 km, which is narrower than before (see Table 2-7).

Table 2-7 Comparison of the Safety Zones

Safety Zone	Aero City MP	Ministerial Decree No. A56
A	3-km radius	3-km radius
B	10-km radius	8-km radius

Source: JICA Study Team based on CAAM's information

Table 2-8 Land Use Regulations in the Safety Zones

Land Use	Zone A	Zone B
Buildings		
Residence	×	○
Office	○	○
Commercial facility	○	○
Outdoor commercial facility	×	○
Cemeteries	×	×
Food factory (meat, flour, feed, etc.)	×	×
Hotel and mortel	○	○
Restaurant	○	○
Parking	○	○
Gas stand	×	○
Warehouse	○	○
Agriculture		
Agriculture	×	×
Growing seedlings	×	×
Animal husbandry and farm	×	○
Bird feeding and husbandry	×	×
Slaughterhouse	×	×
Field collection of livestock raw materials and bones	×	×
Fish farming	×	×
Wildlife Sanctuaries		
Bird garden and zoo	×	×
Hunting	×	×
Sports and Leisure		
Sports square (Golf, Tennis, Bowling, Gymnasium)	○	○
Leisure spot	○	○
Play ground	○	○
Naadam square, stadium, equestrian facility, outdoor circus	×	○
Temple	×	×
Tourist camp	○	○
Engineering Infrastructure		
Water treatment facility	×	○
Waste disposal site	×	×
Waste collection point	×	×
Quarry and open pit mining	×	×
High voltage lines	×	○
Thermal plant	×	○
Solar and wind power plants	×	○
Road, road facility, street lighting	○	○

Source: MRTD Minister Order No. A/131

3. Issues of New Zuunmod Development and Policy for This Study

3.1. Status, Challenges and Recommendations for New Zuunmod Development

3.1.1. Promotion of Feasible Satellite City Development

The future population to be allocated to satellite cities is expected to be 440,000 (15% of the metropolitan population), and this will require substantial incentives to encourage people to move to the satellite cities.

Strategic Development of Satellite City Development: The development of satellite cities in Ulaanbaatar was planned in the UBMP2020, and a city-specific plan for each was formulated. While the population of the six central districts of Ulaanbaatar increased by 1.3 times (210,000 people) since 2013 when the UBMP2020 was approved, the population in the three enclaves, where relatively more investment has been made than the other satellite cities, increased only slightly by about 1.1 times. Considering this development trend, it will be quite difficult for all satellite cities to attract population and industries by the year envisioned in UBMP2040.

Based on UBMP2040, many projects will be developed at the same time. This will lead to competition among satellite cities (for population and industrial attraction) and for development budgets. There is a risk that all of them will not reach even halfway through. Considering the above constraints, developing satellite cities should be strategic and focus on specific areas.

Development as an international gateway city: Figure 3-1 shows the SWOT analysis for Khushig Valley. While the weaknesses and threats are common to any satellite city, the strengths and opportunities are unique to Khushig Valley, especially New Zuunmod, which is the only place that meets the requirements of a potential international gateway. The new international airport, followed by the development of the Bogdkhan railway and AH-3 bypass, will make New Zuunmod a nexus of three modes: airport, rail, and road. Thus, it has a high development priority among the planned satellite cites. It is important to promote the development of New Zuunmod based on this characteristic of an international gateway (industry/cargo and business/tourism/passenger) that maximizes its strengths and opportunities and minimizes its weaknesses and threats.

Strengthening Public Transportation Access to Ulaanbaatar City: To promote the development of New Zuunmod as an international gateway city, it is essential to strengthen public transportation access to/from Ulaanbaatar City. Especially for satellite cities in general public transportation access to the mother city is important. It is currently very difficult for airport workers to commute from Ulaanbaatar. For tourists and other airport users, the ability to travel to the center of the capital city comfortably and safely by public transportation is one of the factors to promote tourism.

Strength	Weakness
• Being the international airport so an airline gateway. • Locating about 50 km from the central part of the UB and can be accessed in about an hour, and about 30 minutes from with New Yarmag city center. • Being one of Ulaanbaatar (UB)'s satellite cities and expectations are high as a new satellite city will absorb some of development pressure in UB. • The government obtains and secures the land so can carry out systematic urban development. • Availability of an abundant space. • Being an access hub for Mandalgobi and Dalanzadgad (access to OT/TT, Gobi Desert Tourism).	• Underdeveloped public transport to the UB. • Shortage of water. • As a new urban development, basic infrastructure investment cost is high. • There are only a limited industry and the low residential demand in the surrounding area.
Opportunity	**Threat**
• It is undeveloped area, so new ideas can be developed for urban development, logistic base and industrial location. • The government plans Bogdkhan Railway development and AH-3 bypass (international highway) to connect to the new airport, which locates on the China-Russia logistics network. It has a high potential to become a gateway for land transportation (railways and roads). It can also serve as a transit point for the logistics of the China-Mongolia-Russia-Europe Economic Corridor. • It is located on a circular route connecting UB, Yarmag, Zuunmod, and Nalaikh. • It will serve as a hub for foreign tourists and MICE. • Development policy linked with environmental improvement of UB can be introduced, as a new satellite city to be required to contribute to solving problems such as traffic congestion and gas emission, influx of large cars and inefficiency of logistics by dotting distribution facilities, deterioration of living environment by dense population, progress of unhealthy urban development such as sprawl in ger areas and so on, so.	• Because of its small population and high risk, it is difficult to attract foreign investment. • Mongolia's industry, especially manufacturing, is weak, and the export industry, in particular those requiring airlift, is limited. • Freight volume, especially air cargo, is small and is likely to compete with other logistics hubs, especially Nalaikh, Emeelt and Bagakhangai, which are located at the entrance of UB City. • Domestic industrial scale is limited, and competition is likely to occur in industrial estate development. • A number of development projects is planned, and development may be halted depending on government priorities. • Smaller cities are likely to fail because of their small economy scale.

Source: JICA Study Team

Figure 3-1 SWOT Analysis for Khushig Valley Development

3.1.2. Promotion of Khushig Valley Development including New Zuunmod

In 2020, the combined population of Zuunmod and Sergelen soum center was 17,921, which was about 20% of the total population of Tuv aimag (93,162) and only a little over 1% of Ulaanbaatar's (1,499,140). In terms of industrial production, Tuv aimag is only 1% that of Ulaanbaatar City, indicating that the scale of industries around New Zuunmod is overwhelmingly small compared to that of Ulaanbaatar City. Currently, the area around New Zuunmod has a limited number of industries, and because it is 50 km away from the center of Ulaanbaatar City, it is not a commuter town for the capital and has limited housing demand.

Promotion of Regional Development in Tuv Aimag: To alleviate the concentration of population and industries in Ulaanbaatar City, it is important to promote regional development in Tuv aimag to encourage the location of population and industry there. Zuunmod is the capital of Tuv aimag, and the development of the Khushig Valley area, including Zuunmod, is a good opportunity for Tuv aimag to develop. For the advantages of urbanization based on economies of scale and agglomeration of Ulaanbaatar City, regional development in Tuv aimag should be given higher priority than dispersing urban functions and industries to Darkhan City, the second largest city in Mongolia, and Erdenet City, the third largest city in Mongolia.

The core of Tuv aimag's regional development is the Khushig Valley area development being promoted by the Mongolian government. The cores of this area development are Zuunmod City, the capital of Tuv aimag, and New Zuunmod around the new airport. The integrated development of Khushig Valley will further enhance the attractiveness of New Zuunnmod and increase the attraction to the city.

Urban Development with Proximity to Jobs and Housing: To relocate people to New Zuunmod, it is necessary to develop a comfortable and good living environment that is

equal to or better than in Ulaanbaatar. Since New Zuunmod is 50 km away from Ulaanbaatar City, it is also essential to provide housing and generate jobs within the city.

Industrial Attraction: There is a huge economic gap between Tuv aimag and Ulaanbaatar City. Therefore, to relocate industries to New Zuunmod from Ulaanbaatar, it is important to have strategic policies such as those related to the division of urban functions in the capital city, as well as those on industrial attraction and relocation incentives for industries. In addition, it is necessary to regulate the establishment of target industries in Ulaanbaatar City. Chapters 4 and 5 of this report provides more information on these issues.

3.1.3. Promotion of Development of High Quality Living Environment

The future resident population of Khushig Valley is expected to be eight times higher than the current resident population or 144,000 residents in total as planned. (New Zuunmod: 34,000; Zuunmod: 70,000; and Maidar: 40,000 (including Sergelen soum: 3,500)).

Looking at the population of Ulaanbaatar City as a whole, the growth rate from 2000 to 2010 was 1.6 times, and from 2010 to 2020, it was 1.3 times. Bayanzurkh, Khan-Uul, and Songinokhairkhan districts had the highest growth rates. Bayanzurkh and Khan-Uul districts in particular, increased rapidly, i.e., by about 1.8 times from 2000 to 2010 and from 2010 to 2020, respectively. In Bayanzurkh district, there are apartment developments in Bayanzurkh 26 khoroo between Narnii Road South and National Park, in Bayanzurkh 14 khoroo around Narantuul market and the ger area around Natur Road, north of Narnii Road. In Khan-Uul district, there are apartment developments in the Zaisan area, and more recently in the Yarmag area and around the National University of Public Administration, west of Marshall Bridge. In these areas, reputable private schools are also located.

The average prices of new apartments in Ulaanbaatar City have continued to rise even under the Covid-19 situation, reaching 2.78 million MNT/m^2 in September 2021. In Khan-Uul district, which accounts for 48% of the new apartments available for reservation, many apartments are sold at more than 3 million MNT/m^2, which is higher than the above average price. Even some apartments are sold at almost double the average price. However, it should be noted that there are many units that have not yet been sold. The housing that is said to be most in need is low-priced housing, of which there is little supply.

Looking at the population of Zuunmod City, on the other hand, the rate of increase was lower than that of Ulaanbaatar City, at almost flat from 2000 to 2010, and was 1.2 times from 2010 to 2020. Recent housing prices are 1.5-1.6 million MNT/m^2, nearly half the price of Ulaanbaatar City, and have not generated the same demand as in Ulaanbaatar City. Like Zuunmod, since New Zuunmod is located far from the center of Ulaanbaatar City, it will not generate the same housing demand as the one in Ulaanbaatar City.

Housing Environment to Promote Relocation: To increase the population in New Zuunmod, it is necessary to provide high-quality living environment while being affordable for the residents of Ulaanbaatar to relocate. The interview with NUBIA LLC revealed that there are limited number of shops, even supermarkets, in Zuunmod, and many employees commute from Ulaanbaatar City because they are not satisfied with the living environment there. As this demonstrates, Ulaanbaatar citizens have a strong preconception that Zuunmod is an inconvenient environment with nothing to offer. On the other hand, there are young households with children, showing interests to live outside of Ulaanbaatar City to avoid air pollution. Therefore, it is important to implement a housing development with a good living environment that enhances the value of New Zuunmod and promotes relocation so that urban development can steadily be realized.

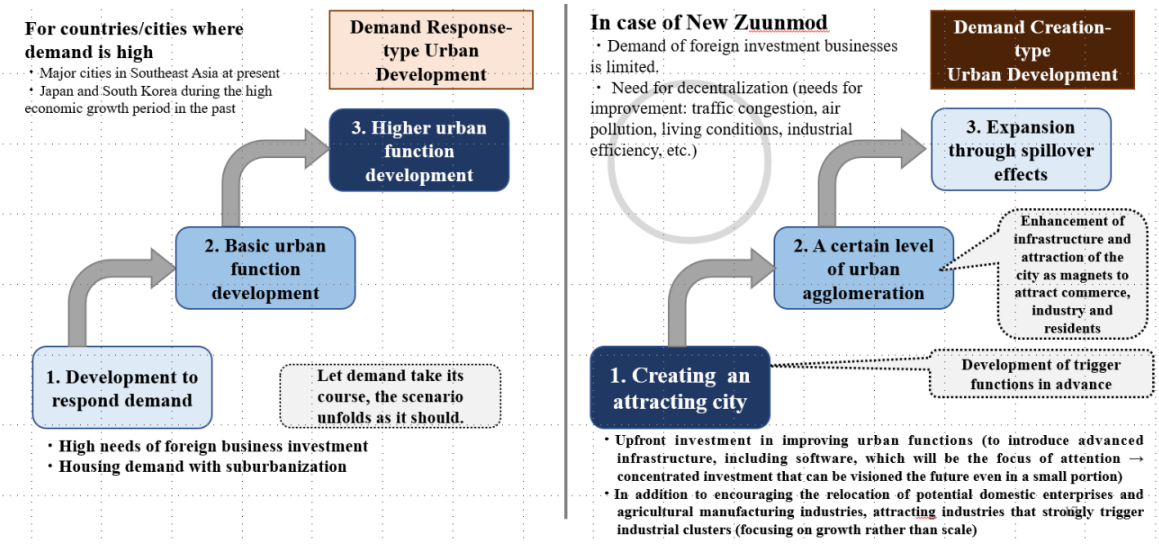
3.1.4. Promotion of Government-led Development and Land Use Regulation

Mongolia's situation is unlike that in other Asian countries. The population density of

Ulaanbaatar City is 340 people/km^2, which is much lower than that in other Asian metropolises, such as Metro Manila in the Philippines (12,330 people/km^2), Jakarta in Indonesia (9,756 people/km^2), and Bangkok in Thailand (5,336 people/km^2) in 2020. In these metropolises, Japanese companies are actively expanding their businesses; especially foreign investment inflow is very high; housing and office demand is high; and selling and renting real estate are easy.

Government-led Urban Development: In Mongolia, business investments and housing demand are even much lower outside of Ulaanbaatar's six central districts. Thus, in the initial stages of New Zuunmod's development, the Mongolian government must lead urban development to generate demand until private demand emerges (see Figure 3-2).

In Mongolia, infrastructure development at the initial stage is important for private companies to develop real estate. In Yarmag, roads and other infrastructure are being developed using government budget. Yet, the development of the area is becoming a bit overdeveloped due to insufficient government control. Individual, private-led developments in other districts in Ulaanbaatar have also resulted in severe traffic congestion due to inadequate road development. Unless the government succeeds in its investment, control, and management, overdevelopment will occur and the city will not be able to develop according to the government's plan. As a reflection on the past urban development in Ulaanbaatar, it is important for the government to take the lead in developing the infrastructure.



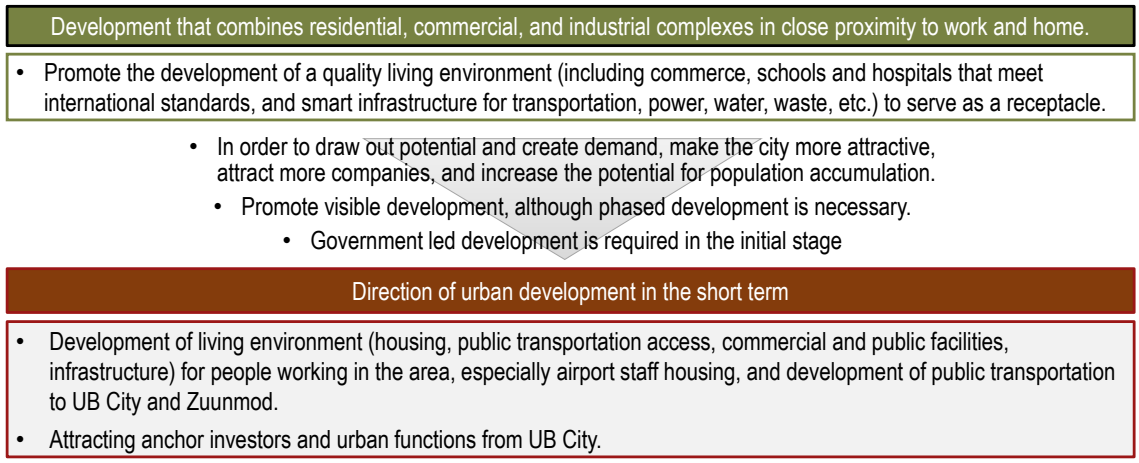
Source: JICA Study Team

Figure 3-2 Differences between Demand Response-type Development and Demand Creation-type Development

Securing the Long-term Rights to Special-use Land: In areas where demand exists, it is possible to recover the cost of infrastructure development even if infrastructure that meets a high demand is built in advance. On the other hand, in the case of New Zuunmod, it is not possible to make such an upfront investment on a large scale, so urban development by phase is necessary. It is important to limit infrastructure development to a minimum in the initial stage, and to focus the investment on area where demand is assured, until such time when the demand becomes self-sustaining. Since urban development is a long process with an indefinite timetable, it is important that the government does not redistribute the rights to special-purpose land in the future. Moreover, it is also essential that land rights holders develop the land with government permission and based on the masterplan. Thus, there is a need to establish strict penalties for violators.

3.1.5. Recommendations to Address Urban Development Challenges

In light of the aforementioned urban development challenges, Figure 3-3 summarizes the direction of short term development the JICA Study Team proposes.



Source: JICA Study Team

Figure 3-3 Direction of Urban Development in the Short Term

3.2. Challenges and Recommendations about Project Risks

Table 3-1 summarizes the project risks that were identified in this JICA study and the recommended actions. Although the Mongolian government is in a hurry to implement the development project on New Zuunmod, there are many issues that need to be addressed as the plan is still in the preparation stage.

Table 3-1 Challenges and Recommendations about Project Risks

Risk Associated with	Challenge	Action to Take
Administrative Boundary	• The boundary of New Zuunmod has not yet been decided. • New Zuunmod is currently under the jurisdiction of Tuv aimag, but as a satellite city of Ulaanbaatar City, there is a move to put it under the jurisdiction of Ulaanbaatar City.	• Determine administrative boundaries and delineate responsibilities for the infrastructure through discussions among various government levels, i.e., national, Tuv aimag, and Ulaanbaatar City.
Land Rights	• Some private parties hold the rights to the land, and expropriation will take time.	• Implement land expropriation in accordance with the law. • Carefully explain and consult with residents based on New Zuunmod development project plan with high accuracy (future-oriented measures, e.g., livelihood security, job training, provision of new jobs, etc.). • Conduct environmental and social impact assessment.
Bogdkhan Railway Development	• Delayed development of Bogdkhan railway.	• Prepare a feasible project implementation plan (construction period, project cost, financing, and project schedule). • Revise the Aero City MP with the Bogdkhan railway as a milestone.

Risk Associated with	Challenge	Action to Take
Basic Infrastructure Access	• Only the facilities for the airport are in place, and the infrastructure for New Zuunmod is not yet developed. Since the airport infrastructure cannot be used, coordination on infrastructure connectivity is required. • Basic infrastructures, except for power and telecommunications, need to be developed under the jurisdiction of the local government. Depending on the decision of the administrative boundary, Tuv aimag might not have jurisdiction over New Zuunmod. • Power is nearing its capacity.	• Secure financial resources to develop basic infrastructure. • Determine administrative boundaries and delineate responsibilities for the infrastructure. • Introduce green infrastructure and passive building technology.
Regime Change	• Government officials and decision-makers change every four years, and such a change often stops a project.	• Establish a law (New Zuunmod or Khushig Valley Development Law) to promote development so that it is not influenced by changes in government.
Plan	• The project implementation schedule tends to be politically motivated. • The estimated construction cost is underestimated and project funding is insufficient. • Inadequate project planning, including construction and financial resources, implementation structure, and phasing. • Although an industrial park is planned, only a limited number of companies are considering investing there at the initial time, partly because the details have not been finalized. • The vision of New Zuunmod's functions and facilities is not uniform among the parties concerned.	• Prepare highly accurate and practical business plans that take into account industrial investment policies. • Ensure that project funds are secured at the time the plan is approved. • Formulate an industrial promotion strategy that is linked not only to spatial planning but also to industrial policy. • Unify the development direction among the parties involved, and create a consensus building scheme for this purpose.
Implementor	• The project implementation structure and the division of roles among related organizations within the government are unclear. • New urban development is a new project for Mongolia, so there is limited knowledge on how to implement the project.	• Establish a business promotion system. • Formulate the New Zuunmod (or Khushig Valley) Development Law. • Build capacity of related officials.
Finance Procurement	• Although the Khushig Valley development will be included in the PIP list, financial resources have not been secured as neither the F/S nor the detailed plan has not been formulated. • Government budget is limited. The amount that can be borrowed is also limited due to the loan ceiling. On the other hand, PPP has not functioned well so far.	• Secure government commitment. • Establish a highly viable project financing scheme based on accurate business plans and risk analysis. • Create an environment that facilitates investment by the private sector, such as by providing government guarantees for PPPs. • Establish a new financing scheme.
Development Sprawl Outside the	• Overdevelopment is expected around the special-use land expropriated by the State, as can be observed especially	• Regulate and control the acquisition of land rights in the vicinity by formulating the New Zuunmod (or

Risk Associated with	Challenge	Action to Take
Project Site	along the road between New Zuunmod and Zuunmod and between Zuunmod and Ulaanbaatar City.	Khushig Valley) Development Law, or include the land in the planning area and expropriate it as part of special-use land.
Attracting Industries	• There is no anchor company and no company will invest because the existence of a plan does not ensured implementation.	• Consider strategies for attracting new businesses. • Identify industries to attract and incentives appropriate to them. • Improve investment environment in general.
Demand	• Planned commercial and industrial facilities, housing, etc. cannot be sold or leased.	• Examine the long term demand under F/S. • Consider real estate product design, pricing, marketing and sales methods that meet the needs of the market. • Phase construction and sales in response to market risks.
Rights	• The development method, the land rights for the project site, and the method of granting project rights to the private sector have not been determined.	• Formulate the New Zuunmod (or Khushig Valley) Development Law.

Source: JICA Study Team

3.2.1. Revision of Aero City MP

According to MCUD, the Aero City MP is expected to be revised based on the Khushig Valley Comprehensive Plan. The above-mentioned measures against risks need to be integrated into the plan.

3.2.2. Formulation of the Project Implementation Organization

Regarding the implementation structure, the challenges are: (1) weak capacity for industrial development and financial planning and (2) uncertainty about the development initiative and decision maker. Thus, setting the organizational arrangement needs to be done in two steps:

Establish the New Zuunmod (or Khushig Valley) Development Management Committee: To position and promote the development of New Zuunmod (or Khushig Valley) as a national priority project, it is desirable to establish a management committee under the Cabinet Secretariat as a cooperative scheme among related ministries and agencies. It is also desirable to have Ulaanbaatar City and Tuv aimag as members of the committee. The committee should be established in the project's planning stage.

Establish the New Zuunmod Development Corporation for the Implementation: The New Zuunmod Development Corporation is recommended to be established in the implementation stage. In Mongolia, government agencies have a limited number of staff, and they are busy with their regular work. Their main task is policy making, which is different from the expertise required for project implementation. Thus, it is more practical to use public corporations for this. Experts from relevant ministries and agencies, as well as staff from the private sector with experience in implementing new urban development, should be hired to handle land, operations, preparation of development plans and securing of budgets, preparation and implementation of policies related to labor and employment, and safety management. As for the structure of the public corporation, the establishment of a special purpose company (SPC), either by the government or by soliciting private sector

investment, is also possible, but further study is necessary because development must be led by the government.

3.2.3. Formulation of New Zuunmod (or Khushig Valley) Development Law

The boundary of New Zuunmod is not yet clear. Initially, 12,000 ha of New Zuunmod was designated as a special-use land, but 19,000 ha surrounding it is being expropriated for the development of Khushig Valley.

And whether the jurisdiction over New Zuunmod belongs to Ulaanbaatar City or to Tuv aimag, the government needs to deeply consider the future development of the region and clarify this in the early planning stage.

Since it is difficult to solve the population concentration in Ulaanbaatar City, it is necessary to consider the integrated development of the capital city and Tuv aimag as a metropolitan area. The central government will play a major role in the development of New Zuunmod, as the mechanism for regional administration has not yet been established. In particular, it is necessary to consider industrial policies and business attraction strategies in spatial planning, and cooperation among related ministries and agencies across sectors is essential.

To clarify the boundary and the scope of the New Zuunmod development and the division of roles among the relevant government agencies, it is necessary to formulate a New Zuunmod (or Khushig Valley) Development Law. The issues summarized in Table 3-1 should be also clarified in the law, including the project implementation entity, securing of financial resources, monitoring system, land disposal, and cooperation mechanism with the private sector.

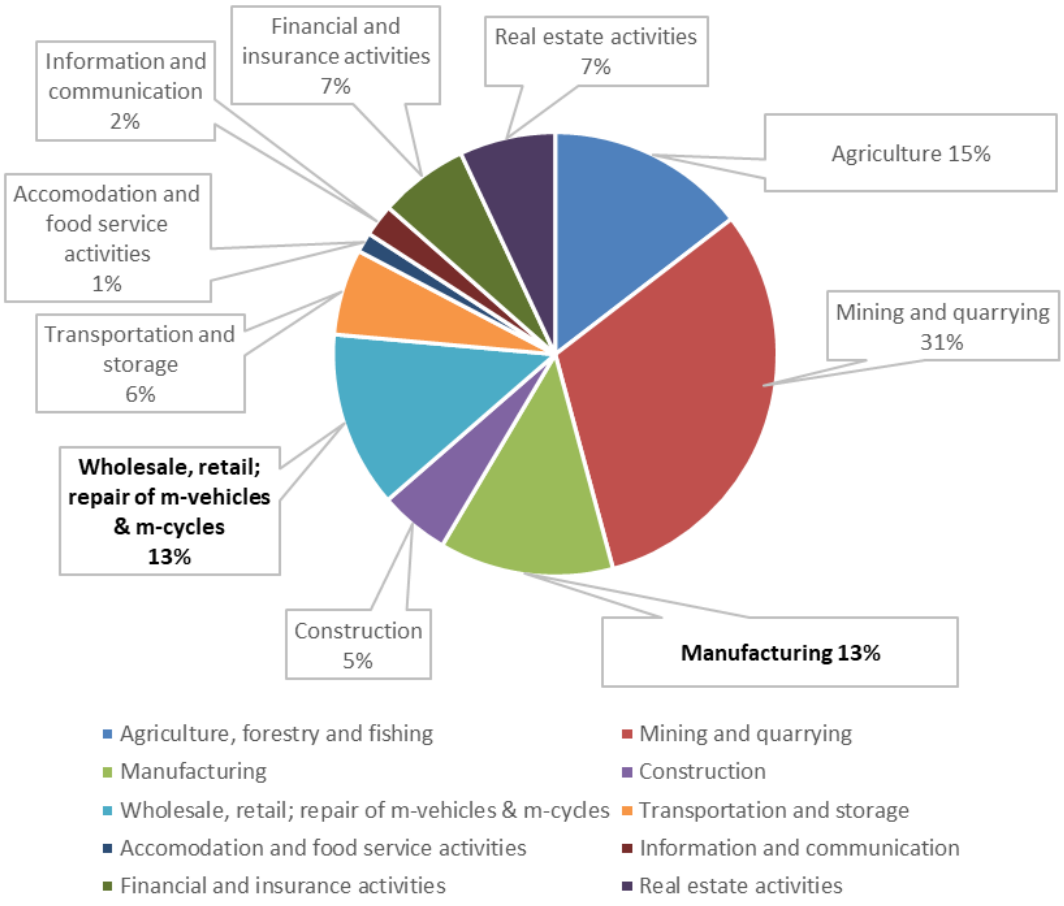
4. Analysis of Industrial and Investment Trends

4.1. Status, Challenges, and Recommendations for Industrial and Investment Trends

4.1.1. Industrial and Investment Trends

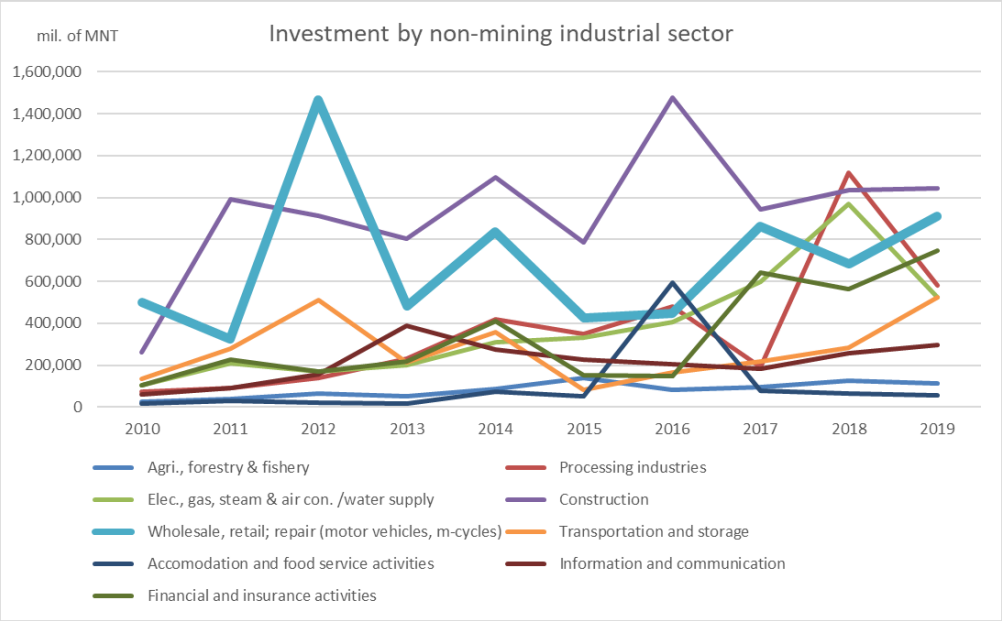
The key trends based on statistical analysis are as follows:

- ✓ GDP: Mining (31%), agriculture (15%) and manufacturing/commerce (13%);
- ✓ Export: Livestock (unprocessed wool and skin at 4.9%), followed by mining;
- ✓ Import: Share of passenger cars and trucks is large (28.6%);
- ✓ Investment (excluding mining): The percentage of commerce, finance, and transportation increased, and manufacturing declined; and
- ✓ Foreign Direct Investment (FDI) (excluding mining): The percentage of commerce, finance, construction and service increased, and others declined.



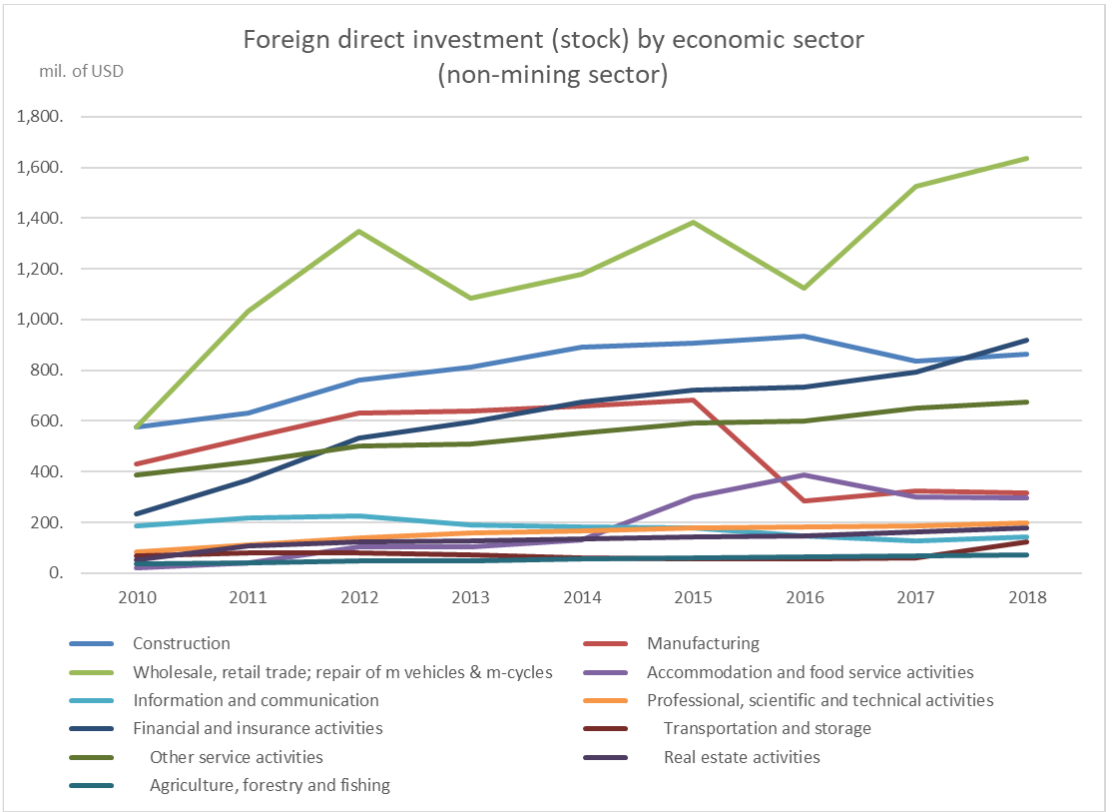
Source: JICA Study Team based on NSO data

Figure 4-1 2019 GDP by Industry



Source: JICA Study Team based on NSO data

Figure 4-2 Investment by Non-Mining Industrial Sector



Source: JICA Study Team based on NSO data

Figure 4-3 Foreign Direct Investment by Economic Sector (Non-mining Sector)

As a result of the statistical analysis of key trends, the following facts are identified:

- ✓ Expectation of attracting the target manufacturing industries is low;

- ✓ Commercial sector has increased; and
- ✓ The second most important economic sector (including exports) after mining is livestock industry.

To promote industrial development, the following findings should be considered in an industrial development plan for New Zuunmod:

- ✓ Relocating industries, dispersing logistics, and attracting commerce from Ulaanbaatar are realistic; and
- ✓ In terms of other development areas and industries, competition/demarcation with Nalaikh and Emeelt should be considered.

As a result of the analysis based on the above, the following issues are identified:

- ✓ For the industrial sector, even if the manufacturing plants in the Khan-Uul area of Ulaanbaatar (production value: about USD337.8 mil., employees: 9,910) are relocated to the New Zuunmod's development area (1,188 ha), it will only account for roughly 18% of the area (fully relocating large enterprises, such as APU, is unrealistic); and
- ✓ Nalaikh and Emeelt are already grouped under light industry/furniture and leather/chemical sectors, respectively, so the chance to invite these sectors in New Zuunmod is small.

4.1.2. Challenges and Recommendations for Industries and Investment

Based on an analysis of trends in the industrial and investment sectors, the issues are summarized as follows:

- ✓ Export industries, especially those requiring airlift, are limited;
- ✓ Foreign investment is limited;
- ✓ Expectations of attracting manufacturing are low;
- ✓ The commercial sector has increased; and
- ✓ The second largest economic resource (including exports) is the livestock sector after the mining industry.

Countermeasures to address the issues are recommended, as follows:

- ✓ Identify the industries to be directed to New Zuunmod.
- ✓ Focus on industries targeting the domestic market ⇒ Fostering of import substitute industries.
- ✓ Focus on tourism as a means of earning foreign currencies, and consider measures to increase the number of passengers rather than logistics.
- ✓ Strengthen potential export industries.
- ✓ Focus on target industries that can attract foreign capital.
- ✓ Attract industries and investment based on the current situation and prospects.
- ✓ Attract industry/commerce and investment considering the value chain.
- ✓ It is realistic to relocate industry, logistics and commercial from Ulaanbaatar City. However, it is necessary to assign complementary functions of other development areas, especially Nalaikh and Emeelt, to avoid competition.

4.2. Potential Investment Industries

Attracting industries and investment based on current conditions and potential is required. Promising industries (candidates) to be guided in the short term are listed as follows based on the current trend and the government policies:

- ✓ Large commercial facilities;
- ✓ Passenger cars, trucks, and other automobiles (including repair): Imported car sales and automobile repair parts, ICT parts in light of the future shift to CASE (Connected, Autonomous, Shared & services, Electric) vehicles or EVs (electric vehicles);
- ✓ Tourism, cultural and creative industries: MICE;
- ✓ ICT: Fintech (blockchain technology), EC (electronic commerce), smart grids for renewable energy, etc., ICT related to traceability/health management aspects of livestock, etc.;
- ✓ Food processing sector (especially beverages and meat processing): Meat and processing for export;
- ✓ Livestock processing: Raw wool, raw hides and their processing;
- ✓ Pharmaceutical products (traditional medicines, import and sales of products); and
- ✓ Advanced technology: Technological and agricultural institutions, universities, etc.

4.3. Investment Demand Survey

For the above mentioned industries, an investment demand survey was conducted through interviews, targeting 21 companies for each sector, five government organizations, and four business associations. Besides two stakeholder meetings were held with the Japan Chamber of Commerce and Industry in Mongolia and ICT incubators. A questionnaire survey to ICT start-up businesses was also conducted.

4.3.1. Survey Results

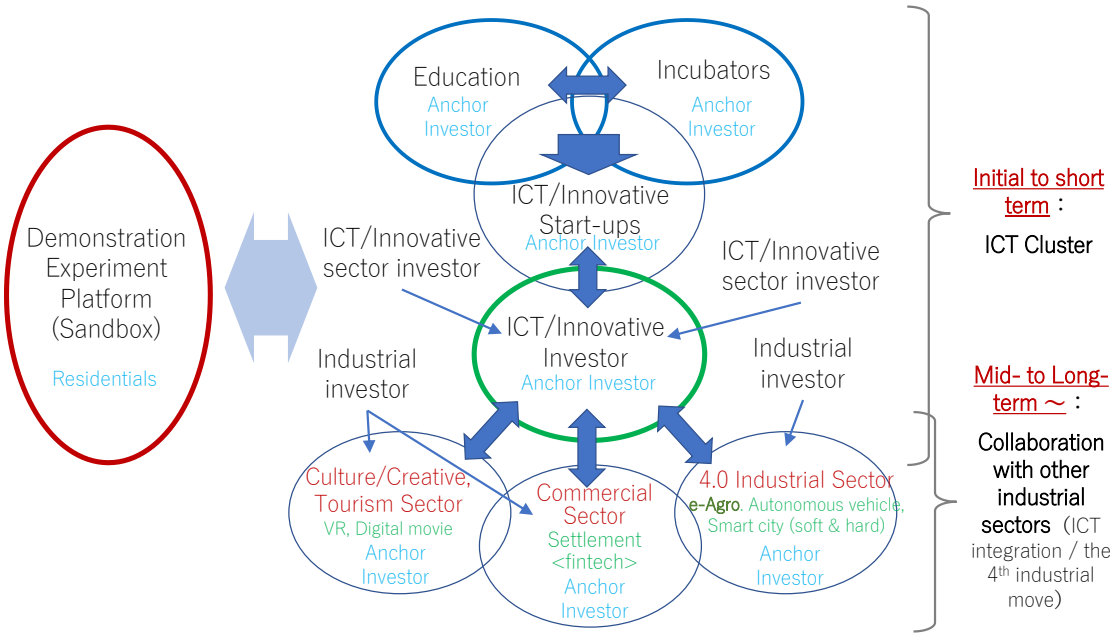
In the interviews and stakeholder meetings, most private companies said that the Khushig Valley Comprehensive Plan is not yet ready for investment, as the plan is not yet finalized, there is no clear structure yet in place to ensure the consistent implementation of the development without changes in government policy, and the differentiation and advantages of Khushig Valley for development are unclear at this stage. The interviewees are not yet in the stage of considering investment. However, if the infrastructure, legal environment, and guarantees and incentives expected by investors are superior to those of other development areas, and if they can be maintained after investment, then investment can be considered.

4.3.2. Development Possibility from the Investment Aspect

The proposed Khushig Valley Comprehensive Plan does not envisage urban development anchored on attracting industries, especially manufacturing, at this stage. If population relocation through industrial agglomeration is to be considered, it is considered realistic to based it on making New Zuunmod as a logistics center especially with the planned location of the Bogdkhan railway there.

The investment demand survey showed that the majority of the respondents would wait until the investment environment, market, and other conditions have improved. Attracting anchor investments in the initial development stages of New Zuunmod is expected to trigger subsequent industrial investment.

The investment demand survey also confirmed the possibility of considering new investments by ICT-related organizations and companies. The ICT sector has the potential to stimulate demand of other sectors. In the short term, ICT cluster can be formulated as an anchor, gathering incubators, educational institutions in the ICT field, R&D, ICT companies and start-up companies (see Figure 4-4). For this, a business complex with laboratories needs to be developed.



Source: JICA Study Team

Figure 4-4 Concept of ICT Cluster Development

Yet, a possibility of the ICT cluster development is for areas other than the center of Ulaanbaatar City, not for New Zuunmod specific. Therefore, to promote ICT cluster development in New Zuunmod, it is necessary to develop distinctive advantages and incentives specific to the area. For example, it is necessary to differentiate the residential area for airport-personnel (600 units), which has relatively high feasibility, by opening it up to the ICT sector as a platform for demonstration in a sandbox[4]-like environment. Moreover, if the potential investment interest and needs of this sector are to be organically linked to the development of New Zuunmod, the concentration of incubators and ICT educational institutions, as well as the concentration of start-ups and small and medium-sized ICT companies, must be promoted in parallel.

The results of the investment demand survey also show that there is room to consider investment if the conditions and profitability are met. Once an ICT cluster is formed, the benefits of ICT collaboration are recognized as a differentiating factor for New Zuunmod, and a preferential system is in place to ensure profitability, the initial strategic sectors can be attracted in the medium to long term.

The ICT cluster development will be the priority for New Zuunmod development. If this ICT cluster can be made, a differentiating factor in attracting industries in the medium term, the synergy with the expected development of Bogdkhan railway and the construction of a logistics center will give it a significant advantage over other developed areas.

[4] Sandbox is a type of software testing environment that allows software or programs to be run in isolation for independent evaluation, monitoring, and testing, and the term is used in the IT sector.

5. Analysis of Free Zones and Special Zones

Fundamentally, the issue for introducing free zones (FZ) in New Zuunmod, where industries from Ulaanbaatar are expected to relocate, to promote new industries and to be designated as a satellite city with residential areas is different from the existing FZs located on the border. This chapter, therefore, proposes how to develop a new special zone that is different from existing FZs. Based on a review of the existing laws (Section 5.1) and the challenges FZs currently face (Section 5.2), the development concept of a new zone is presented (Section 5.3), as well as the measures to address expected obstacles it may face (Section 5.4).

5.1. Current Legal Framework for Free Zones

Existing laws relevant to FZs are summarized in the table below.

Table 5-1 Relevant Laws and Key Issues

Relevant Law	Issue
Law on Free Zones	• The law does not specify cooperation between private companies and governments in the development of FZs, and their rights and responsibilities which is a common trend in successful international FZs. • In particular, the development should be carried out with the strong, long term government support, but while the responsibilities of the government including securing funds are not stipulated, the private sector shall bear the risk that the registration shall be canceled if business operation cannot be started within a certain period of time. • Incentives are not attractive because there is no regulation tailored to respective FZs which have distinct characteristics such as location, market, population, and regional development plan. • Incentives are common in all industries and do not aim to attract specific industries or businesses.
Law on Business Entity's Income Tax	• In 2019, stipulations of incentives on income tax in Law on FZs were transferred to law on business entity income tax. • Corporate income tax of up to 50% of the investment amount can be reduced for the investment in infrastructure with USD500,000 or more, and investment in the transportation, tourism, and manufacturing industries with USD300,000 or more. • In addition, the loss reported in the tax return of a business entity that made investment in an FZ shall be deducted from taxable income for the period of consecutive four tax years following the completion of construction project and start of operations.
Law on Investment	• Chapter 4 of the law stipulates investment promotion, tax and non-tax incentives. Article 11 (Tax incentives) stipulates that depreciation expenses and employee training expenses shall be deducted from taxation as well as tax exemptions, but details shall be stipulated by the General Tax Law. • Article 12 (Non-tax incentives) stipulates assistance for investors in FZs, relaxation of registration and the checkpoint process, support for the implementation of innovation projects, and guarantee of financing for production of innovative products for exports. • Chapter 5 (Stabilization of Investment Environment) stipulates that a "Stabilization Certificate" shall be issued to clarify the investor protection environment and that the stabilization certificate shall guarantee tax rates regulated by this law for 2 to 18 years depending on the investment scale and investment target.
Law on Concessions	• Law on Concessions stipulates matters for giving investors interests in properties owned by the national and local governments. • In practice, most PPPs were Build-Transfer (BT) projects which caused the deferral of off-the-book liabilities. The implementation of BT projects placed a financial

	burden on the government. Based on this experience, a government resolution freezing all BT projects was issued in 2016. • The government has been discussing amendments to the law to formulate and implement more feasible PPP projects. As of December 2021, a draft PPP law which is to replace the law is under discussion in the Parliament.
Law on Legal Status of Ulaanbaatar City (amended in 2020)	• Law on Legal Status of Ulaanbaatar City amended in 2020 specifies that SEZs may be established in satellite cities of Ulaanbaatar City in article 38 of Chapter 6. Article 39 defines that functions (sectors) of the SEZs shall be IT, innovation, tourism, culture, arts and leisure, greenhouse farming, light industry, food industry (excluding production of alcohol and cigarette), repair, maintenance and assembly of aircraft. • The law also stipulates that the mayor shall be the head of the SEZs. The cabinet shall define the areas and locations and then the Ulaanbaatar City Council shall approve SEZ masterplans. Incentives of the economic zones are specified in Articles 42 and 43.

Source: JICA Study Team

5.2. Status and Challenges faced by Free Zones and Recommendations

5.2.1. Status and Challenges

There are three FZs in Mongolia, i.e., Altanbulag in the north near the border with Russia, Zamyn-Uud in the south near the border with China, and Tsagaannuur in the west. Among three existing FZs, Altanbulag (from 2014) and Zamyn-Uud (from July 2021) operate on a regular basis but hardly recognized as successful. The reasons are as follows:

- Incentives are not attractive enough for investors for FZs in Mongolia that have disadvantages of limited market and high logistics cost;
- Dilemma over lack of progress in infrastructure development due in turn to limited number of industrial locators;
- Limited financial support and commitment from the Mongolian government, resulting in lack of practical phased development plans; and
- Vicious cycle of changes in policies and incentives which have disappointed investors, resulting in slow progress in the number of industrial locators.

In Mongolia, the budget allocation for these FZs from the government is not stable. There have been lengthy periods of no budgetary allocations which have made the FZs less attractive to investors.

5.2.2. Recommendations for the New Zuunmod Free Zone

Considering the above issues and the industrial and investment analysis in Chapter 4, the following are recommendations for the new special zone in New Zuunmod:

- Attract domestic companies, including export and trade industries, as well as industries targeting domestic markets and import substitution industries, especially encouraging relocation from Ulaanbaatar;
- Set specific industry promotion policies and incentives to attract Ulaanbaatar-based industries;
- Set preferential policies focusing on target industries including those that can attract foreign capital;
- Establish a special zone in New Zuunmod that is different from the FZs under the existing FZ Law and set preferential measures for industrial locators; and
- Promote an enabling environment, which establishes a set “rules of the game” for

investors willing to locate in New Zuunmod, a greenfield project, through transparent legislative frameworks and financing structures, and political commitment.

It is necessary to develop a special zone that is not bound by the FZ Law to pursue the recommendations above.

5.3. Development of a Special Zone

The three existing FZs have not been successful in attracting manufacturing industries under the current FZ Law and policy framework. They have taken many years to open, the basic infrastructure has not been developed, and the number of registered companies has been small. Therefore, instead of developing New Zuunmod within the confines of a FZ, it is desirable to create a new special zone in line with the characteristics of the target industries for New Zuunmod to attract specific industries. To this end, it is necessary to design the special zone from the two points of view.

5.3.1. Introduction of a Strategic Special Zone

In view of the aforementioned challenges faced by the existing FZs, the characteristics of the Khushig Valley development, and the need to attract both existing and new industries to relocate/locate to Khushig Valley, the JICA Study Team recommends that the whole area to be designated as a Strategic Special Zone (SSZ).[5]

The existing FZs in Mongolia aims for trade promotion and are to determine the location and set the incentives in fenced-off areas. On the other hand, the SSZ aims to create a business-friendly environment[6]. It will have a sandbox-like environment in line with the characteristics and development policies of the region to attract strategic industrial sectors to form a cluster and strengthen their international competitiveness.

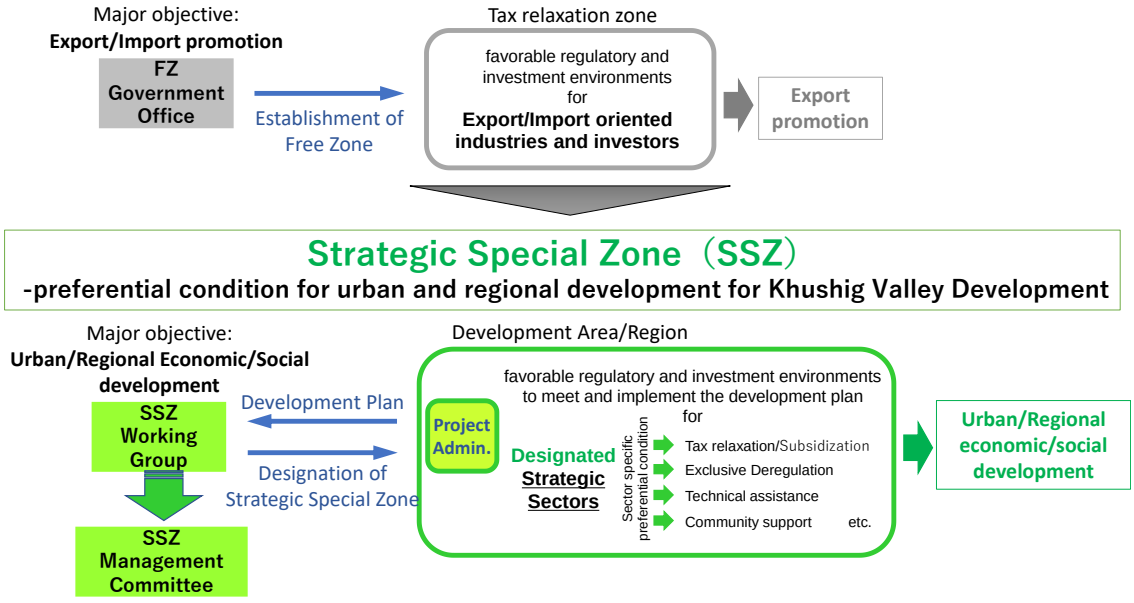
On the economic side, the main objective is to promote the local economy through the revitalization of local industries and the attraction of industries to the region by providing a range of incentives, including tax incentives, to benefit the target industries. The preferential system is characterized by its aim to achieve deregulation expected by the target industries on a regional basis (Figure 5-1). The development body that will draw up the masterplan will establish the specific plan detailing the economic aspect (e.g., the preferential system, timetable, deregulation to stimulate industry, etc.,) and the social aspect (e.g., housing and other infrastructure). It will be desirable for the appropriate government or public body to approve the plan and designate the area as an SSZ.

Once the above actions are done, a special purpose company (SPC) will have to be established. It may include private companies such as investors and contractors.

It is assumed that the Khushig Valley Development WG, or Khushig Valley Development Committee proposed in Section 3.2.2, will play a key role as the development entity in the preparatory phase. When the project reaches the stage of forming a concrete project using the PPP approach, the financial resources for the development will be examined. Then, once the financial resources are secured, market soundings (i.e., discussing the vision of the development with the private sector and building consensus on the necessary deregulation and planning) can follow.

[5] Japan's National Strategic Special Zone is a good example of the proposed mechanism. This was formulated to create the "world's most business-friendly environment" by implementing bold regulatory and institutional reforms necessary to realize growth strategies. Its aim is to comprehensively and intensively implement special measures and reforms of related systems to address regulations that have been an obstacle to the creative efforts of governments and businesses for many years, but which have not been reformed. The aforementioned sandbox system has also been introduced in recent years.

[6] In Japan, Okinawa prefecture has set aside the whole prefecture as a target area for attracting leading industries, and has offered incentives tailored to specific target industries rather than focusing on specific areas.



Source: JICA Study Team

Figure 5-1 Concept of a Strategic Special Zone

There are advantages for creating industrial clusters. If new industries and services are clustered in a particular area, it provides opportunities for joint research and creates a conductive environment for sharing and combining their ideas and activities. The industries that would benefit most from a cluster are those in the biotechnology, medical, and digital sectors and their universities and research institutions. In addition, industrial clusters are efficient in terms of infrastructure development and economies of scale. It is also efficient in terms of environmental management such as sewage treatment.

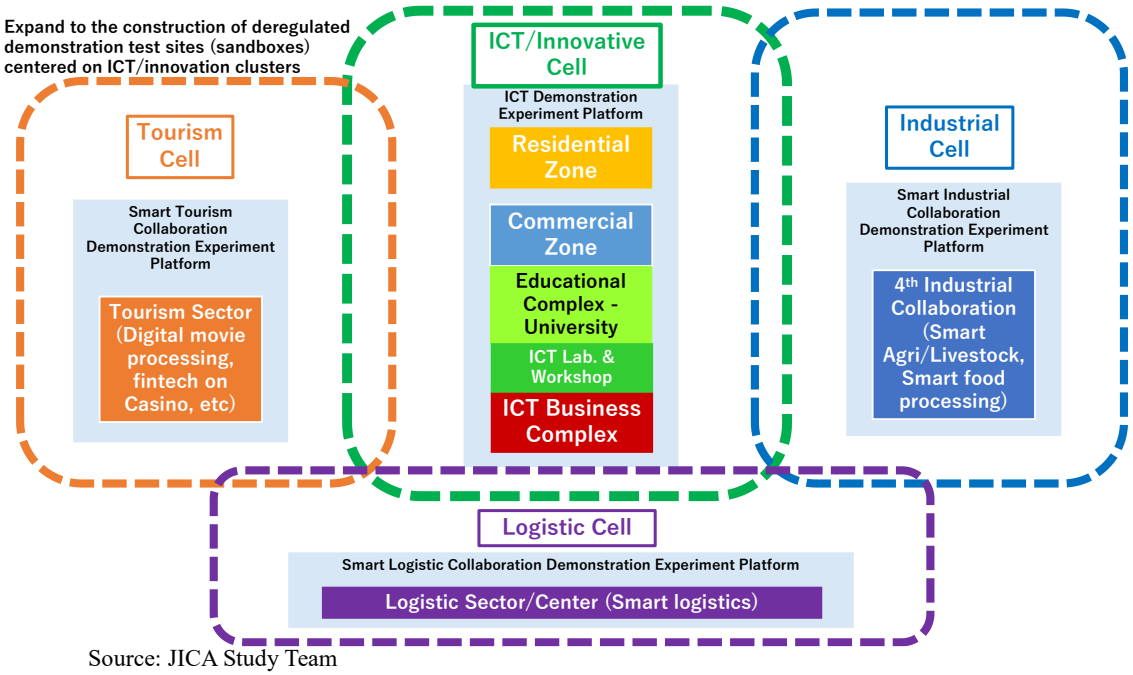
To create industrial clusters in Khushig Valley, it is necessary to offer incentives tailored to the characteristics of each industry, such as ICT special zone and logistics special zone.

5.3.2. Development of an ICT Cluster with Demonstration Sites

The Mongolian government is considering industries and companies in the vicinity of the airport, with a view to increasing the import and export of high value-added cargo through the airport without going through other countries. However, it will take time to develop the basic infrastructure, which is a prerequisite, because there is nothing in place.

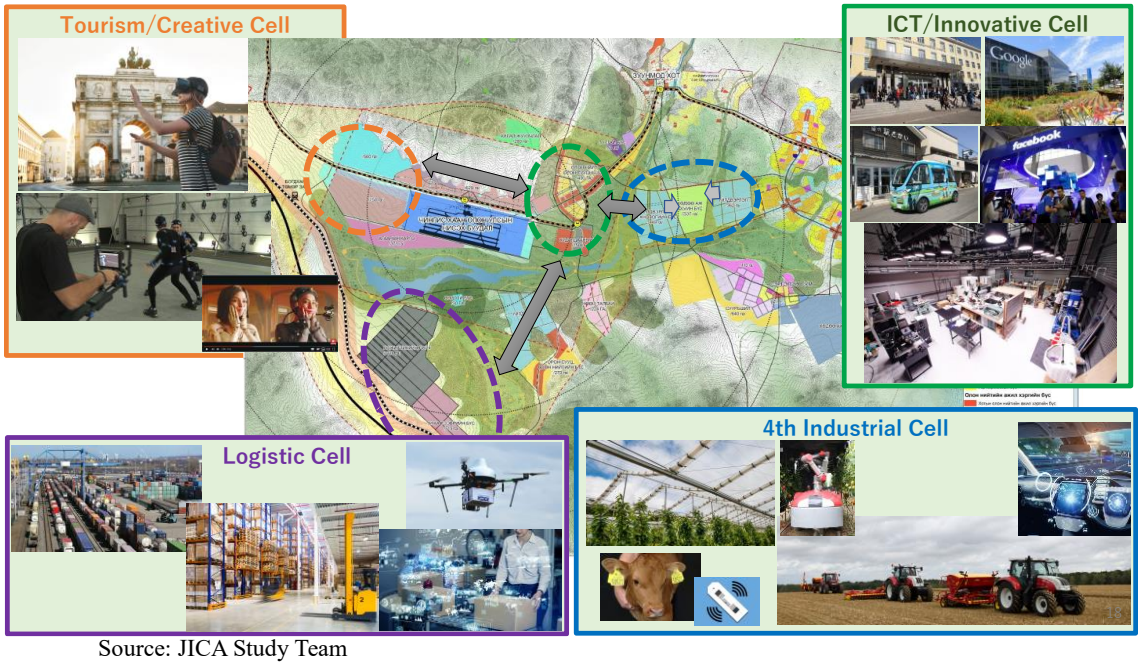
On the other hand, the JICA Study Team proposes that a business complex necessary for the ICT industry be built near the airport, so that companies and universities with research facilities can be attracted to the area (see Figure 4-4). Moreover, a limited regional sandbox-like environment and a testing ground for new businesses are proposed, wherein locators are not subjected to existing regulations and are given freedom to innovate. The concept of development is to develop clusters of ICT and digital transformation (DX) industries through this means and, on the basis of the advantages, to gradually expand the application to tourism, logistics, and agriculture and to develop innovative industries in stages. In other words, in the short term, the ICT business complex will be developed into an ICT/innovation cluster, and in the medium term, the ICT cluster will be developed into logistics, tourism, and industrial clusters (see Figure 5-2 and Figure 5-3). The unique feature of the ICT sector in Khushig Valley will be the availability of a site for experiments or demonstrations on, for example, automated driving, drones and other technologies which usually need coordination with relevant ministries. By making this kind of sandbox-like environment possible in Khushig Valley, the aim is to attract ICT- and DX-related

companies from Japan and abroad.



Source: JICA Study Team

Figure 5-2 Sectors to be Introduced Strategically in Khushig Valley



Source: JICA Study Team

Figure 5-3 Concept of Cluster Development in Khushig Valley

5.4. Implementation Challenges

The lessons to be drawn from the challenges facing the three existing FZs mentioned above are described below. The institutional design for the new SSZ should take these into account.

- The existing FZs are targeted at export and trade industries, while New Zuunmod, being in the vicinity of Ulaanbaatar City, needs clear guidelines and incentives for attracting domestic, business-oriented industries, including those targeting the domestic market and

import substitution industries, so especially for promoting relocation from Ulaanbaatar City.

- Investment promotion strategies that reflect target industries and the needs of private companies are needed.
- Legislation needs to be improved.
- While the prioritization of infrastructure development for New Zuunmod is unclear and expectations from PPPs may be excessive, it is necessary to secure government budget and to establish a mechanism to generate reserve funds.
- Project should be implemented together with the private sector.

5.4.1. Need for Policies to Promote Exports and Import Substitution for New Zuunmod

The basis of industrial strengthening in any country is to strengthen the export capacity of domestic industries, which in turn improves the balance of payments and earns foreign currency. To strengthen export capacity, it is important to have a strategy in the value-added structure up to the final trade to make the potential raw materials a national industry. In Mongolia, there is export potential in areas such as luxury cashmere clothing and meat. However, much of the former is limited to the export of raw materials, and the business of selling cashmere products worldwide as a brand has only just begun. The latter, too, exports only meat and has not yet been able to add value downstream to the processed products. Although Vision 2050 sets out the direction of the country's major industries and aims to develop export industries, it is necessary for each industry to incorporate downstream businesses (product development and sales channel development functions) and to add policies to strengthen its export capacity. It will also be important to integrate supply chains between industries and link them to international networks, particularly utilizing the fourth industrial revolution which is underway. To achieve it, it will also be necessary for the State to take the lead in developing legislation that meets international standards. These will strengthen the country's industries, which in turn will create demand for domestic industries in New Zuunmod.

Yet, since it takes time for export industries to develop, it is important to promote import substitution to produce locally products that have been imported, thereby preventing the outflow of domestic money. It is also necessary to have a strategy to develop these industries.

5.4.2. Need for Incemtives to Limit Industrial Expansion in Ulaanbaatar City Center and Promote Relocation to New Zuunmod

In Mongolia, the concentration of industries and urban functions in the six central districts of Ulaanbaatar is significant, and this has led to a deterioration of the urban environment there. Traffic congestion and air pollution are getting increasingly worse every year. On the other hand, New Zuunmod is located about 30km from Yarmag area in Ulaanbaatar City, where the city hall will be located, so can benefit from the dispersion of functions from the city center. However, without special regulations and guidance, the concentration of functions in the city center will continue as it is, and the demand for industrial locators in this area will not materialize.

To improve the urban environment of Ulaanbaatar, it is necessary to strengthen the regulations and incentives for the locators. In addition, regulating the locators in the city center can generate demand in the suburbs without large financial expenditure from the government (see the proposed mechanism in Section 8.4.1).

In addition, considering the policy of industrial development, New Zuunmod is advantageous if some industries require a certain amount of land and it is difficult for those companies to locate new sites in Ulaanbaatar City. In particular, it is more desirable for

Mongolian domestic industries, whether in the food, biotechnology, medical or new energy sectors, to be located in the suburbs or close to the airport to explore new opportunities for collaboration with foreign companies and to encourage the development of cutting-edge products. The same applies to logistics-related facilities to make New Zuunmod a logistics hub.

5.4.3. Need for Incentives Focusing on Target Industries

Along with the formulation of policies to develop these target industries, it is necessary to have preferential measures to attract the target companies to New Zuunmod in conjunction with the above policies. Especially for New Zuunmod, the priority industries are those listed in Section 4.2, so it is necessary to set up incentives that suit each industry. For example, to attract large international supermarkets, incentives such as exemption from corporate tax and import duty on general consumer goods sold, can be considered.

It is widely known that universities and research institutes create the seeds of new industries and the seeds create a cycle of business demand. Particularly in new industrial sectors such as biotechnology, medicine, food technology, digital and energy, there is competition at an international level between universities and research institutes to develop modern technologies, and attracting international institutions with cutting-edge technologies can make or break a country's development. Normally, these leading-edge institutions remain in developed countries, but some international universities and research institutes of global companies are trying to set up bases in various regions and countries as well.

To win the battle, subsidies and a reduced tax system are essential. In addition, incentives in a broad sense, including soft activities, are important. The following are examples: (1) the government must actively support the implementation of R&D and exchange activities with companies; (2) deregulation to facilitate demonstrations; and (3) the development of advanced urban functions suitable for overseas personnel to live in.

5.4.4. Need for Investment and Sales Strategies to Promote of Mongolia

To attract investors to New Zuunmod, specific strategies are needed and the following two strategies are proposed:

- Open an experimental field to test and demonstrate modern technologies (e.g., ICT technology (DX) in cold regions, livestock processing management ICT (DX), logistics by drone, etc.); and
- Organize periodic international trade fairs, exhibitions, and academic conferences in areas associated with the target industrial value chains and MICE (such as international cashmere trade fairs, etc.)

A platform for demonstrations will attract companies particularly interested in cold climate technology and agro-pastoral technology development which are unique features of Mongolia. In particular, given the characteristics of Mongolia, it would be highly significant to conduct demonstration tests on, for example, the durability of solar panels and the battery efficiency of EVs in cold climates, and traceability and livestock health management technology in the field of pastoralism, which requires more difficult control technology in Mongolia, which is mainly nomadic.

As part of the development of ICT clusters, it is realistic to consider the contribution to urban functions by promoting the interconnection of technologies through the smart development of demonstration platforms. In fact, if the whole of the New Zuunmod development area is to be used as a platform, it can function as a place for smart-city demonstrations and as a platform for demonstrations of related technologies. The strategy can be developed with a view to creating synergies not only in terms of technology but also in terms of attracting industries. To achieve this, it is particularly important to set up a digital

infrastructure for the digital and urban management of New Zuunmod (an infrastructure that enables the digital management of distribution sales, logistics upgrading, and business transactions). Specifically, it will be necessary to develop data centers, data aggregation systems, and control and management systems, as well as to develop special legislation on data management in the short term.

There is also potential for other advanced technologies to be tested and applied (e.g., unmanned vehicle driving, unmanned bus services, drone deliveries, etc.).

It is also important to use MICE to attract regular international trade fairs, exhibitions and conferences of a certain size. Holding large-scale, high-capacity events on a regular basis means that people will visit regularly. As tourism in Mongolia is dominated by the summer months, there is a need to attract visitors and keep them busy at other times of the year.

5.4.5. Improvement of Legislation

According to the private companies interviewed, it is necessary to improve the ICT investment environment by developing data protection laws based on international standards and clarifying government intervention in information and communication regulations to make New Zuunmod an attractive location for the ICT industry.

5.4.6. Development of Business Complexes around Airports

The introduction of a business complex near an airport requires cooperation between the public and private sectors. One of the concrete examples is the area near Haneda Airport in Tokyo, Japan, for which the public and private sectors jointly planned and funded the initial development of 20 ha. Since the project was carried out in a realistic and phased manner, taking into account funding constraints and other factors, this can be a useful reference for the development of New Zuunmod

The first phase of the development, which partially opened in 2020 on the old airport site near the current airport, is not limited to the development of a business complex, but aims to become a base for the creation and spread of new industries that will contribute to the economic growth of Japan as a whole. It is important to note that in this case while the government selected the area for development, a group of private companies drew the development policy, planned, designed, and constructed the infrastructure necessary for the area. A public tender was held for the project method and plan, and several consortia (groups of companies) responded to the competitive tender.

6. Analysis on Logistics Centers

6.1. Status and Challenges for Logistics Centers

AH-3 and the Mongolian railway comprise the logistics lifeline among China, Mongolia (Ulaanbaatar), and Russia. Products, parts, and other industrial and consumer goods are imported from China (mainland and Tianjin Port). Consumer goods are also imported from Russia. In addition, transit cargo for products and consumer goods is transported from China to Russia via Mongolia. Thus, Bogdkhan railway and the AH-3 bypass will remain to be vital routes for international logistics, and are particularly important to the development of New Zuunmod.

Industrial products and consumer goods are put in containers and wagons. For this, a logistics center (a cluster of distribution facilities with storage and cargo handling functions) plays an important role.

Mongolia's consuming region for import cargo is Ulaanbaatar. Import cargo is unloaded at railway terminals and warehouses in Ulaanbaatar and transferred to delivery vehicles.

6.2. Transportation Performance by Mode

Railway and road freight are about 30 million tons/year, each. A comparison of transportation performance by mode shows that railway freight increased by about 3 times from 9.16 million tons in 2000 to 29.84 million tons in 2020, while roads freight increased about 20 times from 1.48 million tons to 30.46 million tons.

The majority of products transported by railway and roads is heavy goods or minerals (mining products, such as coal and oil) for export. On the other hand, goods imported by railway and roads are construction materials, machinery and various small items such as consumer goods including foodstuff. The share of export cargo (weight cargo) was higher than import cargo (light cargo).

The percentage of air cargo is quite low, at only several thousand tons per year even in absolute terms, with no increase. Most are international shipments and only a few are domestic.

Table 6-1 Handling Volume by Transportation Mode

Transportation Mode	2000	2005	2010	2015	2016	2017	2018	2019	2020
Total (10,000 tons)	1,064	2,367	2942	3,220	4,040	5,399	6,780	6,900	6,030
Railway	916	1,559	1,680	1,915	1,999	2,277	2,576	2,814	2,984
Roads	148	808	1,261	1,304	2,041	3,121	4,203	4,085	3,046
Air	0.3	0.2	0.2	0.3	0.5	0.5	0.6	0.6	0.3
Water	0.2	0.05	-	-	-	-	-	-	-

Source: MRTD

Table 6-2 Handling Volume by Transit, Mode, Export and Import

Transportation Mode		2019	2020	2020/2019 (%)
Total transportation volume		6,900	6,046	87.6
Roads	Total	4,085	3,045	74.6
	Export	3,475	2,878	
	Import	95	149	
Railway	Total	2,814	3,000	106.6
	Domestic	1,109	1,102	99.4
	Export	1,022	1,168	114.3
	Import	294	302	102.9
	Transit	390	128	109.8
Air	Total	0.58	0.27	47.6
	Domestic	0.01	0.01	116.9
	International	0.57	0.26	46.5

Source: MRTD

6.3. Status and Challenges for Logistics Centers

The status and challenges faced by logistics centers in Ulaanbaatar are as follows:

- Consumer goods from China and Russia directly flow by rail and AH-3 to distribution facilities scattered all over Ulaanbaatar City;
- Users bear the high cost caused by deteriorating distribution facilities and decreasing productivity;
- Container and wagon operations are carried out in the city center which is not a suitable place;
- Handling of hazardous substances (i.e., raw materials and volatile substances for the chemical industry, etc.) in densely populated areas pose a risk and create adverse impact, such as air pollution, dust and noise; and
- Capacity of logistics companies for individual delivery and terminal processing is small, the quantity is low, and the seasonal disparity is severe, resulting in unoptimized operations.

Thus, the need to develop a modern regional distribution center and facilities that to consolidate the existing distribution facilities in the city center is high. The distribution center is expected to do the following:

- Combine the distribution facilities in Ulaanbaatar's central area, and have upgraded facilities, and can meet new demand;
- Have modern facilities need to be modernized and improved productivity; and
- Respond to the rising demand for industrial products and consumer goods.

6.4. Challenges related to Existing Logistics Centers and New Development Plans

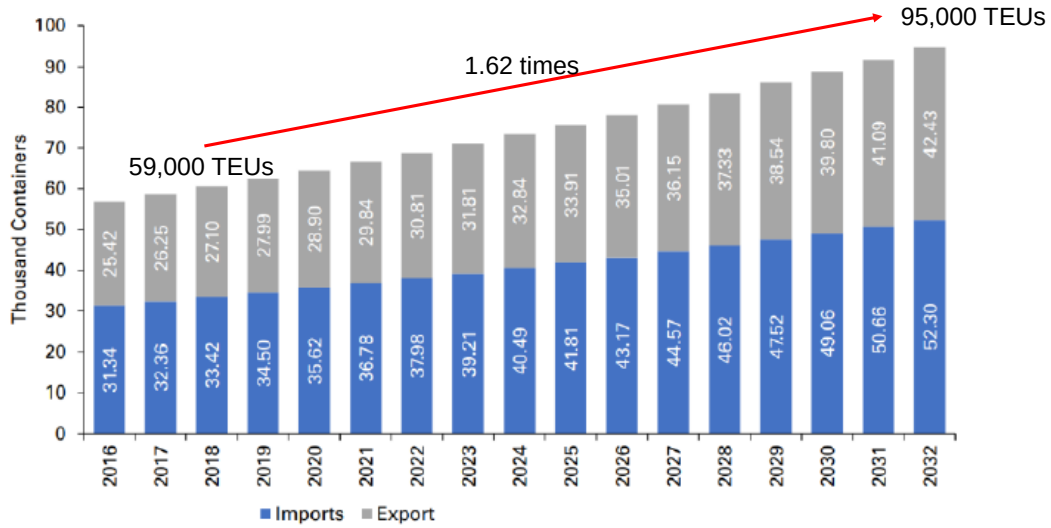
The envisioned scale and function of the logistics center in New Zuunmod need to be coordinated with existing logistics centers and new development plans listed below to determine the options between centralization of operations or division of functions.

- Enhancement of the logistics chain involving China, Ulaanbaatar, and Russia by developing Bogdkhan railway, i.e., the development of a bypass route;
- New Zuunmod logistics area: Dry port and distribution hub concept promoted by MRTD;
- Development of transshipment facilities and distribution centers with sufficient capacity at border points such as Zamyn-Uud and Altanbulag;
- Logistics bases in New Zuunmod, Nalaikh, Emeelt, Bagakhangai, and Baganuur as indicated in UBMP2040, including the relocation of existing logistics facilities and the development of railway and truck terminals, as well as an air cargo distribution centers in New Zuunmod; and
- Concept of a combined logistics center for railway terminals and truck terminals by Ulaanbaatar Logistics Center (UBLC) in Nalaikh. Preparations have been underway to start operation in 10 years to promote the relocation of the existing Ulaanbaatar City railway terminal (a plan has been reflected into UBMP2040).

6.5. Future Freight Demand and Recommendations

6.5.1. Outlook for Freight Demand

Freight demand due to net increase and the area required for a logistics center in the future were estimated. According to an ADB survey, the demand for cargo (excluding export minerals) is projected to increase by 1.4 to 1.6 times from 2017 to 2032. Based on this increase and applying the same trend (2.6 times) to logistics operation, the current logistics center (i.e., railway terminal in the city), which has an area of 90 ha, will need about 230 ha by 2051.



Source: Logistics Capacity Development Study, ADB

Figure 6-1 Trend in Container Shipping

To secure the feasibility of the planned logistics center, it is necessary to promote the further increase in freight demand from the following perspectives:

- Increase in consumer demand: Increase in purchasing power through economic development;
- Increase in export volume: Fostering and developing export industries; and
- Increase in conversion logistics: Increase in demand for railways from Northeast Asia to Europe, increase in air transit demand due to open sky policies, etc.

6.5.2. Challenges and Recommendations

In developing a new logistics center, the followings are the challenges and recommendations:

- As growth of imports depends on consumption demand (population), a corresponding increase in railway and road cargo cannot be readily expected because of various reasons. The need for a large-scale import-responsive logistics center should thus be considered carefully.
- The Mongolian route in the international logistics network is competitive because it offers the shortest route distance between Northeast Asia and Europe. However, the center of this route, i.e., Zamyn-Uud, is promising because Zamyn-Uud is in the border with China and where the transshipment of goods takes place.
- The plan for relocating railway terminals to New Zuunmod has to be discussed with UBLC which is in Nalaikh, a particular competitor.

- The size of air cargo volume can be handled in the airport's cargo terminal, so establishing another facility outside the airport should be considered carefully.
- To increase air cargo, a long term strategy is necessary, such as promoting new industries, deregulation, and foreign capital investment.

6.6. Recommendations for Establishing a Logistics base in New Zuunmod

The logistics centers for New Zuunmod are proposed by each term shown in Table 6-3.

The railway logistics center and the road logistics center are proposed to set up in the medium term. In the long term, expanding distribution and processing functions is proposed in line with transit-oriented air logistics and industrial development step-by-step.

Table 6-3 Recommendation for the Logistics Center Development in New Zuunmod, Status, and Development Issues

	Component	Option	Status	Issue
Medium term	Railway Logistics Center	• Relocation of Ulaanbaatar's railway freight terminals • Set up large-scale railway terminals in line with Bogdkhan railway development	• Scattered in Ulaanbaatar. Total area is only 90 ha, and the facilities are deteriorating. Individual operation causes low productivity. • There is a need for relocation of entire operations.	• Cooperating with UBLC planning is required (130 ha space is for railway terminal + bonded warehouse + loading/unloading + regional delivery) as it overlaps with New Zuunmod planning.
	Road Logistics Center	• Delivery center next to the railway terminal • Loading/unloading center for long term international (Russian and Chinese) shipment	• Truck terminals are operated individually. • A truck terminal with small space and old facilities located next to the railway terminal in Ulaanbaatar.	• Collaboration with railway terminals (Relocation of railway terminals also allows truck terminals to be located next to each other and combine long-distance rail transport with single-distance truck delivery)
Long term	Air Logistics Center	• Formation of an airline cargo hub by attracting cargo airlines	• Cargo volume is about 5,000 tons/year. • Even if the capacity of freight transportation increases with the increase of routes, it is difficult to make it for a freight hub, considering the current airline and route.	• Northeast Asia and the EU open sky policy for attracting air cargo airlines (hub operation) • Attracting the air cargo industry (electronic devices, semiconductors, precision equipment, jewelry, etc.) • Attracting air cargo forwarders
	Other logistics functions (Long term distribution processing, etc., linked to industry attraction)	• Attracting export processing industries (wool → apparel, materials → texture industry)	• Natural resources are exported as raw materials and have no added value, so export exceeds import on a weight basis, but import exceeds export on a value basis.	• Fostering the attraction of the logistics industry in conjunction with industrial development • Supporting the improvement of distribution capacities of logistics of attracted industries
	Location function in border areas (Distribution function in Zamyn-Uud is superior.)	• In Zamyn-Uud. • Cargo from China to Mongolia and from China to Russia via Mongolia.	• Due to the gauge difference (standard gauge of the Chinese railway and broad gauge of the Mongolian railway), reloading always occurs at the border with China. Therefore, it is reasonable to reload transit cargo to Russia in Zamyn-Uud.	• Should import cargo destined for Mongolia (Ulaanbaatar) be transported by road or railway? Railway is cheaper if they can operate efficiently, but trucks are better in terms of mobility. How do shippers evaluate?

Source: JICA Study Team

7. Analysis on Basic Infrastructure Development Plan

7.1. Water and Wastewater System

7.1.1. Overview of the Existing Plans and Surveys

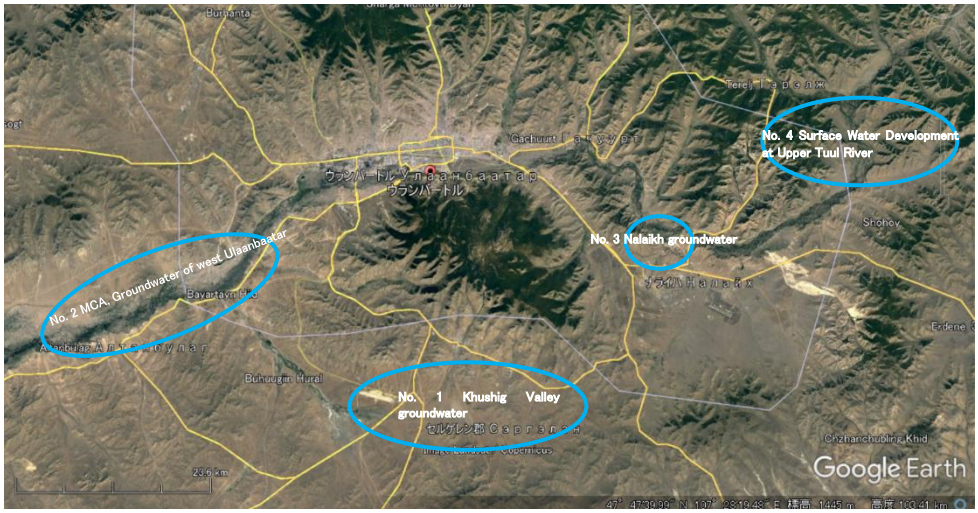
(1) Water Resource Plan

There are four candidate water sources for New Zuunmod (see Table 7-1 and Figure 7-1). The details of each are explained in the next section.

Table 7-1 Potential Water Sources for New Zuunmod

No.	Water Source	Remark
1	Khushig Valley groundwater	There are three Khushig Valley groundwater sites (around new airport, Zuunmod and Sergelen soum), which are the nearest water sources from New Zuunmod. The capacity is 13,300 m^3/day.
2	Millennium Challenge Account – Mongolia（MCA）	MCA（a state-owned entity to implement the compact signed with the Millennium Challenge Corporation) is constructing wells, a water treatment plant (WTP) and pipes to supply water to western Ulaanbaatar, completed in 2025. The holding capacity is 11,100m^3/day. To supply water to New Zuunmod, pipeline of 41.6 km and pumping station are required to build.
3	Nalaikh groundwater	42.3 km pipeline and pumping station are required to supply water to New Zuunmod. The details in location and water quality are not provided. The capacity is 7,344 m^3/day.
4	Surface water development at upper Tuul River	Originally planned by USUG, but transferred to Ulaanbaatar City and now being suspended. Details of the plan are unknown.

Source: JICA Study Team compiled information from the following sources: 1) Water Agency, 2) MCA, 3) Maidar City Development Research Project, 4) Ulaanbaatar Satellite Cities Development Investment Program (USCDIP), Interim Report, December 2020, ADB and 5) USUG



Source: JICA Study Team added on Google Earth

Figure 7-1 Location of Water Source for New Zuunmod

1) Groundwater Source in Khushig Valley

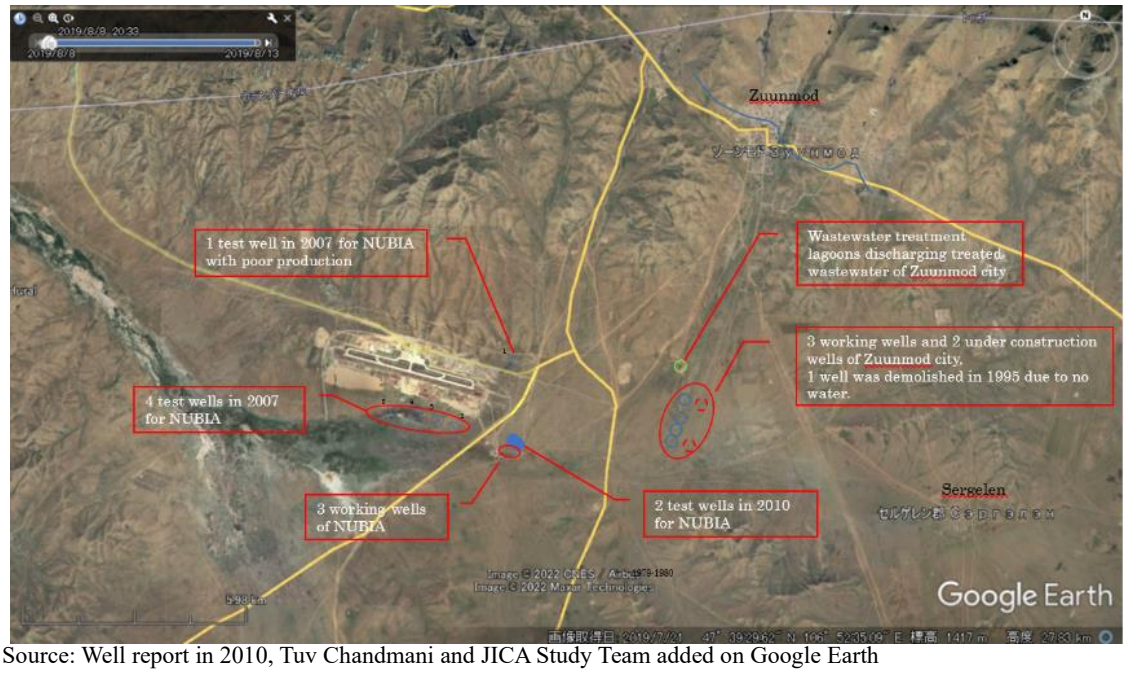
As shown in Table 7-2, the total potential groundwater capacity in Khushig Valley, approved by the Water Agency, is 13,303 m^3/day, although the test results of the groundwater capacities in Zuunmod and Sergelen soum were not obtained and confirmed.

The present total well production including the planned wells is 3,190 m^3/day. The remaining groundwater capacity obtained by subtracting this from the total potential groundwater capacity is 10,113 m^3/day. The unit water consumption of Ulaanbaatar City in 2021 was 70-90 L/c/day, based on data from the Apartment and Public Works Authority (OSNAAUG). Based on this, unit water demand (including domestic, commercial and industrial water) in New Zuunmod is estimated as 200 L/c/day including non-revenue water. From these figures, the remaining groundwater capacity of 10,113 m^3/day can supply 50,000 people (= 10,113 m^3/day / 200 L/c/day = 50,565 people). Therefore, the Khushig Valley source can supply water to the planned long term population of New Zuunmod, which is 34,000.

Table 7-2 Current Operation and Potential Capacity of the Khushig Valley Water Source

Year	Project	Groundwater capacity		Remark		Estimated potential service population by 3 per capita water demand cases (People)			Served population (People)
						Per capita water consumption (L/c/day)			
		L/sec	m3/day			100	200	300	
Present operation									
2021	New Airport	9.26	800	Present capacity of WTP at NUBIA with 3 wells, based on the 2010 well test resulting 10L/sec with 2 wells	Based on the above study, 3 wells were constructed	8,000	4,000	2,667	
2021	Zuunmod	16.67	1,440	20m3/hr (5.5L/sec) x 3pumps =60m3/hr (16.7L/sec = 1,440m3/day)	TuvChandamani	14,400	7,200	4,800	17,200
2022	Zuunmod	27.67	2,390	Adding 2 wells (2 x 5.5L/sec) besides above, from 2022	Ditto	23,904	11,952	7,968	
Total (A)		36.93	3,190			31,904	15,952	10,635	
Potential capacity									
2007	New Airport	45.40	3,923	4 wells located at southern part of new airport	2007, 5 well survey report by TuvUs	39,226	19,613	13,075	
2007	Zuunmod	73.55	6,355	Original study in 1979-1980, revaluated in 2007,	Water Agency, missing well survey report	63,547	31,774	21,182	
2020	Maidar Ecocity	35.02	3,026	Seregelen som	Water Agency, missing well survey report	30,257	15,129	10,086	
Total of Khushig Valley ground water potential (B)		153.97	13,303	Summartion of the above 3 figures	-	133,030	66,515	44,343	
Remaining Capacity (C)=B - A		117.04	10,113			101,126	50,563	33,709	

Source: NUBIA LLC, Tuv Chandmani, Water Agency and JICA Study Team



Source: Well report in 2010, Tuv Chandmani and JICA Study Team added on Google Earth

Figure 7-2 Major Facilities related to Water Sources in Khushig Valley

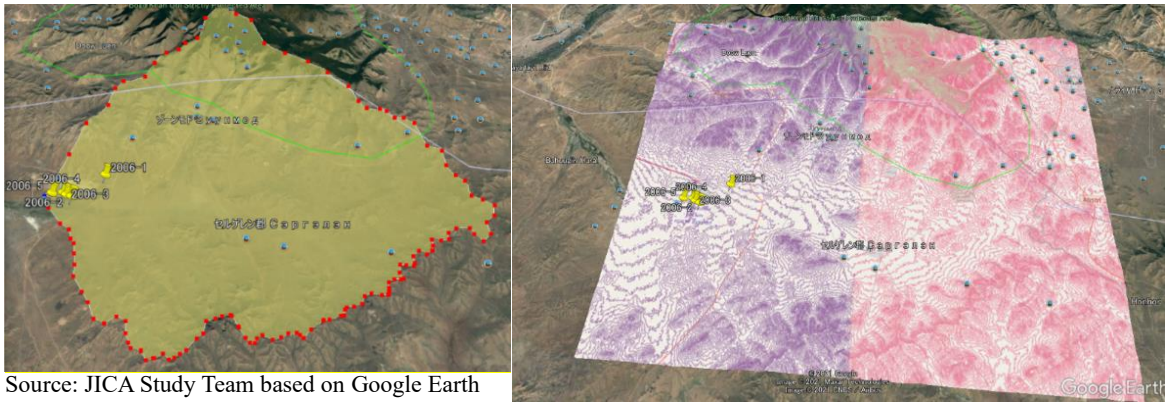
As a verification of groundwater capacity in Khushig Valley, the amount of groundwater recharge was confirmed based on the basin area, precipitation, and underground infiltration

rate of precipitation (see Table 7-3). Based on the basin area of the new airport which is 579 km[27] shown in Figure 7-3, the following were estimated: a groundwater recharge of 84,708 m^3/day, a precipitation of 267 mm/year[8] and a groundwater recharge rate of 20%[9]. The amount can serve 127,000 people under the following conditions: 30% of the groundwater recharge amount is used and unit water demand is 200 L/c/day.

Table 7-3 Groundwater Recharge and Estimated Groundwater Capacity at the Chinggis Khaan International Airport

Item		Unit	Data	Remark / Source
Catchment area at Airport	A	Km^2	579	
Annual rainfall	B	mm/year	267	http://www.1212.mn/
Recharge ratio to groundwater	C	-	20%	Water balance and evapotranspiration in Mongolian Rangeland, 2016
Groundwater recharge	D=AxBxC	m^3/year	30,918,600	
Ditto	E=D/365	m^3/day	84,708	
Utilizing ratio of groundwater	F	-	30%	Assumed
Available groundwater	G=E x F	m^3/day	25,413	
Unit water demand	H	L/c/day	200	
Potential service population	I= G / H	People	127,063	

Source: JICA Study Team



Source: JICA Study Team based on Google Earth

Figure 7-3 Basin and Topography around the Chinggis Khaan International Airport

2) Water Resources Outside of Khushig Valley

Besides the Khushig Valley water sources addressed in the previous section, there are two more candidate water sources for New Zuunmod (see Figure 7-4).

A: Receiving water supply from MCA: scheduled to be completed in 2025. Utilizing this requires a pipeline (about 41.6 km) between the MCA water treatment plant (WTP) and New Zuunmod's pumping station.

B: Receiving water supply from Nalaikh: Same as MCA, it requires a pipeline (about 42.3 km) and a pumping station. Well information (location and water quality) was not provided.

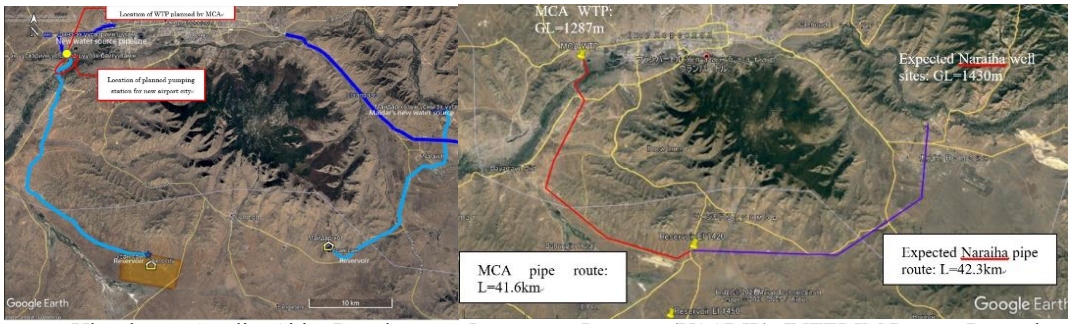
Both of A and B were not reviewed in this study because of the following reasons.

A: Pipeline cost from MCA WTP till New Zuunmod is higher than the cost of well development in Khushig Valley.

[7] Measured based on a Google Earth image
[8] Source: Zuunmod city meteorological data.
[9] Source: Report on water balance and evapotranspiration of Mongolian grazing land, 2016.

B: Same as MCA but the construction cost is higher the needed pipeline is longer.

Reviewing the Tuul River surface water development project was also not done in this study because the plan is currently suspended.



Source: Ulaanbaatar Satelite Cities Development Investment Program (USCDIP), INTERIM Report, December 2020, ADB, MCA and JICA Study Team based on Google earth

Figure 7-4 Outline for Receiving Water from MCA and Nalaikh

7.1.2. Issues in Water supply, Wastewater, and Drainage System Development

Issues related to the development of water supply, wastewater, and drainage systems in New Zuunmod are shown in Table 7-4.

Table 7-4 Issues in Water Supply, Wastewater and Drainage

Item	Remark
Groundwater quality of Khushig Valley	According to NUBIA LLC and Zuunmod City, which currently use well water, the groundwater qualities meet the drinking water standards. However, according to the well test result in 2010, it contained 3.0 mg/L of ammonium, which is higher than the water quality standard for Mongolia and WHO of 1.5 mg/L. In this study, two development scenarios were considered for a water supply planning, (i) groundwater contains 1.5 mg/L of ammonia that needs WTP and (ii) water quality meets the drinking water standards which needs no WTP. Groundwater quality of the western part of Ulaanbaatar City, which is the water source of MCA project, does not seem to meet the drinking water standards (the quality information was not provided). Thus, a WTP with RO (reverse osmosis membrane) is planned to be installed.
Environmental protection and flight safety measures	Sewerage system is required for New Zuunmod. A wastewater treatment plant (WWTP) in Zuunmod City locates upstream of New Zuunmod. Yet, its RC structure cracks and there is a risk that sewage may have flowed into the groundwater and deteriorate groundwater quality, so rehabilitation of the WWTP is necessary. Additionally, an oxidation pond, which is used as a WWTP for Zuunmod, may invite birds, which may hinder flights. In this study, for a wastewater planning, one development scenario to construct WWTP for Zuunmod City at the planned New Zuunmod WWTP site was considered to demolish the existing Zuunmod WWTP and the oxidation pond.
Flood measures	Drainage did not analyze in this study because a drainage plan needs to be studied with the road plan which is not started. Following points shall be studied further to make a drainage plan: ・For smooth drainage of rainwater flowing from Mt. Bogd, re-study of the existing drainages needs to be conducted. (A part of the new airport was inundated in June 2020 due to heavy rainfall.) ・Maintaining the present wide river area working as rainwater reservoir at the southern part of the new airport is effective to prevent flooding. However, it is necessary to make sure that the reservoir does not cause flight obstacles due to the flight of birds. ・In Ulaanbaatar City, groundwater has invaded underground structures. When planning underground structures at New Zuunmod, they shall be carefully planned and designed not to be affected by groundwater.

Source: JICA Study Team

7.1.3. Planning for Water supply, Wastewater and Drainage System

(1) Demand Projection

According to the Aero City MP, the future population of New Zuunmod will be 34,000 and the water demand will be 10,637 m^3/day.

For water supply plan, the planned population is set at 13,000 in the medium term in this study; unit water demand (including domestic, commercial and industrial water) is estimated at 200 L/c/day (including non-revenue water); water demand is 2,600 m^3/day; and water supply capacity is set at 3,000 m^3/day. The planned population in the long term plan is 34,000, and the water supply capacity is set at 7,000 m^3/day (see Table7-5).

Table 7-5 Water Demand Projection

Item	Unit	Medium Term 2040	Long Term 2050
Population	people	13,000	34,000
Unit water demand	L/c/day	200	200
Water demand	m^3/day	2,600	6,800
Rounded water demand	m^3/day	3,000	7,000

Source: JICA Study Team

In the medium term plan, it is confirmed that 3,000m^3/day is sufficient when the water demand is estimated separately for domestic and industrial/commercial use as shown in tables 7-6 (domestic water demand), 7-7 (industrial and commercial water demand), and 7-8 (total water demand). (The same can be applied for the long term plan, so it is omitted.)

Table 7-6 Estimates of Domestic Water Demand

Item	Unit	Water Demand
Population	people	13,000
Unit water demand	L/c/day	150
Water demand	m^3/day	1,950

Source: JICA Study Team

Table 7-7 Estimates of Industrial and Commercial Water Demand

Item	Unit	Unit Consumption	Quantity	Water Demand (m^3/day)	Remark
Hotel	L/(bed x day)	2,000	150	300	No. of beds 2,000
Supermarket	L/(m^2 x day)	12	50,000	600	Floor area 50,000 m^2
Staff	L/c/day	100	600	60	-
Total	-	-	-	960	-

Source: JICA Study Team

Table 7-8 Estimates of Total Water Demand

Item	Water demand (m^3/day)
Domestic water	1,950
Industrial water	960
Total	2,910
Round Total	3,000

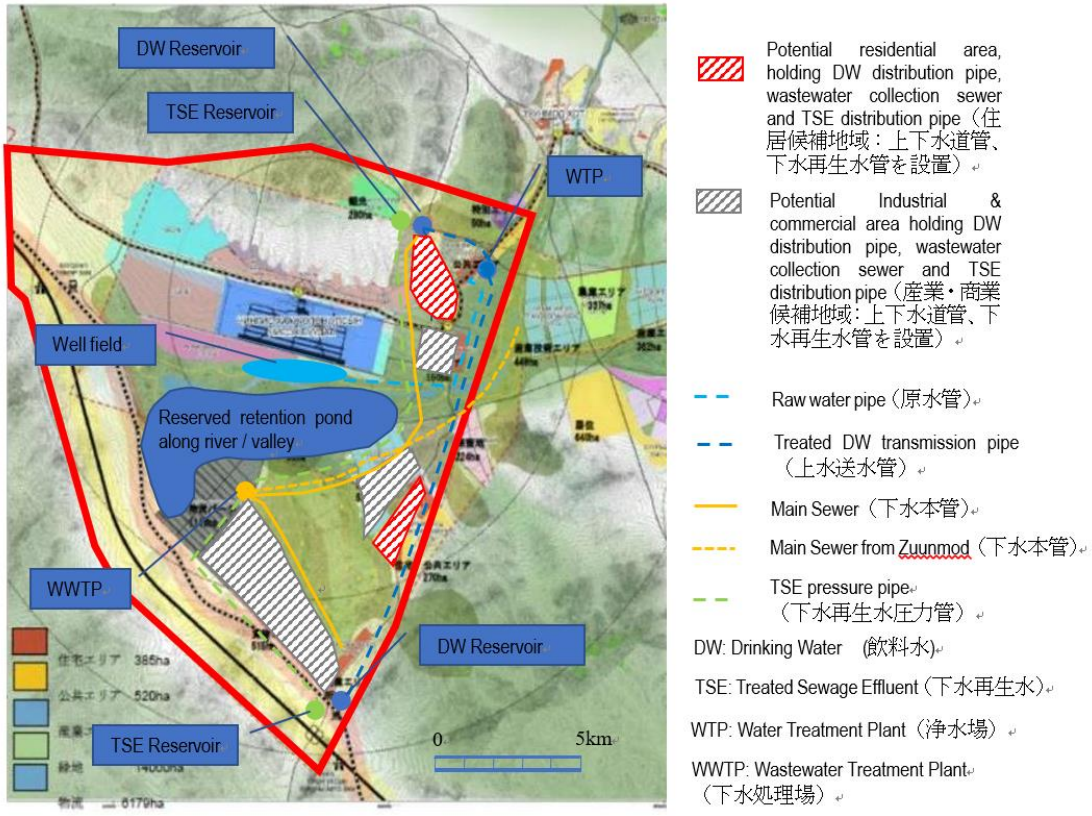
Source: JICA Study Team

Regarding wastewater plan, a WWTP capacity of 3,000 m^3/day is planned together with the sewers collection facility, whose size is the same as the water demand. In this wastewater study, reusing treated wastewater was also studied.

(2) Facility Planning

The JICA Study Team prepared a rough facility map showing the planned water supply and wastewater facilities, and regulating ponds for stormwater drainage.

In the development area, candidate sites for residential, industrial, and commercial areas are planned as shown in Figure 7-5 referring to the Aero City MP. The water and wastewater service area is the same as the planned residential area of 33 ha with a population density of 400 persons/ha, and the planned industrial/commercial area is 600 ha referring to the set area of 105 ha.



Source: JICA Study Team on Aero City MP

Figure 7-5 Rough Facility Plan for Water and Wastewater Systems in the Medium Term (2040)

1) Water Supply Facility Plan

Water supply facilities consist of wells, pumping station, distribution reservoirs (two locations in the north and south), and water distribution pipes in the development areas in the north and south. Regarding the WTP, two case studies were done in this study, i.e., (i) with WTP and (ii) without WTP. The WTP also includes the water pipe between it and the wells (when required) and from the distribution main from the WTP (when required) to the distribution reservoir.

Based on the results of the well surveys conducted in 2007 and 2010 in Khushig Valley (see Table 7-9), the average well capacity was 9.9 L/sec/well. The planned well is set as 6.9 L/sec/well (600 m^3/day/well), estimating that 70% of the test well capacity is available for the planned well. The required well number is set six comprising five working wells and

one spare well to cover the water demand of 3,000 m^3/day (see Table 7-2).

Table 7-9 Estimation of Planned Well Production based on Well Capacity on Test Wells in 2007 and 2010

Item	No	Production		Remark
		L/s	m^3/day	
Well test in 2007	1	1.0	86.4	Excluded as this production is too small.
	2	20.0	1728.0	
	3	8.3	717.1	
	4	13.3	1149.1	
	5	5.0	432.0	
Well test in 2010	1	6.0	518.4	
	2	6.5	561.6	
Average Population, 2007	-	9.9	851.0	Average after excluding Well No. 1.
Planned Well Production	-	6.895	595.7	70% of Average = 600m^3/day/well

Sources: Well survey reports in 2007 and 2010 and JICA Study Team

If the groundwater contains 1.5 mg/L of ammonia, a WTP is required to remove it. There are three treatment processes to do this: (i) chlorine oxidation, (ii) reverse osmosis (RO), and (iii) chemical-free biotreatment. As shown in Table 7-10, the biotreatment method is superior in both construction cost and maintenance. This method has a filtration rate of 400 m/day compared to that of the biological contact filtration (120 m/day), and it can remove ammonia, iron and manganese with a single filter. This method is thus recommended for removing 1.5 mg/L ammonia in water.

When proceeding with the New Zuunmod development, raw water quality must first be studied to confirm whether a WTP is required or not. If required, the appropriate water treatment should be selected.

Table 7-10 Comparison of Water Treatment Method

Item	Chlorine Injection + Rapid Filtration	Pretreatment + RO Membrane Method	Chemical-Free Biotreatment Method
Cost	Good	Fair	Good
Operation	Fair	Bad	Good
Outline	Oxidizing ammonia with chlorine. Chlorine charges are expensive. Chlorine by-products can be generated.	Removing ammonia with RO membrane. Costs of construction, pressure pump electricity, and membrane replacement are expensive.	O&M (operation and maintenance) cost is low because it is a biological treatment that does not use chemicals. It is safe because trihalomethanes are not generated and chlorine is not used in the treatment. It takes about 2-3 months for exhibiting proper treatment performance. The water temperature needs to be 5-7 ℃ or higher. It is a patented Japanese technology.

Source: JICA Study Team

2) Wastewater Facility Plan

Regarding the wastewater facility plan, a centralized system (off-site system as one WWTP) is applied, in stead of an on-site system which needs smaller but multiple WWTPs in each development sites, a set-up which is usually economical in construction but harder to operate.

Wastewater facilities consist of wastewater collection pipes in the northern and southern development areas, as well as a WWTP and a treated sewage effluent (TSE) (retreated wastewater) supply system such as pumping station, TSE reservoirs (storage tanks) and

TSE distribution pipes in the northern and southern development areas. It also includes the wastewater main from the development area to the WWTP and the pressure pipes from the WWTP/pumping station to the TSE reservoirs.

Applying a TSE system is good for maintaining underground resources but it needs a higher construction cost. When proceeding with the New Zuunmod development, the TSE application should be studied considering the balance.

The oxidation pond used in Zuunmod City has to be closed to ensure safety operation in the new airport because the pond may invite birds, which are a flight hazard. In addition, untreated wastewater may have flowed into the groundwater from cracks in the reinforced concrete at the WWTP and may have deteriorateded groundwater quality. It is thus necessary to rehabilitate the WWTP. The JICA Study Team recommends constructing a WWTP for Zuunmod and a wastewater main to the planned New Zuunmod WWTP to close the existing Zuunmod WWTP with oxidation poind.

There is a flood prone area at the south side of the new airport in summer season (see Figure 7-5). It is important to maintain the site as a stormwater reservoir as the site is flood-prone and not good for development. However, if rainwater stays in this reservoir for a long period, it might invite birds which can hinder flights. No damage has been reported so far during the half year the new airport has started operation (July 2021). It is necessary to investigate the area's inundation status (freshwater depth, period) and birds migration to better utilize it for inundation countermeasures while ensuring safe airport operations.

(3) Cost Estimation

In the medium term scenario (2040) that the JICA study team set (13,000 people), the construction costs of water supply and wastewater facilities are estimated, as shown in tables 7-11 and 7-12. In the long term plan, it is estimated to proportionally increase with the population ratio (34,000 / 13,000 = 2.6).

Table 7-11 Cost Estimation on Water Supply Facilities

Unit: JPY1,0000,0000

Item	Medium Term Scenario (2040)	Long Term Plan (2050)	Remark
Water supply facilities with WTP	27.1	70.5	Ammonia concentration of raw water is assumed as 1.5 mg/L and the water treatment method is a chemical-free biotreatment method.
Water supply facilities without WTP	22.0	57.2	

Source: JICA Study Team

Table 7-12 Cost Estimation on Wastewater Facilities

Unit: JPY1,0000,0000

Item	Medium Term Scenario (2040)	Long Term Plan (2050)	Remark
Without Zuunmod City wastewater	-	-	-
➢ Water supply facilities with treated wastewater reuse	49.2	127.9	-
➢ Water supply facilities without treated wastewater reuse	35.7	92.8	-
Addition for including Zuunmod City wastewater	17.1	-	Sewer from Zuunmod City to New Zuunmod WWTP + additional WWTP for Zuunmod City

Source: JICA Study Team

7.2. Heating System

7.2.1. Policy and Legal Environment

The heating supply can be provided by a public utility entity licensed by the Ministry of Energy under the Energy Law of Mongolia with consideration of the current situation of heating system.

7.2.2. Status of Heating Systems

In Mongolia, which is located in cold regions, heating facilities for living are indispensable. About 40% of the people use central heating from coal-fired power generators. The remaining 60% use individual coal stoves. Only a few households use electric heating. The status of the heating systems is as follows:

- The total amount of heating consumption in Mongolia in 2020 was 10.71 million Gcal, compared with 10.31 million Gcal in 2019.
- 177 kg coal is used to produce 1 Gcal of thermal energy.
- The main heating system in Ulaanbaatar City and the surrounding area are coal-fired combined heat and power plants (CHPPs). The main facilities are the 3rd combined heat and power plant (CHPP-3) and the 4th thermal power plant (CHPP-4). These facilities are aging, and it is getting more and more difficult to meet the increasing demand.
- The heating supply in Ulaanbaatar City is different in the central, intermediate, and remote areas.
    - The central area is mainly composed of mid- and high-rise apartment buildings, and CHPP is the main heating source.
    - The intermediate area is mainly a low- and mid-rise residential area, and the main heating source is a high-efficiency boiler (heat-only boiler, HOB). There are multiple HOBs for 200 to 300 households.
    - In remote areas which are composed of low-rise residential buildings, district heating facilities are not installed, and heating equipment (mainly a coal stove) is installed in each house.
- In New Zuunmod, the airport heating facility is a 42 MW HOB, consisting of two 14 MW furnaces and one 14 MW furnace in reserve. It has a high efficiency of 81% and supplies heating to 13 airport facilities which operate at a load of 11.64 MW. The facility has a future plan to supply 29.27 MW of heating to 14 buildings in the airport, including the police station, logistics building, postal and fire facilities, and parking lots. It does not have sufficient capacity to supply new urban development areas, so it is essential to secure a new heating source for the New Zuunmod development.

7.2.3. Overview of Existing Plans and Surveys

(1) Aero City MP

In the Aero City MP, the future heating demand in the area was planned to be 186.4 Gcal/h (216.8 MW).

The main heating source is HOB. Heating was planned to be supplied via 20 heating distribution centers. The total length of the pipeline was planned to be 15 km.

The breakdown of heating demand was as follows: 120.2 Gcal/h (139.8 MW) for heating, 33.4 Gcal/h (38.84 MW) for ventilation, and 32.9 GCal/h (38.26 MW) for hot water supply.

(2) Khushig Valley Comprehensive Plan (Draft)

According to the Khushig Valley Comprehensive Plan (draft), the heating plan is as follows.

- Heating demand in Maidar and Sergelen, New Zuunmod and Zuunmod cities is

estimated to be 465 MW in total. The breakdown is as follows: 160 MW for Maidar City, 210 MW for New Zuunmod, and 95 MW for Zuunmod City. These are planned to be supplied by HOB.

- It is planned to build new 40 MW HOB for New Zuunmod logistic center, expand the existing airport HOB to 140 MW, and add a new 65 MW HOB to the existing 30 MW HOB in Zuunmod City.
- In the initial stages, it is planned to expand the existing 42 MW HOB for the airport by 27 MW and supply heating via eight heating distribution centers. The design work will start shortly.

7.2.4. Proposal for Heating System

(1) Basic Principle

The existing coal-fired heating system causes serious environmental problems such as air pollution and arises safety issues such as carbon monoxide poisoning. Based on the global trend of coal-free power generation and green urban development concept of the Mongolian government, the JICA study team proposes the passive technology that does not use coal for New Zuunmod. The construction of houses and facilities by ZEH (Net Zero Energy House and Passive House) and ZEB (Net Zero Energy Building) can be applied to reduce energy consumption and ensure urban development with renewable energy.

(2) ZEH/ZEB Type Heating System Plan

Assumption of ZEH/ZEB type heating system plan is as follows:

- Power and heating will be provided by solar power generation installed in each house and power supply from the existing power system;
- According to the proposed system, on-grid solar panels will be installed in low energy passive buildings. 4 kW heat storage unit will be provided to accumulate electricity converting into thermal energy to be used as needed. It is also expected to supply backup power from the power grid;
- There is an energy-efficient way to reduce the load on the power grid and it is to supply hot water through a heat pump installed in each house. Concerning its heat source, either air source technogloy or ground source technogloy will be selected based on a F/S; and
- Power is distributed to the grid-linked (on-grid) system in the summer time when heating supply is not required. This possibility needs further study.

7.2.5. Challenges to Realization and Issues to Adderss

Issues for business promotion and matters that need to be dealt with are as follows.

- Large numbers of building materials with high thermal insulation properties are used for passive buildings, so the construction cost is about 20% higher than that of conventional buildings. Therefore, it is necessary to take measures to reduce the burden of interest rate by improving the credit system for private housing construction.
- Therefore, it is recommended to set different rank according to the reduction rate of the heat loss of the building with respect to the standard value and set interest rate of the mortgage that matches the rank. Concerning building evaluations, it is necessary to develop the policy to promote the introduction of passive technology such as building evaluation and creation of a mortgage system to form a carbon-free society, for instance, displaying annual heating energy consumption in the real estate registration.
- Due to few numbers of green buildings in Mongolia, lack of awareness regarding

electricity and water conservation, and building insulation are the reason that government organizations' and financial institutions' understanding is limited, concerning the matters of power saving, water saving, and protection from cold weather. Although provisions on green buildings have been specified in the building codes and the Law on Energy Saving has been passed, they have not been put into effect yet. Limited number of highly qualified specialists necessitates the training of specialists with appropriate knowledge and skills.

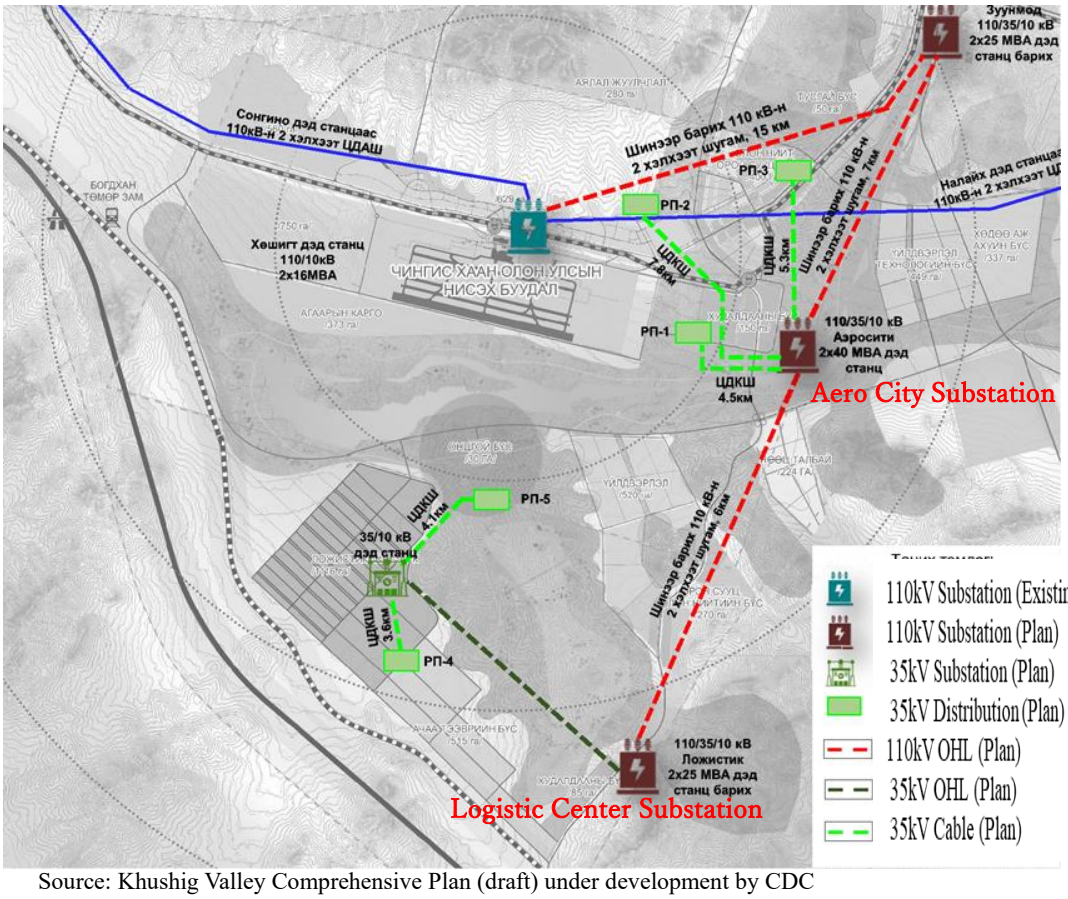
- It is necessary to develop a New Zuunmod construction guideline aimed at introducing ZEN and ZEB-built apartments and buildings that use passive technology to reduce New Zuunmod's energy needs and turn it into a clean urban development using renewable energy.

7.3. Electrical Power Infrastructure

7.3.1. Overview of Existing Plans and Surveys

(1) Khushig Valley Comprehensive Plan (Draft)

Regarding the electricity demand of New Zuunmod, the demand for residential and commercial areas is estimated to be 19.6 MW, and the demand for logistic centers is estimated to be 18.8 MW. On the other hand, the power supply facilities, such as the 110/35/10 kV Aero City substation and three 35 kV closed power distribution facilities are planned to construct near the residential/commercial area. There are also plans to build the 110/35/10 kV logistics center substation, one 35/10 kV distribution substation and two 35 kV closed distribution facilities near the logistic center.



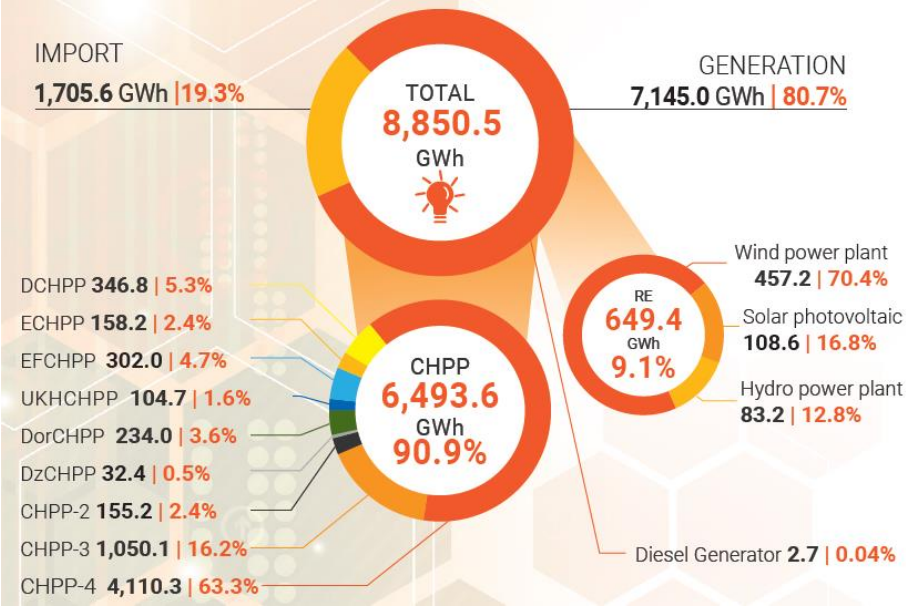
Source: Khushig Valley Comprehensive Plan (draft) under development by CDC

Figure 7-6 Electrical Power Infrastructure Development Plan in New Zuunmod

7.3.2. Status and Demand Forecast for Electrical Power Infrastructure

(1) Status of Electrical Power Infrastructure in Mongolia

The dependence of coal-fired power generation is extremely high in Mongolia. 77.3% of the installed capacity of power generation facilities are coal-fired CHPPs, and 90.9% of the power production is generated by coal-fired CHPPs. On the other hand, renewable energy (hydro power, wind power, solar power) accounts for 17.9% of the total installed power generation capacity, which has not yet reached the national target of 20% in 2023.



Source: ERC material

Figure 7-7 Breakdown of Power Generation in 2020

(2) Status of Electrical Power Infrastructure in Khushig Valley

The only existing major power supply infrastructures in the Khushig Valley area are the 110/10 kV substation for the new international airport and the 35/10 kV Zuunmod substation. The power supply infrastructure is planned to be built in the future.

(3) Examination of Scope and Facilities to Develop

In the medium term scenario (4,000 houses) that the JICA Study Team set, if all the houses built in the residential area are passive houses (ZEH) and the heating is electrified, the average 2 kW of electric boilers per house will be installed in 4,000 units, so the power demand will increase by about 8 MW. However, even if the demand other than heating is combined, the demand is about 16 MW. Thus, the demand can be sufficiently supplied by the Aero City substation currently planned.

If 4 kW of photovoltaic power generation is installed in all passive houses in the medium term scenario, the total installed capacity of photovoltaic power generation will be 16 MW. Since the power flow of generated power flows in the opposite direction to the demand, the load of the Aero City substation changes in the range of +16 MW to -16 MW. When a reverse current flows through the transformer of a substation, it becomes difficult to control the voltage of the power system. In addition, if a reverse current flows through the distribution line, the voltage may rise above the permissible level, so countermeasures are required. Specific measures will be explained in the next section.

7.3.3. Challenges to Realization and Issues to Address

When roof top photovoltaics are installed in a large number of houses, the following local

challenges arise in the power system.

- It is difficult to control the voltage of the power system when a reverse current flows through the transformer of the substation.
- When a reverse power flows through the distribution line, the voltage rises above the allowable level.

Regarding the first issue of the substation voltage control, it is necessary to change the specifications to a voltage control device that supports reverse power flow. The following measures can be considered for the voltage rise of the distribution line.

- Suppress or stop power generation when the voltage is about to exceed the permissible level.
- Install storage batteries in houses to reduce reverse power flow to distribution lines.
- Install voltage control devices such as SVC (Static Var Compensator) and STATCOM on distribution lines.

The advantages and disadvantages of each measure are shown in Table 7-13.

Table 7-13 Advantages and Disadvantages by Measure

Measure	Advantage	Disadvantage
Suppress or stop power	Additional equipment cost is relatively small.	Renewable energy cannot be fully utilized.
Storage batteries	It is possible to avoid the voltage rise.	Power storage equipment is relatively expensive. Electricity is lost due to charging and discharging.
Voltage control devices	It is possible to suppress the voltage rise.	Voltage control equipment is relatively expensive.

Source: JICA Study Team

Since the flow of electrical power is different from the conventional one, the operation method of the electrical power network is different from the conventional one. For this reason, it is necessary not only to consider measures for equipment but also to improve the technical level of distribution companies regarding planning and operation.

7.4. Information and Communication System

7.4.1. Overview of Existing Plans and Surveys

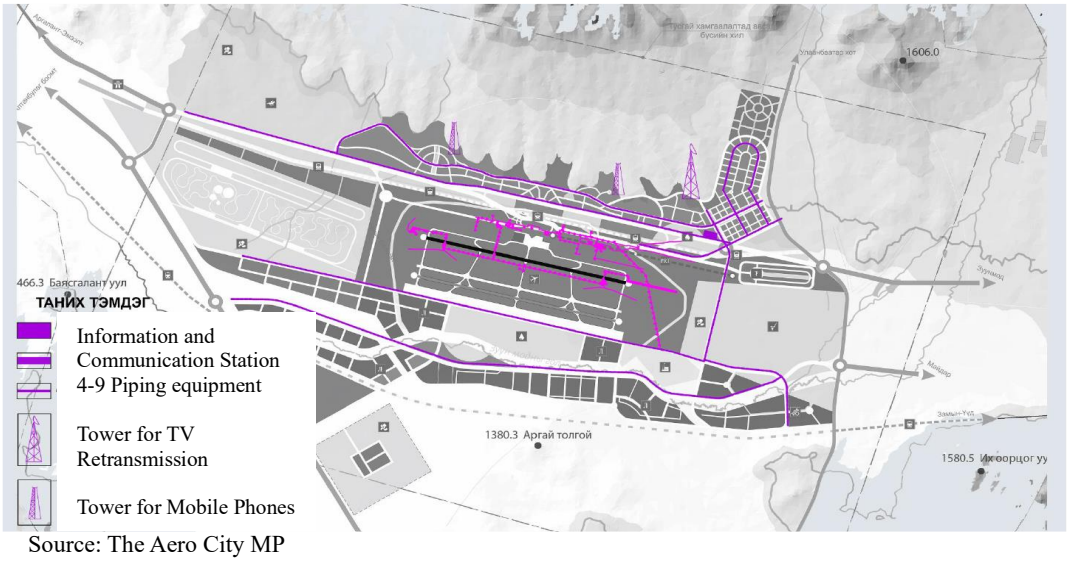
(1) The Aero City MP

In the Aero City MP, the installation of ICT facilities, such as piping (duct), optical fiber cables, and information and communication station building, for New Zuunmod are planned for 2030.

The piping (duct) and one 96-core optical fiber cable is planned to be installed as the main access within the city. This pre-installation of the piping equipment can solve repeated excavation works when utility companies provide services to customers.

As a connection to the domestic backbone, a 48-core optical fiber cable is planned to be installed along the road from the new information and communication station building in New Zuunmod to that planned in Buyant Ukhaa Airport and Yarmag area.

As for the access equipment for customers, services such as telephone, high-speed Internet connection, and TV broadcasting, are planned to be provided by installing a state-of-the-art multi-service access accommodation device in the new station building. Service providers can expand it as the population increases.



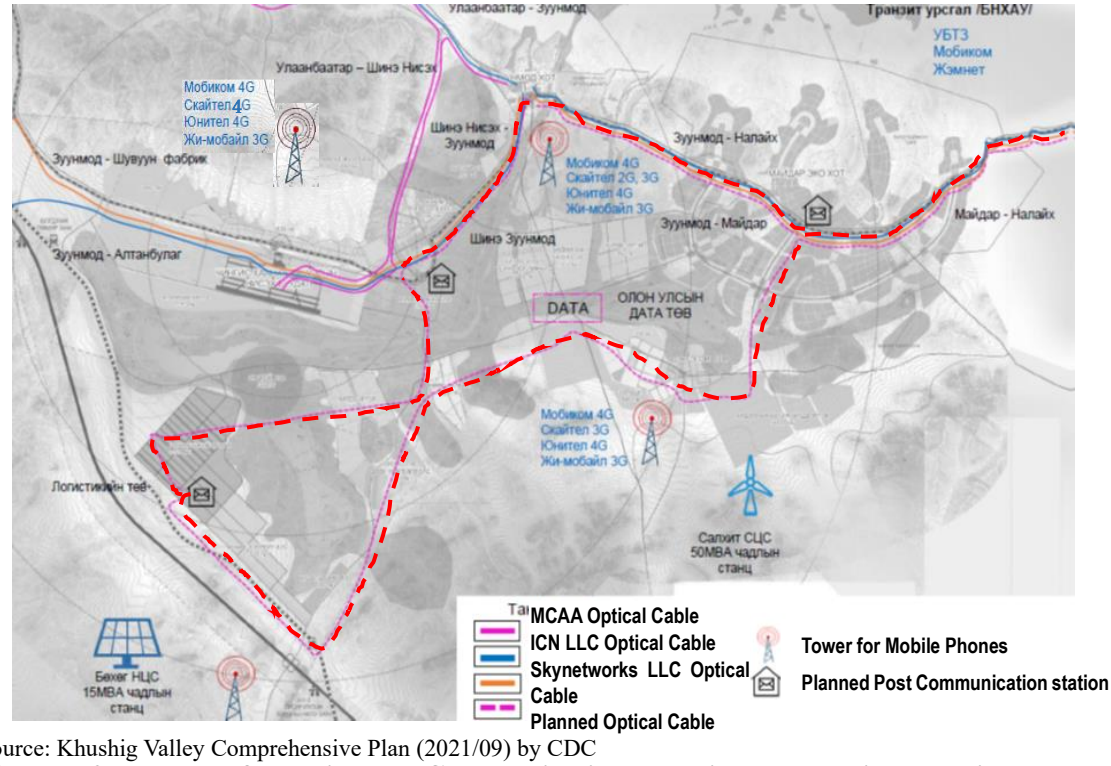
Source: The Aero City MP

Figure 7-8 Plan on Information and Communication Access Network in the Aero City MP

(2) Khushig Valley Comprehensive Plan (Draft)

In Khushig Valley Comprehensive plan, as shown in Figure 7-9, five new intercity optical fiber cables were planned to be installed in the Khushig Valley area: (1) Zuunmod to New Zuunmod, (2) New Zuunmod to logistics center, (3) logistics center to Maidar, (4) Zuunmod to Maidar, and (5) Maidar to Nalaikh. This network will connect to the existing domestic network in Ulaanbaatar City from Zuunmod and Nalaikh. This connection establishes a highly reliable information and communication network between Ulaanbaatar City and Khushig Valley.

Moreover, three communication station buildings are planned: one in the east side of the new airport, another near the logistics center, and still another in Maidar.



Source: Khushig Valley Comprehensive Plan (2021/09) by CDC

Figure 7-9 Plan on Information and Communication Intercity Network in Khushig Valley

7.4.2. Status and New Plan of Information and Communication Infrastructure

(1) Status of Information and Communication Infrastructure

Figure 7-9 also shows the existence of a reliable optical fiber cable ring in Khushig Valley through the eastbound and westbound routes from Ulaanbaatar City. The cable routes are owned by state-owned Information and Communication Network LLC (ICN LLC, Netcom) and the private firm, Skynetworks LLC. In addition to these two companies, cables of Mobicom Networks LLC are laid in the area.

Using these optical cables and the information and communication stations in Zuunmod which houses communication equipment, four mobile phone service providers are providing services in Zuunmod, Sergelen soum, and the new airport area. As well, fixed service providers, such as the state-owned Mongolian Telecommunication JSC, Univision LLC, and Mobinet LLC, provide telephone and internet connection services in these areas.

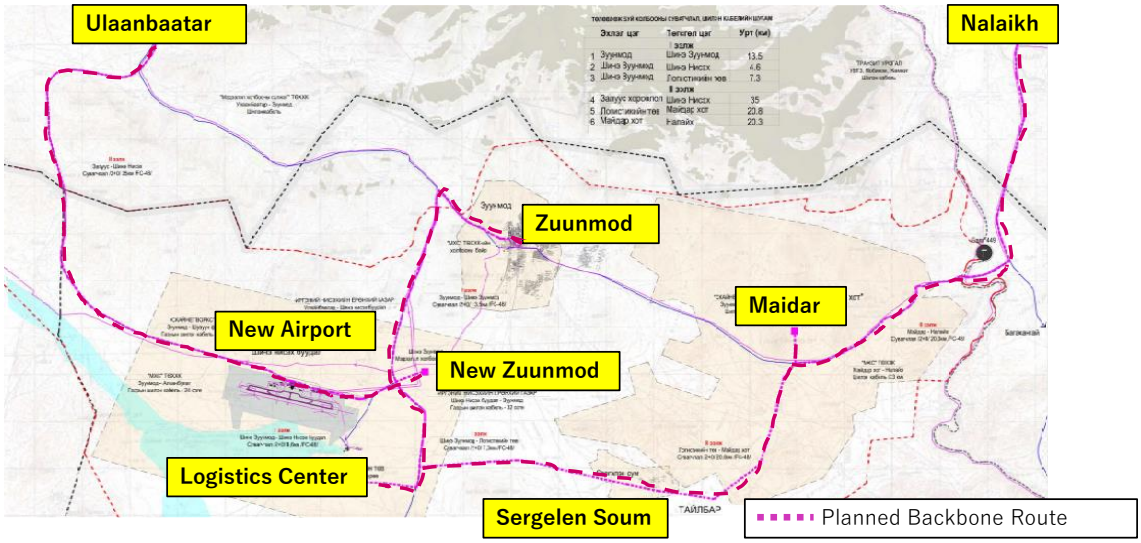
(2) New Plan on Information and Communication Infrastructure

Multiple network providers have already installed optical fiber cables from Ulaanbaatar City to the Khushig Valley area, and communication services are provided. There is sufficient ground to provide communication services in newly developed areas. Additionally, the Mongolia government decided to issue a frequency license for 5G mobile phone services in 2023. Mobile phone service providers are preparing for these services which can provide high-speed, low-latency, and multi-terminal connection and will make possible the use of various advanced applications.

However, for the 5G technology, it is necessary to install more wireless base stations at narrow intervals than before, and it is necessary to prepare an infrastructure that can accommodate more optical fiber cables corresponding to the number of 5G base stations. 5G uses a higher frequency than that used in previous services; its radio wave reachability is extremely low; and it has the disadvantage of covering only an area of a few hundred meters, while 4G can cover an area of several kilometers.

Considering 5G mobile phone services along the highway connecting Ulaanbaatar City and Khushig Valley area, the design plan by UPRI shows the construction of the backbone and intercity routes, as shown in Figure 7-10. It plans to lay two pipes in advance along the roads that can be shared by various network providers and to install utility access holes used for cable branching and connection in shorter intervals than usual, taking into consideration the easy installation of base stations for 5G services by providers. A 48-core optical cable will also be laid in advance in the pipeline, and service providers can choose to rent the cable or lay a new cable in the pipeline on their own.

The city level plan for the information and communication infrastructure has not been formulated yet, but the JICA Study Team recommends that the cable pipelines be laid along the road in advance and shared by network and service providers, as planned in the Aero City MP and UPRI's backbone and intercity route plan. It is also necessary to design the infrastructure to be able to install the base stations for 5G services.



Source: UPRI

Figure 7-10 Plan on Information and Communication Network in Khushig Valley

7.4.3. Challenges to Realization and Issues to Address

Since state-owned and private network and service providers are developing the ICT infrastructure and provide services in accordance with the development policies of the government and the Communication and Information Technologies Authority (CITA, became the Ministry of Digital Development and Communications from January 2022), JICA does not need to support this sector.

7.5. Solid Waste System

7.5.1. Policy and Legal Environment

(1) Law of Mongolia on Household and Industrial Waste

In Mongolia, the revised version of the Law of Mongolia on Household and Industrial Waste entered into force on 12 May 2017. Its objectives are to reduce and prevent adverse effects of waste on human health and the natural environment, introduce economical recycling of waste, conserve natural resources, and improve residents' knowledge of waste, including waste reduction, sorting, collection, and transportation. In addition, the government has established the following regulations: waste reduction, sorting, collection, transportation, storage, reuse, recycling, reclamation, disposal, export, import of hazardous waste, and prohibition of domestic transit.

According to the Waste Law, waste in Mongolia is divided into “general waste” and “hazardous waste.” There is no clear definition of hazardous waste, but it is recognized as explosive, flammable, chemically reactive waste, waste that generates toxic gases when reacting with air or water, infectious waste, and all waste that has a short- or long-term harmful effect on humans or animals.

Each municipality (aimag, city, and soum) is responsible for the management of general waste, and collection fees are set by each municipality. However, the entity responsible for implementing waste management for New Zuunmod has not yet been identified.

Construction waste generated during the construction of the new international airport was brought to the final disposal site in Zuunmod in Tuv aimag, and the cost of receiving the waste had been discussed with Tuv.

On the other hand, hazardous waste is managed by the MoET, which is responsible for the planning of temporary storage and treatment facilities for hazardous waste and the registration of hazardous waste generation, transportation, collection, storage, recycling, and disposal companies.

Article 43 of the Waste Management and Public Cleansing Law stipulates penalties for illegal dumping, and violators are penalized based on stipulations in the National Public Service Law and the Penal Code or the Law on Violations. However, in practice, illegal dumping has increased and relevant regulations and rules to ensure compliance with the law are insufficient.

(2) Waste Tariffs

The waste tariffs to be paid by residents have not been determined in the Aero City MP.

As a reference, the waste tariffs in Zuunmod City are shown in Table 7-14. The tariffs are calculated based on the collection and transportation costs of general waste and landfill maintenance cost. The per capita waste tariff is 500 MNT/month (about JPY20), which seem inexpensive when compared to the 2,500 MNT/L of gasoline (about JPY100).

Table 7-14 Waste Tariff (Zuunmod City)

No.	Classification	Period and Unit of Charge	Tariff (MNT)
1	Inhabitants	Month	500
2	State budget agencies, Commercial/Industrial/ Service facilities, Enterprises/Organizations, Regional property and State property corporations	Up to 10 employees	10,000
		11-25 employees	20,000
		25-50 employees	40,000
		Over 51 employees	60,000
3	Households with livestock in the community	m^2	5,000
4	Industrial and service facilities (depending on the amount of waste generated)	Month	8,000-10,000
5	Construction waste	Ton	20,000
6	Households in summer camps (based on amount of waste generated)	Month	10,000
7	Transporting and disposing of waste to a waste disposal site with your own vehicle	Ton	3,000

Note:
1. Waste tariff is applied and collected during the opening of schools and kindergartens.
2. Contractors constructing and renovating buildings and heat suppliers using boilers, etc. transport the generated waste by a tariff set by a vehicle of the Urban Development Bureau.
3. Residents, enterprises, organizations, and state agencies that generate a large amount of waste shall mutually agree on the price per ton and sign a contract with the municipality when requesting a waste transportation service.
Source: Appendix 3 of Decision No. 5 of the Fourth Session of the Ninth Residents' Assembly of Zuunmod City

(3) Installation Standards for Waste Treatment Facilities

Standards to establish final waste disposal sites and primary collection sites are set by the Municipal Building Code and the Civil Aviation Law, both of which state that a final waste disposal site should be 300 m from residences and 10 km from the center of an airport, respectively.

The Aero City MP shows that the existing disposal sites in Zuunmod City and Sergelen soum center is planned to be used as the final disposal site for New Zuunmod. However, the primary collection sites planned in the MP are considered as too close to the new airport.

7.5.2. Overview of Existing Plans and Surveys

(1) The Aero City MP

The Aero City MP proposes a waste management system, including sorting, transportation, and final disposal for waste generated from residential, commercial, industrial, and tourism activities in New Zuunmod, based on the principle of smart and eco-friendly waste management. The 3Rs principle of "reduce, recycle, and reuse at the source" is applied in waste management. Advanced technologies, such as incineration facilities, is also introduced to reduce the volume of waste. To enhance the urban wastes management, the MP identifies the following activities to be implemented:

- Enhance the waste management network;
- Introduce and establish general waste separation and regular waste collection services;
- Support private waste recycling businesses;
- Improve the knowledge of the general public, and implement environmental education in schools and kindergartens;
- Prevent pollution of the living environment and the spread of infectious diseases due to abandoned garbage in residential complexes;
- Prohibit the disposal of medical, special, explosive, and other hazardous wastes at disposal sites; and
- Place large and small trash cans at residences and offices and interchangeable containers at industrial facilities, and establish a system for transporting wastes to disposal sites.

The amount of waste generation estimated in the Aero City MP is shown in Table 7-15. The amount of general waste generated is estimated to be 288.4 tons per week by approximately 70,000 population including residents and workers. The estimation of general waste amount and the selection of waste collection points are planned based on the population density of the target area, the automobile network, and the location of existing disposal sites, according to the mandatory Appendix 16 of the General Waste Collection Standards (the Municipal Building Code No. 30.01.04).

Table 7-15 Waste Estimation for New Zuunmod

Waste Source	Population	Amount of general waste per capita (day)	Amount generated per day (tons)	Amount generated per week (tons)	Amount generated per month (tons)	Amount generated per years (tons)
Estimated population (Residential area)	34,119	0.5	17	119	510	6,120
Presumed population (Public area)	21,000	0.8	16.8	117.6	504	6,048
Estimated population (Workers)	14,881	0.5	7.4	51.8	222	2,664
Total estimated population	70,000	-	41.2	288.4	1,237.7	14,832

Source: The Aero City MP

In the Aero City MP, wastes are classified as general, solid, special, and hazardous wastes, which are to be actively recycled and reused. Waste segregation and piped transportation

technology (dust chute) are also proposed.

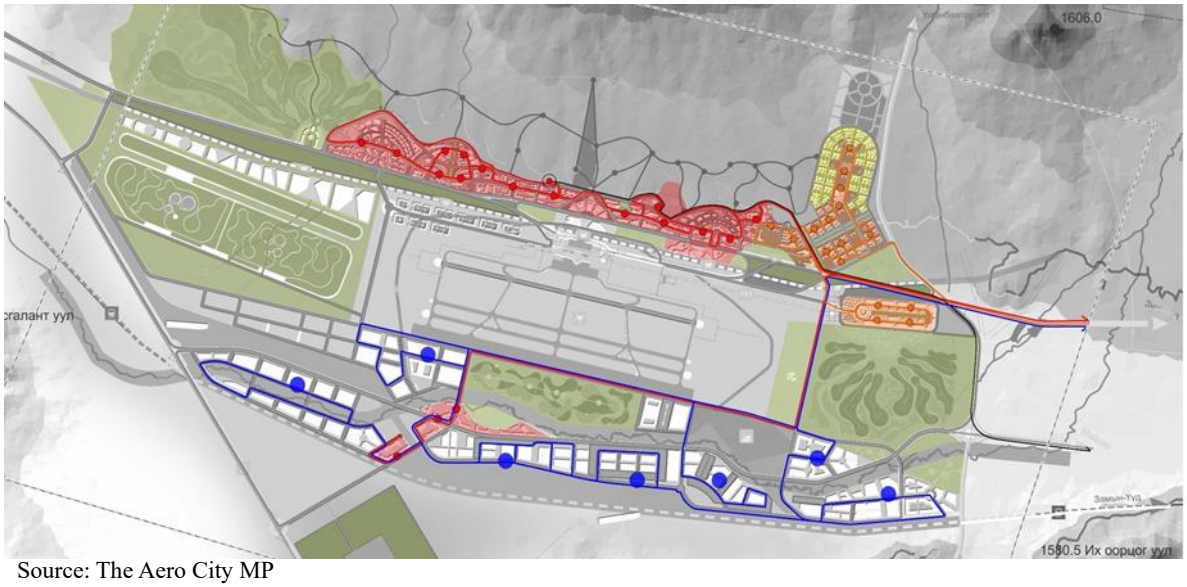
Table 7-16 Waste Segregation Types, Containers, and Destination Planning

Waste Separation	Type of Waste	Container for Disposal	Destination
Burnable waste that cannot be reused	Burnable waste that cannot be reused or recycled	Place in a garbage bag and dispose of at a garbage dump	Transport of primary waste from collection site to disposal site
Reclaimed or recycled waste	General and industrial solid waste, waste that can be reused or recycled	Separating and discarding	Sort and compact at primary waste sorting facilities and transport to reclamation and recycling facilities
Other waste	Bulky trash such as home appliances	No container	Transport to waste reclamation and recycling facilities

Source: The Aero City MP

To collect waste, the primary collection box dedicated to waste separation that complies with sanitation and storage standards is planned to separate general waste generated in residential and public areas. In low-rise residential areas, waste is expected to be separated and collected at entrances of buildings. The number of primary waste collection points planned in residential areas, public areas, industrial areas, and the FZ is 12, 18, seven, and four, respectively.

The layout of waste collection points and haulage routes are planned to be on community roads and area trunk roads to reduce road congestion and to ensure proper haulage (see Figure 7-11). The feasible frequency of transporting waste is determined to be four trips per day by two special vehicles with good sealing and a loading capacity of 5 tons, according to the relevant standards (see Table 7-17).



Source: The Aero City MP

Figure 7-11 Waste Collection and Transportation Plan in the Aero City MP

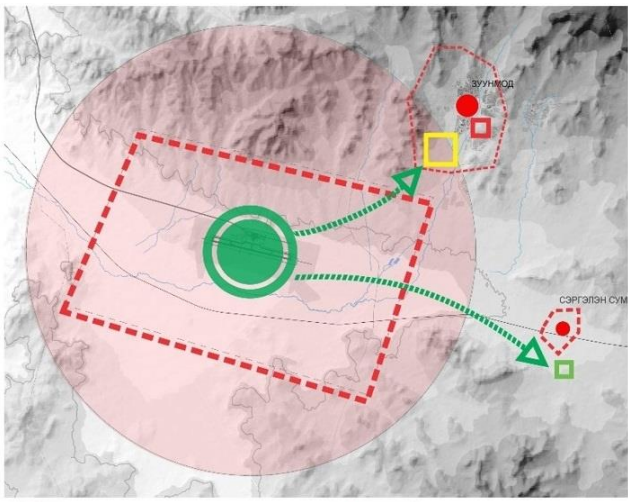
Table 7-17 Waste Collection and Transportation Plan in the Aero City MP

	Loading Capacity	Number of Units	Number of Trips per day	Transported Amount per day	General Waste Volume per day
Trucks	5 tons	2 units	4 times	40 tons	41.2 tons

Source: The Aero City MP

In the Aero City MP, the final waste disposal site identified is either the existing disposal site in Zuunmod City or a location called Ikheriin Buuts, which is located 3.5 km south of Sergelen soum center. Meanwhile, the Zuunmod City Development MP points to a new waste treatment facility to be used in the future.

On the other hand, medical (infectious) waste generated in hospitals and health centers is not considered as general waste. Based on UBMP2020, medical waste will be transported by special waste transportation vehicles to a facility that is designed to accept hazardous waste, 3 km west of Chuluut station toward Bagakhangai.



Source: The Aero City MP

Figure 7-12 Location of Final Disposal Site Proposed in the Aero City MP

(2) Khushig Valley Comprehensive Plan (Draft)

The draft of the Khushig Valley plan, which is still being studied, does not propose a specific waste management method. Yet, a new organization or wide-area management is being considered.

(3) Construction Plan for a Temporary Storage and Treatment Facility for Hazardous Waste

The MoET plans to build a temporary storage and disposal facility to manage the increasing amount of hazardous waste, and Tuv aimag has been identified as the site for this. The purpose of this facility is to properly dispose 369 tons of illegally dumped waste and 68,000 L of chemical, hazardous substances and other hazardous wastes and to establish a system to prevent risks to residents' health and the natural environment. According to the study conducted by MoET in 2009, the construction of this facility would be implemented by a concession and through PPP. The total cost was estimated to about MNT30.8 billion (about USD123 million). While the 2020-2024 program by the Cabinet states that the facility will meet international standards for hazardous waste, the project has been postponed due to opposition from local residents.

Cabinet Decision No. 337 of 28 August 2019 secured 10 ha of land for state special use in Baganuur district of Ulaanbaatar City. However, on 9 March 2020, the Mayor of Baganuur district applied for the cancellation of the land for construction by Document No. 01/46. Based on this application, the project was canceled by Cabinet Decision No. A/134 dated 15 April 2020.

At the 43rd Cabinet Meeting in 2020, the Minister of MCUD, the governor of Tuv aimag, and MoET were instructed to resolve the issue about the construction site. In October 2020, MoET wrote to the Mayor of Ulaanbaatar for the speedy resolution and decision on the issue to secure land for the facility.

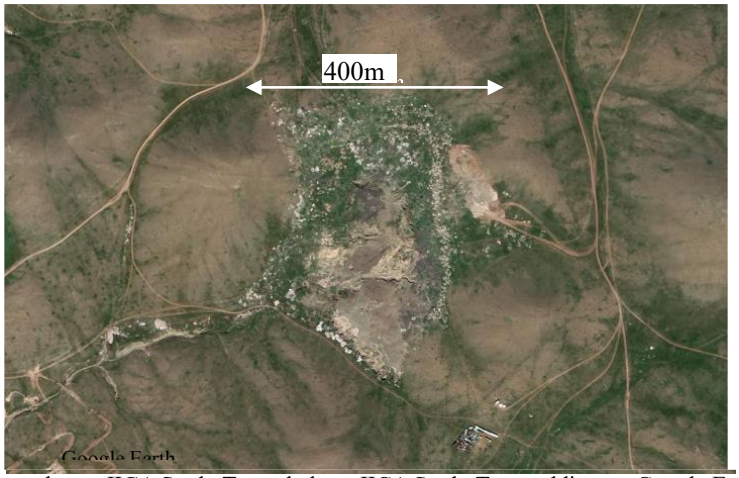
7.5.3. Status and Demand Forecast of Waste Management Infrastructure

(1) Status

<u>Final disposal site</u>

Zuunmod City's final disposal site, which is expected to be used as the final disposal site

for New Zuunmod as well, is about 14 ha in size (the site boundary is unclear). The site is large enough for future expansion, and it is possible to pile up the waste by bulldozing and pushing the soil. Since the wastes that are extensively dumped are mainly construction wastes, such as concrete rubble, the amount of organic waste that can be incinerated is considered small and not enough for the waste incineration method. In 2021, Zuunmod City conducted a feasibility study for the construction of a final disposal facility and an incineration plant. MNT28 billion (about JPY1.13 billion) has been allocated for the facility with a 20-year service period. However, the progress is uncertain due to the lack of budgetary sources.



Source: above: JICA Study Team, below: JICA Study Team adding on Google Earth

Figure 7-13 Existing Final Disposal Site in Zuunmod City

Waste collection and transportation vehicles

Currently, waste collection and transportation at the airport and in Zuunmod City are carried out by dump trucks, and there is no shortage of collection and transportation vehicles at the moment. For the planned population of 70,000 in the Aero City MP, only two 5-ton vehicles are expected to be in operation. Meanwhile, based on the Khushig Valley Comprehensive Plan, there is a possibility that waste from four areas will be managed collectively. In this case, the coverage of waste collection and transportation will expand, which may lead to a shortage of waste collection and transportation vehicles.

Temporary storage and treatment facility for hazardous waste

There are few facilities in Mongolia that are capable of disposing of hazardous wastes, and MoET has identified this as an urgent issue to address. The Aero City MP plans for the transportation of medical (infectious) for disposal and treatment to outside of New Zuunmod.

In Zuunmod, the pastoral industry has flourished, and the government promotes the development of agriculture and the livestock industry. For these sectors, the disposal of medical (infectious) wastes in the area will be a problem in the future.

(2) Consideration of Scope and Facilities to Develop

Final disposal site

The remaining capacity of Zuunmod City's final disposal site, even considering future expansion, is sufficient. Even a population of about 70,000 by 2040 based on the Aero City MP can be accommodated with proper landfill management. Therefore, it is not necessary to develop a new landfill site in the short to medium term.

However, unabated waste dumping has occurred in vacant areas in the disposal site, resulting in uncontrolled expansion of the dump site. The landfill capacity can be greatly expanded by using bulldozers and other heavy equipment to manage waste dumping. Considering that the current landfill method encourages uncontrolled expansion, the provision of heavy equipment (e.g., bulldozers and excavators) used for final disposal site management and capacity building for heavy equipment operation can be supported by JICA.

Waste collection and transportation vehicles

The demand for collection and transportation vehicles is considered to be small due to the small population size. The Aero City MP proposes only two 5-ton collection vehicles for a population of 70,000. This is sufficient to handle in Mongolia. On the other hand, if the waste in the four areas of Khushig Valley is collectively managed by a new organization, the number of vehicles may be insufficient.

Temporary storage and treatment facility for hazardous waste

In Mongolia, building the temporary storage and treatment facility for hazardous wastes is urgently required. Since it is difficult to locate hazardous waste treatment facilities throughout this vast country, it will be significant to construct temporary hazardous waste storage and treatment facilities planned by the MoET in New Zuunmod, which is the center of logistics. This makes transporting hazardous wastes from rural areas by rail to be treated in an integrated manner.

Information and data on hazardous wastes in Mongolia is limited, so a detailed study is needed to deepen the overall understanding of and planning for the facility.

If Japanese companies were to build an incineration plant for medical waste (hazardous waste treatment covers a wide range, including medical waste and chemicals), the construction cost for a kiln-stoker type incinerator (200 tons/day x 1 furnace) will be about JPY5 billion (see Table 7-18). In addition, the annual maintenance cost will be about JPY300 million. It is unfortunately difficult for Japanese companies to enter the market in Mongolia, due to the small market size and high country risk.

Table 7-18 Example of a Proposed Hazardous Waste Treatment Facility (Incineration Facility)

Item	Content	Remark
Waste disposal amount	62,000 tons/year	Need survey
Reactor type/ Reactor scale	Kiln stalker type incinerator (200 tons/day x 1 furnace)	312.5 working days
Pretreatment equipment	Consultation required (depending on the sorting situation)	Need survey
Exhaust gas treatment	Dry type (activated carbon/slaked lime spray), non-catalytic denigration	
Ash treatment	Landfill	
Required site area	2 ha	
Construction period	3 years	Depends on local conditions
Approximate construction cost	JPY5 billion	Does not include cause fortifications and pile construction
Maintenance fee	JPY5 billion (total for 20 years)	Staff fee, service fee, maintenance fee

Source: JICA report (2021) and interviews with manufactures

7.5.4. Challenges to Realization and Issues to Address

General waste management covers many aspects such as sorting, collection, transportation, landfill, and implementation of 3Rs. Various waste management services need to be provided in the future, but the current waste tariff is inexpensive at about 500 MNT/month (about JPY20) per resident. It is necessary to set a waste tariff considering the future waste management to provide the necessary facilities and maintenance.

8. Development Finance and Public-Private Partnerships for New Zuunmod

8.1. Status of PPP in Mongolia

The policy to promote infrastructure development through PPP schemes was launched in 2009. According to data from the PPP Knowledge Lab, however, only six PPP projects have been implemented in Mongolia, i.e., three wind power projects, two solar power projects and one ICT project (see Table 8-1).

Table 8-1 PPP Projects in Mongolia

Project Name	Sector	Final Closure Year	Investment (USD Million)
1. Tsetsii Wind Farm (by JICA Overseas Investment Finance)	Energy	2016	128.00
2. Sainshand Wind Farm	Energy	2017	120.00
3. Newcom Salkhit Wind Farm	Energy	2012	120.00
4. Desert Solar Power	Energy	2018	54.00
5. Sermsang Khushig Khundii Solar PV Power Plant	Energy	2019	18.70
6. Mongolia Telecom Company	ICT	1995	4.50

Source: https://pppknowledgelab.org/countries/mongolia

The existing FZs are also trying to develop their infrastructure through PPP schemes. However, due to the lack of experience in forming PPP projects and an enabling institutional environment, progress has been slow. Given the lack of institutional arrangement, financial challenges and lack of practitioners in Mongolia, it is clear that it will be challenging to introduce a PPP scheme to promote the various projects for the development of New Zuunmod.

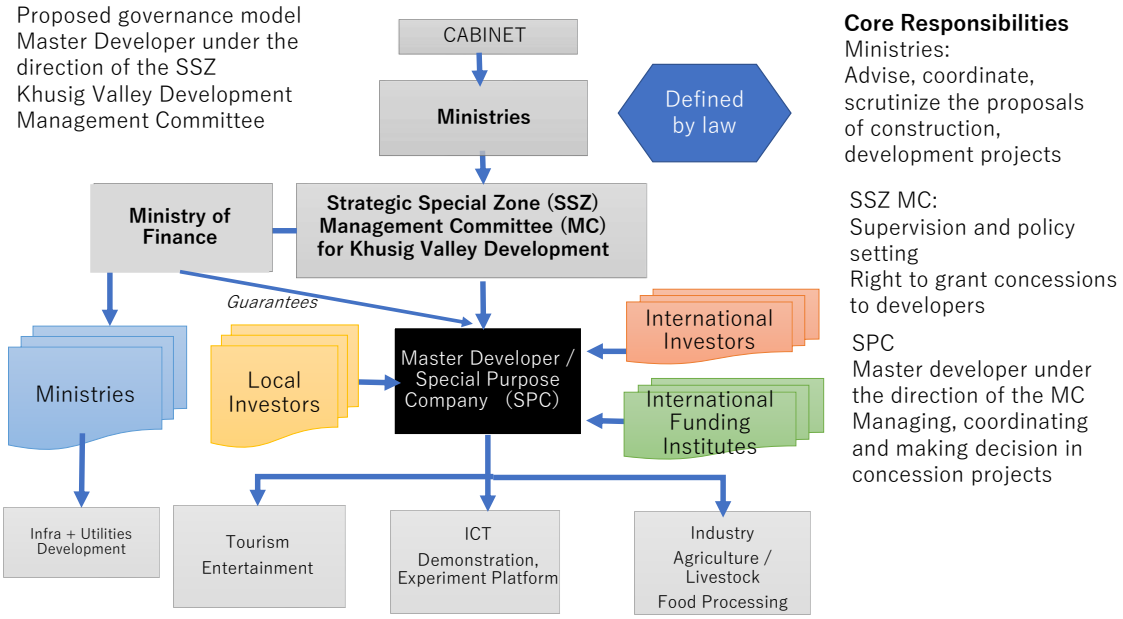
8.2. Developing Financial Schemes for New Zuunmod

The cost of developing basic infrastructure (roads, electricity, water supply, logistics, etc.) in New Zuunmod is enormous, because it is greenfield project. In pursuit of PPP, there is a risk that the project schedule will significantly be delayed due to poor financing. An appropriate division of roles between the public and private sectors, especially in terms of using public funds is essential. Projects should be classified into types according to their potential for fee collection, risks, etc., and appropriate business schemes should be selected.

- Transportation and road ➡ Government-led public finance
- Power, water supply and sewerage ➡ PPP
- ICT business complex and other office buildings, hotels, etc., where the financial returns can be estimated, ➡ Private finance

8.3. Institutional Set-up for New Zuunmod

To have overall management, the JICA Study Team proposes that the Khushig Valley Development WG, which currently exists, should be responsible for the planning, and that the development entity (master developer or SPC) should be manage the implementation phase (see Figure 8-1). The feasible approach is for the project to be managed by a master developer led by the private sector, with a commitment from the government as to the detailed area to be covered and financial plan, among others.



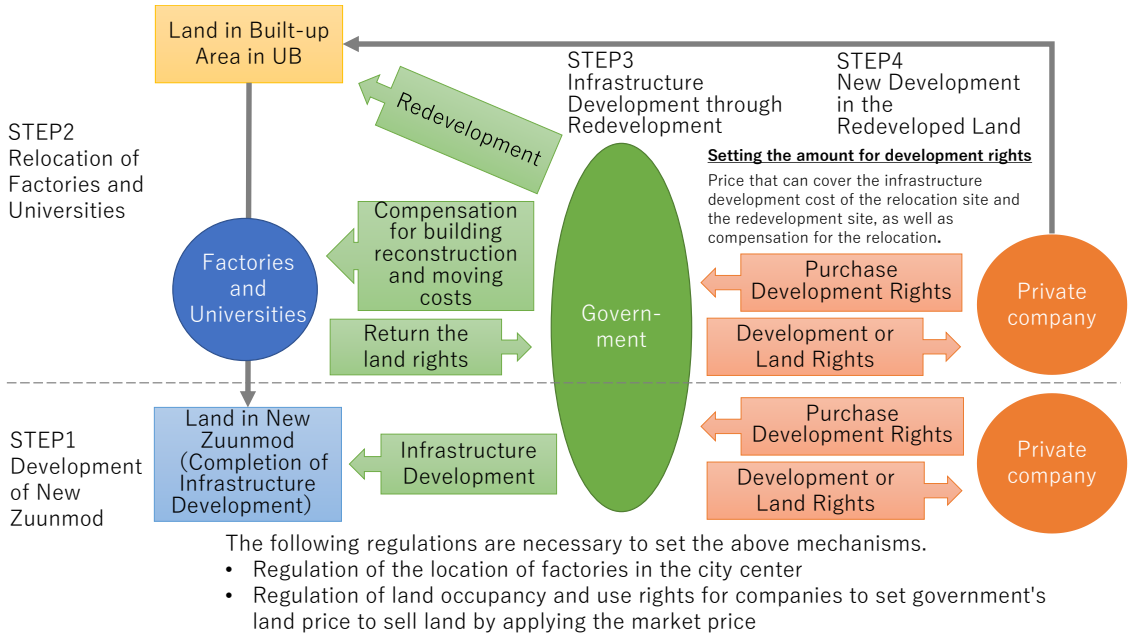
Source: JICA Study Team

Figure 8-1 Draft PPP Framework for Khushig Valley Development

8.4. Financial Schemes for New Zuunmod

8.4.1. Introduction for the New Financial Scheme

It is difficult to obtain large plot of land in the six central districts of Ulaanbaatar, so land within this built-up area has high asset value. However, once the relocation of industrial facilities, R&D and technical support institutions, logistics facilities, and others from Ulaanbaatar to New Zuunmod has been secured, the government can implement redevelopment projects on the vacated lands in the city center for sell the development rights and use the capital gain to cover the development costs in New Zuunmod (see Figure 8-2). The lands previously occupied by universities and factories can accommodate higher buildings, and the development rights of these lands can be sold to the private sector at market prices after providing new infrastructure and a road network. Developing the appropriate funding mechanism to fund both redevelopment and relocation sites will require a detailed study.



Source: JICA Study Team

Figure 8-2 Development Concept utilizing Vacated Lands in Ulaanbaatar

8.4.2. Green Finance

Interest among financial institutions in green finance is increasing, although the definition of green finance is not clear but could be used. Under the international fund called the Green Climate Fund (GCF), Xac Bank in Mongolia became an accredited bank in 2015. So did the Trade and Development Bank (TDB) in 2020. Since both are commercial banks, they are of the view that major infrastructure projects are difficult to undertake without a clear policy from the Mongolian government and the presence of international financial institutions to support them. The infrastructure development in New Zuunmod aims at green urban development through the introduction of passive architectures. Consequently, it can be developed using green finance, but it is undeniable that the enabling environment is still inadequate to encourage private sector investment.

9. Proposed Roadmap

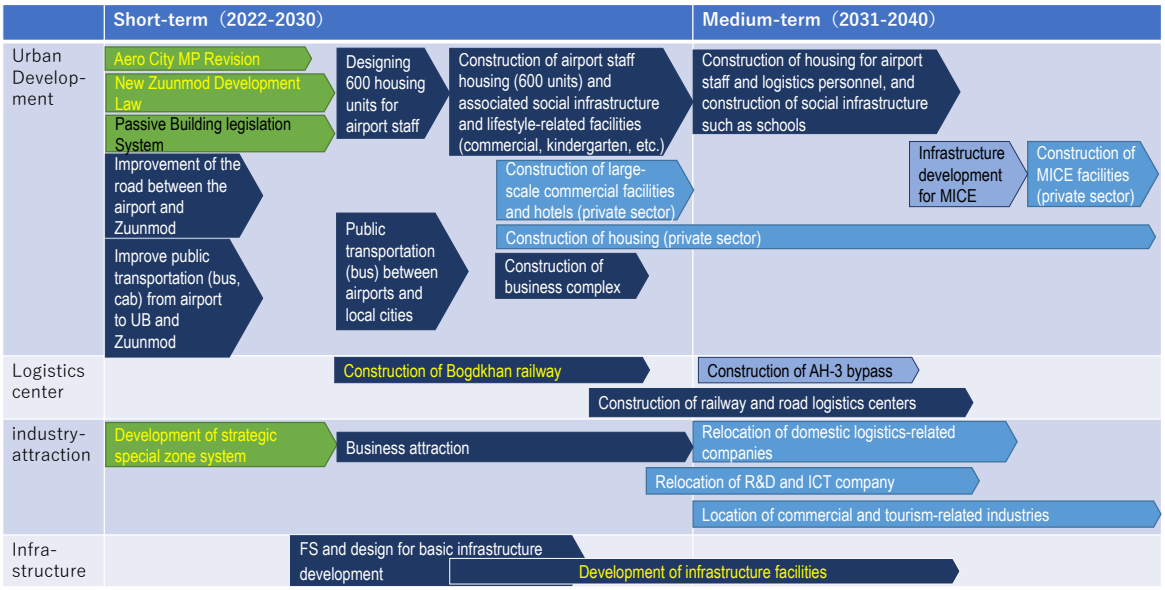
Based on the analyses presented in the previous sections, this chapter presents the proposed roadmap for the development of New Zuunmod in the short and medium terms as a conclusion of this report.

9.1. Recommendations for the Phased Implementation of New Zuunmod Development

Followings are essential conditions for the development of New Zuunmod in line with the Aero City MP: i.e., revising the Aero City MP; formulating the New Zuunmod (or Khushig Valley) development law; developing water supply, sewage, and power facilities; and constructing Bogdkhan railway.

9.2. Roadmap for the Development of New Zuunmod in the Short and Medium Term

The proposed roadmap for the development of New Zuunmod in the short and medium term is shown in Figure 9-1 in overview and Table 9-1 in detail.



Source: JICA Study Team

Figure 9-1 Proposed Roadmap for the Development of New Zuunmod in the Short and Medium Term

Table 9-1 Detailed Roadmap for the Development of New Zuunmod in the Short and Medium Term (Proposed)

Com-ponent	Short Term（2022-2030）		Medium Term (2031-2040)
	2022-2025	2026-2030	
Urban Develop-ment	• Administrative boundaries will be clarified and the administrative structure of New Zuunmod will be determined. • The development body and decision-making structure will be determined. • The policy of relocating the logistics center from Ulaanbaatar City will be decided. • The New Zuunmod Development Law will be formulated, and the Aero City MP will be revised. • Passive construction related regulations will be formulated. • The detailed design of 600 units of airport staff housing reflecting passive construction technology will be prepared and approved. • The detailed design of the road between the airport and Zuunmod will be approved and the road will be constructed. • Regular bus service between airport and Zuunmod and airport and Ulaanbaatar (limousine) will start.	• The infrastructure of the development site on the north-east side of the airport will be developed. • 600 housing units for airport staff and related facilities such as social infrastructure will be constructed. • Regular long-distance bus service between the airport and regions will start. • Detailed designs for staff housing for airport (besides the above 600 units), railway, and logistics centers, social infrastructure and other service facilities reflecting passive construction technology will be prepared and approved. • Development rights of private development sites will be sold. • The F/S and detailed design of the business complex will be prepared and the business complex will be constructed. • Detailed design of a large commercial facility and hotels to be developed by the private sector will be prepared and the construction will start.	• The infrastructure in the north-east side of the airport will be completed. • The airport staff housing, railway staff housing, logistics center staff housing, social infrastructure, and other service facilities will be constructed. • The detailed design of private housing reflecting passive building technology will be prepared and construction will be started. • Infrastructure and facilities for MICE will be built.
Logistics Center	• F/S and detailed design of Bogdkhan railway will be prepared. • Estimation of road and rail related logistics projection will be carried out. • An air cargo marketing study (air cargo hub concept) will be conducted. • A study on the promotion of simplified trade and logistics procedures (simplified transit procedures) will be conducted.	• Bogdkhan railway will be constructed. • F/S and detailed design of railway logistics center will be made. • F/S for AH-3 bypass will be prepared. • F/S and detailed design of road logistics center will be studied. • Strategy for realization of air cargo hub will be studied.	• The construction of the Railway Logistics Center will be completed. • Relocation of companies to the rail logistics center from Ulaanbaatar City will start. • F/S and detailed design of Road Logistics Center will be prepared. • Detailed design of AH-3 bypass will be prepared and construction will start. • Road Logistics Center will be constructed.

Com-ponent	Short Term（2022-2030）		Medium Term (2031-2040)
	2022-2025	2026-2030	
			• Relocation of companies to the Road Logistics Center from Ulaanbaatar City will start. • Air Cargo Logistics Center will be established.
Industrial-Attraction (Strategic Special Zone)	• Development plans and projects will take shape, and the implementing entities and decision-making structure will be determined. • SSZ system will be established. • Start attracting companies to business complexes, MICE, commercial facilities including large hotels and private real estate development. • Clusters of ICT/innovative sectors will be launched.	• ICT/innovative sectors, R&D institutions, etc. will move into the business complex to form clusters. • Investment in the form of capital participation in ICT/innovative cluster development will increase.	• Start of business alliances in ICT/innovative clusters and of foreign investment (export) through overseas development of services originating from the clusters. • Relocation of companies in the agro-pastoral sector and the food processing sector that are moving into the fourth industry and DX will begin through collaboration with ICT/innovative clusters. • The relocated sectors will begin to expand and export to other regions.
Infra-structure Develop-ment (Water and Sewage)	• Water supply facilities and sewerage facilities (sewage and storm water drainage) plans will be formulated in accordance with population and land use plans, and develop F/S. • According to the above plan, following construction permits (e.g. for well construction) water and sewage facilities will be constructed. • Business permits for the operation of water and sewage facilities will be obtained.	• Same as left	• Same as left
Infra-structure Develop-ment (Power)	• The plan for the preparation of the power infrastructure (transmission lines, transformer stations, and distribution equipment) will be formulated. • The detailed design of transmission lines and substations will be approved and construction	• The detailed design of the power distribution system will be approved and will be constructed.	• Measures for the stable operation of the electrical power grid associated with the mass interconnection of renewable energies will be determined and implemented.

Com-ponent	Short Term（2022-2030）		Medium Term (2031-2040)
	2022-2025	2026-2030	
	will begin.		
Infra-structure Develop-ment (Commu-nication)	• A backbone optical network connecting Zuunmod, New Zuunmod, and the new airport will be developed by the national telecom operator. • 5G infrastructure will be developed by mobile carriers, and services will be provided at the new airport and New Zuunmod.	• A ring shape backbone optical network connecting Ulaanbaatar City and the Khushig Valley area will be developed by the state-owned telecom operators and others. • Fiber optic communication services and 5G services will be provided according to the usage in housing and social infrastructure facilities are constructed. • Studies for the provision of 6G services will be initiated.	• Fiber optic communication services and 5G/6G services will be provided, in line with the expansion of construction of housing, social infrastructure facilities and business complexes.
Infra-structure Develop-ment (Solid Waste)	• A waste management plan for New Zuunmod will be prepared. • A plan for the development of a final disposal site will be prepared.	• A new final disposal site will be developed. • F/S and design of a temporary storage and treatment facility for hazardous wastes will be conducted.	• Construction and operation of a temporary hazardous waste storage and treatment facility will begin.

Source：JICA Study Team