SUTI
Sustainable Urban Transport Index

PLANNING SAFE, SUSTAINABLE, RESILIENT, AND INCLUSIVE PUBLIC TRANSPORT IN **ULAANBAATAR**

ESCAP
Economic and Social Commission for Asia and the Pacific

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ABBREVIATIONS

ADB	Asian Development Bank
AFC	Automatic Fare Collection
AIRI	Asian Infrastructure Research Institute
BIS	Bus Information System
BMS	Bus Management System
BRT	Bus Rapid Transit
CREC	Chinese Railway Engineering Consulting Company
FS	feasibility study
GPS	Global Positioning System
GHG	greenhouse gas emission
ITS	Intelligent Transport System
JICA	Japan International Cooperation Agency
KOICA	Korea International Cooperation Agency
LRT	Light Rail Transit
MGL	Mongolia
MRT	Mass Rapid Transit
NSO	National Statistical Office of Mongolia
UAVs	Unmanned Aerial Vehicles
UB	Ulaanbaatar
UDC	Urban Development Consulting Co. Ltd
UNECE	United Nations Economic Commission for Europe
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNCRPD	United Nations Convention on the Rights of Persons with Disabilities
VTOL	Vertical Takeoff and Landing
eVTOL	Electric Vertical Takeoff and Landing

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1. INTRODUCTION

Ulaanbaatar, the capital of Mongolia, is the largest city in the country. It has an area of 4,700 square kilometers (0.3 per cent of the country's total territory), and in 2021 was home to 1.54 million people in 412,500 households (46.5 per cent of the country's total population) (National Statistical Office of Mongolia, 2022). Over the past two decades, Ulaanbaatar has experienced a number of challenges, including air and environmental pollution, unchecked urban growth, traffic congestion, internal migration from rural areas, the expansion of *ger* (traditional dwellings like a yurt) district areas, and more. Congested roads are filled with private cars, public transport vehicles like buses, trolleybuses, and taxis, as well as informal public transit vehicles such as taxis and vans. Informal public transport vehicles operating without permits compete aggressively for passengers. Furthermore, an estimated 25.4 per cent of the city's population lives in poverty (National Statistical Office of Mongolia, 2022).

Due to the rapid growth of *ger* communities, a lack of paved roads, and the difficulty in accessing public transport, informal public transport vans have been operating in Ulaanbaatar's outside districts. High rates of unemployment, sources of untaxed income, and relatively low taxi fares[1], as well as internal migration to Ulaanbaatar from other provinces, have allowed the number of informal public transit cabs to increase, which has contributing to the congestion.

According to the National Statistical Office of Mongolia (NSO), as of 2021 the total number of registered vehicles in Ulaanbaatar was 662,644, up by 42 per cent (466,683) from 2015. Of this total, 72.2 per cent (or 478,469) were passenger cars, representing a rise of 38 per cent (337,181) from 2015. Checks on motorization have also weakened; as of 2022, only 428,182 of the total 662,644 registered vehicles, or 64.6% of the total, had received technical inspections. Up to 20 per cent of the air pollution of Ulaanbaatar is believed to be caused by motorized transport.

For low-income households and women, who frequently walk or take public transport, accessibility is a major issue. Although there was decent access to public transport, only those with medium/high incomes or who had to make urgent trips could afford to use a taxi or drive their own automobile. Due to the low cost of fuel and affordable price of Japanese hybrid vehicles, demand for imported old and used cars in Mongolia has risen. The Mongolian Customs General Administration reports that in 2021, Mongolia imported 52,014 passenger cars from Japan, making up 94.2 per cent of all passenger cars imported. When it comes to passenger transport, 508 buses were imported from the Republic of Korea, 235 from the Russian Federation, and 267 from Japan, making up 92.2 per cent of all buses imported.

Due to the fact that Ulaanbaatar is the world's coldest capital and experiences heavy rain and snow, people are more inclined to use their own vehicles to get around if the public transport system is not available. To address these challenges, the city needs to make a firm commitment to improve connectivity for its residents through an innovative new mass transit system in Ulaanbaatar. In addition to investing in infrastructure improvements, they have to enhance walking, bicycling, and general access in the city to be ready for a changing climate and more frequent extreme weather occurrences.

Daily transport issues have now moved to the fore of social and economic issues, with travel time and cost having a large impact on the lives of Ulaanbaatar’s population. While urban transport has introduced conveniences in connectivity, it has also introduced new environmental, physical, and economic challenges. The COVID-19 pandemic, which encouraged private car travel to maintain social distancing and secure a healthy, safe and clean environment, has negatively contributed to the situation as well. There are concerns about how to design Ulaanbaatar so that it is more livable.

[1] Average fares were 500 MNT, or about 0.18 USD, per km in 2019, but increased to 2000 MNT or about 0.58 USD per km in 2022 due to rising fuel prices and high inflation.

There are significant similarities as well as contrasts in the types of urban traffic challenges in Asia. A widespread conclusion is that, despite growing national efforts, transport conditions are frequently getting worse rather than better in developing Asian countries, including Mongolia. Today, many cities experience widespread congestion and traffic bottlenecks, which have a significant influence on urban life. Air pollution, noise, serious health risks, a lack of open space, and environmental deterioration are examples of externalities. The paradox is that the path to prosperity made possible by motorized transport has also been one of poverty and suffering for those in lower socioeconomic groups. Nevertheless, some cities with greater economic levels such as Bangkok, Kuala Lumpur, Seoul, Tokyo, and Singapore, have had some success in creating and sustaining effective public transport networks.

There are numerous studies on the sustainable transport challenges in Mongolia, but there is not much scholarly literature that focuses on Ulaanbaatar's urban transport challenges. In order to put the discussion on transport policy and urban travel in perspective, a review of recent urban public transit research is provided in this report.

The remainder of this report is structured as follows.

Chapter 2. Existing Urban Development Plans and Policies

This chapter covers Ulaanbaatar’s general development plans and government policies as well as policy documents pertaining to urban road and transport. According to the Urban Design Institute, the execution rate of the sixth general urban development plan was low. The concept and draft for Ulaanbaatar's Seventh General Development Plan until 2040 were developed in 2021-2022, and the plan draft is currently undergoing discussion and approval.

Chapter 3. Rapid Urbanization: Challenges and Opportunities

Ulaanbaatar's population has increased by 2.8 times since 1990 as a result of the country's economic transition from a centrally planned to a market economy, resulting in a variety of urban transportation issues such as traffic congestion, air pollution, an abundance of used and old cars, and outdated and diesel-powered public transportation buses. This chapter describes the challenges and opportunities presented by Ulaanbaatar's recent rapid urbanization from 1990 to the present.

Chapter 4. Sustainability, Inclusivity and Resilience of Public Transport in Ulaanbaatar

This section describes sustainability efforts in Ulaanbaatar, such as green, inclusive, integrated, and resilient urban transportation systems. This section discusses the evolution of ITS in public transportation as well as the requirements for the future. It includes SUTI assessment comparisons for 2018 and 2021. One of the main reasons for declining the SUTI assessment was the lack of investment in Ulaanbaatar's public transportation system between 2009 and 2021. The city has begun purchasing new public transportation buses with EURO V engines since 2022, and the SUTI 2023 is expected to increase. This chapter also includes the recommendations from the "National

Capacity Building Workshop on Planning for Resilient and Inclusive Public Transportation System in Ulaanbaatar," which took place in September 2022 in Ulaanbaatar.

Chapter 4. Conclusions and Recommendations

The final section concludes with general and short-, medium- and long-term policy recommendations for achieving an urban public transport system in Ulaanbaatar which is safe, sustainable, inclusive, and resilient.

2. EXISTING URBAN DEVELOPMENT PLANS AND POLICIES

2.1. OVERVIEW OF ULAANBAATAR'S GENERAL DEVELEOPMENT PLAN

The beginning of Ulaanbaatar's history may be traced to 1639, when the area was founded as a mobile monastery in Mongolia.[2] This originally nomadic town expanded dramatically during the course of its 380-year history to become home to over 1.5 million people, or half of the population of Mongolia. The general development plan for Ulaanbaatar's capital city was created six times over the course of its history, in 1954, 1963, 1971, 1986, 2002, and 2012, along with two updates that considered the socioeconomic development trends of the time. Due to the transition to a market economy, Ulaanbaatar's planning changed with the Fifth General Development Plan for the Capital City (2002-2013) in 2002. Since 2000, public transport service providers have been privatized, many private taxi businesses emerged, and transport associations and non-governmental organizations have been transformed into private businesses. The Sixth General Development Plan of Ulaanbaatar, "Ulaanbaatar 2020 Master Plan and Development Approaches for 2030," approved in 2013, envisaged that large-sized buses and trolleybuses would play a significant role in public transport. Due to the city's monocentric characteristics, public transportation routes were built along Enkhtayvan Avenue, Chinggis Avenue, and Ikh Toiruu to provide for urban mobility flow. In order to implement mass transit, it additionally suggested two BRT lines for the city's horizontal (Sharhad - Bayangol) and vertical (Selbe Sub-Center - Buyant-Uhaa) axes as well as one subway/metro line along Enkhtayvan Avenue. However, the Urban Development Planning and Design Institute estimated that by 2021, the execution rate of the master plan was only 29.6%.

The concept for the Seventh General Development Plan of Ulaanbaatar until 2040 (hereafter Urban Development Plan 2040) was discussed by the Cabinet as well as the Citizen's Representative

[2] When the city became the capital of the new Mongolian People's Republic in 1924, its name was changed to Ulaanbaatar (lit. 'Red Hero').

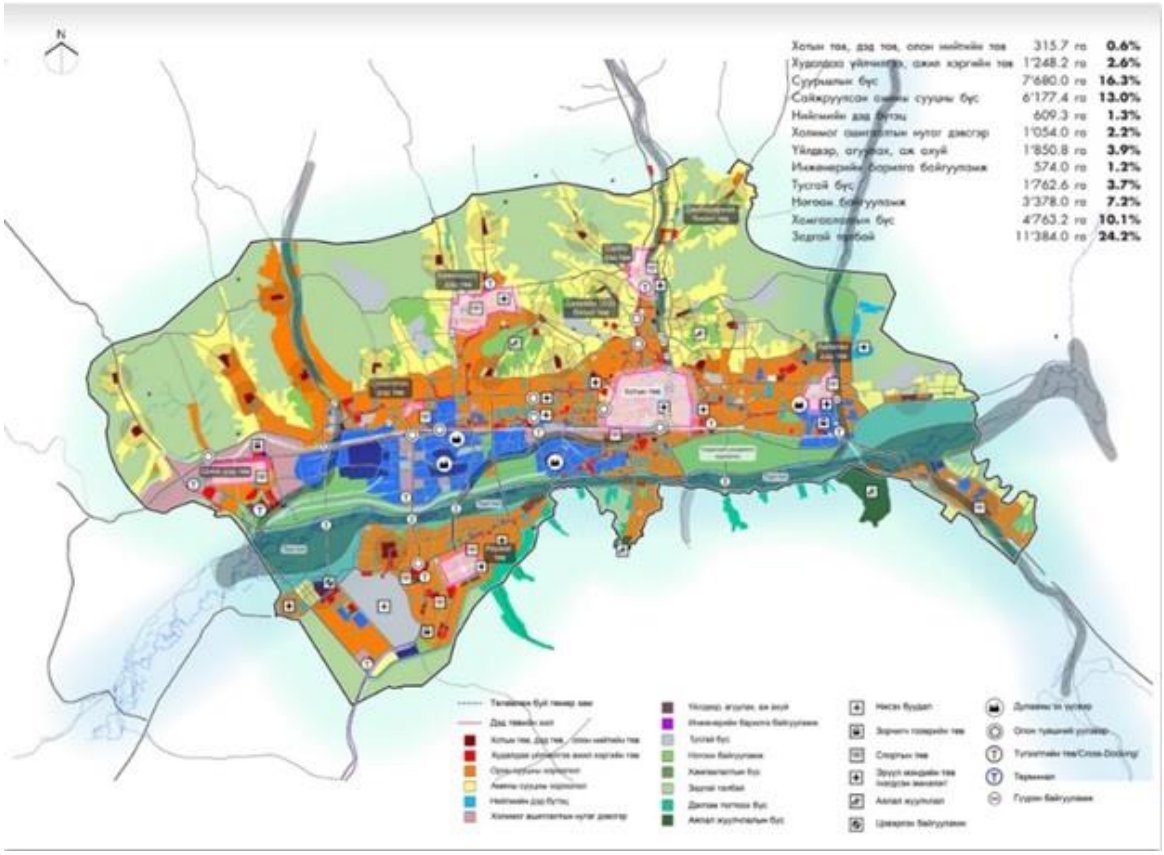
Khural of the Capital City in 2020. The draft for this plan was developed in 2022 but had not been approved at the time of this report.

Ulaanbaatar in 2022

According to the draft Urban Development Plan 2040, the Capital City (or Metropolitan Ulaanbaatar region) is made up of Ulaanbaatar City, nearby satellite cities, as well as auxiliary and outlying towns/villages. To reduce the load and concentration of the population coming to Ulaanbaatar and open up opportunities for sustainable urban development, the plan looks at diversifying production and service sectors, balancing the growth of the population in the capital city, and increasing the availability and accessibility of road transport, logistics services, engineering infrastructure (central water supply and wastewater utilities, wastewater treatment, central heating, electricity, gas, and communication) and urban settlements.

Based on its primary functions, the territory of Ulaanbaatar city will be divided into 4 sections: territories with settlements (constructed area and improved *ger* districts area); industrial and establishment territory; green facilities territory; and special purposes territory. Measures will be taken to gradually transfer Ulaanbaatar from its current mono-centric city to a multi-centered city system by the year 2040.

FIGURE 1. Architectural Spatial Planning of Ulaanbaatar



Source: Draft for General Development Plan of Ulaanbaatar until 2040 (Urban Planning Research Institute, 2021)

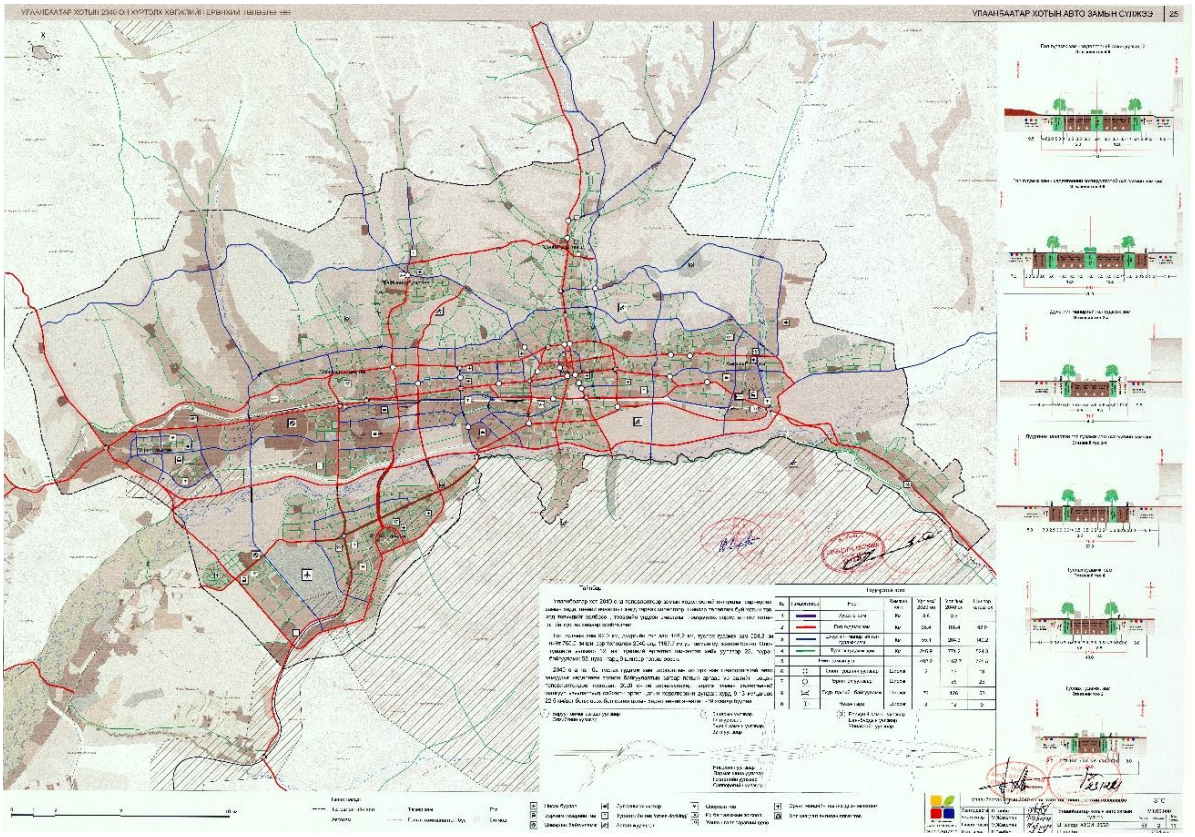
The majority of the suggestions in the draft Urban Development Plan 2040 address general issues of development planning in Ulaanbaatar, such as making engineering infrastructure accessible to households, improving accessibility of public services such as kindergartens, schools, healthcare, culture, and sports, parking areas, introducing waste separation systems, expanding living in apartments, creating more job opportunities, reducing pollution, and developing satellite towns (adjunct suburbs) and villages.

Road Planning

The draft Urban Development Plan 2040 states that road network density will be expanded to 4.0 km/km^2, its usage for public transit will be increased to 70 per cent, and its use by private cars will fall below 30 per cent. By expanding its road system, the Ulaanbaatar region will have a total road network of 3,107.5 km by 2040. According to the draft of the seventh general urban development plan until 2040, the length of major roads in Ulaanbaatar city in 2020 was 402.2 km, and it will be increased by 765.5 km by 2040 (Figure 2, Table 1). The objective of "Creating an Urban City of Equitable Access " will be accomplished by improving the public transport system based on the city's land architecture. The residents will be offered high-quality services during the planning period, along with the planning of the road network, parking, integration of various modes of

transport, introduction of innovative technologies, and measures to make public transport more economically efficient.

FIGURE 2. Road Network Planning of Ulaanbaatar until 2040



Source: Draft for General Development Plan of Ulaanbaatar until 2040 (Urban Planning Research Institute, 2021)

TABLE 1. Major Road Planning until 2040 Excluding Neighborhood Streets

Road Type	Road Length in 2020 (km)	Road Length by 2040 (km)	Increasing Length (km)
Highway	3.8	3.8	
Primary roads	96.4	188.4	92.0
Main streets at the district level	55.1	204.3	149.2
Feeder streets and roads	246.9	771.2	524.3
Total	402.2	1 167.7	765.5

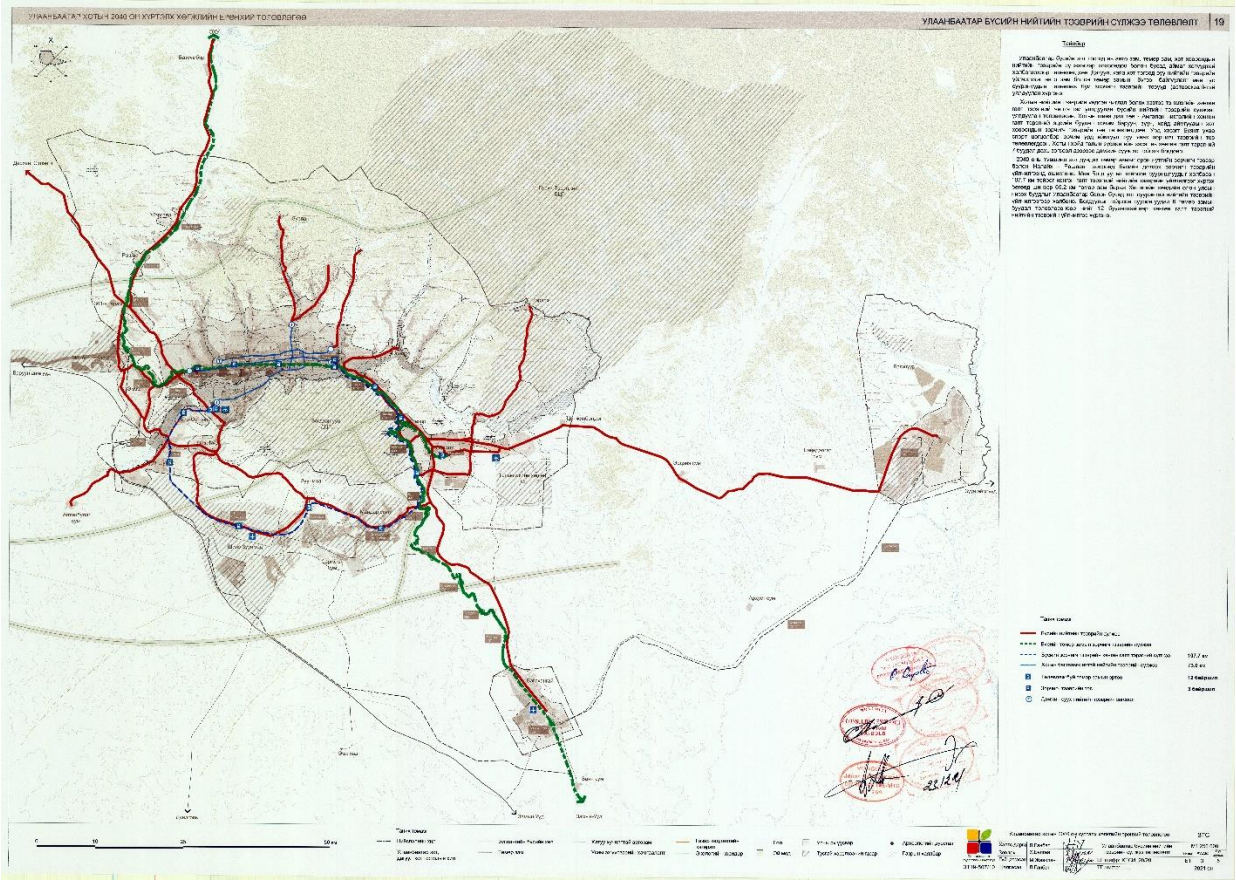
Source: Draft for General Development Plan of Ulaanbaatar until 2040 (Urban Planning Research Institute, 2021)

Public Transport Planning

Bus services will continue to serve as the primary mode of transport within the city, as well as to connect 14 satellite towns. Based on the anticipated traffic flow, a mass transit system, such as an LRT or tram system, is proposed for the city and for linking satellite towns. The proposed route

will be 135.2 km long and serve as a ring of public transport connecting Ulaanbaatar, Shine Zuunmod, Zuunmod, and Maydar cities around Bogdhan mountain.

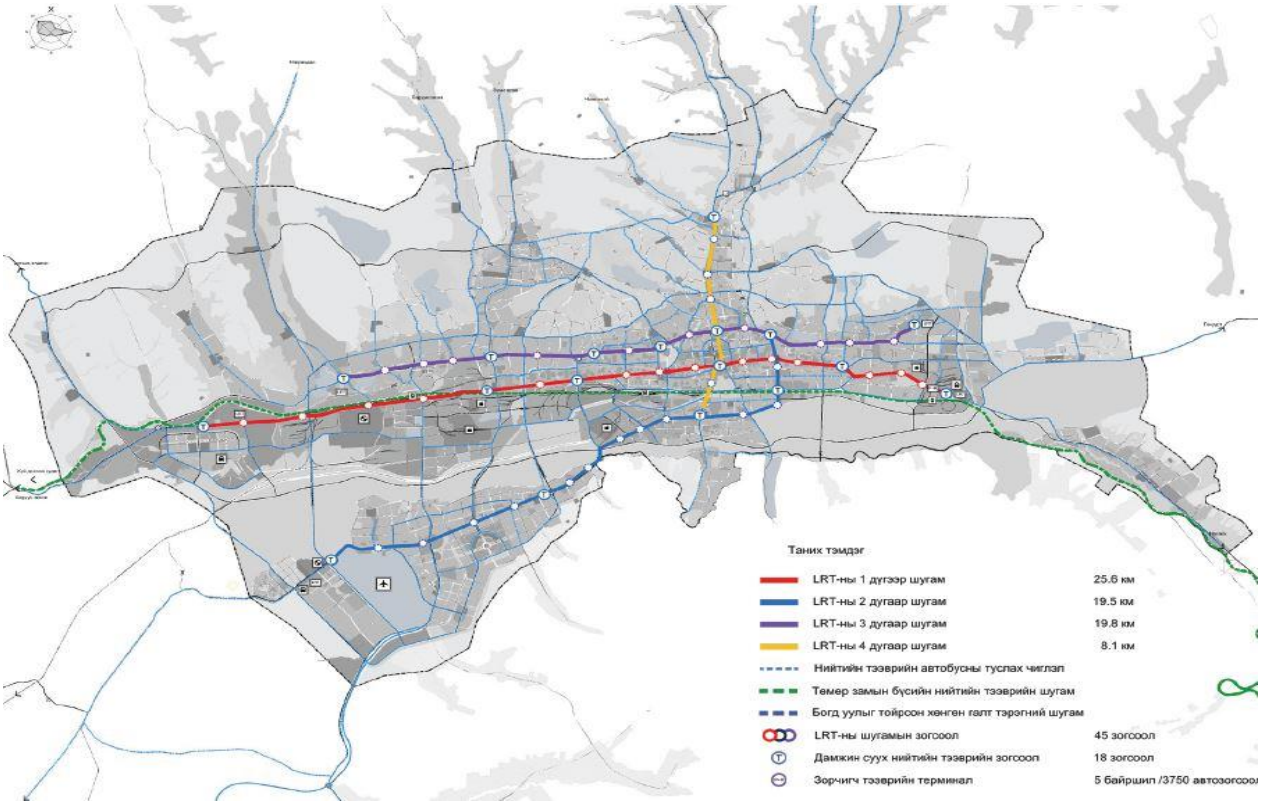
FIGURE 3. Public Transport Planning of Ulaanbaatar



Source: Draft for General Development Plan of Ulaanbaatar until 2040 (Urban Planning Research Institute, 2021)

By 2040, it is predicted that there will be four light rail lines in Ulaanbaatar city, namely Line 1 (25.6 km); Line 2 (19.5 km); Line 3 (19.8 km); and Line 4 (8.1 km). Based on the analysis of modeling demand for public transport, it is predicted that the current daily average of 600,000 passengers using public transport will rise to 1,200,000 by 2040. Five locations with a total of 3,750 parking lots are planned for passenger transport terminals.

FIGURE 4. LRT Planning of Ulaanbaatar until 2040

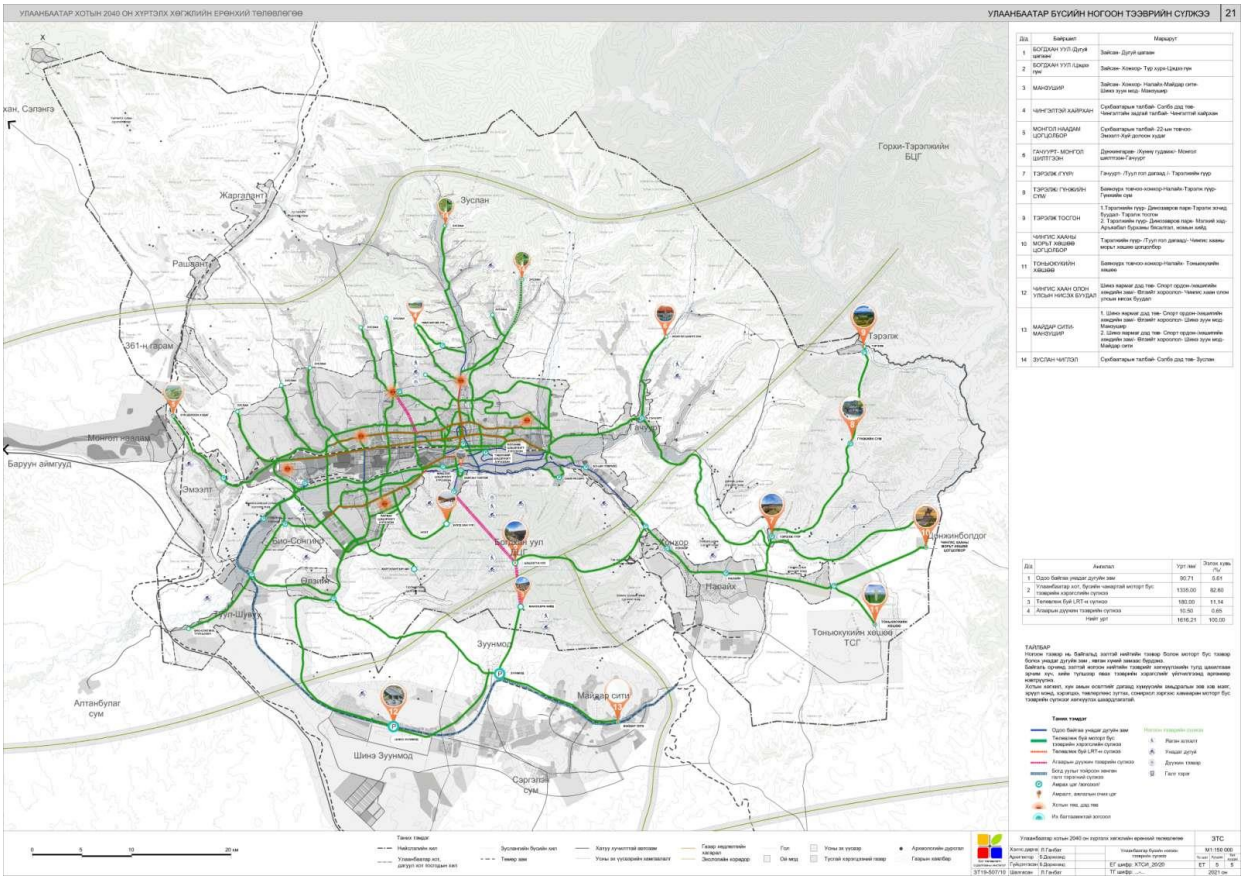


Source: Draft for General Development Plan of Ulaanbaatar until 2040 (Urban Planning Research Institute, 2021)

Active Mobility Planning

It is well known that boosting active mobility can lessen traffic congestion. To achieve this, bike and pedestrian paths that adhere to certain standards are required. The use of non-motorized transport such as bicycles is sporadic and seasonal because of Mongolia's harsh weather and lack of bicycle road infrastructure. One of the key elements of the Urban Development Plan 2040 is to expand Ulaanbaatar's current network of bicycle roads to 1,386.56 km by 2040. The two components of bicycle infrastructure are bicycle paths and bicycle parking. The primary planning solution is to make bicycle transport available to all Ulaanbaatar-area service locations, workplaces, recreational sites, and places of employment. The design of bicycle lanes in a city's physical layout will take into account two basic concepts, namely (i) to be incorporated into the city's road network; and (ii) to be separate from the street system.

FIGURE 5. Green Transport Infrastucture Planning (Bicycle Road, LRT, and Cable Car)



Source: Draft for General Development Plan of Ulaanbaatar until 2040 (Urban Planning Research Institute, 2021)

The proposed bicycle parking with facilities for renting and storing bicycles will be placed at around 90 high-traffic spots along the network of bicycle roads, as well as in shopping and leisure areas. Additionally, bicycle parking places require ambient lighting, bicycle storage sections with the necessary amenities, cameras, and alarm systems.

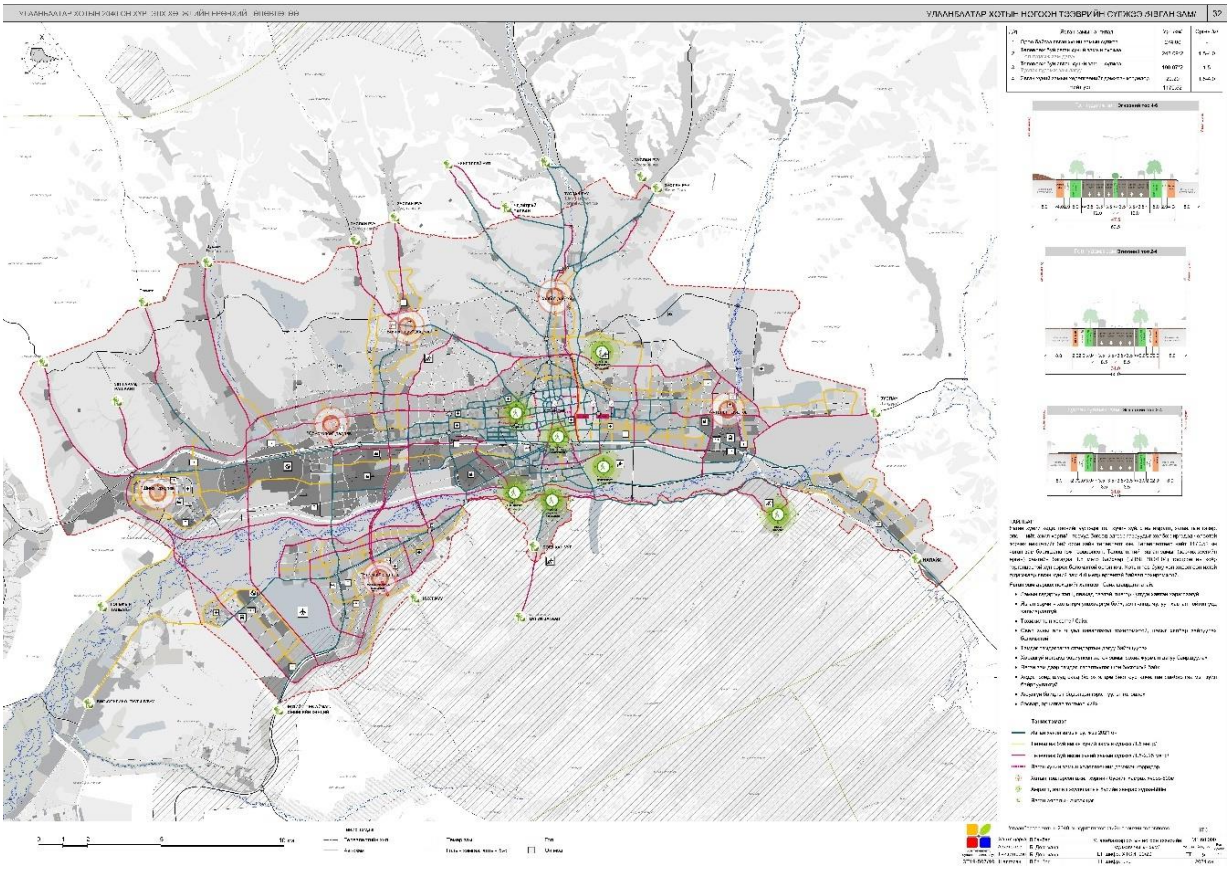
Supporting inhabitants' everyday walking is another element of a livable city. ADB research estimates that between 600,000 and 700,000 people visit Ulaanbaatar city every day, with about 2 per cent of them walking (Asian Development Bank, 2018). Pedestrian roads will be developed as part of the urban road network throughout the planning period until 2040. A green structure separating these from the road is planned to ensure the safety of pedestrian traffic in the area of re-planned development and the establishment of new settlements. Typically found on both sides of the road network, pedestrian sidewalks are amenities with lighting, green areas, and rest spots that guarantee the safety and comfort of the locals.

TABLE 2. Bicycle Road Planning until 2040

№	Classification of bicycle road	Length, km	Width, m
1	Current bicycle road	67.52	
2	Planned bicycle road along the city's primary road network (cycle lane in both directions of the road)	419.79 x 2= 839.58	1.5-4.0
3	Planned bicycle road along the city's secondary road network (cycle lane in both directions of the road)	228.13 x 2= 456.26	1.5
4	Planned bicycle road (distinct corridor)	20.20	1.5-4.0
	Total	1,383.56	

Source: Draft for General Development Plan of Ulaanbaatar until 2040 (Urban Planning Research Institute, 2021)

FIGURE 6. Pedestrian Infrastructure Planning for Ulaanbaatar



Source: Draft for General Development Plan of Ulaanbaatar until 2040 (Urban Planning Research Institute, 2021)

TABLE 3. Pedestrian Infrastracture Planning until 2040

№	Classification of bicycle road	Length, km	Width, m
1	Current pedestrian infrastructure	274.0	
2	Planned pedestrian infrastructure along the city's primary road network (footpath in both directions of the road)	248.09 x 2=496.18	1.5-4.0
3	Planned pedestrian infrastructure along the city's secondary road network (footpath in both directions of the road)	190.07 x 2=380.14	1.5
4	Planned pedestrian infrastructure (corridors)	20.20	1.5-4.0
	Total	1,170.52	

Source: Draft for General Development Plan of Ulaanbaatar until 2040 (Urban Planning Research Institute, 2021)

Low-Carbon Transport

Many cities around the world have announced plans to become carbon neutral or have net zero greenhouse gas (GHG) emission cities by 2050. Based on the success of other nations, the government's vision is that low-carbon transport, such as electric and gas-powered vehicles, will be widely implemented in order to limit the emissions released from internal combustion engine vehicles. Measures will be taken to decrease the use of outdated automobiles, especially diesel, in order to improve both traffic and environmental quality.

In 2019, the Government of Mongolia formally adopted the updated Nationally Determined Contribution (NDC) under the Paris Agreement, raising its initial commitment of reducing GHG emissions by 14 per cent to the more ambitious 22.7 per cent by 2030. Emission reduction targets were raised for each key emitting sector after reviewing the potential for the respective sectors.

According to the Mongolian public transport service, classification and requirement standard (MNS 5012: 2021), vehicles used for public transportation after 12 years from the date of manufacture should be decommissioned. In order to determine the maximum permissible level of diesel engine smoke, its measurement method, and the technical and safety requirements for measuring equipment, there is an emission standard on diesel engines (MNS 5014:2009, "Permitted limit and methodology of measurement of diesel engine automobile in emission", effective from 1 January 2009). The goal of this standard is to redefine the maximum allowable level for diesel engines and lower the amount of air pollutants released during vehicle operation, thereby reducing and minimizing the negative effects on air pollution, population health, and the environment. Additionally, MNS 0216:2017, "Diesel Fuel Euro. Technical requirements", which took effect on 1 October 2018, stipulates that the sulfur content of Euro 5 (K5) gasoline must be less than 10mg/kg.

Other options for Ulaanbaatar include using low-carbon vehicles like CNG/LPG, hybrid or electric city buses. This requires a reconsideration of the operation schedule and route planning (Lajunen, 2014). Regular diesel buses can operate without refueling for a whole day. However, depending on the weather and road conditions, electric buses require recharging after 200–250 km, and

hydrogen fuel cell buses require refueling after 200–400 km (CIVITAS, 2016). This underlines the need to build a network of new types of infrastructure for electric busses.

2.2. EXISTING GOVERNMENT STRATEGIES AND POLICIES

The relevant official documents have been categorized into three categories, according to their purpose and content: development policies, programs, and policy documents.

FIGURE 7. Existing Policy Document

01. DEVELOPMENT POLICY	02. PROGRAM	03. POLICY DOCUMENTS
Long-term and medium-term development policies 1. "Vision-2050 – Long-term Development Policy of Mongolia" 2. New Revival Policy 3. The General Development Plan of Ulaanbaatar Development until 2040	Action plans of the Government of Mongolia and Governor of the Capital City 1. Action plan of the Government of Mongolia for 2020-2040 2. Action plan of the Governor of Ulaanbaatar for 2020-2040	Urban planning policy documents & implementation measures in line with development policies 1. Medium and Long-term Master Plan for Road Network Development of Ulaanbaatar 2. Concept of the General Development Plan of Ulaanbaatar until 2040

It is essential that the various agencies involved in the development policy documents, the four-year action plans of the government and the mayor, as well as the annual action plans of the ministries and agencies, work together to harmonize policy measures.

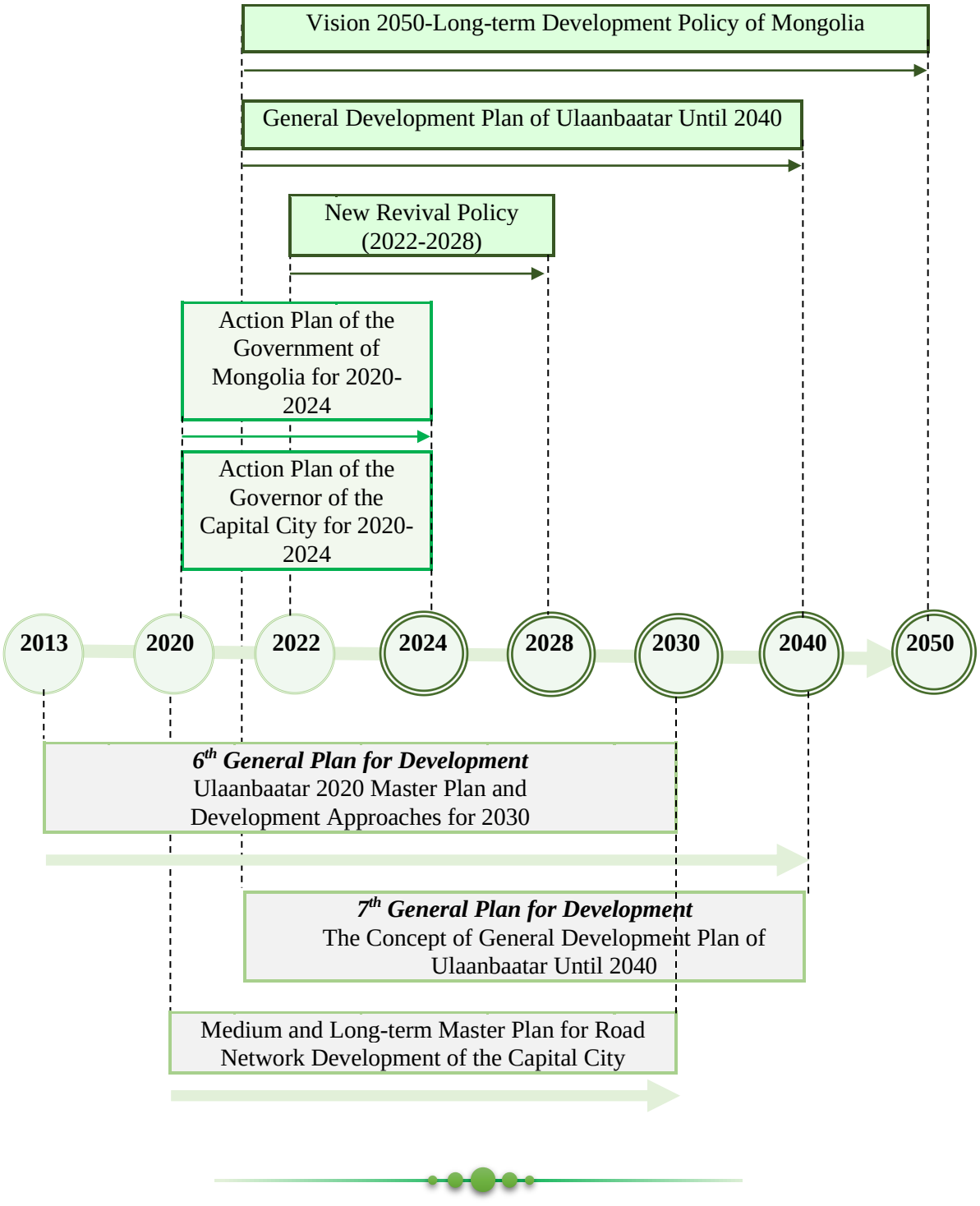
TABLE 4. Development policies for Mongolia and the Capital City

Policy Documents	Public Transportation Related Purposes
Vision - 2050	2021-2030: Smart information system-based urban development activities will be carried out while accounting for Ulaanbaatar city's agglomeration, the expansion and limitation of the settlement territory, structure of land and open spaces, road and public transport network, and potential use of underground spaces. The multi-mode public transport system will be introduced. 2031-2050: Eco-friendly and electric transport will be implemented in public transport to reduce greenhouse gas emissions while utilizing smart, green technology that preserves the equilibrium of urban ecosystems.
New Revival Policy	2021-2023: The quality and standards of public transport will be improved while introducing a mass transit public transport system with innovative technology. This aims to reduce the demand for 50–60,000 cars on the road and increase public transport usage by 30%.

Policy Documents	Public Transportation Related Purposes
	2022-2025: Modernization of the city's public transport network and the implementation of a mass transit system, such as an elevated LRT network, are planned.
General Development Plan of Ulaanbaatar until 2040	The Urban Development Plan 2040 sets out the overall direction of government policies, and aims to achieve the following: - To encourage the growth of active transport and public transport within the context of the compact city concept. - To create and execute a TOD (Transit Oriented Development) concept for the public transport system. - To introduce mass transit systems such as BRT and LRT in the public transport network.
Action Plan of the Government of Mongolia 2020-2024	The development of "Transportation and Logistics" is addressed in Chapter 3, and the establishment of a national network for transport and logistics based on a smart transport system is discussed in Chapter 3.6. The public transport system in the capital will be fully powered by vehicles using both electricity and natural gas. There will be networks for transfer, electricity, and natural gas recharge. In addition, smart, eco-friendly, electric multi-decker buses that offer comfortable travel conditions for passengers in public transport services, and electromagnetic and suspension road vehicles, are planned to be introduced gradually in order to develop a green city with optimal spatial planning, smart solutions, and a pleasant living environment within the framework of the capital, regional, and local development policy.
Action Plan of the Governor of the Capital City and Mayor of Ulaanbaatar 2020-2024	The development of modern technology vehicles with disabled people's facilities is featured in Article 6 of the Action Plan's section on "Transportation and Logistics." The replacement of the public transport bus fleet will be done in conformity with international standards. Additional smart and multi-modal transport projects, including a cable car and mass transit, are planned for implementation in public transport services.
Ulaanbaatar 2020 Master Plan and Development Approaches for 2030	Ulaanbaatar is aiming to establish an efficient mass transit system using bus rapid transit (BRT). The BRT system will have designated lanes for buses (with restricted regular vehicle access) to ensure it is a fast and reliable high-capacity system. The BRT system will be supported by the following public transport improvements: - Upgrade the public transport fleet and plan new routes - Implement state-of-the-art technology in the public transport system - Provide a multi-modal public transport system that allows passengers to reach their destinations in shorter time; and - Improve traffic management by expanding the road network, giving public transit the right-of-way and reducing the overlapping of bus routes.

The Concept of the General Development Plan of Ulaanbaatar Until 2040	The concept takes into consideration the expansion of mass transit public transport as an LRT/Tram system. The development of comprehensive urban public transport is anticipated to be guided by the following principles. These include: - Optimal development of the public transport system - Introduction of public transport in mass transit - Development of large-sized bus services, increasing the capacity of passenger transport, modernizing and renewing the fleet, and improving the quality of service. - Development of taxi services that meet contemporary international standards - Integration of public transport with innovative information and communication technology - Introducing a designated line for public transport with a priority in the city's traffic
Medium and Long-term Master Plan for Road Network Development of the Capital City	According to the PTV Visum demand modeling projection for public transport until 2030, it is necessary to expand and renew the bus fleet and establish a mass transit public transport network.

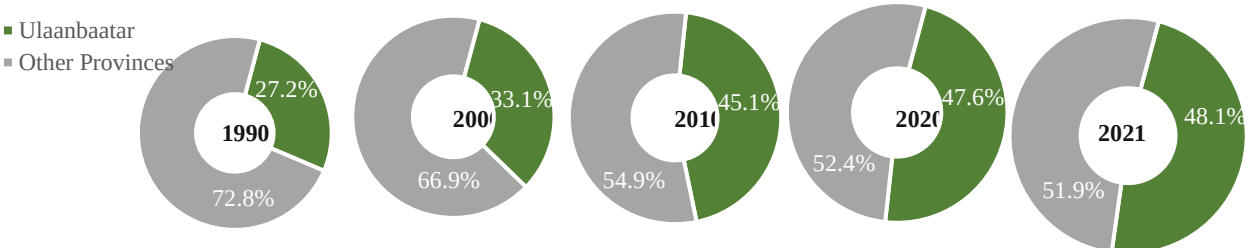
FIGURE 8. Existing Policies Timeline



3. RAPID URBANIZATION: CHALLENGES AND OPPORTUNITIES

Ulaanbaatar has been struggling with a variety of urban transport issues, including traffic congestion, air pollution, an abundance of used and old cars, as well as outdated and diesel-powered public transport buses. Its population has grown by 2.8 times since 1990 as a result of the country's economic transition from a centrally planned to a market economy, and people's desire for employment opportunities, better education and higher living standards.

FIGURE 9. Number of Population and Its Growth Rate of Ulaanbaatar Capital City



MGL Population	2 153 466	2 403 105	2 760 968	3 357 542	3 409 939
UB Population	586 228	794 730	1 244 449	1 597 290	1 639 172
Average annual growth rate, %		↑ **3.6%**	↑ **5.7%**	↑ **2.8%**	↑ **2.6%**

Data Source: (National Statistical Office of Mongolia, 2022)

Since 2000, Ulaanbaatar's population share has rapidly increased while all other areas have been losing population share (Figure 9). These population changes are primarily caused by rural-urban migration. Ulaanbaatar population's growth projections can be seen in Table 5.

TABLE 5. Population Projection through 2050

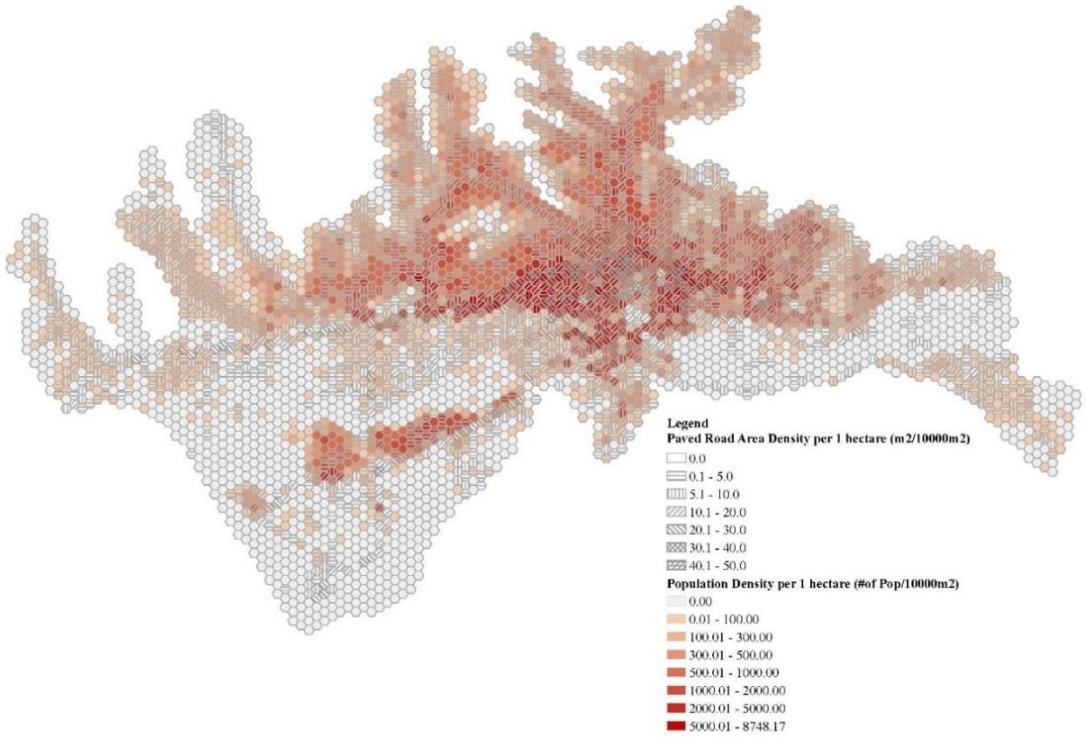
Gender	Region	2020	2025	2030	2035	2040	2045	2050
Total	MGL*	3,225,152	3,525,834	3,767,314	4,025,138	4,333,430	4,672,515	5,003,938
	UB**	1,482,632	1,672,902	1,822,010	1,973,970	2,146,360	2,336,181	2,524,511
	UB%	46.00%	47.45%	48.36%	49.04%	49.53%	50.00%	50.45%

Gender	Region	2020	2025	2030	2035	2040	2045	2050
Male	MGL	1,590,114	1,735,073	1,851,602	1,979,228	2,134,262	2,303,456	2,466,460
	UB	717,594	808,607	879,533	953,618	1,039,719	1,134,315	1,227,218
Female	MGL	1,635,038	1,790,761	1,915,712	2,045,910	2,199,168	2,369,059	2,537,478
	UB	765,038	864,295	942,477	1,020,352	1,106,641	1,201,866	1,297,293

* MGL = Mongolia. ** UB = Ulaanbaatar. Data Source: (National Statistical Office of Mongolia, 2022)

Ulaanbaatar's population density increased from 169.1 people per square kilometer in 2000 to 264.8 in 2010 and 348.8 in 2021.[3] This is in stark contrast to Mongolia's population density of 2.2 persons per square kilometer. Ulaanbaatar varies considerably by city center and *ger* (traditional Mongolian dwelling) areas, where the central part of Ulaanbaatar is more densely populated. Ulaanbaatar's central area has a large concentration of paved roads, whereas the *ger* districts have earth roads. This makes it more difficult to access public transport because services are mainly available along paved roads (Figure 10, Figure 11). As a result, informal minibus public transport services run in the city's *ger* and other remote areas (Figure 12).

FIGURE 10. Densities of Population and Road of Ulaanbaatar Capital City, 2000-2021



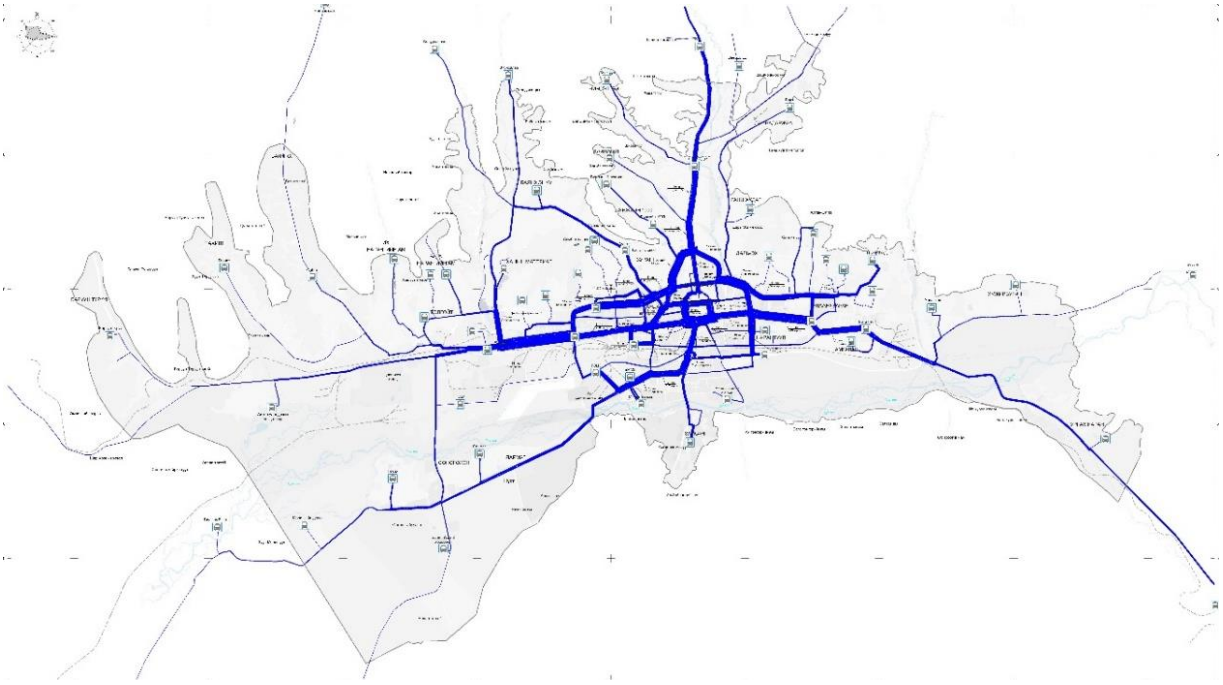
Source: Asian Infrastructure Research Institute, 2022

The increasing agglomeration of people in dense urban areas necessitates the use of efficient modes of transport to connect the city center to sub-centers, *ger* districts and satellite towns. To meet

[3] (National Statistical Office of Mongolia, 2022)

transport demand, transport planners and policy makers and politicians must carefully assess what kinds of mass transit systems are acceptable and appropriate for this rapidly growing city.

FIGURE 11. Bus Public Transport Routes, 2021



Source: Draft for General Development Plan of Ulaanbaatar until 2040 (Urban Planning Research Institute, 2021)

FIGURE 12. Informal Public Transport Services, 2019

TABLE 6. Number of Households by Dwelling Types, 2016-2020

Indicators	2016	2017	2018	2019	2020
Total number of households	380,828	386,218	387,453	411,420	414,292
Households that reside in apartment residential areas	164,807 (43.3%)	175,445 (44.3%)	171,062 (45.3%)	202,938 (49.3%)	206,243 (49.8%)
Households that reside in *ger* areas	216,021 (56.7%)	212,008 (55.7%)	215,156 (54.7%)	208,482 (50.7%)	208,049 (50.2%)

Source: Introduction of Population and Households 2020 (Statistics Department of Ulaanbaatar, 2020)

The growing population led to an extension of the *ger* neighborhood around Ulaanbaatar City between 2005-2015. The Statistical Department of the Capital City estimates that 50.2 per cent of the city's households, or 208,049 households, lives in *ger* areas by 2020 (Table 6). Neither *gers* nor houses in *ger* neighborhood areas are connected to engineered infrastructure, and the majority of houses have been built without strict standards. Of the total, it is estimated that about 206,248 households have limited or no access to urban infrastructure, including central heating, central water supply, wastewater utilities, wastewater treatment system, paved roads and, in some cases, electrical supply, in addition to having poor urban services and socioeconomic facilities. The main causes of air pollution are burning coal, coal-fired power plants, traffic congestion, and waste burning. Due to the ammonia and sulfur that are created by pit toilets, outdoor wooden pit latrines in ger areas are a major source of soil contamination as well as air pollution. In an effort to reduce air pollution, the government decided that households in Ulaanbaatar would be permitted to use only refined coal as of 15 May 2019 (companies that are authorized to run thermal power plants and power stations are excluded). Despite the reduction in PM10 and PM2.5 since 2019, it appears that the decision had little impact on nitrogen dioxide, and there has been an increase in sulfur dioxide and carbon monoxide, as evidenced by the air pollution data (Table 7).

TABLE 7. Annual Average Concentration of Pollutants in Air in Ulaanbaatar

Indicators	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
PM10 ($\mu g/m^3$)	160.3	266.9	290.0	273.2	198.6	146.8	135.9	127.7	132.4	117.1	84.4	77.8
PM2.5 ($\mu g/m^3$)	98.1	114.7	91.6	93.0	64.2	79.0	83.6	76.5	71.6	60.4	46.8	41.1
Carbon Monoxide CO ($\mu g/m^3$)	1167	1518	1416	1810	1230	1358	1290	1347	1370	1637	1949	1502
Ozone O_3 ($\mu g/m^3$)	45.5	30.5	16.9	16.3	19.1	31.9	31.7	33.9	28.4	25.2	19.9	32.4
Nitrogen Dioxide NO_2 ($\mu g/m^3$)	36.2	53.3	52.4	80.2	43.8	38.4	39.1	45.0	41.7	38.6	43.7	43.1
Sulfur Dioxide SO_2 ($\mu g/m^3$)	26.7	35.1	35.9	31.0	22.6	34.3	36.6	24.5	22.5	30.5	60.2	67.3

Source: (National Statistical Office of Mongolia, 2022)

In 2019, Ulaanbaatar had an average PM2.5 value of 60.4 $\mu g/m^3$. Many people living in Ulaanbaatar would have trouble breathing at this level of air quality, especially some demographics like young children or persons who already have respiratory diseases. Ulaanbaatar improved its pollution levels in 2021, with an average PM2.5 value of 41.1 $\mu g/m^3$. The main sources of air pollution are burning coal and coal-fired power plants during the cold season, while transport and construction activities are the main sources of nitrogen dioxide and PM10 all year around.

Additionally, the rapid increase in the vehicle fleet poses serious challenges. The majority of these vehicles are older than 10 years, which contributes to persistent traffic congestion and lower air quality in Ulaanbaatar. Pollutants produced by vehicle exhausts include carbon monoxide, hydrocarbons, nitrogen oxides, particles, volatile organic compounds and sulfur dioxide. The number of registered vehicles in Mongolia reached 1,243,445 by the end of 2021, an increase of 116,669 (+10.35 per cent) compared to the same period of the previous year (Table 8). Electric vehicles increased by 33.98 per cent and gas-powered vehicles by 103.5 per cent (or 839). However, the number of diesel vehicles increased by 13 per cent between 2020 and 2021, from 282,035 to 318,703 (Ministry of Road and Transport Development, 2022).

TABLE 8. Number of Registered Vehicles, 2015-2021

Vehicle types	Region	2015	2016	2017	2018	2019	2020	2021
Bus	MGL*	6 474	6 823	6 859	6 501	19 535	36 084	34 073
	UB**	4 928	5 055	4 942	4 482	11 021	16 834	16 573
Truck	MGL	181 665	188 884	198 668	211 945	227 525	241 268	225 539
	UB	85 208	85 481	87 098	88 710	91 670	98 176	87 372
Passenger car	MGL	509 287	547 299	586 854	631 436	667 375	715 309	775 171
	UB	337 181	356 544	377 071	397 990	417 383	447 413	478 469
Special purpose vehicle	MGL	22 852	23 013	22 630	21 468	20 075	20 672	58 717
	UB	11 812	11 952	11 903	10 752	9 984	9 925	29 955
Machinery & Mechanisms	MGL	9 931	10 612	11 335	12 561	13 595	15 004	16 527
	UB	7 748	8 200	8 599	9 410	10 120	10 988	12 000
Trailer	MGL	21 039	22 169	25 596	31 043	47 972	40 616	52 997
	UB	13 835	13 947	15 459	18 734	22 959	22 452	27 326
Motorcycle	MGL	38 472	42 752	48 203	55 926	46 951	67 781	71 677
	UB	5 971	6 349	6 935	7 594	5 729	9 834	10 949
Total	MGL	789 720	841 552	900 145	970 880	1 043 028	1 136 734	1 234 701
	UB	466 683	487 528	512 007	537 672	568 866	615 622	662 644

* MGL = Mongolia. ** UB = Ulaanbaatar. Source: (National Statistical Office of Mongolia, 2022)

For Ulaanbaatar, the number of registered vehicles reached 662,644 in 2021, of which 64.6 per cent or 428,182 vehicles participated in the technical inspection (Ministry of Road and Transport Development, 2022). Gasoline-powered vehicles that participated in technical inspections between 2020 and 2021 decreased by 19.7 per cent (from 189,317 to 152,073), while diesel, hybrid, and gas engine vehicles increased by 48.9 per cent (from 58,538 to 87,139), 39.4 per cent (from 129,307 to 180,265) and 33.1 per cent (from 6,541 to 8,705), respectively.

TABLE 9. Number of Registered Vehicles by Age, 2017-2021

Vehicle by age	Region	2017	2018	2019	2020	2021
0-3 years	MGL	6,859	6,501	19,535	36,084	34,073
	UB	4,942	4,482	11,021	16,834	16,573
4-6 years	MGL	198,668	211, 45	227,525	241,268	225,539
	UB	87,098	88,710	91,670	98,176	87,372

Vehicle by age	Region	2017	2018	2019	2020	2021
7-9 years	MGL	586,854	631,436	667,375	715,309	775,171
	UB	377,071	397,990	417,383	447,413	478,469
10+ years	MGL	22,630	21,468	20,075	20,672	58,717
	UB	11,903	10,752	9,984	9,925	29,955
TOTAL	MGL	900,145	970,880	1,043,040	1,136,734	1,234,707
	UB	512,007	537,672	568,872	615,622	662,644

Source: (National Statistical Office of Mongolia, 2022)

Public Transport Fleet

A total of 1,787 vehicles make up the rolling stock as of 2021, with 1,354 large-sized buses accounting for 67 per cent of that total, 433 taxis for 24 per cent, and the remaining 9 per cent made up of 50 trolleybuses, 49 medium-sized buses, 18 articulated buses, and 47 small-sized buses (Table 10). Over the five-year period between 2017 and 2021, 745 cars in total entered the public transport fleet through renewal (12) and used vehicle replacement (733) (Table 111).

TABLE 10. Public Transport Fleet, 2017-2021

Indicators		2017	2018	2019	2020	2021
Large-sized bus	Public	270	269	271	349	292
	Private	877	769	838	799	898
Medium-sized bus	Public	30	30	29	29	28
	Private	9	23	12	17	21
Trolleybus	Public	42	42	38	42	44
	Private	8	8	7	6	6
Articulated bus	Public	20	20	18	17	18
Small-sized bus	Feeder bus line	11	2	9	0	0
	Express bus line	93	8	7	59	47
Taxi		590	566	481	503	433
Total		1,950	1,737	1,710	1,822	1,787

Source: (Public Transport Department of the Capital City, 2022)

TABLE 11. Public Transport Fleet Renewal and Replacement, 2017-2021

Indicators		2017	2018	2019	2020	2021
Renewal	Large-sized bus	-	-	3	-	-
	Medium-sized bus	9	-	-	-	-
Replacement	Large-sized bus	137	190	206	163	77
	Trolleybus	2	1	-	1	-
	Medium-sized bus	6	-	5	-	-
	Taxi	220	288	197	167	55

Source: (Public Transport Department of the Capital City, 2022)

According to the Department of Public Transport, as of 2021, two public enterprises owned by the capital city and 20 private enterprises provided public transport services in Ulaanbaatar. On

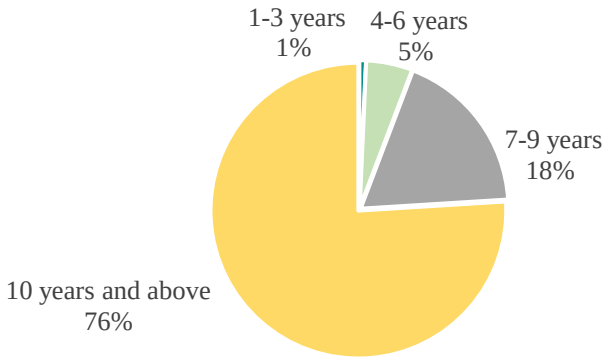
average, 1,377 vehicles were in use each day, of which 944 buses and trolleybuses transported 500,000–600,000 passengers daily along 83 routes. Large-sized buses accounted for 840 or 89 per cent of the total buses and trolleybuses, followed by 36 (3.8 per cent) medium-sized capacity buses, 26 (2.8 per cent) small-sized buses, 25 (2.6 per cent) trolleybuses and 17 (1.8 per cent) articulated buses.

TABLE 12. Public Transport Vehicles for Daily Operation, 2017-2021

Indicators		2017	2018	2019	2020	2021
Large-sized bus	Public	220	222	214	208	189
	Private	588	594	586	588	601
Articulated bus	Public	16	16	14	17	17
Medium-sized bus	Public	7	7	7	8	8
	Private	8	8	10	10	9
Trolleybus	Public	27	27	28	21	21
	Private	6	6	5	4	4
Feeder route		13	7	4	-	-
Express route	Small-sized bus	93	8	7	26	26
Sub-urban route	Large-sized bus	43	43	39	40	45
	Medium-sized bus	18	17	25	22	19
	Small-sized bus	3	4	-	-	-
Camp route	Large-sized bus	-	-	5	-	5
	Small-sized bus	-	-	-	-	-
Night route	Trolleybus	4	-	-	-	-
	Large-sized bus	-	4	10	-	-
Bus		1,046	963	954	970	944
Taxi		590	566	519	503	433
TOTAL		1,636	1,529	1,473	1,473	1,377

Source: (Public Transport Department of the Capital City, 2022)

FIGURE 13. Public Transport Fleet by Age



Source: (Public Transport Department of the Capital City, 2022)

When examining the age of buses and trolleybuses, 76 per cent were 10 years old and above, 18 per cent were 7-9 years old, 5 per cent were 4-6 years old, and 1 per cent were 1-3 years old. The average age of public transport buses and trolleybuses was 9.5 years. In Mongolia, the MNS:5012

standard applies, which delists buses for public transport after a maximum of 12 years of use. In the coming years, 87 per cent of all buses and trolleybuses need to be replaced by new vehicles. The majority of buses operated in public transport services had diesel-engines using Euro II and Euro III (Table 13).

TABLE 13. Public Transport Vehicles by Manufactured Year, 2009-2021

№	Vehicle by Model	2009	2010	2011	2012	2013	2014	2015	2016	2018	2019	2021	Total	%
1	AEROBUS				9	2							11	0.9%
2	AEROCITY	20	72	206	30	46	10	6					390	31.6%
3	AEROCITY 540	2	12	43	9	21	6						93	7.5%
4	AEROEXPRESS	4											4	0.3%
5	COUNTY			5				25					30	2.4%
6	DAEWOO 106	364	9	10		7	10	1					401	32.5%
7	ECOBUS J-800T						6						6	0.5%
8	GRANDBIRD		1		1								2	0.2%
9	HENAN								1				1	0.1%
10	JEA-800			3	6	13	10						32	2.6%
11	MAZ 215067							18					18	1.5%
12	NANJING										1	35	36	2.9%
13	SY-WG110A	6											6	0.5%
14	UNIVERSE		3	5	9	12							29	2.4%
15	YANTAI									2			2	0.2%
16	YUTONG					3			1				4	0.3%
17	YUTONG ZK 6108							2					2	0.2%
18	YUTONG ZK6608								9				9	0.7%
19	ZHONGTONG.LCK 6103				1	10	10						21	1.7%
20	ZHUHUI										8		8	0.6%
21	HYUNDAI CITY 540	42	28	18	26	10	4						128	10.4%
	TOTAL	438	122	288	87	121	68	52	11	2	9	35	1 233	100%

Source: (Public Transport Department of the Capital City, 2022)

Using diesel buses with Euro II and Euro III fuel standards is not sustainable and increases carbon emissions and urban air pollution. Alternatives to conventional diesel buses are offered by electric, battery-electric, and hydrogen fuel-cell buses, which are referred to as zero-emission buses (ZEBs).

FIGURE 14. New Buses in the Public Transport Fleet, 2022

Source: Public Transport Department of the Capital City

Since both the population and urbanization of Ulaanbaatar are rapidly growing from year to year, the city needs to shift from a private car-oriented city to one based on public and low carbon transport, prioritizing environmentally-friendly mass transit and active mobility over private passenger vehicles. Although the COVID-19 pandemic disrupted our daily routines, it also provided an opportunity to reconsider and develop the sustainable urban transport strategy for Ulaanbaatar.

4. SUSTAINABILITY, INCLUSIVITY AND RESILIENCE OF PUBLIC TRANSPORT IN ULAANBAATAR

4.1. ACCESSIBLE, SAFE AND AFFORDABLE TRANSPORTATION SERVICE

Accessibility. Public transport is becoming more and more necessary to achieve a variety of goals, including giving disadvantaged people access to transport, while also making the best use of available financial resources. These various goals frequently conflict. For instance, while disadvantaged individuals without cars frequently want access to local destinations, commuters to city centers prefer quick public transport services. Historically, public transit has provided a means of transport for those without access to automobiles. Since many of these people are unemployed or with low/medium income, their first objective when traveling is to get to community centers, shops, and schools. Additionally, the number of vehicles is rising year on year, reaching 0.71 private vehicles per household in Ulaanbaatar (Statistics Department of Ulaanbaatar, 2022). The current dilemma is that automobile owners need to switch to active mobile and public transport for commuting in order to meet the social and environmental goals of sustainable urban development. To attract users, public transport has to be able to maintain high occupancy rates with good cost recovery while combining a high service level with attractive service frequencies and operating hours. Figure 15 depicts Ulaanbaatar's current regular bus and trolleybus network, which tries to take travelers to every part of the city.

FIGURE 15. Public Transport Network in Ulaanbaatar, 2021

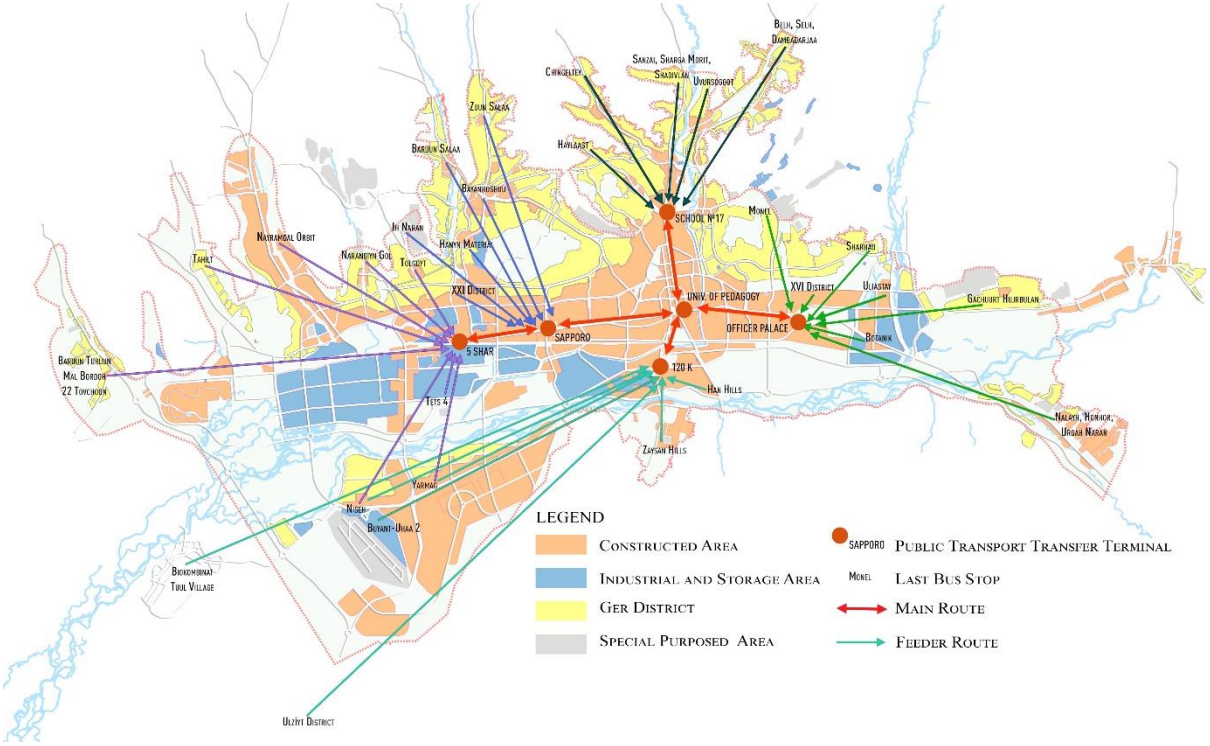


TABLE 14. Length of Public Transport Route, km

Route Classification		2017	2018	2019	2020	2021
TOTAL LENGTH, km		3,696.3	3,735.4	4,227.2	4,248.0	4,182.4
Main Route Length, km	Total	1,958.2	2,782.8	2,126.2	2,348.8	2,079.7
	Large-sized bus	1,867.8	2,692.0	1,927.4	2,148.7	1,879.6
	Articulated bus	24.0	24.4	24.4	24.0	24.0
	Medium-sized bus			108.0	109.7	109.7
	Trolleybus	66.4	66.4	66.4	66.4	66.4
Suburban Route Length, km	Total	897.2	923.7	1,088.0	909.6	815.4
	Large-sized bus	897.2	923.7	627.6	565.9	396.2
	Medium-sized bus			331.4	343.7	419.2
	Small-sized bus			129.0	0	0
Feeder & Express Route		812.0	812.0	812.0	788.6	1,086.6
Camp Route		0	0	116.0	116.0	115.7
Night Route		28.9	28.9	85.0	85.0	85.0

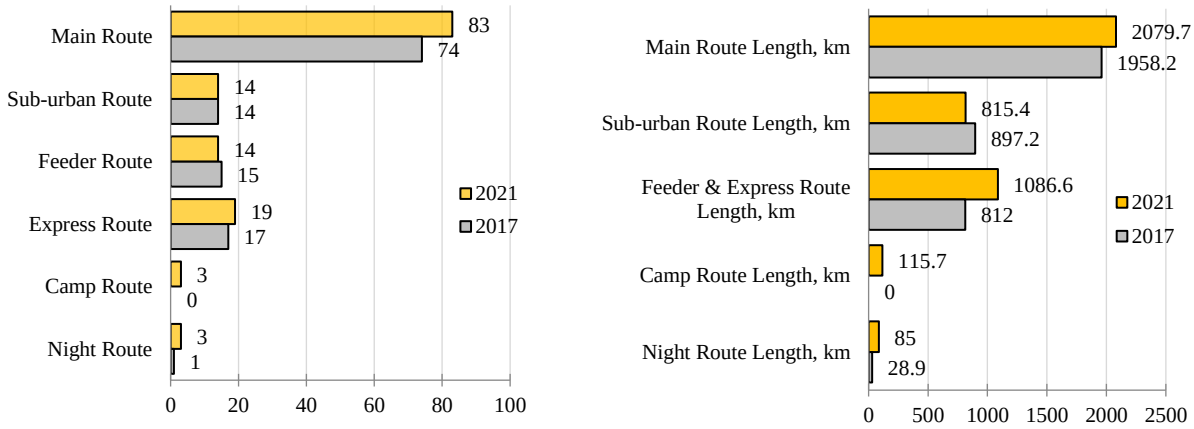
Source: (Public Transport Department of Ulaanbaatar, 2022)

TABLE 15. Number of Public Transport Route

Route Classification			2017	2018	2019	2020	2021
TOTAL			121	126	138	134	133
Main Route	Total		74	76	85	84	83
	Public company	Large-sized bus	18	19	21	21	20
		Articulated bus	1	1	1	1	1
		Medium-sized bus	2	2	3	2	2
		Trolleybus	2	2	2	2	2
	Private company	Large-sized bus	49	50	54	54	54
		Medium-sized bus	1	1	3	3	3
		Trolleybus	1	1	1	1	1
Feeder Route			15	15	15	14	14
Express Route			17	17	17	19	19
Camp Route			0	3	3	3	3
Suburban Route	Total		14	14	15	14	14
	Public company	Large-sized bus	2	2	2	4	3
		Medium-sized bus	7	6	4	5	5
	Private company	Large-sized bus	4	5	8	4	5
		Medium-sized bus	0	0	0	1	1
		Small-sized bus	1	1	1	0	0
Night Route			1	1	3	3	3

Source: (Public Transport Department of Ulaanbaatar, 2022)

FIGURE 16. Number of Route and Its Length by Type, 2017 & 2021



Source: (Public Transport Department of Ulaanbaatar, 2022)

Public transport in Ulaanbaatar had over 136 routes totaling 4,182.4 km in length in 2021. The road network serves as the foundation for planning the public transport network. Most of the public transport routes specifically overlap along Enhtayvan Avenue. Ulaanbaatar's four main avenues and roads—Enhtayvan Avenue, Ih Toyruu, Narny Road, and Chingis Avenue—see a lot of traffic. On average,

- 280 buses operate 20-30 routes and carry 30.6 per cent of all passengers on Enkhtayvan Avenue;
- 120 buses operate 8–9 routes and carry 8.6 per cent of all passengers on Gengis Avenue;
- 150 buses operate 10–14 routes and carry 6.2 per cent of all passengers on Ih Toyruu;
- 70 buses operate 5–7 routes and carry 2.6 per cent of all passengers on Narny Road.

Public transport routes typically carry 92 passengers in a round; however, 44 high-capacity routes carry an average of 178 passengers in a round, which is above average. In Ulaanbaatar, the lengths of public transport routes are typically 30 km long, and it takes approximately 90 minutes to complete a round trip. This indicates that even though the intended speed for using public transport is 18 km/h, it is now traveling at an average speed of 14.8 km/h or below. About 78 per cent of the main routes within the city move more slowly than anticipated.

Access to public transport is considered convenient when an officially recognized stop is accessible within a distance of 0.5 km from a reference point, such as a home, school, workplace, market, etc. There are 9 taxi stands and 1,169 public transport bus stops. There are 242 out of a total of 1,169 bus stops (20.7 per cent) which have facilities up to international standards, although in suburban areas, bus stops are still unreliable and lack route information. In addition to loading and unloading passengers at the last stop, public transport also begins and finishes services in accordance with the traffic schedule, and allows drivers and conductors to switch shifts, take breaks, use the restroom, have a cup of tea, and clean the vehicle.

TABLE 16. Number of Bus Stops, 2015-2021

Year	Bus stops	Han-Uul	Bayanzurh	Bayangol	Suhbaatar	Chingeltey	Songinohayrhan	Total
2015	Total	59	190	76	130	103	195	753
	FS*	9	19	3	7	6	25	69
	IS**	50	171	73	123	97	170	684
2016	Total	59	189	76	120	72	195	711
	FS	9	19	73	5	6	25	67
	IS	50	170	3	15	66	170	644
2017	Total	198	209	51	183	83	216	931
	FS	9	13	2	7	6	18	57
	IS	178	196	49	176	77	198	874
2018	Total	189	216	52	184	87	218	946
	FS	9	13	2	7	6	18	57
	IS	180	203	50	177	81	200	889
2021	Total	206	203	93	197	129	285	1,169
	FS	9	14	2	7	6	19	59
	IS	197	189	91	190	123	166	1,110

Source: (Public Transport Department of Ulaanbaatar, 2022)
Notes: *FS-Final Stop, **IS-Intermediate Stop

TABLE 17. Access to Public Transport

Distance from Bus Station, m	Walking Minutes	Area, km^2	Number of Households within the Area	Number of People Living in the Area	Population density, Inh/km^2	Percentage of the population access to public transport
420	0-5 min	206.47	280,297	1,069,358	5,179.3	79.40%
500	0-6 min	249.16	301,007	1,147,289	4,604.7	85.12%
670	6-8 min	126.26	46,564	174,532	1,382.3	13.00%
830	8-10 min	74.18	12,529	47,697	643	3.50%
1250	10-15 min	184.33	12,288	47,004	255	3.50%
1670	15-20 min	168.98	3,299	12,107	71.6	0.90%
2500	20-30 min	301.94	1,447	5,065	16.8	0.40%
5000	30-60 min	829.63	736	1,986	2.4	0.10%

Source: (Eldev-Ochir, 2019)

Table 17 indicates that 85.12 percent of the total population has convenient access to public transport services within 500 m buffer zone or approximately 6 min distance zone from the operating bus stations.

The first dedicated bus lane of Ekhtayvan Avenue runs from east to west through Ulaanbaatar. Private vehicles are not allowed to enter the bus lane except when turning right. But in times of congestion, private vehicles frequently use the first lane, making it impossible to meet priority lane goals and keep bus services on schedule. Taxis and fully electric vehicles are permitted to use the bus lanes and are not restricted by last number of the license plate.

TABLE 18. Waiting Time to Public Transport Bus

Vehicle Types	2017	2018	2019	2020	2021
Large-sized bus (within the city)	8.2	8.1	10.3	12	12
Large-sized bus (suburban area)	28.1	29.7	36.4	62	62
Trolleybus	9.7	9.7	12.1	15	16
Articulated bus	6.9	6.9	4.6	7	6
Medium-sized bus (within the city)	13.3	13.3	20	29	31
Medium-sized bus (suburban area)	41.6	40.4	22.5	46.5	45
Small-sized bus	29.3	40.8	50.9	0	0
Average	19.6	21.3	22.4	28.6	28.7

Source: (Public Transport Department of the Capital City, 2022)

The public transport service hours in Ulaanbaatar are from 6:30 until 23:30, but due to Mongolia's harsh weather, the winter and summer schedules vary based on the time of year and the location. For instance, the Ch:7 route runs from 5:30 to 2:30. By 2021, there will be a 12-minute wait for a large bus, a 16-minute wait for a trolleybus, a 6-minute wait for an articulated bus, a 31-minute wait for a medium bus, and a 45-minute wait for a suburban trip.

Gender equality. ESCAP's analysis on mapping gender data availability in Mongolia[4] indicates that Mongolia has achieved notable progress in terms of gender equality. In 2011, Mongolia enacted the Law of Mongolia on Promotion of Gender Equality. The fifth principle of the law focuses on principles and policies of gender equality, where sex-disaggregated data and other gender data are integrated. Throughout, the law emphasizes the use of sex-disaggregated data within the policy framework to assess the state of gender equality and policies surrounding it. The emphasis of gender statistics embedded within existing laws is significant, as it can pave the way for gender data-policy integration in future time-bound national development strategies and plans.

Mongolia's National Committee on Gender Equality has various gender-responsive policies and plans that are sector-based, including education, construction and urban development, labor and social protection, law enforcement, food and agriculture sectors. However, these strategies largely pertain to the delivery of services and human resource development within the responsible agencies and not to the collection of data on the general population. Although building awareness of gender issues within statistical agencies is an important element of capacity development, it is not the focus of this report.

It is estimated that 788,400 men (48.1 per cent) and 847,500 women (51.7 per cent), or 93 men for every 100 women, made up Ulaanbaatar's 1.64 million population in 2021. In 2040, the gender ratio will change to 94.0 males to 100 females, according to NSO's population projection estimates (Table 5). Since there is no data for ridership by gender until today, it is difficult to remark on the role of gender in the ridership of public transport in Ulaanbaatar.

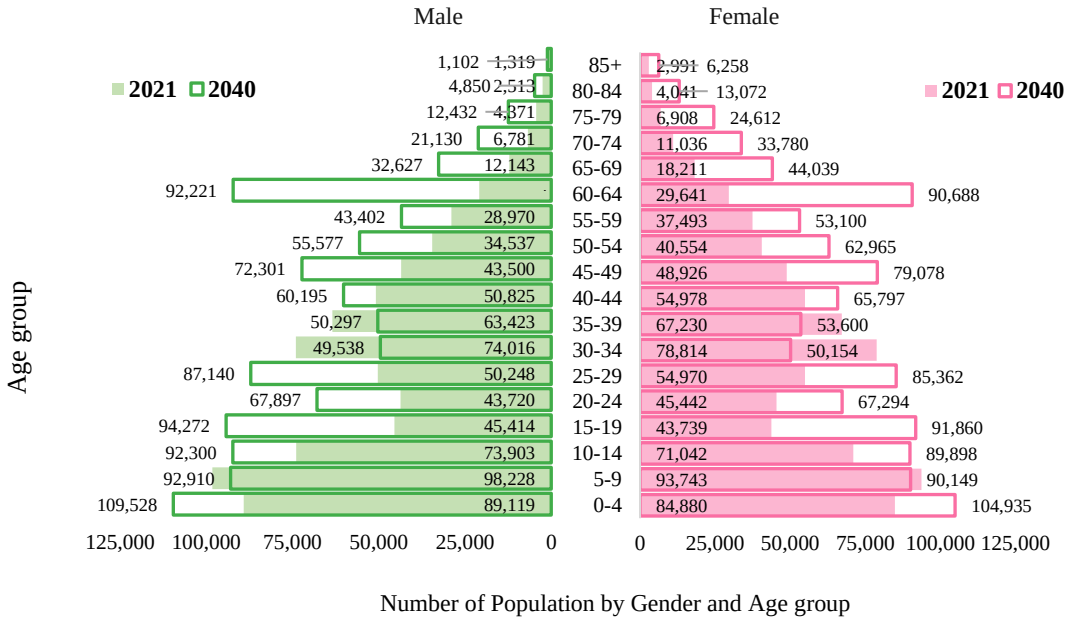
Men and women travel differently and have distinct demands, which has a profound impact on how they perceive space and navigate. Therefore, it is critical to comprehend women's travel requirements in order to close the gender mobility gap. Statistics show that women are more prone than males to trip-chain, or make many stops along their route, perhaps as a result of domestic responsibilities including child care, helping elderly relatives, and stopping at the grocery store. As a result, the city needs to prioritize women's transport requirements such as enlarging walkways, building ramps for strollers, and enhancing lighting for security. Women's preferences for mobility are strongly influenced by safety and security. In order to avoid harassment on public transit, women frequently pay more to use taxis and ride-hailing services in many cities around the world.

Another criterion for classifying public transport as convenient is (i) whether it is accessible to all passengers, including those with special needs such as people who are physically, visually, or audibly impaired, as well as those with temporary disabilities, the elderly, children, and other people in vulnerable situations; (ii) whether there are more public transit service during rush hour; and (iii) whether stops provide a safe and comfortable station environment.

[4] https://data2x.org/wp-content/uploads/2021/04/BtG-Asia-Policy-Report-Mongolia.pdf

To encourage older persons to use transport, accessible, safe, age-friendly, and inexpensive transport services must be made available. The population is aging, as can be seen by comparing the UB region's population pyramid for 2021 and 2040 (Figure 17).

FIGURE 17. Population Pyramid of Ulaanbaatar Capital City, 2021 & 2040



Data Source: (National Statistical Office of Mongolia, 2022)

Ulaanbaatar has a young population, with 70 per cent of the entire population under 40 years of age, while only 7.8 per cent were over 60 years in 2021. However, the NSO predicts that by 2040, 1 in 6 individuals in Ulaanbaatar will be 60 years of age or older, up from 1 in 13 in 2021, while just under 60 per cent of the total population will be under 40 years old. According to data on ridership, seniors make up around 25 per cent of all public transport users, a number that will rise in the coming years (Table 19).

TABLE 19. Ulaanbaatar Public Transport Ridership, 2017-2021

Passenger types	2017	2018	2019	2020	2021
Regular passenger	91,613,445 (51.0%)	89,791,612 (49.6%)	75,063,886 (47.7%)	59,516,130 (51.6%)	55,768,772 (53.7%)
Children	25,237,125 (14.0%)	26,195,320 (14.5%)	18,632,189 (11.8%)	12,196,413 (10.6%)	13,061,403 (12.6%)
Students with discounted rate	10,194,191 (5.7%)	9,274,706 (5.1%)	8,191,635 (5.2%)	963,262 (0.8%)	1,631,667 (1.6%)
Donors (free of charge)	38,988 (0.0%)	83,635 (0.0%)	83,570 (0.1%)	78,635 (0.1%)	76,664 (0.1%)
Seniors (free of charge)	33,860,505 (18.8%)	35,493,421 (19.6%)	36,904,598 (23.5%)	29,084,874 (25.2%)	23,001,567 (22.2%)

Passenger types	2017	2018	2019	2020	2021
People with disability (free of charge)	13,860,124 (7.7%)	13,725,725 (7.6%)	12,813,347 (8.1%)	10,148,855 (8.8%)	7,690,262 (7.4%)
Inspectors & police officers (free of charge)	492,338 (0.3%)	562,658 (0.3%)	455,523 (0.3%)	393,224 (0.3%)	721,340 (0.7%)
Regular passengers with reward/bonus cards	3,158,454 (1.8%)	4,513,104 (2.5%)	4,366,326 (2.8%)	2,780,982 (2.4%)	1,784,196 (1.7%)
Children with reward/bonus cards	1,176,653 (0.7%)	1,295,148 (0.7%)	816,307 (0.5%)	244,730 (0.2%)	107,112 (0.1%)
Total	179,631,823	180,935,329	157,327,381	115,407,105	103,842,983

Data Source: (Public Transport Department of the Capital City, 2022)

The global population is aging, and many nations, including Mongolia, have major difficulties in changing their social and health systems to meet the demands of this demographic shift. It is common knowledge that a person's independence, well-being, and quality of life are frequently inextricably related to their mobility. Since the aging population is an issue for the future population of Ulaanbaatar, concern is rising about how the mobility needs of the aging society might be addressed.

In order for the senior population of a city to be able to age actively, stay involved in their community and have access to health and social amenities, accessible and affordable public transport is essential. Older drivers should be taken into consideration when designing city parking and driving conditions. Ideally, older people should be able to easily use the city's transport system. In addition to cost, individuals' perceptions of the safety of public transport will influence their willingness to use it. People with a range of mobility issues should be catered to by transport providers.

Additionally, helpful drivers and station employees who are aware of the needs of the elderly are better able to help senior commuters. For older individuals, having a car might be a necessity. City driving can be challenging due to heavy traffic, poor road conditions, inadequate street lighting, and poorly placed signage, especially for senior drivers who may have eye issues. In order to ensure everyone drives safely, it is crucial for drivers to maintain their confidence as they become older. Seniors appreciate parking spaces near buildings as well as drop-off and pick-up areas. Finally, in order to encourage older people to use transport services, it is necessary to provide safe, age-friendly, and inexpensive transport options, as well as age-friendly parking places and driving conditions.

Disability inclusiveness. According to the Statistical Department of Capital City, there were 35,500 people with disabilities, or about 2.5 per cent of the total population, in Ulaanbaatar in 2020. Men make up 20,200 (55.1 per cent) of the disabled population, while women make up 16,500 (44.9 per cent). About 33.7 per cent of the total disabled people of Mongolia resided in Ulaanbaatar (Table 20). People with disabilities accounted up 5.5 per cent of the population in the

0–9 age group, 6.2 per cent in the 10–19 age group, 9.3 per cent in the 20–29 age group, 21.9 per cent in the 40–49 age group, 27.6 per cent in the 50–59 age group, and 12.2 per cent in the 60+ age group. Some studies suggest that older adults are more likely to report disabilities and that those disabilities are more likely to be severe.

TABLE 20. Population with Disabilities of Ulaanbaatar, by Districts, 2000-2020

Districts	2000	2005	2010	2015	2016	2017	2018	2019	2020
Mongolia		73,001	82,631	101,730	100,993	103,630	105,730		
Ulaanbaatar	8,937	18,506	25,154	33,943	33,713	34,246	35,589	34,860	35,556
Baganuur	459	628	806	1,077	987	1,004	1,039	1,063	1,076
Bagahangay	37	80	105	150	164	157	163	168	174
Bayangol	902	2,668	3,728	4,764	4,693	4,819	5,873	5,636	5,845
Bayanzurh	1,313	3,087	4,815	7,233	7,794	7,638	8,026	7,558	8,206
Nalayh	867	1,550	1,436	1,754	1,760	1,731	1,626	1,582	1,560
Songinohayrhan	2,319	3,841	5,053	7,271	7,284	7,254	7,857	7,578	7,411
Suhbaatar	687	1,982	2,723	3,374	3,181	3,138	2,974	3,220	3,134
Han-Uul	1,094	2,027	3,062	3,670	3,861	3,899	3,930	3,872	4,047
Chingeltey	1,259	2,643	3,426	4,650	3,989	4,606	4,101	4,183	4,103

Data Source: (Ulaanbaatar, 2022)
Note: Persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others (UNCRPD, 2006)

According to data on ridership, people with disabilities make up around 7.4% of all public transport riders. Overall, there is limited information on the travel patterns of people with disabilities. The information available tends not to distinguish travel based on a person's level of disability severity, household income, whether they have a driver's license or not, if they own a car, or any other important factors that may have an impact on mobility, such sex and age.

For persons with disabilities, transport is a crucial policy concern. People with disabilities have frequently explained how transport obstacles have significant negative effects on their life. Further measures to meet the mobility requirements of people with disabilities include mandating by rules or legislation the appropriate kinds of transport services and facilities. Although all fleets should be fully accessible to those with disabilities, buses are outdated and lack the necessary features, such as a lowered entrance side or mechanical lifts.

Caring for one another and taking action to safeguard those who are vulnerable, such as elderly adults and those with disabilities, are crucial. Since it is now known that best practices and standards can make human settlements more resilient, we also need to review the way we plan our cities. The key to governing cities is to make sure that everyone is included, so rethinking cities through the creation of public spaces for sustainable mobility and transit is necessary.

Road Safety. Safety is of primary concern for any transport system. There are still too many people being seriously injured or killed in car accidents every year on our roads. In Mongolia, the third

most common cause of death in 2021 was traffic accidents, which accounted for 15.5 per cent of all deaths recorded in the nation (National Road Safety Council, 2021). Seven out of every ten fatalities in provinces were caused by automobile accidents. Looking at injured people by car accident (except for passengers on bicycles), brain injuries are the most frequent when comparing the kind of vehicle to the organ that was harmed (see Table 21).

Travelers expect transport to be safe, so it is essential to enhance the roads so that people can use public transport safely. The implementation of the country's national safety policy involves tight collaboration between transport operators, unions, the police, local government offices, and metropolitan areas. The government also sets safety standards for materials and infrastructure.

TABLE 21. Injury Type by Vehicle Type, 2021

Vehicle Types	Injure Types				
	I	II	III	IV	V
V01-V09 (Pedestrian)	Brain damage (S00-S09) 34.3%	Knee and shin injuries (S80-S89) 15.5%	Ankle and foot injuries (S90-S99) 13.3%	Abdominal injury (S30-S39) 9.7%	Chest injury (S20-S29) 5.7%
V1-V19 (Bicycle)	Elbow and forearm injuries (S50-S59) 25.2%	Brain damage (S00-S09) 21.6%	Knee and shin injuries (S80-S89) 14.5%	Wrist and paw injuries (S60-S69) 8.3%	Shoulder and ankle injuries (S40-S49) 7.8%
V20-V39 (Motorcycle)	Brain damage (S00-S09) 38.2%	Knee and shin injuries (S80-S89) 16.1%	Shoulder and ankle injuries (S40-S49) 11.2%	Chest injury (S20-S29) 9.0%	Elbow and forearm injuries (S50-S59) 5.7%
V40-V49 (Passenger car)	Brain damage (S00-S09) 56.0%	Chest injury (S20-S29) 10.0%	Abdominal injury (S30-S39) 7.8%	Injuries to many parts of the body (T00-T09) 5.1%	Knee and shin injuries (S80-S89) 3.7%
V50-V69 (Truck)	Brain damage (S00-S09) 41.6%	Chest injury (S20-S29) 14.7%	Abdominal injury (S30-S39) 10.2%	Knee and shin injuries (S80-S89) 6.5%	Hip and thigh injuries (S70-S79) 5.1%
V70-V79 (Public Transport)	Brain damage (S00-S09) 40.3%	Chest injury (S20-S29) 14.5%	Abdominal injury (S30-S39) 11.3%	Knee and shin injuries (S80-S89) 8.1%	Shoulder and ankle injuries (S40-S49) 4.8%
V80-V89 (Horse)	Brain damage (S00-S09) 25.0%	Shoulder and ankle injuries (S40-S49) 16.0%	Elbow and forearm injuries (S50-S59) 15.8%	Knee and shin injuries (S80-S89) 11.3%	Chest injury (S20-S29) 9.9%

Source: (National Road Safety Council, 2021)

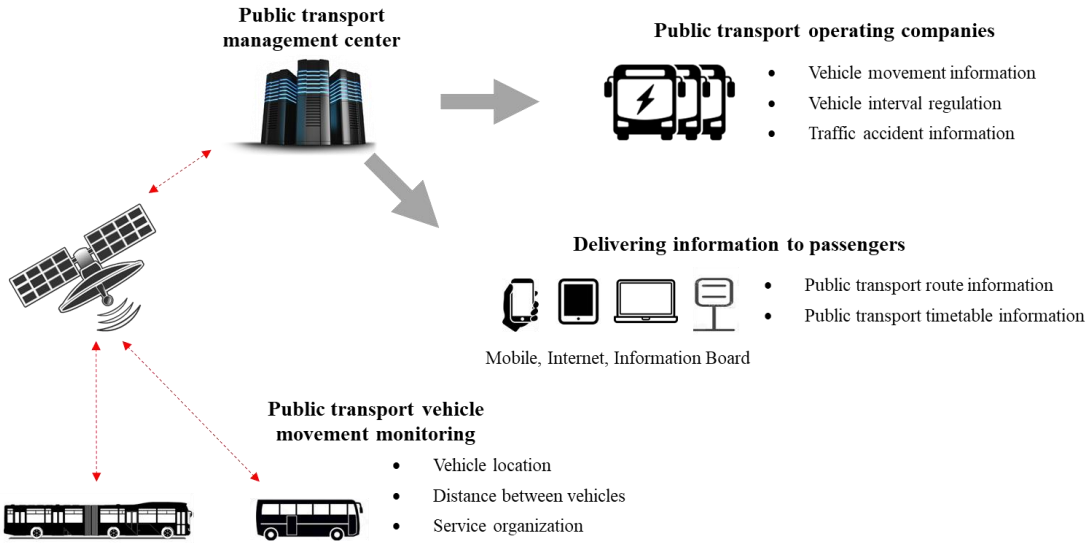
In many countries, security professionals are kept occupied by regular security and safety issues. Coordination with law enforcement is essential since accidents and incidents involving moving cars and people happen frequently every day.

4.2. ITS IN PUBLIC TRANSPORT

Public transport can be made faster, more efficient and more passenger friendly by increasing the use of innovative Intelligent Transport System (ITS) applications for traffic management, public transport operations, and urban transport planning.

Traffic management and public transport operation. Ulaanbaatar's public transport monitoring system was controlled by over 130 route dispatchers until 2002. Since 2003, public transport ID buses movement monitoring and station reporting system based on analog radio control system have been utilized. The number of reporting stations rose from 26 for 373 buses in 2003, to 47 for 1,100 public transportation buses in 2015 (Khurelbaatar, 2020). As the analog radio control technology was somewhat outdated, the "Ulaanbaatar Smart Card" LLC launched the Bus Control Centre using ITS in 2015, which included a bus management system (BMS), automated fare collection system, and bus information system (BIS). Currently, 1300 buses of 20 public transportation providers are equipped with GPS tracking devices, automated fare collection readers, and CCTV cameras.

FIGURE 18. Ulaanbaatar Intelligent Public Transport System



Bus Management System (BMS): Utilizing GPS and mobile communication, the BMS helps bus drivers to manage bus operations and increase punctuality through the information on intervals between buses. In daily operations, unpredictable events such as traffic congestion, unanticipated delays, erratic passenger demand, irregular vehicle dispatching times, and other incidents have an impact on the movement of vehicles in a bus management system. The Bus Control Center has worked hard to create adaptable control strategies that take into account the unique characteristics of public transportation systems in a real-time scenario. Bus operating companies enable the tracking devices to obtain GPS data of bus locations, which they subsequently transfer to the

centralized bus control center. The traffic control center's real-time video feed is used by the bus control center to monitor everyday traffic and document the daily work performance of buses. BMS collects and processes bus operation data and disseminates it to the Public Transport Department of Ulaanbaatar, operators, bus companies, and drivers.

Automated Fare Collection (AFC). The AFC is a ticketing system where the fare is no longer paid directly in cash to drivers/conductors. The bus device set consists of a driver console and validator. Transit cards are used for the automated fare collection. In the year 2021, 1,831,354 high-security transit cards were sold, of which 67.81 per cent were issued to adults, 21.21 per cent to children, 6.66 per cent to seniors, 1.55 per cent to people with disabilities, 2.77 per cent to students, and 0.01 per cent to donors (Public Transport Department of Ulaanbaatar, 2022). There are 538 locations for buying and charging card services in Ulaanbaatar. When a passenger does not have a transportation card or the card is not charged, they pay the driver in cash thus bypassing the digital system which is believed to negatively influence revenues monitoring. Therefore, a new application that allows the card to be recharged by mobile phone has been created in an effort to improve fare revenue. The Trade and Development Bank coordinates the transaction of the AFC system under a special agreement.

TABLE 22. Public Tranport Cards Sold by Types, 2020

№	Card Types	Number of Cards
1	Adult (Regular)	1,239,307
1.1	Umoney card	1,192,941
1.2	City pass (Khanbank)	44,346
1.3	NFS technology with sim card (Unitel)	1,130
1.4	NFS technology with sim card (Mobicom)	579
1.5	NFS technology with sim card sim (Skytel)	192
1.6	Golomt (Golomt Bank)	119
2	Child (Regular)	388,130
3	Senior	121,972
4	Disabled person	28,321
5	Student	50,742
6	Donor	196
7	Adult monthly card	2,448

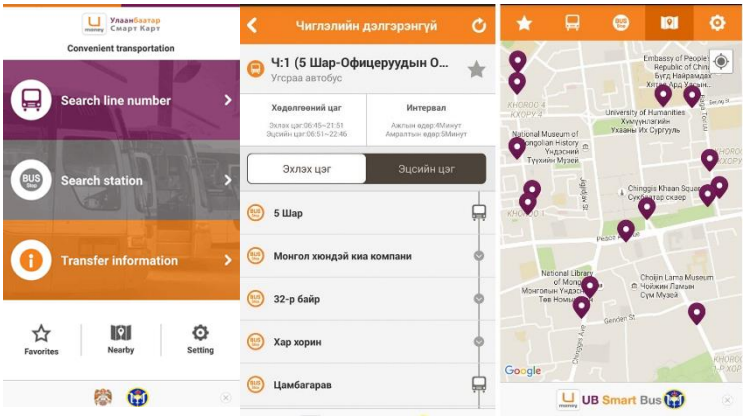
Source: (Khurelbaatar, 2020)

Today, many cities around the world are using affordable and robust android transport validators designed with EMV readers to validate multi-format tickets such as contactless bank cards, smartcards, and mobile and paper barcode tickets. These use wireless networking and built-in GPS, allowing operators the flexibility of using smartphone technology inside a robust and transport-certified validator.

Bus Information System (BIS). The Bus Information System is most closely associated with BMS and AFC, and is linked to the Bus Control Center and Traffic Control Center. The Bus Information

System or “UB Smart Bus” mobile application provides real-time bus arrival time, data about the current location of buses, and incident information to the public based on collected data, as well as data on intervals between buses and monitoring of speed violations. The BIS gathers data on bus location, processes bus arrival predictions, and distributes information to the users and associated institutes.

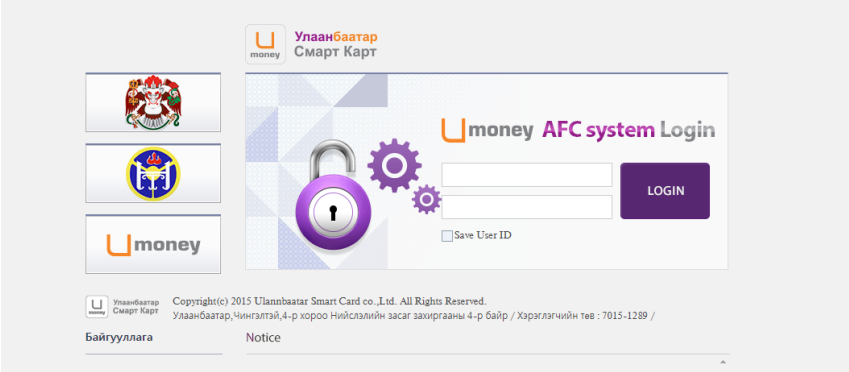
FIGURE 19. UB Smart Bus Application



The passenger information system is synced with LED signage to inform passengers, making it possible for them to anticipate the next stop without having to read the display before getting off. This passenger information system enables passengers who have hearing or visual disabilities to board buses independently.

Data about bus companies, bus fleets, bus schedules, BMS, AFC, and BIS are gathered for research and planning purposes through the development of the T-box software program. To enhance public transportation planning and services, the current intelligent system must be improved and made smarter.

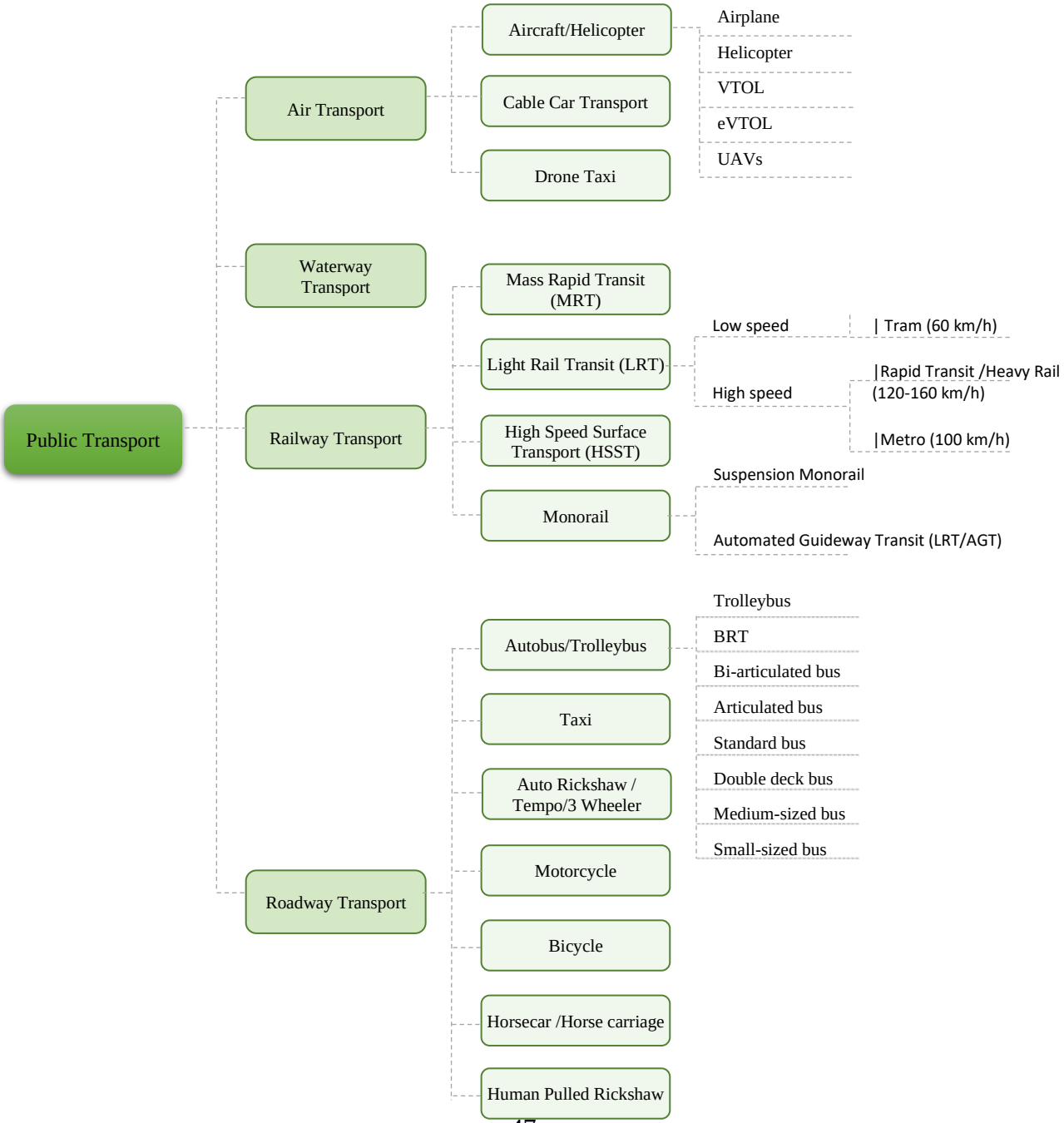
FIGURE 20. T-Box Application Login Page



4.3. INTEGRATED AND RESILIENT URBAN PUBLIC TRANSPORT SYSTEM

Integrated Urban Public Transport System. Public transport services can be classified into four main types: air, water, rail and road transport. Due to the characteristics and economic conditions of the region, these four modes are used for inter-state, inter-city and intra-city public transport services (Figure 21).

FIGURE 21. Public Transport Types



Air Transport. Internationally, small automated aircraft are used to transport passengers and cargo within and outside major cities to avoid traffic jams. These aircraft include traditional helicopters, vertical takeoff and landing (VTOL), electric vertical takeoff and landing (eVTOL), unmanned aerial vehicles (UAVs), and drone taxis.

There are six helipads in Ulaanbaatar, and they are listed in the action plan for carrying out the "General Purpose Aviation Development Program" for 2018–2022, which was authorized by Minister of Road Transport Development Order No. 170 of 2018.

The Financial Agreement of 60.7 million Euros the "Project for the Development of Pendulum Road Transportation in the Capital's Public Transport" was signed on 12 May 2020 between the Government of Mongolia and the Government of France, and then ratified by the Great Khural of Mongolia (Parliament) on 14 May 2020. According to the agreement, the project includes: (i) purchase of French goods and services from France; (ii) it is stipulated that no more than 30 percent of the granted financial support shall be used for the purchase of goods and services from Mongolia and third countries, and (iii) that the relevant contract shall be implemented under the responsibility of the French contractor. Private firms POMA and Egis will implement the project, which is financed by the French Directorate General of the Treasury.

In general, cable cars are only an appropriate means of transport for peripheral urban areas if certain topographical and urban planning conditions are met and if natural barriers (rivers, lakes, gorges, etc.) or infrastructural barriers (railroad lines, roads, industrial areas, etc.) exist. Urban cable car lines are unsuitable as a substitute for bus or tram lines in sensitive downtown areas. Cable cars use ropes and are usually electric-powered, but they are rarely utilized in urban areas; rather, they are employed mostly for tourism, particularly winter ski resorts. According to the Feasibility Study of the Cable Car Urban Transport Development in Ulaanbaatar, topographical and urban planning conditions of Ulaanbaatar is not suitable such a system, except from Yarmag Station to Sapporo Station across Tuul river line. The capacity of cable cars compared to other modes of transport is smaller, while the investment and operation costs are relatively high. Although the French soft loan has excellent conditions, once loan payments begin it will soon become burdensome and increasingly unprofitable since there will be few passengers.

Water Transport. Water public transport systems are usually developed in areas with large seas and rivers. Shipping by water has its disadvantages, such as slow speeds and vulnerability to weather conditions. It is more frequently used for travel, tourism, and recreation than for public transport.

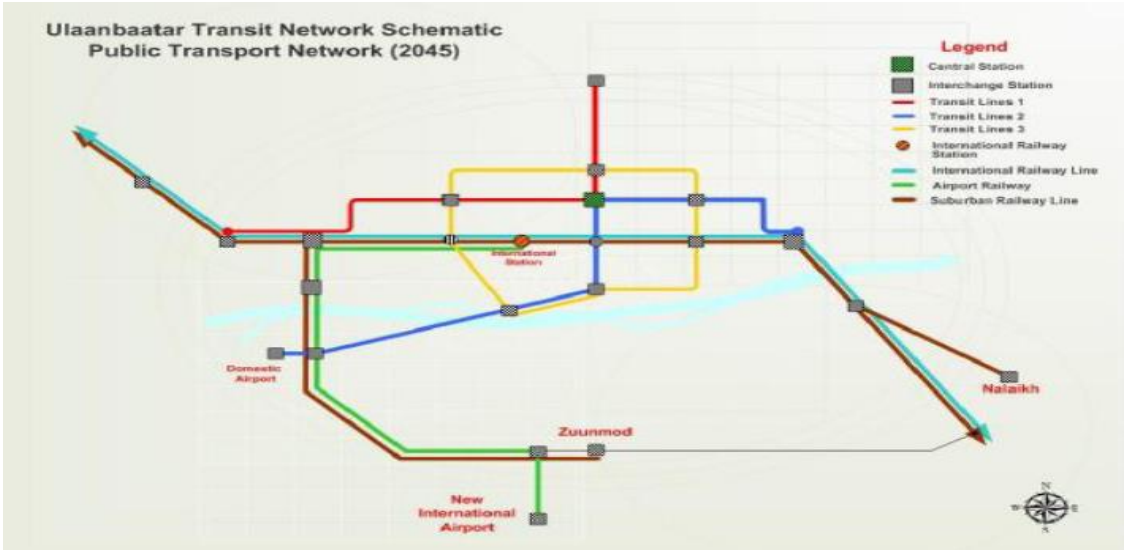
In addition to the potential for developing waterways public transit, including motor boat transport, the Governor of the Capital City and the Mayor of Ulaanbaatar announced the project of canalization of 11 km in the southern portion of a total of 57 km from the Tuul river. Whether the study is feasible or not, it must be thoroughly analyzed, particularly as Ulaanbaatar is not a city with a large sea.

Bus Transport. In Ulaanbaatar, buses continue to be the most popular form of public transport, having been in operation since 1934. Transit buses typically operate on a regular schedule along a fixed route, making stops at predetermined bus stations in accordance with a published public transport timetable. A feeder bus service picks up passengers in a *ger* district/outer area and transports them to a transfer location where they board a bus trunk service for their next destination. The Public Transport Department of Ulaanbaatar organizes special bus services, primarily school buses to transport children to and from school. In 2021, 944 buses served public transport in Ulaanbaatar.

Urban Transport Development Project in Mongolia by Almec Corporation and financed by ADB (ADB TA 7156-MON): The project was carried out in 2009 and developed the Ulaanbaatar urban transport roadmap and investment program for the next 10 to 15 years. The project's feasibility study was created based on essential calculations and research. The capital city administration subsequently entered into an investment agreement with ADB and opened a 215 million USD loan in 2012. A project unit was created after 4 years, and the next year, the finance organization formally presented its technical assistance report. Accordingly, a facility with a length of 49.9 km, 60 bus stations, and three corridors were envisioned. The first corridor, which has 15 stations and runs in the direction of Niseh-Doloon Buudal, should have been operational by 2020. However, the project was stopped, and the project unit was disassembled in 2020, eight years after the investment agreement was signed.

However, during the project implementation, the study was conducted and it identified all major transport corridors in Ulaanbaatar and assessed their potential for rapid transit corridors. Rapid transit included both rail-based mass transit systems and light rail systems, and also BRT. For each corridor, this also included assessments on existing and future public transport demand, an indication of the capacity of the system, alignment and nature of system (at grade/elevated/in tunnel), station location, land acquisition, and/or resettlement, etc. The urban public transport plan is shown as Figure 22.

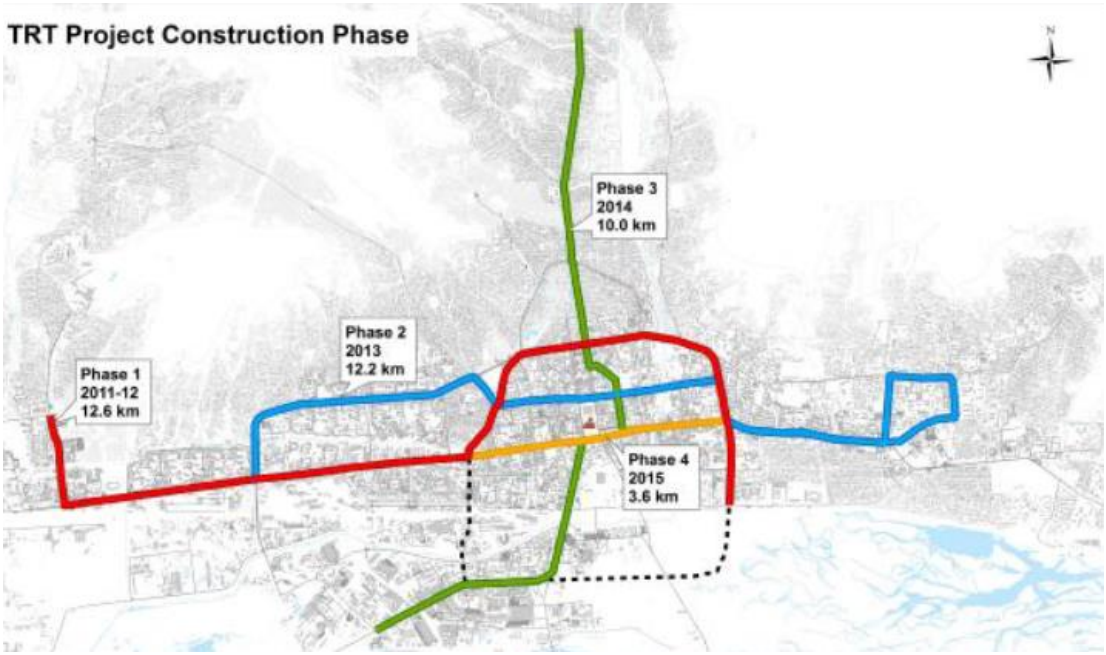
FIGURE 22. Proposed Urban Public Transport Corridor



Source: (Almec Corporation, 2009)

The creation of multimodal transport hubs, where users of public transit can swiftly and conveniently switch from one mode to another in a secure setting, is a crucial component of an integrated public transport network. The Team identified potential transport hubs, as shown in Figure 22. According to the Almec study, a total of 49.9 km of special road bus network in Ulaanbaatar was planned for the period 2017-2021, with six phases of implementation anticipated.

FIGURE 23. Proposed BRT Line by Almec Corporation



Source: (Almec Corporation, 2009)

According to the Almec study, when the guideway right of way is limited, their forecasted traffic volumes suggested that some transit network segments may need to be upgraded to metro-style operations with grade separations. During peak hours, segments of the transit corridor could carry up to 25,000 passengers each way. They advised that a completely separated transit system was suitable.

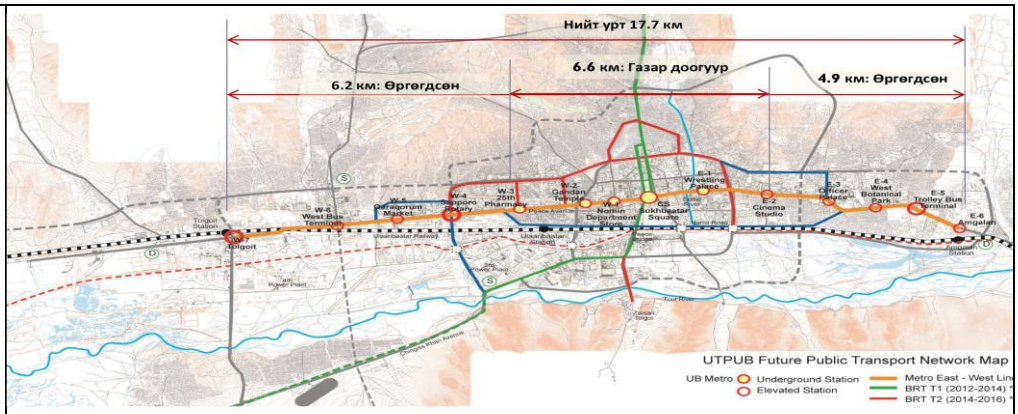
Rail Transport. For Ulaanbaatar, there are many initiatives and studies being conducted to improve urban mobility and put in place mass transit systems including the BRT, LRT, Metro, and Tram (see Table 23). They include:

- "Ulaanbaatar Metro Feasibility Study" developed jointly by Soosong Engineering Co. Ltd. and Seoul Metro Company in 2010–2011 at the request of Governor's Office of the Capital City, and funded by KOICA;
- "Project on Research on Public Transportation for Ulaanbaatar" study conducted jointly with "Value Planning International" Co. Ltd., Almec Corporation, Oriental Consultancy Co. Ltd., Marubeni Co. Ltd., and Nikki Company in 2011–2013, and funded by JICA;
- Privately funded "Research on Tram Introduction into Ulaanbaatar" developed by the Asian Infrastructure Research Institute and Maximal Co. Ltd. in 2020;
- "Pre-Feasibility Study of LRT Introduction into Ulaanbaatar" developed jointly by Maximal Co. Ltd. and Asian Infrastructure Research Institute at the request of the Governor's Office of the Capital City in 2022, and funded by the capital city budget;
- "Feasibility Study of the First Line of Elevated Structured Ulaanbaatar LRT" developed jointly by Urban Development Consultancy (UDC) Co. Ltd., and Chinese Railway Engineering Consulting №6 in 2022 at request of Governor of the Capital City and Mayor of Ulaanbaatar. The project funding is unknown.

Although these systems are the most efficient and sustainable way to move large numbers of people across the city, they vary widely by investment costs and also by their effects on passengers' movements, central and local government costs for public transport providers, environmental and safety issues, as well as on the spatial and economic development of urban areas.

TABLE 23. Rail-based Mass Transit Studies, 2010-2022

"Ulaanbaatar Metro Feasibility Study" developed jointly by Soosong Engineering Co. Ltd. and Seoul Metro Company of South Korea in 2010–2011 Source: (Soosung Enginering Co.Ltd., 2011)	The Feasibility Study proposed that the horizontal line of the metro from east (Uliastay) to west (Emeelt) is 28.38 km, while the vertical line is intended to be 21 km long from the south (Buyant-Uhaa Airport) to north (7 stations). The metro structure is intended to be above ground in the city's outskirts and underground in both directions in the center of the city. The overall budget was calculated to be 4.9 trillion MNT (about 3.9 billion USD). 
"Project on Research on Public Transport Development for Ulaanbaatar" by JICA Team (2011-2013) Source: (JICA, 2013)	A total of 14 stations were planned for a total length of 17.7 km along Ulaanbaatar's Enkhtayvan Avenue from Tolgoyt Station to Amgalan Station. With the exception of a 6.6 km in the city center (from the West 4-way crossing to the East 4-way crossing), which will be an underground construction, the rest of the system will be comprised of a bridge structure that is totally completely isolated from the road. According to estimates, the metro project's initial expenditure will total 1.5 billion USD, with 1.3 billion USD going toward infrastructure like tunnels, bridges, stations, and equipment, and 200 million USD going into purchasing rolling stock and commencement of operation. The research work developed a comprehensive proposal for the metro construction within the scope of public and private sector partnership.

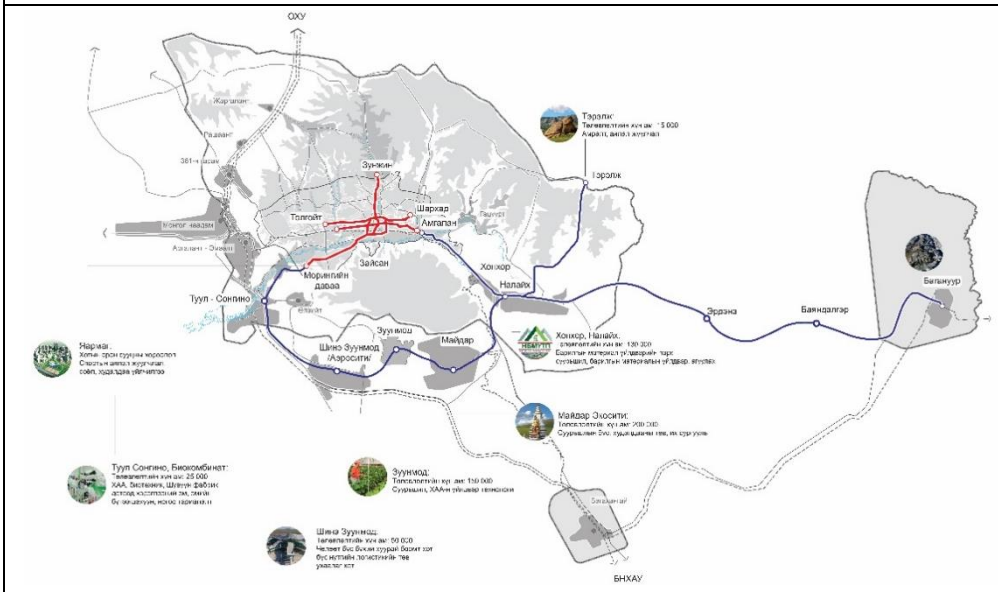


"Research on Tram Introduction into Ulaanbaatar" by AIRI & Maximal. (2019-2021)

Source: (AIRI & Maximal, 2020)

The existing road network, which is only meant for public transport, will be used for the construction of the tram line when this service is introduced. The first line is 15 km long with 25 stations in each direction. The second line will be 15 km long with 23 stations in each direction. A 28.5 km long LRT tram line with 17 stations in each direction was planned in the direction of Ulaanbaatar - Nalaikh to assist the multi-centered urban planning policy for the development of remote districts, outlying areas, and satellite cities. The total estimated cost for 23.2 km tram line (1st and 2nd lines) within Ulaanbaatar is 660.9 million USD (construction cost per 1 km is 17.5 million USD and project cost per 1 km is 28.7 million USD).

Classification	Length (km)	Number of Station	Number Junctio Statio
1st line Amgalan- 5 Shar /along Enkhtayvan Ave./	15	25	7
2nd line Amgalan-5 Shar /along Narny Rd./	15	23	2
3-р шугам Amgalan-Nalayh	28.5	17	2

"Pre-Feasibility Study of LRT Introduction into Ulaanbaatar" by Maximal & AIRI Source: (Maximal & AIRI, 2022)	The proposed plan calls for the construction of five LRT lines within Ulaanbaatar city and four LRT lines outside the city. To connect Ulaanbaatar's center and sub-centers, a total of 71.5 km of double tracks are planned, including 17.3 km of the first line and 11.2 km of the second line in a vertical axis connection; 16.5 km of the third line; 17.4 km of the fourth line in horizontal axis connections; and 9.4 km of the fifth line as a ring line. In order to decentralize Ulaanbaatar and develop satellite towns and villages outside of the city, a total of four LRT lines with 240.9 km of double tracks are planned. The LRT network plans indicate that 68.7 per cent of the city's population (898 000 people) and 65.3 per cent of welfare recipients live within 1000 m or 10-minute walking distance of an LRT station. The total cost of the first phase is between 669.1-736.7 USD (construction cost per 1 km 18.8-21.6 million USD and project cost per 1 km 30-33 million USD) depending on the construction structural options.
	

"Feasibility Study of the First Line of Elevated Structured Ulaanbaatar LRT" Ulaanbaatar by "Urban Development Consulting" Co. Ltd (UDC) & China Railway Engineering Consulting (CREC) №6" Source: (UDC & China Railway Engineering Consulting №6, 2022)	The first line of the Ulaanbaatar light train is expected to be 18.1 km long. The total cost for elevated structured Ulaanbaatar LRT Line 1 including 15 stops was estimated to be 926.1 million USD (construction cost per 1 km was about 30 million USD and project cost per 1 km was 51.2 million USD). 

The Ulaanbaatar Municipality has established a Unit for Reducing Ulaanbaatar's Road Congestion. Additionally, "Ulaanbaatar Shine Büteen Baiguulalt" LLC was created in August 2022 to be in charge of planning development projects and policies that will be used in Ulaanbaatar under the "New Revival Policy."

Ulaanbaatar City government requested that the government issue a debt guarantee of 510 million USD for the LRT project, and the city administration backed the light rail feasibility study created by UDC Co. Ltd and CREC №6. The Capital City's Governor presented a 5 percent loan from Chinese Commercial Bank and 5 percent insurance as the project's source of funding. The Standing Budget Committee of the Parliament of Mongolia stated that "The estimated investment cost by the Feasibility Study for introducing elevated LRT developed by UDC Co. Ltd and CREC №6 is too high. The project will add about 3.5 billion USD to Mongolia's debt; as such, it should be handled cautiously, not enthusiastically, as it is a dangerous move in difficult socioeconomic circumstances. This is violating the "Law on Budget Stability and Loan Management."

There is a need for mass transit transport, but it is also crucial to carefully examine the results of the aforementioned research and investment costs.

Integrated and resilient urban transport for Ulaanbaatar. Sustainable development requires the management of mobility, transport infrastructure, urban development, and environmental protection. Transport integration is an organizational process that unites the planning and provision of the transport system across modes, industries, operators, and institutions. Even though there have been numerous studies on mass transit, none of them have been put into practice to enhance urban transport and ease traffic congestion in Ulaanbaatar. When talking about integrated and resilient urban transport, the following points need to be carefully considered:

- Integration of plans and policies is necessary due to the multi-sectoral nature of transport (modes, operations, priorities, organizations, etc.);
- Need to maintain smooth and seamless urban transport services;
- Since several government levels oversee various agencies, they need to coordinate their efforts based on unified policies as well as for consistency between policies at various levels of decision-making and in different sectors;
- Need for a deeper awareness of effects on other sectors.

The following requirements must be met for the establishment of an integrated and resilient transport system: (i) a physical interface between modes; (ii) operational integration and resilience between modes; and (iii) and service integration and resilience (common fare, ticketing system, etc.).

Ulaanbaatar's current public transport system is made up of a variety of transit types, including but not limited to:

- public transport bus (large-sized and articulated bus) and trolleybus services on the main roads;
- feeder bus (large- and medium-sized bus);
- taxis;
- mainline railway (international, inter-city, freight);
- inter-provincial bus (large-sized bus);
- informal taxis;
- cycle/pedestrian walk-in facilities.

The following effects may result from the deployment of the mass transit network:

- everyone who uses the roadways will profit from less traffic congestion, especially public transport providers;
- improved comfort and reliability will attract new public transport users and persuade drivers of private vehicles to switch to public transport;

- bus operating companies will be affected because many of their customers would transfer to the mass transit line. In order to enable complementary bus operations with adequate connectivity at stations and the growth of bus feeder routes, routings will need to be adjusted.
- the new transit system will actually produce more money for other public transport providers with a fixed fare structure since it will provide more capacity and shorten passenger journey times;
- informal taxi services will decline more than taxi services; however, taxis and minibuses that are extra can be used to launch additional feeder services;
- to reduce any delays when changing forms of transport, better transfer facilities will be offered at transit station hubs;
- any essential planning for improved coordination of transport services in the transport corridors must be finished before the mass transit line's initial phase of service begins.
- to fully convey the advantages of a coordinated and integrated transport network to the City and the bus operators, further communication with the current bus operators and government organizations will be required.

The following factors were taken into account when planning accessible and inclusive LRT stations for all Ulaanbaatar residents:

- accessible and fulfilling to travel demand;
- the ideal distance between stops;
- making sure that passengers are secure as they board and exit the train;
- posting the arrival and departure times of trains and other important information;
- purchasing tickets and having access to the passenger platform directly;
- accessible and friendly travel for those with disabilities; and
- planning “Hub LRT Stations” that allow easy and convenient transfers between modes.

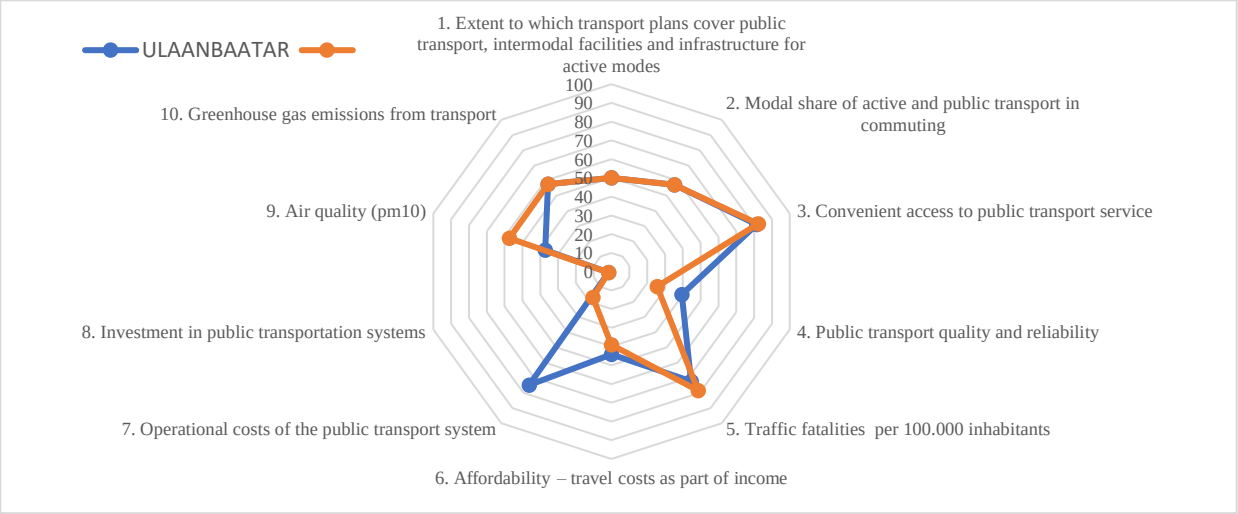
4.4. SUTI ASSESSMENT COMPARISONS FOR 2018 & 2021

UNESCAP developed the Sustainable Urban Transport Index (SUTI) to assess, monitor, and evaluate how Asian cities perform in terms of sustainable urban transportation and transport’s contribution towards the achievement of the Sustainable Development Goals (SDGs). Based on ten indicators in the economic, environmental, and social domains, the SUTI assessment for Ulaanbaatar for 2018 and 2021 are shown in Table 24. The overall SUTI score declined from 39.09 in 2018 to 33.61 in 2021. More details on the individual indicators are given below.

TABLE 24. Ulaanbaatar SUTI- Score Card for 2018 & 2021

№	Indicators	SUTI 2018	SUTI 2021
1	Extent to which transport plans cover public transport, intermodal facilities and infrastructure for active modes	50.00	50.00
2	Modal share of active and public transport in commuting	55.7	55.7
3	Convenient access to public transport service	81.42	82.28
4	Public transport quality and reliability	39.46	25.63
5	Traffic fatalities per 100,000 inhibitions	72.31	78.47
6	Affordability-travel costs as part of income	44.25	39.5
7	Operational costs of the public transport systems	74.85	17.11
8	Investment in public transportation systems	1.76	1.76
9	Air quality (PM10)	37.29	57.36
10	Greenhouse gas emissions from transport	57.60	57.60
	SUTI	**39.09**	**33.61**

FIGURE 24. Spider Diagram of SUTI Assessment for 2018 & 2021



Source: AIRI

Indicator 1. Extent to which transport plans cover public transport, intermodal facilities and infrastructure for active modes: Although the Medium and Long-Term Master Plan for Road Development of the Capital City was prepared, it is still not officially recognized in urban transportation-related policy documents. The approval process for the Urban Development Plan 2040 is also still ongoing. Therefore, Indicator 1 has not changed.

Indicator 2. Modal share of active and public transport in commuting: Although the number of people using public transportation has decreased, no study has been done to assess the modal share of active mobility and public transportation. Hence the value of Indicator 2 for 2021 remained the same as 2018.

Indicator 3. Convenient access to public transport service: There were 1,116 bus stations in 2021 compared to 931 in 2018. Indicator 3, which measures convenient access to public transportation service, was 81.42 in 2018 and 82.28 in 2021, indicating that Ulaanbaatar's public transportation system has a high coverage in both population and geographic area.

Indicator 4. Public transport quality and reliability: Cities must effectively make public transportation an attractive and everyday choice for inhabitants, especially in the wake of disruptions from the COVID-19 pandemic. As a result of traffic congestion and outdated bus fleets, the satisfaction rate of users fell from 56 per cent to 47 per cent. As a result, Indicator 4 decreased from 39.46 in 2018 to 25.63 in 2021.

Indicator 5. Traffic fatalities per 100,000 inhibitions: The number of traffic fatality declined from 140 in 2018 to 116 in 2021, which resulted in a decrease in the traffic fatalities per 100,000 inhabitants (Indicator 5) from 9.7 in 2018 to 7.5 in 2021. As a result, the normalized index value increased from 72.31 to 78.47.

Indicator 6. Affordability-travel costs as part of income: Bus fares are set at 500 MNT (0.15 USD) for adult bus ride, 300MNT (0.09 USD) for adult trolleybus ride, and 200 MNT (0.06 USD) for child ride, with one transfer being free. The minimum subsistence per capita level rose from about 74 USD (198,600 MNT) to just under 84 USD per month (238,700 MNT) from 2018 to 2021. Adults are expected to pay an average of 19 USD (54,190.03 MNT) per month in 2021 compared to 15.6 USD (41,842.17 MNT) in 2018 for public transportation (bus and trolleybus). As a result, urban transport costs as a percentage of income increased from 21.1 per cent in 2018 to 22.7 per cent in 2021 (the normalized value of affordability decreased from about 44 in 2018 to 39.5 in 2021). This shows that poor people spend one fifth of their income on transport costs, suggesting that fares are set at the margin of an affordable level. According to the SUTI methodology, the worst scenario is where the percentage of income spent on public transportation by poorer household is over 35 per cent.

Indicator 7. Operational costs of the public transport systems: The major causes of the SUTI reduction are a decrease in the number of passengers, which has an adverse effect on fare incomes. The amount of operating costs that were covered by fare revenue and reimbursement decreased from 80.38 per cent to 35.35 per cent, which had a significant impact on the normalized value's reduction from 74.85 to 17.11. Because bus operating businesses get subsidies and reimbursement funds from the city's budget, operational cost recovery is not entirely covered but is done so rather well in 2018.

Indicator 8. Investment in public transportation systems: Until the end of 2021, no investments were made in the expansion of public transportation, including no fleet purchases of buses, so there was no effect on Indicator 8 in that year. According to the Public Transport Department of the Capital City, 75 per cent of the 1,240 buses used for public transportation in 2022 were older than ten years, while 18 per cent were between 7-9 years. In 2022, more than 500 buses were scheduled

to be retired from operation. The plan was to purchase 591 buses (of those, 150 will be electric buses and 441 will be Euro 5 diesel-powered buses) in total by 2022, of which 60 had been bought by end of 2022.

Indicator 9. Air quality (PM10): More than 800,000 residents in the capital live in *ger* districts. They used to burn raw coal and other flammable materials to keep warm and cook during the six-month-long cold seasons, which used to exacerbate air pollution in the winter. However, since May 2019, the Government banned the consumption of raw coal and required the use of refined coal in the capital city. This has led to an improvement in air quality during winter of 2020 and 2021. Air quality (PM10) declined from 97.8 in 2018 to 69.7 in 2021 on average, which increased its normalized value from 37.29 in 2018 to 57.36 in 2021. However, in 2022, the quality of refined coal declined and traffic congestion worsened, resulting in an increase in carbon monoxide, nitrogen dioxide and sulfur dioxide levels.

Indicator 10. Greenhouse gas emissions from transport: GHG emissions from the transport sector is relatively high, because 69 per cent of vehicles have petroleum-based engines and 74 per cent are over 10 years of age. Although the predicted annual emissions rose to slightly over 1.57 million tons, the annual emission per person stayed the same at 1.17 tons. As a result, the GHG emission indication is unchanged.

The aggregate SUTI score of Ulaanbaatar in 2021 was estimated to be 33.61. The following suggestions are made, based on the assessment results:

- There is a pressing need to produce, implement and monitor urban transport policy documents and associated measures.
- The primary source for planning and designing urban transportation are surveys and data on travel demand, modal share of active mobility, and public transportation. As the most recent survey was carried out in 2017, the city administration needs to perform more frequent assessments and adjustments to their plans and programmes.
- Enhancing their amenities at transport stops and providing information at the stations is crucial for enhancing public transportation services. Some main stations would benefit from being transformed into transit hub-stations to facilitate the deployment of mass transit transport.
- In addition to improving the quality and reliability of public transportation services, other measures are needed to make public transport more attractive to users.
- Attracted by the possibility of receiving higher salaries from the coal transportation business, many drivers are motivated to quit their positions in public transport. Hence, it is important to increase incentives for bus drivers.
- It is necessary to maintain the National Road Safety Program by putting in place institutional, outreach, and legal initiatives that have a strong emphasis on reducing transport-related death and injuries.

- The public transport fares are higher of reasonable amount. Low-income groups spend one fifth of their income on transportation. If Ulaanbaatar introduces a mass transit, the fare rate should be adjusted to reflect the new mode of transportation. Since urban public transport is an obligated service provided by the city government as well as bus operating companies subsidized by the municipality, a flexible incentive system, including a low-cost or free ride for certain groups of people, may be an option to attract riders to public transport and ease traffic congestion. It is necessary to determine the optimal ticket price in accordance with transport demand. Information on ridership could be collected regularly through ICT tools and analysed.
- Data on ridership, in particular OD data, is crucial for planning public transportation. To improve the quality of riders' data, it is recommended that riders who read the card before exit receive a promotional discount for the next ride and/or that riders who do not read the card before exit pay a higher fare. Currently, due to the free first transfer, only passengers who are changing buses touch their cards before exiting. Calculating the fare based on the distance is an additional option.
- A decline in fare income may also be associated with AFC if only cards are allowed. Because many riders pay drivers in cash, advanced AFS must be improved so that it can both collect cash and other payment types.
- There had not been any investment between 2009 and 2021. In 2022, the city began buying new buses, which will enhance public transport travel comfort. Buying new buses at a price over the market rate has drawn criticism from the general public. Therefore, external monitoring of the investment process and correct public disclosure of information are essential for evaluating the effectiveness of the government's efforts.
- Ulaanbaatar has become the most polluted capital city in the world and has one of the highest cancer incidence rates worldwide as a result of air pollution. Currently, 75 per cent of all vehicles are 10 years old or older, and 60 per cent burn gasoline, 33 per cent diesel, 5 per cent gas, and 3 per cent have either an electric or a dual engine. More incentives, such as easing vehicle import requirements and taxation, will help reduce the number of used automobiles.

4.5. WORKSHOP ON PLANNING FOR RESILIENT AND INCLUSIVE PUBLIC TRANSPORT SYSTEMS

National Workshop on Planning for Resilient and Inclusive Public Transport Systems in Ulaanbaatar, Mongolia

The National Workshop on Planning for Resilient and Inclusive Public Transport Systems in Ulaanbaatar, Mongolia, was organized by ESCAP and the Ministry of Road and Transport Development on 9 September 2022 in Ulaanbaatar. More than 30 people representing ministries and other government organizations, Ulaanbaatar Municipality, research centers, transport and urban transport entities, professional groups, academia, and the private sector attended the national workshop.

The workshop learned that the population of Ulaanbaatar had reached 1.6 million, and there were 650,000 automobiles in total. Since the average speed of traffic had dropped to 10 km/h, the city was experiencing an increase in traffic congestion. About 30 per cent of the city's trips were made by public transport and its improvement was one of the key strategies to ease traffic congestion. Several projects were being carried out in Ulaanbaatar to enhance public transport. A total of 1,100 new buses were expected to be purchased during the next three years. The city office with authority to develop urban public transport was considering the possibility of a Light Rail Transit system, and construction would start after detailed analysis.

Other urban transport challenges and the current state of road development in Ulaanbaatar were discussed. In particular, the workshop:

- Highlighted that the city needs to develop a comprehensive integrated urban and public transport plan, with mass transit system, facilities for non-motorized transport and recognizing

the contribution of informal transport and improve public transport services. Additional efforts by the city and Government of Mongolia were needed in planning, implementing, monitoring and making evidence-based decisions, and to develop short-, medium- and long-term strategies to improve public transport.

- Acknowledged the need for effective ways to manage urban transport demand, congestion and incentivize modal shift to public transport, cross-sectoral cooperation and coordination, to utilize emerging technology, adopt energy efficiency measures and shift to electric mobility.
- Expressed concerns related to rising urbanization and motorization rates and growing emissions and congestion in Ulaanbaatar. Discussed the importance of developing reliable, accessible, and quality mass transit system to attract commuters from cars and reduce congestion as well as emissions from transport.
- Stressed the need to engage various government agencies involved in urban transport, multi-sector stakeholders and as well as the private sector in the process of planning and development of mass transit system and their operation. Other sectors that would need to be engaged include energy, environment, finance, urban development, and labor.

More details about the national workshop are available on the workshop website at: https://www.unescap.org/events/2022/national-capacity-building-workshop-planning-resilient-and-inclusive-public-transport

5. CONCLUSIONS AND RECOMMENDATIONS

Drawing on a wide range of different studies and sources, the current report has outlined the various urban transport issues facing Ulaanbaatar. Ulaanbaatar has experienced explosive, uncontrolled urbanization during the past three decades, which has resulted in home and buildings being built without authorization or failing to adhere to the city's general development plan. Urban poverty and inequality have coexisted with a significant increase in wealth. The existing public transportation network consists of several different kinds of transit, including trolleybus and large-sized and articulated buses for public transportation services on the main road; large- and medium-sized buses for feeder roads; interstate large-sized buses; taxis, informal taxis and vans; and bicycle/pedestrian amenities. Future plans envisage the introduction of mass transit systems such as LRT, BRT, and Metro.

These public transportation vehicles must be integrated, as well as connected to the airport and train terminals. While mass transit systems are the most efficient and sustainable ways to move a large number of people across the city, they have different investment costs and effects on passenger movements, central and local government costs for public transportation providers, environmental and safety issues, and the spatial and economic development of urban areas. Although several studies on mass transit have been conducted, none of them have been implemented. It is therefore necessary to choose a mass transit system that is acceptable for Ulaanbaatar, and to develop a comprehensive strategy for implementing various sustainable urban transport policies.

Fortunately, Ulaanbaatar already has several major policy documents which set out the general directions for sustainable urban development. In particular, the Seventh General Development Plan of the Capital City Ulaanbaatar until 2040 (Urban Development Plan 2040) includes guidance on the development of a more sustainable urban transport system. The approval of the Urban Development Plan 2040 and its phased implementation is therefore vital. Moreover, the decisions taken under this plan should be in line with "VISION 2050", the Long-Term Development Policy of Mongolia.

The current chapter presents a set of general recommendations, followed by short-, medium- and long-term recommendations.

General Recommendations

Ulaanbaatar must transition from being a car-oriented city to one that is transit-oriented, giving environmentally friendly mass transit and active mobility priority over private passenger vehicles. The "Create Urban City with Equitable Access " objective stated in the draft Urban Development Plan 2040 can be accomplished by improving the public transport system based on the city's landscape and architecture.

At the same time, the capacity of the road network can be improved by enlarging and/or building the appropriate segments of the main routes and their intersections. Additionally, comprehensive actions can be taken to improve parking areas, cycling and pedestrian walkways, and other infrastructure including drainage system.

Develop spatial database for road network of the Capital City Ulaanbaatar, which will be the fundamental source for road and transport planning. Expand and upgrade the road system in the outlying areas and satellite cities.

In accordance with the Road Master Plan 2025/2035 and Urban Development Plan 2040, new developments should include a vast network of horizontal and vertical main and feeder roads, a new outer ring road connecting city sub-centers and significant intersections, and any necessary tunnels, bridges, and overpasses in high traffic areas. The road system in the outlying areas and satellite cities is also needed. Additionally, comprehensive actions can be taken to improve parking areas, cycling and pedestrian walkways, and other infrastructure including drainage system. The development of a spatial database for the road network is required, which will be the fundamental source for road and transport planning.

The Government and Municipal office in charge of creating and implementing ITS policies and e-strategies are urged to create and abide by action plans to identify responsible parties, set deadlines, and prioritize tasks according to Ulaanbaatar's particular circumstances. Ulaanbaatar has to design a master plan for ITS urban mobility that takes into account smart public transportation, traffic management and control system, law enforcement, traffic information, and a parking management system.

The technology changes to the Traffic Control Center as well as smart parking management execution need to be finished in order to maximize operational effectiveness, particularly during times of resource scarcity and greater public scrutiny of law enforcement action. It is crucial to develop human resource capability while keeping up with new technologies. The National Road Safety Program should implement national initiatives to reduce traffic-related death and injuries.

Legislation on restricting the import of automobiles older than 10 years and high greenhouse emission should be developed and applied. Investments are also required to upgrade/purchase bus fleet and construct/upgrade bus stations.

Finally, the mass transit implementation plan should be completed. As urban mobility is always changing with the use of new forms of transportation (such as non-motorized, law-carbon and electric transport etc.), government policies and planning of public transport must also be regularly revisited and changed. It is also vital to regularly conduct surveys on (i) travel demand; (i) public transport quality and reliability; and (iii) evaluating the needs and effectiveness of public transport operating companies.

Short-, medium- and long-term recommendations

Short-term:

- The Urban Development Plan 2040 and implementation measures for the city sub-centers must be approved and implemented in order to accelerate the shift from a mono-centered city to a multi-centered city. A comprehensive resettlement plan from *ger* areas also needs to be developed and approved.
- The Medium and Long-Term Master Plan for Road Network Development of the Capital City (Road Master Plan 2025/2030), and its implementation plans and measures, should be approved. The implementation process must be continuously monitored in order to increase and improve the road and street network, parking lots, overpasses, bridges, tunnels, and cycling and pedestrian paths.
- In order to improve accessibility of urban areas, it is necessary to design the Sustainable Urban Mobility Strategy Plan which considers the demands of the "functional city" and its surroundings rather than simply focusing on a municipal administrative zone.
- Collaboration with the Ministry and Ulaanbaatar City, as well as urban transport stakeholders and operators, including the private sector, is required. Workshops/seminars with the participation of stakeholders to disseminate ongoing plans, proposals and studies on improving public transport could facilitate interactions among them.
- A plan to upgrade/modernize the intelligent public transport system with cutting-edge innovative technologies of BMS, AFC, and BIS should be developed.
- Utilize the existing data produced by the traffic control and management center to study and evaluate the state of public transport, including using the SUTI tool, and set priorities for activities to strengthen poor performance indicators and increase the system's overall sustainability.

Medium-term:

- The Urban Development Plan 2040 should continue to be implemented, particularly the urban road, transport, and logistics development sections, as well as the Road Master Plan 2025/2035.
- In order to increase the space for green structures, pedestrian walkways, and bikeways, create sustainable public areas, develop smart parking lots, and improve access to buildings, spatial planning should be revised and carried out in the necessary areas of the city, particularly in the central part of the city.
- Plans to help the road asset management system measure the performance of the road network and transport system should be developed, including personnel training, new ways of thinking about management at all levels, and increased public involvement, among other things.
- Finalize the implementation of the Development Plan 2040's sections on urban road, transport, and logistics development, as well as the Road Master Plan 2025/2035's specific decision-making and investment sites.
- The road system is primarily held by the government and is one of the greatest public assets. Governments should ensure that the management of the road network is more effective and accountable. Additionally, governments should provide tools to enable a more structured and adaptable approach to decision-making in order to meet the expectations of the public.
- The first phase of mass transit development should be constructed. However, the following issues need to be taken into account when discussing these plans:
    - The need to maintain a smooth and seamless urban transport service necessitates the integration of plans and policies due to the transport industry's multi-sectoral nature (modes, operations, priorities, organizations, etc.).
    - Since multiple government levels oversee different agencies, they must coordinate their efforts to ensure consistency between policies at different levels of decision-making and in different sectors.
    - A physical interface between modes, operational integration and resilience between modes, service integration and resilience (common fare, ticketing system, etc.) are the prerequisites for the creation of an integrated and resilient transport system.
- More electric vehicle charging stations should be built, and more environmentally friendly electric and/or emission-free buses are needed.
- Develop public transport which is accessible to (i) passengers with special needs, such as those who are physically, visually, or audibly impaired, as well as those with temporary disabilities, the elderly, children, and other people in vulnerable situations.

Long-term:

- A sustainable urban mobility plan should be developed in line with the achievement of sustainable development goals, specifically SDG 11 “Make cities and human settlements inclusive, safe, resilient and sustainable.”
- Ulaanbaatar should continue to incorporate mobility, transport infrastructure, urban development, and environmental safety into its plans, through unifying the planning and provision of various parts of the transport system across modes, industries, operators, and institutions.
- Strategic plans for new centers, sub-centers, satellite cities, and remote districts/towns should be developed in order to decentralize the city.
- Consistent and comprehensive efforts are needed for organizing and coordinating the implementation of laws, policies, programs, and projects in the field of infrastructure including roads and transportation.
- In the context of aging population, the provision of accessible and affordable transport should become part of the planning for the mobility of older people.

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