

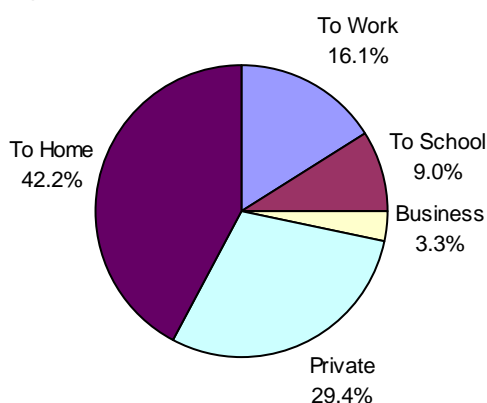
6. URBAN TRANSPORTATION SYSTEM

6.1 Worsening Traffic Conditions

1) Overview of Traffic Behavior in Ulaanbaatar City

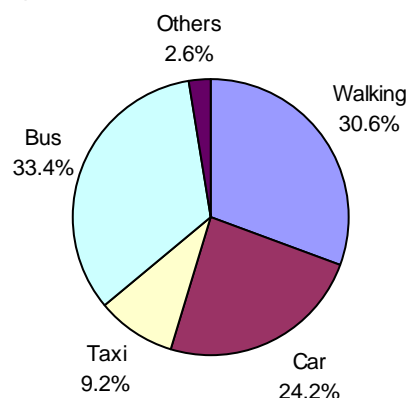
Current transportation demand in Ulaanbaatar City is estimated to be 3.4 million trips/day including walking. The demand is composed of walking (30.6%), car (24.2%), taxi (9.2%), bus (33.4%), and others (2.6%) (see Figures 6.1 and 6.2).

Figure 6.1 Travel Demand by Purpose



Source: JICA Study Team

Figure 6.2 Travel Demand by Mode



Source: JICA Study Team

When walking is excluded, the total demand is 2.3 million trips/day, comprising 34.8% for car, 13.3% for taxi, 48.1% for bus, and 3.8% for other vehicles, as shown in Table 6.1.

Table 6.1 Transportation Demand by Mode and Purpose

Mode	To Work	To School	Business	Private	To Home	Trips (000/day)	Total (%)	Excluding Walking (%)
Walking	15.7	41.9	14.3	36.0	31.3	1,031	30.6	-
Car	31.7	9.6	41.1	26.5	21.5	816	24.2	34.8
Taxi	10.1	5.0	10.7	9.0	9.8	311	9.2	13.3
Bus	38.9	42.9	22.3	26.2	35.2	1,127	33.4	48.1
Others	3.9	0.6	11.6	2.3	2.1	88	2.6	3.8
Total	100.0	100.0	100.0	100.0	100.0	3,373	100.0	-

Source: JICA Study Team.

Meanwhile, road traffic has constantly increased along with population growth and increase in vehicle numbers. During the period 1998 to 2007, traffic volume in the city center doubled. Travel speeds of cars decreased from about 40km/h to 25–30km/h on main roads between 2001 and 2007. In 2007, the number of registered vehicles in the city was only about 92,700 which is still low, but it increased by 11.6% between 2001 and 2007.

The transportation sector in Ulaanbaatar City is confronted with various problems and concerns. Although current mobility and accessibility may still be tolerable to most people in the city, the situation will quickly worsen if urban population further increases, urban areas expand, and transportation demand intensifies without a corresponding provision of infrastructure and services. The city's main problems and concerns on the current traffic/transportation situation are as follows:

- Increasing traffic congestion;
- Decreasing level of safety and amenity of road transportation;
- Unsatisfactory level of public transportation;
- Low awareness of road users;
- Lack of traffic management capacity; and
- Deficient road transportation infrastructure/ facilities.

The causes of these problems are complex and interrelated, requiring both short-term and long-term attention, as well as an integrated approach covering infrastructure management and user awareness; transportation and land use; and economic, social, and environmental aspects, among others.

2) Analysis of Urban Transportation Situation

Overall transportation demand in Ulaanbaatar City is estimated to be 3.4 million trips a day including walking or 2.3 million trips a day excluding walking. This “trip rate” or number of trips made by a person per day is 3.9 including walking or 2.7 excluding walking. Trip rates in the city are relatively high compared to other cities in Asia.⁵ Although the reasons for the high trip rates of Ulaanbaatar residents cannot be determined precisely, it may be attributed partly to social factors and partly to the fact that the land-use pattern and community structure require more trips to access necessary services.

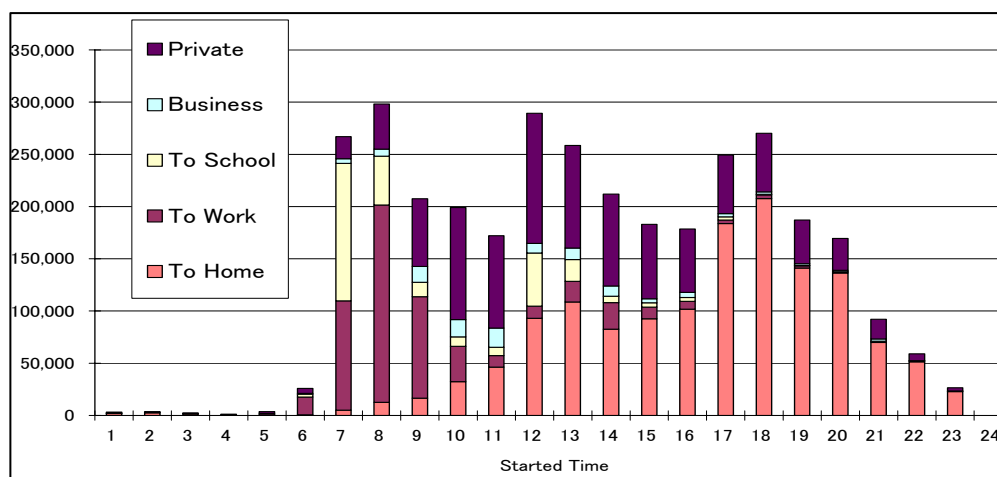
The main characteristics with regard to the choice of transportation modes are as follows:

- a) Dependence on cars is high among households with a car (49%), while low among those without one (11%). However, those without a car still use it to travel (32%);
- b) The use of public transportation is high among all households. Those without a vehicle show the highest (52%), while even those with a car have a relatively high share (27%). The use of bicycles, motorcycles, and private buses, such as company

⁵ The trip rates of Ho Chi Minh City (Vietnam), Manila (Philippines), and Chengdu (China) are 3.0, 2.2 and 2.6 including walking and 2.5, 1.8 and 1.8 excluding walking, respectively.

- or school buses, is not popular. Taxis are commonly used by all households.
- c) The choice of transportation modes varies by travel purpose. For “to work” purpose, bus (38.9%) and car (31.7%) are mainly used, while for “to school” trips, bus (42.9%) and walking (4.5%), for “business” purpose, car (41.1%), for “private” purpose, walking (36.0%), car (26.5%) and bus (26.2%) are mainly used.
 - d) There are peak travel periods, i.e. 7-8 a.m., 12 noon-1 p.m., and 5-6 p.m., as shown in Figure 6.3.

Figure 6.3 Hourly Distribution of Travel Demand



Note: Number of trips by time started and purpose.
Source: JICA Study Team

While travel speeds on roads, queue length at intersections, and volume-capacity ratio at road links are common indicators in urban transportation planning, the study also analyzed “average travel time of a trip” as an indicator of accessibility in the city regardless of the quantity and quality of infrastructure services. Results show that average distance of and time spent on a trip from an origin to a destination in the city are 29 minutes and 3.9km, respectively (see Table 6.2).

Table 6.2 Accessibility of Urban Transportation in Ulaanbaatar City

Trip purpose	Time (min)	Distance (km)
To work	32	4.5
To school	27	3.3
Business	32	4.3
Private	26	3.6
To home	30	4.0
Total	29	3.9

Mode	Time (min)	Distance (km)
Walking	14	1.3
Car	28	4.9
Minibus	39	5.4
Standard bus	43	5.4
Taxi	27	3.4
Total	29	3.9

Source: Household Interview Survey, 2007, JICA Study Team

While traffic congestion is a common problem in most of the world's medium to large cities, although the situation and causes often differ, there are still no universal indicators to aid a common understanding by all of what constitutes traffic congestion. However, the JICA Study Team's analysis of traffic congestion in Ulaanbaatar has resulted in the following observations:

- In general, the level of traffic congestion in the city is not so serious based on a number of indicators, such as average travel speeds of vehicles on major roads (20–30 km/h), average travel time of “to work” trips (about 30 minutes), and a comparison with other cities in Asia as observed by the JICA Study Team;
- Traffic congestion is limited to certain sections during peak hours (morning, lunch time, and evening) and do not last long.
- Traffic congestion is largely due to three (3) major factors, namely: 1) **poor behavior of road users**, including drivers and pedestrians, who often do not observe traffic rules, 2) **poor traffic control and management** by enforcers, 3) **inefficient use of available engineering measures at intersections** to manage traffic lanes, etc.

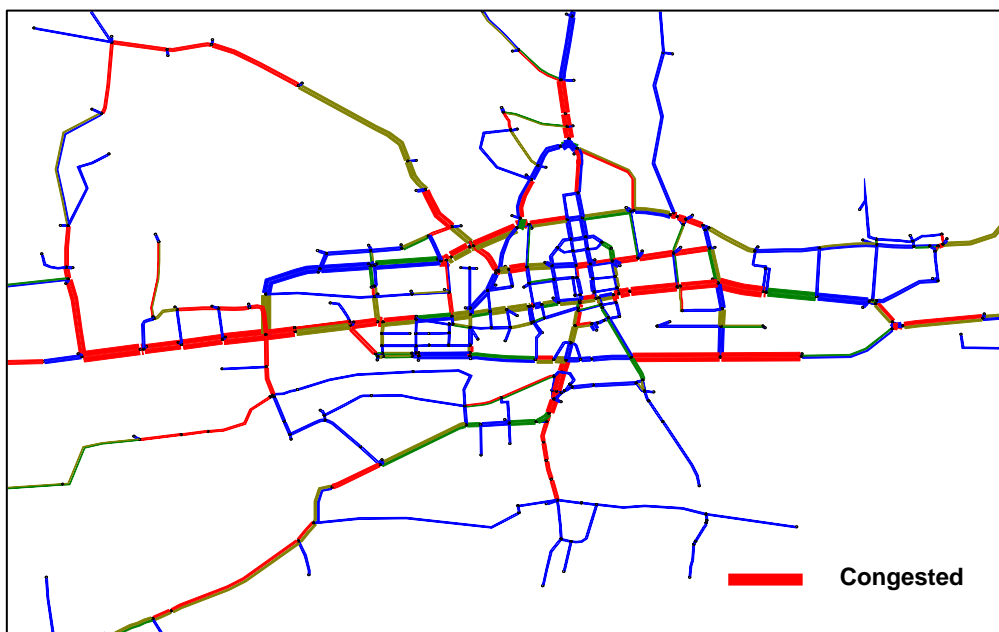
An analysis based on STRADA was conducted in the study indicating that the capacity of existing roads is underutilized and that it could be increased by as much as 20% by merely implementing the traffic management measures mentioned above without putting in substantial funding. Therefore, if the city can formulate an effective mechanism based on this, costly infrastructure investments in the future can be avoided and higher economic returns can be generated (see Figures 6.4 and 6.5).

**Figure 6.4 Assumed Daily Traffic Congestion on Existing Road Network in 2007
(Full Link Capacity)**



Source: JICA Study Team

**Figure 6.5 Assumed Daily Traffic Congestion on Existing Road Network in
2007 (80% of Link Capacity)**



Source: JICA Study Team

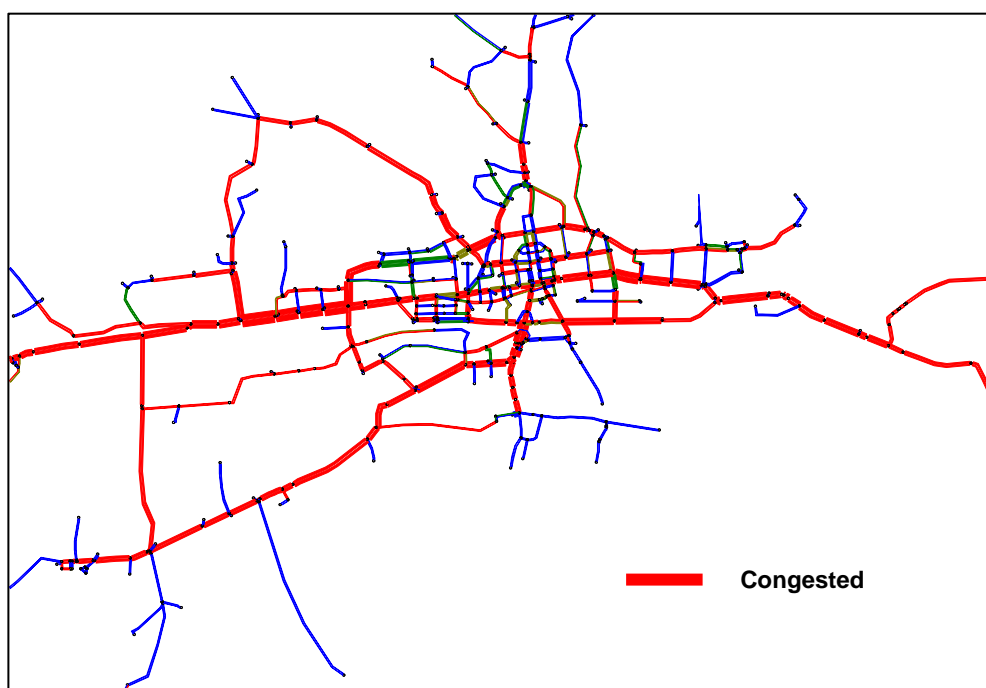
6.2 Prospects of Traffic Congestion

1) Traffic Simulation on Do-nothing Scenario

The real threat of traffic congestion in the city will occur in the future and this may require fundamental policy interventions rather than short-term measures and symptomatic treatment. The combined impact of population growth, urban area expansion, and increased car ownership rates in the city is anticipated to be enormous. By 2030, the population is expected to double, urban areas to expand, and car ownership rates to increase from 20% of households to about 60%. The latter alone indicates that the number of cars will have increased six (6) times the current level.

An analysis of a “Do-nothing” Scenario by 2030, based on the STRADA⁶ model also clearly indicates that traffic congestion will occur everywhere, as seen in Figure 6.5, unless strategic measures are implemented before then.

Figure 6.6 Traffic Congestion by 2030 under a Do-nothing Scenario



Source: JICA Study Team.

Mitigating, if not removing, future traffic congestion in the city will be a big challenge and will require much more comprehensive and strategic interventions than relatively simple measures which are only effective in improving the current situation. The basic factors which affect traffic and congestion include the following:

⁶ The JICA Study Team simulated the future traffic situation on roads under different scenarios using the STRADA model. The Do-nothing Scenario, meaning no projects are implemented, shows the traffic situation when future demand is assigned onto the existing road network.

- Urban structure and land-use pattern, specifically the size of the urban area as well as the density of population and activities;
- Modal policy on public and private transportation, specifically the provision of mass transit system and management of car use; and
- Provision and management of transportation infrastructure, specifically road network development, traffic management measures, as well as provision of parking and other transportation facilities.

2) Comparison of Do-nothing (trend) and Compact City Scenarios

Toward 2030, a critical planning issue must be how to manage the city's growth along with improving people's mobility. As explained in Section 6.4, the following two scenarios of growth pattern, the Trend Scenario and the Compact City Scenario, were compared in terms of people's mobility. Results of the analysis are as follows (see Table 6.3):

- Although the total number of trips/day will only double between 2007 and 2030, passenger-kilometers will increase by **3.3 times** under the Trend Scenario and **2.7 times** under the Compact City Scenario;
- The average trip length of private transportation will increase between 2007 and 2030 from 5km to **7.2km** under the Trend Scenario and only **5.9km** under the Compact City Scenario due to prolonged trips as a result of urban area expansion; and
- The reason the average trip length of public transportation will not increase is attributed to the assumption that mass transit routes have been developed thereby improving connectivity in the urban areas, especially under the Compact City Scenario wherein future urban development is closely integrated with the development of mass transit lines.

An explicit conclusion from this simple analysis is that the development of a compact city with an effective mass transit system can contribute greatly to the reduction in traffic congestion and savings in infrastructure provision.

Table 6.3 Impact Analysis of Urban Growth on Transportation by Scenario

		2007	2030 Scenario	
			Trend	Compact City
No. of trips		1.0	2.0	2.0
Passenger-km		1.0	3.3	2.7
Average Trip Length (km)	Private transportation	5.0	7.2	5.9
	Public transportation	4.9	6.0	5.0

Source: JICA Study Team

6.3 Urban Transportation Network Development

1) Objectives and Strategies for Transportation Development

While Ulaanbaatar's development is directed at realizing compact, efficient, and environment-friendly urban areas by managing its growth and land use through an improved planning and institutional framework and sector management capacity, leveraging urban growth and formation on transportation must be exercised by interfacing planning and development between urban and transportation sectors to create more synergy. For this purpose, seven (7) strategies are recommended, as follows:

- **Strategy 1 - Establish competitive public transportation system to promote public-transportation-based urban development:** Worldwide experiences clearly indicate that large urban areas, like the future Ulaanbaatar City with a population of more or less two million, can not be sustained without structuring them with a public transportation orientation, which is the only way to ensure adequate mobility and equitable accessibility to work and essential services for all in the future. Increasing requirements for better environment and energy saving also support the promotion of public-transportation-driven urban development.
- **Strategy 2 - Manage car use effectively:** How to use cars in future Ulaanbaatar has to be discussed. While restraint on car use is a common trend in many cities in the world, Ulaanbaatar should establish its own way of managing car use. It is the JICA Study Team's view that the city should provide opportunities for using cars and other private vehicles especially during weekends and off-peak hours to take advantage of the city's natural environment; its green and open spaces can provide rich recreational opportunities to residents and visitors alike. On the other hand, during peak hours and in the city center where demand concentrates, private cars should be strictly controlled and the people encouraged to use public transportation instead.
- **Strategy 3 - Develop and maintain high-quality transportation infrastructure especially roads:** Roads provide the most fundamental space for urban transportation services both for vehicular and pedestrian traffic. Their quality directly affects the economy, safety, and comfort of the traveling public and the operation of service providers. Although Ulaanbaatar's extreme climate conditions prevent the government from spending on the construction and maintenance of high-quality infrastructure, it is this very same reason why the government should invest more in it in order to provide better transportation services and productive environment for a growing economy.
- **Strategy 4 - Develop effective interface between regional and urban transportation, including road, rail, and air transportation:** As Ulaanbaatar is the capital and international gateway of the country, international and regional transportation is concentrated in the city. Since urban traffic by its very nature is vastly different from regional traffic, their interface in urban areas must be carefully designed to avoid highly damaging socio-economic and environmental impacts, chief among them is traffic congestion. It is thus advisable to, for example, carefully align the function of the Mongolian railway and the Asian Highway No. 3 with that of urban transportation in

order to achieve smooth interface and synergy.

- **Stage 5 - Enhance transportation environment and disaster preparedness:** The transportation sector is expected to become a major contributor to future air quality as vehicular traffic increases and the pollution from ger housing areas and that from power plants are eliminated. The sector must also improve the transportation environment for pedestrians and the physically challenged, while at the same time attending to various environmental issues such as flood protection and urban landscape enhancement.
- **Strategy 6 - Provide adequate institutional arrangements to support improved urban transportation development and management:** Urban transportation development requires strong financial, social, and institutional backing. To support the funding requirements for capital and recurrent investments, a more active involvement of the private sector as well as the imposition of user charges need to be promoted. In addition, communities and stakeholders must participate in the process of planning and project development. Moreover, effective and efficient development and use of transportation infrastructure and system require a pool of qualified human resources and a capable organization, as well as modern planning and management tools.
- **Strategy 7 - Promote social awareness of urban transportation problems and issues:** As it was clearly shown in preceding discussions, the current traffic situation and problems can largely be attributed to low awareness and understanding among the people of traffic rules and regulations as well as the consequences of not following them. The society as a whole must thus be engaged in order to promote an efficient and pleasant transportation environment in the city.

The above strategies are further elaborated into a number of planning directions as shown in Table 6.4.

Table 6.4 Basic Strategies for Urban Transportation Development

Strategy	Planning Direction
1. Establish competitive public transportation system to promote public-transportation-based urban development	<ul style="list-style-type: none"> • Establish a hierarchical public transportation system comprising LRT/BRT as the core system and where buses, minibuses, and taxis are effectively integrated. • Integrate mass transit system (LRT/BRT) with urban development at and around terminals/stations as well as in its influence areas. • Practice strategic implementation methods for improved cost recovery and in resettlement planning through phased development, land readjustment, urban renewal, among others.
2. Manage use of car effectively	<ul style="list-style-type: none"> • Improve roadworthiness and emissions of vehicles through improved vehicle registration/inspection as well as pricing on vehicle ownership. • Control use of cars to avoid congestion through pricing for parking and traffic control, especially in the city center and congested locations. • Provide adequate space/facilities for cars and vehicles in strategic locations.
3. Develop and maintain high-quality transportation infrastructure, especially roads	<ul style="list-style-type: none"> • Immediately improve road maintenance and rehabilitate existing network, including removal of bottlenecks and construction of missing links. • Strengthen the hierarchy of road network comprising primary, secondary, and tertiary roads. • Develop/improve community roads.
4. Develop effective interface between regional and urban transportation	<ul style="list-style-type: none"> • Integrate inter-city and urban transportation network and services as well as intermodal functions among road, rail, and air transportation but segregate inter-city and urban traffic in urban areas. • Develop/relocate inter-city goods distribution/logistics facilities in/to strategic locations of the above integrated transportation system.
5. Enhance transportation environment and disaster preparedness	<ul style="list-style-type: none"> • Improve road space and facilities to provide safe, pleasant, and barrier-free environment for pedestrians, including the physically challenged and non-motorized transportation. • Enhance traffic safety for all road users throughout the year by way of expanding education and campaign on traffic safety, strengthening enforcement, and improving safety facilities/equipment. • Develop roads in integration with preventing disasters such as flood.
6. Provide adequate institutional arrangements to support improved urban transportation development and management	<ul style="list-style-type: none"> • Establish improved mechanism to better develop roads including land acquisition, while minimizing negative impacts such as involuntary resettlement and excessively high compensation costs. • Develop sustainable funding mechanism for roads development and maintenance, including increase in road user charges, among others. • Strengthen capacities in transportation planning and management through expanded trainings and improvement of related universities.
7. Promote social awareness on urban transportation problems and issues	<ul style="list-style-type: none"> • Develop practical rules and regulations. • Expand traffic education and campaigns on transportation problems and issues. • Develop indicators and monitoring system on urban transportation problems.

Source: JICA Study Team

2) Overall Urban Transportation Network

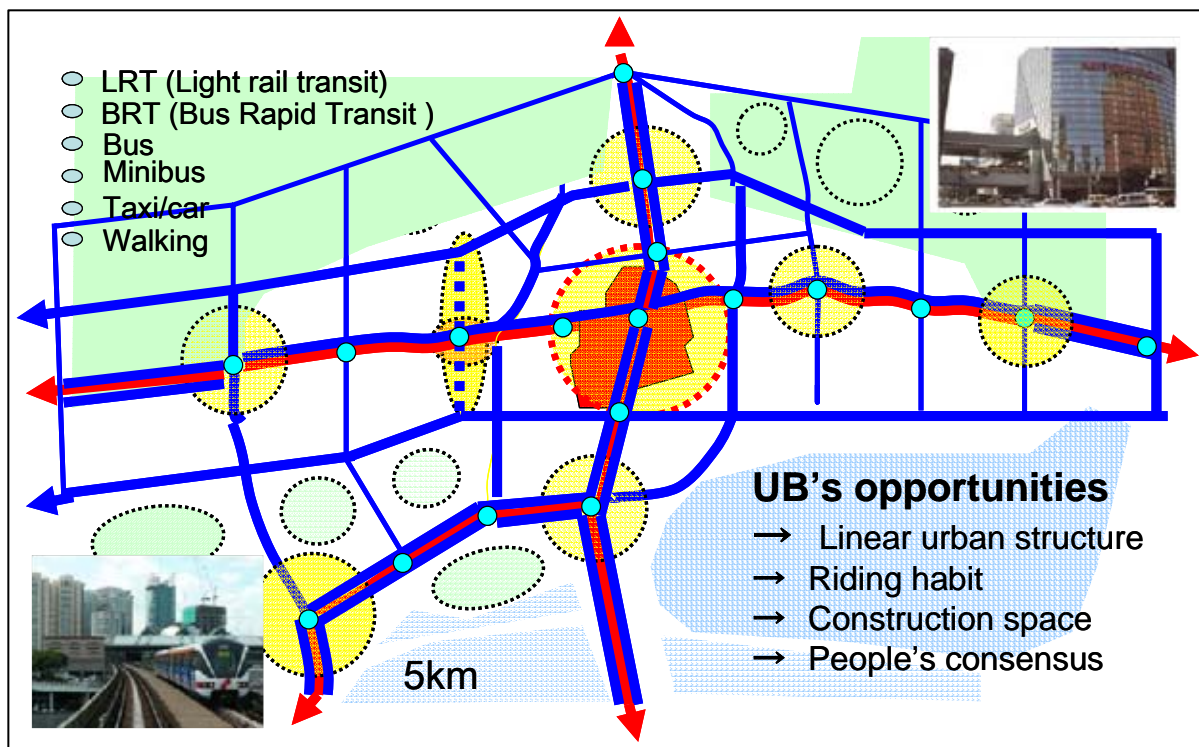
The future transportation network of the city must be planned in such a way that it will not only enhance people's mobility, but also provide a foundation for the sustainable growth of the urban economy and ensure environmental sustainability. The proposed transportation network was thus prepared based on the following concepts and these concepts are illustrated on Figure 6.6:

- Development of the **east-west and north-southwest mass transit corridors** integrated with medium- to high-density mixed-use urban development. Candidate types of mass transit system include light rail transit (LRT) and bus rapid transit (BRT) depending on demand and further technical study;
- Development of the **east-west transportation corridors** comprising an east-west mass transit corridor (Peace Avenue) and two major east-west roads running parallel in the north (Naraizam Street and its extensions) together with a number of north-south connectors to form a strong ladder-type core transportation system. As the two parallel roads are located at only about a kilometer from the mass transit corridor, those residing or working in the vicinity can reach a mass transit station within 15 minutes of walking; and
- Development of a **ring road** covering the CBD and the strict implementation of traffic management measures such as area licensing scheme (congestion pricing) for the CBD. Together with the provision of modern mass transit services, the traffic situation in the CBD is expected to dramatically improve.

The proposed network plan also includes new types of urban road such as **urban expressways** and **buffer roads**. The urban expressway, which will be located along the existing Mongolian railway right of way⁷, intends to further improve vehicular traffic in the city. It will be a toll road and a self-financing project. On the other hand, buffer roads will be constructed to protect main urban areas from flashfloods caused by the fragile natural conditions, as shown in Figure 6.7.

⁷ The right of way of the Mongolian Railway is so wide that it can accommodate an expressway.

Figure 6.7 Concept of the Future Transportation Network



Source: JICA Study Team

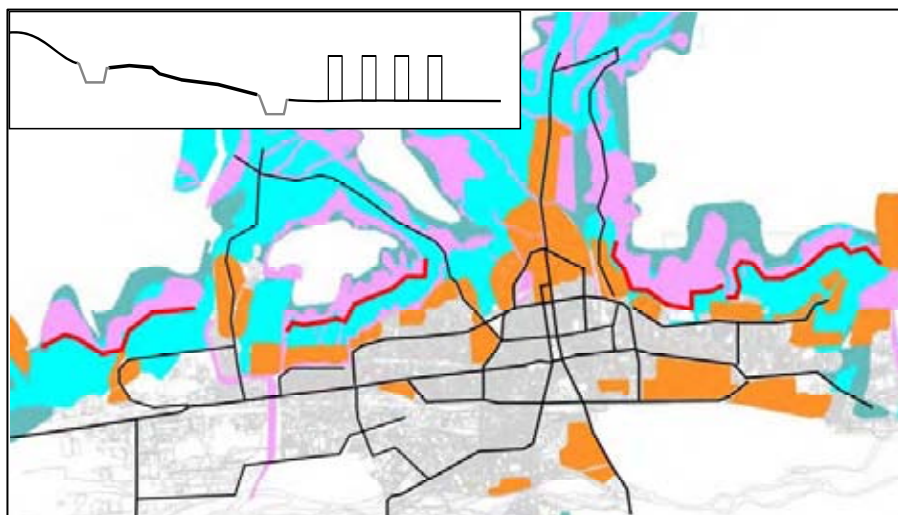
Figure 6.8 Proposed Road Types

Urban Expressway



Source: JICA Study Team

Buffer Roads (Disaster Prevention Road)



3) Public Transportation System

(1) Current Situation

Public transportation demand in the city is large. At present, buses carry **435,000 passengers a day** on average, excluding free riding passengers such as the elderly, physically challenged, soldiers, and policemen who are exempted from paying the bus fare. Students who use season tickets are also excluded in the count. On the other hand, the estimated figure from the Household Interview Survey (HIS) carried out by the JICA Study Team in 2007 indicates that about **1.1 million daily passengers** use buses. The minibus, large bus, and trolley bus together account for 35% of the total demand including walking or 48% of the total demand excluding walking.⁸

Bus service is provided by three (3) state-owned operators, nine (9) cooperatives, and 38 private operators which own a total of 1,725 units, of which 623 are large buses and 1,102 are minibuses. The characteristics of bus operation in the city are summarized as follows:

- The route structure needs improvement together with a clearer functional split between large buses and minibuses;
- Most buses are so old that roadworthiness is low. Only 77% of large buses and 41% of minibuses are currently in use;
- The load factor of large buses is low, compared to that of minibuses. Route structure and allocation of bus units need to be designed in a way that differences in load factor are narrowed;
- The operation of large buses is highly subsidized under the current fare level of 200Tg./trip. About 62% of the total revenue comes from subsidy. Meanwhile, minibus operation is almost free from subsidy, as seen in Table 6.5. This sharp contrast suggests there are opportunities to improve bus transportation services in the city.

Table 6.5 Bus Performance Indicators in Ulaanbaatar City, 2007

Bus Type	No. of Routes	No. of Bus Units	Average/Bus/Day			Revenue/Bus/Day (000 tug)		
			No. of Trips	Km. Run	No. of Passenger	Fare	Subsidy	Total
Large	47	483	15	192	357	68 (37.8)	112 (62.2)	180 (100%)
Minibus	34	446	16	219	151	42 (94.2)	3 (5.8)	45 (100%)
Total	81	929	15	203	258	-	-	-

Source: Transport Department, Ulaanbaatar City

⁸ Total transportation demand in the city is 3.4 million a day including 1 million (31% of the total) walking trips.

(2) People's Expectation on Public Transportation Improvement

People's expectation on public transportation improvement is remarkably high. The types of public transportation modes which people desire in the future include standard bus (28.8%), underground rail (24%), elevated rail (13%), rapid bus (12%), and others, according to HIS results.

(3) Opportunities for Mass Transit Development in Ulaanbaatar City

Since Ulaanbaatar is relatively small and the income level is low, it would be costly to develop a rail-based mass transit system, especially one with an underground arrangement, judging from the experiences of other Asian cities. At the same time, however, there are a number of factors favoring such a project for Ulaanbaatar City, as follows:

- **Fitting Urban Structure:** The linear form of the city's main urban area, wherein business and commercial activities concentrate along Peace Avenue, enables it to become a catchment area for a mass transit line. With good feeder/ access transportation services, one line can cover most of the main urban area⁹ which is sandwiched by Ard Ayush Avenue on the north and Naryn Zam on the south, both running parallel to Peace Avenue. This area can be within walking distances to a mass transit station, if ever one is developed.
- **Good Public Transportation Ridership:** At present 48% of the total demand for motorized urban transportation is met by buses; the figure increases to 61% if taxis are included. The high rate of public transportation demand is the potential main market for a modern mass transit system. If the system is attractive enough, it can also encourage car users to shift.
- **Availability of Construction Space:** In many cities, finding good construction space with minimal land acquisition and relocation of buildings/ facilities has always been a costly and problematic issue. However, in Ulaanbaatar City, the right of way for a mass transit system along Peace Avenue is already available due to its wide road space including the median and sidewalks.
- **Consensus of the People:** As is explicitly seen from the results of the HIS, the people expect much improvement in public transportation services through the introduction of a mass rapid transit system, such as an LRT/ MRT.

A preliminary study was thus carried out on the possible location of the LRT/MRT, and two (2) lines are proposed as follows (see Figure 6.8):

- **Line 1 (Red Line):** Line 1 will be constructed in an east-west direction along Peace Avenue. It will have a total length of **26.6km** including a **5.0km** underground section in the CBD and the remaining length as at-grade or elevated sections. A total of **17 stations** are needed to be located, and
- **Line 2 (Blue Line):** Line 2 will be constructed in a north-south direction in the urban area and farther to connect to the airport. It will have a total length of **20.6km** including

⁹ The area has about 44% of the population.

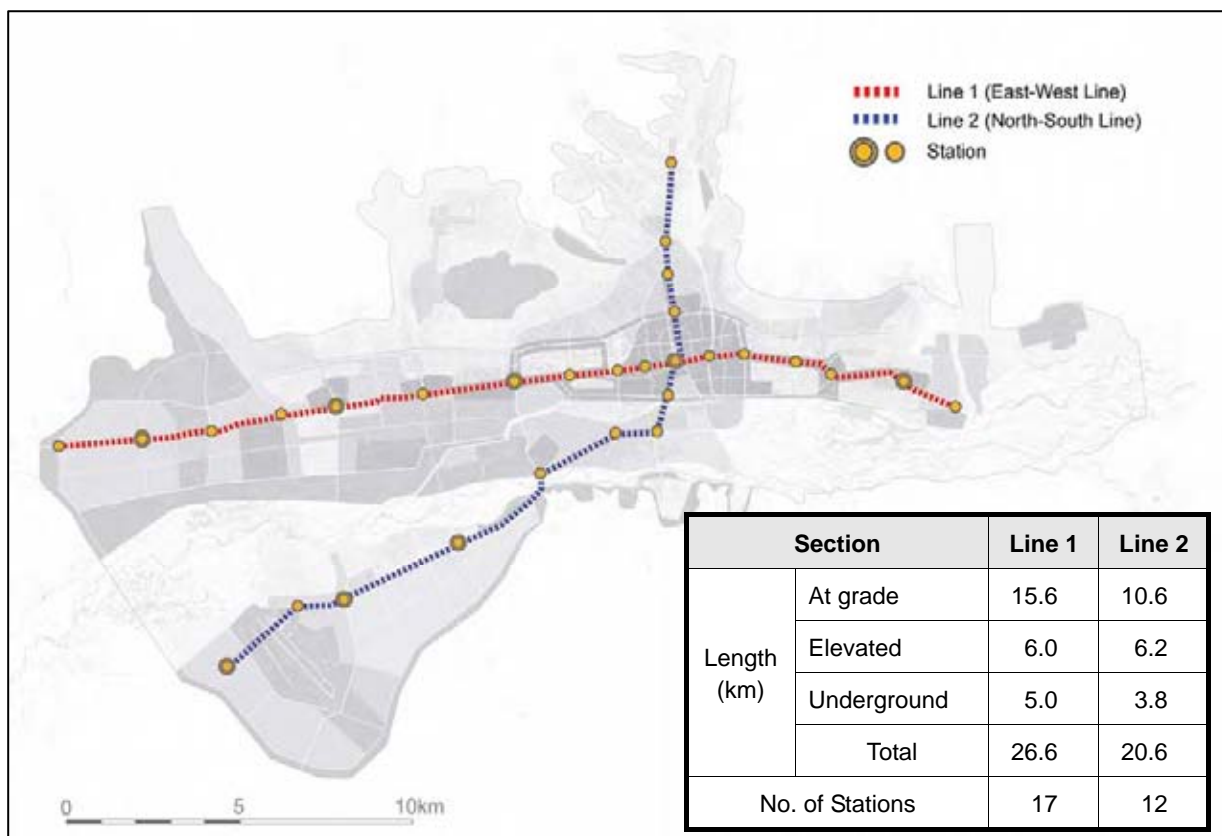
a **3.8km** underground section intersecting Line 1. A total of **12 stations** are planned, including the central station, which is the interchange to/from Line 1.

It is expected that further technical and developmental studies will be made on these two (2) lines. The initial findings on the viability of an LRT system are briefly explained below.

- There are no serious technical constraints in construction, engineering, and operation of the system;
- Future demand is affected by a number of factors including fare level, competition and complementation with bus services, as well as traffic congestion on mass transit corridors, among others. Fare is particularly crucial in terms of ridership and fare revenue. As is seen in Figure 6.10, if Line 1 is free, it is estimated that demand will reach 700,000 a day by 2030; demand will shrink to less than 100,000 when the fare is 500 Tg. or higher.¹⁰ The revenue-maximizing fare level is about 300 Tg. which will attract about 300,000 passengers a day;
- Line 1 will attract more passengers than Line 2, even if all proposed urban development projects are realized by 2030. Line 2 is estimated to have a ridership of roughly 65% that of Line 1;
- In order to enhance the effects of the LRT services, there is a need to undertake associated improvements such as:
 - (a) Restructuring bus/minibus routes to enhance the overall public transportation network;
 - (b) Improving connectivity between LRT and other modes including BRT, bus, minibus, taxi, car, and walking;
 - (c) Establishing an equitable fare policy and efficient collection system (giving due consideration to affordability, use of smart cards, etc.); and
 - (d) Effectively controlling traffic and managing cars and other vehicles along the LRT corridor.
- Considering the high investment needed for the mass transit system, the study will further carry out the following:
 - (a) Survey of the areas along the proposed two (2) main LRT corridors (in terms of land use, main facilities, available space, related roads, etc.);
 - (b) Demand analysis and forecast;
 - (c) Selection of adequate mode/systems;
 - (d) Determination of opportunities for integrated urban development;
 - (e) Preliminary economic and financial evaluation;
 - (f) Environmental impact analysis; and
 - (g) Formulation of development strategies and investment program.

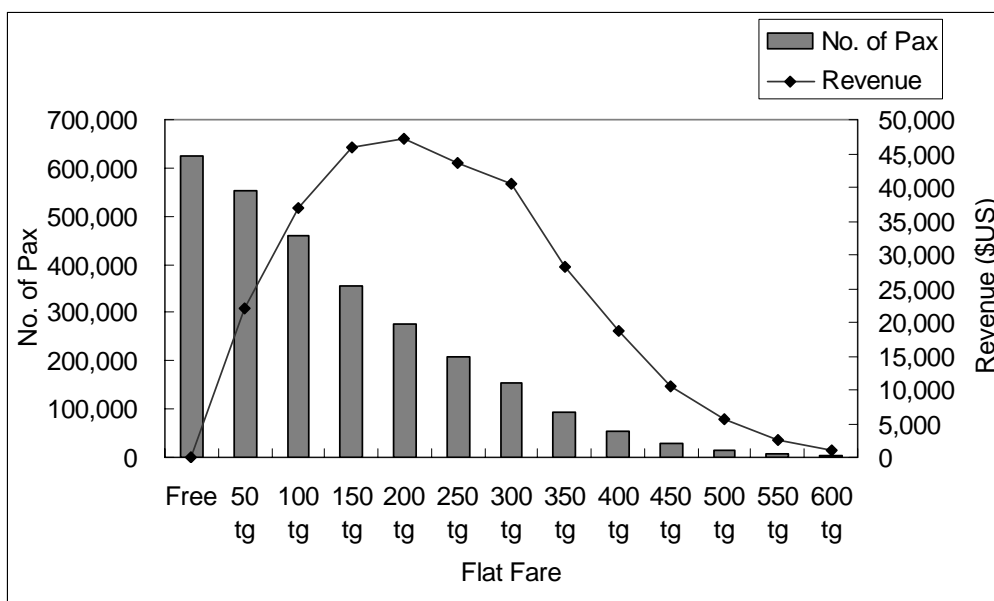
¹⁰ This analysis is still tentative but can provide a basis for discussion on the relationship between fare and ridership.

Figure 6.9 Preliminary Mass Transit Location Plan



Source: JICA Study Team

Figure 6.10 Preliminary Estimate of Line 1 Ridership and Most Efficient Operation



Source: JICA Study Team

4) Road Development

(1) Current Situation

In 2007, Ulaanbaatar City had a total of 439km of roads including 55km of state roads, 203km of city roads, 104km of district/special roads, and 78km of roads to satellite town/villages. In addition, there were about 100km of roads in residential areas and earth roads. Between 2000 and 2006, the road length increased by only 21km, as shown in Table 6.6.

Table 6.6 Road Length by Classification

(km)

Classification	2000	2006
State Road	76.5	54.5
City Road	168.8	202.7
District and Special Road	94.9	104.0
Road to Satellite Towns and Villages	78.0	78.0
Residential Area Road	(67.3)	(67.3)
Earth Road	(35.5)	(35.5)
Total Length	418.2	439.1

Source: JICA Study Team based on data from the MRTT and Ulaanbaatar City

Road development varies by area but faces a number of common problems which are briefly as follows:

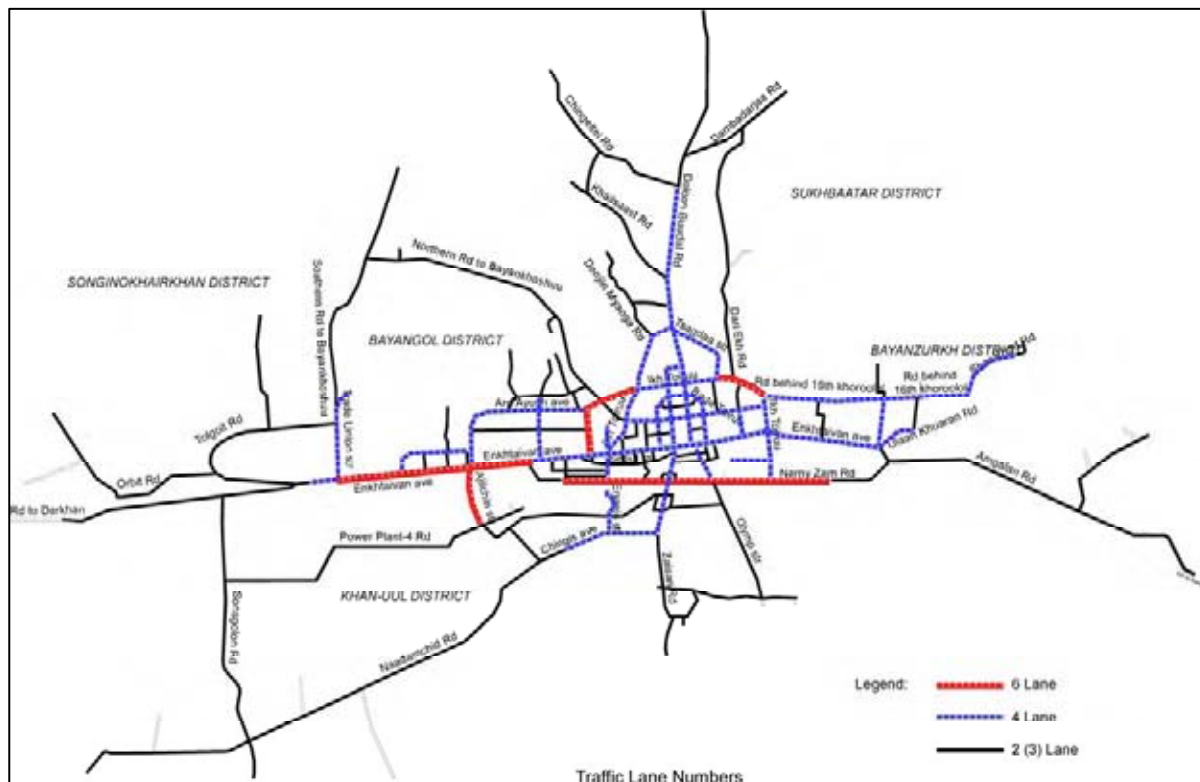
- Although the basic arterial structure exists, especially in the city center which is provided with a well-articulated network with wide space and basic facilities, the quality of pavements and facilities is substandard, and missing links/ bottlenecks exist;
- Roads in suburban areas are poorly developed in terms of network connectivity, pavement quality, design standards, and facilities, including sidewalks and various traffic management facilities; and
- Commune roads both in the city center and elsewhere are not satisfactory; vis-à-vis the main roads and within areas/ blocks, they lack the appropriate configuration and proper facilities, such as smooth sidewalk, street lights, and parking space. Roads and facilities are also not adequately maintained.

In the long term, the strategy taken to develop roads and road transportation services will determine the urban structure. Therefore, the following strategies need to be duly taken into account:

- Develop roads as an integrated/ coordinated network with clear hierarchy and connectivity as well as adequate spacing;
- Improve the quality of road construction and maintenance to ensure smooth and safe travel and to help reduce vehicle operating cost and traffic accidents; and

- Provide adequate traffic management facilities and measures, including traffic signals, flyovers, pedestrian and safety facilities, parking, public transportation facilities, street/traffic lights, among others.

Figure 6.11 Road Network in Ulaanbaatar City by Number of Lanes



Source: JICA Study Team

(2) Road Development Strategies

The road development strategy delineated in the 2030 plan aims to undertake short-term measures with a long-term perspective. They are more specifically as follows:

Short-term Measures:

1. Mitigate traffic congestion through improved traffic management;
2. Eliminate traffic bottlenecks;
3. Rehabilitate/ Restore deteriorated road sections/ facilities; and
4. Improve traffic safety through better enforcement, campaign, and education, as well as provision of safety facilities.

Medium-term Measures:

1. Strengthen road network through widening and new construction in compliance with the long-term network plan;
2. Improve traffic mobility along key corridors through comprehensive measures,

including traffic management and facilities development;

3. Control roadside activities and land use; and
4. Provide adequate parking facilities and rules on parking, especially in the city center.

6.4 Traffic Management and Safety

1) Current Issues

(1) Importance of Traffic Management Improvement

Due to increasing traffic volumes and worsening traffic congestion, travel speeds have decreased (see Table 6.7). In 1998, average travel speeds on most sections of the main roads were about 30–40 km/h, and in 2007 these decreased to 20–25 km/h. A traffic management system is a crucial part of transportation improvement. Traffic management strategies should thus not contribute to worsening the situation.

Table 6.7 Comparison of Travel Speeds in 1998 and 2007

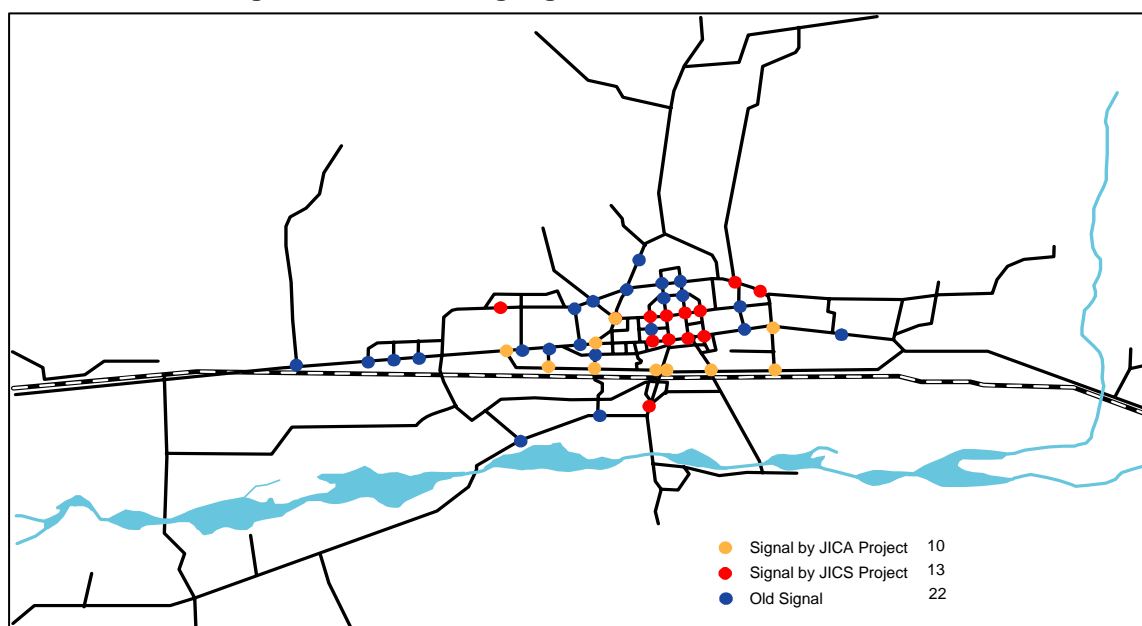
Vehicle Type	Route	Direction	Travel Speed (km/h)	
			1998	2007
Car	Peace Avenue	East	41.1	25.4
		West	42.4	25.7
	Khovagakchid-Ihk Toiruu	East	30.3	21.3
		West	29.0	20.9
	IKH Toiruu	South	40.9	19.1
		North	24.5	20.3
	Naray Zam	East	42.3	31.7
		West	41.2	19.7
Bus	UBIS-Yarmag	East	35.7	21.4
		West	31.9	20.1
	IBIS-Chingehei	East	24.1	16.8
		West	24.1	18.0

Source: JICA Study Team

(2) Traffic Signals

Ulaanbaatar City has 48 signalized intersections, 22 of which have old signals, having been installed in the 1970s and 1980s. A study of the existing signals shows that they are not efficient. All are isolated fixed-time signals and there is no coordination between adjacent signals. Moreover, signal phase design and signal timing are not optimized, causing unnecessary delays to vehicles. The fundamental reason for the inefficient signal operation is the lack of signal design standards including signal warrant, phase sequence design, and calculation of signal timing parameters. There is a great room therefore to improve the traffic signaling system as a whole.

Figure 6.12 Existing Signalized Intersections



Source: JICA Study Team

Meanwhile, the problem of inadequate intersection geometry is aggravated by the lack of pavement markings which are virtually nonexistent in Ulaanbaatar City, with few exceptions like on Naryn Zam, where markings are still visible and function to some extent. It is understandable that severe winter conditions are detrimental to pavement markings. Nonetheless, the improvement of pavement markings is urgent as with relatively small fund, it greatly helps regulate traffic flow particularly at intersections.

(3) One-way Traffic, Turning Restrictions, and Other Regulations

A one-way traffic system is applied to several streets in the CBD. The most effective is the one-way pair on the east and west sides of Sukhbaatar Square, wherein Sukhbaatar Street is one-way southbound from Juulchin to Peace Avenue, while Ikh Surguuli is one-way northbound from Peace Avenue to Zaluuchuud Street. This one-way pair has reduced congestion at the staggered intersection of Peace Avenue-Ikh Surguuli, although traffic jams still occur at the Peace Avenue-Sukhbaatar Street intersection.

(4) Traffic Information

Currently, no real-time traffic information and congestion information are available to road users. The introduction of an area traffic control (ATC) system to Ulaanbaatar City is being planned. The system will have vehicle detectors at 22 locations to collect traffic information. In addition, 26 sets of closed circuit television (CCTV) cameras will be installed to monitor traffic flow. The data and image from the detectors and cameras will serve as valuable traffic information. Once these devices are installed, real-time traffic surveillance can be done and the information can be fed to road users through two variable message signs (VMSs) to be installed at East Cross and West Cross intersections.

(5) Traffic Discipline

A no-priority rule exists at unsignalized intersections, and stop signs are not installed to indicate lower priority for crossing the road. Vehicles enter intersections on a first-come, first-served basis, compromising both efficiency and safety. At roundabouts, it is a common rule that vehicles already circulating inside have higher priority over vehicles entering them. The latter must give way to the former so that vehicles will not accumulate inside roundabouts and no congestion occurs. This rule is not observed at such locations as the Sapporo Roundabout.

Another high-priority problem is the lack of protection for pedestrians who are not given priority at intersections and pedestrian crossings. Vehicles do not stop at pedestrian crossings even when there are pedestrians trying to cross them. At the same time, jay-walking is common among pedestrians.

(6) Parking Management

A rapid increase in the number of vehicles is expected to continue in the next several years. Such being the case, parking problems will persist or worsen unless radical parking management policies, strategies, and measures in the city are taken to address both parking demand and supply.

2) Recommended Strategies

(1) Basic Strategies

The importance of traffic management cannot be overemphasized, since without it costly projects would not generate the expected benefits. And while it is likely that the provision of infrastructure will not meet the fast-growing demand, traffic management strategies such as the following can greatly improve the situation:

- Strengthen traffic management and improve traffic flow by enforcing traffic rules/ regulations on **road parking** and use of road space, installing traffic signals for vehicles and pedestrians, etc.;
- Improve management of main transportation corridors by developing infrastructure/ facilities, managing traffic, and improving public transportation services to ensure smooth traffic flow and safety along the corridors; and
- Improve traffic management in the CBD by developing infrastructure, improving traffic circulation/ and parking control, improving pedestrian environment, etc.

In the medium- to long-term perspective, the city must introduce **car demand management measures**. Car ownership has been increasing and should not be discouraged because the people are also entitled to use cars during off-peak hours and weekends/ holidays. However, if the trend in car use continues as is seen today, it is certain that future congestion will become serious. Car users must therefore be made to shoulder the social, economic, and environmental costs that come with using cars in order to generate funds to counteract its negative effects and to facilitate a shift to public transportation. Car restraint measures include the following:

- Physical restrictions including on-road parking control, requirement for a garage certificate¹¹, car use ban such as number coding and car-less days, and vehicle inspection; and
- Economic restrictions, including increased prices for purchasing and registering cars, expansion of pay parking areas, introduction of congestion pricing such as road pricing, area licensing scheme¹², etc.

The undisciplined behavior of drivers and pedestrians is another main cause of traffic accidents, although poor road surface and the lack of traffic management measures/ facilities are also major contributors. At the same time, accident reporting is not systematically done. Hence the first important steps to improve the situation include the following:

- Strengthen the accident reporting system based on an improved accident database;
- Establish an analysis system available to all interested stakeholders; and
- Build capacities of related agencies for handling an accident data management system.

(2) Establishment of a “Transportation Research Center”

Knowledge and experience in transportation and traffic engineering have not been accumulated in the country. Government staff both at the national and local levels have little opportunity to acquire knowledge in these fields. Seminars, workshops, and learning sessions are held on an ad hoc basis only and there is no systematic way to increase one’s knowledge of and develop skills in traffic management. It is therefore proposed that a **research institute** be established to become the center of knowledge and experience in transportation technologies and traffic engineering. The main objectives of the research institute will be to engage in the following activities:

- Construct and maintain a transportation database, conduct modeling and planning;
- Undertake traffic engineering studies and design; and
- Promote human resource development.

¹¹ Car ownership will not be permitted unless owners certify that they have parking spaces for them.

¹² Vehicle users who want to pass through congested road sections or designated areas, such as the CBD, have to pay for it.

6.5 Comprehensive Urban Transportation Development

The urban transportation development program was formulated for both the short term and the long term. Figure 6.10 indicates the long-term plan targeting 2030. The following are proposed strategies and measures to realize a comprehensive urban transportation development.

1) Rationales for Introducing Mass Transit System under a Compact City Scenario

The future traffic demand in the city is large. Total demand in terms of number of trips will increase by 2.4 times from 2.3 million to 5.5 million from 2007 to 2030, respectively. While the demand will increase only by 2.4 times, the impact on road traffic is large. The traffic analysis using STRADA indicates that the future traffic in terms of PCU-km and PCU-hour will increase by five (5) times and more than 10 times, respectively. This will reduce the average travel speed from 27 km/h in 2007 to 12 km/h by 2030. Similarly, the increase in transportation costs and emissions of pollutants will also be significant (see Table 6.8).

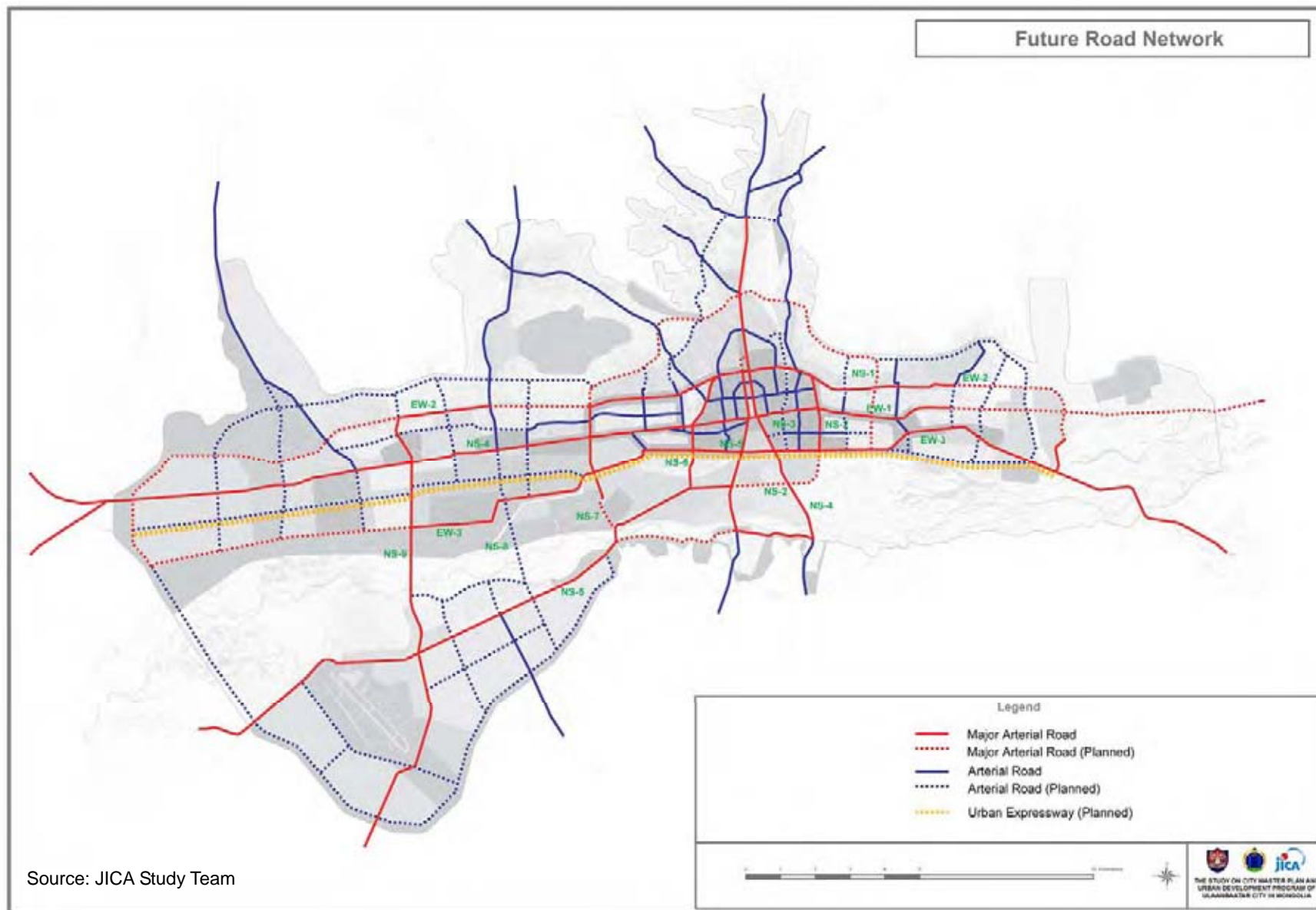
In order to meet the transportation demand, an analysis was made on the impact of urban growth on urban transportation under the Trend and Compact City scenarios wherein the former represents a land-use pattern that follows the current development trend up to 2030, while the latter represents a compact land-use pattern proposed by the JICA Study Team. The results of the analysis are as follows (see Table 6.8):

- The Compact City Scenario shows a 15% increase in PCU-km and a 22% increase in PCU-hours. With this average travel speeds are faster by 10%;
- With regard to economic indicators, the Compact City Scenario shows about 20% reduction in transportation cost which comprise vehicle operating cost and travel time cost; and
- The effects on the environment of the Compact City Scenario are better compared to those of the Trend Scenario, i.e. about 17% and 18% lower NO_x and CO₂ emissions, respectively.

Further analysis was made on the impact of transportation network development with particular regard to LRT/BRT and expressway. The results are briefly as follows:

- The development of at-grade roads alone will not be able to accommodate future traffic demand because there is not much room for developing new roads or widening existing roads in urban centers and built-up areas where traffic demand concentrates;
- The development of two grade-separated mass transit lines, comprising LRT and BRT, can contribute to the improvement of the traffic situation significantly in the city's most critical areas. However, traffic congestion will remain on many sections of primary roads. This implies that while the introduction of the LRT and BRT will significantly improve the mobility of public transportation passengers, it will not contribute much to improving traffic congestion on roads, thereby requiring the enforcement of car-restraint measures;

Figure 6.13 Proposed Urban Transportation Network Development Plan for 2030



- The development of expressways provides an opportunity to greatly improve the traffic situation. Under this scenario, both public and private transportation users can enjoy a high level of mobility and accessibility.

Table 6.8 Traffic Impact Analysis

Indicators	2007	2030 by scenario		Ratio of compact scenario to "Trend"			
		"Trend"	"Compact"	with roads only	with LRT/BRT	with LRT/BRT & expressway	
No. of Trips/day (000)	2,288	5,486	5,454	0.99	0.99	0.99	
Mobility	Pcu-km (000)	4,900	25,929	22,049	0.85	0.76	0.77
	Pcu-hr (000)	184	2,189	1,700	0.78	0.65	0.54
	Ave.speed (kph)	27	12	13	1.09	1.18	1.42
Economic	VOC (\$000/day)	666	6,689	5,350	0.8	0.73	0.65
	TTC (\$000/day)	268	2,886	2,239	0.78	0.59	0.5
	Total costs	934	9,575	7,590	0.79	0.69	0.6
Environment	NOx (ton/day)	6	46	39	0.83	0.78	0.74
	CO ₂ (ton/day)	279	2,074	1,685	0.81	0.66	0.6

Source: JICA Study Team

2) Overall Transportation Sector Strategies

In view of the above, the suggested strategies for competitive urban transportation development for the city are as follows:

- **Promotion of Public Transportation-based City through Integrated Development:** This overall development goal involves the following:
 - To realize public transportation-based compact urban areas through the development of competitive public transportation systems and integrated urban developments. A public transportation system is composed of highly competitive primary mass transit corridors comprising LRT and/or BRT, secondary bus network, and other public transportation services which will be developed in proper hierarchy and connectivity with the primary network;
 - To promote resettlement of households residing in sprawling ger areas to appropriate areas in and along the mass transit corridors through integrated development of underutilized public lands and space; and
 - To develop an urban transportation network which meets both public and private transportation needs effectively at the same time. While private transportation use will be restricted in and along public transportation corridors, appropriate measures will be provided for off-peak hours, weekends, and peak business purposes.
- **Development of Mass Transit Corridors:** Ulaanbaatar City, especially along Peace Avenue, is suited for the development of mass transit corridors in an effective manner with high cost-benefit performance,. Urban areas with relatively high density devel-

oped in an east-west liner form can be effectively served by a mass transit line. If the urban areas are farther developed and redeveloped in integration with the mass transit system, performance of the system can be farther enhanced.

A choice of a system between LRT and BRT depends on the level and features of demand. The study indicates that the demand along the corridor is sufficiently large to justify longer system, say LRT, particularly in the central and heavily developed areas, while the other areas need less capacity. It is concluded that a combination of LRT and BRT can best form the mass-transit function along the Peace Avenue. The second corridor is important in two ways : one to integrate central urban areas with the first corridor and two to integrate growing urban areas in the south-west and the north. Needless to say, urban development must be closely coordinated with the mass-transit development. The second corridor can also be a combination of LRT in the central area and BRT in other areas. As to type of structure, it is a view of the study team the system must be either elevated or underground in city centre and density developed urban areas due to following reasons:

- Although space is available along Peace Avenue, future traffic demand on this road will be much larger including private transport numbers. There are also a number of main roads which intersect with Peace Avenue;
 - Segregated at-grade LRT/BRT will separate urban areas at both sides;
 - A grade-separated mass transit system can significantly increase overall transport capacities of the corridor;
 - A grade-separated mass transit system whether elevated or underground can facilitate integrated urban development at and around the stations. Especially underground system in the central part of the city can provide attractive opportunities for underground space development; and
 - A grade-separated system can enhance the city's image.
- **Immediate Undertaking of Short-term Programs:** Prior to any heavy investment in transport infrastructure, the city must attend to unfinished work in many areas such as the following:
 - **Strengthening of Road Network Management:** This includes improved maintenance, rehabilitation of damaged infrastructure, removal of bottlenecks, and construction of missing links to improve connectivity and performance of the network;
 - **Strengthening of Traffic Management:** This includes improvement of traffic circulation, parking control, and pedestrian environment to maximize available traffic capacity and enhance road transport environment. Inspection of road vehicles must be gradually strengthened to reduce emissions. Traffic safety must also be addressed through comprehensive measures;
 - **Improvement of Public Transport Services:** Current public transport users must be provided with improved services through the introduction of new buses, rationalization of bus routes, improvement of bus operation and bus facilities, and

provision of affordable fares, especially to the poor; and

- **Enhancement of Public Awareness on Urban Transport Issues:** Many existing transport problems facing the city can be attributed to low awareness among transport service providers and users. The city must thus take the initiative to enhance public awareness through formal education, regular campaign, and improved enforcement, among others.

7. HOUSING & LIVING CONDITIONS

7.1 Housing Development Issues

The following are the housing development issues tackled during the urban planning process in this study:

- Housing construction is currently booming, and the housing market is improving. However, construction costs are increasing which could affect the smooth implementation of the 40,000 units housing program;
- The banking sector has developed a financial scheme that provides housing loans for individuals who purchase apartment units. However, only high- and middle-income households earning over 450,000 Tg./month can avail themselves of the commercial banks' housing loans. The majority of households, or low-income households, still have no access to housing loans and policy benefits;
- The Mongolian Housing Financing Corporation (MHFC) was established to promote the 40,000 units housing program in its capacity as a public corporation, but it has yet to perform its substantial financing function;
- Government efforts have focused on housing development (supply side) and there is still insufficient housing finance and low affordability by the people (demand side);
- There are no institutional systems providing low-cost houses for middle- and low-income households, households earning less than 300,000 Tg./month. This group comprises more or less 70% of the total households, based on the 2006 statistics and data from the JICA Study Team's survey.
- To date, the lack of effective development guidelines and legal framework for land and housing development has made it difficult to implement the 40,000 units housing program.

7.2 History of Government Housing Development Strategies and Programs

The history of housing policies in Mongolia is relatively new, starting with the "Housing Finance Project" conducted by the ADB in 2002 and the 40,000 units housing program supported by the GTZ in 2006, as shown in Figure 7.1.

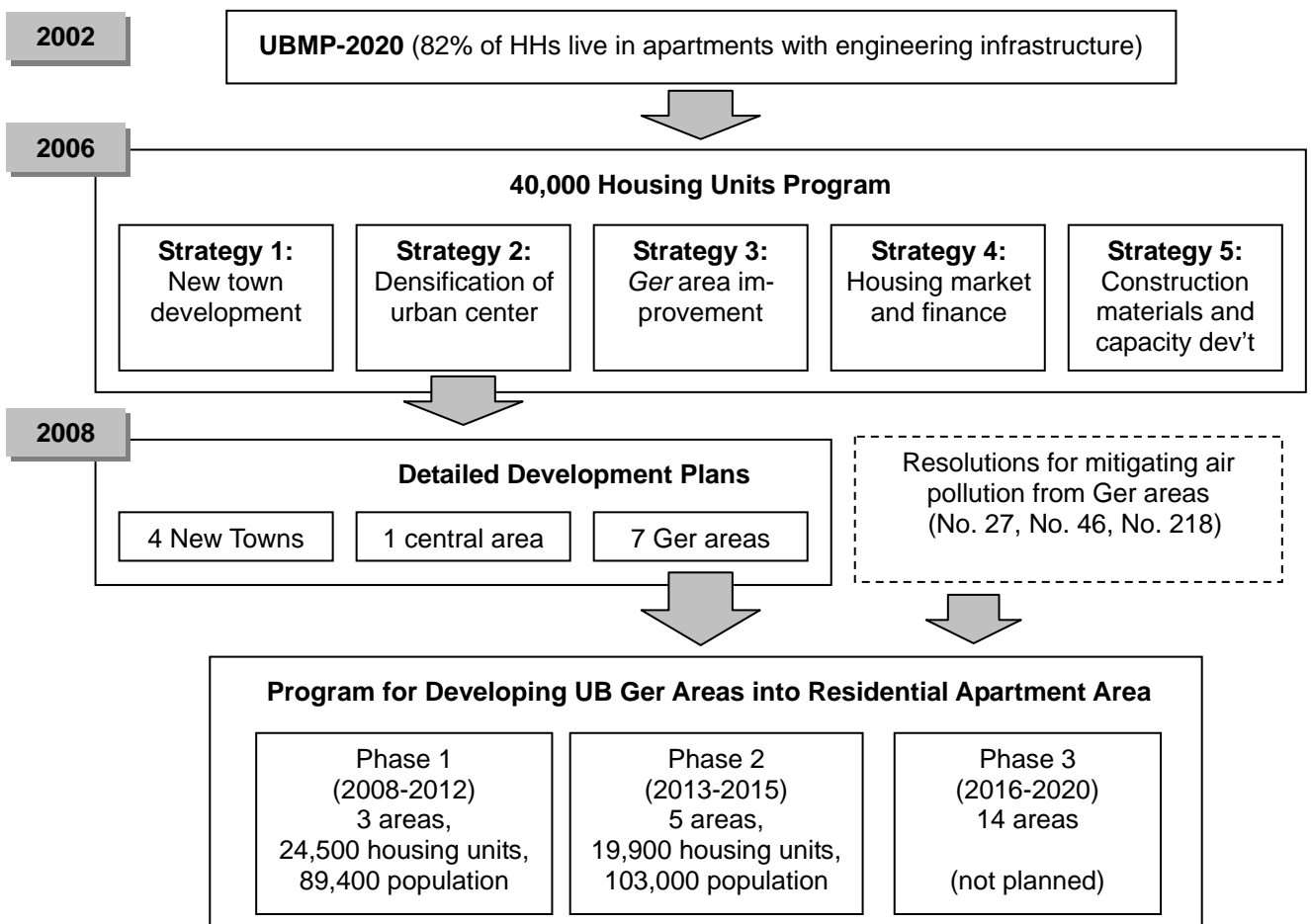
The 40,000 units housing program addresses five (5) strategies, namely: (a) New town development; (b) Densification of urban center; (c) Ger area improvement; (d) Housing market and finance enhancement; and (e) Promotion of the construction industry and construction

materials production. These five strategies are all necessary and appropriate to develop the housing sector under a market economy. However, definite guidelines that would materialize these strategies have yet to be developed.

In 2007, the Parliament passed a special resolution on air pollution mitigation, encouraging the construction of apartments for Ger area residents. In line with the same policy, the Ulaanbaatar City government officially presented in 2008 a detailed physical development plan highlighting four (4) new town projects, one (1) central area redevelopment project, and seven (7) Ger area improvement projects. These are shown in Figure 7.2 and Table 7.1.

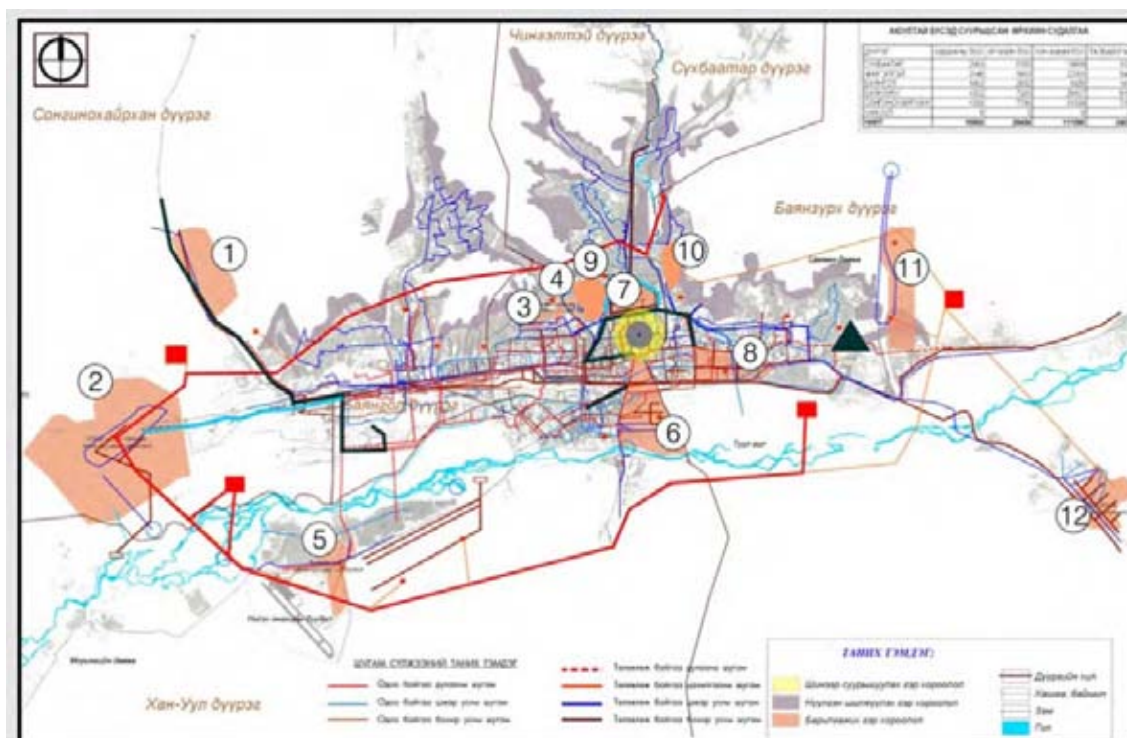
As of April 2008, the Government drafted the “*Program for developing the Ger Areas into apartment residential areas*” with priority given to three (3) areas for Phase I (2008–2012) and plans to provide about 24,500 housing units. Phase 2 targets the construction of 19,900 housing units between 2013 and 2015.

Figure 7.1 History of Housing Policies, Strategies, and Programs in Mongolia



Source: JICA Study Team

Figure 7.2 Physical Development Plan Proposed by UB City¹



Source: JICA Study Team

¹ See Table 7.1 for details.

Table 7.1 Planning Profiles for the Physical Development Plan Proposed by UB City

Project Area		Area (ha)	Population	No. of HHs	Estimated Cost (mil. US\$)	
Ger Area Redevelopment	4	Residential area around Radio & TV Authority	27	10,500	2,470	131.2
	3	7 th Micro district	93	40,000	9,100	577.1
	10	Dari Ekh Residential area	61	8,600	2,043	70.9
	8	14 th Khoroolol	235	36,400	9,106	275.8
	7	7 th Khoroolol	210	42,500	10,000	497.2
	9	Denjiin 1000	145	14,550	3,600	183.8
	6	Zaisan	700	-	13,200	-
	Sub total	771	152,550	36,319	1,735.8	
New Town Development	5	"Buyant-Ukhaa" residential area (Nisekh)	170	42,000	10,200	525.9
	1	Residential area of Bayangoliin Am	180	30,000	7,250	387.1
	2	New City Center	450	50,000	10,262	537.9
	12	"Urgah Naran" Residential area (Nogoon Zoori)	120	45,000	10,750	551.8
	Sub total	920	167,000	38,462	2,002.7	
TOTAL		1691	319,550	74,781	3,804.5	

Source: UB City Government

7.3 Current Housing Policies and Institutions

In 2002 commercial banks started to provide housing loans to middle and upper low-income groups, with funding from Asian Development Bank (ADB)-assisted “Housing Finance Project” loan. They have also started to provide housing loans in 2007 for households with monthly incomes of over 450,000 Tg. with funds from the 40,000-unit housing program. The **Mongolian Housing Finance Corporation (MHFC)** was established in 2006 through the initiative of then MCUD, MOF, and UB City as a public finance corporation to help implement the 40,000-unit housing program.

However, a study of the mainstream housing policies show that current housing policies don't focus on vulnerable groups such as the poor and low-income groups, revealing a bias for the supply side (i.e., housing development) rather than the demand side (i.e., housing finance). Figure 7.3 shows the income groups covered by the current housing policies both on the supply and demand sides. At present, private developers are the major players on the housing supply side, while the commercial banks are the major players on the housing demand side.

Figure 7.3 Current Housing Policy Framework in Mongolia

Income Group	Housing Development (Supply Side)		Housing Finance (Demand Side)	
High Income (700,000TG/M-)		Private Sector Consumption tax and Import tax exemption; 20% of houses provided for war veterans without developer's profits; 2% of houses donated to ..		Commercial Bank + Mortgage Corporation (MC)
Middle Income (300,000-700,000 TG/M)	Mongolian Housing Finance Corporation (MHFC) + Private Sector		Mongolian Housing Finance Corporation (MHFC) + Commercial Bank	ADB: Housing finance project; Japan Fund: for Poverty Reduction
Low Income (63,000-300,000TG/M)	Self-Help (Partially Supported by Donor, NGO and Community Based Organizations (CBO))		NGO Fund	
Poor People (~63,000TG/M)				

Less attention has been paid to the housing provision for low-income groups. The following are findings that underlie this fact:

- ADB and NGOs provide financial assistance to vulnerable groups through housing development funds and micro-credit finance; but these activities are not part of mainstream housing policies. ADB’s “Housing Finance Project” was completed in 2007;
- The central government tries to help private developers in promoting housing development through such actions as exemptions on consumption of and import taxes on construction materials. However, these benefits don't filter down to the vulnerable groups which suffer from increases in housing prices;

- On the other hand, the central government obliges private developers to provide 20% of housing stock to war veterans without gain and to donate 2% to the same group. However, even with such policy riders, there are no housing policies for low-income groups;
- Due to financial problems, the MHFC, which is expected to function as a provider of public housing and finance provider, it has little to boast in terms of achievements in mass housing. The MHFC is eligible to get benefits in the development of national and city-owned lands gratis and to use national bonds pooled in commercial banks as financial resources for both housing construction and housing loans. Compared with private developers, the MHFC is obliged to provide low-priced houses to households with incomes of over 450,000 TG/month (middle-income class). However, the recent increases in construction costs make it difficult to supply low-cost houses amounting to just US\$ 350, which is the regulated construction cost by the MHFC. Enhancement of its institutional capacity as a public corporation is inevitable to help realize housing supply for low-income groups;
- **Mongolian Mortgage Corporation (MIK)** was established in 2007 by the Bank of Mongolia and 10 commercial banks to set up a long-term framework on housing loan resources and to develop a housing market and stabilize long-term financial resources. The impact of the MIK has yet to be felt, but the legal enhancement of this mortgage system is, at present, a major issue in the current housing policies in Mongolia; and
- Most low-income groups living in Ger areas are forced to build their own houses and improve their living conditions by themselves. They have no access to housing loans. The ADB and NGOs assist them in formulating community-based organizations (CBOs) and in providing community mortgage loans for community development. So far, seven (7) CBOs have been created in UB City but this approach is not yet enough. Therefore, it is important to promote community-led efforts at improving the living environment.

7.4 Proposed Housing Policies and Institutions

1) Housing Development System: Supply Side

To meet increasing housing demand, housing supply needs to be strengthened in the long term. To meet this goal, the following policies are proposed:

(1) Establishment of New Legal System to Facilitate Housing Development

The national government has enacted several basic laws related to housing and apartment housing development as described in the Housing Law of Mongolia, such as the “Housing Privatization Law” and “Law on the property of shared ownership of residential buildings and the legal status of the Condominium Association”. However, various other relevant laws and regulations have to be established or amended to make them realistic with current socio-economic conditions. For example, there is no legal system for the promotion of housing development in the Ger areas, as well as the rebuilding of old apartments and new town development in a planned manner. Guidelines for community improvement and housing provision for low income groups are particularly important. This issue will be further discussed in

Chapter 11.

(2) Promotion of Domestic Construction Industries and Materials Production

The increasing cost of construction materials is a vital factor that influences housing policies. The prices of imported construction materials are stable except for cement and reinforced iron rods. The percentage of imported and homemade construction materials is shown in Table 7.2.

Table 7.2 Percentage of Imported and Homemade Construction Materials

Construction materials	Percentage of imported and homemade
Wall materials	100% homemade
Glass	100% imported
Window frame and door	100% homemade
Roof materials	10% homemade, 90% imported
Water pipeline	30% produced by Chinese and Korean plants in Mongolia. 100% imported for joint material of pipeline
Paint	100% imported
Concrete and brick	100% homemade
Electric cable	100% imported
Precast concrete	In the past, produced, but the plant is closed at present.

Source: Building Material Manufacturer's Association of Mongolia

To attain price stability, the necessary policies needed to stabilize construction costs are summarized as follows:

- Policy level support for the private sector is required to construct plants for cement and reinforced iron rods which influence construction costs. Special incentives should be provided for start-ups.
- An economical way of transporting and supplying construction materials, such as cement and bricks, etc., has to be studied and introduced. The distribution system should be rationalized through governmental intervention, if necessary.
- A production system that will make the cost of construction materials cheaper has to be developed. For instance, while processed cement and insulation materials are manufactured together as one insulation block, the production of precast concrete is needed.
- Encourage the growth of construction materials industries and stabilize the domestic supply market (this is being currently supported by the GTZ).

(3) Establishment of “Social Housing Corporation (SHC)”

The Social Housing Corporation (SHC) not only provides houses for low- and middle-income groups, but is also an agency that promotes comprehensive housing development projects through land and infrastructure development, the redevelopment of old apartment houses, land readjustment of Ger areas, and the cross-subsidy of development incomes from the middle to the low income groups, etc.

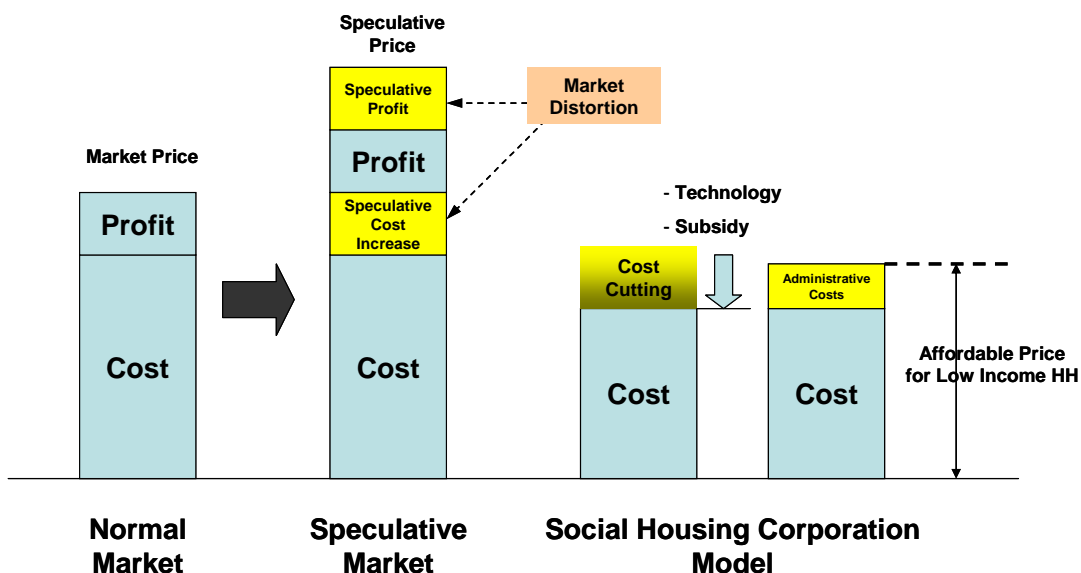
Another of its important functions is to intervene in market distortions due to speculations on materials costs and profits. This is significant since the housing and real estate markets are not always perfect and suffer distortion due to disinformation and speculations. Governmental intervention through the provision of housing units at proper market prices is an effective market remedy, (see Figure 7.4).

The provision of social housing is a public duty that is not incumbent only upon the private sector. Taking into account its objectives and mandate, the MHFC could be reorganized into a “Social Housing Corporation”, or a national agency, because its stocks are held by UB City (51%), MCUD (24.5%), and MOF (24.5%).

As one of its targets, the role of SHC is to provide at least **10%** of the total housing stock for low-cost housing, and this has reference to the housing policies in other east or south Asian countries. The provision of **rental houses** is also expected to act as temporary accommodations for immigrants and students in UB City and for seasonal workers.

Financial sources for the SHC could be the Mongolia Development Fund, Housing Development Fund, and National Pension Fund, besides the National Bond Fund pooled in commercial banks.

Figure 7.4 Social Housing Corporation Model



Source: JICA Study Team

(4) Organization of a Community & Local Partnership Housing Association

To aid self-help housing construction among low income households and the poor who don't have access to housing loans, a **Community & Local Partnership Housing Association** is recommended as a joint initiative of MRTCUD (then MCUD), UB City, Building Material Manufacturer's Association of Mongolia, Architect and Construction Company's Association, NGO, and Community Representatives. This organization is an advisory institution that will assist the poor in the construction of self-help housing through community mortgage programs.

A good model in this regard would be the Community Organizations Development Institute (CODI) program of Thailand.

(5) Enhancement of People's House Purchasing Capacity

Without stable employment opportunities, the poor's ability to purchase houses cannot improve, so they remain in Ger settlements even though living conditions there are bad. Needless to say, the housing policy should address housing affordability.

Table 7.3 summarizes major recommended policies focusing on the enhancement of the supply side of the housing market.

Table 7.3 Expected Roles of Proposed Organizations for Housing Development

Organization	Roles and Functions
Social Housing Corporation	<ul style="list-style-type: none"> ■ To construct low-cost houses to cover 10% of total housing units ■ To perform a land development function for new towns and Ger areas, through land acquisition, land readjustment and urban redevelopment ■ To sale housing units for low income group with financial arrangement ■ To provide "rental housing" for a variety of housing demands ■ To arrange internal cross subsidy for low income group ■ To introduce house purchasers formal Job-opportunities
Community and Local Partnership Housing Association	<ul style="list-style-type: none"> ■ To facilitate self-help housing construction and improvement of living Conditions such as sanitation and utilities ■ To provide appropriate technical advice and introduce low price and environment-friendly construction materials
Private Sector	<ul style="list-style-type: none"> ■ To construct quality housing units for high and middle income groups ■ To participate in "Social Housing Development" in a PPP scheme, with public sector's special incentives such as provision of land areas with basic infrastructures, permission of utility connection, etc.

Source: JICA Study Team

2) Housing Finance System (Demand Side)

The housing financing system needs to be further enhanced with due consideration to affordability for middle- and low-income groups. The following are recommendations to attain this goal:

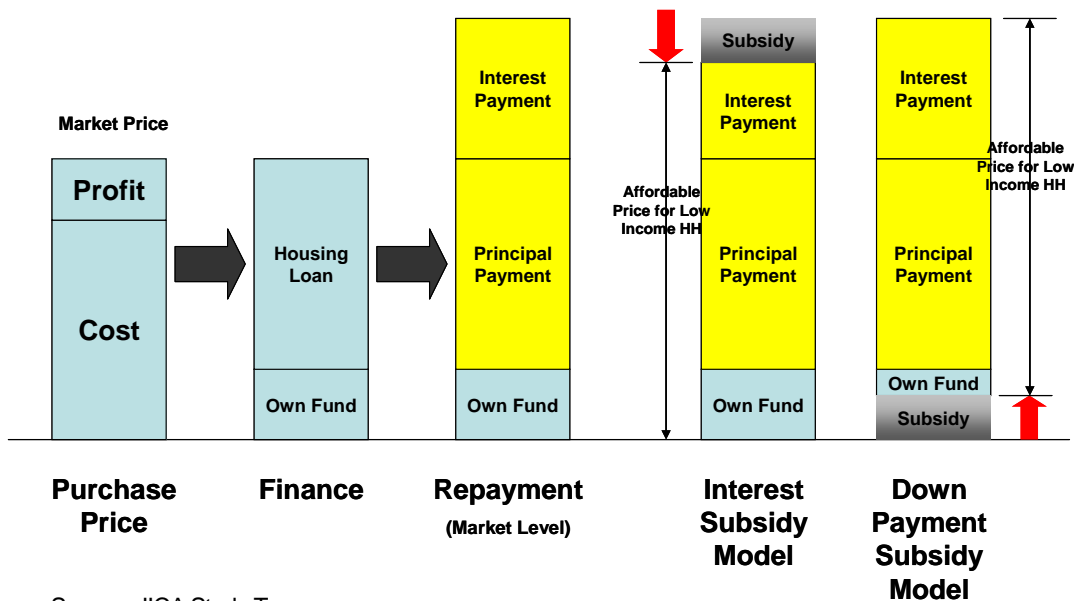
(1) Provision of Long-term and Low-interest Rate Housing Loans

A long-term financing system providing housing loans with low interest rates needs to be developed for all middle- and low-income households whose monthly income is over 300,000Tg./month. This can be done through the following aspects:

- Legalization of the “Mortgage Law” and provision of escrow account (down payment subsidy) in commercial banks, and
- Enhancement of a “Secondary Mortgage Market” through the MIK’s functions.

A government subsidy system should also be considered to fulfill the gaps between prevailing financial conditions and the affordability levels of the target groups. For this purpose, two (2) schemes are possible: subsidy on interest or subsidy on down payments, as shown in Figure 7.5. Since interest rates are variable, they affect borrower’s repayment schedules. The interest subsidy scheme could be more preferable for middle and low-income households.

Figure 7.5 Interest/Down Payment Subsidy Model



Source: JICA Study Team

(2) Establishment of “Housing Development Financing Institution”

With the importance of promoting housing development especially for the low and middle income groups in Mongolia, the establishment of a **Housing Development Financing Institute** (HDFI), as a financing institution for managing not only the “Housing Development Fund”¹ but also other financial resources, should urgently be studied. The HDFI itself has a financial function as a mortgage corporation and will have an important role in the provision of long-term and low-interest rate loans for low and middle income groups. For the moment, the commercial bank and the MIK will handle this role, but it would be difficult if they will function as a substitute to the HDFI in meeting housing demand for low income groups.

The following are the possible funding sources in the operation of the HDFI:

- “Mongolian Development Fund”: based on the tax revenue from the mining industry;
- “National Pension Fund”: it’s legally prohibited to utilize this Tg.100 billion fund for other purposes in Mongolia; however, it could be utilized for to meet the goals of socialized housing and for housing development in general; and
- “Housing Development Mutual Fund” is a membership system or public association that provides housing funds for its members. This system is popular in the Philippines and other Asian countries, and it’s one of the possibilities that could be examined in Mongolia.

The financing department of the MHFC will be incorporated into the HDFI as a national agency and expected to take an important role for the finance of low cost houses.

(3) Introduction of “Community Organizations Development Initiatives”

In order to provide community mortgage finance to help the poor who avail themselves of housing loans, a **Community Organization Development Institute** (CODI) should be introduced, with reference to the Thai model.

Thailand established a CODI network in 2000 to promote community development in the slum areas. CODI takes a community network-driven bottom-up approach by providing **community mortgage loans** and **subsidies** to aid self-help housing construction, improve living environments, and train informal workers to engage in formal jobs. This approach has been effective in fulfilling shortages in the traditional top-down approach by the National Housing Authority (NHA) of Thailand.

The following are the major achievements of CODI:

- Enabled the poor to build self-help housing and promote the improvement of their living environment through the organization of community groups and cooperatives;
- Enabled communities to influence city development through the enhancement of community networks, which resulted in the establishment of support systems for the national and local governments; and

¹ In the Housing Law of Mongolia, the article to enable the establishment of “Housing Development Fund (HDF)” had been incorporated for the purpose of housing and infrastructure development, and the financial resources and the disbursement procedure was precisely stipulated. However, the national government declared this article invalid by the Law on Government Ad Hoc Fund approved on 29th June 2006.

- Enabled community organizations to keep up with every phase of development dynamically by taking a major pro-active role.

(4) Utilization of CDM (Clean Development Mechanism) for Ger Area Environmental Improvement

At present, ambient air pollution during the winter season is one of the most serious problems. It has been studied that the major source of air pollution are the individual houses located in Ger areas, and this form of pollution constitutes 90% of the total ambient pollution. Although the central government has placed importance in facilitating apartment provision for Ger residents, a short-term program should be explored to mitigate the pollution. In this sense, three (3) measures need to attain an integrated solution: (a) **Fuel innovation**, (b) **Improved stove dissemination**; and (c) **Energy-efficient housing materials** (insulations) provision for self-help housing.

A model CDM may be utilized to implement these three measures, simply because these policies will be effective in mitigating total CO₂ emissions which otherwise would increase if not properly addressed.

Table 7.4 Roles and Functions of Proposed Housing Financing Organizations

Organization	Roles and Functions
Housing Development Financing Institution	<ul style="list-style-type: none"> ■ To finance with long-term and low interest rate housing loan for low income group by raising Housing Construction Fund by the Government ■ To function as a Secondary Mortgage Corporation
Community Organizations Development Institute (CODI)	<ul style="list-style-type: none"> ■ To be established jointly with Ministry of Social Welfare and Labor ■ To formulate "Saving Groups" based on community development plans ■ To support to make "Self-Help Housing Development Plan", with small infrastructure development and job opportunity development. ■ To provide with subsidies or community mortgage loans to Improve living environment as well as housing construction.
Commercial Bank	<ul style="list-style-type: none"> ■ To provide long-term housing loans for middle and high income groups in cooperation with MIK (Secondary Mortgage Cooperation) ■ To establish "escrow account" (for down-payment subsidy or buy-down system), focusing on all middle income households over 300,000TG/Month
Secondary Mortgage Corporation (MIK)	<ul style="list-style-type: none"> ■ To enable commercial banks to provide secured long-term housing loans by improving investment environment and market exploitation of secondary mortgage bond under forth-coming Mortgage Law

Source: JICA Study Team

3) Proposed Housing Policy Framework

Major policy issues on housing development, as discussed above, are summarized in a policy framework in Figure 7.6. Essential is the integrated policy mix that covers all the segments of income levels toward substantial housing improvement. Both the top-down and bottom-up approaches are also institutionalized in housing policies.

Figure 7.6 Proposed Housing Policy Framework

Household Income Group	Housing Development (Supply Side)		Housing Finance (Demand Side)	
High Income Group (> 700,000TG/M)	Private Sector		Commercial Bank + Mortgage Corporation + Escrow Account (Down Payment Subsidy)	
Middle Income Group (300,000 – 700,000Tg./month)	Contribution to Social Housing Development with PPP Mechanism	Social Housing Corporation / Economic Development Corporation	Long Term Housing Loan	Housing Development Financing Institution (Housing Development Fund / Central Provident Fund / Others)
Low Income Group (63,000 – 300,000TG/M)	Community & Local Partnership Housing with Self-Help Mechanism	Housing Subsidy for Low Income Group	Community Organization Development Institute (CODI) Community Mortgage Loan / Subsidy	Long Term & Low Interest Rate Housing Loan / Housing Subsidy
Poor People (> 63,000TG/M)				

Source: JICA Study Team

7.5 Housing Demand Forecasts

1) Methodology for Housing Demand Forecasts

Estimates on future housing demand were based on population projections. Figure 7.7 shows an analytical flow of the housing demand forecast for 2020 and 2030. The housing statistics of UB City and the Household Interview Survey (HIS) conducted by the JICA Study Team were used as the base data for this forecast.

2) Current Housing Stock and Preferences for Housing Change

(1) Characteristics of Current Housing Stock (2007)

A look into the housing structure shows that 39.2% of total housing stock comprises apartment houses. Substandard houses, including simple houses without infrastructure (33.8%), Ger houses (25.5%), and Homeless (0.7%), account for about 132,000 units with a share of 60% of the total stock (see Table 7.5).

Table 7.5 Current Structure of Housing Stocks by Type in 2007

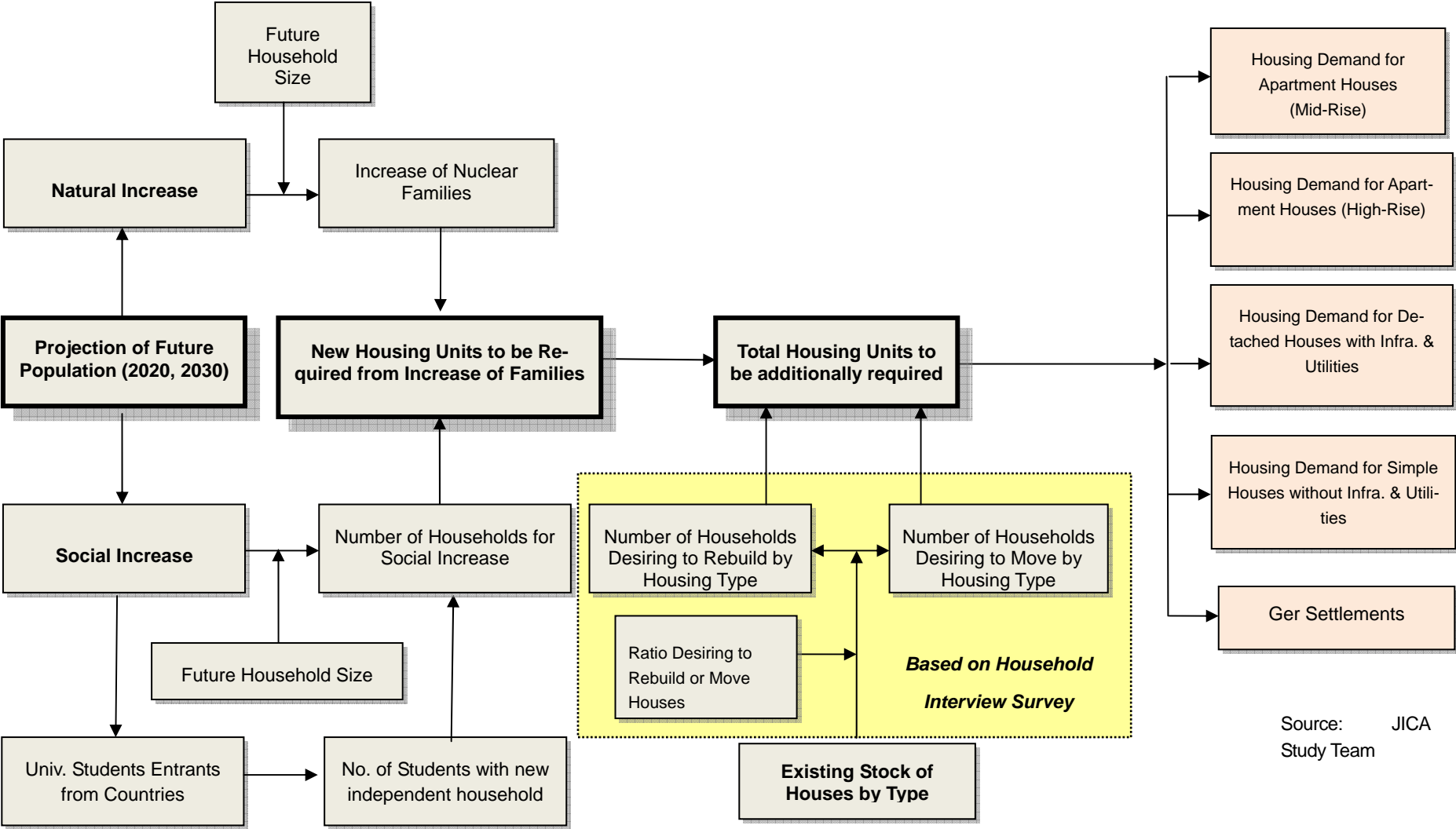
	Existing Units	share(%)
Apartment	86,091	39.2%
Mid-rise	60,264	27.4%
High-rise	25,827	11.7%
Detached with Infra	1,957	0.9%
Simple house w/o infra	74,283	33.8%
Ger	56,101	25.5%
Homeless	1,460	0.7%
Total	219,892	100.0%

Source: UB City

(2) People's Preferences to Move, Rebuild, or Improve

Preferences among residents showed that a total of **54%** of apartment residents prefer to move (7.4%), rebuild (3.1%) or improve (42.1%) their residential apartments. On the other hand, **67%** of Ger residents answered they will move (9.2%), rebuild (16.8%) and/or improve (40.8%) their Ger houses. Only a third of Ger residents were satisfied with their current living conditions (see Table 7.6).

Figure 7.7 Analytical Flow of Housing Demand Forecasts for 2020 and 2030



Source: JICA Study Team

Table 7.6 People’s Preference to Move, Rebuild or Improve Current Houses

	Apartment Residnets	(%)	Ger Resident	(%)
Want to Move	130	7.4%	251	9.2%
Want to Rebuild	54	3.1%	459	16.8%
Want to Improve	740	42.1%	1,115	40.8%
No Needs	833	47.4%	908	33.2%
Total	1,757	100.0%	2,733	100.0%

Notes: Based on Home Interview Survey (HIS) conducted by JICA Study Team in 2007.

(3) Desired Patterns of Housing Changes

Table 7.7 indicates the people’s future changes in their housing conditions by housing type. For those living in mid-rise apartments, 35% of them prefer transferring to other mid-rise apartments, 25% to high-rise apartments, and 40% to detached houses with infrastructure and utilities. This assumption was used as basis for the housing demand forecast by housing type.

Table 7.7 Desired Housing Pattern for Rebuilding and New Construction upto 2030

		<i>Future</i>					
		Apartment Mid-rise	Apartment High-rise	Detached with Infra	Simple house w/o Infra.	Ger	Total
<i>Present</i>	Apartment (Mid-rise)	35%	25%	40%	0%	0%	100%
	Apartment (High-rise)	25%	25%	50%	0%	0%	100%
	Detached w Infra	45%	10%	45%	0%	0%	100%
	Simple house w/o Infra.	40%	20%	40%	0%	0%	100%
	Ger	40%	15%	45%	0%	0%	100%
	Homeless	40%	15%	45%	0%	0%	100%
Immigarat Household (2008-2020)		35%	15%	40%	5%	5%	100%
Immigarat Household (2021-2030)		40%	20%	40%	0%	0%	100%

Notes: Based on Home Interview Survey (HIS) conducted by JICA Study Team in 2007.

3) Forecast of Housing Construction Demand

Estimates show that there is a housing demand of about 128,700 for newly constructed houses between 2007 and 2020, and more than 178,800 between 2007 and 2030. These include demand for re-building. Total housing demand was estimated at 207,834 from 2007 to 2020, and 347,640 from 2007 to 2030, as shown in Table 7.8.

The demand for apartment houses is 64,337 of newly constructed houses from 2007 to 2020, and 102,532 of newly constructed houses, from 2007 to 2030. Along with re-building demand, the total apartment demand was estimated at 109,842 from 2007 to 2020, and 199,106 from 2007 to 2030. More than half of the total demand consists of apartment houses.

Table 7.8 Housing Units to be Rebuilt and Constructed by Housing Type

	2007 - 2020			2007 - 2030		
	Re-built	Newly Constructed	Total	Re-built	Newly Constructed	Total
Apartment	45,505	64,337	109,842	96,574	102,532	199,106
<i>Apartment (Mid-rise)</i>	30,856	45,036	75,891	65,409	69,856	135,265
<i>Apartment (High-rise)</i>	14,649	19,301	33,950	31,165	32,676	63,841
Detached with Infra	33,656	51,469	85,125	72,243	74,360	146,603
Simple house w/o infra	0	6,434	6,434	0	1,287	1,287
Ger	0	6,434	6,434	0	643	643
Total	79,160	128,673	207,834	168,817	178,822	347,640

Source: JICA Study Team

4) Housing Stock by Housing Type by 2020 and 2030

Total housing stock in UB City will approximate be 348,534 by 2020, and 444,340 by 2030, as summarized in Table 7.9. More than half of the units are apartment houses.

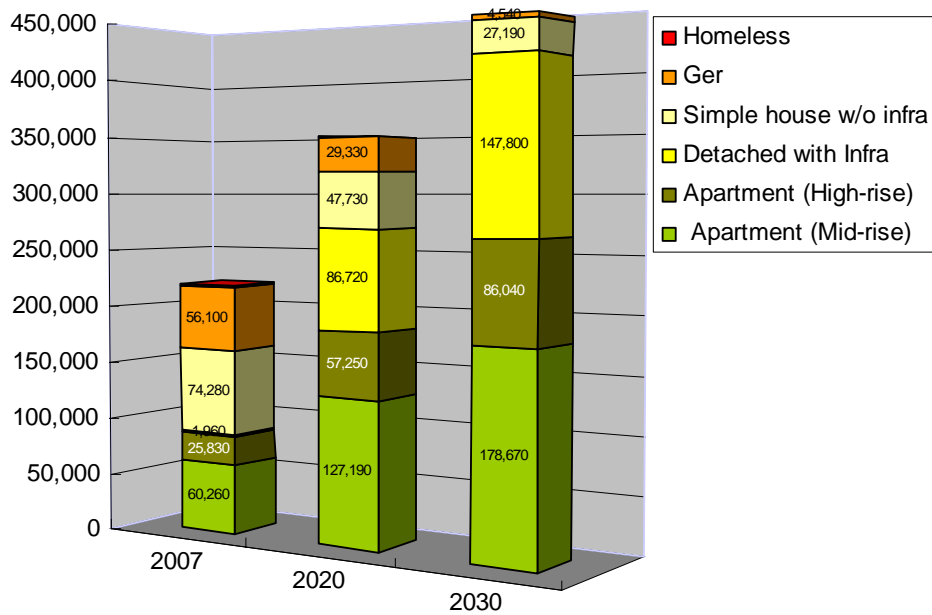
Table 7.9 Projections of Housing Stocks by Housing Type in 2020 and 2030

	2007	2020			2030		
		Unchanged	Rebuilt & Constructed	Total	Unchanged	Rebuilt & Constructed	Total
Apartment (Mid-rise)	86,091	74,600	109,842	184,442	65,600	199,106	264,706
<i>Apartment (Mid-rise)</i>	60,264	51,300	75,891	127,191	43,400	135,265	178,665
<i>Apartment (High-rise)</i>	25,827	23,300	33,950	57,250	22,200	63,841	86,041
Detached with Infra	1,957	1,600	85,125	86,725	1,200	146,603	147,803
Simple house w/o infra	74,283	41,300	6,434	47,734	25,900	1,287	27,187
Ger	56,101	22,900	6,434	29,334	3,900	643	4,543
Others	1,460	300	0	300	100	0	100
Total	219,892	140,700	207,834	348,534	96,700	347,640	444,340

Source: JICA Study Team

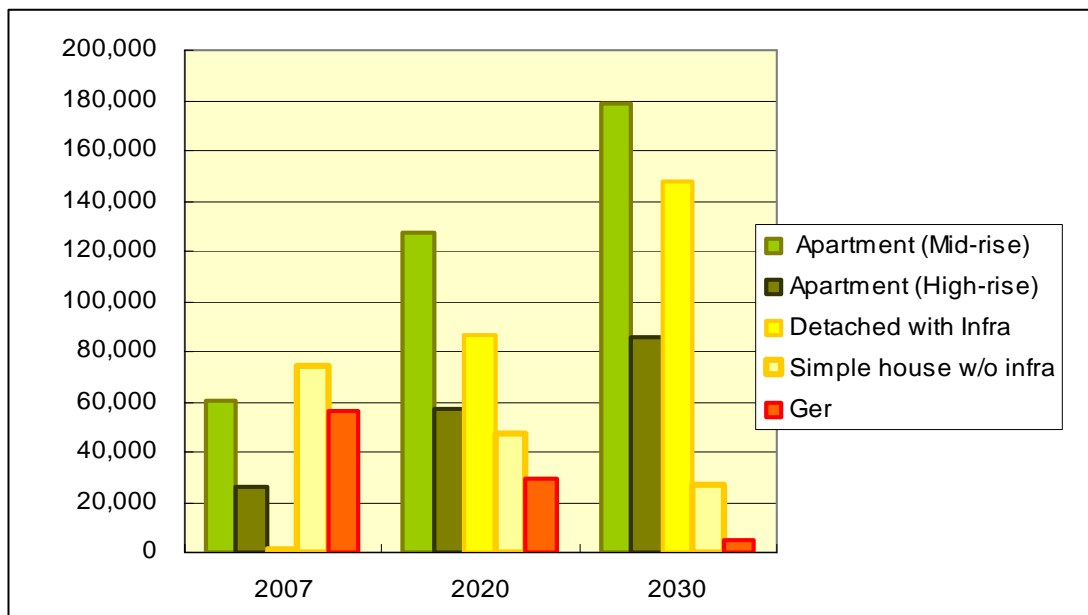
Figures 7.8 and 7.9 indicate changes in housing stock by type from 2007 up to 2020 and 2030. Ger houses accounted for about 56,100 as of 2007, and the number will dramatically decrease to about 29,300 by 2020 and 4,500 by 2030. The trend can be regarded as a definite housing policy target.

Figure 7.8 Forecast of Housing Stocks by Type in 2020 & 2030



Source: JICA Study Team

Figure 7.9 Change in Housing Unit by Type



Source: JICA Study Team

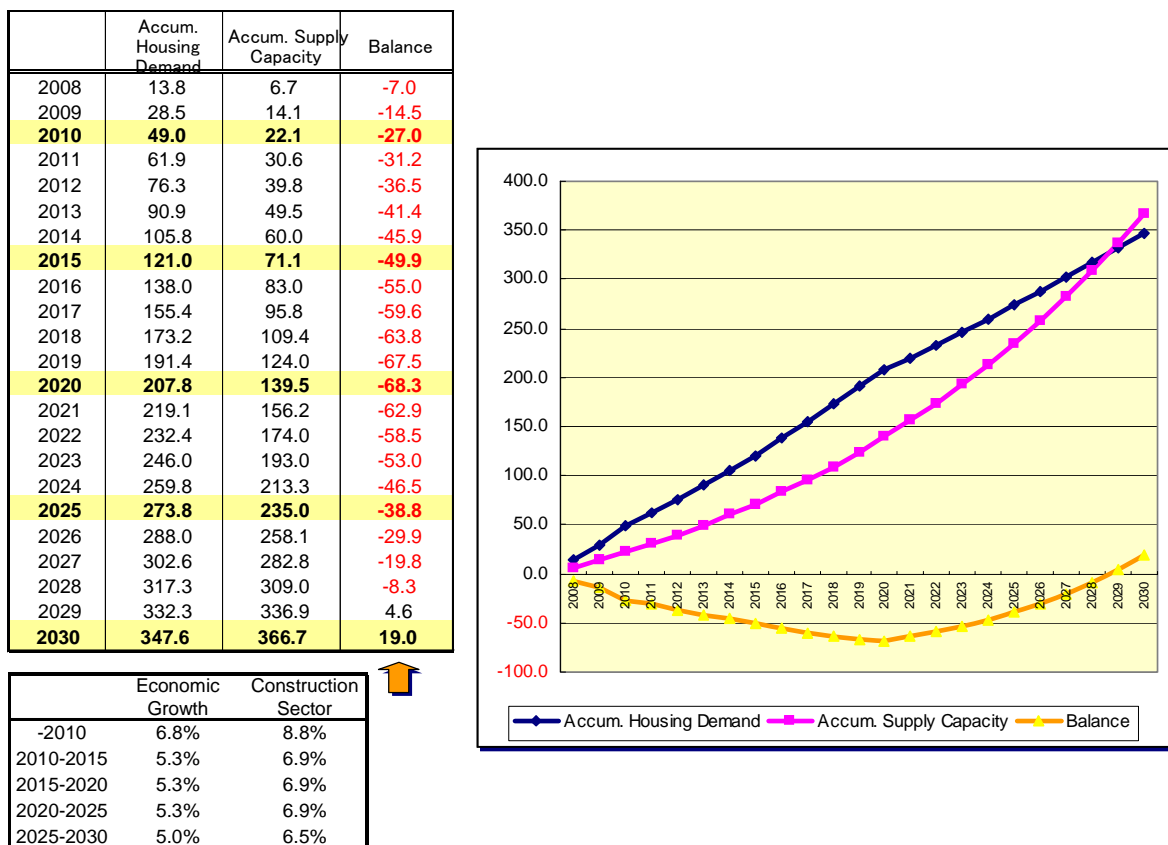
5) Housing Gaps between Demand and Supply by 2020 and 2030

The housing demand projections show that approximately 200,000 housing units will be required up to 2020. This implies that around 16,000 to 17,000 housing units will be needed annually. At present, Ulaanbaatar has a very limited supply of housing units. In 2007 it was more or less 6,000 - 7,000 housing units, including apartments and detached houses.

The gap between housing demand and supply will be 7,000 units in 2008. If not strategically narrowed, this gap will exponentially grow in the long term. This means that housing prices will continuously increase annually due to strong pressures brought about by supply shortages. Assuming that the construction sector will grow at a higher rate than the average of GRDP, or by 7% p.a., the gap will decrease in the long run and will balance out by 2030, as shown in Figure 7.10.

Needless to say, the growth of the construction sector should be encouraged in tandem with the enhancement of local capacities to produce basic construction materials, as well as the rationalization of the transport and distribution systems for construction materials.

Figure 7.10 Anticipated Housing Gap between Demand and Supply



Source: JICA Study Team

2) Affordable Models for Average Households

A model of a “housing purchase plan” by an average household with an income of 250,000 Tg./month was studied. It was assumed that the minimum floor area requirement was **35 m²** and two options of apartment units are available in the hypothetical market, i.e. House A, costing Tg.21.2 million (**550 US\$/ m²**); and House B, costing Tg.15.4 million (**400 US\$/ m²**). It was likewise assumed that 70% of the purchase cost will be covered by a housing loan and 30% as cash down payment given the currently available loan conditions such as a **1.0 % monthly** interest rate and a **10-year** repayment period.

Under the above assumptions, in order to purchase “House A”, the average family has to pay Tg.129,000 for the monthly loan repayment, and should have an income of at least Tg. **322,500** per month, if the loan repayment should be less than 40% of their total income. The average family cannot afford to purchase House A. On the other hand, with the provision of a subsidy that will lessen the interest rate to **0.7%** per month (instead of 1.0%) and a **15-year** repayment period (instead of 10 years), the average household could purchase “House B”, as the required income is computed at Tg.265,000 per month.

As a result, the affordable housing model requires a unit cost of 400 US\$/ m² with a 35 m² floor area.

Figure 7.13 Affordable Housing Models for Average Households in Ulaanbaatar City

	House A	House B
Housing Market Floor Area per Household Unit Price of Housing Unit	35 m ² 550 US\$/m²	35 m ² 400 US\$/m²
Purchasing Plan Housing Purchase Price Down Payment Mortgage Loan	21,175,000 Tg 6,352,000 Tg (30%) 14,823,000 Tg (70%)	15,400,000 Tg 4,620,000 Tg (30%) 10,780,000 Tg (70%)
Loan Conditions Interest Rate Repayment Period	1.0% per Month 10 yrs	0.70% per Month 15 yrs
Requirements (Repayment & Income) Monthly Repayment Necessary Income	129,000 Tg/Month 322,500 Tg/Month	106,000 Tg/Month 265,000 Tg/Month

Source: JICA Study Team

3) Need for Low Cost Housing Supply

In December 2008, the Mongolian government launched its new policy on “100,000 Housing Units Construction Program” which is based on more or less 80% achievement rate of the 40,000 Housing Unit Construction Program. It was announced that this target can be attained in the coming 4 years or within the term of the current administration. However, in reality the supply capacity of housing units in Ulaanbaatar was very limited in 2007 up to the present, with, more or less, 6,000 - 7,000 housing units per year, including apartments and detached houses, as mentioned in Section 8.4. Therefore, the achievement of this target would be very difficult without drastic government intervention.

Based on the foregoing housing analysis, it is clear that the provision of low cost houses is extremely important so that the majority of the middle and low income households can be provided with housing. To this end, some crucial measures should be taken with a particular focus on the importance of government intervention. Organizational measures, such as the establishment of the Social Housing Corporation and Housing Development Financing Institution (HDFI), and social measures to enhance community-based activities are proposed in Figure7.6.

In addition to the measures proposed in Section 7.4, the following government interventions should be further explored:

- Encourage the growth of construction industries and construction materials production, by providing further incentives for FDIs and soft loans for start-ups;
- Appropriate special budgets to subsidize R&D activities to invent new locally made construction materials and low-cost housing structures;
- Guide and work jointly with the private sector to develop affordable low cost housing units and to facilitate housing area development with social housing units;
- Establish the Social Housing Corporation and prepare a 20,000 housing units construction program for lower middle and low income groups; and
- Encourage the Social Housing Corporation to provide rental houses.

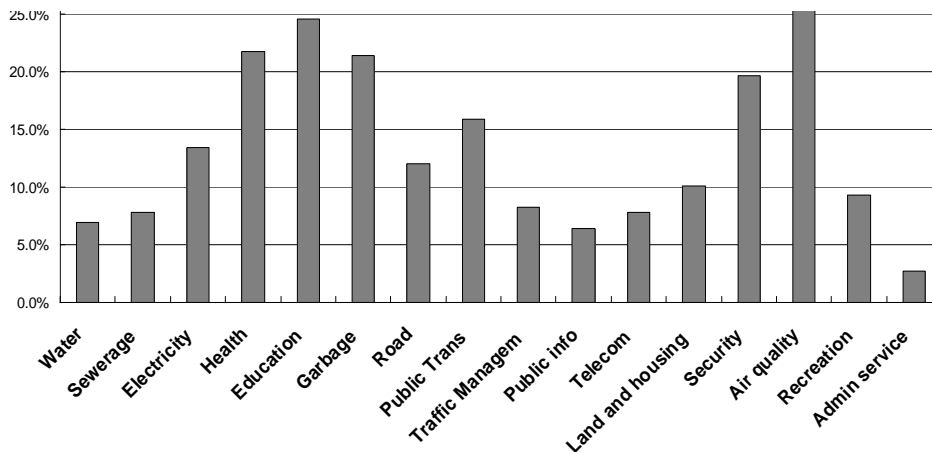
8. LIVING CONDITIONS IMPROVEMENT

8.1 Planning Issues, Visions and Strategies

1) Issues of Ger Area Improvement

Figure 8.1 shows the important concerns among Ger residents such as health, hygiene, and safety in the improvement of their living conditions.

Figure 8.1 Important Aspects of Basic Urban Services in Ger area



Source: Household Interview Survey 2007 by JICA Study Team

In general, present resettlement into apartment areas lack feasibility and affordability among Ger residents. In addition, various ongoing projects in the Ger areas mainly aim at short-term improvements of living conditions and lack long-term strategies and planning. To improve the urban environments in the Ger areas in a comprehensive and sustainable manner, it is necessary to develop a holistic vision and strategy applicable through feasible measures. The following is a summary of the main issues prevailing in Ger areas:

Mitigation of negative environmental impacts: Uncontrolled expansion of Ger areas cause negative environmental impacts such as air pollution, smog from the burning of coal during winter, soil pollution from pit latrines without sewerage treatment, etc. These negative impacts affect not only the Ger areas but also the whole Ulaanbaatar City. They also cause diseases.

Land use: Extensive and inefficient land use, which occurs when Ger areas expand, spoil and damage the natural environment. Settlements in dangerous areas such as riverbeds and hilly terrain both threaten lives and properties.

Infrastructure and public services: There are few infrastructure and utility services in the Ger areas. Though water supply through kiosks has been improved by donors, these improvements are just symptomatic and short-term treatments. A long-term fundamental solution on infrastructure development for the Ger areas is lacking.

Living conditions: Due the lack of basic housing necessities, insufficient and inconvenient access to public facilities, degraded environment, etc. the living conditions in the Ger areas do not allow residents to enjoy urban living. This is being exacerbated by the lack of effective policy support from the government. Though residents in the Ger areas worry about their living conditions and other concerns such as their financial conditions, safety, their children's future, etc., they cannot afford to improve their plight through their own initiatives.

Housing: Of the 60% of Ulaanbaatar residents who live in the Ger areas, half of them (30% of total) live inside Gers and the other half (30% of total) live in simple houses, mostly self-built wooden houses lacking the necessary utilities. Both Gers and simple houses are inadequate urban dwellings in terms of environment, sanitation, safety, and an ideal townscape.

2) Vision and Objectives

Generally, the two (2) elements of **safety** and **health** are basic concepts in the harmonization of neighboring environments. In the diversification of urban facilities and activities, the two (2) other elements of **convenience** and **amenity** are adopted. In summary, an ideal vision of improved living conditions is a situation wherein “**all urban residents live under healthy housing conditions with basic urban services and in a safe and environment-friendly manner.**” To achieve this vision, the following objectives are proposed:

- Promote appropriate land use and mitigate environmental damages;
- Ensure effective development of infrastructure and urban utilities;
- Comprehensive improvement of living conditions;
- Develop legal and institutional mechanisms to improve living conditions and housing development; and
- Raise people's awareness of urban lifestyles, conditions, initiative, and community participation.

3) Strategies for Ger Area Improvement

To achieve the proposed target, a comprehensive strategy is needed which includes planning mechanisms, physical improvement, institutional arrangements, socio-economic improvement, etc. The following six (6) strategies are proposed:

- (a) Define living conditions standards;
- (b) Propose a proper zoning system and clear resettlement mechanisms;
- (c) Provide basic utilities through the expansion of central infrastructure networks or the development of a local cluster infrastructure system;
- (d) Supply various types of houses;
- (e) Establish various planning methodologies to provide proper urban facilities and services; and
- (f) Promote self-help improvement and support from the government.

8.2 Planning Methodologies for Living Conditions Improvement

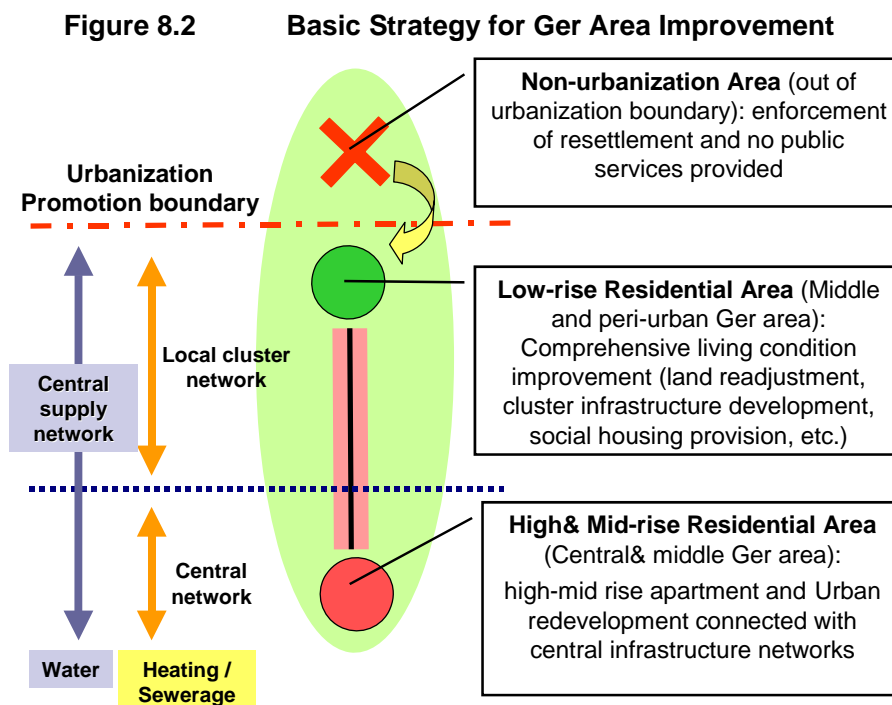
1) Zoning Mechanism for Controlling Ger Area Expansion

The potential for future development of the Ger areas will mostly depend on infrastructure connectivity, especially on a central heating system. Depending on infrastructure accessibility, the Ger areas are categorized into three (see Figure 8.2):

(a) Non-urbanization Area: Ger settlements located outside the urbanization promotion boundary are forced to move and relocate to safer areas inside the boundary. Infrastructure and utilities provision are not prioritized, or provided, in these areas.

(b) Low-rise Residential Units in Middle and Peri-urban Areas: A comprehensive living conditions improvement project based on community-based approaches and facilitated through institutional mechanisms involving “Land Readjustment” in association with infrastructure development and social housing provision by the public sector. Heating and sewerage facilities are provided through a local cluster system and water supply is centralized.

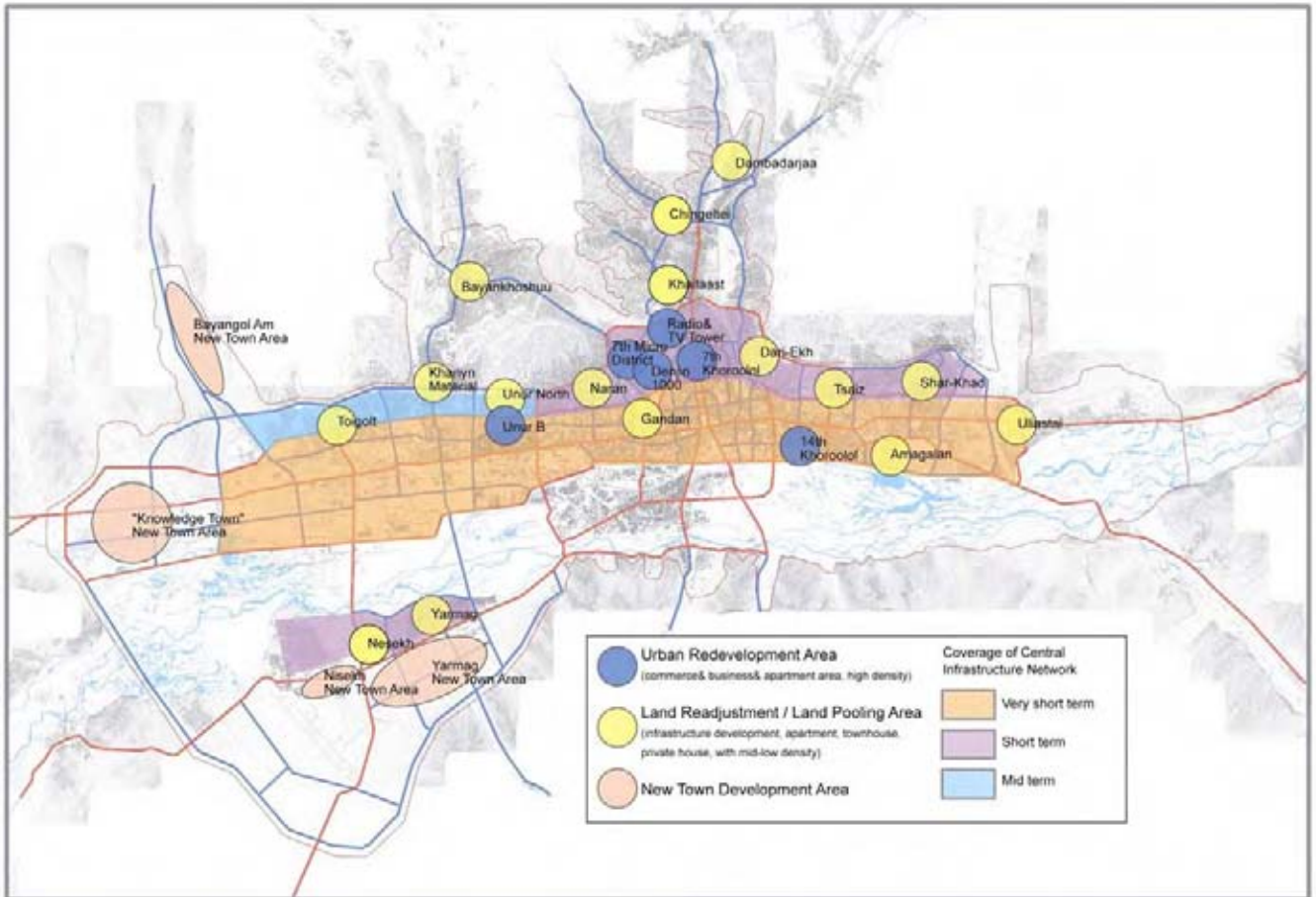
(c) High- and Midrise Residential Units in Central and Middle Areas: The promotion of high- and midrise apartments and urban redevelopment projects connected to a central infrastructure network.



Source: JICA Study Team

The basic requisites or orientations for the improvement and development of a number of residential areas, including the Ger areas, are proposed in Figure 8.3. Projects are categorized into three (3) types: (a) Urban redevelopment for on-site improvement in central apartment areas; (b) Land readjustment for on-site improvement in the Ger areas; and (c) New town development for the creation of new settlements.

Figure 8.3 Development Orientations of Residential Areas in UB City



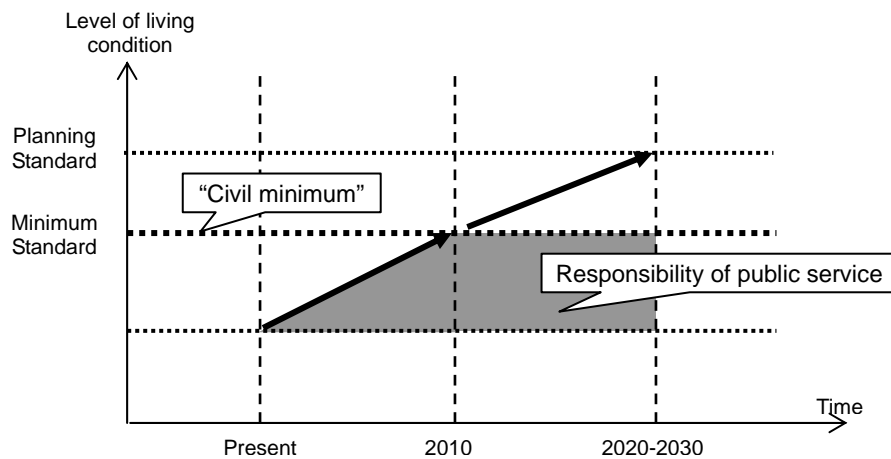
Source: JICA Study Team

2) Planning Standards for the Improvement of Living Conditions

To develop strategies on the improvement of living conditions, as well as attain policy targets, it is necessary to establish clear planning standards and define the responsibilities of both the government and the citizenry. Two (2) standards will be set: (a) “Minimum Standard” to secure the required minimum living conditions, and (b) “Planning Standard”, to achieve the desired living conditions. To satisfy both the minimum and planning standards, the public sector will play an essential role, especially in the Ger areas where public service provision is limited. The government has to be responsible for providing the necessary public services to secure the minimum standard (see Figure 8.4).

Standards are proposed for housing, basic utilities, and public urban facilities (see Table 8.1). Existing standards on public facilities should be applied not only in the apartment areas but also in the Ger areas. For example, the minimum standard of 5m²/person for the “Parks and Green Areas” is based on the existing standard, and the basic standard of 20m²/person is from the target of the UBMP-2020.

Figure 8.4 Basic Concepts of Living Conditions Standards



Source: JICA Study Team

Table 8.1 Proposed Policy Targets and Standards

Facilities		Policy Targets	Minimum Standard (Civil Minimum)	Basic Standard (Planning Targets)
Housing	Housing type	All households have shelters.	Living area: 10 m ² /person	Living area: 12 m ² /person
Utilities	Water supply	All households have access to tap water at the same cost.	Houses without tap water: 25 m ² /person/day	Houses with access to central water pipeline: 200 m ² /person/day
	Sewerage	Domestic and industrial wastewater is discharged after treatment complying with environmental standards.	Use shield-type pit latrines (ECOSAN) ²	1. Connect to central sewerage network. 2. Connect to local cluster sewerage network. 3. Treated by septic tanks.
	Electricity	All households have access to electricity.	All households are connected to the electric power distribution network.	
	Heating	All households can use clean heating system.	Use improved stoves or briquettes	1. Connect to central heating pipeline. 2. Connect to local cluster heating network.
	Solid waste	All households can dispose of solid waste after treatment.	Establish a garbage collection system per community.	Treatment and recycling system
Facilities	Kindergarten	All households can access these facilities within the service catchment area designated for each service.	Size: 100 children per 1000 persons Service catchment area: r = 300-500m Area: 30-40 m ² /child	
	Elementary & Secondary Schools		Size: 200 pupils per 1000 persons Service catchment area: r = 500-750m Area: 18-50 m ² /pupil	
	Clinics and/or hospitals for primary health care		Size: 9 beds per 1000 persons Service catchment area: r = 1-2km Area: 60-300 m ² /bed	
	Parks & green areas		5 m ² /person	20 m ² /person

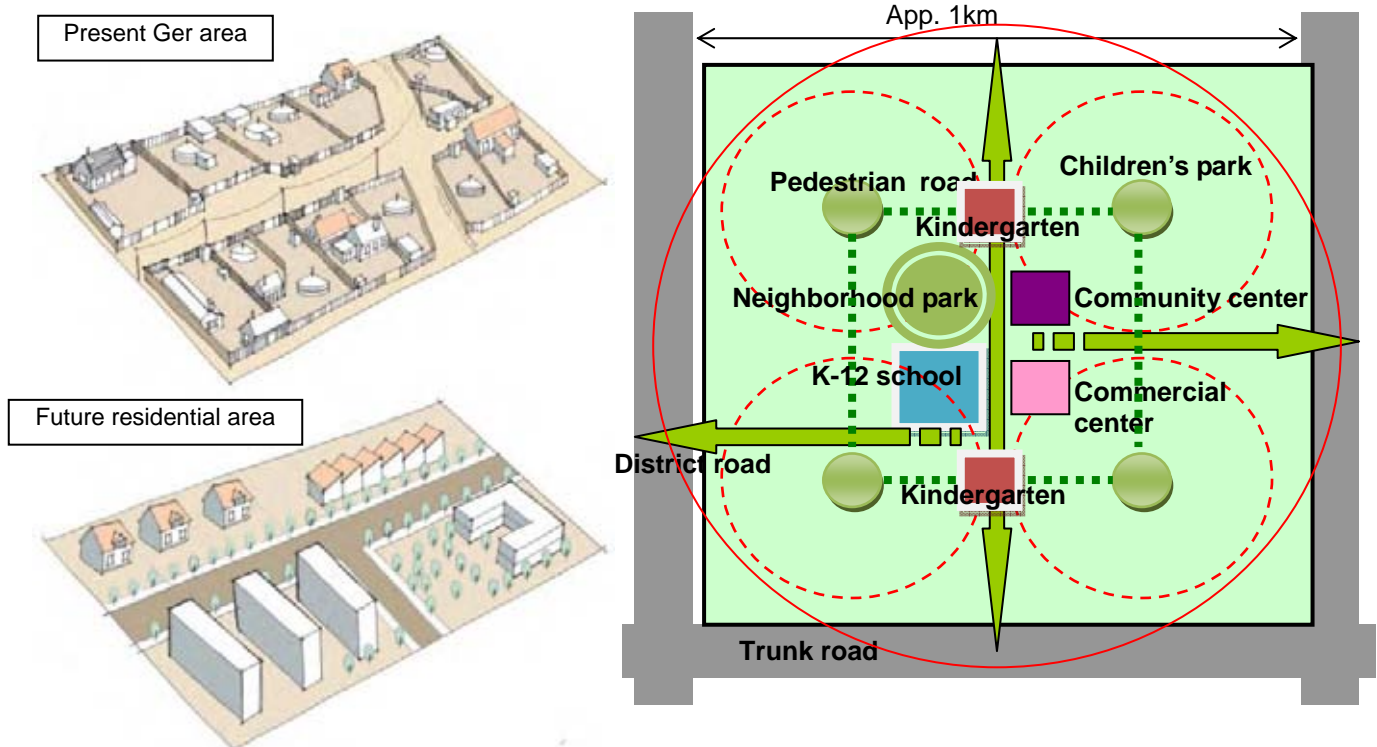
Source: JICA Study Team

² In terms of costs and customs, it is not realistic to treat solid waste onsite through latrine pits. The establishment of a solid waste collection system, wherein solid waste is utilized as fertilizer, or treated and disposed of at garbage dumps, etc., is proposed.

2) “Neighborhood Residential Unit” Planning

A “Neighborhood Residential Unit” is a basic urban planning unit with the development of community facilities such as kindergarten and elementary schools, as well as parks in the residential areas (see Figure 8.5). Basically, the service area of 1 school is the basic unit and consists of a 7,000 - 10,000 population. In UB City, the Khoroo-based “Neighborhood Residential Unit” can be applied for plans on living conditions improvements, especially in the Ger areas. This concept gives residents access to public facilities and amenities in the neighborhood and enhances a school-centered community. Based on a two-shift system of classes and the capacity of complex schools (for 6 - 17 year-old students), an 18,000–20,000 population residing within approximately 100ha (1km x 1km) is an average Neighborhood Residential Unit (180 - 200 persons/ha). The central facility of this unit is the school with service coverage of approximately 500m and where students go to on foot.

Figure 8.5 Image of a Neighborhood Residential Unit



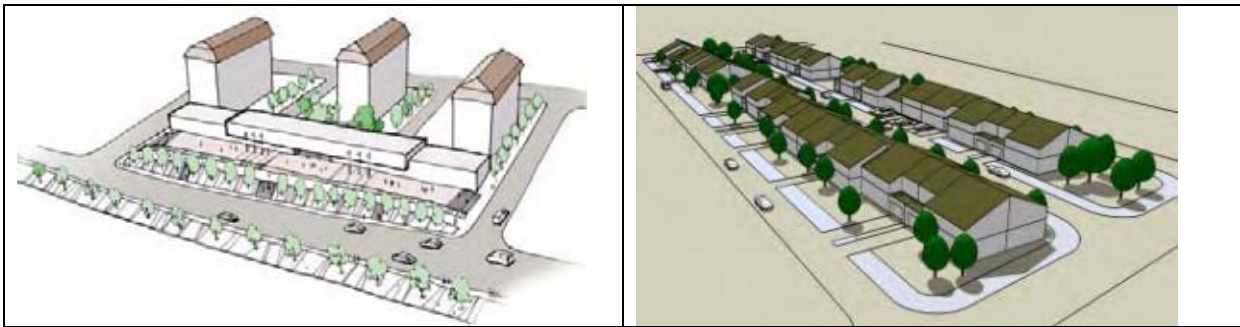
Source: JICA Study Team

3) Affordable Housing Development in the Ger Areas

Though many Ger area residents expect to move into apartments or live in private detached houses with amenities such as a garden, garage, etc. the affordability of such proprietary dreams should be taken into account. In theory, housing development is basically invested in by residents, but if residents are burdened with such difficulties as poverty, joblessness, etc., the public sector should provide technical and financial support under appropriate housing policies (e.g. social housing development, rental housing development, community fund, etc.).

In terms of economic and environmental efficiency, the collective housing model such as the **townhouse** is recommended (see Figure 8.6). Townhouses are low-rise houses in a row. Several homes (10 - 20) can be planned as such and developed into a community. The land is either shared by homeowners or owned by each household. The advantages of a townhouse are: (a) land, infrastructure, and utilities are integrated; (b) construction and maintenance costs are cheaper than in detached houses; and (c) they attain heat efficiency since walls are common.

Figure 8.6 Images of Future Housing Types



Source: JICA Study Team

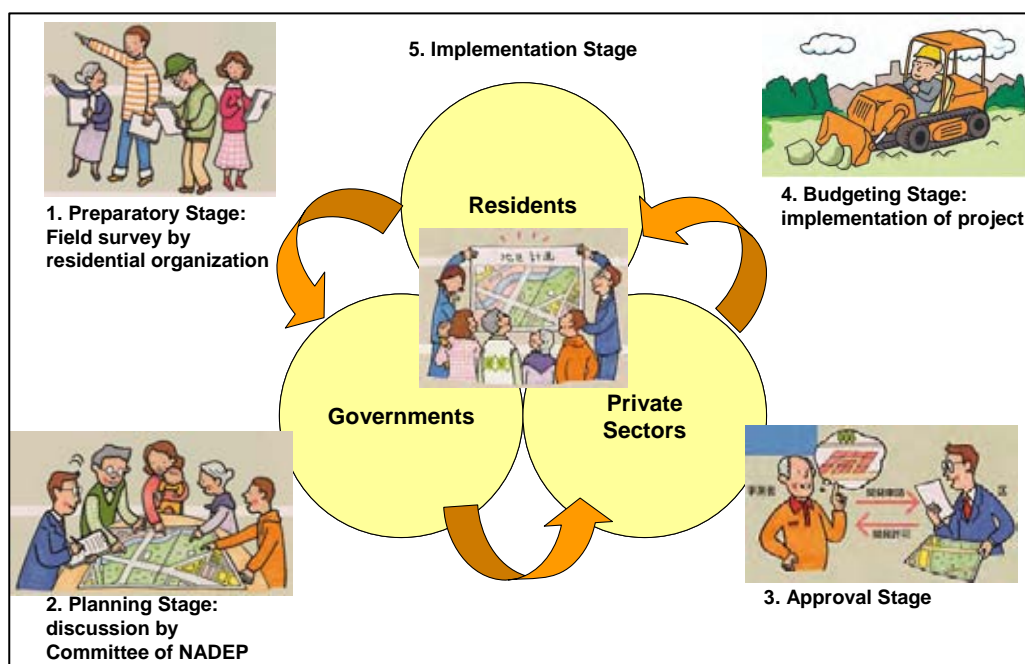
8.3 Proposed Community-driven Implementation Mechanisms

1) Planning and Implementation Mechanism for NADEP

It will be necessary to develop community-driven implementation mechanisms, in the development of a residential area plan that is acceptable to Ger residents as well as technically and financially feasible. To appropriately implement residential development projects that will improve living conditions through a community-driven mechanism, the main issues involved are the following: (a) Formulation of a “**Neighborhood Area Development Plan**” (NADEP); (b) Consensus building; (c) Financial feasibility; and (d) institutional mechanism.

The involvement of three (3) main stakeholders, i.e. residents, the government, and the private sector (developers), into the whole planning and implementation process of NADEP is crucial (see Figure 8.7). This participatory system aims to build consensus among residents, secure the smooth approval of development plans by government institutions, and ensure financial sustainability. Figure 8.8 shows the overall process of the proposed community-driven neighborhood area development from preparation up to implementation. It also presents stakeholders’ roles and functions.

Figure 8.7 Planning Process and Stakeholders of the NADEP



Source: JICA Study Team

2) Contents of the Neighborhood Area Development Plan (NADEP)

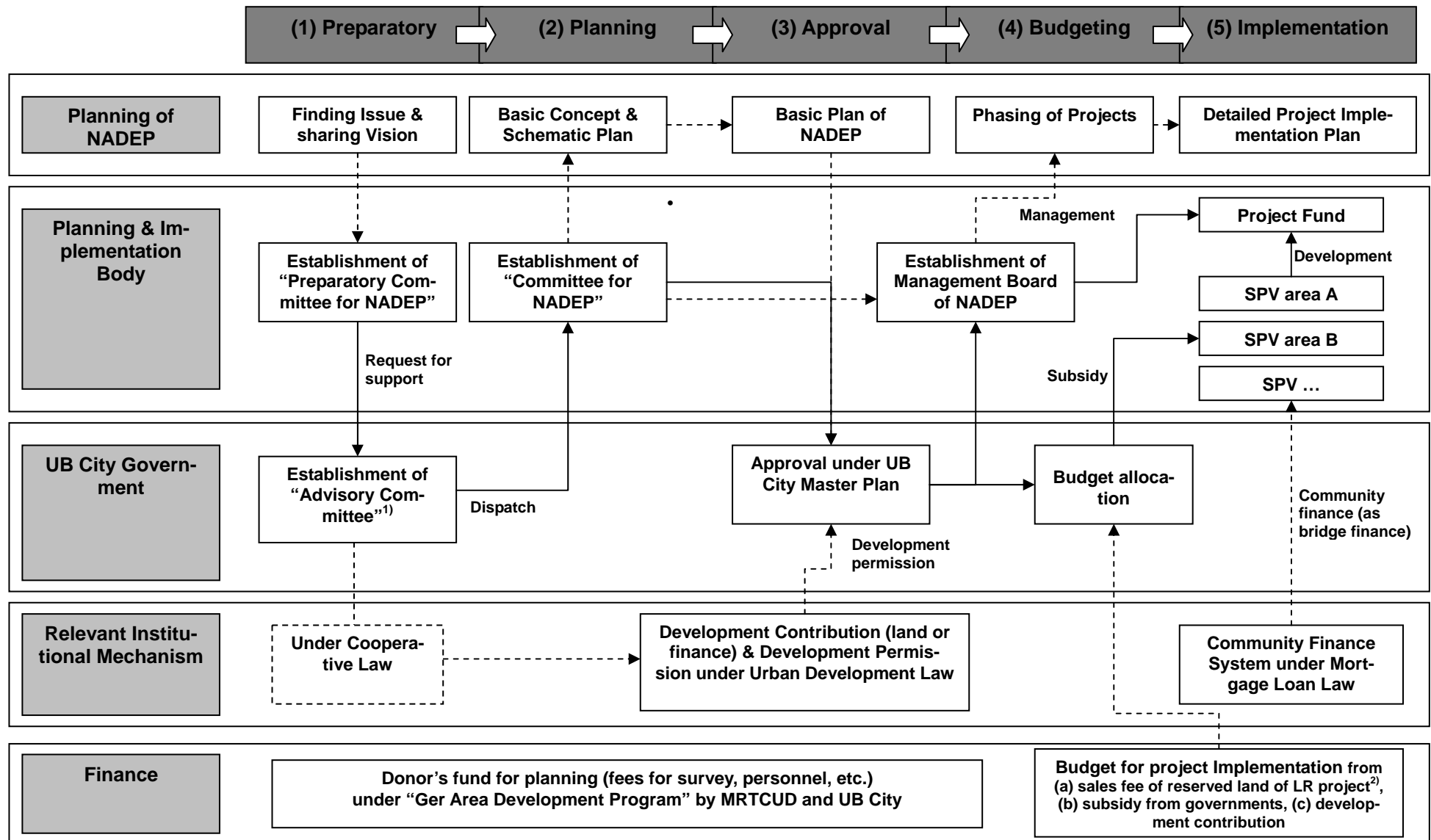
Compared to the city Master Plan, the planning elements of the Neighborhood Area Development Plan or NADEP are detailed and specific, as shown in Table 8.2. The contents of the NADEP are flexibly designed according to residents' opinions on how detailed they want their future plans to be.

Table 8.2 Contents of the NADEP

Category	Plan		Contents
Development orientation	Vision		Future image of area
	Future conceptual zoning plan		Conceptual map
Detailed development plan	Land-use plan		
	Road network plan	Arterial road, distributor road, collector road	Location, width
	Urban utility plan	Water, sewerage, heating, electricity, solid waste	Location, capacity
	Public facility plan	School, kindergarten, hospital, clinic, community center, park, etc.	Type of facility, location, capacity
	Housing plan	Apartment, townhouse, detached house, etc.	Type of housing, number of stories
	Other guidelines/regulations		Regulation of building usage, environmental control, preservation of heritage, etc.

Source: JICA Study Team

Figure 8.8 Planning Process of NADEP and Project Implementation for Ger Area Development



Note: 1) UB City government, MRTCUD, consultants, lawyers, etc. 2) UB City commits purchase reserved lands which are unsold for a certain period.
 Source: JICA Study Team

3) Introduction of Land Readjustment Project

The “land readjustment” system lies at the other end of the spectrum and differs from individual urban development. It has unique characteristics such as: (a) Comprehensive urban development methods; (b) Fair distribution of development charges and development benefits; and (c) Preservation of community life and lifestyles, as illustrated in Figure 8.9.

“**Land Readjustment**” is a method that re-plots land lots and develops infrastructure and public facilities on the readjusted lots. In general, but especially in Japan, original land shapes are mainly preserved, while needed partial land for roads and public facilities are contributed to the development project. Procedures for land and asset assessment are detailed and vital, but complicated and takes a long time.

Among the various land readjustment mechanisms, “**Land Pooling**” (**LP**) is a simple process which can be applicable in the Ger areas. The process is as follows: 1) All stakeholders reach a consensus on land pooling for land readjustment; 2) Land plots are readjusted to secure public lands for the provision of infrastructure and utilities; and 3) Residents move back to the newly plotted land. Reserved lands can either be used for public purposes, put up for sale, etc. Participation and consensus building among residents are indispensable factors in the success of the land pooling system.

In this context, Land Pooling may be applied to the Ger areas where land values are relatively not high compared with central apartment areas.

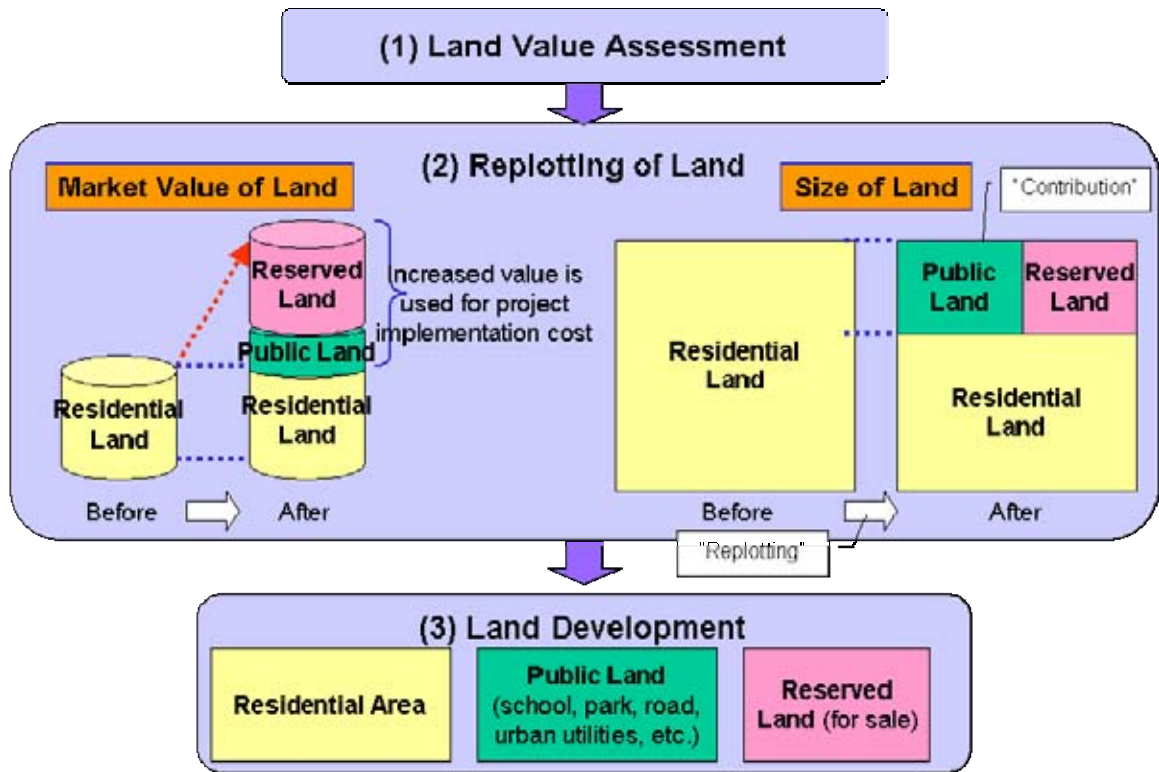
4) Land and Housing Value Assessment Systems

In the application of land readjustment (including land pooling) project in the Ger areas, a pivotal issue is how to assess land and immovable assets to which all stakeholders will be amenable. This issue is one of the preliminary points in carrying out the NADEP. However, currently Ulaanbaatar has no official rational land valuation system. To accelerate urban development projects, including land readjustment, it is essential to establish a legal valuation system first.

Under the current circumstances, the establishment of a “**Weighting and Rating System**” for lands and assets especially for the Ger areas is proposed through community participation. This system has three (3) steps; 1) Weighing land values by comparing land lots in the project area; 2) Rating each land value through scores; and 3) Assessing the value, as shown in Figure 8.11. The following are the general characteristics of this system:

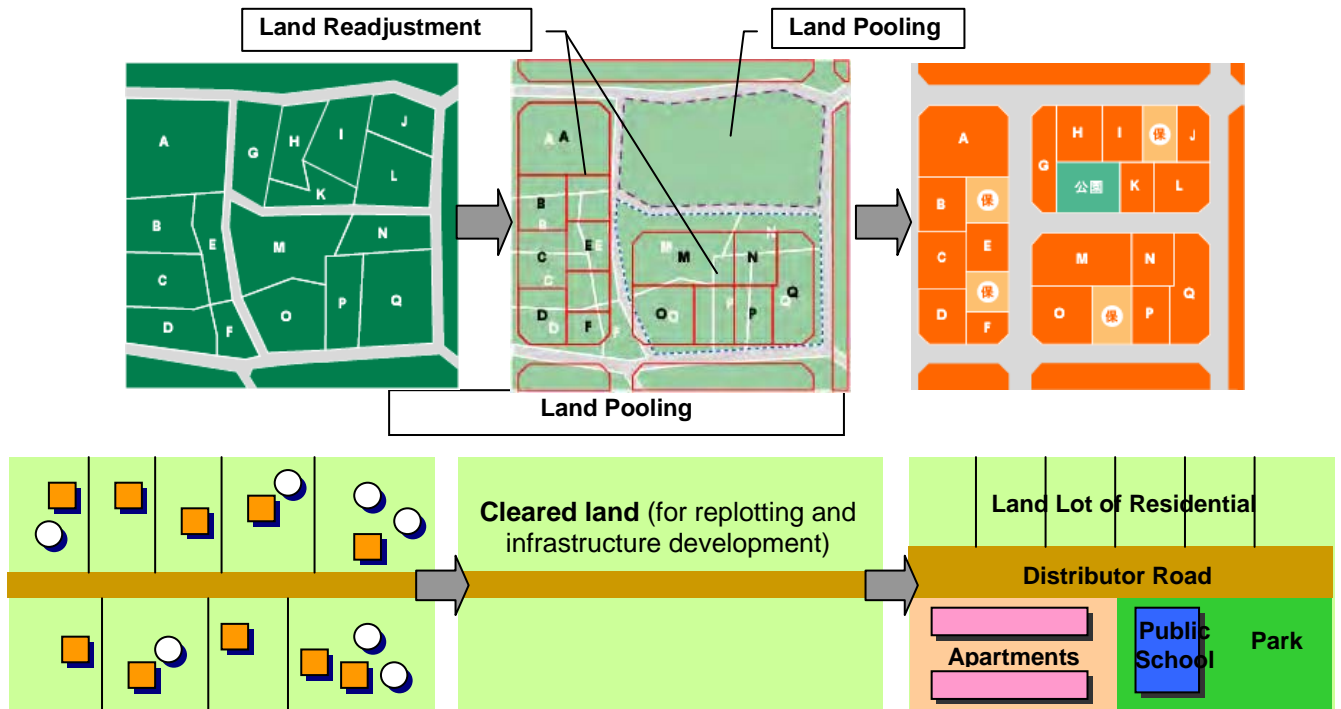
- It establishes a land and asset valuation committee that includes experts, lawyers, the land management department of UB City, and representatives of residents;
- It defines assessment indicators through clear common standards; and
- It establishes an assessment system relative to each project area to build consensus among affected stakeholders especially land and asset owners in the area.

Figure 8.9 Basic Concepts and Approaches of Land Readjustment



Source: JICA Study Team

Figure 8.10 Processes of Land Adjustment and Land Pooling

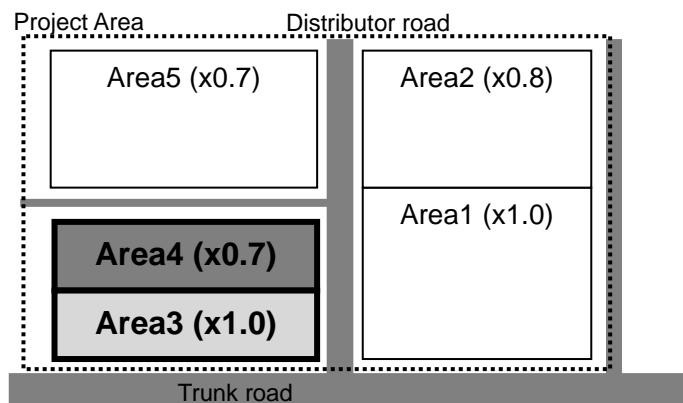


Source: JICA Study Team

Figure 8.11 Weighting and Rating System for Land and Asset Valuation

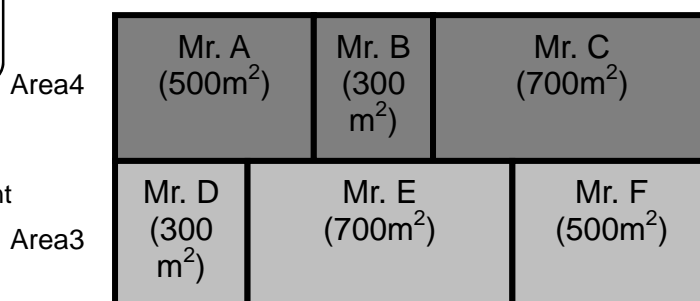
STEP 1: Weighting of land value relative to other land values in the project area

- Categorize homogeneous land lots for relative land value assessment
- Give advantage to land lots in front of trunk road or intersection
- Define weighting by each land lot (1.0 is the maximum)



STEP 2: Rating of each land value with scores

- Allocate score to each land of households by multiplying weighting and share of present land area



STEP 3: Assessment of Value

- Define indicators for housing and other asset assessment among stakeholders
- Define rank (weighting) of indicators, and score/ point for each indicator (Maximum points of rank: A=20, B=10, C=5)

Indicator	Rank	Scoring (example)				
		20	10	5	0	
House	Structure	A	Detached with hard structure	Wooden house	Ger	/
	Floor area	A	More than 200m ²	100m ² -200m ²	Less than 100m ²	/
	Construction year	B	/	Less than 1 year	1-3 years	Older than 3 years
	Toilet	C	/	/	Flush / with septic tank	Pit latrine/ none
	Water supply	C	/	/	Running water/ well	Kiosk
	Electricity	C	/	/	Connected	None
	Heating	C	/	/	Electricity / improved stove	Coal stove
	Car parking lot	C	/	/	Owned	None
Others	Business right (annual turnover)	A	More than 10,000\$	5,000\$-10,000\$	Less than 5,000\$	/
	Special consideration	C	/	/	(add points)	/
Total (maximum score)		100				

Source: JICA Study Team

8.4 Proposed Detailed Plans on Model Ger Areas in Unur and Dambadarjaa

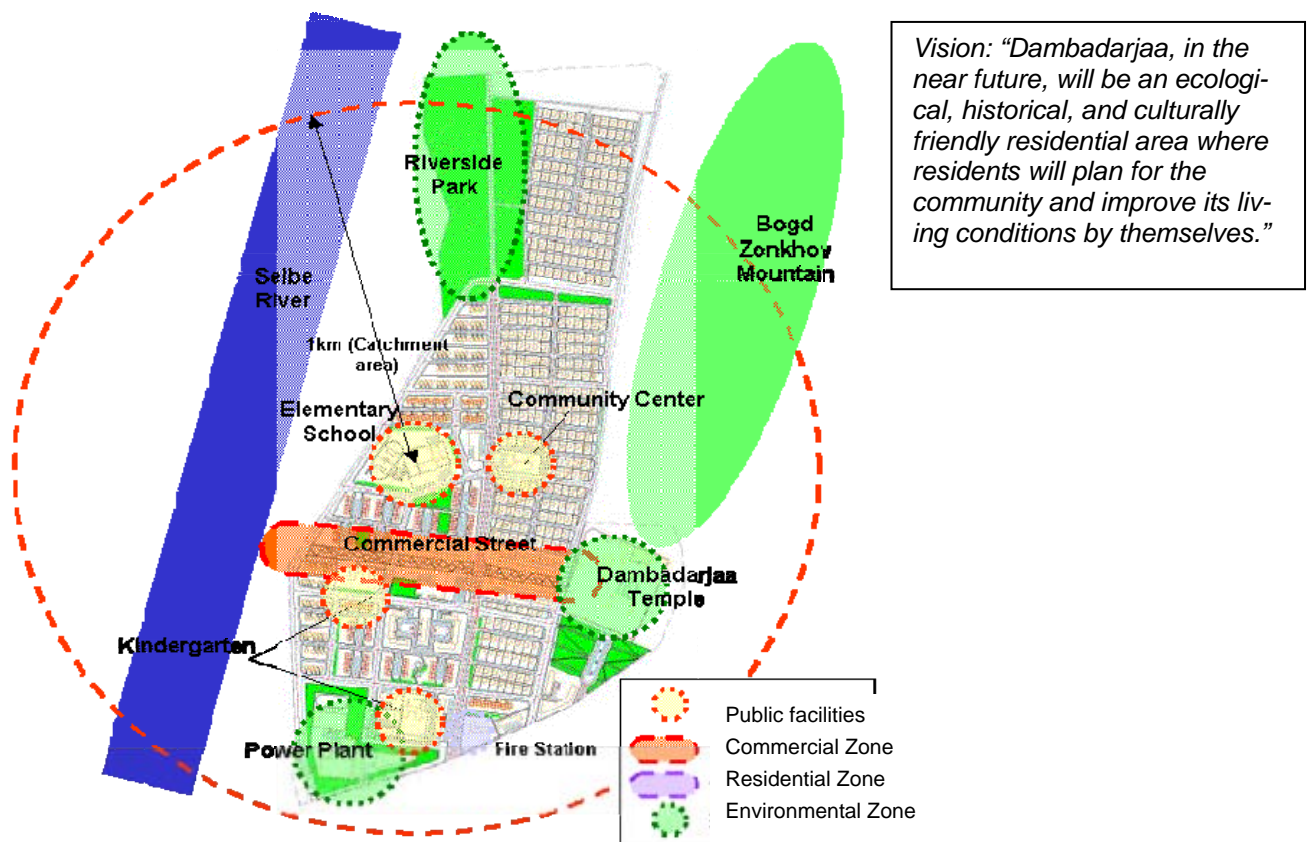
1) Objectives and Outcomes

The main objectives of the pilot detailed plans on model Ger areas in Unur and Dambadarjaa are to examine the planning measures and institutional mechanisms proposed in the Master Plan, then verify their feasibility and applicability through a community participatory approach.

In these model projects, the tried methods are: (a) neighborhood area development planning, and (b) land readjustment. To formulate the detailed plans that complies and complement with the proposed Master Plan, as well as build consensus among stakeholders, the JICA Study Team conducted a series of meetings with stakeholders including district, Khoroo authorities, and the community residents.

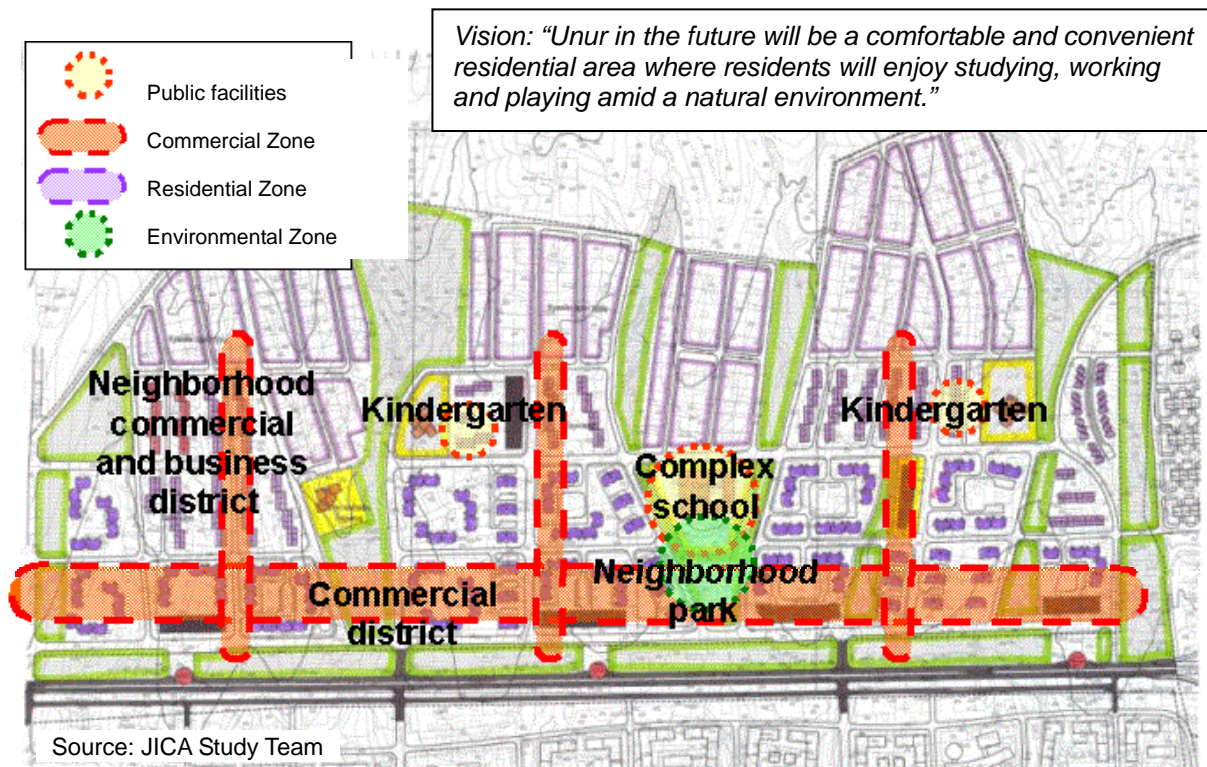
In the planning and discussion processes with stakeholders, a number of outcomes were achieved, and these included: (a) Sharing future development visions; (b) Proposal on appropriate infrastructures and housing development; (c) Proposal on necessary institutional and financial mechanisms; and (d) Participatory process toward consensus-building and feasibility. At the end of the model projects, concept plans were developed, which are expected to be approved as NADEP by Ulaanbaatar City (see Figure 8.12 and 8.13).

Figure 8.12 Proposed Concept Plan for Dambadarjaa



Source: JICA Study Team

Figure 8.13 Proposed Concept Plan for Unur



2) Pilot Project Discussions

On-site discussions were made through regarding the proposed community-driven implementation mechanism. Most of the residents insisted on discussing land ownership, size, and the settlement of their present houses. They worried about being evicted, resettled, or their lands becoming smaller. The following were the major findings from the discussions:

- Residents expect that the government will develop infrastructure and construct apartments, which explains their inherent passive attitude;
- Residents understand the basic concept of land readjustment and land pooling, but they don't fully trust that the value of their land would increase after the project. They expect to monitor pilot LR projects in other areas and apply their finding to their areas;
- Most of the residents have no financial capacities to build new houses by themselves; so they expect that a housing development project is integrated with the LR project; and
- Residents welcome government officials to participate in the planning process and expect further studies on urban planning through practical methods.

In general, it is necessary to identify stakeholders and relevant agencies to facilitate and implement the NADEP and other urban development projects (e.g. LR project) with financial and institutional feasibilities. Community meetings are a good opportunity for consensus-building and role sharing. They help achieve expected outcomes and create consensus about the next developmental step.

9. URBAN UTILITIES & ENVIRONMENT

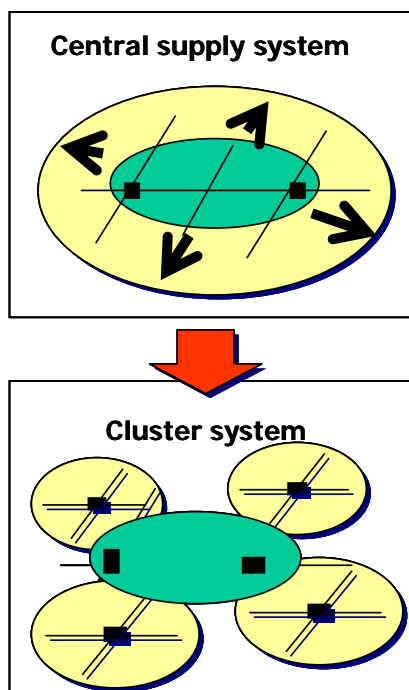
9.1 Common Issues on Urban Utilities

This chapter looks into the development directions for urban utilities such as water supply, sewerage system, electricity and heating system, and environment-related subsectors such as solid waste management, air pollution control, and disaster management in Ulaanbaatar City. In the utility infrastructure, some common issues were identified as follows:

Physical Improvement: Expansion of the capacity in association with rehabilitation and/or replacement of decrepit facilities.

Management Improvement: Improvement of the management system in association with reforms of existing tariff structures, taking into account their affordability and the feasibility of sustainable service provision. Some Public Private Partnership (PPP) models need to be explored for good management practices.

Figure 9.1 Concept of Cluster System



Merits of Local Cluster Network System

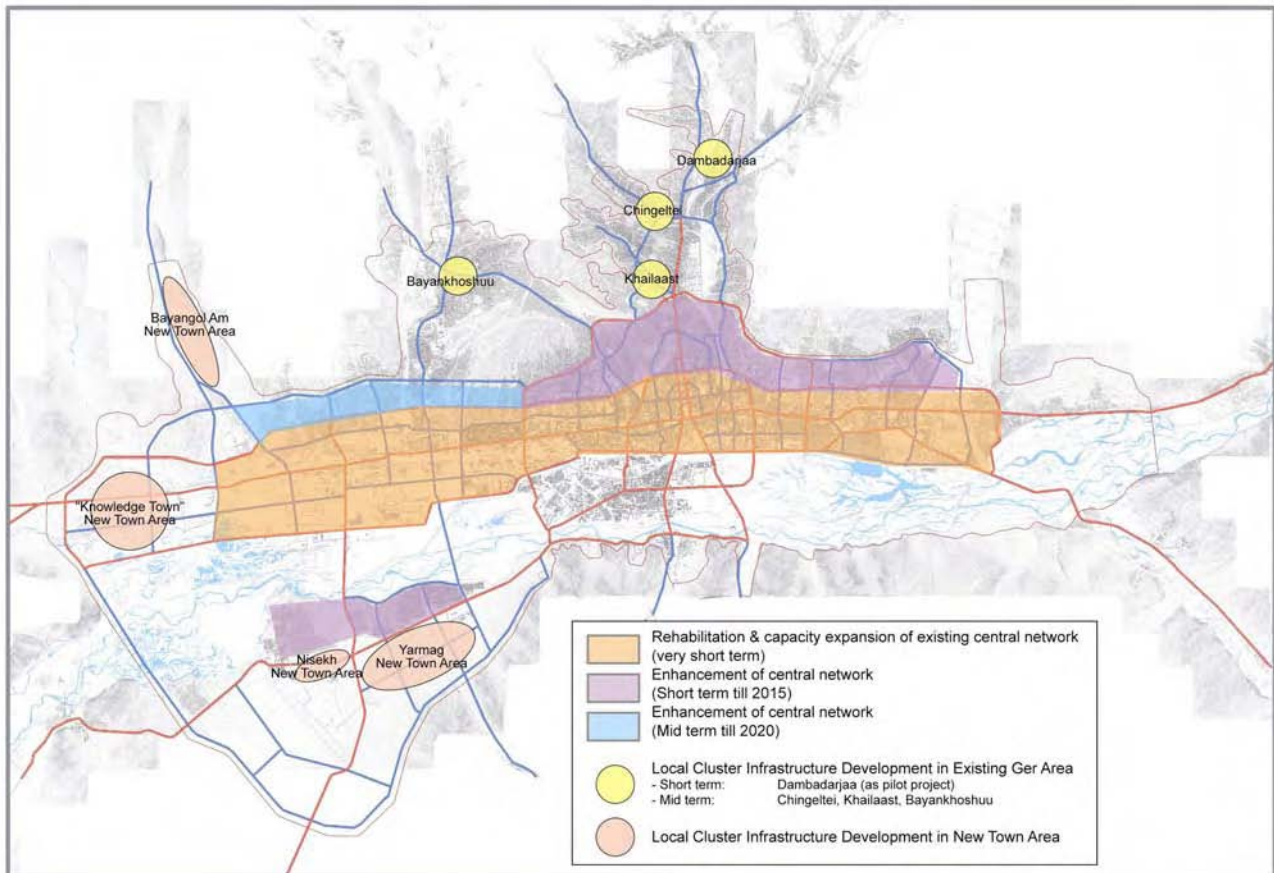
- Small initial cost
- Time-saving implementation
- Possible management by private sector

Technical System: The centralized services of utilities, especially for heating system and sewerage system, will be hard in reaching residents in suburban areas during rapid urbanization or continued urban sprawling. The expansion of the capacity of the centralized system will become less feasible both technically and financially. Therefore, it is proposed that a number of local cluster sub-systems should back up the central system and be incorporated into the overall integrated system in Ulaanbaatar City (see Figure 9.1).

Environmental Issues: Ambient air pollution during winter is a recurrent environmental problem. Short-term solutions should be sought through a multi-sector approach. Likewise, disaster management needs the enlistment of the 3 “E”s, i.e., Environmental measures, Enforcement measures and Engineering measures. This is the case for solid waste management as well.

Overall Coverage and Spatial Structure: In consideration of spatial urbanization toward 2030, an overall coverage concept of infrastructures and utility services is proposed as shown in Figure 9.2.

Figure 9.2 Overall Coverage of Infrastructure and Utilities



Source: JICA Study Team

9.2 Water Supply

1) Planning Issues

Water is a key lifeline that Ulaanbaatar City needs for it to continuously function as a capital city through another millennium. Water resources should be conserved with the highest priority. Its importance is not comparable with other resources. The planning issues on water are summarized in the following:

- Water capacity enhancement;
- New water source development;
- Improvement and/or rehabilitation of water supply facilities and equipment; and
- Demand-side management to water saving.

2) Planning Target

The planning target is laid forth in the goal: "That all Ulaanbaatar citizens can readily access potable piped water" for the long term.

3) Demand-Supply Balance

Water demand projections were made based on consumption assumptions of two housing type cases, as shown in Table 9.1. The future housing demand by type is forecasted in Chapter 7. Case 1 involves a higher demand case wherein 230 liters/person/day (l/prs/d) is employed, as in the Water and Wastewater Master Plan 2020. Case 2 is a lower demand case through strong demand management aimed at 150 l/prs/d for apartment dwellers, which is the per-capita demand target of the water authority.

Table 9.1 Assumed Per-capita Water Consumption Volume

	Unit	2007	2010	2020	2030
Case 1 (higher case)					
Apartment	(litters/person/day)	230	230	230	230
Detached with central system	(litters/person/day)	80	88	142	230
Ger and simple house	(litters/person/day)	7.2	25	25	25
Total demand	(m ³ /day)	154,500	225,000	351,300	510,700
Case 2 (lower case)					
Apartment	(litters/person/day)	230	218	181	150
Detached with central system	(litters/person/day)	80	85	113	150
Ger and simple house	(litters/person/day)	7.2	25	25	25
Total demand	(m ³ /day)	154,500	217,100	294,900	367,700

Source: USUG and JICA Study Team

Current water supply capacities are as follows:

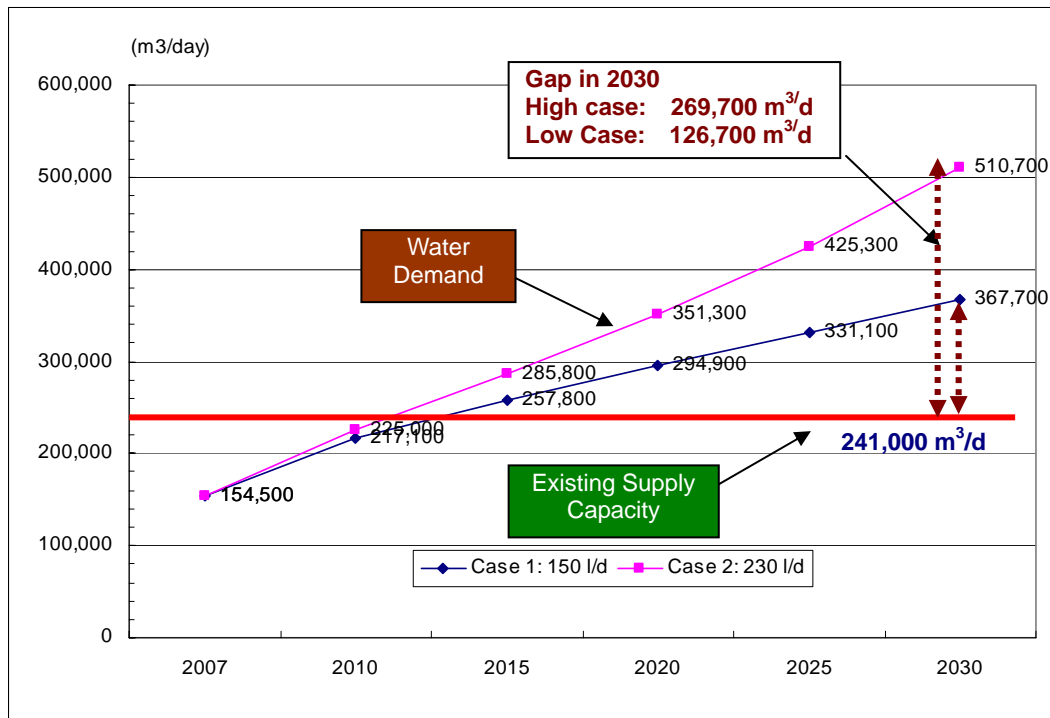
- Average capacity: 161,000 m³/day
- Design capacity: 241,000 m³/day (with 4 water sources)

Figure 9.3 shows the demand-supply gap in water supply in the long term. Water demand will increase along with urbanization and the improvement of housing conditions. It will reach 351,300 m³/day by 2020 and 510,700 m³/day by 2030 for the higher demand case, and 294,900 m³/day by 2020 and 367,700 m³/day by 2030 for the lower demand case.

Obviously, the current capacity of 241,000 m³/day will be reached sooner than 2012 and will mean a shortage by 2015. By 2030, the gap between capacity and demand will account for 269,700 m³/day. This means that additional capacity should be developed up to 2030 for the higher case, and by 126,700 m³/day for the lower case.

A well-thought out demand management may defer the critical point by some years; however it is crucial that new water resources should be developed as soon as possible to address future demand.

Figure 9.3 Demand-Supply Balance in Water Supply



Source: JICA Study Team

4) Requirements on Water Supply

(1) Development Requirements

Three areas of development should be carried out to stave off a future water crisis in Ulaanbaatar City, These are: capacity expansion, system improvement, and water tariff reforms:

- **Capacity Expansion:** Two measures should be taken at once, i.e. expansion of existing water sources and new source development. There are three options on new source development, as shown below. However, despite its historical argument a decision has yet to be made on this. On volume of demand, the issue is not a matter of selection but the pursuit of all options in the long term.
 - Biokombinat, Lower Biokombinat (90,000 m³/day) (WWWMP 2020);
 - Lower Nalaikh (40,000 m³/day) (Gachuurt) (1995 JICA Study); and
 - Dam at Tuul and Terelj River (45,000~225,000 m³/day).
- **System Improvement:** Demand management needs to be encouraged in association with the rehabilitation of aging pumps, reservoirs, and distribution pipelines. Water leakage should be minimized. The ongoing metering project should be further expanded to include an additional 55,000 households. It has been shown that once a water meter is installed a subscriber's consumption drastically drops to 180 l/pax/day. This project also substantially contributes to revenue increases.
- **Water Tariff Reform:** The current tariff structure needs to be reformed on the following aspects: 1) The standard of fairness, and 2) The feasibility of the entire water business.
 - At present, there is a large difference in water charges between kiosk water and

piped water. Charges on kiosk water should be lessened and piped water charges could be raised. A cross-subsidy system can be formulated by taking both these measures into consideration.

- It is ideal for the entire water business to be financially feasible in the long run. Even though the recovery of initial investments through tariff revenue could be difficult, operation and maintenance costs should at least be recoverable through revenues. Based on this concept, the current tariff structure should be re-assessed and re-formed. Otherwise, the water business will deteriorate and its operations will be adversely affected by business downturns.

(2) Investment Requirements

At least a total of US\$ 326 million will be required, out of which the Water Master Plan 2020 (WWWMP), including new water source development, is proposed at about US\$ 290 million up to 2020. In addition, the following important projects should be financed:

- Lower Nalaikh: US\$ 29 million;
- Metering: US\$ 6.5 million; and
- Development of other water sources and administrative improvements.

9.3 Sewerage

1) Planning Issues

The existing sewerage system has deteriorated, and urgent improvement is urgently required to keep Ulaanbaatar City environmentally sound and healthy. A well-functioning sewerage system is needed to protect underground water sources from possible contamination. Three (3) issues should be considered in this sense:

- Enhancement of treatment capacity
- Proper treatment of industrial wastewater
- Improvement of sanitation in Ger areas, summer house areas and tourist camps

2) Planning Target

The planning target is for domestic and industrial wastewater to be treated 100% before being discharged into rivers.

A new industrial wastewater treatment system, through a cluster pattern, should be developed and separated from the domestic system.

3) Demand-Supply Balance

It is assumed that the volume of wastewater for treatment is almost equal to the water supplied, as shown in Table 9.2.

Table 9.2 Projection of Wastewater Volume to be Treated

	2007	2010	2020	2030
Wastewater to be treated (Higher case)	154.5	222.5	351.3	510.7
Wastewater to be treated (Lower case)	154.5	217.1	294.9	367.7

(m³/day)

Source: JICA Study Team

Existing treatment capacities of domestic wastewater in the central wastewater treatment plant (WWTP) are the following:

- Operation: 177,500 m³/day, and
- Design capacity: 230,000 m³/day.

In practice, the central WWTP cannot be operated to its full capacity without rehabilitating or improving the entire system.

The balance between operating capacity and demand will almost be 173,000 m³/day by 2020 and 333,200 m³/day by 2030 for the higher case, and 117,400 m³/day by 2020 and 190,200 m³/day by 2030 for the lower case. Which means that in the higher case, the capacity needs to be doubled by 2020.

On industrial wastewater treatment, it has been noted that all treatment plants have been privatized, which means almost un-functional in the treatment.

4) Requirements for a Sewerage System

(1) Development Requirements

There are four development requirements for the sewerage system, as follows:

- **Capacity expansion of the total treatment system:** The total treatment capacity needs to be enlarged to cover the entire urbanized area. The central WWTP alone cannot cover this requirement. Therefore, the following components should be developed in an integrated manner:
 - Rehabilitation and expansion of the central WWTP;
 - Development of several new medium-scale wastewater treatment plants to form a local cluster wastewater treatment system; and,
 - Expansion of existing collectors and development of new collectors to create a total system.
- **Individual Treatment Systems:** In suburban areas, including summer house areas and tourist camps, where a sewerage system is not provided, the introduction of individual local sanitation systems should be promoted, such as:
 - Septic tanks (individual to groups of households); and
 - Shield-type pit latrines.
- **Development of an Industrial Wastewater Treatment System:** There are four (4) “in-

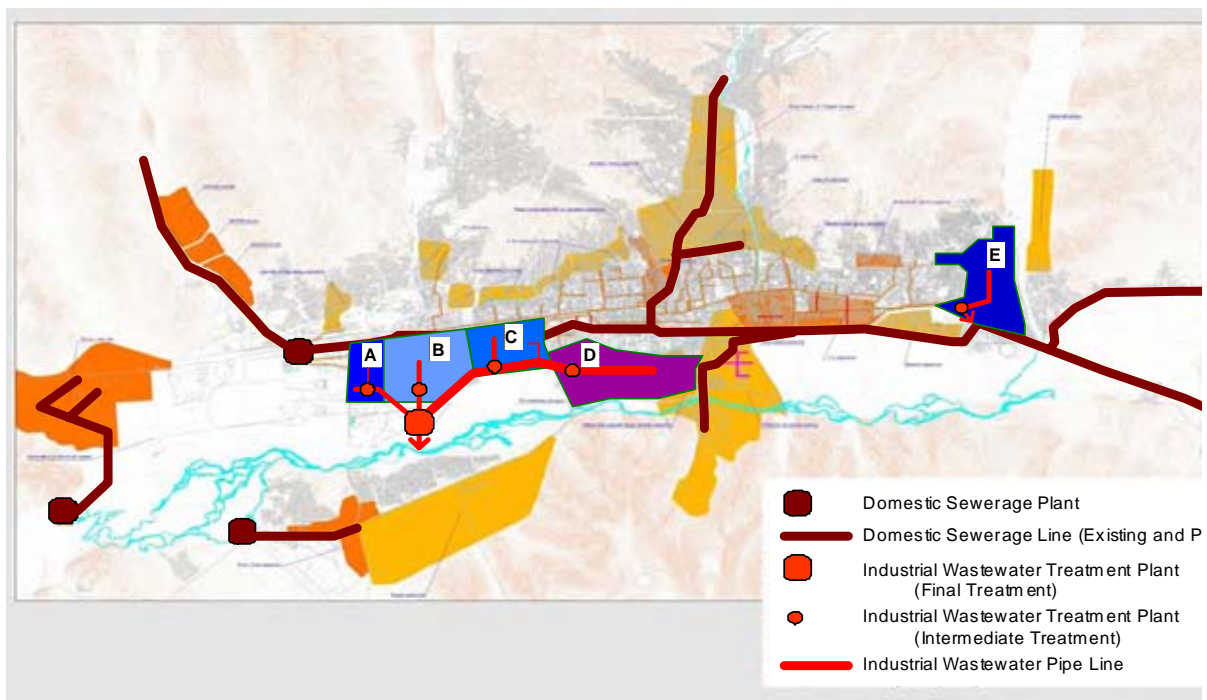
ustrial promotion zones” in Ulaanbaatar City. The Environmental Law should stipulate that each factory should be responsible for the primary treatment of its discharged wastewater. Then a secondary treatment plant should be developed in each zone, while a tertiary (or final) treatment plant should be connected to the secondary plants, as conceptualized in Figure 9.4.

- **Structural Reform:** Rules and regulations related to wastewater treatment needs to be reviewed, and this should include the review of the Environmental Law, privatization of industrial wastewater treatment, and delineation of the responsibilities of the Ulaanbaatar Water Supply and Sewerage Authority (USUG). The examination of a regulation imposing charges on wastewater treatment service as a form of water surcharge is likewise proposed.

(2) Investment Requirements

The rehabilitation and capacity improvement of the existing central WWTP and collector systems will cost US\$320 million, while the industrial wastewater treatment system will require US\$120 million.

Figure 9.4 Concept of a Collective Industrial Wastewater Treatment System



Source: JICA Study Team

9.4 Power Supply

1) Planning Issues

To meet future demand the electricity supply system needs to be improved along with the distribution network from the sub-stations. A new power generation plant is required as well to increase capacities and enhance the heating system. A suitable location of the new plant (the 5th plant) is turning out to be a great issue, because of its corresponding environmental impacts.

The introduction of new power sources other than coal is another planning concern in the long

term. Nuclear power deserves to be looked into in terms of its technical and financial feasibilities. However, human resources in the area of nuclear science and engineering will have to be developed for the long term in consideration of such energy innovation.

2) Planning Target

Since electric power is an indispensable commodity for social and economic activities, connection to a central power system by 100% of the households, businesses, and industries should be the target. Another strategy to do this is the introduction of environment-friendly power sources through PPP schemes.

3) Demand-Supply Balance

Based on economic and population forecasts as well as Ulaanbaatar's GRDP, electric power demand was projected for 2020 and 2030. The results are summarized in Table 9.3.

Current power supply capacities are tabulated in Table 9.4. Current total working capacity in UB is about the 555 MW. If the current capacity is maintained for a while, capacity will be reached by 2016. On paper, Thermal Power Station-2 (TPS-2) is due for retirement in several years time while TPS-3 will retire by 2015. Taking into account the retirement schedules of these aging plants, a new power plant is required even before 2015.

Table 9.3 Projection of Future Demand for Electric Power

	2007	2010	2020	2030
Total (mill. kWh/yr)	1,321	1,649	3,462	6,551
Load (MW)	274	334	702	1,328

Source: JICA Study Team

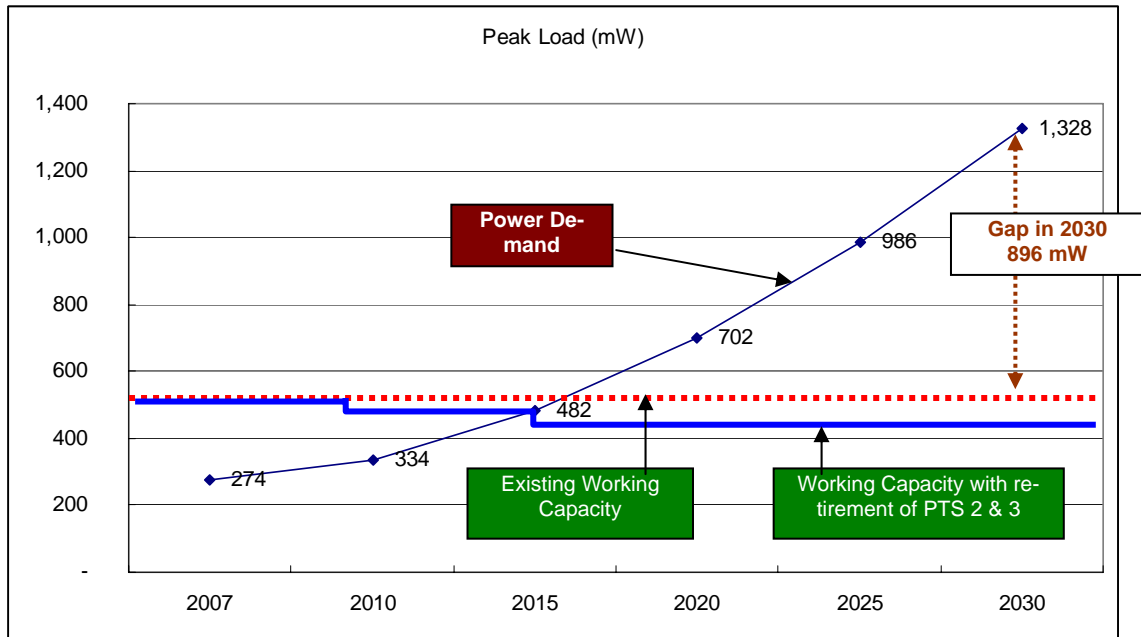
A capacity of 896 MW is expected to be installed up to 2030. This means that two more TPS-4s should be developed by that year.

Table 9.4 Current Supply Capacities of Electric Power Plants (June 2008)

Thermal Power Station	Design Capacity (MWt)	Working Capacity (MWt)
UB TPS-2	21.5*	17.6
UB TPS-3	148.0	105.1
UB TPS-4	540.0	432.0
UB Total	709.5	554.7
Darkhan	48.0	38.6
Erdenet	28.8*	21.0
Total	786.3	614.3

Source: JICA Study Team

Figure 9.5 Electric Power Demand-Supply Gap



Source: JICA Study Team

4) Requirements for Electric Power Supply System

Improvement of the entire power supply system is the most crucial requirement. This will include the following necessities: (a) Capacity enlargement to meet the increasing demand; (b) Rehabilitation of sub-stations to improve supply efficiency; and (c) Expansion of cables to extend service coverage.

For the new power plant, new power sources other than coal should be explored to mitigate negative environmental impacts. For this purpose, the pursuit of a PPP scheme is recommended.

The existing **tariff structure** should be reformed in order to make the entire power business more feasible and thereby lessen government subsidies. Power supply at politically influenced or set prices will not promote energy-saving behavior. Rational pricing policies should be applied.

9.5 Heating System

1) Planning Issues

Development of the heating system involves crucial planning issues relevant to issues on air pollution, as well as electric power generation. Due to the spread of urbanization, or urban sprawl, the supply of heating will become more difficult in reaching residents in the suburban areas. From an engineering standpoint, capacity expansion is also a crucial issue that should be addressed. The following is a summary of the issues involved in heating system development:

- Capacity expansion;
- Expansion of heating pipelines;
- Development of a local cluster system to supplement the centralized system; and
- Air pollution reduction.

2) Planning Target

The planning target is to form an integrated **Clean Heating System** for all with the following aspects: (a) A central heating system connected to power plants, (b) local cluster systems, and (c) individual heating systems.

3) Demand-Supply Balance

Additional residential demand from 2007 was projected, as shown in Table 9.5.

Table 9.5 Projection of Residential Heating Demand from 2007

(Unit: Gcal/h)

	2007	2010	2015	2020	2025	2030
Additional Demand	0	287	749	1,178	1,590	1,979

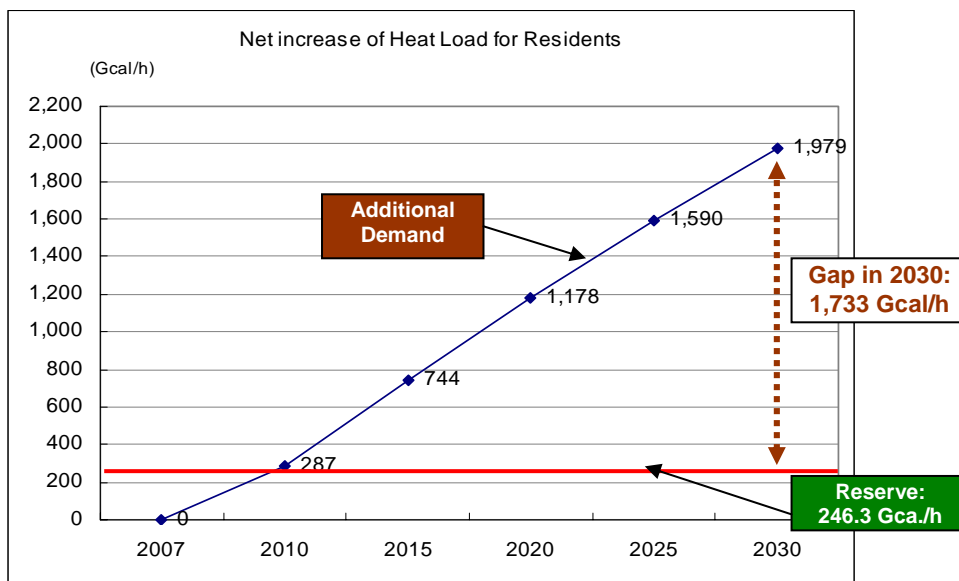
Source: JICA Study Team

The following are the existing supply capacities:

- Installed capacity: 1,695 Gcal/h
- Operating capacity: 1,594 Gcal/h
- Connecting capacity: 1,449 Gcal/h
- Reserve: 246.3 Gcal/h

The difference between the projected demand and existing reserve refers to the additional heat load that would be needed in the future. The result is illustrated in Figure 9.6. Heating calorie with about 1,733 Gcal/h will be an additional requirement by 2030.

Figure 9.6 Demand-Supply Gaps in Heating for Residential Use



Source: JICA Study Team

4) Requirements for Heating System

The following are the three development areas for the heating system:

Capacity Expansion: The supply capacity of the centralized system will expand through the capacity enhancement of the existing power plants and the provision of a new one (TPS-5). For this purpose, the heating pipeline needs to be rehabilitated and expanded.

Local Cluster System Development: New town, large-scale housing, and/or urban redevelopment projects may install their own local heating systems to provide heating services within their project areas. Such a local cluster system can be managed by the developer, or by residents' associations, through self-financing mechanisms. This system is applicable in the community level. An economical and low-maintenance heating system should be invented or selected.

Individual Heating System: Individual houses not connected to the central system or local cluster systems can generate heating capacity through the following measures:

- Constructing heat-efficient buildings and houses;
- Improving stoves used in Ger areas; and,
- Improving fuel quality used in Ger areas (briquettes, etc.).

Tariff Structural Reform: A flat charge is imposed on households that receive heating services from the central system. However, since the charge is so cheap, the overall collection is not enough to cover operating and maintenance costs, thereby resulting in poor maintenance. The tariff structure should thus be reformed from the standpoint of both consumer affordability and sustainable provision of quality services.

9.6 Solid Waste Management

1) Planning Issues

The JICA Solid Waste Management Master Plan (2007) underscores the following solid management issues:

- Poor waste collection network;
- Inadequate self-treatment and illegal dumping of wastes;
- Limited capacity of existing disposal sites; and,
- No medical and toxic industrial waste treatment system.

2) Planning Target

The SWM Master Plan targets the establishment of an adequate solid waste management system that complies by 2020 with environmental conservation.

3) Demand-Supply Balance

The volume of solid waste generated by Ulaanbaatar City will constantly increase along with the urbanization process and high economic growth. The total volume will account for 2,000 tons/day (winter) by 2030, or 2.6 times as much as that in 2006, as shown in Table 9.6.

Table 9.6 Projections on Solid Waste Generation for 2010, 2020 and 2030

Unit: ton/day

			2006	2010	2020	2030
Demand Projektion	Household and Multiple Waste	Winter	593.6	681.9	894.5	1,454.0
		Summer	276.9	375.2	708.4	1,151.5
	Others	Winter	146.1	179.9	298.6	475.0
		Summer	208.5	257.1	430.6	690.0
	Total	Winter	739.7	861.8	1,193.1	1,929.0
		Summer	485.4	632.2	1,139.0	1,841.5
Total Disposal Ammount		Winter	372.0	752.0	997.8	
		Summer	530.7	553.0	1,001.4	

Source: JICA Solid Waste Management Master Plan in Ulaanbaatar City (2007)

4) Proposed Measures on Solid Waste Management

Based on the status and demand analyses, the Master Plan proposed the following measures:

- Construction of sanitary disposal sites and recycling plants;
- Strengthening of the waste collection network;
- Promotion of recycling business to the private sector; and
- Public awareness raising.

The total investment cost for to implement the above measures up to 2020 was estimated at **Tg. 21.8 billion** (US\$ 18.6 million).

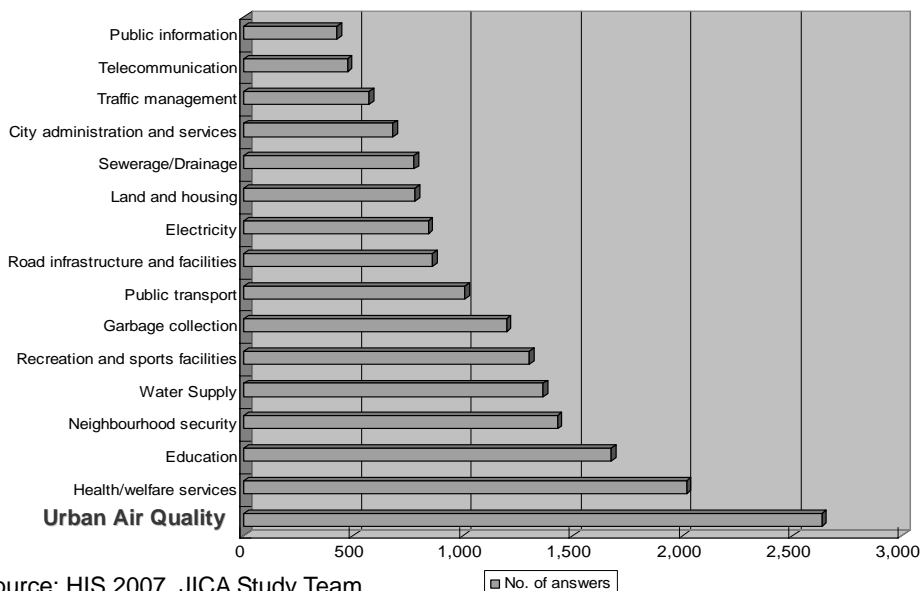
9.7 Air Pollution Control

1) Planning Issues

According to the Household Interview Survey conducted by the JICA Study Team, the top issue that people considered as the most important urban service was improving air quality as shown in Figure 9.7. Air pollution control then is one of the most vital political issues.

As one of the consequences of rapid urbanization, the degradation of ambient air quality is taking place especially during winter. It has been noted that major pollution loads come from Ger areas. Therefore, a planning issue is to mitigate heating emissions from Ger dwellings first before focusing on boilers in many types of plants.

Figure 9.7 Citizens' Opinion on Most Important Public Service



Source: HIS 2007, JICA Study Team

2) Planning Target

By shifting from traditional household practices to an effective heating system, the reduction of pollution levels to 70% of the 2007 levels is a practical and achievable planning target.

3) Policies and Measures

(1) Mitigation of Pollutant Emissions from Ger Dwellings

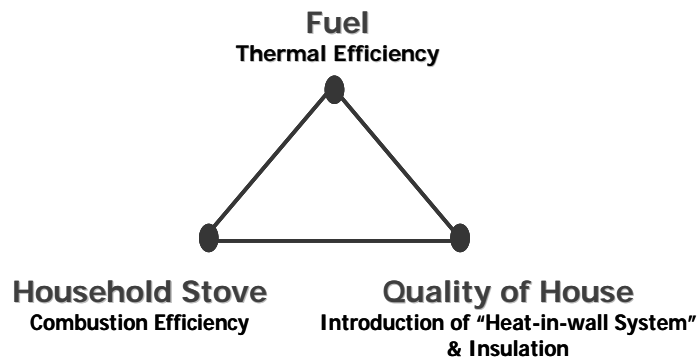
The central government has pursued a policy to accelerate apartment provision for *ger* dwellers to mitigate air pollution. This policy is necessary and rational in the long term, but at the same time, short- and medium-term solutions are also required to solve this serious problem.

Three technologies need to be adopted at once in an integrated manner, as shown in Figure 9.8; otherwise, their effectiveness will dissipate:

- (a) **Fuel innovation** to improve thermal efficiency;
- (b) Household **stove improvement** to uplift combustion efficiency; and,
- (c) **Use of energy-saving housing materials and** techniques such as “heat-in-wall system” and insulation materials.

As these three technologies have already been proven and are readily available, what is required is strong public support and political will.

Figure 9.8 Integrated Measures to Combat Air Pollution



Source: JICA Study Team

Based on this recognition, the following measures are proposed:

- Conduct of a public awareness campaign to fight air pollution and create a “**healthy city**”;
- Introduction of new energy sources such as biomass and coal-based fuel products, e.g. briquettes, etc.;
- Facilitation of an improved-stove distribution program (a World Bank-funded program);
- Housing improvement and heating network extension to develop local cluster heating networks;
- Promotion of energy-efficient housing construction with financial support such as subsi-

dies and tax exemptions; and,

- Pursuit of “Co-beneficiation Approach” together with air pollution reduction.

(2) Mitigation of Pollutant Emission from Utility Plants

There exist a remarkable number of aging boilers low on combustion-efficiency in the utility plants. These **heat-only boilers** should be replaced or rehabilitated. The central government may provide a subsidy program or a credit provision scheme in line with the SME enhancement policy.

Fuel innovation through **coal improvement projects** should also be encouraged through government initiative, or through PPP schemes.

Notes: Feasibility of Innovative Stoves

A few models of innovative stoves have been invented and tested through World Bank and GTZ programs. These stoves demonstrate considerable combustion efficiency, which translated to more than 40% saving on coal consumption. A financial viability of the installation of such stoves is examined below.

Assumptions:

One household consumes approximately 5 tons of coal in one season. Using the improved stove, 40% of coal consumption can be saved.

The cost of the new stove is Tg.100,000, compared to around Tg.28,000 for the traditional stove.

Expected Savings = (Unit coal cost) x (Saved coal amount in one winter)
= Tg.50/kg x 5,000 kg X 40%
= **Tg.100,000**

Thus, the purchase cost can be recovered from savings obtained in one season alone. In order to facilitate the increased use of the improved stoves, financial support is key. Initial payment for the stoves can be done through a micro credit, community finance, or government subsidies.

A trade-in program is also feasible and would bring down the prices of new stoves, i.e. the depreciated value of old stoves can be deducted from those of new ones.

9.8 Disaster Management

1) Planning Issues

Flooding is one of the disaster issues which Ulaanbaatar City should tackle. Flooding often takes place due to the degradation of the water-retaining capacities of land caused by the urbanization of hilly and steep areas as well as the deforestation of watershed areas.

The northern hilly areas, where numerous houses have encroached on, are especially problematic. Since flood-prone areas are identifiable from past records, the continued urbanization in these areas should be prohibited.

The occurrence of an **earthquake** is another potential disaster, especially because Ulaanbaatar City is not located on an earthquake-free zone. Since it is impossible to predict and mitigate an earthquake's occurrence, action should focus on minimizing anticipated human and structural

damages in such an event and on recovering from such a disaster.

2) Planning Targets

The plan targets the following:

- To mitigate damages caused by flooding;
- To prohibit residential occupation of flood-prone areas; and
- To minimize human and structural damages in the event of an earthquake.

3) Policies & Measures against Flooding

(1) Flood Protection and Flood Damage Mitigation

The **three E** (3E) measures, i.e. environmental, enforcement, and engineering, should be incorporated into flood disaster management policies.

Environmental measures:

- The continued urbanization of the northern hilly areas should be prohibited; instead, these areas should be preserved;
- Deforestation and any form of tree trimming should be stopped in the northern mountainous areas to mitigate flood damages;
- Environmental conservation should be the first priority in land use management and control; and
- Community organizations should be promoted to facilitate people's awareness and preparedness.

Enforcement measures: All environmental measures should have inherent enforcement powers to help guide citizens' behavior toward the appropriate direction.

- Designation of conservation areas for flood protection;
- Prohibition of building construction in designated areas; and
- Facilitation of resettlement programs for residents located in designated areas.

Engineering measures:

- Local roads should be designed and constructed in a way that they function as dikes for disaster prevention;
- Improvement of drainage canals should be facilitated along with the construction of disaster prevention roads; and
- A technical and information center should be established to provide adequate technical advice on land development and disaster management to citizens and related authorities. Monitoring should be mandated to this center and linked up to universities and the Meteorological Office.

(2) Earthquake Preparedness

Since data on and scientific analyses of the potential occurrence of an earthquake are currently few, further research on the subject should be further encouraged. An “***Ulaanbaatar hazard map***” should be delineated, based on local scientific and engineering information and knowledge.

In the meantime, ***preparedness*** on earthquake disaster management and relief should be enhanced in both the government and community levels. A vital element is the community-based activities that increase disaster preparedness and awareness. It should focus on the following aspects:

- Areas for evacuation in the occurrence of a large-scale earthquake;
- Escape routes for evacuees;
- Provision of information network;
- Emergency activities; and,
- Sufficient stocks of survival food, medicine, etc.

These community-based preparedness activities should be promoted by the local government and international NGOs that are experienced and knowledgeable in disaster preparedness and rescue.