ECONOMIC ANALYSIS

A. Macroeconomic Context

1. Since reforms began in 1996, Mongolia has transformed itself from a socialist country into a vibrant democracy with a rapidly expanding economy. Driven by a booming mining sector, livestock sector development, inward remittances, and an invigorated services sector, Mongolia's economic performance has been impressive. From an annual rate of 1.1%–4.0% during 1996–2002, Mongolia's average yearly gross domestic product growth accelerated to about 10% during 2002–2011. While growth has been impressive and prospects are highly positive, challenges remain. Mongolia has chronic rural poverty, inadequate trade facilities, and insufficient institutional and human capacity. Exacerbating these problems is a limited regulatory framework for private sector participation, a relatively weak public sector, a small domestic market, and an economic base that is narrow compared with those of other Asian economies. Mongolia's competitiveness also suffers from insufficient infrastructure, which is lacking in many places and rapidly deteriorating in others. The proposed Ulaanbaatar Urban Services and Ger Areas Development Investment Program will be pivotal to sustaining the economic growth of Mongolia.[1] It will support the government's sustainable development and poverty reduction strategy by enabling connectivity in the *ger* areas and promoting safety through improved and well-lit urban roads, helping provide households and business establishments with access to water, addressing critical sanitation issues, and providing more environment-friendly and efficient heating systems in the subcenters of Bayankhoshuu and Selbe.[2]

B. Urban Sector Context

2. About 68% of Mongolia's people live in urban areas. Ulaanbaatar, the capital and primary city, dominates the country's economic, political, and cultural landscapes and is home to 45% of its population. The city population of 1.3 million grew by an annual average 5.7% during 2000–2010. Ulaanbaatar accounted for 65% of gross domestic product and 35% of total employment in 2010. An estimated 800,000 of its residents—60% of the city population and 30% of the country's—live around the city's core, in the large and expanding peri-urban *ger* areas, named after the traditional round tents that house many of the in-migrants who have moved from the countryside.[3] The current simultaneous process of densification and urban sprawl within the *ger* areas is putting tremendous pressures on the urban environment and residents' health. The lack of employment and income prospects in Mongolia's rural areas, coupled with severe winters, continue to push migrants into a city already cramped with people, buildings, and vehicles. Project 1 of the investment program will contribute significantly to decongesting the city center of Ulaanbaatar by stimulating economic development in two subcenters in the peri-urban *ger* areas—Bayankhoshuu and Selbe. The proposed

[1] This economic analysis focuses on the first project, referred to as Project 1, of the proposed Ulaanbaatar Urban Services and Ger Areas Development Investment Program.

[2] Subcenters within the *ger* areas are clusters of public facilities and businesses with an associated transport hub. Their socioeconomic sphere of influence can cover 30,000 to more than 100,000 people. Surrounding the subcenters are residential areas of mostly individual homes on large plots. Twenty-four subcenters of different sizes have been identified in the *ger* areas of Ulaanbaatar. Under the investment program, subcenters will serve as entry points and potential catalysts to unlock the future redevelopment of *ger* areas and break the *ger* area redevelopment challenge into manageable pieces.

[3] *Ger* is the Mongolian language term for the round tents long used by nomadic people in the vast countryside, which now make up a substantial portion of the housing of in-migrant settlers in the peri-urban *ger* areas of the capital.

developments under Project 1 have been planned to occur in the *ger* subcenters first, then over time in the wider *ger* areas surrounding the two subcenters. The program will also help pull migrants away from the city center to the *ger* areas, reducing the pressure on the already fragile and inadequate urban infrastructure and services in the city's core.

C. Economic Rationale for Government Intervention

3. Projections of Ulaanbaatar's economic and population growth show a clear need to improve the quality and coverage of roads, water supply, sanitation, heating, and socioeconomic facilities and services. This needs to be done in both the city core and in the expanding *ger* areas surrounding it. Undertaking such urban redevelopment presents complex technical and financial challenges in Mongolia, particularly in the g*er* areas, which if left unaddressed *by* the government will continue to deter private sector investments. These challenges include the high cost of construction in a city which is often described as the coldest capital in the world.[4] In addition, highly deficient urban planning failed to allot sufficient space in the *ger* areas for businesses and economic enterprises. This constrains the prospects for economic growth and for improving the relatively low household incomes of the *ger* residents. These and other factors mean that the investments needed to connect the *ger* areas to the central systems of water supply, sanitation, and heating in the core city or to develop more decentralized delivery systems will be significant and may not be fully recoverable, thus requiring subsidies. The program will serve as a catalyst, spurring coordinated investments among the public, private, and people's organizations which will lead to more widespread and broad-based economic growth in the *ger* areas.

D. Economic Analysis of Subprojects

4. The economic analysis of subprojects under Project 1 of the investment program was conducted in accordance with the relevant Asian Development Bank (ADB) guidelines.[5] The estimated costs and benefits of the subprojects were valued at their economic prices using the domestic price *numeraire*, which adjusts border prices to their equivalent domestic values using the shadow exchange rate factor of 1.02. Unemployment among unskilled labor is considerable in Ulaanbaatar; hence, conversion factors of 0.7 and 1.0 were applied to unskilled and skilled labor, respectively.[6] Capital and recurrent operation and maintenance costs (O&M) in constant 2013 prices, inclusive of physical contingencies, were also converted into economic costs by subtracting all transfer payments, including taxes and duties, and applying the appropriate conversion factors. Capital costs were estimated based on the basic designs prepared during the feasibility studies and included allowances for resettlement costs. Annual costs and benefits for each subproject were evaluated from 2014–2033, allowing for a 4-year construction period, followed by a benefit period of 16 years.

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[4] For instance, an important lesson from the World Bank-funded Ulaanbaatar Services Improvement Project I, which was completed in December 2003, was that Mongolia's cold winters called for more innovative engineering designs capable of protecting infrastructure built against damage from freezing. However, such designs tended to be very costly emphasizing the need to balance between appropriate designs, costs, affordability, and subsidies.

[5] ADB. 2003. *Key Areas of Economic Analysis for Projects: An Overview.* Manila; ADB. 1998. Guidelines for the Economic Analysis of Water Supply Projects. Manila; ADB. 1993. *Guidelines for the Economic Analysis of Projects*. Manila.

[6] These conversion factors are consistent with similar projects of the same nature in Mongolia. For example, see ADB. 2012. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Mongolia for the Urban Transport Development Investment Program.* Manila.

5. **Urban roads improvement.** The planned development schemes for Bayankhoshuu and Selbe subcenters aim to (i) provide a defined, level road network to delineate neighborhoods; (ii) densify the area, stimulate local economic activities, and introduce alternative urban housing modes; (iii) protect zones prone to flooding; (iv) open up landlocked land allotments; and (v) provide public open spaces and green parks to encourage a healthy community lifestyle. Anticipated economic benefits were quantified by determining the incremental increase in the potential annualized rental benefits from the use of the land surrounding the improved roads. Leasable spaces were estimated for each subcenter at 25% of the areas of economic and commercial influence of the proposed urban road improvements. These areas were assumed to be 50% of the land within a 20-kilometer radius of the planned urban roads. An average lease price of $7 per square meter per month was used to determine the annualized rental benefits, which were further assumed to increase by 5% each year.[7] In addition, vehicle operating cost savings were calculated by assuming that 30% of the projected subcenter population would own cars and that savings amounting to $175 per year will be generated from the improved road conditions beginning in 2018, increasing thereafter at an annual rate of 5%.[8]

6. The resulting base case economic internal rates of return (EIRRs) of 17.76% for Bayankhoshuu and 25.10% for Selbe are both higher than ADB's 12% economic opportunity cost of capital (EOCC). These results affirm the economic viability of the proposed subprojects and the significantly positive net benefits they will provide to subcenter development. Sensitivity analysis suggested that the EIRRs would be most vulnerable to a delay in the realization of the subprojects' anticipated benefits. For the EIRRs of the subprojects to drop to the EOCC (Table 1), the analysis showed that either capital costs would have to increase by 82.8% in Bayankhoshuu and by 42.6% in Selbe or benefits would have to decline by 33.8% in Bayankhoshuu and 68.3% in Selbe.

Table 1: Economic Evaluation of Urban Roads Improvement

Base Case/Sensitivity Scenarios	Bayankhoshuu Urban Roads	Selbe Urban Roads
Base case EIRR (%)	17.76	25.10
Sensitivity Tests		
Case 1: capital costs increase by 10%		
EIRR (%)	16.41	23.51
Switching Value	42.56	82.79
Sensitivity Indicator	2.35	1.21
Case 2: O&M costs increase by 10%		
EIRR (%)	17.61	24.93
Switching Value	373.05	797.54
Sensitivity Indicator	0.27	0.13
Case 3: benefits decline by 10%		
EIRR (%)	16.06	23.18
Switching Value	33.80	68.32
Sensitivity Indicator	2.96	1.46
Case 4: benefits delayed by 1 year		
EIRR (%)	15.02	21.27
Case 5: Combination of cases 1, 2, and 3		
EIRR (%)	14.56	21.51

EIRR = economic internal rate of return, O&M = operation and maintenance.
Source: Asian Development Bank estimates.

[7] Based on published report on lease rates and annual rental rates of growth in comparable areas of Ulaanbaatar. M.A.D. Investment Solutions. 2013. *The Mongolian Real Estate Report 2013–2014*. Ulaanbaatar.

[8] These assumptions were based on the socioeconomic survey results conducted by the Marketing Consulting Group from November 2012 to January 2013 under the ADB project preparatory technical assistance. See ADB. 2011. *Technical Assistance to Mongolia for Preparing the Ulaanbaatar Urban Services and Ger Areas Development Investment Program.* Manila.

7. **Water supply and sewerage system improvements.** The benefits of the water supply improvement subprojects in the Bayankhoshuu and Selbe subcenters were assumed to come from two major sources: (i) the benefits from the incremental water sales, calculated according to the willingness to pay of the consumers, existing water demand, and water demand projections for the Bayankhoshuu and Selbe subcenters (adjusted for unaccounted-for water); and (ii) nonincremental water sales benefits, equivalent to the resource cost savings from the time and income water consumers will save by obtaining water from the new supply rather than existing sources. A socioeconomic and willingness-to-pay survey conducted in these subcenters showed that households were willing to pay MNT19,756 per month for improved water services. The resource cost savings were estimated at MNT21,150, based on socioeconomic survey results that indicated that households took about 30 minutes three to four times a week to access water from kiosks, delivery trucks, and other private sources.[9]

8. Benefits from the sewerage improvements were quantified as (i) savings resulting from a change in the disability-adjusted life years (DALYs) of beneficiaries, due to a reduction in health risks and water-related diseases; and (ii) savings in medical expenses in households now exposed to soil pollution through untreated groundwater. The DALY is an indicator of life expectancy that combines mortality and morbidity into one summary measure of population health to account for the number of years lived in less than optimum health. The approach of the World Health Organization (WHO) was adopted in calculating the EIRR. It determines the annual economic value of one disability-adjusted life year, or DALY, to be equivalent to a country's annual gross national income per capita. Using a modest growth rate of 5% per annum, Mongolia's per capita gross national income was projected to be $3,952 in 2019, when the benefit period starts. Based on the global burden of disease approach of the WHO, 2% of the calculated savings in terms of DALYs for the Bayankhoshuu and Selbe subcenters subprojects was attributed to the proposed sewerage improvements.[10] To calculate the savings of households, it was assumed that 10% of their monthly medical expenses were linked to waterborne diseases. Based on the socioeconomic survey results, the average household annual medical expenses in the two subcenters amounted to MNT375,922. The base case EIRRs calculated for the subprojects were 15.14%–23.41%, all exceeding ADB's 12% EOCC, and confirming the economic robustness of the proposed subprojects (Table 2).

9. **Heating services expansion.** The major benefits of the heating services subproject were considered to be (i) a reduction in the health risks currently posed by air pollution, measured through savings in terms of the DALY; and (ii) medical savings of households from improved air quality in the *ger* areas. A 2012 World Bank study concluded that coal-fired heating appliances such as the stoves and small furnaces used in the households in *ger* areas contributed as much as 65% of the air pollution in Ulaanbaatar.[11] Hence, using the WHO global burden of disease approach, 5% of the calculated savings in DALYs for the Bayankhoshuu and Selbe subcenters was attributed to the proposed program-supported heating services, which will allow households to switch to more environment-friendly heating technology that generates less

[9] The socioeconomic and willingness-to-pay survey using the contingent valuation method showed that the mean willingness to pay for monthly charges for water supply was MNT19,756. For valuing the nonincremental water benefits, the resource cost savings were estimated by multiplying the time spent by the family to access water by the average household income per hour in Bayankhoshuu and Selbe as indicated in the socioeconomic survey results.

[10] According to the WHO, the burden of disease in DALYs attributable to lack of water, sanitation and hygiene in East Asia can reach as high as 10%. See WHO. 2007. Water, Sanitation and Hygiene: Quantifying the health impact at national and local levels in countries with incomplete water supply and sanitation coverage*. Environmental Burden of Disease Series.* No.15. Geneva.

[11] World Bank. 2012. *Project Appraisal Document on a Proposed Credit in the Amount of SDR9.7 million to Mongolia for a Ulaanbaatar Clean Air Project.* Washington, D.C.

air pollution than the existing heating methods.[12] To calculate the savings of households, 20%–30% of their monthly medical expenses were ascribed to diseases related to exposure to air pollution. The socioeconomic survey results indicated that the average household in the two subcenters spent MNT375,922 on annual medical expenses. The base case EIRRs calculated for the subprojects ranged were 18.13%–19.83%. They all exceeded ADB's 12% EOCC, confirming the economic viability of the proposed subprojects (Table 3).

Table 2: Economic Evaluation of Water Supply and Sewerage

Base Case/Sensitivity Scenarios	Bayankhoshuu Water Supply	Selbe Water Supply	Bayankhoshuu Sewerage	Selbe Sewerage
Base Case EIRR (%)	**19.76**	**23.41**	**20.18**	**15.14**
Sensitivity Tests:				
Case 1: Capital cost + 10%				
EIRR (%)	18.89	22.42	19.08	14.13
Switching value	89.20	116.10	73.99	31.16
Sensitivity indicator	1.12	0.86	1.35	3.21
Case 2: O&M cost + 10%				
EIRR (%)	19.69	23.34	20.09	15.07
Switching value	1,100.40	1,788.30	894.75	461.20
Sensitivity indicator	0.09	0.06	0.11	0.22
Case 3: Benefits - 10%				
EIRR (%)	18.73	22.26	18.85	14.04
Switching value	75.00	99.00	61.52	28.67
Sensitivity indicator	1.33	1.01	1.63	3.49
Case 4: Benefits delayed by 1 year				
EIRR (%)	18.11	21.89	17.28	12.73
Case 5: Combination of cases 1,2, and 3				
EIRR (%)	17.80	21.23	17.68	12.98

EIRR = economic internal rate of return, O&M = operation and maintenance.
Source: Asian Development Bank estimates.

Table 3: Economic Evaluation of Heating Services

Base Case/Sensitivity Scenarios	Bayankhoshuu Heating	Selbe Heating
Base Case EIRR (%)	**18.13**	**19.83**
Sensitivity Tests:		
Case 1: Capital Cost + 10%		
EIRR (%)	17.22	18.90
Switching value	67.45	83.70
Sensitivity indicator	1.48	1.19
Case 2: O & M Cost + 10%		
EIRR (%)	17.78	19.44
Switching value	78.02	201.02
Sensitivity indicator	0.56	0.50
Case 3: Benefits – 10%		
EIRR (%)	16.76	18.39
Switching value	44.85	54.20
Sensitivity indicator	2.23	1.85
Case 4: Benefits delayed by 1 year		
EIRR (%)	15.47	16.59
Case 5: Combination of cases 1, 2, and 3		
EIRR (%)	15.53	17.09

EIRR = economic internal rate of return, O&M = operation and maintenance.
Source: Asian Development Bank estimates.

[12] WHO. 2004. Outdoor Air Pollution: Assessing the environmental burden of disease at national and local levels. *Environmental Burden of Disease Series.* No.5. Geneva.