1. The Asian Development Bank (ADB) is supporting the Government of Mongolia to achieve economic diversification and linkage with regional value chains by developing and operationalizing the Zamyn-Uud free zone, as part of the Zamyn-Uud (Mongolia)–Erenhot (People’s Republic of China [PRC]) economic cooperation zone. Zamyn-Uud is at a junction of road, rail, and air transport networks, and one of Mongolia’s busiest international border crossing points (BCPs); it is also on the fastest route for access from Mongolia to the ocean via the port of Tianjin. The project will assist Mongolia to realize the full potential of the Zamyn-Uud free zone through three outputs: (i) Zamyn-Uud free zone infrastructure and facilities constructed and operational; (ii) sustainable operations and management of Zamyn-Uud free zone promoted; and (iii) Zamyn-Uud free zone port of entry system established. Zamyn-Uud has a direct north–south road link with the Altanbulag BCP on the Russian Federation border, which provides the main route for goods and travellers along Central Asia Regional Economic Cooperation (CAREC) program corridor 4. Given the project’s location and potential benefits—including increased trade, investment, promotion of small and medium-sized enterprises, job creation, and labor mobility—beneficial regional spillover effects beyond Mongolia, specifically with the border town of Erenhot in the PRC, are expected. This analysis evaluates the economic viability of the project to develop the Zamyn-Uud free zone in accordance with ADB guidelines.

   A. Project context

2. Macroeconomic and sector context. Mongolia has considerable mineral wealth (including coal, oil, copper, gold, molybdenum, and others) estimated to be worth $1 trillion to $3 trillion in a country with a population of some 3 million. Ninety percent of the country’s exports are from the minerals sector, with over 90% exported to the PRC. The narrow economic base leaves the country highly vulnerable to fluctuations in minerals-sector foreign direct investment and global commodity prices, and changes in demand from a small number of trading partners. A boom–bust cyclical pattern has dominated Mongolia’s economy since the 1990s, and this pattern may persist until the economy is significantly diversified. Economic growth fell from a high of 17.3% in 2011 to 1.2% in 2016, coinciding with a drop in international mineral prices, before recovering in succeeding years alongside increased mineral foreign direct investment and exports. Meanwhile, in 2017 the agricultural sector accounted for 10.3% of gross domestic product and about 6.0% of merchandise exports, and manufacturing accounted for 9.4% of gross domestic product and 5.0% of exports.

3. Complex, cumbersome, and non-transparent trade procedures keep cross-border trading costs (including time costs) high. Mongolia ranks 130th out of 160 countries in the World Bank’s Logistics Performance Index 2018. Furthermore, the World Bank’s Doing Business 2019 report ranks Mongolia 117th out of 190 countries on indicators relating to the ease of trading across borders. High trade costs undermine the competitiveness of Mongolia’s exports, especially the export of perishable goods, and thus constrain Mongolia’s ability to diversify its economy through export-led growth. Higher costs for imported inputs also limit the country’s production and export of manufactured goods. In contrast, mineral products are not time-sensitive and can be transported in bulk at relatively low cost.

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3 International Monetary Fund. 2015. Article IV Consultation—Staff Report; Press Release; and Statement by the Executive Director for Mongolia. IMF Country Report No 15/109. April 2015.
4. **Demand analysis.** Demand for improved facilities at the Zamyn-Uud free zone is significant; up to 58 investors have been granted lease agreements and have signified interest to start physical investments either immediately or in the foreseeable future. These investors are expected to produce goods and services for the export as well as domestic markets, including: (i) manufacturing industries, (ii) wholesale and retail trade operations, (iii) cargo storage and logistics services, (iv) hotels and travel services, (v) food processing, (vi) construction companies, and (vii) fuel handling depots.

5. **Alternative analysis.** ADB and the government identified the infrastructure, equipment, and facilities investments to be funded by the proposed project through consultations that sought to strike a balance between the government’s requests and the limited resources available. The priority is to establish a well-functioning and operational zone that will attract significant new private sector investment, with flexibility for expansion subject to additional resources.

B. **Economic analysis**

6. **Key assumptions.** This economic analysis is based on the domestic price numeraire, with shadow wage rate factors of 1.0 (skilled labor) and 0.8 (unskilled labor) and a shadow exchange rate factor of 1.025 for tradable goods.\(^6\) Values were expressed in constant mid-2019 prices and with corresponding dollar values converted at $1.00 = MNT2,650. The analysis covers 23 years (2021–2043), including a 5-year implementation period.

7. **Costs.** Estimated project capital financial costs include investment costs for road works, underground heating, water supply, power supply, solid waste, gateway, and other works. These are converted to economic terms by excluding price contingencies, financial charges, and taxes and duties, and applying the shadow wage rate factors to the labor component and the shadow exchange rate factor to tradable goods. Zone facilities operation and maintenance costs are project estimates while the investors’ direct operational costs were based from results of the limited survey of investors’ business plans.\(^7\) Incremental investment and annual operation and maintenance costs will be met by a mixture of public and private sector finance. Investment from the public sector will be financed by a loan from ADB that will provide infrastructure within the zone to enable the private sector to invest in productive capacity. The investors will finance their respective investments in productive assets, operations, procurement of raw materials, and maintenance. Overall, there is considerable uncertainty about what the investors actual plans are in terms of capital investments and production costs. The data was extrapolated from companies operating in eight different commercial sectors representing the 58 investor firms (footnote 7).

8. The production of goods and services within the Zamyn-Uud free zone will be carried out by the investors and will proceed according to their respective business plans, which include projections of output at start-up, after the first 5 years, and after the first 10 years. The structure of the zone and its amenities will be carefully designed to attract the investors best equipped to promote diversified production and long-term growth, with limited water demands. It is assumed that the zone will be fully operational in 2026, but that the private sector investors will begin major capital investments beginning in 2022, with phased investments continuing through 2028.

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\(^6\) Based on values used in ADB. 2016. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Mongolia for the Regional Improvement of Border Services Project.* Manila; calculated using the formula in footnote 2.

\(^7\) In October 2019, a survey was carried out among 5 of the 58 companies in an effort to gather representative data. For the purposes of this analysis, results from the limited survey have been extrapolated to the full set of 58 investors.
9. **Benefits.** The project’s benefits comprise: (i) direct local employment generated by the project and its participating investors; (ii) trade operators’ savings in the form of faster inspection and processing of truck-carried cargo, which reduces waiting time for trucks and drivers; (iii) time savings for travellers and traders through the economic cooperation zone due to faster processing; (iv) the labor value-added of incremental trade facilitated by the project as accrued in the Mongolian economy; and (v) the labor value-added of incremental trade as accrued in the regional economy. Incremental trade is estimated as the value of incremental output, net of raw materials costs, produced by investor companies that, as a result of the project, are attracted to locate and operate within the zone. All benefits (and costs) are incremental solely due to the project, derived by comparing the with-project scenario and a without-project scenario.

10. An unquantified benefit is that the project will help to increase and diversify exports, which will make Mongolia’s economy more resilient. Mongolia’s economy, with a narrow economic base dominated by minerals exports, is highly vulnerable to large and sudden swings in mineral commodity prices (para 2). Commercial activity in the zone will focus on a spectrum of exports including services, manufacturing, and agricultural products, which are subject to disparate local, regional, and global economic, and are highly unlikely to vary in unison as mineral commodity prices normally do. Thus, a downturn in manufacturing is likely to be countered by continued buoyancy in unrelated agricultural markets, maintaining a healthy demand for Mongolian products even in the face of temporary adversity in a single sector. In addition, creating economic opportunities in the zone will help increase incomes and living standards in the community.

11. **Direct local employment.** Based on the survey, employment in the zone and the weighted average salaries to be paid to the zone workforce (held constant in real terms) are projected as follows: (i) at start-up, the total zone workforce is 897, paid a weighted average wage of MNT16.8 million/year/worker; (ii) after 5 years, 1,259 workers and MNT16.3 million/year/worker; and (iii) after 10 years, 1,901 workers and MNT14.9 million/year/worker (this is held constant in all subsequent years). The national average salary level in Mongolia is about MNT11.59 million/year.\(^8\) It is assumed that workers hired in the zone are recruited from salaried workers already employed in Zamyn-Uud and elsewhere in Mongolia, who on average are paid the national average wage. The direct incremental employment benefit is calculated as the difference between the weighted average salary offered to workers in the zone and the national average salary level in Mongolia.

12. **Trade operators and travellers savings.** About 2.3 million travellers and about 75,000 trucks crossed the border at Zamyn-Uud (in both directions) in 2018.\(^9\) These volumes are conservatively assumed to remain constant through the planning period. It is not currently known what portion of this traffic would pass through the Zamyn-Uud free zone and what portion through the Zamyn-Uud-PRC BCP. However, as the expected investors in the zone include agricultural processors, retailers and light manufacturers, it is estimated that the truck volume through the zone will comprise about one-third of the annual truck traffic crossing the border, or 25,000 trucks/year. Similarly, as the expected investments also include a number of hotels, retailers, and other services providers, the passenger traffic through the zone is estimated to equal about one quarter of the annual cross-border passenger and foot traffic, or 575,000/year in the current BCP.

13. The project is estimated to provide about 1 hour of reduced processing and waiting time per truck, valued at the estimated hourly cost of an idled truck of about MNT7,000 (average traffic

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\(^9\) ADB. 2019. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Mongolia for Regional Improvement of Border Services Project (Additional Financing).* Manila.
in 2019 is 4.5 hours inbound, and 6.5 hours outbound). The benefit is calculated as the product of the truck traffic volume annually and the reduced cost resulting from an hour’s saved waiting time per truck (footnote 9). For passengers and foot traffic, it is estimated that improved efficiency in processing travellers through the zone due to the project results in 0.25 hours saved per traveller. The time saved per traveller is valued as the product of the time saved (0.25 hours) and the average national hourly wage in Mongolia (MNT5,269 per hour).

14. **Labor value-added of incremental trade.** The estimated labor value added benefit is based on a measure of the total labor intensity of gross production: the total (skilled plus unskilled) domestic labor value added embodied in a sector’s outputs, including the wages paid directly for the production of the sector’s outputs and indirectly via the production of economy-wide inputs for the sector’s outputs (backward linkages), measured as a percent of a sector’s economy-wide gross outputs. For the regional economy, the same value is estimated on the basis of the volume and value of imports needed as raw materials by producers in the free zone. The data is derived from the World Integrated Trade Solution (WITS), a global database of trade statistics covering 197 countries and territories developed by the World Bank in collaboration with the United Nations Conference on Trade and Development and in consultation with the International Trade Center, United Nations Statistical Division and the World Trade Organization. From the WITS database for Mongolia, data regarding labor-value added by relevant export sector was extracted for 2011 (the latest year for which such analysis is available).

15. Investor set-up and operational costs (derived from the results of the survey in footnote 7) to be measured against gross production values consist of (i) estimated labor costs based on project labor requirements and wage levels derived from the results of the limited investor survey, (ii) private investment costs to establish productive capacity in the zone, and (iii) estimated non-labor operating costs and asset maintenance costs. The analysis is based on economic estimates of labor value added to the Mongolian and regional economies of the 58 investors (by sector), and estimated investor operating costs calculated under the above approach.

16. **Results of the cost–benefit analysis.** The economic internal rate of return (EIRR) and economic net present value (ENPV) calculations have been carried out to include the benefits to the Mongolian and regional economy (i.e., including the PRC). The proposed project is found to be economically viable with EIRR estimated at 13.2% with an ENPV of MNT 124.2 billion ($46.9 million equivalent).

17. **Sensitivity analysis.** When Mongolian and regional economic benefits are considered together, it is estimated that the proposed investments will remain economically viable when each cost and benefit parameter is separately adversely varied by 10% (Table 1). The project is most sensitive to increases in private sector investment and operation and maintenance costs within the zone, and to adverse changes in the Mongolian and regional economic benefits. The effect of a 1-year project delay (i.e., investment starts in 2022 instead of 2021) is small: with regional benefits included, EIRR falls to 12.9% and ENPV falls to MNT101.7 billion ($38.4 million).

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Table 1. Sensitivity Analysis Results

<table>
<thead>
<tr>
<th>Test Case</th>
<th>ENPV</th>
<th>EIRR</th>
<th>Sensitivity Indicator</th>
<th>Basecase Parameter ($)</th>
<th>Switching Value ($)</th>
<th>Switching Value % (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base (reference case)</td>
<td></td>
<td></td>
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<td>124,180</td>
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<tr>
<td>Increases in Costs (10%)</td>
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<tr>
<td>Public Economic Investment Costs (MNT million)</td>
<td>118,106</td>
<td>12.9%</td>
<td>0.49</td>
<td>75,301</td>
<td>229,251</td>
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<tr>
<td>Private Economic Investment Costs (MNT million)</td>
<td>85,288</td>
<td>11.7%</td>
<td>3.13</td>
<td>539,249</td>
<td>711,430</td>
<td>31.9%</td>
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<tr>
<td>Public Economic O&amp;M Costs (NPV)</td>
<td>122,677</td>
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<td>Private Economic O&amp;M Costs (NPV)</td>
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<td>1.96</td>
<td>439,949</td>
<td>564,129</td>
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<tr>
<td>Decreases in Benefits (-10%)</td>
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<tr>
<td>Direct Local Employment Benefit (NPV)</td>
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<td>6.13</td>
<td>761,683</td>
<td>637,504</td>
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<td>Economic Benefits to Mongolia (NPV)</td>
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<td>0.34</td>
<td>41,788</td>
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<tr>
<td>Economic Benefits to the Region (NPV)</td>
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<td>1.77</td>
<td>219,550</td>
<td>95,371</td>
<td>-56.6%</td>
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<tr>
<td>Delay in Project by 1 Year</td>
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<td>12.9%</td>
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<tr>
<td>Costs Increased (+) and Benefits Decreased (-) by 10%</td>
<td>-48,885</td>
<td>7.4%</td>
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</tr>
</tbody>
</table>

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

18. Regional spillover effects. Since 2012, a key focus of Mongolia’s regional cooperation and integration strategy has been strengthening its role in connecting with the PRC and Russian Federation as a transport-logistics hub and continental bridge connecting Asia and Europe. By strengthening CAREC corridor 4 generally, and CAREC corridor 4b (which traverses the Zamyn-Uud free zone) in particular, Mongolia can use its location to boost economic and social development, including through enhanced cooperation with the PRC.

19. Issues relevant to regional cooperation and integration include: (i) gaps in physical infrastructure (e.g., logistics facilities and cross-border connectivity, including roads); (ii) inefficient customs clearance processes; and quarantine, sanitary and phytosanitary measures and standards; and (iii) inadequate business development support systems, which make private sector investment in border areas challenging, especially for small- and medium-sized enterprises. The project outputs will help address some of these constraints and support regional integration. The project will enable 58 investors included in the above analysis to produce goods and services in the economic cooperation zone; these will be traded between Mongolia and the PRC and could be exported to other markets. This trade will be conducted and support development of the regional value chain along the CAREC corridor 4.

12 In June 2019, Mongolia and the PRC signed an agreement establishing the Zamyn-Uud and Erenhot economic cooperation zone, which details measures to integrate trade, investment, logistics and warehousing, import and export processing, e-commerce, tourism, and financial services within the cooperation zone.