ECONOMIC AND FINANCIAL ANALYSIS

A. Introduction

1. The project will renovate irrigation and drainage facilities across 171,100 hectares (ha) in four provinces that currently receive no irrigation: 79,256 ha in East Kazakhstan, 27,900 ha in Karaghandy, 28,974 ha in Kyzylorda, and 24,977 ha in Zhambyl. The project will improve water delivery to restart irrigated agriculture in these provinces, and will increase water productivity through diversification from traditional grain crops to high-value horticulture and cash crops. It will also build the capacity of farmers for water management through water users’ associations, and improve institutional operation and maintenance (O&M) of the irrigation infrastructure. The primary beneficiaries will be farmers cultivating land in the rehabilitated irrigation schemes.

B. Rationale

2. Agriculture’s contribution to Kazakhstan’s gross domestic product (GDP) has become increasingly minor in comparison with the energy sector (oil and gas). The share of agriculture in GDP has fallen steadily from 9.3% in 2001 to 4.9% in 2016. Its share in employment has also fallen, from 28.3% in 2010 to 16.2% in 2016—despite the country’s considerable natural endowment and corresponding agricultural potential, and significant government support for the sector. Kazakhstan’s agricultural area totals 222 million ha, of which about 13% (29 million ha) is classified as arable. During the country’s transition in the 1990s from a command economy under the former Soviet Union to a market-based economy, and the uncertainties that accompanied it, production ceased on large areas of land. According to a diagnostic study by the Asian Development Bank (ADB), 20.6 million ha of cropland were abandoned between 1991 and 1999. The situation started to improve at the beginning of the new millennium, but in 2015 the total agricultural area was still 40% lower than in 1990, and the value of agricultural output only recently reached pre-independence levels. It is considered unlikely that the extent of cultivated areas will return to pre-transition levels, because much of the abandoned terrain was marginal land with low productivity.

3. In addition to the constraints arising from climate change impacts and the poor state of irrigation infrastructure, several other constraints limit Kazakhstan’s ability to realize its full agricultural potential. While agricultural enterprises dominate the structure of production, individual farmers have significantly higher technical efficiency than enterprises, which suggests that they make better use of inputs and are more productive. Value chains are typically dominated by a small number of processors sourcing from large agricultural enterprises, and are concentrated in commodities with little processing and value addition. Value-chain integration is hampered because production and quality standards are not established or enforced, and the quantities and qualities offered by farmers do not match the demands of processors and marketers. Many small agricultural producers are locked into saturated local markets or are dependent on monopsonistic (single buyer) trading arrangements, which limits their integration into value chains and restricts farmers to subsistence production. ADB’s diagnostic study identified the key hurdles that agriculture needs to overcome: (i) restructuring the massive ex-Soviet state farms into smaller, more efficient farms, (ii) enabling crop intensification to account for highly variable growing conditions, (iii) pricing water more effectively to better manage its scarcity, (iv) improving public infrastructure, and (v) reducing value-chain fragmentation.

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4. The proposed project will address a number of constraints by rehabilitating irrigation infrastructure and putting about 171,100 ha of largely unproductive land back under cultivation. It will also promote the diversification from traditional low-yielding and low-value grain crops into high-value horticulture and cash crops. It will build the capacity of farmers for water management by strengthening water users’ associations, and the capacity of Republican State Enterprise Kazvodkhoz (KVK) for managing irrigation systems and irrigation delivery.

5. Public sector investment in irrigation rehabilitation is justified on the basis that irrigation infrastructure is a public good. The scope for private sector investment is limited by legal restrictions on ownership, the high cost of investment in rehabilitation, and the fragmentation of a large number and variety of farmers and farm enterprises across the project irrigation schemes.

C. Demand Analysis

6. ADB’s diagnostic study indicates that Kazakhstan has a potentially strong comparative advantage in agriculture, being endowed with one of the world’s most extensive per-capita arable land masses and having sufficient fiscal resources to invest in the sector’s development, as well as having a political commitment to support it. Kazakhstan’s favorable agricultural development potential extends far beyond its natural resource endowments. The country has recognized the reasons for its comparative advantage in agricultural production as follows:3

(i) As a former “bread basket” of the Soviet Union, Kazakhstan has a legacy of using extensive arable land resources as well as vast amounts of natural pastures for competitive, surplus agricultural production.

(ii) The potential for increasing yields in the country’s major crop, wheat, is significant, since the yield gap is estimated at 60% of achievable yield.

(iii) Given that agriculture accounts for 16% (2016) of the nation’s workforce but only for 5% of GDP, labor availability for agriculture is relatively high.

(iv) Kazakhstan has the fiscal resources to support rapid agricultural development, as well as a political commitment to the agrofood subsector.

(v) Kazakhstan features a relatively open trade regime compared with much of Central Asia, as witnessed by its recent accession to the World Trade Organization and its membership in the Eurasian Customs Union.

(vi) Demand prospects in neighboring countries (notably the People’s Republic of China and the Russian Federation) are projected to be positive in the medium to long term.

D. Alternative Analysis

7. The national feasibility study (NFS), conducted by a national design entity recruited under the transaction technical assistance, analyzed three alternative development plans: Alternative I included basic irrigation and drainage rehabilitation works, and project management; Alternative II comprised Alternative I plus lining of selected secondary irrigation canals; and Alternative III comprised Alternative II plus system control and data acquisition (SCADA) for the main canals, better water management and development of beneficiaries’ capacities, as well as development of KVK’s capacity and provision of equipment for more efficient O&M. The relative costs per ha were: T361,152 under Alternative I; T942,969 under Alternative II; and T1,007,846 under

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Alternative III. Alternative III was the preferred option, but the costs were considered too high. A fourth alternative was developed, in which costs were reduced by (i) only leveling and grading inspection roads, without the addition of gravel; (ii) eliminating the concrete lining of small canals with lengths up to 1.5 kilometers or those serving small areas (less than 100 ha); and (iii) reducing the length of canal lining. The resulting cost per ha of Alternative IV was T767,853. Further modifications to the design included a reduction in the lengths of the lined main canals, reducing the thickness of the concrete lining from 10 to 8 centimeters, replacing steel reinforcement with geogrid, and reducing the lengths of geomembrane. The proposed cost reductions were considered to have a minimum adverse impact on system performance and benefits.

E. Cost–Benefit Analysis

8. The economic analysis comprises the economic analysis of each of the four project provinces and of the project as a whole. After irrigation rehabilitation, an area of about 171,100 ha will be brought back into production. Investigations during the preparation of the NFS, which were confirmed by KVK, indicate that none of these areas has been cultivated in recent years because the existing irrigation infrastructure had collapsed. In some cases, the land had been abandoned. Some opportunistic cultivation of low-value crops requiring little or no investment in inputs may take place, but no estimate of such cropping is available. In this respect, all future production after rehabilitation is assumed to be incremental. This may marginally overstate the with-project benefits of irrigation rehabilitation.

9. Project benefits. Benefits are estimated on the basis of post-rehabilitation cropping patterns in each province projected in the NFS, and gross margins estimated from crop budgets prepared for each crop within the projected provincial cropping pattern. Crop budgets were estimated from data on physical inputs and outputs and prevailing financial (market) farm-gate prices in the financial analysis, and economic prices in the economic analysis. The value of crop outputs are based on yields and prices estimated during the NFS. Crop inputs are based on the crop input norms of the Ministry of Agriculture (MOA) for each crop in the projected cropping pattern of each province. Adjustments were made to both the cropping patterns and yields projected in the NFS based on comparisons with alternative official data sources.

10. Project costs. Costs are based on estimates prepared during the NFS of the cost of investment in infrastructure rehabilitation and annual O&M costs in each province. Where appropriate, financial cost estimates were converted into economic terms by removing the transfer payments (e.g., taxes, duties) in cost estimates. Each province’s cost stream also includes an allocation of project-wide costs of rehabilitation design and construction supervision, capacity building of both KVK and project beneficiaries, and the costs of project implementation. These costs are allocated either directly based on each province’s actual need, or pro rata to each province on the basis of its share in the total area to be rehabilitated under the project.

11. Methodology. The economic analysis is based on the domestic price numeraire. Financial prices are based on mid-2018 prices using the Kazakh tenge (T) as the unit of account. Crop output prices are based on prices obtained from field investigations during the NFS. Input prices are based on the prices reported in the MOA crop budget norms for 2016, updated to 2018 using escalation factors for each province. For tradable inputs, parity prices were used. The financial cost of irrigation in each crop budget is based on the national rate per cubic meter, effective from August 2018. For the economic analysis, the actual cost of providing irrigation

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Data used in the analysis were collected through field investigations and from data used in the NFS. These were supplemented as appropriate with data from official Kazakh government sources.
water, as estimated in the NFS, was used after adjusting for transfer payments (taxes) and nonresource costs (depreciation). To determine the unit rate per cubic meter, the economic cost of water supply is divided by the total volume of water required, which is calculated from each province’s cropping pattern (estimated for the economic analysis) and the volume of water required per crop based on MOA input norms.

12. In estimating the economic prices, a standard conversion factor of 0.99 and a corresponding shadow exchange rate factor of 1.01 were used. The estimation of both factors is based on 2017 data. Under the domestic price numeraire, domestic (Kazakh) market (financial) prices of non-tradable project inputs and outputs are assumed to represent their real economic value, and tradable inputs and outputs are valued at their border price equivalent values, using export and import parity prices as appropriate. For crop outputs, based on Kazakh export statistics, export parity prices were estimated for wheat, maize (grain), barley, and rice, which have been used in economic crop budgets. All other crop outputs are assumed to be non-tradable, and financial prices were used in the estimation of economic crop budgets. For inputs, it has been assumed that they are all non-tradable, with the exception of fertilizers. On the basis of the volume of fertilizer imports to Kazakhstan in 2016 and 2017, import parity prices were estimated for urea and diammonium phosphate, the principal nitrogen and phosphatic fertilizers identified in crop budgets.

13. On the basis that the areas to be rehabilitated have not been cultivated in recent years, accessing farm labor may prove to be problematic. In these circumstances, no shadow wage rate factor was applied to labor costs, because the economic value of labor will be reflected in its financial cost.

14. For each province and the project as a whole, an economic cash flow was prepared and an economic internal rate of return (EIRR) estimated for a period of 30 years. The economic viability of each province and the project as a whole was assessed by comparing the EIRRs with the cut-off rate for economic viability of 9% that ADB has established for production projects. Sensitivity analysis was undertaken for each province and for the project to determine the impact on economic viability of potential adverse changes in key benefit and cost parameters. The sensitivity analysis is based on switching values for key benefit and cost variables in economic cash flows.

15. **Results of economic and financial analysis.** EIRRs were estimated for each of the project provinces and of the project as a whole (Table 1). The EIRRs are 24.2% for Kazakhstan, 14.8% for Karaghandy, 27.3% for Kyzylorda, and 17.8% for Zhambyl. All these values are well above the cut-off level for economic viability of 9.0%. Individual provincial cash flows were aggregated into a project-wide cash flow. On the benefit side, the contribution to total project benefits by individual province is 36.8% (East Kazakhstan), 19.0% (Karaghandy), 18.5% (Kyzylorda), and 25.7% (Zhambyl). With respect to total project investment costs, including irrigation rehabilitation and project overhead costs, the provincial shares are 33.4% (East Kazakhstan), 18.7% (Karaghandy), 15.7% (Kyzylorda), and 32.1% (Zhambyl). The aggregation of the individual provincial benefit and cost streams results in an overall project EIRR of 25.1%. As with individual provincial EIRRs, this exceeds the ADB cut-off rate for economic viability of 9.0%.
Table 1: Economic Rates of Return and Switching Values

<table>
<thead>
<tr>
<th>Item</th>
<th>EIRR (%)</th>
<th>Benefits</th>
<th>Investment Cost</th>
<th>Operating Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Kazakhstan</td>
<td>24.2</td>
<td>47.5</td>
<td>184.1</td>
<td>387.3</td>
</tr>
<tr>
<td>Karaghandy</td>
<td>14.8</td>
<td>13.9</td>
<td>46.6</td>
<td>33.5</td>
</tr>
<tr>
<td>Kyzylorda</td>
<td>27.3</td>
<td>46.7</td>
<td>189.1</td>
<td>288.5</td>
</tr>
<tr>
<td>Zhambyl</td>
<td>17.8</td>
<td>28.5</td>
<td>73.1</td>
<td>144.9</td>
</tr>
<tr>
<td>Project</td>
<td>25.1</td>
<td>41.9</td>
<td>126.7</td>
<td></td>
</tr>
</tbody>
</table>

EIRR = economic internal rate of return.

F. Risk and Sensitivity Analysis

16. Sensitivity analyses show that the EIRRs for the provinces are, for the most part, highly robust with respect to adverse changes in benefits and costs. The EIRR for Karaghandy is marginally sensitive to a reduction in benefits with a switching value of 13.9%. Sensitivity analysis indicates that the project EIRR is highly robust to adverse changes in the benefits and costs of individual provinces.

17. Given the limited availability of field data, uncertainties exist in respect of what cropping patterns and crop yields will actually be achieved after irrigation rehabilitation. An analysis of changes in cropping patterns indicates a higher level of economic viability when cropping patterns are diversified away from low-yielding grain crops to higher-value vegetable crops. This reflects the general trend toward diversification in the agriculture sector. The upward trend in crop yields will also improve the viability of irrigation rehabilitation. Moreover, the viability of rehabilitation in Zhambyl is likely to improve over the current estimates once the detailed analysis of the proposed vegetable cluster has been made. Uncertainties also surround the costs, especially O&M costs, which vary considerably as a percentage of investment and/or rehabilitation costs. However, the application of physical contingencies at the rate of 10% on all items of expenditure helps mitigate such uncertainties.

G. Water Sector Tariffs

18. The Committee on Regulation of Natural Monopolies and Protection of Competition (CRNMPC) under the Ministry of National Economy is the central executive body for the regulation and control of natural monopolies and for the regulated markets, with the exception of telecommunication and mail services. The CRNMPC carries out its activities in accordance with the Constitution and laws of the Republic of Kazakhstan, acts of the President and the Government of the Republic of Kazakhstan, as well as its regulations.

19. The functions of the CRNMPC include control and regulation of activities of natural monopolies, and also development and approval of bylaws that are binding for state bodies and for the subjects of natural monopolies. The general principles of state regulation are to (i) provide equal conditions to consumers of services; (ii) ensure quality of services for consumers, taking into consideration prices set by the regulator; (iii) apply efficient production methods and technologies; and (iv) submit to the regulator reports on their activities.

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5 By the Order of the President of RK No. 872 dated August 13, 2014, the Agency of RK on Regulation of Natural Monopolies and the Agency of RK on Protection of Competition were reorganized by the merger into the Committee on Regulation of Natural Monopolies and Protection of Competition of the Ministry of National Economy.
20. The key guiding principles are that the tariffs have to (i) cover the costs needed to provide such services; and (ii) consider the profit levels that would ensure efficient operation of a subject of the natural monopoly (in this case, KVK).

21. The procedures for calculation of KVK tariffs for their services account for the costs associated with the provision of services and consist of production and operating costs for the period. Production costs include: (i) construction materials’ expenses (defined according to the norms of raw materials consumption for fabrication of one unit of product approved by relevant authorities); (ii) labour costs of personnel (determined according to the actual number of staff, but not exceeding the number stipulated by Law); and (iii) amortization of tangible and intangible assets in production process. Operating costs include: (i) labour costs of administrative personnel; (ii) cost of compulsory insurance; (iii) taxes, fees, and charges; (iv) other administrative expenses (consultancy, marketing, audit, payment, fees for use of natural resources etc.); (v) repair costs and other expenditures that are directly related to water delivery; and (vi) expense on interest payments on loan agreements.

22. For projects attracting investment from international institutions, the methodology for tariff calculation is regulated by Order No. 710 dated 24 November 2015 of the Ministry of National Economy “On approval of the special order of regulation of the activity of the natural monopoly entities, attracting loans from international financial organizations and members of the list of natural monopoly entities, attracting loans from international financial institutions.”

H. Water Sector Subsidies

23. MOA is authorized by the government’s Resolution No. 310 of 6 April 2005 to formulate procedures and rates for subsidizing the supply of irrigation water to agricultural producers.

24. The law on “State Regulation of Agribusiness and Rural Territories Development dated 8 July 2005” is the legal basis for providing subsidies to the agriculture sector. Subsidies to farmers and agricultural enterprises are provided annually on the basis of a resolution of MOA based on the National Law No. 66 of 8 July 2005 “On Government’s Regulation of Agricultural and Rural Development.”

25. The MOA Decree No. 6-3/597 dated 30 June 2015 approved a 50% subsidy on the cost of water supply services provided to agricultural commodity producers. The decree became effective in January 2016. Guidelines for the calculation of subsidies as percentages of the provided water supply services were approved by the government’s Resolution No. 237 of 4 April 2006.

26. In accordance with Article 80 of the Water Code of the Republic of Kazakhstan, KVK is a natural monopoly and its activities are regulated by the law on “Natural Monopolies and Regulated Markets” adopted on 9 July 1998. The KVK tariffs on their services are set according to procedures approved by the Head of State Policy Committee of Price and Antimonopoly on 17 July 2013. The tariff levels of products and services of natural monopolies in the country are based on the cost-plus-fee principle.

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6 Water sector tariffs in Kazakhstan are based on the “cost plus” principle, under which a standard mark-up is added to the cost of services.
7 In 2015, the subsidies in the agriculture sector totaled T157.3 billion, 1.8 times more than in 2013.
27. The KVK tariffs calculated for its services account for the costs associated with the provision of services and consist of production and operating costs for the period.

28. In case of attracting loans from international institutions to implement investment projects, the water service provider (e.g., KVK) can apply for the approval of new tariffs if the existing ones do not cover the costs relating to the loans from international financial institutions.9

29. All the investments relating to expansion, recovering, upgrade of existing assets, reconstruction, technical re-equipment of fixed assets, creation of new assets, and payment of principal and interest on loans should be considered in setting new tariffs. The corresponding existing tariffs that do not consider such investments, and the resulting increase in the value of assets, are cancelled after the new tariffs are approved.

I. Financial analysis

30. The analysis of the historical performance of KVK from 2014 to 2017 shows a stable earnings before income tax, depreciation, and amortization (EBITDA) margin. With respect to 2018, the figure might change because it is based on interim year-end results. A significant decrease in the cost of sales occurred but, compared with the revenue, it is less than proportional. The administrative costs seem to have increased significantly in 2018, mainly driven by an increase in personnel costs. However, with an increase in capital investment starting in 2017 and without increases in tariffs in the near future, the entity will lack the cash flow to repay the debts in the future.

31. The debt service coverage ratio (DSCR) had historically been rather high because of the low portion of debt leverage. From 2017, the DSCR began to increase as a result of loans from the European Bank for Reconstruction and Development and the Islamic Development Bank. Similarly, the leverage ratio increased since 2014, but even at 2.5% in 2018, it is still much lower than that of corporate companies. Current assets were at least 2 times higher than liabilities during 2014–2017, with even higher growth in 2018.

32. It is assumed that KVK will adjust its water tariff in accordance with Order No. 710 when obtaining loans from international institutions. The financial projections from 2019 to 2033 show that KVK is financially sustainable since revenues from sales exceed its operational costs. Water supply services and water facilities provide the main source of revenue. These income streams will benefit from further improvements to utilities and infrastructure, and from further agricultural development. The additional investments will enhance the revenues, and the KVK’s cash situation will improve. Simultaneously, the DSCR will increase, although from 2022 to 2028 it is lower because of large debt services to the European Bank for Reconstruction and Development and the Islamic Development Bank, and the proposed ADB project. KVK’s equity is expected to almost double over the projection period. The ratio of long-term debt to long-term assets, which was historically low at less than 3%, will grow by up to 30% during the active debt leveraging period, but it will subsequently decline. This is considered good because the debt is less than half of the assets.

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9 According to Order No. 710 “On approval of the special order of regulation of the activity of the natural monopoly entities, attracting loans from international financial organizations and members of the list of natural monopoly entities, attracting loans from international financial institutions” of the Ministry of National Economy, dated 24 November 2013.
33. In conclusion, the project is sustainable because KVK generates sufficient revenue to cover its O&M. However, it must review and adjust the water tariff in accordance with the regulations to be able to generate enough funds to repay the investment cost.