SECTOR ASSESSMENT (SUMMARY): ENERGY AND URBAN PUBLIC TRANSPORT

A. Sector Road Map

1. Sector Performance, Problems, and Opportunities (Energy)

1. The Kyrgyz Republic is rich in renewable energy resources. In 2018, 91.2% of the country’s total electricity generation came from hydropower, with a share of 3,068 megawatts (MW) out of 3,920 MW in total installed capacity. The remaining electricity production comes from the two combined heat and power plants: Bishkek and Osh. The country is a major exporter of excess hydropower. Since 2017, it has exported on average 745 gigawatt hours annually. Despite its vast hydropower capacity, untapped technically feasible hydropower potential is estimated to be about 30,000 MW.

2. The total primary energy supply is dominated by fossil fuels—oil (40.7%), coal (28.3%), natural gas (5.8%)—and hydropower (24.2%), with the residential, transport, and industry segments being the largest energy consumers. The country depends on oil and oil products from Kazakhstan and the Russian Federation; gas from the Russian Federation’s Gazprom; and coal from Kazakhstan, particularly in the period between November to March, to operate the Bishkek and Osh combined heat and power plants for heating. The Kyrgyz Republic’s energy sector is characterized by (i) old assets operating beyond their economic life; (ii) poor supply reliability and service quality; (iii) a recent substantial increase in household consumption because of fuel switching; (iv) power shortages, especially in winter; (v) inadequate capital and operation and maintenance spending; (vi) low cost recovery; and (vii) inefficient energy use by consumers.

3. Energy security. The Kyrgyz Republic’s energy system is subject to supply security threats. Hydro-based electricity production is susceptible to seasonal and weather-related fluctuations, particularly during winter months when lower water inflows into reservoirs are met with higher power demand for heating. Despite being a net power exporter, the country covers more than 90% of its domestic demand for gasoline, diesel, and compressed natural gas (CNG) with fossil fuel imports, spending more than $900 million annually or 11.1% of its gross domestic product. Since the transport sector is a major consumer of such imports, large-scale adoption of electric vehicles (EVs) would enable significant foreign exchange savings and allow the country to use excess electricity in the summer in lieu of imported fossil fuels.

4. Large hydropower. The Government of the Kyrgyz Republic is expanding its hydropower capacity by modernizing existing hydropower plants (HPPs) and constructing new large HPPs. With the rehabilitation of Toktogul HPP, the reconstruction of Uch-Kurgan and At-Bashinskaya HPPs, and the installation of the second unit at Kambarata-2, the government plans to increase its hydro capacity by 700 MW by 2027. In addition, it plans to attract investments to build new large HPPs including Kambarata-1 (1,860 MW), Cascade of Verkhne-Narynsky HPP (237 MW), and Cascade of Suusamyr-Kokomerensky HPP (1,300 MW).

5. Renewables. The national share of renewable energy, excluding large hydropower, is negligible. The Kyrgyz Republic has good potential for solar power, with 2,100–2,900 annual sunshine hours, and direct normal irradiation of 1,600–2,000 kilowatt-hours per square meter

1 This compares with a 95% share in Norway, 64% in Canada, and a global average of 16%
3 Data were provided by the National Energy Holding Company, which was formed in August 2016, with the transfer of state-owned shares of the principal energy companies, to improve the industry’s management and performance.
4 According to the IEA, in 2015, the shares in the Kyrgyz Republic’s final energy consumption were 37% for residential, 27% for transport, and 22% for industry.
5 The winter in Kyrgyz Republic typically lasts from November until March.
per annum (kWh/m²/a) in the Naryn and Issyk-Kul regions and 1,600 kWh/m²/a around Bishkek.\(^7\) The wind power generation potential is in the low-populated mountainous areas, where transport and transmission infrastructure is limited. The country has not benefited from low-priced solar, wind power or battery-based power storage solutions as it lacks access to these technologies locally. The technical capacity for small HPPs from more than 200 mountain rivers and several larger irrigation channels is about 1,800 MW.\(^8\)

6. **Transport sector electrification.** Because of its high renewable energy share, the Kyrgyz Republic’s energy sector has one of the lowest grid emission factors in the region, providing favorable conditions for long-term electrification of the transport sector. In comparison to its neighboring countries, the Kyrgyz Republic’s energy sector only emits 0.13 kilograms of carbon dioxide per kilowatt-hour (kgCO₂/kWh), whereas Turkmenistan and Kazakhstan emit 1.05 kgCO₂/kWh each, and Uzbekistan emits 0.79 kgCO₂/kWh.\(^9\) Taking into account that EV’s are considered to result in significant greenhouse gas (GHG) reductions at a grid factor below 0.8 kgCO₂/kWh, and given that road transport in the Kyrgyz Republic accounts for about 22.1% of the country’s GHG emissions, a gradual electrification of the transport sector would have considerable climate benefits.\(^10\) To identify the key barriers to long-term electrification of road transport in the Kyrgyz Republic, the Asian Development Bank (ADB) conducted an initial country assessment and market survey, and is planning to provide technical assistance in the form of a long-term e-mobility road map. Based on ADB’s analysis, the most efficient strategy to promote long-term adoption of EV’s in the country is, initially, to support the establishment of large EV fleets (buses, taxis, and government vehicles), as they (i) have high mileage, ridership, and utilization; (ii) allow significant cost savings because of the concentration and optimal utilization of cost-intensive charging infrastructure; and (iii) can maximize the benefits of preferential electricity tariffs for EV charging (Som1.58/kWh), introduced by the government in March 2020.

7. **Old assets.** Most of the power generation assets and the network were commissioned in the 1970s–1980s, and 45% of the installed generation capacity is reaching the end of its useful economic operation. Toktogul HPP experienced breakdowns three winters in a row (2015, 2016, 2017) because of delapidated cables, transformers, and generating units. The poor condition of the transmission and distribution assets worsens this situation.

8. **Poor supply reliability and service quality.** Supply reliability (measured by the frequency and duration of outages) and service quality (fluctuations in voltage, frequency, or harmonics that can damage equipment) are likely to worsen because of old equipment. Distribution companies reported 15–16 outages per day on average in the 2015/2016 and 2016/2017 winter months (footnote 3). Emergency shutdowns of transmission and distribution facilities also occur regularly to avoid overloading of key equipment.

9. **Huge immediate investment needs.** A regional energy sector study financed by ADB found that the generation and transmission investments required in 2013–2022 totaled $1.9 billion for domestic needs, rising by 40% if distribution is considered; or about $7.3 billion if power export projects, e.g., $3 billion for Kambarata-1 (1,860 MW), are included.\(^11\)

2. **Sector Performance, Problems, and Opportunities (Urban Public Transport)**

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\(^7\) World Bank Group, Energy Sector Management Assistance Program (ESMAP) and Solargis. *Global Solar Atlas (accessed September 2020).*


\(^9\) According to the IEA, within the region, only Georgia (0.10 kgCO₂/kWh) and Tajikistan (0.07 kgCO₂/kWh) have lower grid emission factors than the Kyrgyz Republic.


10. The Kyrgyz Republic is a landlocked, highly mountainous, and rapidly urbanizing country. Its transport needs and priorities are expanding and changing because of urbanization and the rapid increase in the number of motorized vehicles, concentrated in its urban centers (Bishkek and Osh). Because of the high economic costs of imported fossil fuels, the continued deterioration of urban air quality, and the ready availability of clean hydropower, the government has prioritized the electrification of the country’s transport sector. The Kyrgyz Republic’s urban transport segment is characterized by (i) poor quality of public transport systems, (ii) a rapid increase in congestion in its urban centers, (iii) suboptimal urban traffic management and road design, and (vi) a poor urban road and nonmotorized transport network.

11. **Urban transport needs.** As the economy of the Kyrgyz Republic continues to grow and transitions to a lower middle-income country, urbanization has a growing role in supporting further economic development. The economy is becoming more dependent on growth in the service sector, which is concentrated in urban centers and depends on efficient urban transport. In almost all countries, economic growth is driven by the economies of cities. Bishkek is home to only about 17% of the population but produces nearly 38% of Kyrgyz’s gross domestic product.

12. Migration to urban areas is one of the most effective avenues for the rural poor to grow their income and participate more fully in the economy. As the agriculture sector becomes more productive, less labor is required. The concentration of economic opportunities in cities and the diminishing need for labor in agriculture provide a strong impetus for domestic urban migration. However, the cost of urban land generally compels the poorest urban residents to live near the urban periphery, where relative costs for transport (in terms of both time and money) are high. Investment in urban transport is critical to enable urban enterprises to access labor, materials, products, and services. Urban residents need to be able to access jobs, shopping facilities, and social services, with the poor relying heavily on urban public transport.

13. Bishkek and Osh are the largest urban areas in the country and exhibit many of the problems that plague developing cities across Asia. However, the two cities are quite different from each other. Bishkek, which is a relatively new city (with a population of 1,012,500), has a well-planned street grid network in the urban core. The grid network and street hierarchies become less regular in the newer developed areas and suburban areas. The railway that runs east–west (i) disrupts the city’s street grid, (ii) forces a significant amount of traffic onto the relatively few underpasses, and (iii) creates bottlenecks at grade crossings for traffic traveling north–south. Osh (with a population of 281,000) is the oldest city in the Kyrgyz Republic and grew along major ancient road corridors without much modern planning. Both cities have been overwhelmed by the growth in automobile ownership. Even as a well-planned city in its core, Bishkek cannot handle the escalating number of vehicles. Osh is much smaller; and, because of its overall lack of urban planning, its transport network is overburdened by motor vehicle traffic. Both cities have reasonably extensive but dilapidated electric trolleybus networks, which are supplemented by diesel buses and highly polluting minibuses. Even with the large number of cars, both cities enjoy high public transport ridership, with Bishkek having a public transit mode share of nearly 50% in 2019.

14. **Quality of public transport.** In Bishkek, public transport is dominated by the public bus system—which runs electric trolleybuses and fossil fuel buses under Bishkek Municipality—and the private paratransit system of minibuses. The public transport system in Bishkek consists of a public electric trolleybus network (133 buses), a public fleet of fossil fuel buses (180 buses, of which 60 are CNG), and a privately operated system of minibuses (4,071 diesel minibuses). Minibus service providers increasingly dominate public transport in Bishkek, carrying about 67% of public transport passengers (trolleybuses only carry 18% and fossil fuel buses 15% of passengers).

15. In Bishkek, Osh, and smaller cities, a substantial number of taxis are operating. Bicycles are used and some bike lanes exist, but many bike lanes are encroached upon by
parked vehicles and few trips are made by bicycle. Bishkek is seeking to control parking in the urban core, but the government increasingly realizes that better public transport is needed to provide reasonable and comfortable alternatives to driving. The city has been replacing dilapidated trolleybuses with newer models and has procured some new CNG buses. However, many vehicles are well beyond their useful life, with many being unusable. Development patterns have changed as Bishkek has grown. New areas have been opened to development, with new roads being built and existing ones being extended. However, the trolleybus network has remained essentially the same since the Soviet Union period when the city was much smaller. The growing mismatch between travel demand patterns and the public bus network has resulted in private minibuses providing most public transport trips. To improve the alignment of the public bus route system and travel demand, the city needs to conduct a full review of its public transport network, including origin–destination surveys of all bus riders (public and minibuses); and design a route network to focus the public bus service on key travel markets. These travel markets may require routes that do not have a trolleybus catenary system.

16. **Traffic management.** While urban traffic congestion has rapidly worsened in Bishkek and Osh, compared with other cities in Asia, the problems are still manageable. Investments to stabilize and grow public transport ridership, along with the implementation of good urban traffic management practices—including timing-optimized and synchronized traffic signals, better lane and intersection delineation, appropriate enforcement of traffic rules, and effective parking policies—would be efficient tools to reduce urban traffic congestion and improve urban livability. ADB has conducted a short traffic management study, in cooperation with the Kyrgyz State University of Construction, Transport and Architecture, to analyze and simulate traffic movements at three key congested intersections in the city center. The analysis indicates that the following factors significantly degrade the capacity of the road network: (i) overly short signal timing, (ii) lack of signal synchronization, (iii) lack of a protected left turn signal cycle at some intersections, (iv) uncontrolled and illegal parking blocking traffic lanes, (v) blocking of intersections by stopped vehicles, and (vi) poor bus stop placement. Addressing these issues could be accomplished at a relatively low cost and would alleviate a significant percentage of the congestion and delays in the urban core. A viable option to address this issue would be to pilot a “model corridor,” where full upgrade of the traffic signal system (including timing and synchronization, lane delineation, parking reform and enforcement, and bus stop upgrades and relocations) could demonstrate the congestion relief benefits of relatively minor improvements on a specific congested urban road.

17. **Urban road and nonmotorized transport network.** Off the main corridors, both streets and sidewalks are in generally poor condition. Many streets and sidewalks, even in the city center, have deteriorated to the point of being practically impassable. Upgrades to streets in the lower level of the street hierarchy (category V [sub-main roads] in the Kyrgyz Republic’s road category system) would help improve the pedestrian environment and urban livability, as well as relieve traffic congestion by providing alternative routes.

3. **Government’s Sector Strategy**

18. The government is highly motivated to support the expansion of EV’s. The National Development Strategy of the Kyrgyz Republic, 2018–2040 explicitly promotes the use of EV’s in the transport sector, and numerous tax and duty exemptions have been implemented or proposed during 2019–2020 (Ordinance of the Government No. 385-rp). The Kyrgyz Republic adopted preferential import duties on EV’s in 2018. Government Ordinance No. 385-rp, adopted in 2019, commits the government to an action plan for stimulating the adoption and use of electric vehicles. This ordinance also proposes to eliminate all tariffs and duties on the import of EV’s and components for charging infrastructure. A proposal to amend the tax code to introduce a 7-year moratorium on value-added tax for EV’s and charging infrastructure was approved in 2020. Public EV charging will also receive a preferential tariff of Som1.58 per kWh compared with a commercial rate of Som2.24 per kWh. Both tariffs are exceptionally low,
which ensures that the operating costs of EV’s are much lower than internal combustion vehicles, supporting the financial viability of the proposed project. Bishkek Municipality is preparing a new public transport development strategy. The city has identified the need for 800–1,000 new buses to expand the fleet and replace outmoded and highly polluting vehicles. It is working with ADB, the European Bank for Reconstruction and Development (EBRD), and other development partners on plans to replace its most polluting vehicles and transition to lower emission CNG buses and zero-tailpipe emission battery electric buses.

B. Major Development Partners: Strategic Foci and Key Activities

19. Development coordination encompasses activities in both the energy and transport sectors. The project envisages improvements in public transport services utilizing zero-combustion emission battery electric buses, supporting reduced emission, and jumpstarting the adoption of EV’s in the Kyrgyz Republic. The major development partners in urban transport and energy in the Kyrgyz Republic have supported urban roads, promoted public transport vehicle purchases, and expanded clean energy production.\(^{12}\)

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20. The EBRD has been the primary multilateral partner in the Kyrgyz Republic’s urban transport segment, with three small projects to purchase new electric trolleybuses in Bishkek and Osh. The EBRD is also supporting the preparation of a public transport development strategy, which began in 2020 and in the same year initiated a scoping study to develop a new project to finance lower emission buses for Bishkek Public Transport Company under the municipal government. ADB, the EBRD, and the EBRD’s consultant team have held multiple coordination meetings to ensure the two proposed projects are complementary and to refine the consultants’ terms of reference to prevent overlap and maximize the benefits to the government.

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\(^{12}\) These development partners include ADB, the Eurasian Development Bank, the EBRD, the Export–Import Bank of China, the Swiss Agency for Development and Cooperation, and the World Bank.
C. Institutional Arrangements and Processes for Development Coordination

21. ADB and the Kyrgyz Republic prepared the country partnership strategy, 2018–2022.\(^\text{13}\) ADB held intensive consultations with development partners to ensure a coherent, coordinated response to its implementation. ADB’s strategy and operations in the Kyrgyz Republic’s energy and transport sectors, as the two largest sectors for ADB engagement with the Kyrgyz Republic, are subject to close consultations and agreement with development partners to align their support with the country’s own sector strategies. Energy and transport sector working groups under the Development Partners Coordination Council (DPCC) meet regularly to discuss project pipeline planning, and project and policy coordination; and to seek opportunities for cofinancing. The DPCC members include all major multilateral and bilateral development partner representatives, except the Export–Import Bank of China. ADB chairs the transport sector subcommittee, while ADB and the World Bank cochair the energy sector subcommittee. The DPCC enables development partners to present their position in “One Voice” and invite the government to discuss its strategy and policy for the sector.

D. ADB Experience and Assistance Program

22. ADB’s experience in the Kyrgyz Republic’s energy sector comprises the Power and District Heating Rehabilitation Project (approved in 1996),\(^\text{14}\) the Power Sector Improvement Project (2010),\(^\text{15}\) the Power Sector Rehabilitation Project (2012),\(^\text{16}\) the Toktogul Rehabilitation Phase 2 Project (2014),\(^\text{17}\) the Toktogul Rehabilitation Phase 3 Project (2016),\(^\text{18}\) and the Uch-Kurgan Hydropower Plant Modernization Project (2019).\(^\text{19}\) ADB has provided about $450 million to the energy sector in the Kyrgyz Republic. ADB supports the government’s strategy to improve the performance of the energy sector, given the strong link between efficient and reliable energy supply and economic and social development. ADB’s strategy is to build on the current portfolio and focus on activities where the greatest impact on poor households can be realized. ADB’s assistance program during the country partnership strategy period (2018–2022) prioritized energy efficiency and new technology options for energy security, including the introduction of EV’s for scale-up. This project supports this goal and leverages ADB’s past support to the Kyrgyz Republic to upgrade energy infrastructure and expand clean energy production.

23. ADB’s transport assistance has been in road transport. Since its first transport loan to the Kyrgyz Republic in 1996, ADB has focused on improving the international road corridors linking Kyrgyz Republic to its neighbors under the Central Asia Regional Economic Cooperation (CAREC) framework. ADB has approved 12 transport projects, with total financing of $640 million. This support has succeeded in rehabilitating and improving CAREC Corridors 1, 2, 3, and 5, which connect Kazakhstan, Kyrgyz Republic, the People’s Republic of China, Tajikistan, and Uzbekistan. Combined with the road projects financed by other donors, the main international corridors in the Kyrgyz Republic have largely been rehabilitated. ADB projects are financing the establishment of a road asset management system and the development of a road safety unit in the Ministry of Roads and Transport. This public transport electrification project will be the first ADB intervention in urban transport in the Kyrgyz Republic, and draws on the extensive combined experience of ADB in energy and public transport.

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\(^{14}\) ADB. 2014. *Power and District Heating Rehabilitation Project*. Manila

\(^{15}\) ADB. 2010. *Power Sector Improvement Project*. Manila

\(^{16}\) ADB. 2012. *Kyrgyz Republic: Power Sector Rehabilitation Project*. Manila

\(^{17}\) ADB. 2014. *Kyrgyz Republic: Toktogul Rehabilitation Phase 2 Project*. Manila

\(^{18}\) ADB. 2016. *Kyrgyz Republic: Toktogul Rehabilitation Phase 3 Project*. Manila

\(^{19}\) ADB. 2019. *Kyrgyz Republic: Uch-Kurgan Hydropower Plant Modernization Project*. Manila
Problem Tree for Bishkek Public Transport Sector

**Core Problem**

Bishkek municipality vehicle fleet has significant adverse environmental and economic impacts

**Effects**

- Deteriorated public health
- Decreased quality of life
- Decreased city attractiveness
- Decreased economic growth
- Increased levels of air pollution and GHG emissions
- Reduced energy security of transport sector
- High imports of fossil fuels, with negative impact on national balance of payments

**Causes**

- Public transport in Bishkek municipality is dominated by an outdated and polluting fossil fuel minibus fleet
- Large number of outdated and polluting passenger cars, taxis, and delivery vehicles operating in the city of Bishkek
- Use of low-quality fuel in private and public vehicle fleet
- Congestion during peak hours causes idling time for vehicles and an increase in traffic-related emissions
- Lack of readiness to promote the electrification of the transport sector efficiently
- Lack of experience on EV operation and maintenance causes a barrier for introducing EV introduction

**Root Causes**

- Takeover of bus routes, previously served by large trolley and ICE buses, by private minibus companies
- Insufficient funds to replace decommissioned trolley and ICE buses
- Insufficient financial resources to maintain existing vehicle stock
- Bishkek public transport companies operate below cost recovery
- Higher CAPEX of electric vehicles compared with ICE vehicles makes electric vehicles financially unattractive
- Absence of comprehensive requirement for regular technical inspections and certification of passenger vehicles
- Fuel standards are not enforced
- Previous import of large numbers of low-cost, outdated passenger cars because of low import tax policies
- Higher CAPEX of electric vehicles compared with ICE vehicles makes EV’s financially unattractive
- Decreased quality of life
- Decreased city attractiveness
- Decreased economic growth
- Increased levels of air pollution and GHG emissions
- Reduced energy security of transport sector
- High imports of fossil fuels, with negative impact on national balance of payments

**Proposed ADB Intervention**

- Enhanced traffic management along major corridors (e.g., traffic signal optimization, intersection channelization)
- Improved fuel standards enforcement
- Increased financial resources for fleet modernization
- Improved intermodal transport connectivity
- Increased public awareness on the benefits of electric vehicles

**Definitions**

- ADB = Asian Development Bank
- CAPEX = capital expenditure
- EV = electric vehicles
- GHG = greenhouse gas
- ICE = internal combustion engine