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Report No: PAD5184

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT
ON A
PROPOSED CREDIT

IN THE AMOUNT OF US$50 MILLION

TO THE

KYRGYZ REPUBLIC

FOR THE

KYRGYZ REPUBLIC AIR QUALITY IMPROVEMENT PROJECT

NOVEMBER 3, 2023

Environment, Natural Resources, and the Blue Economy
Europe and Central Asia

CURRENCY EQUIVALENTS

(Exchange Rate Effective October 31, 2023)

Currency Unit =	Kyrgyz Som (KGS)
KGS 89.3 =	US$1
KGS 1 =	US$ 0.01

FISCAL YEAR
January 1 - December 31

Regional Vice President:	Antonella Bassani
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ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
AQ	Air Quality
AQM	Air Quality Management
AQMS	Air Quality Management System
CBA	Cost-Benefit Analysis
CPF	Country Partnership Framework
CPI	Consumer Price Index
DA	Designated Account
DEM	Department of Environmental Monitoring
DFIL	Disbursement and Financial Information Letter
EBCR	Economic Benefit-Cost Ratio
EE	Energy Efficiency
EIRR	Economic Internal Rate of Return
ENPV	Economic Net Present Value
ESCO	Energy Service Company
ESF	Environmental and Social Framework
ESMF	Environmental and Social Management Framework
EX-ACT	Ex-Ante Carbon-Balance Tool
FAO	Food and Agriculture Organization
FI	Financial Intermediary
FM	Financial Management
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information System
HH	Household
HLCCP	High-Level Commission on Carbon Prices
IFR	Interim Financial Report
IPF	Investment Project Financing
IT	Information Technology
KGGTF	Korea Green Growth Trust Fund
MFD	Maximizing Finance for Development
MNRETS	Ministry of Natural Resources, Ecology, and Technical Supervision
MOE	Ministry of Energy
MoF	Ministry of Finance
NDC	Nationally Determined Contribution
NPL	Nonperforming Loan
NWFP	Non-Wood Forest Product
O&M	Operation and Maintenance
PASA	Programmatic Advisory Services and Analytics
PCM	Private Capital Mobilization
PFI	Participating Financial Intermediary
PIU	Project Implementing Unit
PM	Particulate Matter
POM	Project Operational Manual
PPL	Public Procurement Law

PPSD	Project Procurement Strategy for Development
PSC	Project Steering Committee
SEA/SH	Sexual Exploitation and Abuse/Sexual Harassment
SEP	Stakeholder Engagement Plan
SFH	Single-Family Houses
SOE	Statement of Expenditure
STEP	Systematic Tracking of Exchanges in Procurement
TA	Technical Assistance
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
WHO	World Health Organization

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DATASHEET

BASIC INFORMATION

Project Beneficiary(ies)	Operation Name		
Kyrgyz Republic	Kyrgyz Republic Air Quality Improvement Project		
Operation ID	Financing Instrument	Environmental and Social Risk Classification	
P177467	Investment Project Financing (IPF)	Moderate	

Financing & Implementation Modalities

[ ] Multiphase Programmatic Approach (MPA)	[ ] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[ ] Fragile State(s)
[ ] Performance-Based Conditions (PBCs)	[ ] Small State(s)
[✓] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[ ] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternative Procurement Arrangements (APA)	[ ] Hands-on Expanded Implementation Support (HEIS)

Expected Approval Date	Expected Closing Date
29-Nov-2023	31-Dec-2030
Bank/IFC Collaboration	Joint Level
Yes	Complementary or Interdependent project requiring active coordination

Proposed Development Objective(s)

The Project Development Objective is to i) strengthen the capacity of the Kyrgyz Republic to manage air quality; and ii) reduce net PM2.5 and GHG emissions in Bishkek.

Components

Component Name	Cost (US$)

Component 1 - Strengthen air quality management system	9,100,000.00
Component 2 - Support the adoption of clean heating solutions	32,300,000.00
Component 3 - Improve Urban Greening	7,100,000.00
Component 4 - Project Implementation Support	1,500,000.00

Organizations

Borrower:	Kyrgyz Republic
Implementing Agency:	Ministry of Natural Resources, Ecology and Technical Supervision, Ministry of Finance

PROJECT FINANCING DATA (US$, Millions)

Maximizing Finance for Development

Is this an MFD-Enabling Project (MFD-EP)? Yes

Is this project Private Capital Enabling (PCE)? No

SUMMARY

Total Operation Cost	**52.40**
Total Financing	**52.40**
of which IBRD/IDA	**50.00**
Financing Gap	**0.00**

DETAILS

World Bank Group Financing

International Development Association (IDA)	50.00
IDA Credit	50.00

Non-World Bank Group Financing

Commercial Financing	2.40
Unguaranteed Commercial Financing	2.40

IDA Resources (US$, Millions)

	Credit Amount	Grant Amount	SML Amount	Guarantee Amount	Total Amount
National Performance-Based Allocations (PBA)	50.00	0.00	0.00	0.00	50.00
Total	**50.00**	**0.00**	**0.00**	**0.00**	**50.00**

Expected Disbursements (US$, Millions)

WB Fiscal Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Annual	0.50	1.80	2.30	7.50	11.70	13.40	12.26	0.54	0.00	0.00
Cumulative	0.50	2.30	4.60	12.10	23.80	37.20	49.46	50.00	50.00	50.00

PRACTICE AREA(S)

Practice Area (Lead)

Environment, Natural Resources & the Blue Economy

Contributing Practice Areas

Energy & Extractives; Urban, Resilience and Land

CLIMATE

Climate Change and Disaster Screening

Yes, it has been screened and the results are discussed in the Operation Document

SYSTEMATIC OPERATIONS RISK- RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Substantial
2. Macroeconomic	Substantial

3. Sector Strategies and Policies	Low
4. Technical Design of Project or Program	Substantial
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Substantial
7. Environment and Social	Moderate
8. Stakeholders	Moderate
9. Other	
10. Overall	Substantial

POLICY COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

ENVIRONMENTAL AND SOCIAL

Environmental and Social Standards Relevance Given its Context at the Time of Appraisal

E & S Standards	Relevance
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Relevant
ESS 10: Stakeholder Engagement and Information Disclosure	Relevant
ESS 2: Labor and Working Conditions	Relevant
ESS 3: Resource Efficiency and Pollution Prevention and Management	Relevant
ESS 4: Community Health and Safety	Relevant
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Not Currently Relevant
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevant
ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Not Currently Relevant

ESS 8: Cultural Heritage	Relevant
ESS 9: Financial Intermediaries	Relevant

NOTE: For further information regarding the World Bank's due diligence assessment of the Project's potential environmental and social risks and impacts, please refer to the Project's Appraisal Environmental and Social Review Summary (ESRS).

LEGAL

Legal Covenants

Sections and Description
Schedule 2, Section I, para A.1: The Recipient shall establish, by not later than two (2) months from the Effective Date, and thereafter maintain throughout Project implementation, a Project steering committee ("PSC") to be responsible for overseeing Project implementation and providing strategic guidance, with mandates, responsibilities and composition as further described in the POM and acceptable to the Association.
Schedule 2, Section I, para A.2: The Recipient, through MNRETS, shall maintain throughout Project implementation, a Project implementing unit ("MNRETS PIU") within the MNRETS, to be responsible for (i) the implementation of Part 1, 3 and 4 of the Project, including coordination, fiduciary, monitoring and evaluation, social and environmental standards management and reporting, and (ii) coordination with the MoF PIU and preparation of consolidated Project reporting, with mandates, functions, responsibilities, structures, resources and staff, as further described in the POM and acceptable to the Association.
Schedule 2, Section I, para A.3: Without limitation to section I.A.2 of this Schedule 2, (A) the MNRETS PIU shall include inter alia (i) a director, a coordinator, a financial management specialist and a procurement specialist, all with qualifications, experience and terms of reference acceptable to the Association; and (ii) an environmental specialist and a social specialist, both with qualifications, experience and terms of reference acceptable to the Association. The Recipient, through MNRETS, shall, no later than one (1) month after the Effective Date, hire the specialists set out in (ii) above.
Schedule 2, Section I, para A.4: The Recipient, through MoF, shall maintain throughout Project implementation, the Project implementing unit ("MoF PIU") within the MoF, to be responsible for the implementation of Part 2 and 4 of the Project, including coordination, fiduciary, monitoring and evaluation, social and environmental standards management and reporting, with mandates, functions, responsibilities, structures, resources and staff, as further described in the POM and acceptable to the Association.
Section IV of Schedule 2: The Recipient, through MNRETS shall, no later than one (1) month from the Effective Date, install, and thereafter maintain throughout Project implementation, accounting software for the Project acceptable to the Association.

Conditions

Type	Citation	Description	Financing Source
Effectiveness	Article IV, para 4.01	The Additional Conditions of Effectiveness consists of the following, namely that	IBRD/IDA

		the Project Operational Manual, set out in Section I.D.1 and of Schedule 2 to this Agreement and satisfactory to the Association, has been adopted by MoF and MNRETS.	

I. STRATEGIC CONTEXT

A. Country Context

1. **The Kyrgyz Republic is a low-middle-income country in Central Asia with a population of about 6.6 million and an annual growth rate of 1.7 percent**. During 2016–2019, the Kyrgyz Republic's gross domestic product (GDP) grew at a stable rate of 4.3 percent. After a sharp slump of 8.6 percent due to the COVID-19 pandemic, the economy rebounded with a 3.6 percent growth rate in 2021 despite a soaring inflation of 11.2 percent driven by high food and fuel prices. Reduced labor income and remittance caused by the COVID-19 pandemic and inflation pushed an additional 700,000 people (11 percent of the population) into poverty in 2020,[1] reaching 25.3 percent of the poverty rate. GDP growth is expected to be below 4 percent in 2023 and level to around 4 percent in 2024–2025 because of the spillover effects of Russia's invasion of Ukraine and the sanctions on Russia.

2. **The Kyrgyz Republic is facing challenges in transitioning to a green growth path.** The key challenge is the country's narrow economic base dominated by dependence on minerals and natural resources. The resource intensity of the Kyrgyz economy is four times higher than the subregional and regional average. Urban areas are going through rapid expansion without adequate infrastructure to cope with growing population. Despite the high share of renewable energy in electricity generation (hydropower > 90 percent), the energy sector is still dominated by use of fossil fuels (oil 48 percent and coal 17 percent)[2] because of the heavy dependence on fossil fuels for heating. The residential sector is the largest energy consumer due to the high demand for heating, predominantly based on coal. All these factors have contributed to deterioration of the environment, including worsening air pollution, which adversely affects human health, quality of life, and economic productivity.

3. **The Kyrgyz Republic, highly susceptible to climate change in Central Asia, faces increased vulnerability due to limited socioeconomic development, insufficient infrastructure, and reliance on climate-affected sectors such as agriculture and hydropower.** Human activities such as intensive agriculture and logging compound natural aridity, resulting in land degradation, desertification, and air pollution. Glacier melt-induced water resource decline could amplify fossil fuel use, greenhouse gas (GHG) emissions, and air quality (AQ) degradation, exacerbating environmental issues. Despite relatively low GHG emissions (ranked 29th globally), the Kyrgyz Republic aims to unconditionally reduce emissions by 15.97 percent by 2030 and by 43.62 percent with international support, mainly targeting energy, agriculture, and forestry. The Nationally Determined Contribution (NDC) also outlines adaptation measures across sectors such as water resources, agriculture, energy, emergencies, and public health, along with intersectoral themes such as climate-resilient areas and green cities.

4. **In 2018, the Kyrgyz Parliament adopted the 'Concept of Kyrgyzstan as a Green Economy Country' as the first policy guidance on greening its economy.** The 'Program for the Development of Green Economy (2019–2023)', enacted in 2019, sets out a strategy and plan to create the basis for green economy approaches in the development of the national economy. The Program focuses on seven priority areas: green energy, green agriculture, green industry, low carbon and environmentally friendly transportation, sustainable tourism, waste management, and green cities.

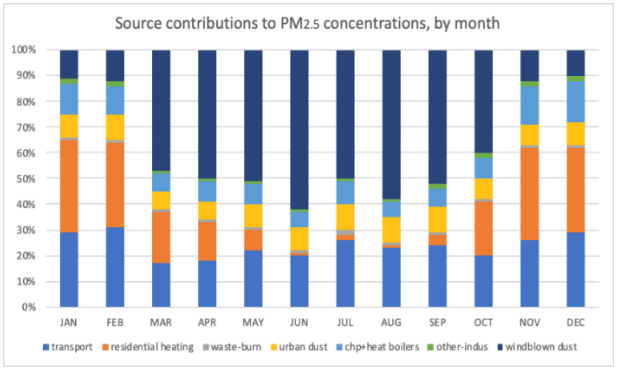
B. Sectoral and Institutional Context

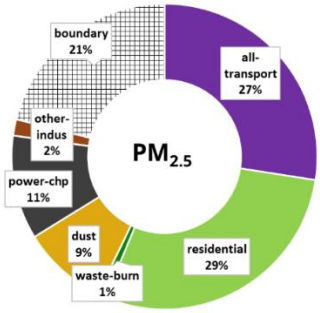
[1] World Bank. 2021. *One Year Later in the Kyrgyz Republic's Battle Against COVID-19*. https://www.worldbank.org/en/news/feature/2021/03/17/one-year-later-in-the-kyrgyz-republic-s-battle-against-covid-19.
[2] IEA (International Energy Agency). 2020. Kyrgyzstan Energy Profile.

Air Quality Issues

5. **Ambient air pollution is a significant health risk in many cities of the Kyrgyz Republic, with fine particulate matter ($PM_{2.5}$) being the pollutant of gravest concern.** According to the World Health Organization (WHO), $PM_{2.5}$ is estimated to have caused 2,586 deaths (11.2 percent of all annual deaths[3]) and 5,319 years lived with disability in 2019. The health damage from ambient $PM_{2.5}$ pollution in 2019 is estimated to have cost US$1,147 million (purchasing power parity), which is equivalent to about 5.1 percent of GDP.[4] International air quality standards set by the WHO, European Union, and United States Environmental Protection Agency are frequently surpassed with respect to $PM_{2.5}$. Bishkek, the capital of the Kyrgyz Republic, is among the most polluted capitals in Central Asia, with the average annual $PM_{2.5}$ concentrations in 2022 surpassing the WHO guideline value of 5 µg/m^3 by nearly sevenfold. During the winter period, the daily average concentrations of $PM_{2.5}$ in Bishkek often exceed 200 µg/m^3, against the WHO guideline of 15 µg/m^3. Although pollution levels are higher in winter months, the international standards are surpassed throughout the year. The other two big cities, Osh and Jalalabad, where AQ is not monitored regularly, are also believed to be facing increasing air pollution levels.

Figure 1 . Modeled Source Contributions to $PM_{2.5}$ Concentrations in Bishkek by Month (left) and Annually (right), in Percentage





Source: World Bank Study 2023.

6. **Residential heating, transport, and windblown dust coming from outside the city are the largest contributors to high levels of ambient $PM_{2.5}$ concentrations in Bishkek.** Together, these sources contribute to over 75 percent of the annual average ambient $PM_{2.5}$ concentrations in Bishkek. Recent air quality analyses[5] point to solid fuels (mainly coal) used for heating as the main source of $PM_{2.5}$ emissions contributing to 29 percent of $PM_{2.5}$ concentrations annually and to nearly 40 percent during the winter season—when the highest $PM_{2.5}$ concentrations are recorded in Bishkek. Residential heating's contribution to $PM_{2.5}$ concentrations during the winter is significant due to the widespread use of coal and inefficiency of the heating appliances. Transport and windblown dust also contribute substantially to the $PM_{2.5}$, with windblown dust being the dominant source of $PM_{2.5}$ in the summer (see figure 1).

7. The heating sector remains heavily dependent on fossil fuels (coal and firewood). In Bishkek, a city with a population of 1.07 million, individual coal-based heating is the dominant choice. Heating methods include district heating

[3] Health and Pollution Action Plan 2019.
[4] World Bank. 2021. *The Global Health Cost of $PM_{2.5}$ Air Pollution: A Case for Action Beyond 2021*. The economic cost of $PM_{2.5}$ air pollution in Kyrgyzstan (5.1 percent of GDP) is comparable to other countries with the highest economic impact from $PM_{2.5}$ air pollution in the region, Tajikistan (5.9 percent) and Turkmenistan (5.8 percent).
[5] Air Quality Analysis for Bishkek: $PM_{2.5}$ Source Apportionment and Emission Reduction Measures, World Bank, September 2023 (https://documents1.worldbank.org/curated/en/099110123211021470/pdf/P17087000827dd04e09d6a0d01dc0ab3c41.pdf); UNDP (United Nations Development Program)/ United Nations Environment Program (UNEP) www.undp.org/kyrgyzstan/publications/air-quality-bishkek-assessment-emission-sources-and-roadmap-supporting-air-quality-management.

by centralized suppliers within the city and individual solutions used by households outside the district heating network. Most single-family homes (98 percent) use individual heating, relying on coal stoves or simple boilers (73 percent coal, 22 percent electricity, and 2 percent gas), causing pollution. Pollution hotspots are found where homes use solid fuels for heating. Multi-apartment buildings have a smaller impact on pollution (about 5 percent). The transition of heating to electricity will not only help have cleaner heating and less emissions but will also support the strategic development of renewables considering the expected increase in demand.

8. **Affordability of clean heating options, such as heat pumps, is a concern for many households (HHs) in Bishkek due to high up-front investment costs and a lack of access to affordable financing.** However, the levelized cost of energy, which also includes the cost of fuel and maintenance, is much higher for the coal-based heating systems. Heat pumps are three to four times more efficient, resulting in reduced monthly bills. The HH survey shows that most HHs (68 percent) expressed their willingness to pay KGS 36,000 annually and more to switch to clean heating. The HHs indicated their interest in borrowing to improve their comfort and reduce the time spent on loading the boiler with coal, cleaning the chimney regularly, and keeping the house clean. Key barriers are the underdeveloped market for such technologies and the lack of attractive financial products offered by the banking sector for these investments. The banking sector considers the heat improvement investment as a consumer loan with high interest and low maturity financial products. The average weighted interest rate of consumer loans is about 25 percent for loans with 6–12 months maturity and about 20 percent for loans over three years, while the average weighted interest rates for mortgages is about 17 percent for loans with 6–12 months maturity but comes down to 11 percent for loans over three years in local currency financing.[6] The lack of understanding of clean heating technologies, including the monetary and non-monetary benefits, and the tendency to treat them as consumer loan products instead of home improvement products prevent the development and introduction of adequate financial products targeting the HHs market for investments in heat pump and solar technologies. The Government has a targeted subsidy program for low-income families with a lifeline electricity tariff of US¢0.85 per kWh, which makes electricity-based clean heating affordable.

9. **The transport sector is the second major contributor to ambient $PM_{2.5}$ concentrations in Bishkek, and some efforts to address emissions from the transport sector are under way.** Air pollution from transport in Bishkek is due to (a) the rapidly increasing number of vehicles in Bishkek,[7] (b) a large share of outdated vehicles, and (c) a large share of vehicles with standards lower than Euro-5 (95 percent of all registered vehicles in Bishkek are over 15 years old[8]). Given the absence of mandatory technical inspections of vehicles, a large share of vehicles is likely to have emissions beyond the manufacturers' specifications. With support from other development partners, the Government has been implementing several projects to modernize public transport vehicles such as the Urban Transport Electrification Project of the Asian Development Bank (ADB) to finance battery-electric buses and enhance transportation infrastructure in Bishkek and the Bishkek Buses Project of the European Bank for Reconstruction and Development (EBRD) to finance replacement of outdated diesel buses with natural gas ones.

10. **Windblown dust is the third largest contributor to ambient $PM_{2.5}$ levels in Bishkek—contributing 21 percent to the annual $PM_{2.5}$ concentration and the largest contributor during the summer season.** Windblown dust brought into Bishkek from the adjoining areas such as agricultural land, open fields, and degraded land contribute to high ambient $PM_{2.5}$ concentrations. In addition, urban dust from construction activities and unpaved roads and so on contributes around 9 percent to the annual $PM_{2.5}$ concentrations in Bishkek. Bishkek's dry climate makes it more susceptible to increasing

[6] See the Bulletin of the National Bank of Kyrgyz Republic.
[7] About 350,000 private vehicles are officially registered in Bishkek plus perhaps another 200,000 are on Bishkek roads despite being registered in other regions of the country.
[8] National Statistics Committee, Bishkek Municipality 2022.

dust in the air. Bishkek has been observing sandstorms with increased frequency during spring and summer and is expected to experience them more frequently according to climate change forecasts.

11. **Bishkek's diminishing green spaces, partly due to a deteriorating irrigation system, worsen air quality issues, harming urban residents' health and well-being**. Urban green areas offer various benefits, including ecological, climate-related, resilience, and recreational advantages. Properly planned urban greenery helps improve air quality by capturing pollutants and acting as barriers, reducing people's exposure to pollution.[9] However, Bishkek's green cover has decreased dramatically, dropping from 19 m^2per person[10] in 1990 to 3.5 m^2 per person in 2016—far below the WHO-recommended 9 m^2 per person. This decline is mainly due to poorly planned construction, tree removal, and irrigation system decay. According to estimates by the BishkekVodkhoz,[11] roughly 30 percent of the city's irrigation network is significantly deteriorated, and one-third of boreholes do not function, threatening the survival of the existing green spaces.

Institutional and Policy Underpinnings of Air Quality Management

12. **A recent World Bank review points to the lack of institutional capacity, sound policy framework, regulations, enforcements, and effective coordination among key stakeholders as priorities requiring swift actions to improve air quality management (AQM).** Fragmented distribution of responsibilities across the Ministry of Natural Resources, Ecology, and Technical Supervision (MNRETS); Ministry of Health; and the Ministry of Emergency Situations remain an issue. Frequent organizational changes have resulted in reduction of institutional memory and weakening of the capacity for data collection, verification, and quality control of emission inventories. Emission standards and emission control regulations need to be updated, as some are still based on the Soviet-era methodologies. The infrastructure for AQ monitoring and analysis does not meet in full the coverage requirements of either the national legislation or the international guidelines. Only one automated AQ monitoring station located in Bishkek provides international AQ reference levels in the country. Due to insufficient national and local laboratory infrastructure and limited capacity, it is not possible to measure air pollutants,[12] conduct comprehensive AQ analyses and source apportionment studies in the Kyrgyz Republic, inform policy making and enable an operational air quality management system (AQMS).

Recent Progress on the AQ Agenda and Emerging Priorities

13. **Growing concerns about poor air quality in Bishkek have spurred the Government into action.** In 2017, the Government established norms for PM_{10} and $PM_{2.5}$ under air protection laws. Additionally, the State Committee on Environment transitioned into the MNRETS in 2021, tasked with the air quality agenda as part of its environmental responsibilities. Recently, the most recent 'Plan of Comprehensive Measures to Improve the Environmental Situation in the City of Bishkek and Nearby Districts' (referred to as the 'Plan') has been developed. This Plan outlines actions in several key areas, many targeting air pollution and AQM. Proposed measures encompass cleaner heating and transportation options, increased urban greenery, and enhanced air quality monitoring. However, the Plan lacks clear prioritization, feasibility assessment, financial allocation, and an overarching framework to effectively tackle air quality issues.

14. **Improving access to clean, reliable, and efficient heating solutions and reducing reliance on solid fuels-based heating are among the key priorities of both the central and local governments (Bishkek).** The National Sustainable

[9] Lee, E. S., D. R. Ranasinghe, F. E. Ahangar, S. Amini, S. Mara, W. Choi, Y. Zhu, 2018. "Field Evaluation of Vegetation and Noise Barriers for Mitigation of Near-Freeway Air Pollution under Variable Wind Conditions." *Atmospheric Environment* 175: 92–99.
[10] Based on the inventory of 1989.
[11] In September 2022, the municipality of Bishkek established an irrigation-dedicated municipal enterprise 'BishkekVodKhoz' (Bishkek irrigation) to manage and maintain the irrigation system in Bishkek.
[12] For example, carcinogenic pollutants and those causing respiratory illnesses and damage to nervous systems such as ozone, heavy metals, and polycyclic aromatic hydrocarbons.

Development Strategy 2018–2040 and the National Development Program till 2026 outline goals for decarbonizing heating to enhance air quality (AQ). Energy efficiency (EE) laws, including the Law on Energy Saving (1998) and Law on Energy Performance of Buildings (2011), are supported by regulations and decrees.[13] BishkekTeploEnergo, a district heating utility, has converted coal boiler houses to gas and is transitioning more, while challenges persist in single-family houses (SFHs). The Government plans to finance clean heating demonstration projects to showcase AQ and other benefits, promoting wider adoption and fostering a transition away from coal in SFHs.

15. **The Government recognizes the positive effect of urban greenery in AQ management and in enhancing the urban living experience and quality of life of urban residents.** The urban greening agenda has been included in the abovementioned Plan to complement measures targeted at reducing emissions from sources and is also in line with 'green cities' concept under the 'Program for the Development of Green Economy (2019–2023)'. Potential areas for parks and landscaping activities have been identified in the city urban planning document titled 'Concept of Urban Development Scheme of the Greening Territories of the Natural Complex of Bishkek (2005)'. However, a detailed plan of actions on how to implement the concept has not been developed due to the lack of resources. The Government is currently updating the Bishkek City Master Plan (for 2050) and plans to integrate urban greenery development into the Master Plan.

16. **With ongoing engagement on the AQ agenda with the World Bank, the Government is now keen to adopt a systemic approach to addressing the multisectoral AQ issues.** This project will support the Government of the Kyrgyz Republic to address critical existing gaps in the AQMS of the country and efforts to reduce $PM_{2.5}$ and GHG emissions in Bishkek through targeted investments in clean heating and urban greenery. Building on past and ongoing efforts, the proposed project will establish a foundation for the country's overall AQ management framework, which needs the support of long-term and cross-sectoral efforts.

C. Relevance to Higher Level Objectives

17. **The proposed project is aligned with the World Bank's twin goals to end extreme poverty and promote shared prosperity in a sustainable way, as well as the overarching goal of the Country Partnership Framework (CPF)[14] (FY24–FY28).** The proposed project will help reduce air pollution, which causes or contributes to heart attacks, strokes, lung cancer, and respiratory diseases and premature deaths as well as significantly reduced labor productivity in the country. By supporting the establishment of the national AQMS, financing mechanism to increase clean heating technologies adoption, and investments for urban greening in Bishkek, the proposed project contributes to three objectives under the CPF (FY24–FY28) - Objective 1.3: Promote financial sector deepening and inclusion; Objective 2.2: 'Enhance sustainability and increase renewable capacity in the energy sector'; and Objective 2.3: 'Strengthen infrastructure resilience to climate and disaster risks.

18. **The project is aligned with the World Bank Group (WBG) Climate Change Action Plan 2021–2025, which emphasizes that "the WBG will step up support to cities, including technical assistance and financing, to help them decarbonize and build resilience."** The project also has strong links with the World Bank's Environment Strategy 2012–2022: Toward a Clean, Green Resilient World. The strategy clearly stipulates that the WBG will build on lessons from successful policies and projects to provide innovative solutions, with priority efforts focusing on 'air pollution'. The recently

[13] Particularly Regulation on the Modalities for the Energy Certification of Buildings (Government Decree № 531, August 2, 2012); Regulation on the Procedure for Periodic Monitoring of Energy Efficiency of Boilers, Heating and Hot Water Supply Systems (Government Decree № 531, August 2, 2012); Regulation on the State Register of Energy Certificates of Buildings; Reports on Periodic Monitoring of Energy Efficiency of Boilers, Heating and Hot Water Supply Systems of Buildings (Government Decree № 131, January 17, 2020); and Regulation on Rules and Procedures for Qualification Certification of Specialists in Energy Certification of Buildings and Periodic Monitoring of Energy Efficiency of Boilers, Heating Systems and Hot Water Supply of Buildings (Government Decree № 13, January 17, 2020).

[14] Report # 182689-KG, discussed by the Board of Executive Directors on October 31, 2023

completed SCD highlights 'air pollution' as "a major problem in the Kyrgyz Republic" and calls for policy actions to "Improve air pollution reduction, given its impact on human capital and morbidity, particularly in urban centers such as Bishkek," under Pathway 2.

19. **The project is consistent with the country's updated NDC in 2021.** The proposed project contributes to achieving the set mitigation goal to reduce GHG emissions by 36.61 percent in 2025 and 43.62 percent in 2030 with international support. Given that the energy sector, accounting for around 60 percent of all GHG emissions in the country, is a priority area in its mitigation commitment, the proposed activities, particularly supporting the replacement of coal-based heating by low carbon and clean heating options, are fully aligned with the measures reflected in the updated NDC. The project is also consistent with the adaptation and resilience goals of NDC and the ongoing National Adaptation Plan. The enhancement of urban green spaces, accompanied by efficient use of water, will contribute to both mitigation and adaptation goals of the country's NDC. The project is also consistent with the National Sustainable Development Strategy 2018–2040 and the National Development Program till 2026, which outline goals for decarbonizing the heating sector, among others.

20. **Maximizing Finance for Development (MFD) and Private Capital Mobilization (PCM).** The proposed project promotes the MFD approach by (a) financing clean heating options through commercial loans, including 5 percent co-financing from the own resources of private participating financial intermediaries (PFIs). With IDA credit expected to revolve for a period of 20 years, and the likelihood of PFIs offering individual sub-loans for a period of 5 years, the IDA resources are expected to rotate four times in principle. Since the project implementation period is limited to seven years, the PCM is estimated considering a 1.5 time revolving of IDA credit and the accompanied 5 percent co-financing. The US$31.8 million IDA credit (Subcomponent 2.1) is thus expected to result in an estimated the PCM of US$2.4 million (5 percent × 31.8 × 1.5) during the project period.

II. PROJECT DESCRIPTION

A. Project Development Objective

PDO Statement

21. The Project Development Objective (PDO) is to i) strengthen the capacity of the Kyrgyz Republic to manage air quality; and ii) reduce net $PM_{2.5}$ and GHG emissions in Bishkek.

22. The first part of the PDO is premised on the need to build national capacity for comprehensive AQMS for laying the foundation and further expansion of AQM activities beyond the sectors and Bishkek tackled under the proposed project. The establishment of such AQMS will enable the Government to make informed decisions and ensure sustainability of the investments in other priority areas and sectors for the long term while tackling the key air pollution sources. The second part of the PDO reflects investments in the selected priority sectors for improved AQ.

PDO Level Indicators

23. The following results indicators are proposed.

(a) Air quality analysis report is published once in two years (Yes/No).

(b) Projected lifetime $PM_{2.5}$ emission reductions from project interventions (metric ton).

(c) Projected lifetime GHG emission reductions from project interventions (metric ton).

B. Project Components

24. **The project will help the Government apply a sustained engagement in AQM, by supporting the establishment of critical AQM infrastructure and piloting two selected complementary interventions to demonstrate AQ improvement in Bishkek, which could be scaled up based on successful outcomes.** Due to financing limitations in national IDA allocation and considering significant multisector investment needs, this project is prepared within a programmatic framework, allowing activities to be scaled up and replicated, if additional financing becomes available either by the World Bank or other development partners. The project has four components: (a) strengthen air quality management system, (b) support the adoption of clean heating solutions, (c) improve urban greening, and (d) project implementation support.

Component 1: Strengthen Air Quality Management System (US$9.1 million)

This component aims to strengthen and operationalize the key elements of the AQMS, contributing to PDO indicator 1.

Subcomponent 1.1: Enhancing Ambient AQ Data Collection, Analysis, and Dissemination (US$3.2 million)

25. This subcomponent will finance investments to improve the quality of ambient AQ information. The specific activities to be funded by the project include (a) expansion of the ambient AQ monitoring network to include new reference-level automatic stations for monitoring of key pollutants (specific fractions of PM, NOx, SO_2, and others) in Bishkek and other cities of Osh, Kara-Balta, Tokmok, and Cholpon-Ata, totaling 11 new stations;[15] (b) upgrading of the existing eight manual ambient AQ monitoring stations in Bishkek and Osh; (c) expansion of meteorological monitoring capabilities that allow air pollution forecasts and analyses in Bishkek and Osh/Jalal-Abad ; (d) upgrading of the national AQ chemical testing laboratory, purchasing of equipment for analysis,[16] and strengthening of quality assurance and quality control procedures; (e) deployment of advanced models and tools for AQ forecast and related capacity building and knowledge transfer; and (f) introduction of advanced communication methods and tools for improving access and easier communication of air quality information (for example, converting air quality data to easy to understand air quality index; making air quality data accessible through web portal and mobile applications, presenting air quality data through LED display boards at important locations in the city etc) to influence behavioral change. The necessary AQ data from KyrgyzHydromet will be integrated into the MNRETS' data center (under Subcomponent 1.2) to enable comprehensive AQ analysis and its dissemination.

Subcomponent 1.2: Enhancing AQ Management and Pollution Control (US$5.9 million)

26. This subcomponent will finance investments in infrastructure, equipment, and consultancy services to (a) improve the AQ management and pollution control functions and capacity of relevant environmental and technical inspection departments/agencies under the MNRETS and (b) strengthen cross-sectoral coordination mechanism beyond the MNRETS.[17] Under this subcomponent, the project will finance (a) construction of a modern laboratory (energy efficient and seismic resistant) in Bishkek to strengthen the air pollution analysis capability of the Department of Environmental Monitoring (DEM);[18] (b) equipment and mobile laboratories for easy spot checks and related monitoring and analysis of emissions from sources requiring immediate attention; (c) establishment of a data center with necessary information technology (IT) infrastructure, to be housed in the DEM's new laboratory, including development and management of database on AQ and GHG emissions from different sectors and categories and ambient AQ collected by KyrgyzHydromet; (d) development of the inventory and registry of key air pollutants and GHG emissions, including geographic information

[15] The detailed locations will be determined based on land availability, parameters of international practices, and local legislation.
[16] Enabling analyses on additional parameters, for example, heavy metals, ozone, and volatile organic compound.
[17] These are the DEM, Department of Air Quality, Technical Inspection, and IT Department.
[18] The DEM has the mandate for monitoring pollution and GHG emissions from specific sources/enterprises.

system (GIS)-based mapping with emission sources; (e) TA support, training and capacity building for pollution monitoring and policy modelling tools; and (f) expert support to technical secretariat and preparation of Air Quality Management Plans—national and Bishkek. In addition, this subcomponent may finance other related activities such as (a) necessary equipment, infrastructure, capacity building, and knowledge exchange to improve compliance monitoring and enforcement functions of the relevant environmental and technical inspection agencies; (b) conducting of technical studies and pilot programs to inform development of policy regulations and technical guidelines related to AQM; and (c) support to the National Council on Air Quality and stakeholder engagement.

Component 2. Support the adoption of clean heating solutions (US$32.3 million)

27. This component aims at piloting select interventions to create a market towards scale-up of clean heating technologies among SFHs, by making the investment cost of clean heating options more affordable to HHs. Currently, the potential market of SFHs in Bishkek for transition to clean heating is about 118,000 HHs. The initial investments will support about 13,000 HHs during the project duration with scale-up to about 20,000 within 10 years of implementation of the revolving mechanism. It is estimated that with the market opening and further demand due to the project activities, the number of HHs with clean heating may be doubled during the same 10 years. Component 2 will be implemented by the Project Implementation Unit (PIU) under the Ministry of Finance (MoF). The PIU has strong experience in implementing financing schemes with the involvment of private and public banks.

Subcomponent 2.1: Establishment of a revolving mechanism, to provide Subsidiary Loans to PFIs for provision of Sub-loans to Beneficiaries to carry out Sub-projects (US$31.8 million)

28. **This subcomponent will pilot the adoption of clean heating solutions by SFHs in Bishkek by addressing the main barriers around high up-front costs and lack of access to financing.** Sub-loans in local currency through the PFIs will be provided to SFHs interested in switching to clean heating solutions and private entities interested in expanding their businesses to clean heating technologies and services in Bishkek. Investments supported under this subcomponent will cover a range of clean heating technologies such as heat pumps of different configurations, including, air-to-water and water-to-water, electrical boilers,[19] and solar water heating with varying costs to cater to different segments of SFHs. Fossil fuel based heating solutions are not part of this project.

29. This subcomponent will be implemented though revolving mechanism at two levels: at the PFI and the MoF. The loan from the MoF to the PFIs will cover the cost of funds and the foreign exchange risk, and it will be provided on a longer-term maturity than that of sub-loans, so the PFIs may use the funds multiple times until full repayment to the MoF. Similarly, the MoF will manage a special account through the PIU of MoF, where the returned funds will be accumulated and channeled to the same or other PFIs, thus maximizing the number of beneficiaries and impact on air quality. It is expected that such revolving mechanisms will continue for around 20 years, with the intention to extend the financing to more households after the project closing. Both state-owned and private commercial banks will have access to financing under this component, subject to meeting the eligibility criteria and according to the terms and conditions set in the Project Operational Manual (POM). Eligibility criteria for the PFIs are expected to include compliance with national prudential requirements, for instance, minimum capital adequacy ratio, maximum nonperforming loan (NPL) ratio, and adequate appraisal standards. The terms of finance will be determined considering (a) affordability for borrowers (monthly payments), (b) incentives for borrowers (the current level of spending on heating costs and the longer-term energy cost savings), and (c) incentives for the PFIs (interest rate to cover the full costs of loans such as cost of funds, operating expenses, and regulatory costs including provisioning). The terms and conditions of the loans to be detailed in the POM will ensure that the IDA concessionality is passed on to the households. The proposed financing arrangement

[19] Criteria and conditions under which electrical boilers will be eligible to be defined in the POM.

(see figure 1.1, Annex 1) will allow multiple rotation of funds to benefit increased number of beneficiaries. The project will mobilize co-financing from the PFIs to serve larger number of households and equipment suppliers and will thus contribute to realization of the PCM.

Subcomponent 2.2: Supporting adoption of clean heating (US$0.5 million)

This subcomponent will support the clean heating market development through legal-regulatory and institutional framework strengthening capacity building for market players, targeted marketing, and awareness raising activities.

30. Among other activities, this component will support, in coordination with other international financial institutions and donors, the following:

(a) **Development of policy, institutional, and regulatory measures to achieve longer-term sustainability of the heating sector.** This activity will support (i) development of sustainable heating strategy of the country, (ii) adoption of technical standards and codes, and (iii) introduction of quality assurance systems.

(b) **Market development and capacity building** for clean heating and EE market players, including government institutions, heating appliance manufacturers and suppliers, and banks. This activity will particularly (i) support the PFIs to promote the lending product and (ii) finance vocational technical training on clean heating technologies for targeted workforce to serve in the potential new clean heating markets. There will be technical consultancy services to support the residents and PFIs on site-specific questions. These activities will be planned and implemented in cooperation with the International Finance Corporation, relevant government agencies, and other development partners. Targeted communication and outreach activities will be planned and implemented to raise awareness among the Kyrgyz population on the benefits of clean heating investments and available support programs.

(c) **Design of a financial assistance mechanism for low-income HHs and vulnerable groups living in SFHs in Bishkek.** The financial mechanism shall consider the selection of HHs, technical specifications of the clean heating systems, terms and conditions of financing, implementation arrangements, supervision and verification mechanisms, environmental and social requirements, and other important parameters. Currently, Bishkek Municipality supports such HHs through social assistance programs, including coal purchase subsidies. The municipality is committed to mobilize its own budget or other resources to support the transition of vulnerable families to clean heating and replacement of coal purchase subsidy with a capital grant. If Bishkek Municipality initiates such program, this component could be used to support implementation activities (supervision, technical specifications preparation, and so on).

Component 3: Improve Urban Greening (US$7.1 million)

31. This component will be implemented by the PIU under the MNRETS while coordinating with agencies under the city administration of Bishkek Municipality. This component will finance equipment, civil works, necessary preparation works for detailed design, and TA needed to (a) create and maintain public green spaces; (b) expand irrigation system through water-saving and climate-resilient solutions essential to support and maintain urban greenery; and (c) build institutional capacity to support the broader urban planning agenda with community participation, focusing on healthy urban greenery and its maintenance. This component will contribute to PDO indicator 2.

Subcomponent 3.1: Supporting measures to preserve and expand urban green cover in Bishkek, including creating green belts to mitigate the impacts of windblown dust (US$1.1 million)

32. This subcomponent will support the implementation of an urban greening pilot, in the form of a green belt, specifically designed for reducing urban air pollution. Green belt(s) or green corridor(s) of about 10 km[20] length along selected roads in the city with varied widths, with an estimated green area of about 13 ha will be created in the project. The proposed green belt would include cascade greening (grass, hedge, and tree combinations with strategic spacing, alignment, and species) for effectively mitigating the impacts of dust and their survival in the Bishkek climate. The green belt would enhance the city's resilience to impacts of climate change, especially increased temperature, alongside a range of other ecosystem services, such as water flow regulation, runoff mitigation, and moderation of environmental extremes. The implementation will be coordinated by Bishkek Zelenkhoz under the Bishkek City administration.

Subcomponent 3.2: Construction of irrigation system to ensure sustainability of urban green in Bishkek (US$ 4.5 million)

33. This subcomponent will finance investments in the urban irrigation system, to increase the supply of irrigation water and its efficient use to maintain the existing and planned new green spaces in the city. To ensure sustainability of the newly created green belt(s) described above and ensure supply of adequate irrigation water for the underserved areas, this activity will support installation of about 15–20 borewells,[21] including rehabilitation of 2 existing borewells and associated irrigation infrastructure (including water-efficient and climate-resilient solutions). The project will also finance rehabilitation of two to three monitoring wells in different parts of the city to support hydrogeology expedition in improving groundwater monitoring and analysis. The activities will comprise both works contract and studies/consulting services for detailed design and supervision aspects. The irrigation activities will be coordinated by BishkekVodkhoz Municipal Enterprise (Bishkek municipal irrigation service agency).

Subcomponent 3.3: Strengthening institutional capacity of the municipal greening and irrigation agencies in Bishkek (US$1.5 million)

34. This subcomponent will finance equipment, tools, and TA support to BishkekVodkhoz and Bishkek Zelenkhoz for better irrigation and urban tree management, respectively, and expert support on urban planning with a focus on greenery and irrigation. These are as follows:

(a) **Improving operation of BishkekVodkhoz Municipal Enterprise (municipal irrigation agency).** This activity will finance (i) updating of irrigation inventory; (ii) development of GIS-based information system and provision of IT equipment; and (iii) equipment and capacity building for planning, management, and operation and maintenance (O&M) of irrigation assets and systems. This activity will strengthen the long run adaptation capacity of BishkekVodkhoz Municipal Enterprise to properly target irrigation malfunctions and enhanced maintenance, leading to better irrigation outcomes.

(b) **Improving operation of Bishkek Zelenkhoz (municipal greening agency).** This activity will support capacity building of relevant national and local agencies for urban greening such as planning, inventory updates, and maintenance of urban green space. The preliminary list of activities include (i) providing tools and trainings to estimate land and tree canopy cover in the city and support assessment of the impact of the proposed

[20] Based on a preliminary joint survey by municipal agencies.
[21] The number and locations of the bore wells have been jointly proposed by BishkekVodokhoz (the municipal irrigation service agency) and BishkekZelenkhoz (the greening agency) based on demand in specific areas, in discussion with the groundwater agency. The exact number and locations will be finalized based on additional assessments.

interventions on relevant indicators such as carbon dioxide, air pollution, stormwater flows, and energy savings for planning and (ii) maintaining urban tree inventories with regular surveys.

(c) **Support to integrating urban greening in city planning.** This activity will finance consulting/expert support to the city government and urban planners at the Design Institute for City Construction and Town Planning, State Agency of Architecture, and Bishkek Architecture in developing a new Urban Master Plan until 2050 by providing TA in developing several chapters of the strategic document, focusing on urban greening, urban irrigation, and water protection zones following international best practices. A strategic approach to urban greening in city planning is crucial to enhance climate adaptation of cities and regions, as this prevents the risk of maladaptation and strengthens the outcomes of urban greening.

Component 4: Project Implementation Support (US$1.5 million)

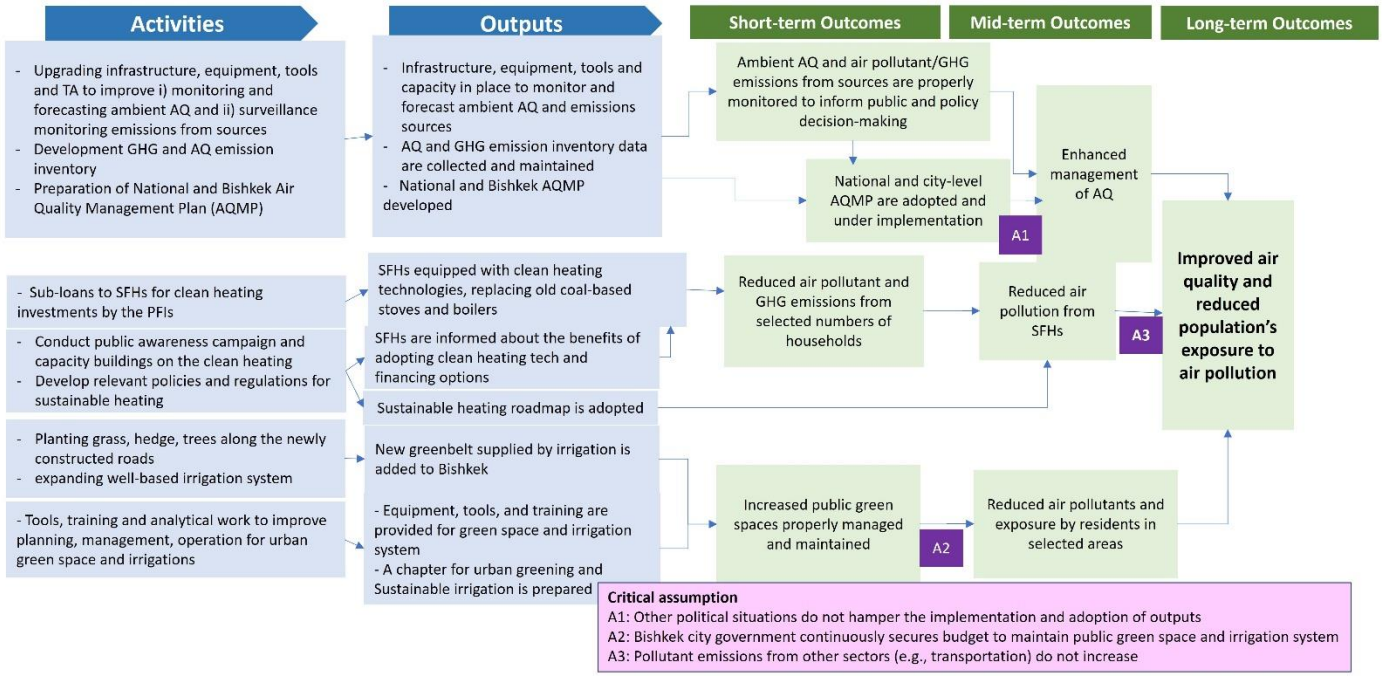
35. This component will support project implementation through provision of adequate funds for the MNRETS PIU and MoF PIU operations, including on-lending, procurement, financial management (FM), environmental and social risk management, monitoring and evaluation, and necessary capacity building of the PIUs. The project will finance incremental operating costs of both the PIUs, including remuneration, transportation, office supplies, and other implementation-related costs. To cover necessary mobilization costs for project implementation, retroactive financing is envisaged in an amount of at least US$50,000 to cover costs of both the PIUs related to the activities before project effectiveness.

C. Project Beneficiaries

36. Ultimate beneficiaries of the project are the residents of Bishkek who will benefit from the improved air quality, including from the expansion of green areas and sustainable management of new and existing green spaces. Direct beneficiaries of the project are the HHs living in SFHs in Bishkek and surrounding areas, who can transition from coal heating to clean energy. The female population will benefit more as they spend more time in the house, and they are more involved in nonpaid housekeeping tasks. Other groups of beneficiaries include PFIs, contractors, and suppliers of clean heating systems due to the increased demand for their services, as well as workers and technicians for potentially increased job opportunities. In a broader context, the population of the Kyrgyz Republic benefits from the project, as the establishment of a sound AQMS will promote policy actions toward AQ improvement.

D. Results Chain

Problem statement: Polluting residential heating and urban transport, declining urban green spaces, and limited government capacity to manage air quality contribute to worsening air quality in urban areas of the Kyrgyz Republic.
Project Development Objective: i) strengthen the capacity of the Kyrgyz Republic to manage air quality; and ii) reduce net PM2.5 and GHG emissions in Bishkek.



E. Rationale for Bank Involvement and Role of Partners

37. The World Bank has up-to-date insights on AQ issues in the Kyrgyz Republic with ongoing analytical support for this agenda. In 2021, the World Bank launched TA to improve air quality in Bishkek supported by the Korea Green Growth Trust Fund (KGGTF) grant. Under this TA, the World Bank conducted a comprehensive analysis to identify and quantify key contributors to air pollution in Bishkek and a review of the AQMS in the country to identify critical policy and institutional gaps, including a heating option study. Together, these activities identified key actions to be taken for a fully functional AQMS in the country, sources of air pollution, and technical and financing measures to improve air quality in Bishkek, which has informed the design of this investment project. The project thus has a solid analytical base to support the Government to improve its AQMS and inform some of the priority investments that are required to improve air quality in Bishkek.

38. Drawing from the World Bank Group's extensive global experience in advancing the air quality (AQ) agenda, the institution is well-equipped to assist the Kyrgyz Republic in showcasing the efficacy of multisectoral investments for curbing air pollution and its negative effects. Financial institutions lack familiarity with clean heating technologies, inhibiting the provision of affordable loans. Consequently, the growth of the clean heating market is stifled. Urban green spaces, dependent on irrigation, offer ecological benefits that qualify as a 'public good,' benefiting the entire populace and augmenting climate resilience. However, due to their non-revenue nature, private sector investment in such green infrastructure is scarce. Leveraging its experience in AQ improvement engagements in various countries including Egypt (P172548), China (163397), Poland (P170131), and Armenia (P057880), the World Bank is well-positioned to design effective interventions to support the AQ agenda in the Kyrgyz Republic.

39. The World Bank has been leading the coordination of various development partners on air quality issues in the Kyrgyz Republic. Managing air quality is a multisectoral challenge. With low capacity and fragmented efforts in the country, there is a need for a systemic and coordinated approach to address air quality issues. This project can provide the needed platform for the World Bank to play a convening role in the country for sustained engagement in the air quality agenda.

F. Lessons Learned and Reflected in the Project Design

40. The project design is based on lessons learned from ongoing studies supported by the KGGTF under the regional Programmatic Advisory Services and Analytics (PASA) Central Asia: Climate and Environment (CLIENT) (P170870). The AQMS review in the Kyrgyz Republic identified key gaps in infrastructure, institutional capacity, and policy framework to be addressed as priorities. These priorities were discussed with relevant stakeholders and reflected in the design of Component 1. The heating options study for affordable and sustainable heating options informed the design of Component 2. Heat pumps were found to be the most effective option for reducing $PM_{2.5}$ and CO_2 emissions in SFHs, with lower O&M costs compared to coal.

41. A study in Kazakhstan under the regional PASA reviewed cost-effective measures to improve air quality and reduce GHG emissions at the national level and in the two largest cities. The study found that developing the air quality monitoring network and improving legislation and responsible institutions are important for improving AQM. Clear communication of air quality data also contributes to engaging stakeholders. The activities in Component 1 of the project are informed by these lessons and aim to strengthen the policy and institutional environment and institutional capacity of AQM.

42. Poland's experience of phasing out coal as the main energy source for households highlights the importance of public awareness, consensus building, and political commitment. The project design for the Kyrgyz Republic aims to reflect key takeaways from Poland's experience, including building a strong institutional setup, providing good technical alternatives to coal, and offering adequate incentives (for example, affordable financing) for clean heating technologies.

43. One of the successful experiences is the on-lending for residential heating under the Urban Heating Project (Armenia). With a US$4.2 million on-lending component channeled through the three PFIs, the project could open markets for lending to the same market segment for similar investments by 14 local banks. This will create an appliance supply market and significantly reduce the usage of non-efficient and non-safe heating options in the country. The project design considers elements such as revolving at the PFI level, flexibility in decision-making by the PFIs in the selection of sub-borrowers, and adjustment of sub-loans based on the respective banks policy and marketing tools.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

44. The MNRETS will be responsible for implementation of the project through its PIU and for overall coordination of the project activities including fiduciary and Environmental and Social Framework (ESF) aspects by working closely with key stakeholders, including the Ministry of Emergency Situations, Ministry of Energy (MoE), MoF, Bishkek Municipality, and their relevant units. The MNRETS PIU is responsible for the planning, budgeting, and reporting of the project activities.

45. **A Project Steering Committee (PSC)** will be established to oversee the project implementation activities. It is a multiagency committee with delegated decision-making-level representatives of the MNRETS, MoF, MoE, Bishkek Municipality, KyrgyzHydromet, and other related institutions. The PSC will supervise implementation progress; approve project annual budget and work plans; and monitor project timelines, disbursements, and results. The PSC may also provide guidance regarding the strategy documents and legal regulatory acts developed under the project. The MNRETS PIU could be assigned as secretariat for the PSC.

46. The **POM** will be developed and approved to regulate details of the processes and procedures, as well as roles and responsibilities of the involved institutions. It is expected that the POM will be approved by the first disbursement from the credit proceeds.

47. The implementation of Component 2 is assigned to the MoF PIU. Given the strong capacity and experience in implementation of financial schemes through commercial banks, as well as successful execution of the World Bank-financed financial intermediary (FI) project, implementation of activities under this component will be assigned to it. The MoF PIU on behalf of the MoF will manage the subsidiary loan agreements signed with eligible PFIs, transfer the credit tranches from the specified Designated Account (DA2), collect repayments from the PFIs, and monitor the usage of funds by the PFIs. The PIU of MoF will perform fiduciary functions and assigned ESF activities for Component 2. It will provide sufficient information to the MNRETS PIU for further consolidation and presentation. More details on the implementation arrangements for Subcomponent 2.1 are presented in annex 1.

B. Results Monitoring and Evaluation Arrangements

48. The progress toward the PDO will be monitored by the PDO indicators and intermediate indicators, as presented in section VII, Results Framework and Monitoring. The MNRETS PIU will be responsible for proper monitoring and reporting on all results and indicators. The MoF PIU will provide data relevant to Component 2 activities and results.

C. Sustainability

49. One project would not be sufficient to tackle air pollution in the Kyrgyz Republic. Thus, the project is designed to (a) support development of key priority elements in the AQMS of the country, building the institutional capacity to monitor, identify underlying causes, and develop evidence-based policy making for addressing air pollution and (b) demonstrate pilot financing mechanism/investments to reduce emissions from polluting sources (clean heating) or mitigation measures (urban greening). This design can help build foundations for the country's AQMS and a framework that can be scaled up.

50. To enable the interagency coordination, which is critical for sustained engagement on AQ, Component 1 would finance a technical secretariat, which would lead the technical work program and support regular meetings of the committee. The technical secretariat would likely transform itself into a mainstream unit under the MNRETS to carry forward this work into the future, enhancing the sustainability of this arrangement. Investments in equipment and laboratory for improved monitoring and enforcement capacity will be accompanied by necessary training and repair/maintenance provisions for reliable service from suppliers and smooth operation of equipment.

51. The sustainability of investments under Component 2 hinges on the following factors: (a) creation of demand for clean heating technologies through commercial financing; (b) a revolving mechanism providing opportunity to support market establishment and further scale-up, including during the post project period; (c) support to improve policies and regulations that would enhance the economics and uptake of such technologies; and (d) a model for longer-term

relationship between HHs and technology suppliers to ensure proper O&M and enhance the sustainability of investments made by the HHs. All the above factors have been considered in the project design. The TA provisions, for instance would support policies and regulations that would enhance the economics and uptake of such new technologies by the HHs. Based on the findings from the piloting of financing mechanism and lessons learned, at the project midterm review, the implementation arrangements of the Component 2 could be adjusted to meet the project targets and reach higher impact and sustainability.

52. The sustainability of Component 3 is being enhanced through collaborative and targeted project design, such as inclusion of irrigation infrastructure, and community amenities; joint selection of important green belt/corridor locations; support for developing urban greening chapters in Bishkek Urban Master Plan; and engagement of all key stakeholders including BishkekZelenkhoz, which is the ultimate municipal body responsible for implementing and maintaining most urban greenery in Bishkek. Moreover, the project will build necessary capacity of Bishkekvodkhoz and BishkekZelenkhoz to ensure sustainability beyond the project.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic and Financial Analysis (if applicable)

Technical Analysis

Clean Heating Options

53. Walk-through energy audits were conducted in buildings across Bishkek in September 2022 to gather data on heating sources and building performance for Component 2. The audits provided scenarios on heating technology conversions and estimated the costs of those changes as well as expected efficiency gains and emissions reductions. A heating options study was also concluded in July 2023 to inform project design, presenting key sectoral challenges and assessing a variety of heating solutions. The World Bank conducted a flagship study, 'Toward a Framework for the Sustainable Heating Transition', for the Europe and Central Asia region, which provides region- and country-specific data and information.

54. The study identified technical considerations for selecting investments, including fuel availability, local availability of technology, and air pollution reduction potential. Geothermal groundwater potential exists in some areas, making water-to-water heat pumps feasible. Air-to-water heat pumps are widely applicable. Most heating options assessed are available from domestic or regional production. Based on the studies, as well as alignment with ongoing activities and priorities in Bishkek, the following recommendations can be made for SFHs: (a) heat pumps and electrical boilers are among the most applicable investment to meet the project objective; (b) solar collectors for hot water can complete a package of clean sources; (c) additional EE measures will not have significant impact on HHs' energy cost, as many HHs living in SFHs in Bishkek have already replaced their windows and doors from thermal or aesthetic comfort perspective.

Urban Greening and Urban Irrigation Measures

55. Urban greening. Aligned with the main objective to mitigate the impacts of windblown dust from outside the city boundary, a green belt or corridor approach to develop urban green space along the affected areas of the city has been studied to be more effective, as it provides larger cross-sectional areas to intercept the dust. Species will be selected based on their effectiveness in mitigating the impact of windblown dust on ambient $PM_{2.5}$ levels. Preference to drought-resistant native tree species will be considered for the greenery plantations. Experience of the local Botanical Institute,

as well as global research on impact of trees on air pollution, will inform implementation of the green corridor pilot in Bishkek.

56. Urban irrigation. A pragmatic approach is used in the design of the irrigation component, with a focus on groundwater irrigation systems. The pumped system would be introduced with high efficiency irrigation technologies such as sprinkler and drip irrigation. A GIS would be developed under the project, which, combined with water measurement and accounting system, would improve water management in the city, resulting in better water use efficiency. The technology proposed to be used in urban irrigation is not complicated, as the country has sufficient capacity to construct and Bishkekvodkhoz would be able to manage and maintain this system. Urban irrigation will improve the outcomes of urban greening.

Paris Alignment

57. The project is aligned with the goals of the Paris Agreement on both mitigation and adaptation. Activities under Subcomponents 1.1 and 1.2 will improve the quality of AQ information in the country. Such activities are considered universally aligned on mitigation. Under Subcomponent 1.2, a modern laboratory building will be constructed, that will house a data center. This laboratory building will comply with the Kyrgyz building code and related regulations to remain energy efficient. Given its long-lived nature, the laboratory will be built following the latest energy saving standards. Compliance with the Kyrgyz Republic's energy efficiency legislation (Law on Energy Saving [1998] and Law on Energy Performance of Buildings [2011]) will prevent the risk of carbon lock-in. The laboratory building will be connected to grid electricity, which is clean, with provision for solar energy integration. The building design will consider energy efficiency and earthquake-proof standards to strengthen resilience to geophysical hazards present in the project location. The data center will follow good practice guidelines for greener data center covering IT equipment and their cooling needs. The clean heating activities supported under Subcomponents 2.1 and 2.2 are universally aligned on mitigation. The green belt under Component 3 will aid carbon sequestration. The irrigation system will be powered by clean grid electricity, and hence falls under the category of universally aligned activity. More importantly, the project will support the Government in establishing the emission inventory for all air pollution sources and build capacity for calculating both air pollution and GHG emissions in accordance with the United Nations Framework Convention on Climate Change (UNFCCC).[22] The project is also aligned on the adaptation and resilience goals (refer to paragraphs 69 and 70 that discuss the project's exposure to climate risks and their mitigation). The heat pumps to be installed at households, under the FI transaction-based assessment, will not have any exposure to climate risks.

Economic Analysis

58. The proposed project in the Kyrgyz Republic is expected to generate a wide range of benefits in terms of public health, ecosystem services, climate change mitigation, labor productivity, poverty reduction, employment, human capital development, and green growth in the country. Only a handful of the project's benefits—due to a lack of adequate socioeconomic and biophysical data at the time of conducting this economic analysis—could be monetarily valued. These valued benefits include the following: (a) avoided health costs from reduced mortality and morbidity due to the transition to clean residential heating, creation of new urban green belts, and provision of irrigation to existing green spaces by the irrigation infrastructure; (b) net negative GHG emissions due to the transition to clean residential heating and creation of urban green spaces; (c) ecosystem services (habitat/species protection, hydrological regulations, recreation, and other non-wood forest products [NWFPs]) by urban green spaces; (d) avoided labor productivity and other economic losses due to the cooling effects of urban green spaces and expanded irrigation system that will lead to expansion and

[22] The Kyrgyz Republic is a party of the UNFCCC since 2000 and has to submit national GHG inventories regularly in accordance with Articles 4 and 12 of the Climate Change Convention.

sustainability of greenery; and (e) energy cost reduction due to the transition to clean residential heating and EE measures. This cost reduction will result in an increase in the disposable income of the beneficiary HHs. This is likely to contribute to reducing poverty in Bishkek given that a significant share of beneficiary HHs live below the official lower-middle-income poverty line (that is, US$3.65 in 2017 purchasing power parity per person per day).[23] More details about the benefits, costs, and economic analysis are presented in annex 2.

59. Economic analysis[24]—conducted by using the cost-benefit analysis (CBA) method—suggests that the Kyrgyz Republic Air Quality Improvement Project[25] is economically viable. It has an economic internal rate of return (EIRR) of 29.88 percent and 35.87 percent at low and high shadow prices of carbon, respectively. For deriving the economic value of the net GHG emissions, a low shadow price of US$52 per tCO_2eq and a high price of US$104 per tCO_2eq (see the Sensitivity Analysis on carbon price and other factors in annex 2)—as per the guidance given by the High-Level Commission on Carbon Prices (HLCCP) in the World Bank (2017)[26]—are used for the first year when such emissions occur. Following World Bank (2017), an annual carbon price growth of 2.25 percent is applied for the remainder of the analysis period, which is for 25 years. At the low shadow price of carbon, the economic benefit-cost ratio (EBCR) is 3.66. At this price, the economic net present value (ENPV) with an 8 percent discount rate totals nearly US$138.70 million and the discounted sum of all benefit flows is US$190.90 million for the entire analysis period of 25 years. At the high shadow price of carbon, the EBCR is 4.82, while the ENPV amounts to US$199.66 million, and the discounted sum of all benefits to US$251.89 million. The project's average annual investment is US$6.93 million during the disbursement period of seven years. The discounted sum of all cost streams is US$52.23 million over the entire analysis period. A sensitivity analysis is conducted for all key underlying factors (see annex 2 for details). The estimated directions and degrees of sensitivity in EIRR and EBCR due to the changes in these factors are plausible. This suggests that the economic analysis is robust.

B. Fiduciary

(i) Financial Management

60. The FM arrangements at the MNRETS (Components 1, 3 and 4) and the MoF (Component 2 and 4) were reviewed in November 2022 in accordance with the FM Manual for World Bank Investment Project Financing Operations that became effective on March 1, 2010 (revised on February 10, 2017). The MNRETS has no experience in implementing similar projects. Responsibility for project implementation, including the FM function, will rest with the PIU that will be established within the MNRETS, which is required to maintain a satisfactory project accounting system that is capable of tracking all project resources and expenditures and generating regular financial statements. The FM arrangements at the MNRETS-PIU are considered adequate to implement the project and meet the minimum requirements of the World

[23] In the Kyrgyz Republic, the lower-middle-income poverty rate increased dramatically since the COVID-19 pandemic began (from 11.7 percent in 2019 to 21.8 percent in 2021). Due to Russia's invasion of Ukraine and upward inflation pressure driven by higher food and energy prices, the poverty rate is projected to increase to and remain above 23 percent until 2024. Although the poverty rate in Bishkek is slightly lower than the national average—16.8 percent in the city compared with 18.7 percent nationally in 2020 (World Bank 2022a)—it is likely to follow the national upward trend pushing more households into poverty in the next couple of years. Source: World Bank. 2022a. *Social Protection for Recovery - Europe and Central Asia Update*. Washington, DC: World Bank.

[24] The total analysis period is 25 years, 7 years for disbursement and 18 years for capitalization. A discount rate of 8 percent is used in the base case, which is determined by following the guidance given by
World Bank. 2016. *Discounting Costs and Benefits in Economic Analysis of World Bank Projects*. Washington, DC: World Bank.

[25] Because of their highly interconnected and interdependent nature, several components and subcomponents of the Air Quality Improvement Project are often expected to contribute to a single benefit stream. Therefore, it is not possible to disaggregate all benefit streams of each component and thus the economic analysis is conducted for the whole project.

[26] World Bank. 2017. *Guidelines for the Social Price of Carbon*. Washington, DC: World Bank. A sensitivity analysis is conducted with higher carbon prices. See annex 2; Consumer Price Index (CPI)-adjusted 2023 US$ figures were used.

Bank's Policy and Directive on Investment Project Financing subject to implementation of the capacity-building action plan to bring the FM arrangements to an acceptable status. The action plan includes the following: (a) installation of fully functional accounting software for the project (within 30 days after effectiveness) to have capacity to generate interim financial reports (IFRs) and the attachments of withdrawal applications including Statements of Expenditures (SOEs) and annual financial statements; and (b) development of an FM Manual as part of the POM and within the timeline of the POM preparation, including mechanism for disbursement and requirements for the PFIs under sub-loans component of the project. The MoF PIU has adequate staffing and systems for implementation of World Bank-financed projects. The PIU will perform the financial management of Component 2 and 4. It has experience with FI project implementation through the PFIs.

61. Project funds will flow from the World Bank, either (a) through the DAs, which will be replenished on the basis of SOEs or full documentation or (b) on the basis of direct payment withdrawal applications and/or special commitments, received from the implementing entity. The following disbursement methods may be used under the project: reimbursement, advance, direct payment, and special commitment. The ceilings for each DA and the detailed instructions on withdrawal of project proceeds will be provided in the Disbursement and Financial Information Letter (DFIL). The MoF PIU will manage the respective DA for Component 2 and 4; and will provide sufficient information to the MNRETS PIU for preparation of the IFRs. The sub-loans provided (disbursed) by the PFIs after the closing date will not be eligible for financing from the credit funds.

62. As part of the project implementation support and supervision missions, quarterly IFRs will be reviewed, and regular risk-based FM missions will be conducted. The overall residual FM risk rating is assessed as Substantial.

(ii) Procurement

63. The World Bank conducted the capacity assessment of the MNRETS and MoF, and the project procurement risk is assessed as Substantial. The assessment identified risks that could cause procurement delays or inappropriate procurement decisions for the MNRETS. The PIU under the MoF has experience in implementation of the projects under World Bank procedures. Details of the key risks and the corresponding mitigation measures are recorded in the Procurement Risk Management Assessment System of the World Bank.

64. Mitigation measures include the following actions: (a) hiring of a qualified procurement specialist in the MNRETS PIU with terms of references and qualifications acceptable to the World Bank; (b) development of a Procurement Manual as part of the POM and within the timeline of the POM preparation; (c) realistic procurement planning, up-to-date cost estimate, and scheduling including timely preparation of the technical specifications or terms of references with the World Bank's close supervision and monitoring, early engagement with the market and business outreach will be required for critical packages; (d) usage of US$/EUR currency for bid submission in problematic procurement packages, while the payment would be in local currency; (e) more emphasis on and training in appropriate contract management, supplemented by regular physical inspections during the World Bank's supervision missions; and (f) careful review of the delivery terms with the aim to avoid transportation through conflict-affected zones and seek alternative routes.

65. Procurement for the proposed project shall be conducted in accordance with the World Bank Procurement Regulations for Investment Project Financing Recipients: Procurement in Investment Project Financing Goods, Works, Non-Consulting and Consulting Services, dated September 2023 (Procurement Regulations), according to which the MNRETS has developed a draft Project Procurement Strategy for Development (PPSD) and draft Procurement Plan. The PPSD has been developed based on the project requirements, operational context, economic factors, technical solutions, and market analysis and will be regularly updated during implementation to provide justification for procurement arrangements, Procurement Plan, and its update. For each contract financed by IDA resources, the procurement method,

market approach, cost estimate, World Bank review requirements, and time frame for implementation shall be agreed upon between the recipient and IDA and duly reflected in the most recent Procurement Plan. The project will use the World Bank's Systematic Tracking of Exchanges in Procurement (STEP) online tool for planning and tracking of all procurement transactions. Specific procurement procedures to be followed for managing project resources will be documented in the POM. Details of procurement arrangements are presented in annex 2.

C. Legal Operational Policies

Legal Operational Policies	Triggered?
Projects on International Waterways OP 7.50	Yes
Projects in Disputed Area OP 7.60	No

D. Environmental and Social

66. Environmental risk is rated Moderate. Overall, the project is expected to bring positive environmental impacts by improving air quality, particularly in Bishkek, the country's capital, and the largest city in the Kyrgyz Republic. Project implementation risks and anticipated negative impacts will be temporary and typical for small- to medium-scale civil works, rehabilitation, and energy improvements under Components 1, 2, and 3. They are, therefore, mostly predictable and can be easily mitigated. Subcomponent 2.1 will cover a range of clean heating technologies (heat pumps, electrical boilers, and solar water heating) through sub-loans that will be provided by the PFIs according to the POM. As these sub-loans are expected to be small, related activities are expected to have low environmental and social risks or impacts; hence, applying the pertinent national law by the PFIs will be sufficient.

67. The potential adverse environmental risks and impacts associated with the proposed activities of the project may include (a) pollution from dust, noise, and vibration and solid and liquid wastes, including hazardous wastes, due to the construction of the lab and borewells and (b) wastes associated with the disposal of old appliances (such as heating stoves, boilers, and so on) and installation of new ones under the clean heating solution activities. The risks associated with greening activities may include using limited quantities of fertilizers and pesticides. Occupational and community health and safety and traffic safety/disruption during project implementation are also expected. The abovementioned risks and impacts will be mainly short-lived and primarily limited to the project sites (except for the movement of equipment/materials to/from the construction sites and disposal of solid waste, including hazardous waste, to a secure site identified by the respective authorities).

68. The social risk is rated Moderate. The project will result in significant air quality improvements leading to major health benefits, particularly at the HH level. However, one potential risk of the changes in the source of energy for heating purposes is that some poorer HHs may find it difficult to afford such technological changes and may get excluded. The nature and scope of this risk has been assessed in the Environmental and Social Management Framework (ESMF) and will be mitigated through the design of a financial assistance mechanism for these households, building on existing governmental support measures in the energy sector.

69. With regard to economic or physical displacement, the project investment activities are not expected to require land acquisition, restrictions on land use, or involuntary resettlement, as the investments are being placed in existing buildings. Similarly, greening activities such as improved irrigation network (borewells) will take place in public spaces.

The project is expected to engage direct workers and contracted workers, for whom Labor Management Procedures will be prepared. Sexual exploitation and abuse/sexual harassment (SEA/SH) risks are assessed as low. Stakeholder engagement will be a key aspect of the project, given its involvement with the public institutions and residential buildings. It is summarized in the draft Stakeholder Engagement Plan (SEP) prepared by the client. The project will also include grievance mechanisms for labor-related issues and complaints about the project's environmental and social impacts.

70. The project is not expected to involve a major influx of labor. Specialized air quality and energy equipment will be installed by local workers under the supervision of technical experts. Greening in Bishkek shall be contracted to professional companies. The project will include SEA/SH measures, including a code of conduct for workers, a channel in the project grievance redress mechanisms to report SEA/SH cases, and training and awareness sessions for project workers and affected communities.

71. Based on the potential environmental and social risks, the following Environmental and Social Standards (ESS) are considered relevant: ESS1, ESS2, ESS3, ESS4, ESS8, ESS9, and ESS10. To address the above risks and guide the site-specific subprojects during implementation, the MNRETS prepared a draft ESMF, which was consulted on in April 2023 and will be finalized and disclosed by the Effective Date. An Environmental and Social Commitment Plan and SEP were also prepared and disclosed on 29 September 2023. In terms of the borrower's capacity, the MNRETS PIU will be strengthened by hiring or assigning one environmental specialist (with occupational health and safety experience) and one social specialist and by other capacity-building activities identified in the ESMF to ensure effective implementation of the ESF requirements. The MoF PIU has experienced environmental and social specialists who will oversee the PFIs' activities and report on a regular basis.

72. International Waterways (OP7.50): OP 7.50 is applicable to the proposed Project as some of the proposed interventions may involve the use of water from the ground water aquifer in Bishkek that is connected to tributaries of the Chui River, which is considered an international waterway shared by Kyrgyz Republic and Kazakhstan. The Project will not impact the quantity and quality of water in the international waterway as it entails only a negligible amount of groundwater extraction compared to the current levels. The Project investments will not be adversely affected by the other riparians' possible water use, because Kyrgyz Republic is an upstream country. Based on the above, the exception to the notification requirement under paragraph 7(a) of the Policy was approved by the Regional Vice President on September 28, 2023.

E. Climate Change, Gender, Citizen Engagement

Climate Change

73. The project has been screened for climate and disaster risks and the overall risk after considering project design and proposed mitigation measures is rated Low. The Kyrgyz Republic is projected to experience temperature rises significantly above the global average. Warming over the 1986–2005 baseline period could reach 5.3°C by the 2090s, under the highest emissions pathway, RCP8.5. Warming is projected to be even stronger in maximum and minimum temperatures and this is likely to amplify pressure on human lives, livelihoods, and ecosystems. Heat stress may represent a serious risk to human life during peak summer temperatures, with a high likelihood that temperatures will more regularly exceed 40°C. Heat could combine with increased drought incidence to expand arid land cover. The loss of mountain glaciers may reduce the regularity of flows and result in the drying of some watersheds.

74. Climate risks may affect the physical investment components of the project. Air conditioning arrangements will be provided for sensitive equipment and sensors to mitigate the impact of increased temperature on AQ monitoring equipment. The laboratory building will be constructed in compliance with national building codes to make them energy

efficient and earthquake resistant. Expansion of arid land cover due to increased temperature and incidences of droughts may increase the amount of windblown dust getting into the city, worsening the AQ further, especially in the summer months. Proposed urban greening investments would address the risk of increased windblown dust getting into the city. The use of borewells with water-efficient technologies would address the risk of reduced surface water availability. To address the risk of species survival, drought- and climate-resistant species will be selected for development of the green belt/corridor. The project will finance investments to improve urban greenery, which could reduce the heat island effect. Overall, the risks identified would not significantly reduce the project's ability to achieve the PDO, and the project's measures and investments would contribute to both climate mitigation and resilience goals.

75. A significant portion of the project financing is expected to have climate co-benefits. The project activities are all directed to improve AQ with climate co-benefits. Supporting measures to switch from coal to clean heating in the residential buildings will directly contribute to GHG reductions. The urban greening component, by increasing the green space and number of trees, can contribute to improving the city's resilience while also contributing to sequestration of carbon in the trees planted. The net GHG reduction from the project is estimated to be 2.72 million metric tons.

Gender

76. Women disproportionately suffer from negative health impacts due to lack of access to clean, safe, and affordable energy sources. As women and children spend more time near indoor polluting combustion sources in houses, they are at high risk of developing respiratory infections from exposure to indoor AQ. Women are often more likely to sacrifice their personal needs for nutrition or health expenses in their attempt to cope with increasing energy costs to reach a higher thermal comfort in the houses. In the absence of access to modern energy sources, women experience the physical strain of fuel purchase and manual loading of the stove or boiler, as well as regular cleaning of the house during the day. Energy costs disproportionately affect poor HHs, with those headed by women potentially and disproportionately disadvantaged.[27] Female-headed HHs are among those most susceptible to poverty. According to the National Statistical Committee of the Kyrgyz Republic, the percentage of female-headed HHs was approximately 36.7 percent in 2017.[39] The study by the National Bank of the Kyrgyz Republic shows that both male-headed and female-headed HHs have access to bank loans. The study shows that on 'construction or purchase of dwelling/land', female-headed households take approximately 9 percent of the total of bank loans, while male-headed households take approximately 18 percent. Due to lower levels of available collateral, commercial banks consider women to be higher risk borrowers. Most assets are registered to male family members, limiting women's access to loans. The practice of registering women's rights to land often conflicts with customary law, which prevents women from inheriting or retaining land in the event of a divorce (Ministry of Economy and Commerce of the Kyrgyz Republic 2022). Another study[28] shows that 58.4 percent of households favor micro-credit organizations due to the ease of documentation.

77. **Gender action.** The project will support the transition of women's access to modern energy solutions by providing sub-loans, combined with community outreach programs targeting women. The project will actively cooperate with the Gender Council established by the MoE to empower and engage more women in the Kyrgyz energy sector and sustainable energy business. Outreach activities, such as financial literacy workshops, promotional materials, and simplified and easy-to-understand communication of loan process and requirements (for example, no collateral required), will be targeted at increasing the participation of women in the project and its financing scheme for clean heating solutions.

78. **Gender indicator.** To measure the effectiveness of the proposed gender action, the project will have the following indicator: 'Share of female-headed HHs receiving sub-loans to adopt clean heating solutions (percent)'. The baseline for

[27] https://www.adb.org.mcas.ms/sites/default/files/institutional-document/546966/kyrgyz-republic-country-gender-assessment-2019.pdf?McasTsid=20893&McasCtx=4.
[28] https://www.nbkr.kg/DOC/22082016/000000000043715.pdf.

sub-loans for supporting transition to clean heating solutions is 0. Based on the gender gap on access to bank loans for 'construction or purchase of dwelling/land' (female-headed HHs: 9 percent versus male-headed HHs: 18 percent), the target is set on 30 percent of sub-loans for supporting transition to clean heating solutions received by female-headed HHs. The improvement of HHs' access to modern heating is also expected to reduce the burden of unpaid care work for women, contributing to close gender gaps beyond the project life cycle.

Citizen Engagement

79. The project will have extensive interaction through a comprehensive consultative process and a two-way feedback loop. Regular community mobilization workshops (in-person and virtual) will not only inform the residents about project activities but also include them in participatory decision-making and monitoring processes. For activities under Component 2, the MoF PIU will support the PFIs in attracting applications through targeted marketing and establish a feedback mechanism to track the satisfaction of beneficiaries. The project will create an online platform for citizen engagement and broader stakeholder engagement on issues relating to air quality and implementation of the Air Quality Improvement Project on the MNRETS site. The platform will improve outreach to community members about project investments and will also have an online window for community members to ask questions and provide feedback (community mobilizers will respond on time to the feedback online and will design activities to respond to residents' comments and close the feedback loop). All relevant project information documents will be made easily available and accessible to the public on this platform. The proposed citizen engagement activities will be measured through the following indicators: (a) the number of participants in consultation (female participants tracked separately) and (b) share of participants in consultations who responded 'satisfied' with citizen engagement process in the survey conducted at the end of every consultation.

V. GRIEVANCE REDRESS SERVICES

80. ***Grievance Redress.*** Communities and individuals who believe that they are adversely affected by a project supported by the World Bank may submit complaints to existing project-level grievance mechanisms or the Bank's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the Bank's independent Accountability Mechanism (AM). The AM houses the Inspection Panel, which determines whether harm occurred, or could occur, as a result of Bank non-compliance with its policies and procedures, and the Dispute Resolution Service, which provides communities and borrowers with the opportunity to address complaints through dispute resolution. Complaints may be submitted to the AM at any time after concerns have been brought directly to the attention of Bank Management and after Management has been given an opportunity to respond. For information on how to submit complaints to the Bank's Grievance Redress Service (GRS), visit http://www.worldbank.org/GRS. For information on how to submit complaints to the Bank's Accountability Mechanism, visit https://accountability.worldbank.org.

VI. KEY RISKS

The overall project residual risk is rated Substantial. The following paragraphs summarize key risks**.**

81. Political and Governance (Substantial). The Government's recent attention to air quality is influenced by active civil society and public concern, notably in Bishkek due to frequent high pollution instances. The attention of the Government is often perceived to be ad hoc in terms of importance. Frequent changes to leaderships also affect sustained

interest in the agenda. The MNRETS has a mandate over a wide range of environmental issues including AQ and is still strengthening its institutional setup to lead the environmental agenda. The political and governance residual risk for AQ engagement may thus be considered as substantial. This political risk will be mitigated by clearly anchoring the AQ actions under a long-term plan, which is developed through extensive stakeholder engagement to ensure government ownership of the agenda. Maintaining a national air quality dialogue platform that brings together all stakeholders, including citizen groups and international donor community to regularly engage on the agenda, will also help ensure attention to the agenda at all levels of the Government.

82. Macroeconomic (Substantial). Russia's invasion of Ukraine has led to a significant decline in remittances and the risk of further deterioration is high. Inflation has been in double digits since 2020 and any increase in global food and fuel prices will put further pressure on domestic prices. Current difficulties in all aspects of logistical services, including goods transportation, may affect goods delivery from Central Asia and other European countries and lead to implementation delays. The rapidly increasing equipment and overall project costs associated with supply chain disruptions and inflation pose a risk to the AQIP. The project will carefully review the delivery terms with the aim to avoid transportation through conflict-affected zones and seek alternative routes. In addition, local currency depreciation may result in unwillingness of potential bidders to submit bids/quotations in local currency. The project will consider usage of US$/EUR currency for bid submission in problematic procurement packages, while the payment would be in local currency. This is proposed to be mitigated by building in sufficient contingencies into project costing and studying the project economics under the high-cost scenarios.

83. Technical design (Substantial). The residual risk associated with the technical design of the project is considered Substantial. The project will pilot the use of the FI approach to provide financing with the objective of supporting the development of the market for clean heating technologies. While the FI approach itself is not new, its use for promoting clean heating in Bishkek is innovative. The design however is informed by analytical studies carried out by the World Bank team. Extensive discussions with the key stakeholders, for example, the households and banks, clearly illustrate the demand for such a financing scheme. The project includes technical assistance (TA) for both the demand- and supply-side stakeholders to catalyze development of the market. Clean heating technologies such as heat pumps, electrical boilers, and solar heaters are proven technologies and are already in use in Bishkek. Other activities included in the project such as air quality monitoring, green belt development, construction of bore wells, and so on will use proven technologies as well.

84. Implementation capacity and sustainability (Substantial). The project will be implemented through the PIU at the MNRETS (for Components 1 and 3) and the PIU at the MoF (for Component 2). The MoF PIU has extensive experience in implementing World Bank projects and FI transactions, similar to Component 2. The MNRETS however is a newly formed ministry and does not have experience in implementing any World Bank projects. To mitigate the capacity risk, the project has provisioned substantial capacity building and TA resources to support the implementing agencies. Further, the implementation arrangements of the project will consider formation of a PSC, which will not only advise the implementing agencies on critical matters but will also regularly monitor progress and identify barriers/challenges that would need to be addressed for smoother implementation.

85. Fiduciary risk (Substantial). The overall fiduciary risk was assessed as High during the concept stage due to the substantial stand-alone FM risk and the high stand-alone procurement risk. The substantial FM risk was mainly because of beneficiaries' lack of FM capacity at the concept stage and lack of experience with World Bank-funded projects. In addition to having similar risks as FM, the procurement risk was assessed as High during the concept stage because of additional risks such as risk of accountability of procurement decisions due to limited capacity to prepare technical specifications and designs for the proposed investments, uncertainties in procurement planning due to increase of gas/oil prices; potential procurement delays due to limitations at the market and local currency depreciation; potential contract

implementation delays due to geopolitical impacts on the logistical chain; and a high level of corruption perceived by Transparency International. The scale of procurement activities originally envisaged for the project during the concept stage has been significantly reduced through design changes. The clean heating component, which involved most procurement, is now proposed to be implemented as an FI transaction. The remaining fiduciary risks will be mitigated through requirements for proper fiduciary implementation arrangements, including requirements for adoption of the POM and FM Manual, hiring of competent fiduciary staff, capacity building through customized training, and strong supervision. Working alongside the experienced PIU of the MoF would provide opportunity for quick learning and capacity building of the MNRETS PIU. Overall residual fiduciary risk is assessed as Substantial.

VII. RESULTS FRAMEWORK AND MONITORING

PDO Indicators by PDO Outcomes

Baseline	Closing Period
Strengthen the capacity of the Kyrgyz Republic to manage air quality	
Air quality analysis report is published once in two years (Yes/No)	
Oct/2023	Dec/2030
No	Yes
Reduce net PM2.5 and greenhouse gas emissions in Bishkek	
Projected lifetime net GHG emission reductions through project interventions (Metric ton)	
Oct/2023	Dec/2030
0	2720000
➢Projected lifetime GHG emission reductions from households adopting clean heating options (Metric ton)	
Oct/2023	Dec/2030
0	2700000
➢Projected lifetime net GHG emission reductions from increased public green space (Metric ton)	
Oct/2023	Dec/2030
0	22000
Projected lifetime PM2.5 emission reduction from project interventions (Metric ton)	
Oct/2023	Dec/2030
0.00	10520
➢Projected lifetime PM2.5 emission reduction from households adopting clean heating technologies (Metric ton)	
Oct/2023	Dec/2030
0	10500
➢Projected lifetime PM2.5 emission reduction from increased and better maintained public green space (Metric ton)	
Oct/2023	Dec/2030
0	21

Intermediate Indicators by Components

Baseline	Closing Period
Component 1 - Strengthen air quality management system	
Number of ambient air quality monitoring stations fully operational (Number)	
Oct/2023	Dec/2030
1	12
Database for ambient air quality and integrated air pollutant and GHG emission inventory is developed and maintained (Yes/No)	
Oct/2023	Dec/2030
No	Yes
Component 2 - Support the adoption of clean heating solutions	
On-lending by the PFIs for clean heating (Amount(USD))	
Oct/2023	Dec/2030
0	34200000
Number of direct project beneficiary households that are supported by clean heating measures (Number)	
Oct/2023	Dec/2030
0	13000
Percentage of female-headed households receiving sub-loans to adopt clean heating solutions (Percentage)	
Oct/2023	Dec/2030
0	30
Development of policy and institutional measures to achieve longer-term sustainability of the heating sector (Text)	
Oct/2023	Dec/2030
No policy and institutional measure is defined for sustainable heating	Sustainable Heating Development Roadmap is adopted
Component 3 - Improve Urban Greening	
Increased public green space in Bishkek (Hectare(Ha))	
Oct/2023	Dec/2030
0	13
Number of boreholes with water-saving technology newly constructed or rehabilitated (Number)	
Oct/2023	Dec/2030
0.00	21
A chapter on urban greening and irrigation is prepared and endorsed as a part of the new urban master plan (Yes/No)	
Oct/2023	Dec/2030
No	Yes
Component 4 - Project Implementation Support	
Number of participants in consultations (Number)	
Oct/2023	Dec/2030

0.00	200
➢Share of participants in consultations who responded 'satisfied' with citizen engagement processes (Percentage)	
0	90

Monitoring & Evaluation Plan: PDO Indicators by PDO Outcomes

Strengthen the capacity of the Kyrgyz Republic to manage air quality	
Air quality analysis report is published once in two years	
Description	This indicator monitors the air quality analysis report, which draws results from the ambient AQ data monitored, pollutant emission inventory and other analyses using those data, and inspection. Programs supported under the project is published once in two years to inform the public and enable evidence-based policy actions (both national and local level), such as strategic planning, regulatory revision, launching a new program, and so on to address AQ issues in the Kyrgyz Republic. At least two publications are required to qualified as achieving this PDO indicator.
Frequency	**Biennial**
Data source	**MNRETS**
Methodology for Data Collection	Documentary evidence of the official publication of air quality analysis report that draws upon ambient air quality monitoring, source emission inventory, inspection, and relevant analyses. At least two regular publications during project implementation period are required to be qualified as achieving this PDO indicator.
Responsibility for Data Collection	**MNRETS PIU**
Reduce net $PM_{2.5}$ emissions in Bishkek	
Projected lifetime PM2.5 emission reduction from project interventions (Metric ton)	
Description	This indicator measures the change in $PM_{2.5}$ emissions by the sum of (a) $PM_{2.5}$ emission difference between introducing clean heating options in households, compared to the business-as-usual scenario without replacement of the original heating appliance for expected lifetime (15 years) of heating appliance and (b) the estimated lifetime $PM_{2.5}$ reduction capacity of green space due to newly planted trees under the project (0.29 kg per tree-shrub or 384 kg/ha); and the existing green spaces better served by new or rehabilitated borewells (497 kg/borewell) during life years (25 years) based on i-Tree simulation. Emission reductions from each intervention (clean heating and urban greening) will be tracked separately.
Frequency	**Annual**
Data source	**M&E report**
Methodology for Data Collection	Subproject database
Responsibility for Data Collection	**MNRETS PIU & MoF PIU**
Projected lifetime GHG emission reductions from households adopting clean heating options (Metric ton)	
Description	This indicator presents the projected lifetime reduction of CO_2 emissions (a) from adopting clean heating options in households, compared to the business-as-usual scenario without replacement of original heating appliance for an expected lifetime (15 years) of heating appliance and (b) from public green spaces due to the newly created public green spaces or the existing ones better served by new or rehabilitated borewells during life years (25 years) based on i-Tree simulation. Emission reductions from each intervention, clean heating, and urban greening will be tracked separately
Frequency	**Annual**
Data source	**M&E report**
Methodology for Data Collection	Subproject database
Responsibility for Data Collection	**MoF PIU**

Monitoring & Evaluation Plan: Intermediate Results Indicators by Components

Component 1 – Strengthen air quality management system	
Number of ambient air quality monitoring stations fully operational (Number)	
Description	Number of ambient air quality monitoring stations that are fully operational in line with international standards after being either newly installed (automated) and upgraded (existing manual ones) installed and operated in line with international standard.
Frequency	**Annual**
Data source	**KyrgyzHydromet**
Methodology for Data Collection	Evidence of air quality monitoring data continuously collected from newly installed (automated) and upgraded manual monitoring stations more than a year.
Responsibility for Data Collection	**MNRETS PIU**
Database for ambient air quality integrated air quality and GHG emission inventory is developed and maintained (Yes/No)	
Description	Ambient air quality database and integrated air quality and GHG emission inventory database are developed, hosted at the data mangement center and fully functional
Frequency	**Annual**
Data source	**M&E report**
Methodology for Data Collection	**Evidence of database with accumulated air quality and air pollutant/GHG emission inventory data**
Responsibility for Data Collection	**MNRETS PIU**
Component 2 - Support the adoption of clean heating solutions	
On-lending by the PFIs for clean heating (Amount (USD))	
Description	This indicator measures total on-lending by the PFIs including i) IDA financing (31.8 million) and co-financing from the PFIs.
Frequency	**Annual**
Data source	**M&E report**
Methodology for Data Collection	**Subproject database**
Responsibility for Data Collection	**MOF PIU**
Number of direct project beneficiary households that are supported by clean heating measures (Number)	
Description	This indicator will measure the number of households who receive sub-loans from PFIs to adopt clean heating solutions.
Frequency	**Annual**
Data source	**M&E report**
Methodology for Data Collection	Subproject database
Responsibility for Data Collection	**MoF PIU**
Percentage of female-headed households receiving sub-loans to adopt clean heating solutions (Percentage)	
Description	This indicator requires supplemental information and measures gender activity. Based on the assessment and definition of direct project beneficiaries, specify what proportion of the female-headed beneficiary households. This indicator is calculated asa percentage.
Frequency	**Annual**
Data source	**M&E report, Beneficiary analyses**

Methodology for Data Collection	Subproject database
Responsibility for Data Collection	**MoF PIU**
Development of policy and institutional measures to achieve longer-term sustainability of the heating sector (Text)	
Description	This indicator aims to track progress in policy and regulatory development related to sustainable heating.
Frequency	**Annual**
Data source	**M&E report**
Methodology for Data Collection	Documentary evidence on achieved milestones
Responsibility for Data Collection	**MoF PIU in collaboration with the Ministry of Energy, MNRETS and other stakeholders**
Component 3 - Improve urban greening	
Increased public green spaces in Bishkek (Hectare (Ha))	
Description	This indicator measures changes in public green space within Bishkek as a result of newly created green spaces under this project
Frequency	Semi-Annual
Data source	**Bishkek Zelenkhoz**
Methodology for Data Collection	Public green space inventory tracked by Bishkek Zelenkhoz, in terms of area, no of trees and shrubs as well as lawn area
Responsibility for Data Collection	**MNRETS PIU**
Number of boreholes with water-saving technology newly constructed or rehabilitated (Number)	
Description	This indicator measures the number of the boreholes with water-saving technology newly constructed or rehabilitated to supply groundwater under the project
Frequency	**Semi-Annual**
Data source	**BishkekVodkhoz**
Methodology for Data Collection	Irrigation system inventory
Responsibility for Data Collection	**MNRETS PIU**
A chapter on urban greening and irrigation is prepared and endorsed as a part of the new urban master plan (Yes/No)	
Description	This indicator measures a chapter prepared particularly focusing on urban greening and irrigation development plan and endorsed as part of urban master plan
Frequency	**Annual**
Data source	**Bishkek Municipality**
Methodology for Data Collection	Documentary evidence of a chapter on urban greening and irrigation prepared to be part of the new Bishkek urban master plan
Responsibility for Data Collection	**MNRETS PIU**
Component 4 - Project Implementation Support	
Number of participants in consultations (Number)	
Description	This indicator is the citizen engagement indicator which measures participation in consultation meetings (virtual or in-person) to get feedback about the project design and implementation
Frequency	**Annual**
Data source	**Consultation meeting attendace form/participant list of the online meeting**
Methodology for Data Collection	Number of participants will be counted from the collected attendance form (in-person) or from the list of connected users (virtual meeting) in the consultation meetings
Responsibility for Data Collection	**MNRETS PIU & MoF PIU**

Share of participants in consultations who responded 'satisfied' with citizen engagement processes (Percentage)	
Description	Share of participants in consultations who responded 'satisfied' with citizen engagement processes in the survey at the end of consultation meetings
Frequency	**Annual**
Data source	**Survey**
Methodology for Data Collection	Survey will be distributed at the end of each consultation meeting and the share of satisfied participants will be calculated.
Responsibility for Data Collection	**MNRETS PIU & MoF PIU**

ANNEX 1: Implementation Arrangements and Support Plan

COUNTRY: Kyrgyz Republic
Kyrgyz Republic Air Quality Improvement Project

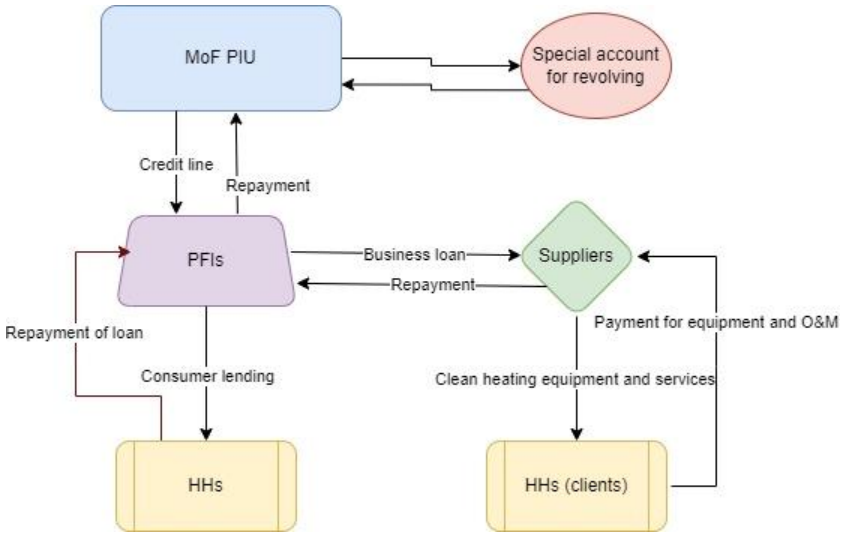
Implementation Arrangements

1. The MNRETS will be responsible for implementation of the Component 1, 3 and 4 of project through its PIU and for overall coordination of the project activities including fiduciary and ESF aspects by working closely with key stakeholders, including the Ministry of Emergency Situations, MNRETS, MoE, MoF, Bishkek Municipality, and their relevant units. The MNRETS PIU is responsible for the planning, budgeting, and reporting of the project activities.

2. **A PSC** will be established to oversee the project implementation activities. It is a multi-agency committee with delegated decision-making-level representatives of the MNRETS, MoF, MOE, Bishkek Municipality, KyrgyzHydromet, and other related institutions. Given the multisectoral nature of the project, the PSC is proposed to be chaired by the Vice Prime Minister, responsible for the environmental agenda in the country. The PSC will supervise implementation progress; approve project annual budget and work plans; and monitor project timelines, disbursements, and results. The PSC may also provide guidance regarding the strategy documents and legal regulatory acts developed under the project.

3. The MoF PIU will implement Component 2 and 4 of the project. Given the strong capacity and experience in implementation of similar on-lending projects through the PFIs, as well as successful execution of the World Bank financed FI project, activities under this component will be implemented by MoF PIU. The MoF PIU on behalf of the MoF will manage the subsidiary loan agreements signed with eligible PFIs, transfer the credit tranches from the specified DA, collect repayments from the PFIs, and monitor the usage of funds by the PFIs. The PIU of the MoF will perform fiduciary functions and assigned ESF activities for Component 2. It will provide sufficient information to the MNRETS PIU for further consolidation and presentation. Under the proposed financing mechanisms, the project funds will be provided to the PFIs as long-tenor local currency loans, with the interest rate that considers full coverage of the operational expenses and regulatory costs of such loans. The PFIs will repay loans according to the schedule, transferring the repayments to the special account opened by the MoF to be used for revolving of the project funds and for the next transfers to the PFIs to cover more beneficiaries under the project. The funds will be available to the PFIs on a first-come-first-served approach. The first tranche to each PFI will be US$300,000. The next tranches will be provided if 80 percent of the previous tranche is disbursed. This way, there will be a competitive approach and space for new PFIs to join. It is expected that after obtaining some experience and confidence in the market, the banks will use other funds to serve additional clients, for example, HHs living outside Bishkek. The financing arrangements for Subcomponent 2.1 are presented in figure 1.1.

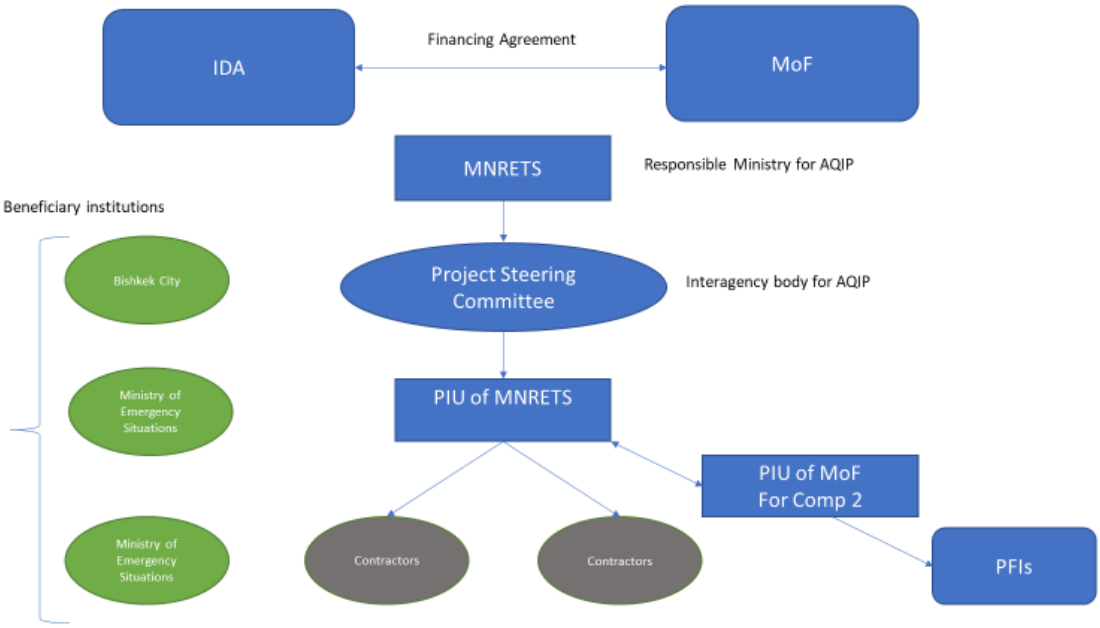
Figure 1.1. Financing Arrangements for Subcomponent 2.1



4. The PFIs will provide sub-loans to HHs with expected five years maturity. The size of the single loan for households will likely not exceed US$5,000 per HH. The PFIs are fully responsible for repayment of the loan to the MoF. They can reuse the funds during the 10-year period, allocating funds multiple times before repaying the MoF. The PFIs may provide loans to energy service companies (ESCOs) as well. ESCOs can use the loan to supply and install clean heating systems at SFHs, then collect the costs of investments and O&M according to the agreement with the household. It is also possible to receive a license for heat supply services and provide such services at the defined tariff for such services. TA under Component 2 will be implemented by the MoF PIU to support smooth implementation of the investments, including awareness raising campaigns to support pipeline development for the PFIs, marketing of the PFIs sub-loan product, training and capacity building of the PFIs and private suppliers, vocational training for technicians, and other TA to promote the market.

5. The MoF PIU will, among others, (a) assess and sign agreements with eligible PFIs; (b) prepare the POM related to Subcomponent 2.1, detailing implementation arrangements, terms, and conditions; (c) support the outreach campaign for the financing scheme in collaboration with PFIs. MoF ensures repayment of loans from the PFIs at the agreed terms.

Figure 1.2. Implementation Arrangements



Financial Management

6. As the lead implementing agency of the project will be the MNRETS, its PIU will have responsibility for implementation of the fiduciary part of the project, while the MoF PIU will be responsible for implementation of Component 2 of the project and perform FM functions. The staff of the PIU will include, among others, a financial manager. It is expected that the two PIUs' staff will handle FM and disbursement activities of the project, manage project funds, maintain projects accounts, and have the accounts audited. When the FM capacity in the PIUs needs to be increased due to increased volume of transactions, a disbursement specialist will be hired to provide the required capacity.

7. The overall FM arrangements for the project, including budgeting, accounting, reporting, internal control, funds flow, and audit, meet minimum requirements (subject to implementation of the action plan agreed with the MNRETS). Table 1.1 lists the actions required to ensure satisfactory FM system by project effectiveness.

Table 1.1. Actions Required

Recommended Action	Responsible Entity	Deadline
FM part of the POM to be developed, to include project accounting and reporting, funds flow, audit arrangements, disbursement procedures, and so on shall also include sub-loans disbursement arrangement.	MNRETS PIU MoF PIU	Within the timeline of the POM (effectiveness condition)
Install automated accounting system with capacity to generate IFRs and attachments to withdrawal applications including SOEs and annual financial statements.	MNRETS PIU MoF PIU	Within 30 days after effectiveness

8. The risk associated with the implementing entity is assessed as Substantial.

Planning and Budgeting

9. There are overall adequate planning and budgeting arrangements at the MNRETS and MoF. Project budgets, prepared annually based on the Procurement Plan cleared by the World Bank, will form the basis for allocating funds to the project activities. The budgets will be prepared in detail, with disbursement categories, activities, and account codes and will be broken down by quarters. Annual budgets should be agreed with the World Bank before final approval. Approved annual budgets will then be entered into the accounting system and used for periodic comparison with actual results as part of interim financial reporting.

Flow of Funds and Disbursement Arrangements

10. There are overall adequate funds flow and disbursement arrangements under the project. Project funds will flow through direct payment and through disbursements to the DA maintained by the MNRETS PIU in the commercial bank acceptable to the World Bank.

11. The project will follow transaction-based (SOE) disbursement procedures (advance payments through DA, reimbursement, direct payments, and special commitments). Withdrawals from the Credit Accounts will be requested in accordance with the guidance to be given in a DFIL. Withdrawal applications will be signed by two persons: (a) an authorized representative of the recipient and (b) another designated person, as authorized by written delegated authority from the recipient.

12. To facilitate timely disbursements for eligible expenditures on works, goods, and services, the recipient will open and operate, under terms and conditions acceptable to the World Bank, two separate DAs in US dollars in a financial institution acceptable to the World Bank. The MNRETS PIU and MoF PIU will be responsible for the appropriate accounting of the funds deposited into the DA, reporting on the use of these funds, and ensuring that they are included in the audits of the financial statements. Ceiling of the DAs and the minimum application size for direct payment or special commitment will be communicated in the DFIL.

13. The proceeds of the IDA Credit will be disbursed over the project implementation period or for such longer period, as will be agreed with IDA. Project funds will flow from IDA either (a) through the DA operated by the MNRETS PIU (to be replenished in accordance with guidelines given in the DFIL), (b) reimbursement with full documentation or SOEs, (c) direct payments with full documentation, or (d) special commitments.

Accounting and Records

14. The project accounting will be maintained on cash basis, with supporting documentation maintained in files in accordance with existing government financial regulations and standards acceptable to the World Bank. In both the PIUs, an automated accounting system based on suitable accounting software will be used for project accounting reporting and other activities.

Project Financial Reporting and Audit Arrangements

15. The MNRETS PIU, as a leading implementing agency, will be responsible for submission of combined unaudited IFRs that will be separately generated by the accounting systems in the two PIUs based on formats agreed with the World Bank. The reports, to include statement of sources and uses of funds by disbursement categories, uses of funds by project activities, project balance sheet, statements of DA, and SOE schedules, will be submitted to the World Bank within 45 days of the end of each quarter, with the first report under the proposed project being submitted after the end of the quarter

of initial disbursement. The annual combined audits of project financial statements will be provided to the World Bank within six months after the end of each fiscal year and also at the project closing. The auditor will also review a sample of 5 percent on the number of transactions of sub-loans made by the PFIs under Component 2 of the project. The borrower has agreed to disclose the audit reports for the project within one month of their receipt from the auditors, by posting the reports on the website of the MNRETS and MoF. Following the World Bank's formal receipt of these reports from the borrower, the World Bank will make them publicly available according to the World Bank Policy on Access to Information.

16. Audit of the proposed project will be conducted (a) by an independent auditor acceptable to the World Bank on terms of reference acceptable to the World Bank and (b) in accordance with International Standards on Audit issued by the International Auditing and Assurance Standards Board. Audit of the project will include the project financial statements, SOEs, and DA statements. The annual audited project financial statements will be submitted to the World Bank within six months of the end of each fiscal year and at the closing of the project. The cost of the audit will be financed from the project funds.

17. The audited project financial statements will be publicly disclosed in accordance with the World Bank's Access to Information Policy.

Financial Covenants

18. The borrower shall cause the MNRETS PIU and MoF PIU to maintain or cause to be maintained an FM system in relation to the project acceptable to the World Bank.

19. The borrower shall cause the MNRETS PIU and MoF PIU to prepare and furnish to the Association, not later than 45 days after the end of each calendar quarter, combined unaudited IFRs for the project covering the quarter, in form and substance acceptable to the Association.

20. The recipient shall cause the MNRETS PIU and MoF PIU to have its project financial statements audited in accordance with the provisions of Section 5.09 (b) of the General Conditions and Section 2.07 (b) of the Standard Conditions and in accordance with the International Standards on Auditing. Each audit of the financial statements shall cover the period of one fiscal year of the recipient. The combined audited financial statements for each such period shall be furnished to the Association not later than six months after the end of such period.

Procurement

21. **Applicable procurement framework.** All contracts' procurement will be conducted through the procedures as specified in the World Bank's Procurement Regulations. The Guidelines on Preventing and Combating Fraud and Corruption in Projects financed by IBRD loans and IDA Credits and Grants, dated October 15, 2006, and revised in January 2011 and July 1, 2016, shall apply to this project. The procurement and contract management processes will be tracked through the STEP tool.

22. **Country procurement environment.** The MoF of the Kyrgyz Republic has introduced several measures to improve the transparency of procurement processes at government entities. One such measure is the adoption of the new PPL in 2022, which introduced key procurement principles and included a list of permitted procurement methods and their practical application procedures. To address transparency issues, the PPL introduced tools for contract administration and three instances of complaint management procedures and gives civil society the opportunity to participate in the tender procedures. Currently, all procuring entities are required to use zakupki.gov.kg platform to announce tenders. Meanwhile,

there is a tendency to make frequent changes in the PPL and increase cases when direct contracting, as a non-competitive procurement method, may be used.

23. **Institutional and implementation arrangements.** The main implementing agency of the project will be the MNRETS for implementation of Components 1, 3 and 4; and the MoF PIU for Component 2 and 4. The MoF already has a PIU, which has extensive experience in implementing World Bank projects and FI transactions, similar to Component 2. The MNRETS, however, is a newly formed ministry and does not have experience in implementing any World Bank projects. The staff of the MNRETS PIU will include, among others, a senior procurement specialist and procurement assistant. It is expected that the PIU's staff will handle procurement planning, procurement process, and contract management. The MoF already has a PIU, which has a procurement specialist with the required experience.

24. **Summary of PPSD.** As required by the Procurement Regulations, the PPSD is developed, based on which a Procurement Plan is prepared setting out the selection methods to be followed by the recipient during project implementation when procuring goods, works, and non-consulting and consulting services, financed by the World Bank. The procurement approaches for key packages have been determined in the PPSD, as described in the following paragraphs.

25. **Procurement approach for key goods, works, and non-consulting services contracts.** Air quality monitoring stations, laboratory equipment, and IT equipment will be procured through Request for Bids using the international/national market approach. Civil works for construction of a water-saving system, construction of a modern laboratory, and drilling and rehabilitation of boreholes and drip irrigation distribution networks will be procured though Request for Bids using the international/national market approach.

26. **Procurement approach for key consultancy contracts.** Consulting firms will be used for development of an information system based on GIS; update of irrigation inventory and development of regulatory documents; preparatory work for the construction of a modern laboratory; development of an AQM plan (national level and Bishkek level); and technical capacity building for monitoring, analysis, and modeling of air pollution. Individual consultants will be used for establishment of a secretariat to support the functions of the National Coordinating Committee for the management of AQ and promote meaningful intersectoral collaboration. Consulting firms will be selected through Quality- and Costs-Based Selection method using an international market approach and through Selection Based on Consultants' Qualifications method for local market.

27. **Procurement rules of the World Bank are not applied for Subcomponent 2.1, as this subcomponent will be implemented through loans made by eligible FIs to private borrowers.** The HHs will receive information about the eligible suppliers of the technologies and could purchase the equipment from the preapproved market. The eligible suppliers' criteria (such as existing store or showroom, availability of warranty, post warranty service, and so on) will be provided in the POM.

28. **Key conclusions from the conducted market analysis.** The local market does not offer the possibility of satisfactory competition, which could be achieved by open competitive approach to the market attracting international supplier/consultants with wide experience in AQM to achieve best fit-for purpose and value for money in procurement. The local market offers the possibility of satisfactory completion of civil works and consulting services related to the preparation of detailed engineering design and technical supervision, which could be achieved by open competitive approach to the local market attracting international and national construction and consulting companies with wide experience in irrigation and canal rehabilitation.

29. The current state of the construction market has sufficient competition to offer the best value under all equal conditions, even considering the regionality, so that the construction market is quite competitive. Considering the size and complexity of components, lack of clarity about potential interest of the market, and the need to combine procurement packages to reach economies of scale while minimizing the need for supervision, a two-envelope procurement approach with post-qualification will be conducted for the main civil works packages. It will help engage the market and mitigate pressure of the price during the evaluation.

30. The market can meet procurement needs of the project. The Government agrees that additional efforts will be required in terms of continuous consultations with the industry, a careful approach will need to be taken for the development of procurement documentation, and deliberate efforts will be needed to widely advertise tenders to ensure appropriate levels of participation by both local and international vendors.

Procurement Risks Analysis

31. A procurement capacity assessment of the MNRETS and MoF was performed by the World Bank using the Procurement Risk Assessment and Management System. Based on the assessment, the project procurement risk is rated Substantial.

Box 1.1. Procurement Risks

- **Procurement planning.** Increase of gas or oil price and fuel will affect the price of the end product and may increase cost estimates.
- **Procurement process.** The possibility of influence attempts by influential government officials on procurement decisions increases the risk of procurement decisions' accountability. Project beneficiaries have limited capacity to prepare detailed designs and technical specifications for the defined investments.
- **Potential procurement delays.** Experience suggests that procurement delays should be expected due to the lack of procurement capacity and market limitations. in addition, local currency depreciation may result in the unwillingness of potential bidders to submit bids and quotations in the local currency.
- **Potential contract implementation delays.** Current difficulties in all aspects of logistical services, including goods transportation, directly affect goods delivery from the Commonwealth of Independent States and other European countries.
- **Overall procurement environment.** Overall unstable procurement environment and frequent changes of the PPL and high level of corruption as measured by Transparency International.

32. To mitigate the risks, the following actions have been identified:

Box 1.2. Preliminary Risk Mitigation Measures

- All procurement activities will be carried out following World Bank procurement procedures, including the related prior- or ex-post reviews. The World Bank good governance and anticorruption safeguards, particularly the transparency and disclosure provisions, will be promoted and enforced.
- With the support of additional consultants, the PIU will be responsible for preparing bidding documents, and the World Bank will provide intensive implementation support.
- Realistic procurement planning, up-to-date cost estimates, and scheduling, including timely preparation of technical specifications or terms of reference with World Bank close supervision and monitoring, particularly from the country office, will be required. Early engagement with markets and business outreach will be required for critical packages.

- The POM should have clear deadlines and timelines for each step in the procurement process for both consultant selection and goods and technical services' procurement to avoid unnecessary delays during implementation.
- USD/EUR currency will be used for bid submission in problematic procurement packages, while the payment will be in the local currency.
- More emphasis on and training in appropriate contract management are required, supplemented by regular physical inspections during World Bank implementation support missions. The delivery terms will be carefully reviewed with the aim of avoiding transportation through conflict-affected zones and seeking alternative routes.
- Application of World Bank Anti-Corruption Guidelines and close supervision by World Bank staff will be ensured.

33. **Use of National Procurement Procedures.** In accordance with paragraph 5.3 of the Procurement Regulations, when approaching the national market, the PIU may use the procedures set out in the PPL. The provisions of the PPL are partially consistent with the World Bank Procurement Regulations Section V - Paragraph 5.4 National Procurement Procedures, subject to conditions specified in the PPSD and Procurement Plan. To promote transparency, efficiency, and value for money under the country-public procurement system, the PPL provides for an e-procurement system. The e-procurement system is assessed by the World Bank, and the project may use it for procurement of simple goods and small works.

34. **Training and operating costs.** The project will finance operating costs for both the PIUs. When required, the PIU personnel will be selected based on experience, qualifications, and capability to carry out the assignment. The selection shall be carried out through the comparison of the relevant overall capacity of at least three qualified candidates among those who have expressed interest in the assignment. Detailed procedures will be outlined in the POM. The PIUs will develop a detailed training plan and prepare an annual operational budget for the World Bank team's review and clearance. Operating costs and training will be financed as per the annual budget approved by the World Bank.

35. **Record keeping.** All records pertaining to award of tenders, including bid notification, register pertaining to sale and receipt of bids, bid opening minutes, bid evaluation reports, and all correspondence pertaining to bid evaluation, communication sent to/with the World Bank in the process, bid securities, and approval of invitation/evaluation of bids would be retained by respective agencies and uploaded in the STEP tool.

36. **Disclosure of procurement information.** The following documents shall be disclosed: (a) Procurement Plan and updates; (b) an invitation for bids for goods and works for all contracts; (c) Request for Expression of Interest for selection/hiring of consulting services; and (d) contract awards for goods, works, and non-consulting and consulting services.

37. The following details shall also be published in the United Nations Development Business and Bank's external website: (a) an invitation for bids for procurement of goods and works following open international market approaches, (b) Request for Expression of Interest for selection of consulting services following open international market approaches, and (c) contract award details of all procurement of goods and works and selection of consultants using open international market approaches.

38. **Fiduciary oversight by the World Bank and procurement supervision.** The World Bank shall prior review contracts as per prior review thresholds set out in the PPSD/Procurement Plan. All contracts not covered under prior review by the World Bank shall be subject to post review during implementation support missions and/or special post review missions, including missions by consultants hired by the World Bank. Two half-yearly missions are envisaged for procurement support and supervision of the proposed project.

ANNEX 2: Economic and Financial Analysis

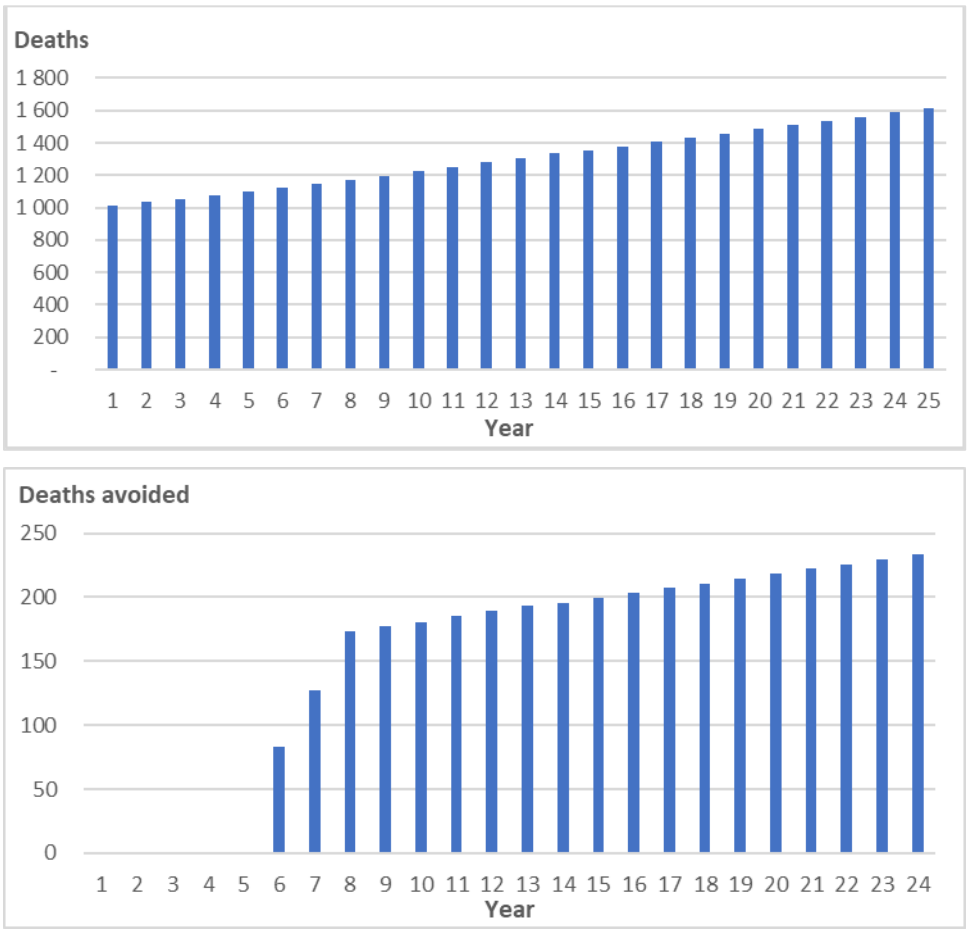
COUNTRY: Kyrgyz Republic
Kyrgyz Republic Air Quality Improvement Project

1. The economic analysis is based on expected benefits of the project that could be valued monetarily. The benefits are quantified by comparing the development impacts expected to be generated 'with the project' with the 'business as usual' (that is, without the project) scenarios. This ensures that the benefits quantified are 'incremental or additional impacts' and do not include the ones that would be generated without the project. The benefits that could be monetarily valued in the economic analysis are detailed in the following paragraphs.

2. **Avoided health costs due to reduced mortality and morbidity from $PM_{2.5}$ exposure.** Bishkek experiences a high concentration of ambient $PM_{2.5}$ far exceeding the international air quality limits during most parts of the year.[29] Long exposure to high ambient $PM_{2.5}$ pollution is responsible for several diseases, notably, ischemic heart disease, stroke, lung cancer, lower respiratory infection, chronic obstructive pulmonary disease, and diabetes mellitus 2,[30] causing death and morbidity in Bishkek like elsewhere in the world. Mortality and morbidity incur economic costs through loss of productive labor and medical expenses. In 2019, high ambient $PM_{2.5}$ pollution was responsible for 2,586 deaths in the Kyrgyz Republic.[31] In Bishkek, 1,012 deaths are estimated to occur due to this pollution in 2023, and this is expected to increase gradually to reach over 1,700 in 2052 (figure 2.1) in the business-as-usual scenario. Such pollution also resulted in 5,319 years lived with disability, that is, morbidity in the country in 2019. The transition to clean residential heating by households, creation of new urban green belts, and construction of boreholes providing irrigation by this project are expected to reduce the ambient $PM_{2.5}$ concentration and thus reduce mortality and morbidity in Bishkek. The transition to clean residential heating means avoiding $PM_{2.5}$ pollution from beneficiary households altogether. Urban green spaces reduce $PM_{2.5}$ concentration from all sources by dispersion, deposition, and modification,[32] thus effectively reducing $PM_{2.5}$ from all sources[33]—residential heating, windblown dust, transportation, and combined heat and power plants. Transition to clean residential heating is estimated to reduce annual $PM_{2.5}$ concentration by up to 35.2 percent and green spaces by another 2.1 percent in Bishkek.[34] Overall, the project will help reduce $PM_{2.5}$ concentration and thus mortality and morbidity and related economic costs in Bishkek.

[29] UNDP and UNEP. 2022. Air *Quality in Bishkek Assessment of Emission Sources and Road Map for Supporting Air Quality Management*.
[30] Lelieveld, J., K. Klingmüller, A. Pozzer, U. Pöschl, M. Fnais, A. Daiber, and T. Münzel. 2019. "Cardiovascular Disease Burden from Ambient Air Pollution in Europe Reassessed Using Novel Hazard Ratio Functions." *European Heart Journal* 40 (20): 1590–1596.
[31] World Bank. 2022b. *The Global Health Cost of $PM_{2.5}$ Air Pollution: A Case for Action Beyond 2021*. Washington, DC: World Bank.
[32] Diener, A., and M. Mudu. 2021. "How Can Vegetation Protect Us from Air Pollution? A Critical Review on Green Spaces' Mitigation Abilities for Air-Borne Particles from A Public Health Perspective - With Implications for Urban Planning." *Science of the Total Environment* 796 (2021): 148605.
[33] Regular and efficient irrigation—made possible by investment in rehabilitating irrigation system by Air Quality Improvement Project—will increase the efficiency of the green spaces in reducing $PM_{2.5}$ concentration as Bishkek is semiarid and suffers from water stress regularly.
[34] World Bank. 2023. Air *Quality Analysis for Bishkek: PM2.5 Source Apportionment and Emission Reduction Scenarios* (*https://documents1.worldbank.org/curated/en/099110123211021470/pdf/P17087000827dd04e09d6a0d01dc0ab3c41.pdf*)

Figure 2.1. $PM_{2.5}$ Exposure-Related Deaths in Bishkek in Business-as-Usual Scenario (top) versus Avoided due to the Project (bottom)



Source: Estimated for this economic analysis by using relative risks from Institute for Health Metrics and Evaluation 2019.

3. **Net GHG emission reduction.** The project will contribute to climate change mitigation by GHG removal from the atmosphere by creating urban green space and emission avoidance by replacing solid fuel and gas-based stoves and boilers with energy-efficient heat pumps and solar stoves and boilers in beneficiary HHs. The project is expected to generate a total net GHG emission of approximately –2.72 million mtCO_2eq over the 25-year analysis period. This corresponds to an average annual net GHG emissions of just over –136,315 tCO_2 eq per year.[35] Of the total net emissions, 2.70 million tCO_2eq will come from clean energy transition, and 0.022 million tCO_2eq from urban greening. The negative emissions (that is, removal and avoidance) will come from sequestration by the new urban green belts and existing green spaces served by the irrigation infrastructure[36] and the replacement of solid fuels (coal mixed with wood) and gas in residential heating. As a key part of clean residential heating transition, the project will replace the existing stoves and boilers with heat pumps that will result in GHG emissions reduction. Therefore, the project, as a whole, will generate net negative GHG emissions.

[35] Since the climate change mitigation benefits are assumed to be realized from year 6, the annual average net GHG emission is calculated for 20 years, not for the entire analysis period of 25 years.
[36] The Ex-Ante Carbon-Balance Tool (EX-ACT) of the Food and Agriculture Organization (FAO) is used for estimating net GHG emissions. The newly constructed boreholes are expected to serve 13 ha of new urban green belts and 98.42 ha of existing green spaces that are currently not served or are underserved by the irrigation system.

4. **Ecosystem services by green spaces.** The creation of new urban green belts and existing green spaces served with regular and efficient irrigation will supply a variety of provisioning, regulating, and cultural ecosystem services. Among these, only four services—habitat/species protection, hydrological regulation, recreation, and other NWFPs—can be monetarily valued due to the lack of necessary data.

5. **Avoided labor productivity and other economic losses due to the cooling effects of green spaces and expanded irrigation network.** Bishkek is located in a semiarid region and is experiencing—due to climate change—extreme heat events in increasing frequency and intensity already. This is likely to worsen as climate change accelerates, which will in turn increase the average temperature gradually in the future (see, for example, World Bank and ADB 2021[37]). Increasing concrete surface in Bishkek together with accelerating climate change creates urban heat islands that intensify the impacts of extreme heat. Extreme heat reduces the labor productivity of working-age citizens and thus incurs economic losses in terms of labor productivity loss. It also causes other economic losses or costs due to, for example, increased costs of cooling (see, for example, ILO 2019[38]), wildfires, and decreased hydropower generation. Urban green spaces created and supported by this project—by reducing the temperature—will counter extreme heat and avoid economic loss in Bishkek.

6. **Energy cost and poverty reduction.** In Bishkek, households without access to district heating that the project is targeting spend about 15 percent of their monthly expenditures on residential heating (World Bank 2020[39]). Transitioning to cleaner residential heating (heat pumps, solar collectors, efficient electric boilers, and thermal storage heaters) and ensuring structurally sound buildings will reduce the overall energy consumption for residential heating. This will result in a reduction of heating energy costs and an increase in disposable income for the beneficiary households. Given the 16.8 percent poverty rate in 2020 in Bishkek and most of the beneficiary households belonging to the lower-income group, the energy cost reduction in heating will help reduce poverty significantly.

7. **The project is expected to generate a range of benefits that could not be monetarily valued for this analysis due to the lack of necessary data.**

(a) **Employment generation will be a key benefit.** Clean residential heating transition will require new stoves, boilers, and technologies to be installed in the beneficiary houses. The above will help secure the existing jobs and create new ones in the local stove and boiler manufacturing and technological solution-providing enterprises in Bishkek. Such employment impacts are also likely to be seen—probably to a lesser extent—in trading enterprises if some clean heating technologies and equipment must be imported from abroad. Additional jobs will be created in the efforts to improve, expand, and maintain urban greenery. Moreover, the provision of loans to HHs through the participating Kyrgyz banks is likely to secure some existing jobs and create some new ones in those banks. The same employment benefits are also likely to be seen in the companies selling or servicing heat pumps or clean heating technologies.

(b) The project is likely to contribute to the health and well-being of particularly women and children in the beneficiary HHs. Women and infants are usually more affected by poor air quality as they handle the stoves and boilers the most and stay indoors longer doing household chores with children under five years of age close to them (IOM 2022[40]). The transition to clean energy in residential heating is likely to mean that women (and men) in the beneficiary HHs will need to spend less time dealing with heating. This will increase leisure

[37] World Bank and ADB. 2021. Climate Risk Country Profile: Kyrgyzstan. Washington DC, USA and Manila, Philippines.
[38] ILO (International Labor Organization). 2019. *Working on a Warmer Planet: The Impact of Heat Stress on Labor Productivity and Decent Work*. Geneva, Switzerland.
[39] World Bank. 2020. *Fueling Kyrgyzstan's Transition to Clean Household Heating Solutions*. Washington, DC: World Bank.
[40] IOM (International Organization for Migration). 2021. *Air Pollution and Its Health Impacts on Internal Migrants in Bishkek, Kyrgyzstan*. Geneva: IOM.

and economically productive time for women and children. This, together with reduced exposure to air pollution, will improve the health and well-being of women and their families. It is also likely to increase families' disposable income by reducing the medical costs of air pollution-related diseases. These benefits will contribute to human capital development and green growth in Kyrgyzstan.

(c) **The economic benefits will be augmented by the increased vitality of urban green spaces.** This will provide a range of important ecosystem services such as scenic beauty, reducing nutrient inflow in water bodies and enhanced cycling, human health benefits and reduction of other air pollutants in addition to $PM_{2.5}$.[41] Additional benefits that are hard to monetize are those related to increased resilience of urban spaces to climate change.

8. The benefits and costs[42] of the CBA analysis are presented with associated assumptions and explanations in tables 2.1 and 2.2, respectively.

Table 2.1. Benefits of CBA

Category	Discounted Value over 25 Years (at an 8% rate)	Comments and Assumptions
Avoided health costs due to reduced mortality and morbidity from $PM_{2.5}$ exposure	US$122.54 million	The transition to cleaner residential heating by avoiding coal and wood in 13,000 beneficiary households; creation of 13 ha of new green spaces comprising of green belt and lawns; and enhanced maintenance of about 98 ha of existing green space resulting from improved irrigation through new boreholes are estimated to reduce annual average $PM_{2.5}$ concentration to 48.32 $\mu g/m^3$ from the current 51.4 $\mu g/m^3$ (World Bank, 2023). As a result, the relative risk of dying from $PM_{2.5}$ pollution will decrease, which will help avoid 3,905 deaths. The avoided deaths will result in avoided economic costs, which are estimated by using the methodology proposed by Narain and Sall (2016).[43] Reduced $PM_{2.5}$ concentration will also result in avoided morbidity. It is assumed that morbidity costs will be 10% of the mortality costs, which is a standard assumption. It is assumed that 50% of the annual benefits of health cost avoidance and all other benefits will be realized in year 6, 75% in year 7, and 100% afterward. It is justified by the fact that all project activities are expected to start from the first year of implementation. It is realistic to assume that the benefits of the Air Quality Improvement Project will start to be realized before the disbursement period ends in year 7. It is also assumed that the newly created green belts will be 1.5 times more efficient in reducing PM2.5 concentration than the existing green spaces, while the existing green spaces served by the project's irrigation infrastructure will be 50% more efficient in reducing $PM_{2.5}$ concentration than the unirrigated green spaces in Bishkek. The assumption is realistic because the

[41] Xing, Y., and P. Brimblecombe, 2019. "Role of Vegetation in Deposition and Dispersion of Air Pollution in Urban Parks." *Atmospheric Environment* 201: 73–83.

[42] All benefits and costs for the analysis period are expressed in constant US dollar of 2022. All relevant input prices and values—if in other currencies than US dollars and not for 2022—are adjusted to 2022 by using appropriate exchange rates, GDP deflators, and US dollar inflation rates (see https://stats.oecd.org/index.aspx?DataSetCode=PRICES_CPI).

[43] Narain, U., and C. Sall. 2016. "Methodology for Valuing the Health Impacts of Air Pollution: Discussion of Challenges and Proposed Solutions." Working Paper, World Bank, Washington, DC.

Category		Discounted Value over 25 Years (at an 8% rate)	Comments and Assumptions
			green spaces will be created in strategic locations, which will be chosen considering potential sources of windblown dust around the city, the direction of winds at different times of the year, pollution hot spots, and availability of adequate linear land in the areas of interest. The plant and tree species would be chosen for their effectiveness in reducing $PM_{2.5}$ concentration and their survival in the specific climate of Bishkek. Moreover, they will be well irrigated and maintained. On the other hand, due to the construction of boreholes, there will be a regular flow of water in comparison to existing unrehabilitated ones.
Net negative GHG emissions	The low shadow price of carbon	US$60.96 million	The net GHG emissions are estimated by using the FAO's EX-ACT for 13 ha of new urban green belts and 98.42 ha of existing green spaces that are served by the project's irrigation infrastructure (that is, new borewells). The green spaces will be created on the roadsides on bare land and essentially forest plantations. It is assumed that the Air Quality Improvement Project will help avoid significant portion of GHG emissions from heating in beneficiary households in comparison to the business-as-usual scenario. This assumption is justified by the fact that (a) solar boilers and stoves, which will replace some existing coal (mixed with wood), and gas-based ones will avoid GHG emissions altogether and (b) heat pumps will be more efficient in reducing energy consumption and GHG emissions. It is assumed that 50% of the annual net negative GHG emissions will occur in year 6, 75% in year 7, and 100% afterward. By following the guidance given by World Bank (2017), CPI-adjusted low shadow price carbon of US$52/$tCO_2$eq and a high price of US$104/$tCO_2$eq—both increasing at a 2.25% annual rate from the second year—are used for calculating the respective economic values of net GHG emissions. A sensitivity analysis is conducted with more ambitious shadow prices of carbon.
	The high shadow price of carbon	US$121.93 million	
Ecosystem services by newly created green spaces		US$0.08 million	Among the numerous ecosystem services that urban green spaces will provide, only four services—habitat/species protection, hydrological regulation, recreation, and other NWFPs—can be monetarily valued due to the lack of necessary data. It is assumed the supply of ecosystem services by the existing green spaces will be enhanced by 50% due to the project's irrigation infrastructure serving them. Economic values of US$27.7 per ha per year for habitat/species protection, US$2.6 per ha per year for hydrological regulation, US26.1 per ha per year for NWFPs and US$65.0 per ha per year for recreation (from Siikamäki et al. 2021[44]) are used for estimating the economic contribution of ecosystem services.
Avoided labor productivity and other economic losses from the cooling effects of		US$6.27 million	Extreme heat is estimated to cause labor productivity and other economic losses equivalent to 3.1% of GDP on average (Callahan and Mankin 2022[45]). As the creation of urban green spaces and water-saving solutions for irrigation will

[44] Original values for 2018 are converted to 2022 constant US dollar through inflation adjustment. Source: Siikamäki, J., M. Piaggio, N. da Silva, I. Álvarez, and Z. Chu. 2021. *Global Assessment of Non-Wood Forest Ecosystem Services Spatially Explicit Meta-Analysis and Benefit Transfer*. Washington, DC: World Bank.

[45] The loss is high in lower-income countries and low in higher-income countries. The use of the global average is justified as the Kyrgyz Republic is a lower-middle-income country. Callahan, C. W., and J. S. Mankin. 2022. "Globally Unequal Effect of Extreme Heat on Economic Growth." *Science Advances* 8: eadd3726.

Category	Discounted Value over 25 Years (at an 8% rate)	Comments and Assumptions
urban green spaces and rehabilitated canals		take place in Bishkek, the avoided labor productivity and other economic losses are estimated[46] by considering that the city contributes 35% of the GDP in the country (Komendantova et al. 2018[47]).
Reduced energy costs	US$1.08 million	According to the World Bank (2020), the average heating expenditure of a household using solid fuel was US$48.48 per heating season in 2020 (that is, US$53.19 per heating season in 2022 constant US dollar). Considering that the alternative cleaner heating solutions will include natural gas and electricity and EE measures will be put in place, the team assumes that the energy costs will be 75% of the current costs in the beneficiary households. This means an energy cost reduction of 25%.

Table 2.2. Costs Quantified for CBA

Category/Component	Discounted Value over 25 Years (at an 8% rate)	Summary of Calculation and Assumptions
Strengthen air quality management system (Component 1)	US$7.14 million	The total cost (US$9.1 million) is distributed equally throughout the project implementation period. This component provides inputs for and thus directly contributes to successfully implementing Components 2 and 3. This means that Component 1 contributes to all benefits of the project along with Components 2 and 3 and therefore, the costs of that component are included in the CBA.
Support the adoption of clean heating solutions (Component 2)	US$25.07 million	The total cost (US$32.3 million) is distributed equally throughout the project implementation period.
Improve urban greening (Component 3)	US$4.43 million	The total cost (US$7.1 million) is distributed equally throughout the project implementation period.
O&M costs	US$14.58 million	It is assumed that O&M costs will be 5% per year of the construction costs of physical infrastructures. O&M will be needed from the 7th year as the infrastructure construction will start from the beginning of the project implementation.

Sensitivity Analysis

9. The sensitivity of the economic viability of the project is tested with the changes in several underlying factors that affect the benefit and cost streams in the analysis. The factors include shadow price of carbon; discount rate; labor productivity; and other economic losses due to extreme heat, morbidity costs, energy costs reduction due to clean residential heating transition, number of beneficiary households, area of urban green belts to be created, green spaces served by irrigation infrastructure, and O&M costs of physical infrastructures.

[46] The estimation is a product of multiplication of the share of urban green space increased due to the Air Quality Improvement Project, share of GDP lost due to extreme heat, total GDP of the Kyrgyz Republic, and Bishkek's contribution in the country's GDP. The canal rehabilitation does not increase the total area of the canals in Bishkek, and thus is not directly integrated into the estimation. However, the irrigation water from these canals is crucial for long-term survival of the green spaces, and thus the rehabilitated canals enter into the estimation indirectly.
[47] Komendantova, N., N. Atakanov, U. Chekirbaev, N. Karabashov, Z. Zheenaliev, E. Rovenskaya, N. Strelkovskii, S. Sizov, and F. S. Rodriguez. 2018. "Industrial Development of Kyrgyzstan: Regional Aspects." Working Paper 5, International Institute for Applied Systems Analysis. Vienna, Austria.

10. The shadow prices of carbon suggested by HLCCP that are used in this economic analysis aim to limit global warming to 2°C by the end of this century. With the 2.25 percent growth rate, the price ranges between US$62 per tCO_2eq and US$124 per tCO_2eq in 2030 and US$97 per tCO_2eq and US$193 per tCO_2eq in 2050. IPCC (2018)[48]—to limit global warming to 1.5°C by the end of this century—suggests a price starting from US$135 per tCO_2eq in 2030 and US$245 per tCO_2eq in 2050. A multiyear study by Rennert et al. (2022)[49] published in the journal Nature estimated the social costs of carbon to be between US$44 per tCO_2eq and US$413 per tCO_2eq with an average of US$185 per tCO_2eq. To see the effects of more ambitious climate targets on this Air Quality Improvement Project's economic viability, a sensitivity analysis, with a carbon price ranging from US$100 per tCO_2eq to US$450 per tCO_2eq, is conducted. Naturally, with higher shadow prices of carbon, the EIRRs and EBCRs increase as the project generates net negative GHG emissions. The EIRR increases from 35.44 percent to 61.78 percent, while the EBCR increases from 4.73 to 12.59 when the shadow price of carbon increases from US$100 per tCO_2eq to US$450 per tCO_2eq (table 2.3).

Table 2.3. Sensitivity Analysis with Shadow Price of Carbon

Shadow Price of Carbon (US$/$tCO_2eq$)	EIRR (%)	EBCR
100	35.44	4.73
150	40.44	5.86
200	44.85	6.98
250	48.82	8.10
350	55.77	10.34
450	61.78	12.59

11. Both the EIRR and EBCR are sensitive—to varying degrees—to changes in all the factors mentioned above except the discount rate. This indicator is highly sensitive to the changes in morbidity costs, total area of new urban green belts, number of direct beneficiary households, and O&M costs and marginally sensitive to changes in heating costs and labor productivity and other economic losses (table 2.4). The direction of change in the EIRR and EBCR depends on the parameters in the economic analysis. For example, both indicators decrease with the increase in O&M costs, while increasing with all other parameters except the discount rate. The EBCR decreases with the increase in the discount rate[50] (table 2.4). Overall, the directions and degrees of sensitivity in the EIRR and EBCR due to the changes in underlying assumptions on parameters are plausible. This suggests that the economic analysis is robust.

12. Avoided health costs from reduced mortality and morbidity constitute 48.65 percent of the discounted sum of all benefit flows at the high shadow price of carbon. This benefit is a joint outcome of two components' transition to clean residential heating (Component 2), creation of new urban green belts, and enhanced irrigation infrastructure of new and existing green spaces (Component 3). Net negative GHG emissions (that is, removal and reduction) from these two components together constitute 48.40 percent of the discounted sum of all benefits. Avoided labor productivity and other economic losses, which are an outcome of Components 2 and 3, constitute 2.49 percent of all benefits at high carbon price. Component 1 contributes to these benefits indirectly by strengthening the AQMS in the country. Energy cost reduction is an outcome of Component 2 and constitutes about 0.43 percent of the discounted sum of all benefits at the high carbon price.

[48] IPCC. 2018. *Global Warming of 1.5°C. Special Report on Global Warming of 1.5°C.* (Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield [eds.]).
[49] Rennert, K., et al. 2022. "Comprehensive Evidence Implies a Higher Social Cost of CO_2." *Nature* 610: (687–692).
[50] The EIRR is not a function of discount rate and thus does not change with the change in the former.

Table 2.4. Sensitivity Analysis with Key Parameters

Parameters	Input Value in the Base Case	Change	EIRR (%)		EBCR	
			With Low Carbon Price	With High Carbon Price	With Low Carbon Price	With High Carbon Price
		Base case	29.88	35.87	3.66	4.82
Discount rate	8%	4%	29.88	35.87	4.87	6.43
		14%	29.88	35.87	2.43	3.20
Labor productivity and other economic losses due to extreme heat	3.1%	0.05%	29.14	35.24	3.54	4.70
		7.5%	30.92	36.76	3.83	4.99
Morbidity costs	10%	1%	28.76	34.93	3.46	4.63
		50%	34.45	39.77	4.51	5.68
Heating cost reduction due to cleaner energy transition	25%	5%	29.77	35.78	3.64	4.81
		55%	30.03	36.00	3.68	4.85
Direct beneficiary households	13,000	8,000	29.83	35.83	3.65	4.81
		18,000	29.92	35.91	3.66	4.83
Total area of new green belts	13	5	29.29	35.37	3.56	4.73
		1000	52.83	56.33	8.64	9.81
O&M costs of physical infrastructure	5%	0%	31.51	37.26	5.07	6.69
		30%	20.29	28.05	1.53	2.01

ANNEX 3: Assessment of Financial Sector and Financial Intermediaries

COUNTRY: Kyrgyz Republic
Kyrgyz Republic Air Quality Improvement Project

1. **The Kyrgyz financial sector is bank dominated.** There are 23 licensed commercial banks in the Kyrgyz Republic. The banking sector assets account for 50 percent of GDP and 92 percent of financial sector assets, with the five largest banks accounting for 56 percent of the assets of the country's entire banking sector. Total bank lending amounted to around KGS 204 billion (US$2.3 billion) in 2022, or around 23.1 percent of GDP. While the level of the credit-to-GDP increased over the past decade from 13.4 percent in 2012 to 23.1 percent in 2022, it is still significantly lower than the average of the Europe and Central Asia region (excluding high-income countries) at 53.3 percent.[51] Financial deepening and intermediation are most hindered by the lack of deposit mobilization and overall weak trust in banking sector.

2. **The banking sector remained resilient during the COVID-19 pandemic but the NPLs have increased and remain somewhat elevated.** After the pandemic hit, the volume of NPLs started to increase drastically. The gross NPL ratio increased from 8 percent at the end of 2019 to peak at 13.1 percent in October 2022.[52] It came down to 10.9 percent in June 2023. The profitability of the banking sector also saw a sharp decline in 2020, before rebounding in 2021 and leaping to a highly profitable year in 2022. The banking sector remained well capitalized with the capital adequacy ratio at 23.5 percent as of June 2023. The liquid asset-to-short-term liability ratio has remained within the range of 60–70 percent between 2018 and 2021, but increased to above 80 percent since October 2022, well above the minimum regulatory requirement of 45 percent. The loan-to-deposits ratio declined sharply from 101 percent in 2018 to 65 percent in 2022, exhibiting a disintermediation trend by the banking sector. This is likely affected by uncertainties created by global inflation and heightened interest rates, slow global economic recovery, and Russia's invasion of Ukraine.

Table 3.1. Banking Sector Indicators (2018–2023)

	End of 2018	End of 2019	End of 2020	End of 2021	End of 2022	May 2023
Capital adequacy	23.7	24.0	24.9	22.2	25.6	24.0
Gross ratio of NPLs	7.5	8.0	10.5	11.1	12.8	11.4
Liquidity ratio	66.9	64.0	64.9	71.3	82.8	84.4
Loan to deposits ratio	101.0	103.0	95.9	80.3	65.0	65.9
Return on equity	9.5	7.7	5.5	7.8	43.4	31.9
Return on assets	1.4	1.2	0.9	1.4	5.9	4.6

Source: National Bank of the Kyrgyz Republic.

3. **While the banking sector is facing a high level of NPLs since 2010, Kyrgyz banks have limited options for reducing their NPLs, forcing them to primarily work out their NPL portfolios by either maximizing the loan repayments or by restructuring the defaulted loans.** The efficiency of NPL workouts and readiness of insolvency systems co-determine the resilience of the financial system and its ability to cope with NPLs. The Kyrgyz insolvency regime is heavily liquidation oriented.

4. **The cost of credit, in terms of net interest margin and collateral requirements, is higher than its peers.** The net interest margin is 8.4 percent, compared to the Europe and Central Asia median of 3.3 percent, and the income group

[51] https://data.worldbank.org/
[52] The National Bank of Kyrgyz Republic, https://www.nbkr.kg/

median of 3.8 percent in 2021.[53] The high net interest margin is rooted in banks' high operational costs. There are many relatively small banks that do not have the economies of scale to recover from the high cost of small and microlending. Regarding borrowers' collateral conditions, 80.2 percent of loans were secured with immovable assets in 2017. According to the World Bank's Enterprise Survey in 2019, more than 90 percent of loans required collateral, with the average value of collateral needed as high as 244 percent of the total loan amount. The high collateral is caused in part by an underdeveloped secured transaction and credit reporting regime, which would take time to improve. There is currently no stand-alone law on secured transactions that accounts for all encumbered assets (for example, assignment of receivables, transfer or retention of titles, or leases and tax liens). Moreover, the current Credit Reporting Law prohibits financial institutions from sharing sufficient credit information with the credit bureau and does not allow the credit bureau to access alternate data sources such as utility and telecommunications companies. In addition, the coverage of the collateral registry and the credit bureau is limited, and there is no automatic connection between the collateral registry, credit bureau, and business registry.

5. **Access to financial services continues to be a major hindrance for individual HHs and businesses.** Despite an impressive progress from only 4 percent in 2011, 18 percent in 2014, and jumping to 38 percent in 2017, account ownership at financial institutions was only 45 percent in 2021.[54] This is much lower than the median among lower-income countries (62.4 percent) and the median in the Europe and Central Asia region (77.8 percent). Bank branch penetration is low, with 7.4 bank branches per 100,000 adults, compared to the Europe and Central Asia median of 20.5 in 2021.[55] However, the number of bank retail outlets is growing in the Kyrgyz Republic, more than doubling from 464 in 2010 to 1,039 in 2018. Digital financial services are also growing and provide more accessible opportunities through e-wallets, cards, and online banking, among others.

6. **There is a lack of affordable financing for clean** heat technologies whose **up-front cost** is high. This is a major constraint in incentivizing HHs to adopt clean heating options, such as heat pumps, due to its higher investment cost compared to coal stoves and boilers. Currently, clean heat technologies are financed through consumer loans that comes with highest interest rates in the market and low maturity. The average weighted interest rate of consumer loans is about 25 percent for loans with 6–12 months maturity and about 20 percent for loans over three years. The project aims to raise awareness of the heating technologies and encourage commercial banks to price the loans as home improvements that could be brought closer to the interest rates for mortgages, which is about 17 percent for loans with 6–12 months maturity but comes down to 11 percent for loans over three years (average weighted interest rates in local currency financing). [56]

7. **It is proposed to leverage the MoF PIU as an implementing agency to implement Component 2**. The MoF PIU has been successfully implementing World Bank-financed projects in the Kyrgyz Republic since 2002. Recent projects include management of a revolving fund for Integrated Dairy Productivity Improvement Project (P155412) and reimbursable financing assistance (P174028) (Emergency Support for MSMEs Project) that required the MoF PIU to work closely with commercial banks (12 participating public and private commercial banks to disburse US$111.75 million). There is currently no suitable commercial institution available for assuming this role.[57] The MoF PIU has an established track record of prudently managing financial assistance schemes through commercial banks and ensuring that selection of commercial banks follow the eligibility criteria in the POM and Procedural Manual. The MoF PIU will closely monitor the implementation and the portfolio quality and track results performance. The MOF PIU has experienced staff including a

[53] FinStats 2023.
[54] Global FINDEX 2021.
[55] World Bank's World Development Indicators.
[56] See the Bulletin of the National Bank of Kyrgyz Republic.
[57] The State Development Bank is still being operationalized following the Government Resolution issued in 2022 to establish the bank.

credit management specialist, a procurement specialist, an FM specialist, environmental and social specialist, and contract management and outreach specialist, among others; however, additional staff may need to be hired.

8. **The MoF PIU will develop detailed eligibility criteria and invite interested/eligible PFIs,** including state-owned and private banks, to submit their expression of interests to participate in the proposed financing scheme. Only sound PFIs that meet the following established criteria will be considered: (a) licensing, (b) compliance with national regulations, (c) operations for at least two years, (d) audited financial statements, (e) sound management and governance practices, (f) management information systems, planning, reporting and internal audits, and (g) standard ratios for capital adequacy, liquidity, equity, and profitability and balanced asset and liability structure and sustained portfolio quality. The eligibility criteria should be set to ensure an open and transparent process for engagement of the PFIs, enable self-assessment of the banks before applying, and ensure continuous engagement of the PFIs without complicated bureaucracy. Upon signature of agreement between the MoF and PFIs, project funds will be provided to the PFIs as local currency loans for most likely a period of 10 years with one year grace period, with the interest rate that considers full coverage of the costs of loans such as cost of funds, operating expenses, and regulatory costs including provisioning. The PFIs will repay loans according to the schedule, transferring repayments to the special account opened by the MoF to be used for the revolving of the project funds and for the next transfers to the PFIs to cover more beneficiaries under the project. The PFIs will bear the credit risk. Further, given that Subcomponent 2.1 financing is made available only for a specific purpose, that is, to purchase heat pumps, it is proposed to develop uniform financing terms within a certain range. For example, a single interest rate or rates within a range could be set considering the cost of financing for the PFIs and the target beneficiaries' borrowing capacity such as (a) affordability for borrowers (monthly payments), (b) incentives for borrowers (the current level of spending on heating costs and the longer-term energy cost savings), and (c) incentives for the PFIs (interest rate to cover the full costs of such loans). A simplified operation with the PFIs bearing the credit risk makes risk management simpler for the MoF PIU. An additional risk mitigation measure is the provision of the loan proceeds in relatively small tranches, to be provided only when the 80 percent of previous allocation is disbursed by the PFIs. The PIU will inform the PSC on selection of the banks.

9. The MoF PIU will, among others, (a) assess and sign agreements with eligible PFIs; (b) prepare the POM related to Subcomponent 2.1, detailing implementation arrangements, terms, and conditions; (c) support the outreach campaign for the financing scheme in collaboration with the PFIs; and (d) ensure repayment of loans from PFIs at the agreed terms during the project implementation.