Greenhouse Gas Emissions Projections Report for the Energy Sector of the Kyrgyz Republic

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Ministry of Resources, Ecology and Technical Supervision of the Kyrgyz Republic

ICAT Initiative for Climate Action Transparency

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Deliverable 5: Reports of projections of GHG emissions for Energy sector, including methodology on GHG emissions projections

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Introduction

Today, climate change issues are of great interest to the global community, which seeks to actively participate in processes related to climate change adaptation and mitigation. The Kyrgyz Republic, as a party to the UNFCCC since 2000, has also committed to combating climate change and accelerating the transition to climate-resilient, low-carbon development models and has ratified all relevant agreements, such as the Paris Agreement. The country also submitted its updated Nationally Determined Contribution (NDC) in October 2021.

Within the framework of the current ICAT project, Kyrgyzstan expects support in developing country-specific tools and frameworks to measure and predict the desired impact of climate actions planned in NDCs on greenhouse gas emissions. The country is expected to thereby improve its monitoring, tracking and reporting mechanisms in implementing its NDCs and achieving its climate goals, which will help it meet the requirements of the Enhanced Transparency Framework of the Paris Agreement. In line with the country's sectoral priorities, the ICAT project will focus on the Energy and Transport sectors.

The overall objective is to support the Kyrgyz Republic in planning, measuring, managing and tracking the implementation of climate change mitigation actions under the NDC and the expected impacts on GHGs by establishing a framework for projecting emissions through individual activities, impact assessments and regular data collection, tracking and management under the NDC. This includes projecting GHG emissions/removals, assessing the impact of relevant policies and measures and developing appropriate indicators for reporting on progress.

1.1. Analysis of the situation, current data and collection of additional data for the development of industry/general economic projections using the selected modelling tool.

Analysis of the situation

The Kyrgyz Republic (KR) is a mountainous country, almost 90% of the territory lies above 1500 m above sea level. About 30% of the territory of the republic is plains and valleys, and 70% are high mountains, which belong mainly to the Tien Shan Mountain range, and a relatively smaller part is located in the Pamirs. The Kyrgyz Republic (KR) has sufficient reserves of fuel and energy resources (FER), including significant coal reserves and about 30% of the hydropower resources of the Central Asian region (CAR). The potential for the development of the fuel and energy complex (FEC) is not realized to an adequate extent - in the structure of the fuel and energy balance (FEB), the share of

energy imports (fuel and lubricants and coal) is 21.4%[1], which has a negative impact on the reliability of energy and fuel supplies to the country and regions.

At present, the current economic situation in the electric power industry of the Kyrgyz Republic is characterized by a deficit both in terms of capacity input and in terms of financial resources for the development of the industry, which is expressed in the outstripping growth rates of expenses in the energy system as a whole compared to the growth rates of income, which is due to an ineffective tariff policy and the unprofitable state of the industry.

Coal resources. To date, the State Balance of Mineral Resources has recorded 48 deposits in the republic with reserves of 1.689 billion tons, including: brown coals 1.240 billion tons, hard coals 327.8 million tons, coking coals 120.896 million tons[2].

Natural gas and oil resources. In the oil and gas industry, oil production is insignificant and for the period 2010-2021 there is an increase from 77.4 thousand tons in 2010 to 275.7 thousand tons by 2021.

Kyrgyzneftegaz OJSC is the only enterprise in the Kyrgyz Republic that carries out its production activities with a full cycle of works in oil and gas production. Gas production tends to decrease to 22.8 million m3 by 2022. The need was covered by increasing imports from 271 to 378 million m3 of Gazprom-Kyrgyzstan LLC.

Hydropower resources. According to estimates by the Institute of Water Problems and Hydropower of the National Academy of Sciences of the Kyrgyz Republic, hydropower resources amount to 245.2 billion kWh, of which the technically possible potential for development is 142.5 billion kWh, and the economic (production) potential is 60 billion kWh. The level of development of the gross potential is 6%, technical 10%, economic (production) 24%.[3]

Renewable energy sources (RES). These include: the hydro potential of small rivers and streams, the potential of solar energy, wind energy, the heat of the earth and geothermal waters, which are capable of effectively and in significant volumes displacing fossil fuels from the sphere of consumption. The total gross hydropower potential of the small rivers and streams surveyed in the territory of the republic is estimated at 9402 MW, with a possible production of an average of 80 billion kWh per year, of which 5-10% is technically acceptable for development and an average of 5 to 8 billion kWh of possible production.[4]

Solar energy. The climate of the Kyrgyz Republic is characterized by an increased duration of sunshine from 2500 to 2800 hours per year. Almost all densely populated valleys of the republic, where the total solar radiation exceeds 1.3 Gcal per m2 of surface, can be areas for the effective implementation of solar heating systems.

Experts estimate the wind energy potential at 44.6 million kWh per year. Currently, Kyrgyzstan does not use the high energy potential of the sun, wind, geothermal sources, and biomass due to the lack of necessary financing. Geothermal water deposits are used mainly for medical purposes and only partially for heating at the resorts of Dzhergalan, Ak-Suu, and Issyk-Ata. The energy potential of biomass processing is quite high and is estimated at 1.3 billion kWh of possible electricity generation per year.

Electric power industry. The main energy company for the production of electric power is OJSC "Electric Stations", OJSC "National Electric Networks of Kyrgyzstan" for transmission and distribution through electric networks of 0.4-500 kV, OJSC "Chakan HPP" for the production of electricity by small

[1] https://minenergo.gov.kg/ru

[2] https://stat.gov.kg/en/

[3] National Energy Program of the Kyrgyz Republic for the period up to 2035

[4] National Energy Program of the Kyrgyz Republic for the period up to 2035

HPPs - 60.9 MW. OJSC "ES" includes 7 HPPs with a total installed capacity of 3,155.6 MW[5]. Private small hydroelectric power plants with a total capacity of 74.9 MW also generate electricity for the grid.[6]

Municipal enterprise (ME) "TEC Bishkek" is also a large generator of electric and thermal energy. The installed capacity of the TEC Bishkek is 812 MW.

Thermal power engineering. Heat supply is centralized in the regions by local, departmental and municipal boiler houses using coal, fuel oil, natural gas and electricity as fuel.

According to the National Statistical Committee (NSC) of the Kyrgyz Republic, for 2010-2021, electricity production increased from 12.073 billion kWh to 15.138 billion kWh, or 1.25 times, and consumption from 7.447 billion kWh to 13.54 billion kWh, or 1.8 times. At the same time, housing and communal services and the population account for 80.3% of total consumption. The growth rate of electricity consumption outpaces the growth rate of its production, and during this period, an electricity deficit of about 3 billion kWh has developed in the Kyrgyz energy system.[7] The dependence of electricity generation on climatic conditions, as well as the growth of its consumption in the autumn-winter period (AWP), leads to a shortage of electricity and imports from neighboring countries.

Electricity losses amount to 18% of its production, with a standard of 12%, and are mainly associated with the depreciation of fixed assets, which has reached an average of 70% (against the 25% crisis threshold) and requires urgent measures to renew and technically re-equip.

The activities of energy companies in the production, transmission and distribution of electric and thermal energy are not able to ensure the optimal level of reliability of energy supply to consumers, due to the ongoing changes in both external and internal challenges. External challenges include weather and climate (low river water levels) and environmental conditions, world pricing policy for energy resources; internal challenges include tariffs for energy resources that do not correspond to the costs of production and delivery to consumers, as a result of which the energy industry is experiencing an investment crisis, and the country is experiencing an energy crisis.

In this regard, the President of the Kyrgyz Republic announced by his decree in July 2023. emergency situation in the energy sector. The goal is to grant the Ministry of Energy of the Kyrgyz Republic the right to identify and allocate land plots suitable for the use of renewable energy sources (RES), with their subsequent transfer to the Green Energy Fund under the Cabinet of Ministers of the Kyrgyz Republic for the development and attraction of investments in the RES sector.

In accordance with the National Energy Program of the Kyrgyz Republic for the period up to 2035, it is planned to achieve the following goals:

- sustainable development of the fuel and energy complex and renewable energy sources, technical re-equipment, diversification of the energy and fuel balance; construction and launch of Kambaratinskaya HPP-1 with an installed capacity of 1860 MW; Upper Naryn cascade of HPPs with a total capacity of 234.5 MW; small HPPs with a total capacity of 100 MW; construction of solar power plants with a capacity of 1000 MW and wind power plants with a capacity of 1750 MW in the regions;

- energy efficiency and ecology: measures to mitigate and adapt energy to climate change and compliance with the terms of international agreements;

- financial recovery through improvement of tariff policy in order to ensure financial stability and

[5] National Energy Program of the Kyrgyz Republic for the period up to 2035
[6] https://minenergo.gov.kg/ru
[7] https://stat.gov.kg/en/

efficient development of fuel and energy complex enterprises;

- improving institutional reforms, ensuring innovative development of the energy sector based on digital technologies, scientific and technical achievements, training personnel and conducting anti-corruption measures.

Current data and collection of additional data for the development of projections

As part of the planned transition to the GASMO tool in Kyrgyzstan, with the support of the ICAT project, the data necessary for constructing projections were collected. Data gaps were identified in accordance with the input data requirements for GACMO, sources of official data and their availability were determined.

The main data required to use GACMO are those of the energy balance for a specific year (considered as the start year-2023), that is the data of the sectoral energy consumption of fossil fuels and electricity of a country, as well as the GHG emissions for the energy sector for the same year (taken for example from a national GHG inventory report).

The key data used as inputs and required for running GACMO are in table 1:

#	Key Data	Sources
	local currency- Kyrgyz Som, exchange rate with the dollar -87,45 discount rate- 9,0%	National bank of Kyrgyz Republic [8] World Bank[9]
	Cost and technical data related to the different fossil fuels and electricity	National Statistical Committee of the Kyrgyz Republic[10] Ministry of Energy of the Kyrgyz Republic[11] Ministry of Economy and Commerce of the Kyrgyz Republic [12] International Energy Agency[13]
	Energy balance data in the start year-2023, that is, the production/consumption data of fossil fuels and electricity for a country	National Statistical Committee of the Kyrgyz Republic[14] International Energy Agency[15]
	Data on the GHG emissions for the key non-energy sectors in the start year: Agriculture, Forests, Waste, and Industrial processes	Ministry of Natural resources Ecology and technical supervision of Kyrgyz Republic [16]
	Growth factors estimated over specific time periods for different sectors of activities	Ministry of Economy and Commerce of the Kyrgyz Republic [17] National Statistical Committee of the Kyrgyz Republic

[8] https://www.nbkr.kg/index.jsp?lang=ENG
[9] https://data.worldbank.org/country/kyrgyz-republic
[10] https://stat.gov.kg/ru/statistics/promyshlennost/
[11] https://minenergo.gov.kg/ru
[12] https://mineconom.gov.kg/ru/direct/10
[13] https://www.iea.org/countries/kyrgyzstan
[14] https://stat.gov.kg/ru/statistics/promyshlennost/
[15] https://www.iea.org/countries/kyrgyzstan
[16] https://mnr.gov.kg/en/page/vybrosy-kadastr?category=20&datalabel=hide&from=1990&table=16&to=2020&type=bar&checked=496%2C497%2C498%2C503%2C506&collapsed=497
[17] https://mineconom.gov.kg/ru

	The number of units of each mitigation option (selected by the user) penetrating toward the years 2025, 2030, 2035, 2040, 2045 and/or 2050	Ministry of Natural resources Ecology and technical supervision of Kyrgyz Republic [18] Ministry of Energy of the Kyrgyz Republic[19]
7	Technical and economical parameters of the technology/mitigation options	Ministry of Natural resources Ecology and technical supervision of Kyrgyz Republic [20] Ministry of Energy of the Kyrgyz Republic[21] International Energy Agency[22] International Renewable Energy Agency[23] Center for Renewable Energy and Energy Efficiency Development[24]

Table 1. Key data and their official sources

The collected data were analyzed and used to fill in the detailed tables of the GASMO tool in the Assumptions section. (Table. 5-12)

1.2. Institutional organization of the Energy sector, identified gaps in data, data management, institutional arrangements and resources.

Sector management system

Currently, the highest governing body of the Government is the Cabinet of Ministers of the Kyrgyz Republic, which is headed by the Chairman with the powers of the Head of the Office of the President of the Kyrgyz Republic. The members of the Cabinet of Ministers of the Kyrgyz Republic include key ministers heading the relevant ministries.[25] The Ministry of Energy of the Kyrgyz Republic (ME) is a state executive body of the Kyrgyz Republic that carries out functions on development and implementation of state policy in the fuel and energy complex, as well as state control and supervision over compliance with legislation in the energy sector. ME has subordinate units: Department for Regulation of the Fuel and Energy Complex - sets tariffs, licenses energy activities; Energy Supervision Service; Research Institute of Energy and Economics; State Enterprise Kyrgyzteploenergo - heat supply in the regions; State Enterprise Kyrgyzkomur - coal mining; Research Institute "Energoproekt". Below in Figure 1 the main participants of the energy sector are shown.

Sector Monitoring, Reporting and Verification System

[18] https://mnr.gov.kg/en/page/vybrosy-kadastr?category=20&datalabel=hide&from=1990&table=16&to=2020&type=bar&checked=496%2C497%2C498%2C503%2C506&collapsed=497

[19] https://minenergo.gov.kg/ru

[20] https://mnr.gov.kg/en/page/vybrosy-kadastr?category=20&datalabel=hide&from=1990&table=16&to=2020&type=bar&checked=496%2C497%2C498%2C503%2C506&collapsed=497

[21] https://minenergo.gov.kg/ru

[22] https://www.iea.org/countries/kyrgyzstan

[23] https://www.irena.org/Data

[24] http://creeed.net/?lang=en

[25] https://www.gov.kg/ru/gov/s/103

The creation of a monitoring, reporting and verification system (MRV) for the Energy sector is one of the most important tools for the successful implementation and implementation of NDC measures for both Mitigation and Adaptation. Taking into account the permanent institutional Coordination Council on Climate Change, Ecology and Sustainable Development (CCCESD) already created in 2022 by the decision of the Government of the Kyrgyz Republic,[26] which is headed by the Chairman of the Cabinet of Ministers of the Kyrgyz Republic, it is proposed to create the following system shown in Fig. 2 below.

•Coordination Council on Climate Change, Ecology and Sustainable Development (CCCESD).

Chairman of the Coordination Council - Head of the Administration of the President of the Kyrgyz Republic, Chairman of the Cabinet of Ministers; Deputy Chairmen - First Deputy Chairman of the Cabinet of Ministers, Minister of Natural Resources, Ecology and Technical Supervision of the Kyrgyz Republic, Head of the Department of Political and Economic Research of the Presidential Administration.

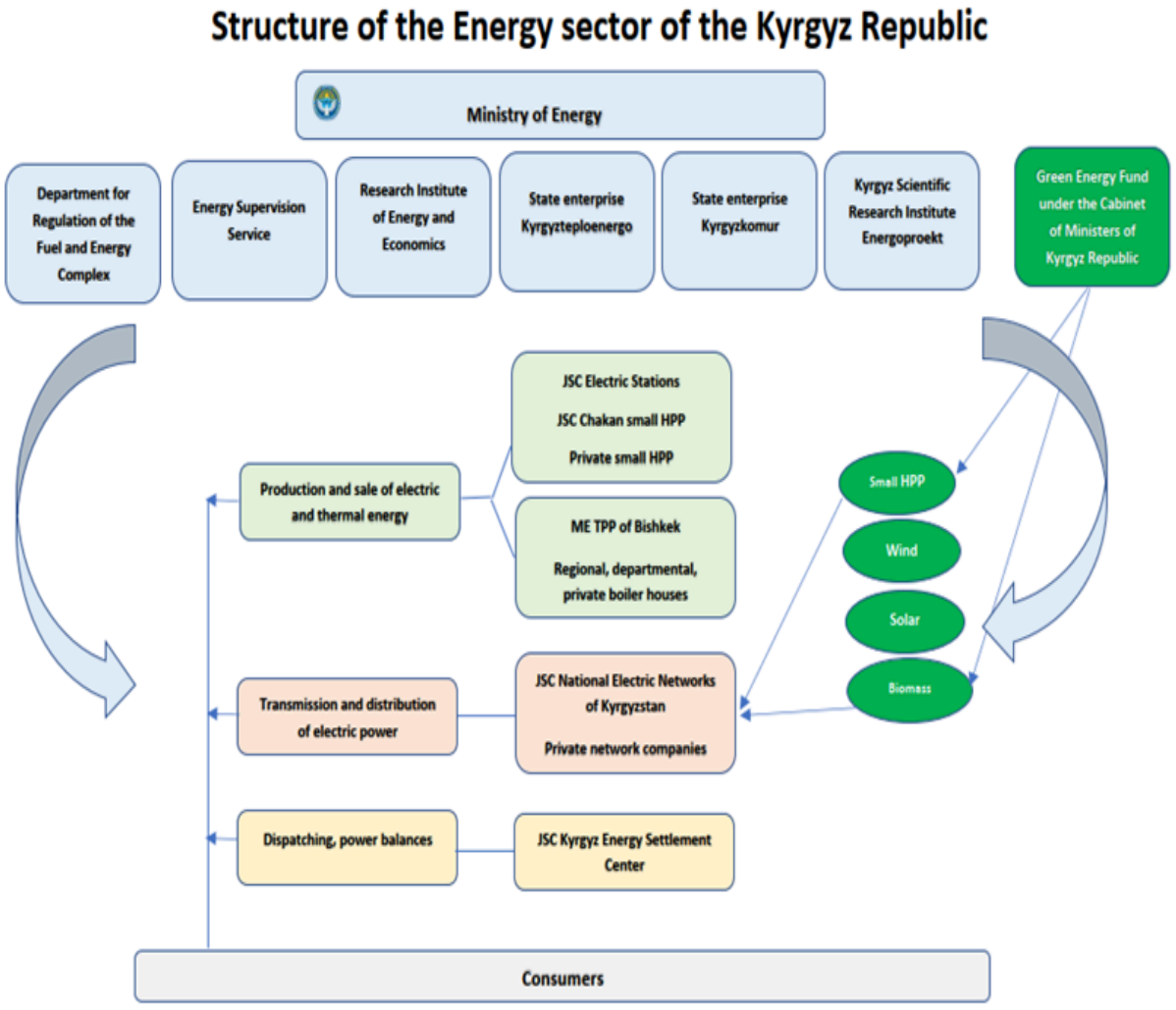


Figure. 1. Structure of the energy sector of the Kyrgyz Republic

The commission includes: representatives of the Zhogorku Kenesh (Parliament), ministers, the

[26] https://cbd.minjust.gov.kg/7-21498/edition/1169203/ru

director of the agency for architecture, construction and housing and communal services, the director of the investment agency, the director of the Central Committee of the Fund. Meetings are held as needed, but not less than once a year.

The tasks of the CCCESD: ensuring coordination and integrated strategic management of the processes of fulfilling the obligations of the Kyrgyz Republic to achieve the SDGs; coordinating and identifying priority measures to mitigate the consequences of and adapt to climate change, on environmental and sustainable development issues; coordinating issues of attracting climate financing, investments in the field of environmental safety in the Kyrgyz Republic. Considers proposals and decisions prepared by the Interdepartmental Coordination Commission (ICC).

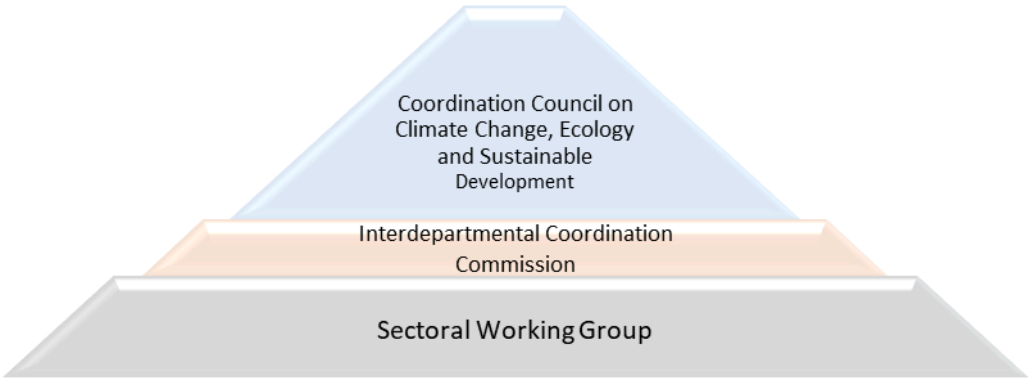


Fig. 2. The structure of the planned MRV system, including the Energy sector.

- Interdepartmental Coordination Commission (ICC).

It is proposed to form for coordination. The Chairman of the ICC is the Deputy Chairman of the Cabinet of Ministers, who oversees the financial and economic block and investments.

Deputy Chairman of the ICC - Minister of Natural Resources, Ecology and Technical Supervision of the Kyrgyz Republic. The commission includes: representatives of the Zhogorku Kenesh, heads of state bodies, business, civil society. Meetings of the commission will be held as needed, at least twice a year.

The tasks of the ICC for the implementation of measures in the form of the NDC plan are: monitoring the progress of the practical implementation of the Program on a countrywide scale; assessing the results of the Program implementation; approving “road maps” for solving the most important problems; forming a unity of approaches and actions at all levels of the public administration system in solving key issues.

Considers proposals and decisions prepared by the Sectoral Working Group (SWG).

- Sectoral Working Group (SWG).

It is proposed to create a NDC for the implementation of tasks, operational execution and monitoring of the PR.

The Chairman of the SWG of the group is the Deputy Minister of Natural Resources, Ecology or the Deputy Minister of Energy;

The group includes representatives of sectoral government bodies, business, civil society and international organizations. Meetings of the SWG of the group will be held as needed, at least once every 2 months.

The tasks of the NDC Implementation Task Force are to: ensure sectoral coordination and

participation in the DP implementation process; ensure continuity, succession and integrity of the DP implementation process; ensure communication with all stakeholders in order to inform about the results of achieving the DP NDC objectives, as well as to provide feedback, and develop new proposals and measures.

The proposed Structure of the Monitoring, Reporting and Verification system (SMOV) will allow work to be carried out on a permanent basis using the existing potential without attracting additional funds from the budget.

It should be noted that the members of the JWG will be required to monitor, report and verify Mitigation and Adaptation.

It is proposed to develop a unified reporting format to formalize and standardize the receipt of data on the implementation of the NDC action plan.

Identified gaps in data, data management, institutional arrangements and resources

Collection of data in the required format is the basis for calculations when using the GASMO tool. During the analysis of the data obtained, gaps were identified related to the system of institutional mechanisms and data management during their initial collection by the National Statistical Committee of the Kyrgyz Republic.

Unfortunately, the National categories of statistics of subsectors in Energy partially correspond to the tree of subcategories used in the IPCC 2006 methodology in sector 1.A.2. "Manufacturing industries and construction". In this regard, the collected data on the fuel used in subcategories that do not match are integrated by an expert taking into account his experience and qualifications according to the principle of using the closest technologies. And then the data is distributed into relevant subcategories in sector 1.A.2. according to IPCC 2006. It should be noted that the GASMO tool also uses the IPCC 2006 subcategory tree.

Such distribution of activity data may result in their absence in some subcategories of sector 1.A.2. However, the total amount of fuel used in sector 1.A.2. "Manufacturing industries and construction" remains correct. Only the distribution of fuel data between subcategories within subsector 1.A.2 may change.

1.3. Draft report on data collection and management improvement recommendations

Data collection in Kyrgyzstan

The National Statistical Committee of the Kyrgyz Republic (hereinafter referred to as the NSC) is a government agency in the field of official statistics with the status of "national", a leading producer of official statistics, ensuring the coordination of activities on the development, production and dissemination of official statistics in the national statistical system[27]. The Ministry of Energy provides support within its mandate. It is the NSC that provides the main information on fuel use for the inventory of greenhouse gas emissions, as well as for the GASMO tool.

In accordance with the tasks assigned to it, the NSC is obliged to:

[27] https://stat.gov.kg/media/files/75938446-4e2e-40c4-bf10-491dda32d058.pdf

- collect data taking into account compliance with the criteria for the quality of official statistics, the costs of collecting and processing information, the burden on respondents;
- provide respondents with reporting and statistical documentation, informing them about the purpose and legal basis of statistical surveys, as well as measures to ensure data confidentiality;
- evaluate and improve the quality of official statistics on an ongoing basis;
- use, if necessary, uniform, internationally agreed upon concepts, definitions, classifiers and methods;
- document the sources and methods used in the production process, as well as the resulting statistical data sets, in accordance with approved standards;
- provide all users with equal and simultaneous access to official statistics, informing them of all sources and methods of statistical production;
- develop and publish a preliminary data release calendar indicating the planned release dates of official statistical information publications, and in case of deviation from the deadlines, inform users about this, indicating in advance the new date of their release.

As part of the implementation of the action plan for the Medium-Term Program for the Development of Official Statistics of the Kyrgyz Republic for 2022-2026, approved by the Resolution of the Cabinet of Ministers of the Kyrgyz Republic dated October 7, 2022 No. 551, the National Statistical Committee began improving energy statistics.

Within the framework of the World Bank project "Modernization of Tax Administration and Statistical System", together with an international expert, the "Methodology for the Formation of the Fuel and Energy Balance and Calculation of Certain Statistical Indicators Characterizing the Energy Sector" was developed and approved by the Resolution of the National Statistical Committee dated November 14, 2024 No. 14.

The main goal of this methodology is to analyse and evaluate changes in the structure of production and consumption of fuel and energy resources, as well as to determine the level of efficiency of their use in various sectors of the economy. The new Methodology allows bringing the fuel and energy balance indicators in line with international standards and facilitates the calculation of the Sustainable Development Goal indicator. 7.2.1 "Share of Renewable Energy Sources in Total Final Energy Consumption". In addition, new forms of official statistical reporting on the fuel and energy balance have been developed (8 forms in total).[28]

Recommendations for improving data management

At present, the National Statistics Committee plans to switch to data collection in the energy sector in accordance with the requirements of the international standards. This will allow in the future to solve the problem of compliance of the categories of accounting of national statistics and IPCC 2006.

As part of the conducted study, the following recommendations were developed for the situation in the republic on the collection of statistical data on activities in the energy sector:

1. It is necessary to develop a reporting form for data collection in which national categories/subcategories of data sources correlate as much as possible with the IPCC 2006 categories/subcategories in sector 1.A.2. "Manufacturing industries and construction".
2. Conduct organizational measures to implement this reporting form.

[28] https://stat.gov.kgyy/media/files/c8d5879a-f67c-43fb-ba7a-a102bd2256c7.pdf

3. Conduct activities to inform users for the implementation of this reporting form.

4. Conduct training and capacity building activities for the specialists of the National Statistical Committee to implement this reporting form.

5. Send a request to international organizations for technical support in resolving this issue and to change the accounting and data collection system.

It should be noted that the introduction of this reporting form is the preparation and first step towards the creation of a market for trading greenhouse gas emissions quotas in Kyrgyzstan. This form will become a necessary document in the future when monitoring and verifying real GHG emissions in each specific case. The Ministry of Energy and the Ministry of Natural Resources, Ecology and Technical Supervision must provide support to the National Statistical Committee in the implementation of new reporting forms.

1.4. Identification of policies and measures in the Energy sector for the development of a GHG emission projections

Climate policies

The conducted analysis of the current national strategic regulations adopted by the Government of Kyrgyzstan shows that the republic is an active participant in international efforts to combat climate change and is involved in the global climate agenda. The Kyrgyz Republic is committed to the implementation of the UN Agenda for Sustainable Development until 2030.[29] The Sustainable Development Goals (SDGs) are included in state policy and reflected in the National Development Strategy of the Kyrgyz Republic for 2018–2040[30].

Thus, in order to achieve the SDGs by 2030, the Kyrgyz Republic has set a key priority: the orientation of policies aimed at human development, which also includes the implementation of national plans to mitigate the effects of climate change. Since the beginning of the implementation of the SDGs, the Kyrgyz Republic has ratified a number of important international agreements, including the Paris Agreement on Climate Change.

At the country level, in 2021, an updated Nationally Determined Contribution - an action plan to reduce emissions and adapt to climate change (NDC) was adopted. The updated NDC of the Kyrgyz Republic has been prepared in compliance with the following decisions of the Conference of Parties of the United Nations Framework Convention on Climate Change and the Paris Agreement.

The NDC is drafted with consideration given to a comprehensive state approach and is approved by a decree of the Coordination Council on Issues of Climate Change, Environment and Green Economy headed by the Prime Minister of the Kyrgyz Republic. Under the overall coordination of the State Committee for Ecology and Climate of the Kyrgyz Republic and with the participation of an inter-agency working group, as well as with the involvement of experts and representatives of the scientific community, civil society, private sector and the youth, an open process of the discussion of these national commitments was ensured.

The drafting of the updated NDC was supported by the UNDP in the Kyrgyz Republic as part of the UNDP's global initiative Climate Promise and the NDC Partnership.

[29] https://mineconom.gov.kg/ru/direct/9/300

[30] https://mineconom.gov.kg/froala/uploads/file/7ec5fa875f2dcee2aa785af041a6976f096c0295.pdf

The achievement of the NDC is underlain by mitigation actions and policies covering five sectors. However, the primary mitigation capacity is concentrated in the Energy, Agriculture, Forestry and Other Land Uses sectors.

"**Being a relatively low emitter of greenhouse gases, Kyrgyzstan nevertheless declares its intention to increase its climate commitments and by 2025 will reduce its GHG emissions by 16.63% under the "Business as Usual" scenario, and with international support by 36.61%. By 2030, Kyrgyzstan can reduce GHG emissions by 15.97% of the GHG emission levels under the "Business as Usual" scenario, and by 43.62% with international support**."[31] - This is the General Goal of Climate Change Mitigation in the Kyrgyz Republic as a contribution to achieving the goal of the Paris Agreement.

The mitigation potential in the Energy sector will be used through the implementation of the following policies aimed at reducing GHG emissions:

1. Increasing the energy efficiency of buildings and households.
2. Reducing coal consumption through gasification of households and boiler houses
3. Development of renewable energy sources (solar, wind, heat pumps, biogas, etc.)
4. Development of hydropower
5. Reducing electricity losses during transmission
6. Reducing electricity losses during distribution
7. Improving heat supply systems

Mitigation measures

The General goal will be achieved through mitigation measures covering key sectors of the Kyrgyz economy, including Energy. All measures are distributed across two scenarios: (a) With measures (WM), which are supported by financial resources and (b) With additional measures (WAM), for the financing of which it is necessary to mobilize international support.

Planned and possible measures are presented in the table 2 below.[32]

[31] https://mnr.gov.kg/assets/files/froala/d5698a92ae2de9d80843b1d338a98f28f535f5d8.pdf , Updated Nationally Determined Contribution 2021

[32] https://mnr.gov.kg/assets/files/froala/d5698a92ae2de9d80843b1d338a98f28f535f5d8.pdf , Updated Nationally Determined Contribution 2021

Sector	Energy		
Goals	**Measures[16]**	**Target indicators, 1000 tons of CO_2 eq.**	
		2025	**2030**
1. Reduction of GHG emissions	1.1. Reducing coal consumption through gasification of households in the country (WM)[19]	809,979	971,247
	1.2. Replacement of light vehicles with internal combustion engines for electric vehicles (WAM)	444,990[17]	423,181[18]
	1.3. Improving Traffic Management and Cycling Infrastructure Development (WM)	253,037	747,963
	1.4. Reduction of electricity losses during transmission (WM)	13,668	13,668
	1.5. Reduction of electricity losses during distribution (WM)[19]	10,888	30,275
	1.6. Replacement of buses with diesel/gasoline fuel engines by buses with gas-powered engines in Bishkek (WM)	7,967	14,734
	1.7. Reconstruction and improvement of the heat supply system of the city of Bishkek (WM)	3,357	3,357
	1.8. Replacement of diesel/ gasoline fuel engines buses with buses with gas-powered engines in Osh city (WAM)	2,749	4,416

Table 2. Mitigation measures in Energy

Sector	Energy		
Goals	Measures[16]	Target indicators, 1000 tons of CO_2 eq.	
		2025	2030
	1.9. Expansion of the trolleybus fleet by replacing buses with internal combustion engines in Bishkek (WAM)	0,882	0,882
	1.10 Replacement of buses with diesel/gasoline fuel engines by buses with gas-powered engines on suburban routes in Bishkek (WAM)	Not estimated (NE)	2,501
2. Improvement of energy efficiency	2.1. Scaling up the installation of energy efficient stoves in households (WAM)	772,449	886,314
	2.2. Improving energy efficiency of small boiler houses by replacing coal-fired boilers with gas-fired ones (WAM)	402,203	1 223,697
	2.3. Construction of new buildings according to energy efficient CSR (WM)	14,552	16,866
	2.4. Energy efficiency improvement of existing Buildings (WAM)	NE	10,868
3. Development of RES	3.1. Expanding the use of biogas plants (BGP)[20] (WAM)	187,666	1 311,980
	3.2. Increasing the capacity of existing HPSs (WM)	98,935	98,935
	3.3. Electricity generation at existing private small hydropower plants (WM)	2,737	2,737
	3.4. Expansion of the application of solar heat collectors (WAM)	NE	78,400
	3.5. Construction of new hydropower plants (WAM)	NE	64,606
	3.6. Construction and launch of new small hydropower plants (WAM)	NE	49,796
	3.7. Development of geothermal energy (heat pumps) (WAM)	-	38,590

Table 2. Mitigation measures in Energy (continue)

Sector	Energy		
Goals	Measures[16]	Target indicators, 1000 tons of CO_2 eq.	
		2025	2030
	3.8. Solar power development (WAM)	NE	13,000
	3.9. Wind energy development (WAM)	NE	3,594

Table 2. Mitigation measures in Energy (continue 1)

2. Deliverable 5. Reports of projections of GHG emissions for the Energy sector.

The collection and processing of data for the preparation of the forecast of greenhouse gas emissions in the sector was carried out in accordance with the IPCC 2006 methodology. To construct a graph of future forecasts in the Energy sector, it was necessary to conduct an inventory of greenhouse gases, since the data obtained are used to calculate future projections.

National Greenhouse Gas Inventory (NGGI)

In this regard, the NHGI was conducted according to the methodology presented in the 2006 IPCC Guidelines for National GHG Inventories, as well as using the updated IPCC GHG Inventory Software 2.95[33].

The inventory was conducted for the period 2021-2023 at level 1 using activity data. Activity data were collected. Activity data are quantitative indicators of the fuel burned, its type and type in the Energy sector in various categories in accordance with the IPCC tree[34] . Previously, a scientific and practical analysis was conducted for the period 1990-2020.

The data sources used were in accordance with the IPCC methodology: National Statistical Committee of the Kyrgyz Republic, Ministry of Energy, Department of Fuel and Energy Complex of the Bishkek City Mayor's Office, MP TPP of Bishkek, OJSC Kyrgyzneftegaz, State Enterprise Kyrgyzkomur, State Enterprise Kyrgyzteploenergo, Ministry of Natural Resources, Ecology and Technical Supervision, Osh City Mayor's Office. Mainly aggregated data were used, which will be further refined for detailed categorization by sources of GHG emissions.

The NIGHG includes data on anthropogenic emissions by GHG sources, which include: carbon dioxide (CO2); methane (CH4); nitrous oxide (N2O); HFCs are not used in the sector.

The NIGHG will also include an assessment of so-called indirect GHGs, which include carbon monoxide (CO), nitrogen oxides (NOx), non-methane volatile compounds (NMVOCs) and sulphur dioxide (SO2), which will be presented later.

The results of the GHG Inventory are shown in Figure 3 in the GHG emission trends for the period from 1990 to 2023 in the main emission source categories in Energy. Also, the GHG Inventory calculation tables for 2021-2023 will be attached to the report in electronic form in Excel format, generated by IPCC GHG Inventory Software 2.95.

[33] https://www.ipcc-nggip.iges.or.jp/software/index.html

[34] https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/

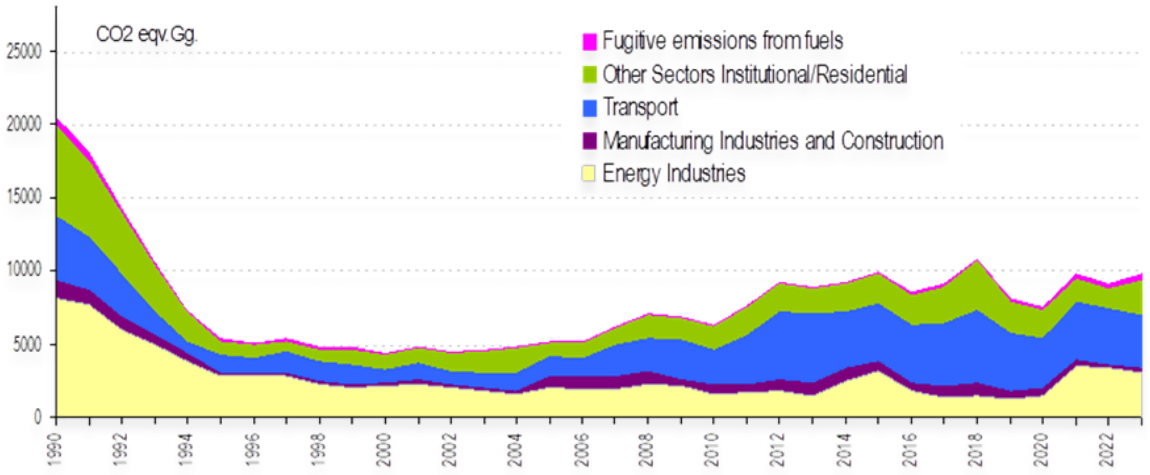


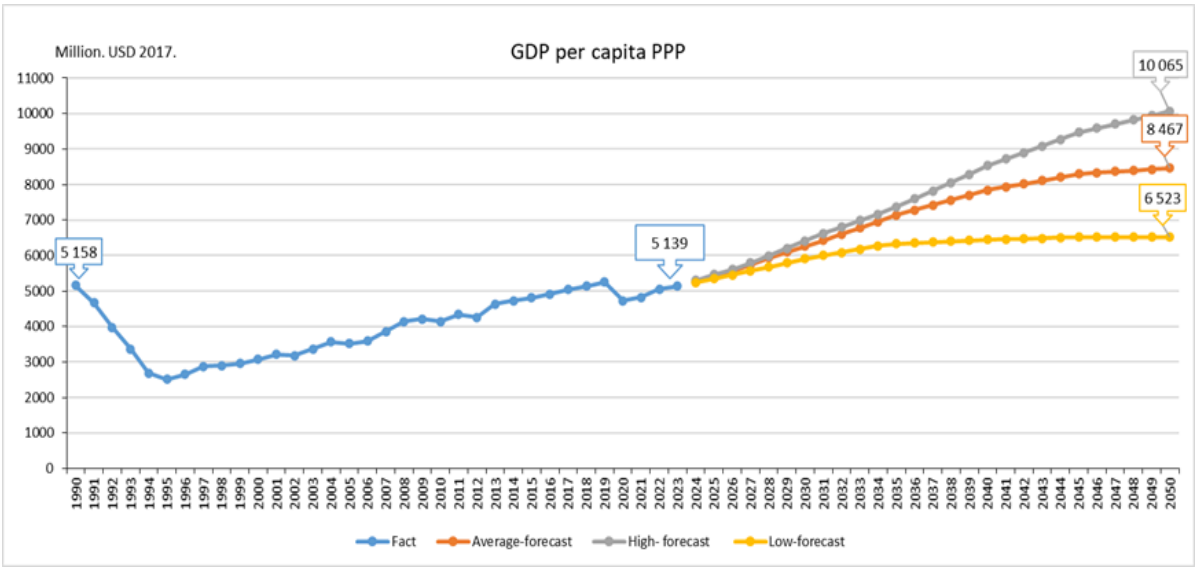
Figure. 3. GHG emission trends for the period 1990-2023 in the Energy sector.

2.1. Projection of future GHG emissions

Calculation based on the use of old methodologies in the Energy sector

Correlation regression analysis was used in previous projections only in the main sectors such as energy, industrial processes, agriculture and waste.

The projection of future GHG emissions in the Kyrgyz Republic was based on the determination of correlations between GHG emissions and the main factors that determine them, i.e. GDP growth[35]. , which determines the growth of production in the country's economy and population growth[36], determining the growth of household consumption. Projections of GDP growth were made: according to the "Low" scenario, the growth of this indicator occurred at 3.9%; according to the "Average" scenario – at 4.7%; according to the "High" scenario – at 5.6%.



[35] calculation by UNDP project expert

[36] https://population.un.org/dataportal/home?df=c072db1a-2d22-42b8-96f0-ff150e5b1881

Figure. 4 Trends in GDP with PPP per capita from 2023 to 2050 for Kyrgyzstan.

After collecting data and conducting an inventory until 2023, new data were used to plot the graph for the energy sector.

In this case, the calculations of values and modeling of changes in GDP at PPP were carried out according to three scenarios: baseline (medium), optimistic (high) and pessimistic (low) (Figure 4). Both of these factors are combined in the value of GDP at PPP per capita. The values of this factor, modeled up to 2050, were used to determine the correlation and the equation of the linear historical trend of GHG emissions in Energy for the period 2000-2023 with high reliability R2 = 0.8557 (Figure 5).

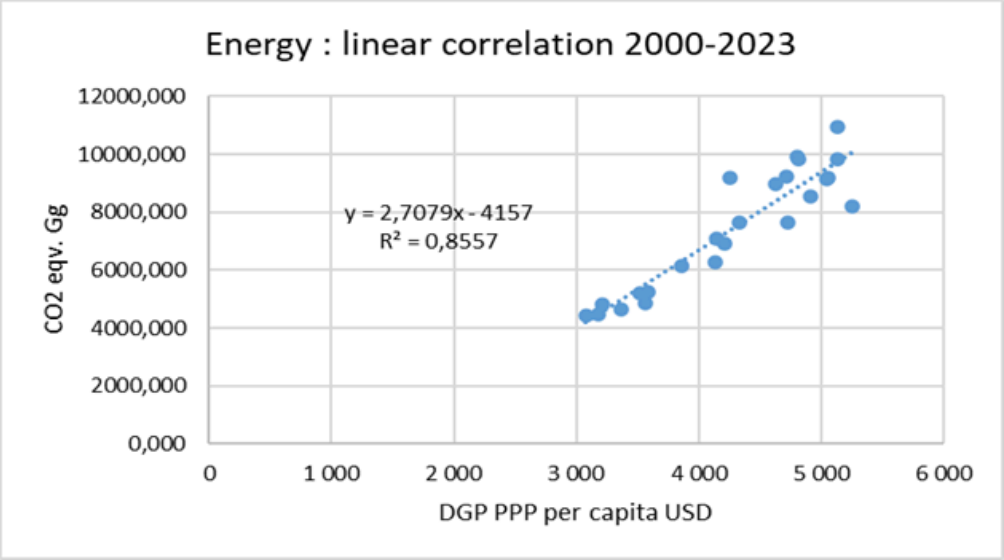


Figure. 5 Correlation of GHG emissions in the Energy sector with GDP PPP per capita for Kyrgyzstan.

Projections of emissions made in this way in 2021 for the 1990-2017 series determined that in 2020 net emissions will amount to 3.4 million, and the actual inventory data gave 3.7 million, i.e. the difference between the projection and the actual inventory estimates was only 8%. For our purposes, this is sufficient, which was confirmed at the validation workshops.

Correlation regression analysis was done for each sector and R2 below 0,82 was not found anywhere.

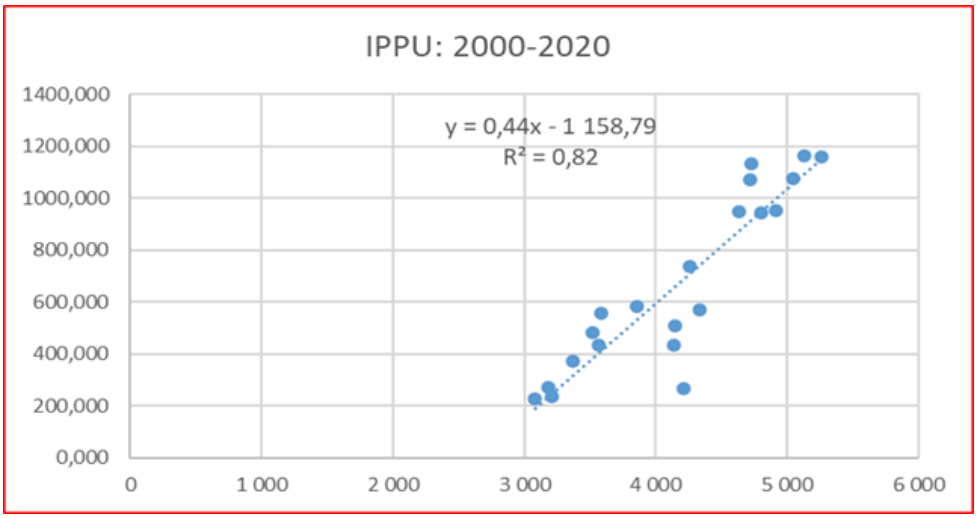


Figure. 6 Correlation of GHG emissions in the IPPU sector with GDP PPP per capita for Kyrgyzstan.

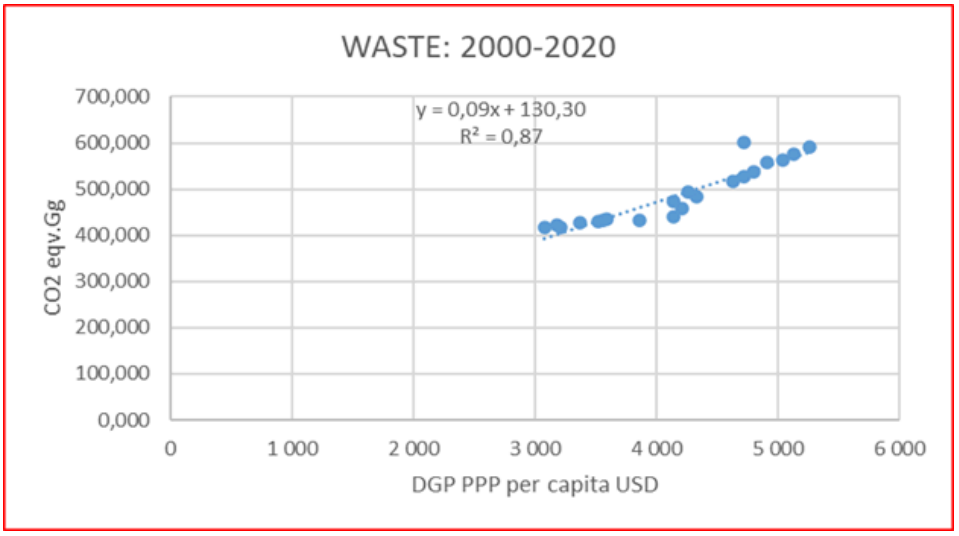


Figure. 7 Correlation of GHG emissions in the Waste sector with GDP PPP per capita for Kyrgyzstan.

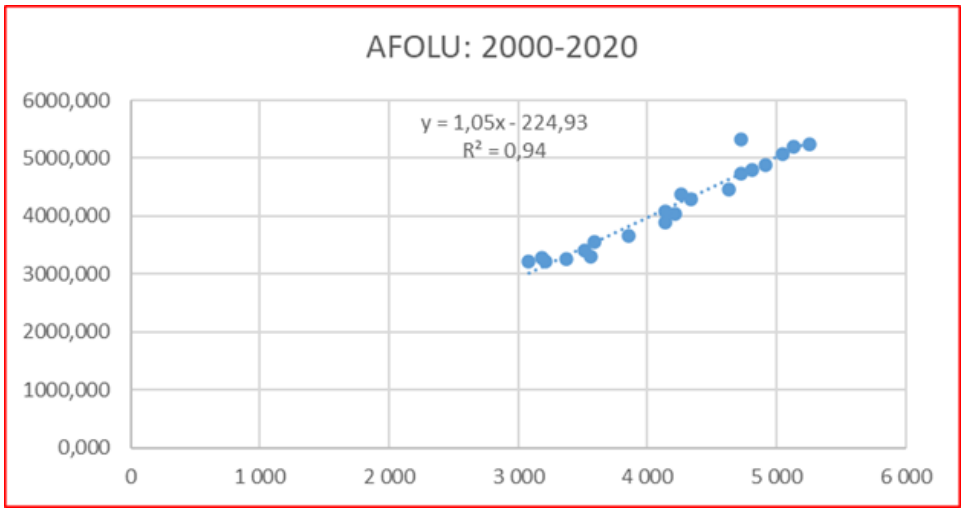


Figure. 8 Correlation of GHG emissions in the AFOLU sector with GDP PPP per capita for Kyrgyzstan

It should be noted that changes in technology in the last 30 years were minor and did not affect emissions, as evidenced by the NIPG. The use of other projection methods requires the institutionalization of this work, which is not expected in the current national circumstances and existing potential.

Since the annual contribution of sectors to total national emissions varied throughout the time series from 1990 to 2023, projections of future emissions are constructed for each sector separately and then combined into total and net national emissions. The projection of future GHG emissions in Energy under the Business as Usual (BAU) scenario, i.e. without climate change mitigation or mitigation measures, using the formula for the resulting linear correlation is presented in Figure 6.

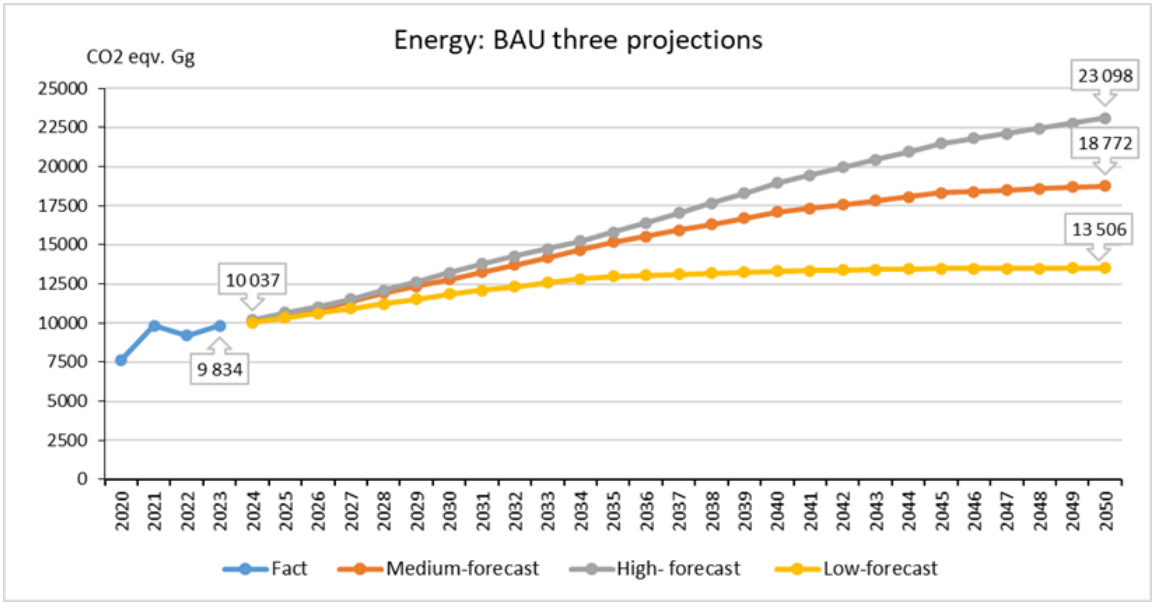


Figure. 6 Projections of future GHG emissions for Kyrgyzstan for BAU under three scenarios: baseline (medium), optimistic (high) and pessimistic (low) for the Energy sector.

BAU scenario emissions by sectors							
ktCO2e/year	2023	2025	2030	2035	2040	2045	2050
Energy (Medium)	9 834	10 479	12 782	15 184	17 091	18 324	18 772
Energy (High)		10 645	13 201	18 297	18 965	21 488	23 098
Energy (Low)		10 321	11 856	13 243	13 311	13 485	13 506

Table 3. Projections of future GHG emissions for Kyrgyzstan for BAU under three scenarios: baseline (medium), optimistic (high) and pessimistic (low) for the Energy sector.

This universal method for calculating future projections, based on the statistical correlation of a series of data for the period from 1990 to 2023, is currently used by a group of experts on GHG Inventory on an ongoing basis, both for the Energy sector and for other sectors.

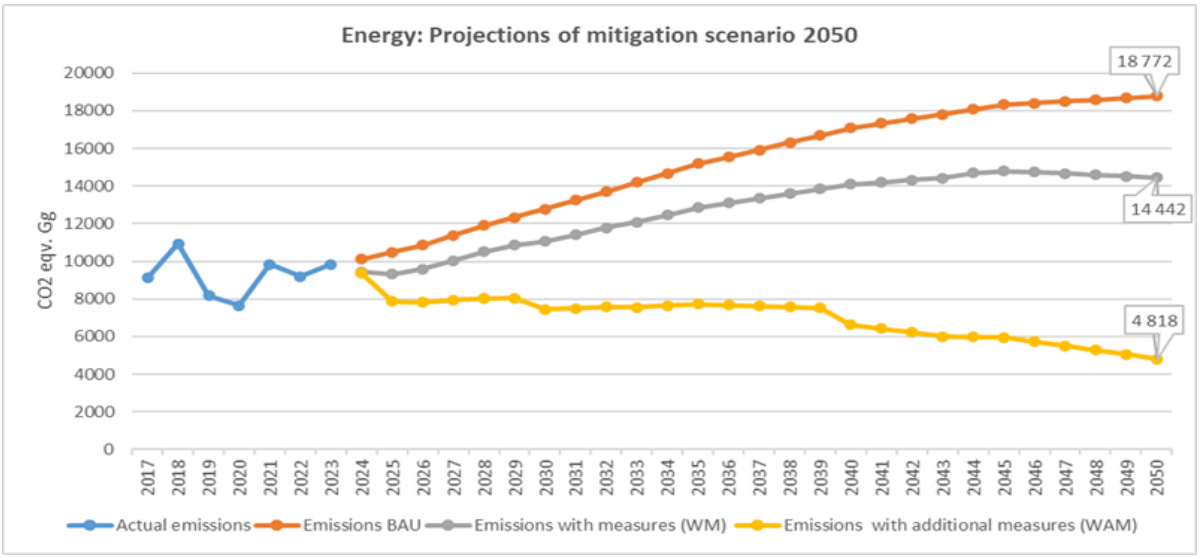


Figure. 7 Projections of future GHG emissions for Energy sector with the mitigation scenarios: BAU, with measures (WM), with

additional measures (WAM).

Mitigation scenario emissions by sectors							
ktCO2e/year	2023	2025	2030	2035	2040	2045	2050
Energy (BAU)		10 479	12 782	15 184	17 091	18 324	18 772
Energy with measures (WM)		9 315	11 062	12 841	14 096	14 802	14 442
Energy with additional measures (WAM)		7 877	7 441	7 726	6 627	5 946	4 818

Table 4. Projections of future GHG emissions for Energy sector with the mitigation scenarios: BAU, with measures (WM), with additional measures (WAM).

Calculation based on Excel tool GACMO (Greenhouse Gas Abatement Cost Model) in Energy

The GACMO (Greenhouse Gas Abatement Cost Model) tool is a bottom-up greenhouse gas emissions modelling tool developed by the UNEP Climate Centre in Copenhagen (UNEP-CCC).

The GACMO tool enables a quick but accurate assessment of the greenhouse gas emission impacts of different mitigation options. The tool is used to calculate the greenhouse gas emission reductions resulting from specific mitigation measures and to generate a mitigation scenario based on specific mitigation measures compared to a BAU scenario.

Within the framework of the ICAT project, a UNEP-CCC representative conducted a practical training session on the use of the GACMO tool. Upon completion of the training, calculations were made on modeling GHG emissions in the Energy sector.

GACMO includes 9 spreadsheets with technical data that the user must consider in a step-by-step approach. The interface of the tool is designed in such a way that the user moves from the first spreadsheet to the last spreadsheet in a logical order. Calculations and generation of graphs are performed automatically. This means that a user who has the data necessary to use GACMO does not need to know the calculations themselves to use the tool, but only how to enter the input data and interpret the results. The formulas included in the GACMO tool are based on the mitigation methodologies proposed under the Clean Development Mechanism (CDM) as well as the IPCC methodologies. GACMO is therefore consistent with the latest internationally approved methodologies for calculating GHG emissions.

The tool works in a step-by-step format and was used to calculate emission projections in Energy in the GACMO-v2.2 version. The calculation process is described below and data from each stage is attached.

Step 1. Assumptions

The Assumptions sheet includes all the basic country, cost, and technical data that the GACMO tool needs as inputs for the calculations. This sheet must be filled in by the user in the yellow fields.

Basic country information table, the user must introduce:

- The name of the country.
- The start year = the year in which the data of the energy balance and GHG emissions of non-energy sectors are collected. This is generally the most recent year for which the necessary data are available.
- The currency = the system of money in general use in the country
- The exchange rate used (1US$=) = the price of the country's money in relation to the US dollar.
- Discount rate = the interest rate used to determine the present value of future cash flows in a discounted cash flow analysis.

Basic country information		
Country:	Kyrgyzstan	
Start year (latest inventory):	2023	
Currency:	Kyrgystani Som	
Exchange rate used (1US$=):	87,45	Kyrgystan Som
Discount rate =	9,0%	

Table 5. Basic country information

Energy prices used for the entire future period and Fuel prices for the entire future period tables, the user must introduce:

•The Energy prices in US$/unit for crude oil, all distillates, coal, lignite, and natural gas used in the energy mix of the country. The model uses the historical relationship between the price of crude oil/liter and the price of distillate/liter. These prices can be entered as constant fuel prices estimated for the future.

Energy prices used for the entire future period:		
Crude oil	50,0	US$/bbl
Crude oil	0,31	US$/litre
LNG	3,3	US$/MBTU
Natural gas	3,1	US$/GJ
Coal	79,5	US$/ton

Table 6. Energy prices used for the entire future period

Electricity and in the Grid Emission Factor tables, the user must introduce:

- US$/kWh = The price of electricity in US$/kWh

- Combined Margin (CM) Other = the grid emission factor or CO2 emission factor for electricity production.
- Note that the value for the Electricity grid losses & own consumption is calculated by the GACMO tool and imported from the Energy Balance sheet.

Electricity

Fuel prices for the entire future period & fuel physical-chemical properties

	LPG	Gasoline	Bioethanol	Jet Fuel	Diesel oil	Biodiesel	Heavy Fuel Oil	Kerosene	Coal	Coke	Petroleum coke
Distillate price/crude oil price (litre/litre)	0,90	2,570		1,40	2,560		0,80	1,40			
Fuel price (US$/liter)	0,28	0,816	0,83	0,44	0,814	1,20	0,25	0,44			
Fuel price (US$/GJ)	11,08	24,560		12,5	21,875		6,4	12,3	4,2	4,2	4,2
Fuel density (t/m3)	0,54	0,750	0,76	0,80	0,840	0,88	0,98	0,80			
Fuel calorific value (GJ/t)	47,30	44,300	26,8	44,1	44,300	26,8	40,4	44,8	18,9	28,0	31,0

Electricity price and grid information	Grid 1
US$/kWh	0,030

Table7. Fuel prices in country

Grid Emission Factor (tCO2/MWh)		
Combined Margin (CM) Solar & Wind	*0,126*	*the less the more hydro, if about 0.5 then a mix of hydro - sun,*
Combined Margin (CM) Other	*0,1260*	
Electricity grid losses & own consumption	*5,3%*	*This value will be imported from step 2*

Table 8. Grid Emission factor

Sector specific Emission factors (kg GHG/GJ) table, the user must introduce:

- The greenhouse gas emission factor for all the fossil fuels. It has to be noted that average default values for those fuel emissions factors are provided by GACMO, but the user can adjust them if national values are available for the same fuels.

Sector specific Emission factors (kg GHG/GJ)				
Sector	**Emission factors**	**CO2**	**CH4**	**N2O**
Power plant	Fuel oil	77,4	0,003	0,0006
	Diesel oil	74,1	0,003	0,0006
	Gasoline	69,3	0,003	0,0006

	Jet fuel	71,5	0,003	0,0006
	Kerosene	71,9	0,003	0,0006
	LPG	63,1	0,001	0,0001
	Natural gas	56,1	0,001	0,0001
	Coal	94,6	0,001	0,0014
	Lignite	101,2	0,001	0,0014
Industry	Oil	as above	0,002	0,0006
	Natural gas		0,005	0,0001
	Coal		0,010	0,0014
	Charcoal		0,200	0,0040
Residential	Oil	as above	0,010	0,0006
	Natural gas		0,005	0,0001
	Coal		0,300	0,0014
	Charcoal		0,200	0,0040

Table 9. Sector specific Emission factors

Global warming potentials tables, the user must introduce:

- The Global Warming Potential (GWP) for methane (CH4) and for nitrous oxide (N2O). GACMO provides the IPCC GWP as default values. It has to be noted that the GWP of PFC gas is also included in GACMO but it is at the level of the "HFC PFC SF6 technology sheet"

Global warming potentials:	SAR	AR4	AR5	GWP used	Unit	TAR
1 Ton CH4 =	21	25	28	28	Ton CO2	23
1 Ton N2O =	310	298	265	265	Ton CO2	296

Table10. Global warming potentials

Population and GDP in start year	2023
Population (thousands)	7037,6
GDP (Current MUS$)	13987,628

Table 11. Population and GDP

The first set of default data are key mitigation parameters such as the IPCC emission factors database (2006 IPCC Guidelines) and global warming potential (GWP). Fuel emission factors, fuel cost in US$, GDP for the year of the latest NIGHG -2023, and population for the year of the latest NIGHG -2023 are entered in the yellow cells.

There is access to view conversion factors for the main types of fuel by clicking the "See Energy conversion factor" button.

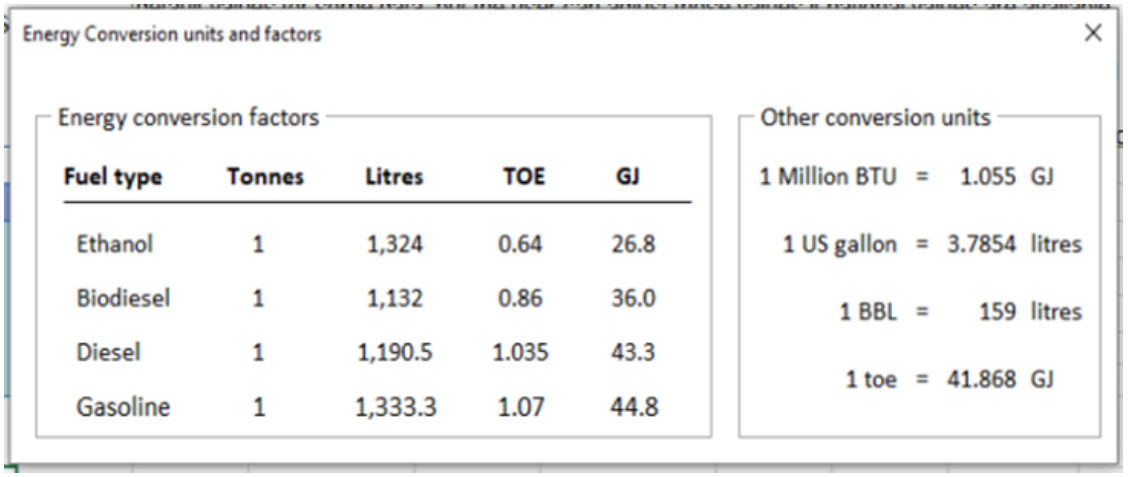


Table 12. Energy Conversion units and factors

Step 2. Energy Balance

The basic data required to use GACMO are energy balance data for a given year (considered as the starting year), i.e. energy consumption data for the fossil fuel and electricity sectors in the country, and greenhouse gas emissions for other non-energy sectors for the same year (taken, for example, from a national greenhouse gas inventory report). Based on these data, GACMO calculates greenhouse gas emissions for the starting year, i.e. the year in which the data were collected (usually the latest year for which the required data are available). Then, applying growth factors for each sector (these factors are country-specific and are estimated and entered into GACMO by the user), GACMO will project greenhouse gas emissions to construct a reference scenario, also called the baseline (or Business as Usual - BAU) scenario, by 2025, 2030, 2035, 2040, 2045 and/or 2050.

Data are entered into Tj from the energy balance (EB) of the last year of the NGGI 2023 received

from the NSC KR . Data is entered into the electricity balance in GWh of the last year of the NGGI 2023. Fill in the yellow cells.

In the table Energy balance in TJ – Country -Kyrgyzstan - Base year and Base year energy balance in mega tonnes and million cubic meters, the balance contains columns for all the fossil fuels, and rows for all the normal sectors of the energy balance.

- For the fossil fuels used in the country's energy mix at the start year-2023, the user must include the amounts of the different fuels used by each normal sector of activity. Usually, the input unit for this energy balance is TJ. However, the user can choose to insert the data in units of mass or volume (mega tonnes and million cubic meters). The user can select either one or another input by clicking the button “Select unit for input (TJ or Mass/volume)”. We have chosen the calculation in TJ.

Energy balance in TJ - Kyrgyzstan - Start year - 2023													
Fossil fuel energy balance in TJ	**LPG**	**Gasoline**	**Jet Fuel**	**Diesel**	**HFO**	**Kerosene and other**	**Total oil products**	**Coal**	**Lignite**	**Natural Gas**	**Coke**	**Petrocoke**	**Total energy (fossil)**
Unit	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ
Total all energy consumption	-	26 480	617	21 958	-	16 711	65 767	10 065	26 923	13 428	-	-	116 182
Fossil power plants						1 402	1 402	10 017	9 221	4 828	-	-	25 468
Final sector consumption	-	26 480	617	21 958	-	15 309	64 365	48	17 702	8 600	-	-	90 714
Industry - steel							-	-	-	-	-	-	-
Industry - chemical						13 117	13 117		-	-	-	-	13 117
Industry - non metallic mineral							-		-		-	-	-
Industry - food processing and beverage						465	465		-	1 828	-	-	2 293
Industry - construction						1 351	1 351	10	8	3	-	-	1 372
Industry - mining							-	-	-	-	-	-	-
Industry - machinery							-	18	-	-	-	-	18
Industry - non ferrous metals							-		-		-	-	-
Industry - paper and pulp							-		-		-	-	-
Industry - transport equipment						12	12	-	12	-	-	-	24
Industry - textile and leather							-		-		-	-	-
Industry - miscellaneous						8	8		2 120		-	-	2 128
Transport - road		26 479,8		21 431,2			47 911	-	-	-	-	-	47 911
Transport - rail				527			527	20	-	-	-	-	547
Transport - domestic air			617				617	-	-	-	-	-	617
Transport - navigation		-		-			-	-	-	-	-	-	-
Households				-		271	271		14 074	6 665	-	-	21 010
Services				-		85	85	-	1 462	100	-	-	1 647
Agriculture & Fishery				-			-		26	3	-	-	29
Non energy - chemical feedstocs				-			-	-	-	-	-	-	-

Table 13. Energy balance in 2023

Once the user has included the energy balance data in TJ or mass/volume units, GACMO automatically calculates the energy balance in ktoe unit. For those calculations, GACMO uses the default IPCC emission factors in tCO2/toe, and calorific values in toe/(ton or m3). The table with the energy balance calculated in ktoe can be shown (or hidden) by clicking the button "Show/Hide table in ktoe values".

In the last table Base year electricity balance in GWh, the user must include:

- Electricity consumption data = amounts of electricity (in GWh unit) used by each normal sector

of activity

- Electricity production data = amounts of electricity (in GWh unit) produced with each fossil fuel or renewable energy sourceLorem ipsum dolor sit amet, consectetur adipiscing elit. Donec urna turpis, porta sed mattis quis, cursus sed leo. Maecenas vehicula dapibus arcu quis fringilla. Mauris quis eros sit amet diam facilisis hendrerit sit amet pulvinar est.

Start year electricity balance in GWh					
Electricity consumption	**GWh**	**Electricity production**	**GWh**	**Share of production**	**Efficiency**
Total consumption	14 467	**Total**	**17 275**		
Industry - steel	264,37	Losses	**2 808**	16,3%	
Industry - chemical	32,49	**Fossil**	**1 894**	**11,0%**	
Industry - non metallic mineral	535,94	Lignite	876,000	5,1%	34%
Industry - food processing and beverage	213,51	Coal	763,00	4,4%	27%
Industry - construction	98,77	Oil	10,37	0,1%	3%
Industry - mining	346,30	Natural Gas	244,84	1,4%	18%
Industry - machinery	40,55	Nuclear	-	0,0%	
Industry - non ferrous metals	0,00	Net import	3 350	19,4%	
Industry - paper and pulp	28,38	**Renewables**	**12 030,600**	**69,6%**	
Industry - transport equipment	3,33	Hydro	12 030,600	69,6%	
Industry - textile and leather	36,88	Wind	0	0,0%	
Industry - miscellaneous	928,91	Solar		0,0%	
Transport - road	27,69	Biomass		0,0%	
Transport - rail	0,00	Geothermal		0,0%	
Transport - domestic air	0,00				
Transport - navigation	0,00				
Households	10426,54				
Services	1261,43				
Agriculture & Fishery	222,39				
Non energy - chemical feedstocs	0,00				

Electricity import and export	**GWh**
Import	3 488,76
Export	138,41

Table 14. Electricity balance in 2023

Step 3. GHG Balance

The balance of GHG emissions in CO2 equivalent for the Energy sector is filled in automatically. We enter data on volatile emissions, CH4 and N2O emissions in the yellow cells.

The GHG Balance sheet includes the GHG emissions data disaggregated by sector of activity for the start year. The first table CO2 Emissions – Country Kyrgyzstan - Start year 2023 includes the balance

for the CO2 emissions at the start year expressed in ktCO2 equivalents unit. GACMO automatically calculates the data in this table. The user should not insert or modify the data in this table.

In the second table Non-CO2 emissions, non-fuel combustion sectors, the user must include:

- The CH4 and N2O data, expressed in ktCO2 equivalent units for each sector/sub-sector as defined by the IPCC. Those data can be found in the greenhouse gas national inventory of the country calculated for the start year. If no data are available for the start year, the user can alternatively take the data for the year closest to the start year.

CO2 Balance - Kyrgyzstan - Start year - 2023

Unit : ktCO2-equivalents	LPG	Gasoline	Jet Fuel	Diesel	HFO	Kerosene and other	Total oil products	Coal	Lignite	Natural Gas	Coke	Petrocoke	Total
Ton CO2/Toe (IPCC):	2,64	2,90	2,99	3,10	3,24	3,01		3,96	4,24	2,35	4,53	4,20	
Total	**0**	**1 835**	**44**	**1 626**	**0**	**1 201**	**4 707**	**952**	**2 725**	**753**	**0**	**0**	**9 137**
Fossil power plants	0	0	0	0	0	101	101	948	933	271	0	0	2 252
FINAL CONSUMPTION	0	1 835	44	1 626	0	1 100	4 606	5	1 791	482	0	0	6 884
Industry - steel	0	0	0	0	0	0	0	0	0	0	0	0	0
Industry - chemical	0	0	0	0	0	943	943	0	0	0	0	0	943
Industry - non metallic mineral	0	0	0	0	0	0	0	0	0	0	0	0	0
Industry - food processing and beverage	0	0	0	0	0	33	33	0	0	103	0	0	136
Industry - construction	0	0	0	0	0	97	97	1	1	0	0	0	99
Industry - mining	0	0	0	0	0	0	0	0	0	0	0	0	0
Industry - machinery	0	0	0	0	0	0	0	2	0	0	0	0	2
Industry - non ferrous metals	0	0	0	0	0	0	0	0	0	0	0	0	0
Industry - paper and pulp	0	0	0	0	0	0	0	0	0	0	0	0	0
Industry - transport equipment	0	0	0	0	0	1	1	0	1	0	0	0	2
Industry - textile and leather	0	0	0	0	0	0	0	0	0	0	0	0	0
Industry - miscellaneous	0	0	0	0	0	1	1	0	215	0	0	0	215
Transport - road	0	1 835	0	1 587	0	0	3 422	0	0	0	0	0	3 422
Transport - rail	0	0	0	39	0	0	39	2	0	0	0	0	41
Transport - domestic air	0	0	44	0	0	0	44	0	0	0	0	0	44
Transport - navigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Households	0	0	0	0	0	19	19	0	1 424	374	0	0	1 818
Services	0	0	0	0	0	6	6	0	148	6	0	0	160
Agriculture & Fishery	0	0	0	0	0	0	0	0	3	0	0	0	3
Non energy - chemical feedstocs	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 15. CO2 balance in 2023

Emissions by sectors and gases				
Unit : ktCO2-equivalent	CO2	CH4	N2O	Total GHG emissions
1. Energy	9 165	582	99	9 845
1.A. Fuel combustion	9 137	162	99	9 397
1.B. Fugitive emissions from fuels	28	420	0	448
2. Industrial processes and product use	0	0	0	0
2.A. Mineral industry	0,00			0
2.B. Chemical industry				0
2.C. Metal industry				0
2.F. Product uses as ODS substitutes				0
Other (2.D, 2.E, 2.G. 2.H)				0
3. Agriculture	0	0	0	0
3.A. Enteric fermentation		0		0
3.B. Manure management		0	0	0
3.D. Agricultural soils				0
Other (3.C, 3.E-3.J)		0	0	0
4. Land use, land-use change and forestry	0	0	0	0
4.A. Forest land	0			0
4.B. Cropland	0			0
4.C. Grassland				0
4.G. Harvested wood products				0
Other (4.D, 4.E, 4.F, 4.H)				0
5. Waste	0,000	0,000	0,000	0,000
5.A. Solid waste disposal	0,000	0,000	0,000	0,000
5.B. Biological treatment of solid waste	0,000	0,000	0,000	0,000
5.D. Waste water treatment and discharge	0,000	0,000	0,000	0,000
Other (5.C, 5.E)	0,000	0,000	0,000	0,000
Total (including LULUCF)	**9 165**	**582**	**99**	**9 845**
Total (excluding LULUCF)	**9 165**	**582**	**99**	**9 845**

Table 16. Emissions by sectors and gases

Step 4. Growth factor

The Growth sheet includes the expected growth in energy consumption for the different sectors of activity for different periods of time. In the table Growth from the start year 2023 – Country Kyrgyzstan, the user must include:

- The Population growth, estimated for the different periods: start year-2025, 2025-2030, 2030-2035, 2035-2040, 2040-2045 and 2045-2050.
- The GDP growth, estimated for the different periods: start year-2025, 2025-2030, 2030-2035, 2035-2040, 2040-2045 and 2045-2050.
- Note that these two parameters Population growth and GDP growth are only used by GACMO to calculate the GHG emissions of the country expressed per capita or per GDP units.
- The annual growth in energy consumption estimated for each sector of activity for the different periods: start year-2025, 2025-2030, 2030-2035, 2035-2040, 2040-2045 and 2045-2050. It must be noted that those data can be estimated from the historical values of each sector of activity. Alternatively, those estimations can eventually be found in national or sectoral documents (for example energy plan of the country) or can be estimated by national experts to the best of their knowledge.

$$\mathrm{CAGR} = \left(\frac{V_{\mathrm{final}}}{V_{\mathrm{begin}}}\right)^{1/t} - 1$$

CAGR = compound annual growth rate
V_{begin} = beginning value
V_{final} = final value
t = time in years

The CAGR (Compound Annual Growth Rate) for the energy sector is estimated for the period 2010-2023 using the NHGI greenhouse gas inventory data. The calculation is made using the attached formula on the calculator for each emission source category, and we also calculate for population and GDP for the period up to 2050. We enter the calculation results in % in the yellow cells.

Growth from the start year - Kyrgyzstan												
Growth and multiplication factors	Annual % increase in the period						% increase from start year values					
	2023 to 2025	2025 to 2030	2030 to 2035	2035 to 2040	2040 to 2045	2045 to 2050	2025	2030	2035	2040	2045	2050
Population growth	1,44%	1,38%	1,21%	1,13%	1,05%	0,91%	3%	10%	17%	24%	30%	36%
GDP growth	2,55%	2,96%	2,69%	1,90%	1,13%	0,40%	5%	22%	39%	53%	61%	65%
1. Energy												
1.A. Fuel combustion												
1.A.2 Manufacturing industries and construction												
Industry - fuel in steel	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	5%	19%	34%	52%	72%	95%
Industry - fuel in chemical	0,6%	0,6%	0,6%	0,6%	0,6%	0,6%	1%	4%	7%	11%	14%	18%
Industry - fuel in non metallic mineral	2,0%	2,0%	2,0%	2,0%	2,0%	2,0%	4%	15%	27%	40%	55%	71%
Industry - fuel in food and beverage	6,0%	6,0%	6,0%	6,0%	6,0%	6,0%	12%	50%	101%	169%	260%	382%
Industry - fuel in construction	10,3%	10,5%	10,5%	10,5%	10,5%	10,5%	22%	100%	230%	444%	796%	1376%
Industry - fuel in mining	4,9%	4,9%	4,9%	4,9%	4,9%	4,9%	10%	40%	78%	126%	186%	264%
Industry - fuel in machinery	2,9%	2,9%	2,9%	2,9%	2,9%	2,9%	6%	22%	41%	63%	88%	116%
Industry - fuel in non ferrous metals	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0%	0%	0%	0%	0%	0%
Industry - fuel in paper and pulp	0,7%	0,7%	0,7%	0,7%	0,7%	0,7%	1%	5%	9%	13%	17%	21%
Industry - fuel in transport equipment	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0%	1%	1%	2%	2%	3%
Industry - fuel in textile and leather	6,8%	6,8%	6,8%	6,8%	6,8%	6,8%	14%	58%	120%	206%	325%	491%
Industry - fuel in miscellaneous	4,7%	4,5%	4,5%	4,5%	4,5%	4,5%	10%	37%	70%	112%	164%	229%
Industry - electricity consumption	1,5%	1,5%	1,5%	1,5%	1,5%	1,5%	3%	11%	19%	28%	37%	48%
1.A.3. Transport												
Transport - fuel in road	2,0%	2,0%	2,2%	2,2%	2,2%	2,2%	4%	15%	28%	43%	59%	78%
Transport - fuel in rail	2,0%	2,0%	2,0%	2,0%	2,0%	2,0%	4%	15%	27%	40%	55%	71%
Transport - fuel in air	2,0%	2,0%	2,0%	2,0%	2,2%	2,2%	4%	15%	27%	40%	56%	74%
Transport - fuel in navigation	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0%	0%	0%	0%	0%	0%
Transport - electricity consumption	2,0%	3,0%	4,0%	4,0%	5,0%	5,0%	4%	21%	47%	79%	128%	191%
1.A.4. Other sectors												
1.A.4.b. Residential												
Households - LPG	0,9%	0,9%	0,9%	0,9%	0,9%	0,9%	2%	6%	11%	16%	21%	26%
Households - Kerosene	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0%	0%	0%	0%	0%	0%
Households - electricity consumption	2,8%	2,8%	2,8%	2,8%	2,8%	2,8%	6%	22%	40%	61%	85%	113%
1.A.4.a. Commercial/institutional												
Services - fuel	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	5%	19%	35%	53%	74%	97%
Services - electricity consumption	3,3%	3,3%	3,3%	3,3%	3,3%	3,3%	7%	26%	48%	74%	104%	140%
1.A.4.c. Agriculture/forestry/fishing												
Agriculture - fuel	2,8%	3,4%	3,4%	3,4%	3,4%	3,4%	6%	25%	48%	74%	106%	144%
Agriculture - electricity consumption	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	9%	35%	68%	109%	160%	222%

Table 17. Growth in Energy sector

Step 5. BAU projected Energy Balance for year 2025, 2030, 2035,2040,2045,2050

BAU energy balance projections for 2025,2030,2035,2040,2045,2050 are calculated automatically by clicking on the corresponding buttons indicating the year. Calculation in Tj or Ktoe is possible. We calculated in Tj.

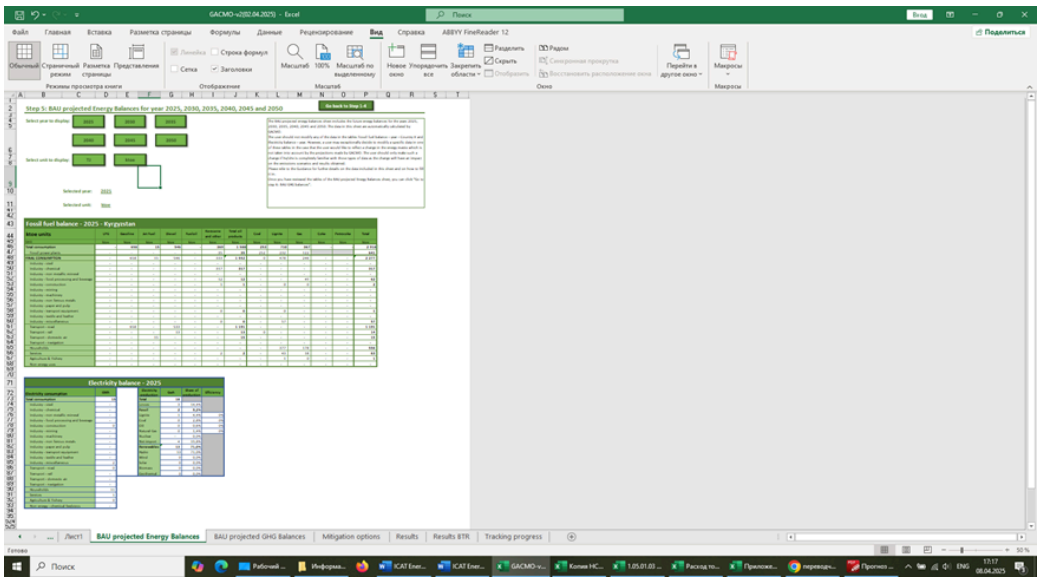


Table 18. BAU projected Energy Balances for year 2025, 2030, 2035, 2040, 2045 and 2050

Step 6. Emissions from fuel combustions for year 2025, 2030, 2035,2040,2045,2050

Projections of CO2 eq. emissions for 2025, 2030, 2035, 2040, 2045, 2050 are calculated automatically by clicking on the corresponding buttons indicating the year.

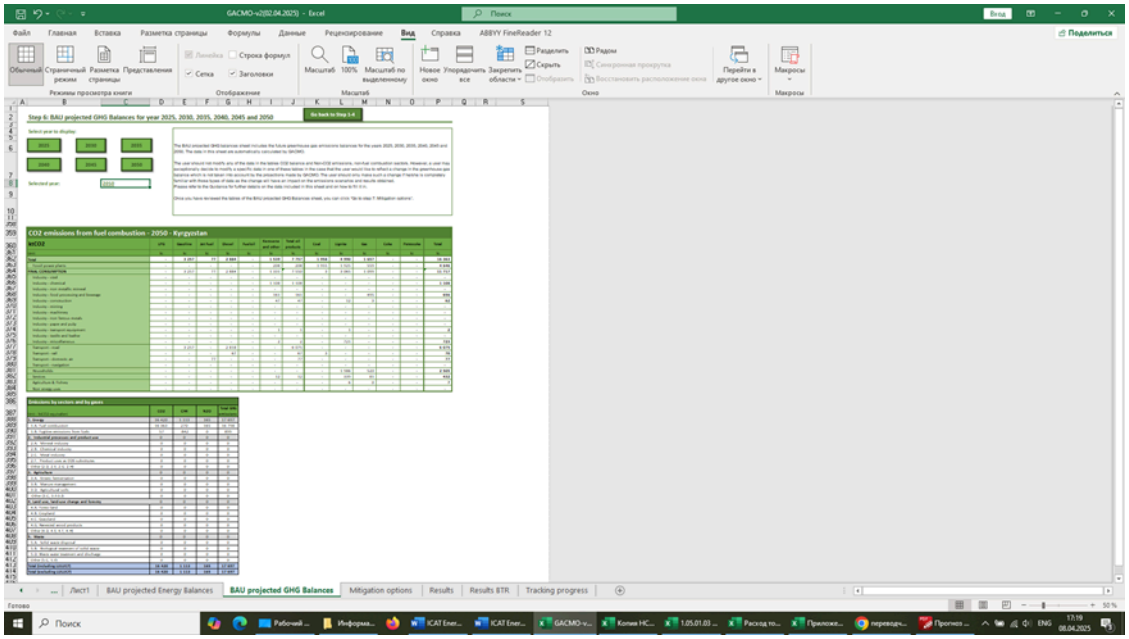


Table 19. BAU projected GHG Balances for year 2025, 2030, 2035, 2040, 2045 and 2050

Emission projections to 2050 for BAU obtained from GACMO calculations

As a result of the calculations, we received emission projections in the Energy sector for BAU only for the baseline (medium) scenario, which is based on actual data. When switching to the Excel Results sheet, we received automatically filled tables and charts for all sectors. In this case, only the calculated data for the Energy sector are provided. The other sectors are used for illustration purposes.

BAU scenario emissions by sectors							
ktCO2e/year	2023	2025	2030	2035	2040	2045	2050
Total (induding LULUCF)	**9 845**	**10 249**	**11 370**	**12 735**	**14 365**	**16 351**	**18 821**
Total (excluding LULUCF)	**9 845**	**10 249**	**11 370**	**12 735**	**14 365**	**16 351**	**18 821**
1. Energy	9 845	10 249	11 370	12 735	14 365	16 351	18 821
1.A. Fuel combustion	9 397	9 780	10 844	12 139	13 683	15 565	17 904
1.A.1. Energy industries	2 252	2 374	2 710	3 097	3 542	4 055	4 646
1.A.2. Manufacturing industries and construct	1 397	1 467	1 684	1 984	2 410	3 027	3 940
1.A.3. Transport	3 507	3 649	4 029	4 491	5 006	5 581	6 222
1.A.4.b. Residential	1 818	1 849	1 930	2 017	2 106	2 199	2 291
1.A.4.a. Commercial/institutional	160	168	190	216	245	277	314
1.A.4.c. Agriculture/forestry/fishing	3	3	4	4	5	6	7
1.B. Fugitive emissions from fuels	448	469	526	596	681	786	916
2. Industrial processes and product use	0	0	0	0	0	0	0
3. Agriculture	0	0	0	0	0	0	0
4. Land use, land-use change and forestry	0	0	0	0	0	0	0

Table 20. Projections of future GHG emissions of Kyrgyzstan for BAU according to one scenario: baseline (medium) for the Energy sector.

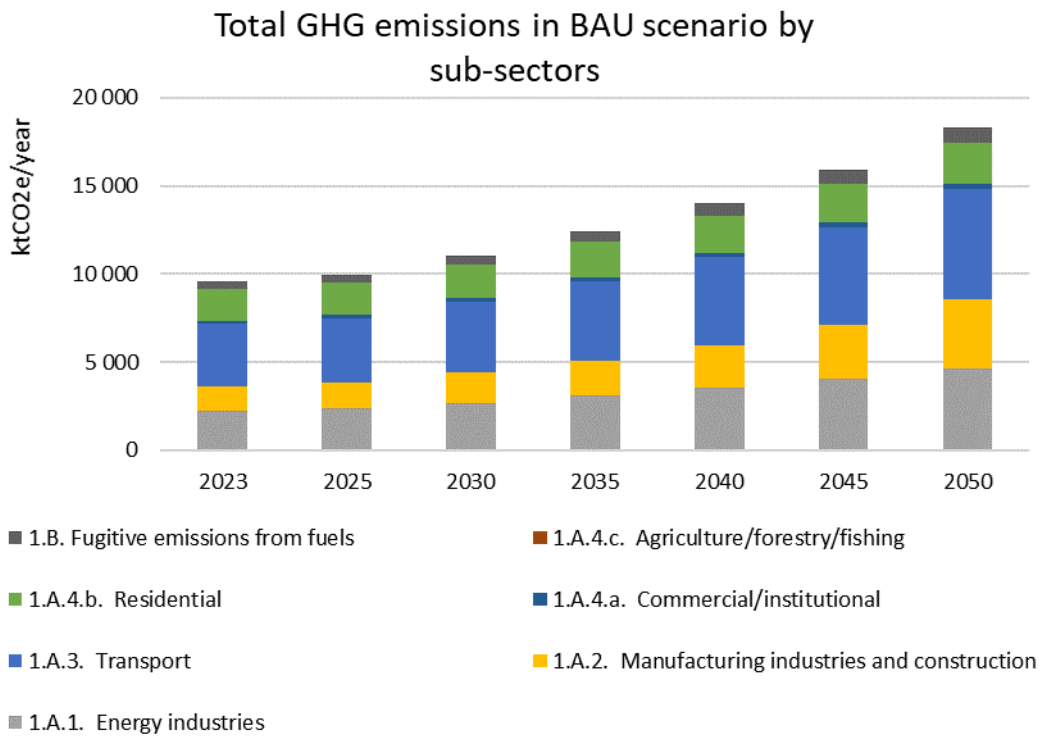


Figure. 6 Projections of future GHG emissions of Kyrgyzstan for BAU according to one scenario: baseline (medium) for all sectors and subsectors of Energy.

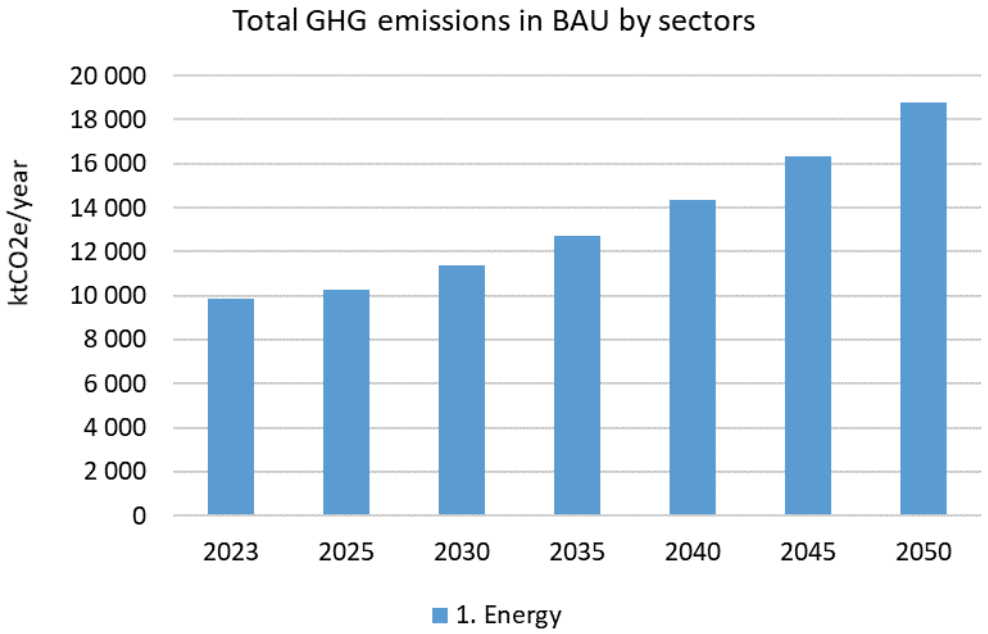


Figure. 7 Projections of future GHG emissions of Kyrgyzstan for BAU according to one scenario: baseline (medium) for all sectors including Energy.

Mitigation scenario emissions by sectors							
ktCO2e/year	2023	2025	2030	2035	2040	2045	2050
Total (including LULUCF)	**9 845**	**9 427**	**8 562**	**11 228**	**12 544**	**14 164**	**16 264**
Total (excluding LULUCF)	**9 845**	**9 427**	**8 562**	**11 228**	**12 544**	**14 164**	**16 264**
1. Energy	9 845	9 427	8 562	11 228	12 544	14 164	16 264
1.A Fuel combustion	9 397	8 959	8 035	10 632	11 863	13 378	15 349
1.A.1. Energy industries	2 252	2 374	2 046	2 076	2 330	2 679	3 105
1.A.2. Manufacturing industries and construct	1 397	1 467	1 684	1 984	2 410	3 027	3 940
1.A.3. Transport	3 507	3 649	2 855	4 006	4 398	4 770	5 208
1.A.4.b. Residential	1 818	1 028	960	2 017	2 106	2 199	2 291
1.A.4.a. Commercial/institutional	160	168	190	216	245	277	314
1.A.4.c. Agriculture/forestry/fishing	3	3	4	4	5	6	7
1.B. Fugitive emissions from fuels	448	469	526	596	681	786	915
2. Industrial processes and product use	0	0	0	0	0	0	0
3. Agriculture	0	0	0	0	0	0	0
4. Land use, land-use change and forestry	0	0	0	0	0	0	0
5. Waste	0	0	0	0	0	0	0

Table 21. Projections of future GHG emissions of Energy sector for Mitigation scenario.

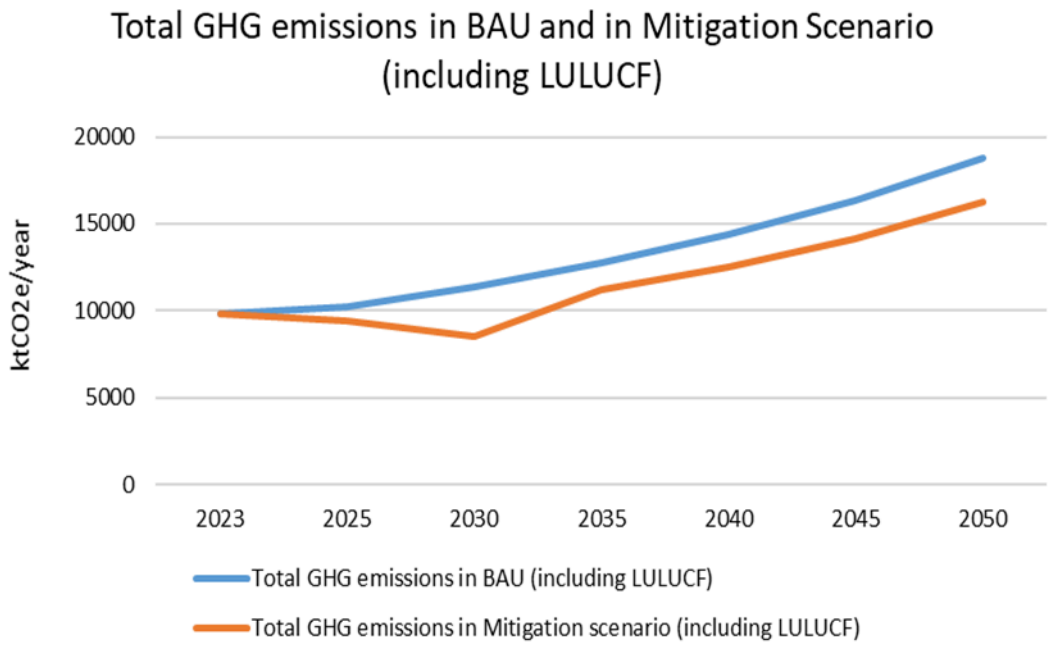


Figure. 8 Projections of total emissions in BAU and in Mitigation scenario in Energy.

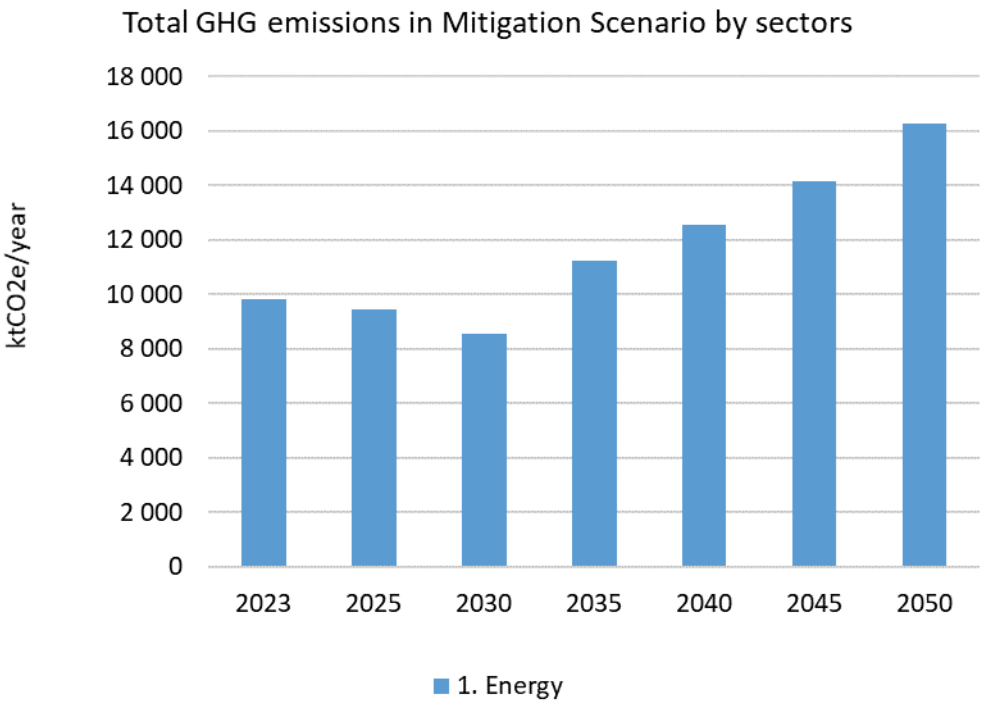


Figure. 9 Projections of total GHG emissions of Energy in Mitigation scenario.

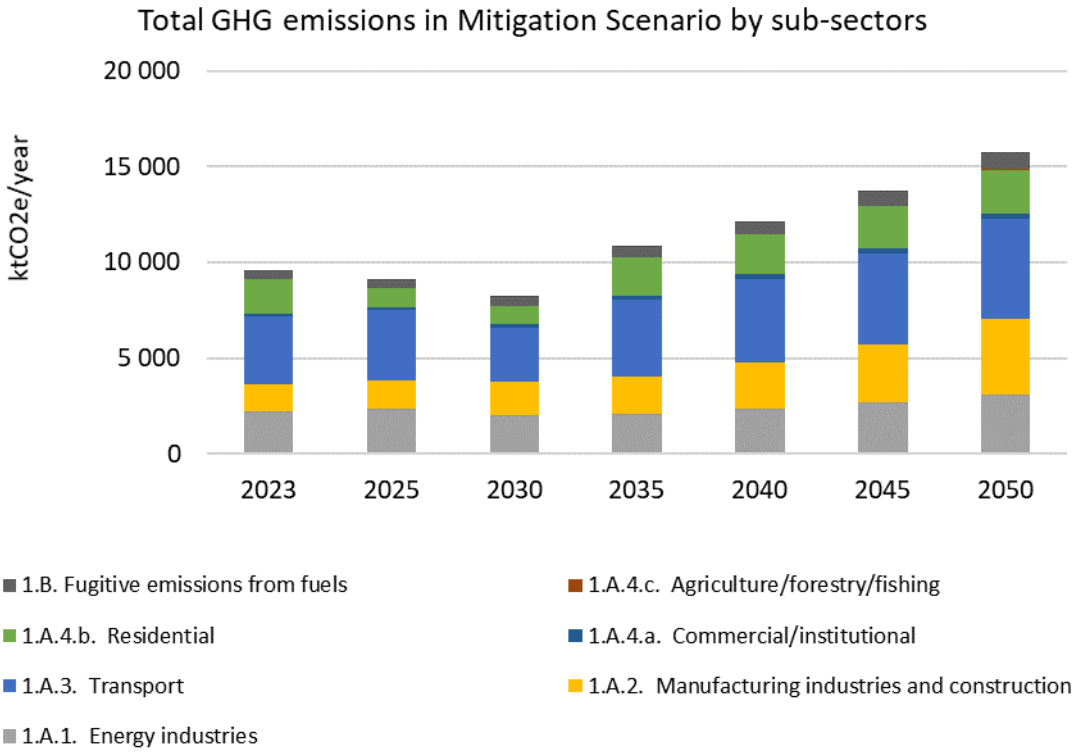


Figure. 10 Projections of total GHG emissions in Mitigation scenario by sub-sectors

List of mitigation measures

Total GHG mitigation in Kyrgyzstan

Type	Reduction option	US$/tCO2e	Sub-type unit	Emission reduction tCO2e/unit	Investment Million US$	Annual costs MUS$/year	Units penetrating in 2025	Emission reduction in 2025 Per option ktCO2e/year	Added ktCO2e/year	Added Frac.of total
EE households	Efficient charcoal sto	218,92	1000 stoves	293	239	40,72	635	186,00	186	1,8%
	LPG stoves replacing	74,36	1000 stoves	2 055	9	47,22	309	634,98	821	8,0%
# GHG reduction options:	2			Totals:	249	88				

Type	Reduction option	US$/tCO2e	Sub-type unit	Emission reduction tCO2e/unit	Investment Million US$	Annual costs MUS$/year	Units penetrating in 2030	Emission reduction in 2030 Per option ktCO2e/year	Added ktCO2e/year	Added Frac.of total
EE households	Efficient charcoal sto	218,92	1000 stoves	293	431	73,30	1 143	334,80	335	2,9%
	LPG stoves replacing	74,36	1000 stoves	2 055	9	47,22	309,00	634,98	970	8,5%
Hydro	Hydro power connec	5,46	1 MW	499	680	1,63	597,70	298,30	1 268	11,2%
	Mini hydro power co	784,64	1 MW	504	830	72,95	184,46	92,97	1 361	12,0%
Solar	Solar PVs, large grid	-65,11	1 MW	276	120	- 5,39	300	82,78	1 444	12,7%
Transport	Electric cars	1 810,99	1000 cars	1 351	1 231	128,70	52,60	71,07	1 515	13,3%
	New bicycle lanes	-273,26	1 km bicycle lar	687	13	- 46,90	250	171,65	1 687	14,8%
Wind	Wind turbines, on-sh	354,98	1 MW	315	900	67,09	600	189,00	1 876	16,5%
# GHG reduction options:	8			Totals:	4 214	339				

Type	Reduction option	US$/tCO2e	Sub-type unit	Emission reduction tCO2e/unit	Investment Million US$	Annual costs MUS$/year	Units penetrating in 2035	Emission reduction in 2035 Per option ktCO2e/year	Added ktCO2e/year	Added Frac.of total
Hydro	Hydro power connec	5,46	1 MW	499	1 024	2,45	900,00	449,18	449	3,5%
	Mini hydro power co	784,64	1 MW	504	1 350	118,64	300,00	151,20	600	4,7%
Solar	Solar PVs, large grid	-65,11	1 MW	276	240	- 10,78	600	165,56	766	6,0%
Transport	Electric cars	1 810,99	1000 cars	1 351	2 462	257,40	105,20	142,13	908	7,1%
	New bicycle lanes	-273,26	1 km bicycle lar	687	25	- 93,81	500	343,29	1 251	9,8%
Wind	Wind turbines, on-sh	354,98	1 MW	315	1 200	89,46	800	252,00	1 503	11,8%
# GHG reduction options:	6			Totals:	6 301	363				

Type	Reduction option	US$/tCO2e	Sub-type unit	Emission reduction tCO2e/unit	Investment Million US$	Annual costs MUS$/year	Units penetrating in 2040	Emission reduction in 2040 Per option ktCO2e/year	Added ktCO2e/year	Added Frac.of total
Hydro	Hydro power connec	5,46	1 MW	499	1 252	3,00	1 100,00	548,99	549	3,8%
	Mini hydro power co	784,64	1 MW	504	1 620	142,37	360,00	181,44	730	5,1%
Solar	Solar PVs, large grid	-65,11	1 MW	276	280	- 12,58	700	193,16	924	6,4%
Transport	Electric cars	1 751,26	1000 cars	1 244	3 314	343,75	157,80	196,29	1 120	7,8%
	New bicycle lanes	-273,26	1 km bicycle lar	687	30	- 112,57	600	411,95	1 532	10,7%
Wind	Wind turbines, on-sh	354,98	1 MW	315	1 350	100,64	900	283,50	1 815	12,6%
# GHG reduction options:	6			Totals:	7 845	465				

Type	Reduction option	US$/tCO2e	Sub-type unit	Emission reduction tCO2e/unit	Investment Million US$	Annual costs MUS$/year	Units penetrating in 2045	Emission reduction in 2045 Per option ktCO2e/year	Added ktCO2e/year	Added Frac.of total
Hydro	Hydro power connec	5,46	1 MW	499	1 366	3,27	1 200,00	598,90	599	3,7%
	Mini hydro power co	784,64	1 MW	504	1 800	158,18	400,00	201,60	801	4,9%
Solar	Solar PVs, large grid	-65,11	1 MW	276	319	- 14,37	800	220,75	1 021	6,2%
Transport	Electric cars	1 751,26	1000 cars	1 244	4 418	458,33	210,40	261,72	1 283	7,9%
	New bicycle lanes	-273,26	1 km bicycle lar	687	40	- 150,09	800	549,27	1 832	11,2%
Wind	Wind turbines, on-sh	354,98	1 MW	315	1 650	123,00	1 100	346,50	2 179	13,3%
# GHG reduction options:	6			Totals:	9 594	578				

Type	Reduction option	US$/tCO2e	Sub-type unit	Emission reduction tCO2e/unit	Investment Million US$	Annual costs MUS$/year	Units penetrating in 2050	Emission reduction in 2050 Per option ktCO2e/year	Added ktCO2e/year	Added Frac.of total
Hydro	Hydro power connec	5,46	1 MW	499	1 480	3,54	1 300,00	648,81	649	3,4%
	Mini hydro power co	784,64	1 MW	504	2 025	177,96	450,00	226,80	876	4,7%
Solar	Solar PVs, large grid	-65,11	1 MW	276	399	- 17,97	1 000	275,94	1 152	6,1%
Transport	Electric cars	1 958,76	1000 cars	1 244	6 049	640,80	263,00	327,15	1 479	7,9%
	New bicycle lanes	0,00	1 km bicycle lar	0	50	- 187,62	1 000	-	1 479	7,9%
Wind	Wind turbines, on-sh	354,98	1 MW	315	1 800	134,18	1 200	378,00	2 543	13,5%
# GHG reduction options:	6			Totals:	11 803	751				

3.Conclusions

1.The GACMO tool is a convenient and accessible way to calculate future projections of GHG emissions in the Energy Sector.

2.GACMO allows you to calculate emission projections not only in the main categories but also in the subcategories in Energy.

3.GACMO calculates projections of future GHG emissions for BAUs under one scenario: the baseline (average) for all sectors including Energy.

4.GACMO really simplifies and automates the process of calculating future projections, while reducing the influence of the human factor in calculations and improving the quality of calculations.

5.The GACMO tool requires minimal time for training and its subsequent use in any sector of the Economy.

6.In practical terms, the following can be said:

- The use of GASMO showed which mitigation measures are the most optimal in terms of their economic efficiency and the lowest costs for their implementation, as well as the amount of emission reduction and the period of operation of the measure in the Kyrgyz Republic.
- Thus, for the period up to 2025, the implementation of gasification of private households is the most optimal measure compared to the introduction of energy-efficient coal-fired stoves.
- For the period up to 2030, the cheapest and most effective measures were in the transport sector: a ban on the import of old cars, the introduction of bicycle paths. Then, with a minimum period of action for reduction – Photovoltaic Stations (PVS) connected to networks, large hydroelectric power plants, gasification measures for private households, the introduction of energy-efficient coal-fired stoves, Wind power plants (WPP), the construction of small hydroelectric power plants (SHP). The most expensive measure was the introduction of electric vehicles.
- For the period 2035-2050. the cheapest and most effective measure turned out to be the introduction of bicycle paths in transport. Then PVS- solar power plants, large hydroelectric power plants, wind power plants, small hydroelectric power plants and the most expensive measure is the introduction of electric vehicles.
- Such an analysis is being conducted for the first time in the Kyrgyz Republic and makes it possible to adjust the Government's actions to attract investments for the implementation of mitigation measures to reduce greenhouse gas emissions.

7.It should be noted that for more accurate forecasting, it is necessary to involve the potential of the Ministry of Economy of the Kyrgyz Republic to forecast GDP growth for individual categories of economic activity.

8.Individual gaps in activity data also require the partnership involvement of the National Statistical Committee of the Kyrgyz Republic to obtain the necessary data. It is also necessary to strengthen the committee's capacity in updating the data collection system on a digital basis.

National Energy Expert

Edilbek Bogombaev

Annex 1

Calculation tables from IPCC GHG Inventory Software 2.95

CO 2 eqv. 2021

Categories	Emissions CO2 eqv (Gg)								
	CO2	CH4	N2O	NOx	CO	NMVOCs	SO2	HFCs	Total Net CO2 eqv
1 - Energy	9321.0803	411.64083	99.288296					NA	**9832,009766**
1.A - Fuel Combustion Activities	9292.139	107.4533	99.288296					NA	**9504,880078**
1.A.1 - Energy Industries	3500.4541	1.9335303	11.306097					NA	**3513,693775**
1.A.1.a - Main Activity Electricity and Hea	2624.2274	0.959196	9.4054145					NA	2634,562224
1.A.1.a.i - Electricity Generation		0	0					NA	0
1.A.1.a.ii - Combined Heat and Power G	2502.0471	0.8456614	8.0917001					NA	2511,984504
1.A.1.a.iii - Heat Plants	122.18027	0.0837246	0.3137143					NA	122,5777197
1.A.1.b - Petroleum Refining	876.22672	1.0041343	1.9006828					NA	879,1315511
1.A.1.c - Manufacture of Solid Fuels and	0	NO	NO	NO	NO	NO	NO	NA	NO
1.A.1.c.i - Manufacture of Solid Fuels	0	0	0					NA	0
1.A.1.c.ii - Other Energy Industries		0	0					NA	0
1.A.2 - Manufacturing Industries ar	477.78925	1.0247772	1.4357816					NA	**480,2499142**
1.A.2.a - Iron and Steel		0	0					NA	0
1.A.2.b - Non-Ferrous Metals		0	0					NA	0
1.A.2.c - Chemicals		0	0					NA	0
1.A.2.d - Pulp, Paper and Print		0	0					NA	0
1.A.2.e - Food Processing, Beverages an	142.09805	0.0833284	0.0977914					NA	142,2781258
1.A.2.f - Non-Metallic Minerals	83.913598	0.2444984	0.3470891					NA	84,5051745
1.A.2.g - Transport Equipment	0.26057	0.0008996	0.0014191					NA	0,362988675
1.A.2.h - Machinery	6.24988	0.0172264	0.0245973					NA	6,2918037
1.A.2.i - Mining (excluding fuels) and Quarrying		0	0					NA	0
1.A.2.j - Wood and wood products		0	0					NA	0
1.A.2.k - Construction	0	0	0					NA	0
1.A.2.l - Textile and Leather		0	0					NA	0
1.A.2.m - Non-specified Industry	245.16825	0.6796744	0.9842449					NA	246,8128186
1.A.3 - Transport	3823.7338	28.839938	81.981137					NA	**3931,592273**
1.A.3.a - Civil Aviation	31.5315	0.008174	0.23373					NA	31,771404
1.A.3.a.i - International Aviation (International Bunkers) (1)									
1.A.3.a.ii - Domestic Aviation	31.5315	0.008174	0.23373					NA	31,771404
1.A.3.b - Road Transportation	3423.7338	28.084057	44.720218					NA	3494,518092
1.A.3.b.i - Cars	3423.7338	28.084057	44.720218					NA	3494,518092
1.A.3.b.i.1 - Passenger cars with 3-way catalysts		0	0					NA	0
1.A.3.b.i.2 - Passenger cars without 3-way catalysts		0	0					NA	0
1.A.3.b.ii - Light-duty trucks		0	0					NA	0
1.A.3.b.ii.1 - Light-duty trucks with 3-way catalysts		0	0					NA	0
1.A.3.b.ii.2 - Light-duty trucks without 3-way catalys		0	0					NA	0
1.A.3.b.iii - Heavy-duty trucks and buses		0	0					NA	0
1.A.3.b.iv - Motorcycles		0	0					NA	0
1.A.3.b.v - Evaporative emissions from vehicles		0	0					NA	0
1.A.3.b.vi - Urea-based catalysts		0	0					NA	0
1.A.3.c - Railways	27.311573	0.0585102	3.2163539					NA	41,18633706
1.A.3.d - Water-borne Navigation	0	0	0					NA	0
1.A.3.d.i - International water-borne navigation (International bunkers) (1)									
1.A.3.d.ii - Domestic Water-borne Navig	0	0	0					NA	0
1.A.3.e - Other Transportation	330.19833	0.6971947	33.220925					NA	364,1164404
1.A.3.e.i - Pipeline Transport		0	0					NA	0
1.A.3.e.ii - Off-road	330.19833	0.6971947	33.220925					NA	364,1164404
1.A.4 - Other Sectors	1497.1203	77.667957	4.5558803					NA	**1579,344115**
1.A.4.a - Commercial/Institutional	197.42632	0.550228	0.7705293					NA	198,7470723
1.A.4.b - Residential	1294.2854	76.667609	3.7846859					NA	1374,717387
1.A.4.c - Agriculture/Forestry/Fishing/Fish	5.40855	0.44982	0.0313261					NA	5,879656125
1.A.4.c.i - Stationary	5.40855	0.44982	0.0313261					NA	5,879656125
1.A.4.c.ii - Off-road Vehicles and Other Machinery		0	0					NA	0
1.A.4.c.iii - Fishing (mobile combustion)		0	0					NA	0
1.A.5 - Non-Specified		0	0					NA	0
1.A.5.a - Stationary		0	0					NA	0
1.A.5.b - Mobile		0	0					NA	0
1.A.5.b.i - Mobile (aviation component)		0	0					NA	0
1.A.5.b.ii - Mobile (water-borne component)		0	0					NA	0
1.A.5.b.iii - Mobile (Other)		0	0					NA	0
1.A.5.c - Multilateral Operations (1)(2)									
1.B - Fugitive emissions from fuels	22.941256	304.12842	0					NA	**327,1296887**
1.B.1 - Solid Fuels	19.910327	0	0					NA	**19,91032738**
1.B.1.a - Coal mining and handling	19.910327	0	0					NA	19,91032738
1.B.1.a.i - Underground mines	18.783327	0	0					NA	18,7833272
1.B.1.a.i.1 - Mining	18.783327	0	0					NA	18,7833272
1.B.1.a.i.2 - Post-mining seam gas emissions		0	0					NA	0
1.B.1.a.i.3 - Abandoned underground	0	0	0					NA	0
1.B.1.a.i.4 - Flaring of drained methan	0	0	0					NA	0
1.B.1.a.ii - Surface mines	1.1270002	0	0					NA	1,127000184
1.B.1.a.ii.1 - Mining	1.1270002	0	0					NA	1,127000184
1.B.1.a.ii.2 - Post-mining seam gas emissions		0	0					NA	0
1.B.1.a.ii.3 - Abandoned surface mine	0	0	0					NA	0
1.B.1.b - Uncontrolled combustion and burning coal du		0	0					NA	0
1.B.1.c - Fuel transformation	0	0	0					NA	0
1.B.1.c.i - Charcoal and Biochar production		0	0					NA	0
1.B.1.c.ii - Coke production		0	0					NA	0
1.B.1.c.iv - Gasification transformation	0	0	0					NA	0
1.B.2 - Oil and Natural Gas	3.0309282	304.12842	0					NA	**307,2193613**
1.B.2.a - Oil	1.4916753	269.64212	0					NA	271,1337979
1.B.2.a.i - Venting	0.6913317	93.209207	0					NA	93,90043874
1.B.2.a.ii - Flaring		0	0					NA	0
1.B.2.a.iii - All Other	0.8004435	176.43292	0					NA	177,2333592
1.B.2.a.iii.1 - Exploration		0	0					NA	0
1.B.2.a.iii.2 - Production and Upgradi	0.800286	176.28432	0					NA	177,1846606
1.B.2.a.iii.3 - Transport	0.0001575	0.0425957	0					NA	0,048753166
1.B.2.a.iii.4 - Refining		0	0					NA	0
1.B.2.a.iii.5 - Distribution of oil products		0	0					NA	0
1.B.2.a.iii.6 - Other		0	0					NA	0
1.B.2.b - Natural Gas	1.539253	34.54631	0					NA	36,08556338
1.B.2.b.i - Venting	1.4925	0	0					NA	1,4925
1.B.2.b.ii - Flaring		0	0					NA	0
1.B.2.b.iii - All Other	0.046753	34.54631	0					NA	34,58706338
1.B.2.b.iii.1 - Exploration		0	0					NA	0
1.B.2.b.iii.2 - Production	0.0021934	7.572304	0					NA	7,5794574
1.B.2.b.iii.3 - Processing	0.000444	0.1554	0					NA	0,155844
1.B.2.b.iii.4 - Transmission and Storag	0.0005868	6.9761684	0					NA	6,976733184
1.B.2.b.iii.5 - Distribution	0.0375228	19.83744	0					NA	19,87502288
1.B.2.b.iii.6 - Other		0	0					NA	0
1.B.3 - Other emissions from Energ	0	0	0					NA	0
1.C - Carbon dioxide Transport and S	0	0	0					NA	0
1.C.1 - Transport of CO2	0	0	0					NA	0
1.C.1.a - Pipelines	0	0	0					NA	0
1.C.1.b - Ships	0	0	0					NA	0
1.C.1.c - Other (please specify)	0	0	0					NA	0
1.C.2 - Injection and Storage	0	0	0					NA	0
1.C.2.a - Injection	0	0	0					NA	0
1.C.2.b - Storage	0	0	0					NA	0
1.C.3 - Other		0	0					NA	0

CO 2 eqv.

Categories	Emissions (Gg)						
	CO2	CH4	N2O	NOx	CO	NMVOCs	SO2
Memo Items (3)							
International Bunkers		0.08202	2.3479				
1.A.3.a.i - International Aviation (International Bunkers) (1)		0.08202	2.3479				
1.A.3.d.i - International water-borne navigation (Internation		0	0				
1.A.5.c - Multilateral Operations (1)(2)		0	0				
Information Items		0	0				
CO2 from Biomass Combustion	0	0	0				
CO2 from Biomass Combustion Captured		0	0				
Biogenic CO2	0	0	0				

CO 2 eqv. 2022

Categories	Emissions (Gg) CO2	CH4	N2O	NOx	CO	NMVOCs	SO2	HFCs	Total Net CO2 eqv
1 - Energy	8649,7809	450,2524	100,37106					NA	**9200,404339**
1.A - Fuel Combustion Activities	8623,8229	122,69103	100,37106					NA	**8846,885015**
1.A.1 - Energy Industries	3334,7083	1,9391317	10,307977					NA	**3346,955432**
1.A.1.a - Main Activity Electricity and Heat	2411,3526	0,8809887	8,3050631					NA	2420,538674
1.A.1.a.i - Electricity Generation		0	0					NA	0
1.A.1.a.ii - Combined Heat and Power Ge	2294,7829	0,8018974	8,1227756					NA	2303,707563
1.A.1.a.iii - Heat Plants	116,56973	0,0790914	0,1822875					NA	116,8311101
1.A.1.b - Petroleum Refining	923,3557	1,058143	2,0629435					NA	926,4167584
1.A.1.c - Manufacture of Solid Fuels and Ot	0	0	0					NA	0
1.A.1.c.i - Manufacture of Solid Fuels	0	0	0					NA	0
1.A.1.c.ii - Other Energy Industries		0	0					NA	0
1.A.2 - Manufacturing Industries and	282,78284	0,8116752	1,1522889					NA	**294,7468041**
1.A.2.a - Iron and Steel		0	0					NA	0
1.A.2.b - Non-Ferrous Metals		0	0					NA	0
1.A.2.c - Chemicals		0	0					NA	0
1.A.2.d - Pulp, Paper and Print		0	0					NA	0
1.A.2.e - Food Processing, Beverages and	127,4014	0,353192	0,5014065					NA	128,2559985
1.A.2.f - Non-Metallic Minerals	50,84037	0,1409436	0,2000896					NA	51,18140318
1.A.2.g - Transport Equipment	0,48076	0,0013328	0,0018921					NA	0,4839849
1.A.2.h - Machinery	3,00475	0,00833	0,0118256					NA	3,024905625
1.A.2.i - Mining (excluding fuels) and Quarrying		0	0					NA	0
1.A.2.j - Wood and wood products		0	0					NA	0
1.A.2.k - Construction	2,64418	0,0073304	0,0104066					NA	2,66191695
1.A.2.l - Textile and Leather		0	0					NA	0
1.A.2.m - Non-specified industry	108,41138	0,3005464	0,4266686					NA	109,138595
1.A.3 - Transport	3657,8959	24,404116	83,643184					NA	**3765,943228**
1.A.3.a - Civil Aviation	37,8378	0,0074088	0,280476					NA	38,1256848
1.A.3.a.i - International Aviation (International Bunkers) (1)									
1.A.3.a.ii - Domestic Aviation	37,8378	0,0074088	0,280476					NA	38,1256848
1.A.3.b - Road Transportation	3211,2103	23,58562	42,068404					NA	3276,864316
1.A.3.b.i - Cars	3211,2103	23,58562	42,068404					NA	3276,864316
1.A.3.b.i.1 - Passenger cars with 3-way catalysts		0	0					NA	0
1.A.3.b.i.2 - Passenger cars without 3-way catalysts		0	0					NA	0
1.A.3.b.ii - Light-duty trucks		0	0					NA	0
1.A.3.b.ii.1 - Light-duty trucks with 3-way catalysts		0	0					NA	0
1.A.3.b.ii.2 - Light-duty trucks without 3-way catalysts		0	0					NA	0
1.A.3.b.iii - Heavy-duty trucks and buses		0	0					NA	0
1.A.3.b.iv - Motorcycles		0	0					NA	0
1.A.3.b.v - Evaporative emissions from vehicles		0	0					NA	0
1.A.3.b.vi - Urea-based catalysts		0	0					NA	0
1.A.3.c - Railways	38,171874	0,0598593	3,9042461					NA	42,13597933
1.A.3.d - Water-borne Navigation	0	0	0					NA	0
1.A.3.d.i - International water-borne navigation (International bunkers) (1)									
1.A.3.d.ii - Domestic Water-borne Naviga	0	0	0					NA	0
1.A.3.e - Other Transportation	370,67596	0,751228	37,390058					NA	408,8172484
1.A.3.e.i - Pipeline Transport		0	0					NA	0
1.A.3.e.ii - Off-road	370,67596	0,751228	37,390058					NA	408,8172484
1.A.4 - Other Sectors	1338,4358	95,536104	5,2676064					NA	**1439,23955**
1.A.4.a - Commercial/Institutional	196,27027	0,5441156	0,7734498					NA	197,5868354
1.A.4.b - Residential	1140,2425	94,832052	4,4875882					NA	1239,56217
1.A.4.c - Agriculture/Forestry/Fishing/Fish	1,92304	0,159936	0,0075684					NA	2,0905444
1.A.4.c.i - Stationary	1,92304	0,159936	0,0075684					NA	2,0905444
1.A.4.c.ii - Off-road Vehicles and Other Machinery		0	0					NA	0
1.A.4.c.iii - Fishing (mobile combustion)		0	0					NA	0
1.A.5 - Non-Specified		0	0					NA	0
1.A.5.a - Stationary		0	0					NA	0
1.A.5.b - Mobile		0	0					NA	0
1.A.5.b.i - Mobile (aviation component)		0	0					NA	0
1.A.5.b.ii - Mobile (water-borne component)		0	0					NA	0
1.A.5.b.iii - Mobile (Other)		0	0					NA	0
1.A.5.c - Multilateral Operations (1)(2)			0						
1.B - Fugitive emissions from fuels	25,957955	327,56137	0					NA	**353,5193244**
1.B.1 - Solid Fuels	22,299023	0	0					NA	**22,29902256**
1.B.1.a - Coal mining and handling	22,299023	0	0					NA	22,29902256
1.B.1.a.i - Underground mines	20,840208	0	0					NA	20,840208
1.B.1.a.i.1 - Mining	20,840208	0	0					NA	20,840208
1.B.1.a.i.2 - Post-mining seam gas emissions		0	0					NA	0
1.B.1.a.i.3 - Abandoned underground m	0	0	0					NA	0
1.B.1.a.i.4 - Flaring of drained methane	0	0	0					NA	0
1.B.1.a.ii - Surface mines	1,4588146	0	0					NA	1,45881456
1.B.1.a.ii.1 - Mining	1,4588146	0	0					NA	1,45881456
1.B.1.a.ii.2 - Post-mining seam gas emissions		0	0					NA	0
1.B.1.a.ii.3 - Abandoned surface mines	0	0	0					NA	0
1.B.1.b - Uncontrolled combustion and burning coal dum		0	0					NA	0
1.B.1.c - Fuel transformation	0	0	0					NA	0
1.B.1.c.i - Charcoal and Biochar production		0	0					NA	0
1.B.1.c.ii - Coke production		0	0					NA	0
1.B.1.c.iv - Gasification transformation	0	0	0					NA	0
1.B.2 - Oil and Natural Gas	3,6589321	327,56137	0					NA	**331,2203019**
1.B.2.a - Oil	1,5565659	288,66265	0					NA	290,1992117
1.B.2.a.i - Venting	0,7398373	99,763433	0					NA	100,5032703
1.B.2.a.ii - Flaring		0	0					NA	0
1.B.2.a.iii - All Other	0,8167286	188,83921	0					NA	189,6959414
1.B.2.a.iii.1 - Exploration		0	0					NA	0
1.B.2.a.iii.2 - Production and Upgrading	0,85656	188,7872	0					NA	189,64376
1.B.2.a.iii.3 - Transport	0,0001686	0,0520128	0					NA	0,05218136
1.B.2.a.iii.4 - Refining		0	0					NA	0
1.B.2.a.iii.5 - Distribution of oil products		0	0					NA	0
1.B.2.a.iii.6 - Other		0	0					NA	0
1.B.2.b - Natural Gas	2,0623662	38,958724	0					NA	41,02109016
1.B.2.b.i - Venting	2,01825	0	0					NA	2,01825
1.B.2.b.ii - Flaring		0	0					NA	0
1.B.2.b.iii - All Other	0,0441162	38,958724	0					NA	39,00284016
1.B.2.b.iii.1 - Exploration		0	0					NA	0
1.B.2.b.iii.2 - Production	0,0029003	10,205468	0					NA	10,2083683
1.B.2.b.iii.3 - Processing	0,000598	0,2093	0					NA	0,209898
1.B.2.b.iii.4 - Transmission and Storage	0,0006034	7,426356	0					NA	7,42695936
1.B.2.b.iii.5 - Distribution	0,0400145	21,1176	0					NA	21,1576145
1.B.2.b.iii.6 - Other		0	0					NA	0
1.B.3 - Other emissions from Energy	0	0	0					NA	0
1.C - Carbon dioxide Transport and St	0	0	0					NA	0
1.C.1 - Transport of CO2	0	0	0					NA	0
1.C.1.a - Pipelines	0	0	0					NA	0
1.C.1.b - Ships	0	0	0					NA	0
1.C.1.c - Other (please specify)	0	0	0					NA	0
1.C.2 - Injection and Storage	0	0	0					NA	0
1.C.2.a - Injection	0	0	0					NA	0
1.C.2.b - Storage	0	0	0					NA	0
1.C.3 - Other		0	0					NA	0

CO 2 eqv.

Categories	Emissions (Gg) CO2	CH4	N2O	NOx	CO	NMVOCs	SO2
Memo Items (3)							
International Bunkers		0,067914	2,57103				
1.A.3.a.i - International Aviation (International Bunkers) (1)		0,067914	2,57103				
1.A.3.d.i - International water-borne navigation (International		0	0				
1.A.5.c - Multilateral Operations (1)(2)		0	0				
Information Items		0	0				
CO2 from Biomass Combustion	0	0	0				
CO2 from Biomass Combustion Captured		0	0				
Biogenic CO2	0	0	0				

CO 2 eqv. Inventory Year 2023

Categories	Emissions CO2 eqv (Gg)								
	CO2	CH4	N2O	NOx	CO	NMVOCs	SO2	HFCs	Total Net CO2 eq v
1 - Energy	9153,5471	581,75389	98,55366					NA	**9833,854699**
1.A - Fuel Combustion Activities	9125,3419	161,76985	98,55366					NA	**9385,66541**
1.A.1 - Energy Industries	3059,3817	1,8414402	10,15464					NA	**3071,377752**
1.A.1.a - Main Activity Electricity and Heat Production	2097,8887	0,7395929	8,0690004					NA	2106,697306
1.A.1.a.i - Electricity Generation		0	0					NA	0
1.A.1.a.ii - Combined Heat and Power Generation (CHP)	2002,4381	0,6564152	7,8699081					NA	2010,964423
1.A.1.a.iii - Heat Plants	95,450613	0,0831778	0,1990923					NA	95,73288328
1.A.1.b - Petroleum Refining	961,49296	1,1018473	2,0856396					NA	964,6804459
1.A.1.c - Manufacture of Solid Fuels and Other Energy Industries	0	0	0					NA	0
1.A.1.c.i - Manufacture of Solid Fuels	0	0	0					NA	0
1.A.1.c.ii - Other Energy Industries		0	0					NA	0
1.A.2 - Manufacturing Industries and Construction	364,12196	0,7068186	1,0002038					NA	**365,8289784**
1.A.2.a - Iron and Steel		0	0					NA	0
1.A.2.b - Non-Ferrous Metals		0	0					NA	0
1.A.2.c - Chemicals		0	0					NA	0
1.A.2.d - Pulp, Paper and Print		0	0					NA	0
1.A.2.e - Food Processing, Beverages and Tobacco	138,50186	0,0902059	0,1223092					NA	138,7143791
1.A.2.f - Non-Metallic Minerals		0	0					NA	0
1.A.2.g - Transport Equipment	2,139888	0,0043501	0,0066573					NA	2,15099541
1.A.2.h - Machinery		0	0					NA	0
1.A.2.i - Mining (excluding fuels) and Quarrying		0	0					NA	0
1.A.2.j - Wood and wood products		0	0					NA	0
1.A.2.k - Construction	4,489482	0,0061594	0,0104662					NA	4,486107615
1.A.2.l - Textile and Leather		0	0					NA	0
1.A.2.m - Non-specified Industry	219,01062	0,6061031	0,8607711					NA	220,4774963
1.A.3 - Transport	3506,3159	26,957831	80,32608					NA	**3613,599791**
1.A.3.a - Civil Aviation	44,1441	0,0086436	0,327222					NA	44,4799656
1.A.3.a.i - International Aviation (International Bunkers) (1)									
1.A.3.a.ii - Domestic Aviation	44,1441	0,0086436	0,327222					NA	44,4799656
1.A.3.b - Road Transportation	3065,0607	26,250922	39,614472					NA	3130,926065
1.A.3.b.i - Cars	3065,0607	26,250922	39,614472					NA	3130,926065
1.A.3.b.i.1 - Passenger cars with 3-way catalysts		0	0					NA	0
1.A.3.b.i.2 - Passenger cars without 3-way catalysts		0	0					NA	0
1.A.3.b.ii - Light-duty trucks		0	0					NA	0
1.A.3.b.ii.1 - Light-duty trucks with 3-way catalysts		0	0					NA	0
1.A.3.b.ii.2 - Light-duty trucks without 3-way catalysts		0	0					NA	0
1.A.3.b.iii - Heavy-duty trucks and buses		0	0					NA	0
1.A.3.b.iv - Motorcycles		0	0					NA	0
1.A.3.b.v - Evaporative emissions from vehicles		0	0					NA	0
1.A.3.b.vi - Urea-based catalysts		0	0					NA	0
1.A.3.c - Railways	39,064038	0,0612583	3,9954972					NA	43,12079354
1.A.3.d - Water-borne Navigation	0	0	0					NA	0
1.A.3.d.i - International water-borne navigation (International bunkers) (1)									
1.A.3.d.ii - Domestic Water-borne Navigation	0	0	0					NA	0
1.A.3.e - Other Transportation	358,04707	0,6370062	36,388888					NA	395,0729666
1.A.3.e.i - Pipeline Transport		0	0					NA	0
1.A.3.e.ii - Off-road	358,04707	0,6370062	36,388888					NA	395,0729666
1.A.4 - Other Sectors	2195,5224	132,26376	7,0727366					NA	**2334,858888**
1.A.4.a - Commercial/Institutional	213,03213	0,5791604	0,6954525					NA	214,3067469
1.A.4.b - Residential	1979,6576	131,46422	6,3667885					NA	2117,488587
1.A.4.c - Agriculture/ Forestry/ Fishing/ Fish Farms	2,832676	0,2203834	0,0104956					NA	3,06355399
1.A.4.c.i - Stationary	2,832676	0,2203834	0,0104956					NA	3,06355399
1.A.4.c.ii - Off-road Vehicles and Other Machinery		0	0					NA	0
1.A.4.c.iii - Fishing (mobile combustion)		0	0					NA	0
1.A.5 - Non-Specified		0	0					NA	0
1.A.5.a - Stationary		0	0					NA	0
1.A.5.b - Mobile		0	0					NA	0
1.A.5.b.i - Mobile (aviation component)		0	0					NA	0
1.A.5.b.ii - Mobile (water-borne component)		0	0					NA	0
1.A.5.b.iii - Mobile (Other)		0	0					NA	0
1.A.5.c - Multilateral Operations (1)(2)			0						
1.B - Fugitive emissions from fuels	28,205349	419,98404	0					NA	**448,1892893**
1.B.1 - Solid Fuels	24,673395	0	0					NA	**24,67339536**
1.B.1.a - Coal mining and handling	24,673395	0	0					NA	24,67339536
1.B.1.a.i - Underground mines	23,059248	0	0					NA	23,059248
1.B.1.a.i.1 - Mining	23,059248	0	0					NA	23,059248
1.B.1.a.i.2 - Post-mining seam gas emissions		0	0					NA	0
1.B.1.a.i.3 - Abandoned underground mines	0	0	0					NA	0
1.B.1.a.i.4 - Flaring of drained methane or conversion of methane to CO2		0	0					NA	0
1.B.1.a.ii - Surface mines	1,6141474	0	0					NA	1,61414736
1.B.1.a.ii.1 - Mining	1,6141474	0	0					NA	1,61414736
1.B.1.a.ii.2 - Post-mining seam gas emissions		0	0					NA	0
1.B.1.a.ii.3 - Abandoned surface mines	0	0	0					NA	0
1.B.1.b - Uncontrolled combustion and burning coal dumps		0	0					NA	0
1.B.1.c - Fuel transformation	0	0	0					NA	0
1.B.1.c.i - Charcoal and Biochar production		0	0					NA	0
1.B.1.c.ii - Coke production		0	0					NA	0
1.B.1.c.iv - Gasification transformation	0	0	0					NA	0
1.B.2 - Oil and Natural Gas	3,5318534	419,98404	0					NA	**423,515894**
1.B.2.a - Oil	1,6397289	296,405	0					NA	298,0447279
1.B.2.a.i - Venting	0,7598388	102,46054	0					NA	103,2203788
1.B.2.a.ii - Flaring		0	0					NA	0
1.B.2.a.iii - All Other	0,8798901	193,94446	0					NA	194,8243491
1.B.2.a.iii.1 - Exploration		0	0					NA	0
1.B.2.a.iii.2 - Production and Upgrading	0,879717	193,89104	0					NA	194,770757
1.B.2.a.iii.3 - Transport	0,0001731	0,053419	0					NA	0,053592077
1.B.2.a.iii.4 - Refining		0	0					NA	0
1.B.2.a.iii.5 - Distribution of oil products		0	0					NA	0
1.B.2.a.iii.6 - Other		0	0					NA	0
1.B.2.b - Natural Gas	1,8921245	123,57904	0					NA	125,4711661
1.B.2.b.i - Venting	1,8225	0	0					NA	1,8225
1.B.2.b.ii - Flaring		0	0					NA	0
1.B.2.b.iii - All Other	0,0696245	123,57904	0					NA	123,6486661
1.B.2.b.iii.1 - Exploration		0	0					NA	0
1.B.2.b.iii.2 - Production	0,026578	93,52168	0					NA	93,548258
1.B.2.b.iii.3 - Processing	0,000548	0,1918	0					NA	0,192348
1.B.2.b.iii.4 - Transmission and Storage	0,0006313	7,7702016	0					NA	7,770832896
1.B.2.b.iii.5 - Distribution	0,0418672	22,09536	0					NA	22,1372272
1.B.2.b.iii.6 - Other		0	0					NA	0
1.B.3 - Other emissions from Energy Production	0	0	0					NA	0
1.C - Carbon dioxide Transport and Storage	0	0	0					NA	0
1.C.1 - Transport of CO2	0	0	0					NA	0
1.C.1.a - Pipelines	0	0	0					NA	0
1.C.1.b - Ships	0	0	0					NA	0
1.C.1.c - Other (please specify)	0	0	0					NA	0
1.C.2 - Injection and Storage	0	0	0					NA	0
1.C.2.a - Injection	0	0	0					NA	0
1.C.2.b - Storage	0	0	0					NA	0
1.C.3 - Other		0	0					NA	0

CO 2 eqv.

Categories	Emissions (Gg)						
	CO2	CH4	N2O	NOx	CO	NMVOCs	SO2
Memo Items (3)							
International Bunkers		0,074088	2,80476				
1.A.3.a.i - International Aviation (International Bunkers) (1)		0,074088	2,80476				
1.A.3.d.i - International water-borne navigation (International bunkers) (1)		0	0				
1.A.5.c - Multilateral Operations (1)(2)		0	0				
Information Items		0	0				
CO2 from Biomass Combustion	0	0	0				
CO2 from Biomass Combustion Captured		0	0				
Biogenic CO2	0	0	0				