Assessment of the mitigation effects of selected policies (including description of methodology and recommendations)

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Initiative for Climate Action Transparency – ICAT

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Abbreviations and Acronyms

BTR	Biennial transparency report
GACMO	Greenhouse Gas Abatement Cost Model
GDP	Gross Domestic Product
GHG	Greenhouse gas
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MPGs	Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement, set out in the annex to decision 18/CMA.1
NC	National communication
NDC	Nationally determined contribution under Article 4 of the Paris Agreement
NDS	National Development Strategy
PaMs	Policies and measures

Introduction and main results

Tajikistan submitted its Biennial Transparency Report (BTR) as the Party to the Paris Agreement 27 December 2024. The BTR contains 11 mitigation actions that are reported as part of the information necessary to track progress in implementing and achieving the NDC. Tajikistan applied flexibility principle for reporting on the achieved and expected impacts of its Policies and Measures (PaMs) because of the gaps and constraints related to its domestic Measurement, Reporting and Verification system on mitigation actions and capacity constraints on the application of the methodologies to assess the impacts of mitigation actions.

This report presents the assessment of mitigation impact of five measures described in Tajikistan's BTR. The impacts have been assessed using the Greenhouse Gas Abatement Cost Model (GACMO) tool, covering actions in renewable energy, energy efficiency, transport, and forestry. GACMO is an MS Excel based tool that allows for rapid assessment of the impacts of measures using predefined methodologies that are integrated into the Excel file. The report includes the short description of GACMO tool and its methodology and mainly focuses on its application to evaluate the impacts of the actions included in the BTR of Tajikistan. Completed GACMO tool in excel format is provided separately. The remaining six measures have not been estimated either due to lack of activity data or because GACMO doesn't include the corresponding methodologies.

The table below summarizes the assessment of the impact of actions by 2030. As can be seen the highest reductions are expected from the afforestation/reforestation activities, followed by the modernization of electric grid.

Table 1. Summary of the Emission reduction in 2030 by mitigation action

Mitigation action	Emission reduction in 2030 per action, $ktCO_{2e}$/year
Supporting the development and use of non-traditional (renewable) energy sources	12.67
Modernization of electric grid	301.46
Modernization and expansion of energy-efficient city-wide street lighting in Dushanbe	0.23
Support to E-mobility (electric taxi fleet and charging stations)	6.02
Afforestation/reforestation activities and development of forest plantations	320.46

Please note that the reductions are not additive, as the mitigation actions concern both supply and consumption of electricity. In addition, the impact of the actions aimed at reducing electricity consumption or increasing renewable electricity generation may be overestimated, because GACMO relies on grid emission factors to estimate these impacts. The grid emission factor used in this assessment has been calculated by dividing the GHG emissions from power plants by the total electricity consumption in Tajikistan. However, the GHG emissions from power plants in Tajikistan are mainly produced by the Dushanbe combined heat and power plant, where electricity is by-product of the heat production. Therefore, reducing electricity consumption will not necessarily result in reducing these emissions. On the other hand, reduced electricity use by energy efficiency measures can be instrumental for substituting fossil fuel consumption, increasing the impact of measures such as electric vehicles.

The assessment in GACMO can be further improved by using more precise country specific values for various parameters instead of GACMO defaults and by applying more sophisticated tools that allow for more flexible modeling of power sector, different types of mitigation actions and assessment of their combined effect.

Short description of GACMO

The GACMO[1] tool has been developed by the UNEP Copenhagen Climate Centre (UNEP-CCC). The tool is regularly updated. The latest version of the tool has been developed under the Initiative for Climate Action Transparency (ICAT). The latest version of the GACMO tool is always made available on the UNEP-CCC website at https://unepccc.org/gacmo-tool/

The GACMO tool allows countries to evaluate a variety of mitigation options. The tool is used to calculate the GHG emissions reductions resulting from specific mitigation actions and to establish a mitigation scenario built on the specific mitigation actions compared to a business as usual (BAU) scenario. The GACMO tool can thus support technical experts and decision-makers to assess and understand the GHG emissions impacts of climate mitigation actions.

The latest version of the GACMO tool includes seven spreadsheets with technical data that the user needs to consider following a stepwise approach. The interface of the tool is made so that the user is taken from the first spreadsheet to the last spreadsheet following a logical order. The calculations and the generation of graphs are done in an automated way. This means that the user, who has the data required to use the GACMO tool, does not need to be familiar with the calculations themselves in order to use the tool, but only with how to enter the inputs and interpret the results.

The GACMO tool also includes a series of default values, that are already pre-loaded in the tool and that the user does not have to update unless the user has better inputs and wants to make more precise estimates. These default values are all visible and accessible to the user. The first group of data with default values are those of key mitigation parameters, such as the IPCC database of emission factors (2006 IPCC Guidelines) and the global warming potential (GWP). In the case of GWP, the GACMO tool uses by default the values of the fifth assessment report published by the IPCC, as established in the Modalities, Procedures, and Guidelines (MPGs) adopted in the Katowice Climate Package through decision 18/CMA. However, previous GWP values are also available in the tool. The second group of data with default values are those for the mitigation potential parameters and economic-financial parameters of each mitigation option and their corresponding reference option in the baseline situation. In this case, the GACMO tool uses by default, average values calculated from relevant CDM projects available on the CDM website and summarized in the project pipeline developed at UNEP-CCC. Experience has shown that the use of default values for data related to baseline and mitigation options works well in the tool. However, it is recommended for a GACMO user to modify those default values for the data related to the mitigation and reference options, by replacing them with values specific to their case (e.g., country, city, region, industrial activity). This allows the user to adapt the GACMO tool to the specific national/local context.

The main data required to use the GACMO tool are those of the energy balance for a specific year (considered as the start year), that is, the data on the sectoral energy consumption of fossil fuels and electricity of a country, as well as the GHG emissions for the other non-energy sectors for the same year (taken, for example, from a national GHG inventory report). From these data, GACMO estimates CO_2 emissions from fuel combustion and summarizes the GHG emissions for the start year, that is, for the year in which the data were collected (generally the most recent year for which the necessary data is available). Then, applying growth factors for each sector (these factors are specific to the country and are estimated and entered in the tool by the user), the GACMO tool will project the GHG emissions to build a reference scenario (also called baseline scenario or business as usual), that includes calculations for the years 2025, 2030, 2035, 2040, 2045, and/or 2050.

To build the GHG mitigation scenario, the GACMO tool proposes a list of 119 mitigation options for different sectors. These mitigation options are organized into 24 categories of activities, such as agriculture, biomass energy, energy efficiency in homes, forestry, as well as geothermal, hydroelectric, solar, and wind energy, among others.

Once the mitigation options of interest have been selected by the user, the tool calculates the emissions based on

[1] Source for this section: **Guidance to the *Greenhouse Gas Abatement Cost Model* (GACMO), Version August 2024**, available at https://unepccc.org/wp-content/uploads/2024/10/english-guidance-for-the-21-version-of-the-gacmo-tool.docx.

the defined growth factors and establishes a mitigation scenario towards the years 2025, 2030, 2035, 2040, 2045, and/or 2050. The GACMO tool calculates also the GHG emissions reductions and an approximation of the investment costs, as well as operation and maintenance costs that result from each selected mitigation action.

In summary, the key input data required for running the GACMO tool are:

- Basic data about the country, such as population, GDP, discount rate;
- Key assumptions (e.g., grid emission factor, emission factors, calorific values of fuels, etc.);
- Energy balance data in the start year, that is, the production/consumption data on fossil fuels and electricity for a country;
- Data on the GHG emissions for the key non-energy sectors in the start year: Agriculture, Forestry, Waste, Industrial processes and Fugitive emissions;
- Growth factors estimated over specific time periods for different sectors of activities;
- The number of units of each mitigation option (selected by the user) penetrating toward the years 2025, 2030, 2035, 2040, 2045, and/or 2050;
- Technical and economical parameters of the technology/mitigation options (e.g., solar insolation, annual distance for transport, number of hours usage of lighting, etc.)

Completing GACMO model for Tajikistan

This chapter describes the data and information that was entered into GACMO tool for Tajikistan to complete the start year data and Baseline scenario. Input in the GACMO tool starts from the input of main assumptions. The start year was selected to be 2022 as the year for which the latest GHG inventory is available. Information on population and GDP for 2022 was taken from World Bank and was input as follows:

Table 2. Population and GDP assumptions in the "Assumptions" sheet of GACMO model

Population and GDP in start year	2022
Population (thousands)	10182.222
GDP (Current MUS$)	10710

For Electricity grid emission factor, an average grid emission factor from 2022 was used, calculated from the 2022 GHG inventory data and electricity balance as GHG emissions from power plants divided by the total electricity consumption in Tajikistan.

Table 3. Greed emission factor assumptions from "Assumptions" sheet of GACMO

Grid Emission Factor (tCO_2/MWh)	
Combined Margin (CM) Solar & Wind	0.1143
Combined Margin (CM) Other	0.1143

Default values from GACMO model were used for all other assumptions.

The next step is to enter the energy balance data for start year (2022). The energy balance for fossil fuels (shown in Table 4) was taken from the Activity data of latest GHG inventory for 2022, whereas electricity balance for 2022 (shown in

Table 5) was taken from Tajikistan's 2022 energy balance published by UN Statistics Division[2].

[2] Available at https://unstats.un.org/unsd/energystats/pubs/balance/

Table 4. The fossil fuel energy balance table from "Energy Balance" sheet of GACMO model

Energy balance in TJ - Tajikistan - Start year - 2022									
Fossil fuel energy balance in TJ	LPG	Gasoline	Jet Fuel	Diesel	Total oil products	Coal	Lignite	Natural Gas	Total energy (fossil)
Unit	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ	TJ
Total all energy consumption	16 626	14 089	515	16 665	47 895	37 341	2 363	6 940	94 539
Fossil power plants	-	-	-	-	-	15 794	-	3 110	18 904
Final sector consumption	16 626	14 089	515	16 665	47 895	21 547	2 363	3 830	75 635
Industry - steel	-	-	-	-	-	-	-	-	-
Industry - chemical	-	-	-	-	-	-	-	-	-
Industry - non metallic mineral	-	-	-	-	-	9 476	255	-	9 731
Industry - food processing and beverage	-	-	-	-	-	56	-	-	56
Industry - construction	-	-	-	-	-	-	-	-	-
Industry - mining	-	-	-	-	-	186	272	-	458
Industry - machinery	-	-	-	-	-	223	-	-	223
Industry - non ferrous metals	-	-	-	-	-	668	-	3 798	4 466
Industry - paper and pulp	-	-	-	-	-	56	-	-	56
Industry - transport equipment	-	-	-	-	-	-	-	-	-
Industry - textile and leather	-	-	-	-	-	111	-	-	111
Industry - miscellaneous	-	-	-	-	-	1 022	306	-	1 328
Transport - road	-	14 089	-	13 451	27 539	-	-	-	27 539
Transport - rail	-	-	-	279	279	37	-	-	316
Transport - domestic air	-	-	515	-	515	-	-	-	515
Transport - navigation	-	-	-	-	-	-	-	-	-
Households	-	-	-	-	-	9 114	1 530	-	10 644
Services	-	-	-	-	-	53	-	-	53
Agriculture & Fishery	-	-	-	2 936	2 936	-	-	-	2 936
Non energy - chemical feedstocs	16 626	-	-	-	16 626	545	-	32	17 203

Table 5. Electricity energy balance table from "Energy Balance" sheet of GACMO model (electricity energy balance)

Start year electricity balance in GWh						
Electricity consumption	GWh		**Electricity production**	GWh	Share of production	Efficiency
Total consumption	14 596		Total	18 855		
Industry - steel			Losses	4 259	22.6%	
Industry - chemical	525		Fossil	1 475	7.8%	
Industry - non metallic mineral			Lignite		0.0%	0%
Industry - food processing and beverage	224		Coal	1 475	7.8%	34%
Industry - construction	32		Oil		0.0%	0%
Industry - mining			Natural Gas		0.0%	0%
Industry - machinery	10		Nuclear		0.0%	
Industry - non ferrous metals	2 512		Net import	-2 544	-13.5%	
Industry - paper and pulp	12		Renewables	19 924	105.7%	
Industry - transport equipment			Hydro	19 924	105.7%	
Industry - textile and leather	420		Wind		0.0%	
Industry - miscellaneous	1		Solar		0.0%	
Transport - road	5		Biomass		0.0%	
Transport - rail			Geothermal		0.0%	
Transport - domestic air						
Transport - navigation						
Households	5 850					
Services	2 780					
Agriculture & Fishery	2 225					
Non energy - chemical feedstocks						

Electricity import and export	GWh
Import	797
Export	3 341

During the next step, the GACMO tool calculates the CO_2 emissions in Energy sector, which are shown in Table 6.

Table 6. CO_2 balance table for energy sector from "GHG Balance" sheet of GACMO model

CO_2 Balance - Tajikistan - Start year - 2022									
Unit : ktCO2-equivalents	LPG	Gasoline	Jet Fuel	Diesel	Total oil products	Coal	Lignite	Natural Gas	Total
Ton CO2/Toe (IPCC):	2.64	2.90	2.99	3.10		3.96	4.24	2.35	
Total	1 049	976	37	1 234	3 296	3 532	239	389	7 457
Fossil power plants	0	0	0	0	0	1 494	0	174	1 669
FINAL CONSUMPTION	1 049	976	37	1 234	3 296	2 038	239	215	5 788
Industry - steel	0	0	0	0	0	0	0	0	0
Industry - chemical	0	0	0	0	0	0	0	0	0
Industry - non metallic mineral	0	0	0	0	0	896	26	0	922
Industry - food processing and beverage	0	0	0	0	0	5	0	0	5
Industry - construction	0	0	0	0	0	0	0	0	0
Industry - mining	0	0	0	0	0	18	28	0	45
Industry - machinery	0	0	0	0	0	21	0	0	21
Industry - non ferrous metals	0	0	0	0	0	63	0	213	276
Industry - paper and pulp	0	0	0	0	0	5	0	0	5
Industry - transport equipment	0	0	0	0	0	0	0	0	0
Industry - textile and leather	0	0	0	0	0	11	0	0	11
Industry - miscellaneous	0	0	0	0	0	97	31	0	128
Transport - road	0	976	0	996	1 973	0	0	0	1 973
Transport - rail	0	0	0	21	21	4	0	0	24
Transport - domestic air	0	0	37	0	37	0	0	0	37
Transport - navigation	0	0	0	0	0	0	0	0	0
Households	0	0	0	0	0	862	155	0	1 017
Services	0	0	0	0	0	5	0	0	5
Agriculture & Fishery	0	0	0	217	217	0	0	0	217
Non energy - chemical feedstocs	1 049	0	0	0	1 049	52	0	2	1 102

Next, the non-CO_2 emissions in the energy sector, as well as emissions from non-energy sector were entered as shown in Table 7 , resulting in the total of 19,444 kt CO_2 eq in 2022. Please note that small difference in total GHG emissions from official GHG inventory (19,468 kt CO_2eq) is due to the fact that GACMO tool combines anthracite, sub-bituminous coal and other bituminous coal into one fuel category with one emission factor, whereas in GHG inventory the emissions from these fuels are calculate separately with individual emission factors.

Table 7. Nonenergy Emission table from "GHG Balance" sheet of GACMO model

Non-CO_2 emissions from fuel combustion, non-fuel combustion sectors	ktCO_2e
CH4 from energy combustion	455
N2O from energy combustion	55
Total Agriculture	7 017
Enteric fermentation	4 653
Manure management	682
Rice cultivation	59
N_2O from agricultural soils	1 623
Burning of agricultural residues	
Fugitive (CH_4)	246
Forestry	-724
Waste - solid	981
Waste - liquid	1 212
Industrial processes	2 744
Total Non-CO_2 emissions from fuel combustion, non-fuel combustion sectors	11 987
Total GHG emissions	19 444

Since the purpose of this exercise is to assess the impact of mitigation actions and not to develop the scenarios, the GACMO's feature for scenario development has not been applied.

Mitigation actions assessed

11 mitigation actions were included in Tajikistan's BTR. Among these, the impact of 5 actions can be estimated using mitigation options available in the GACMO tool. Table 8 lists all these actions and identifies mitigation options used in GACMO.

Table 8. List of mitigation actions in BTR and mitigation options used to assess them in GACMO

#	Name	Objectives	Mitigation Option in GACMO
1	Supporting the development and use of non-traditional (renewable) energy sources	Increase the share of renewable energy sources in electricity generation and demand sectors.	GACMO includes a large variety of mitigation options for renewable energy power plants and therefore the impacts of this action has been estimated in GACMO. The following mitigation options have been used: • Hydro power connected to main grid • Mini hydro power off grid • Solar PVs, large grid • Wind turbines, onshore The Activity unit for all these actions in 1 MW of installed capacity.

#	Name	Objectives	Mitigation Option in GACMO
2	Modernization and expansion of district heating network and infrastructure In Dushanbe	Phase out coal in more than 20 coal-fired boiler houses; Modernize, climate-prove, and expand district heating network and infrastructure.	GACMO includes the option for the "modernization of district heating system" with the unit of 100,000 flats supplied. However, the modeled option assumes the use of 2 biomass boilers that are replacing the heavy fuel oil boilers. This is not in line with the mitigation action for Dushanbe, and therefore the impact of this measure has not been estimated in GACMO.
3	Modernization of electric grid	Reduce electricity losses to 10% by 2030 in the country.	GACMO includes the measure for "Efficient electric grids" with the unit of Activity of 1Gwh reduced. Information is available and therefore the impact of the measure has been estimated.
4	Modernize and expand energy-efficient city-wide street lighting in Dushanbe	Substitute old, inefficient lamps with LED lamps for street lighting in Dushanbe	GACMO includes the measure for "Efficient street lights" with the unit of Activity of 1000 bulbs replaced. Information is available and therefore the impact of the measure has been estimated.
5	Ban on the import, manufacturing and sale of inefficient light bulbs	Phase out the use of inefficient bulbs for lighting	GACMO has several measures for lighting both in households or in the services. However, the activity units of these measures are 1000 bulbs replaced. It can be assumed that all bulbs will be replaced with LED bulbs in the country due to this measure, however the total number of bulbs in the country is not known and cannot be estimated since there are no detailed studies of energy consumption patterns in households or services.
6	Support to E-mobility (electric taxi fleet and charging stations)	Increase the number of electric vehicles.	GACMO includes the measure for "Electric cars" with the unit of Activity of 1000 cars. Information is available and therefore the impact of the measure has been estimated.
7	Development of electric public transport (trolleybuses)	Develop public transport using trolley buses in several municipalities.	GACMO doesn't include the options related to trolleybuses and therefore the impact of this measure has not been estimated.
8	Implementation of Kigali Amendment	Phase down HFCs.	GACMO doesn't include the options related to HFCs and therefore the impact of this measure has not been estimated. However, the reductions can be easily calculated outside of GACMO using the targets of Kigali agreement. However, these are not calculated in this report.
9	Increasing the number of highly productive livestock	Increase the productivity of livestock.	GACMO doesn't include the options related to livestock and therefore the impact of this measure has not been estimated.

#	Name	Objectives	Mitigation Option in GACMO
10	Afforestation/reforestation activities and development of forest plantations	Creation and restoration of more than 15 thousand hectares of forests adapted to local conditions and climate change; doubling forest productivity; cessation of livestock grazing on 30 percent of forest areas.	GACMO includes the measure for "Reforestation" and "Assisted forest regeneration" and therefore these parts of the measures has been estimated.
11	Protection of pastures	To increase the reserves of natural pasture vegetation using modern technologies by sowing seeds of natural pasture vegetation, nutritional value and increasing productivity of pastures	GACMO doesn't include the options related to pastures and therefore the impact of this measure has not been estimated.

Assessment of individual measures

This chapter describes the activity data and parameters used to assess individual measures in GACMO and obtained results.

Measure #1. Supporting the development and use of non-traditional (renewable) energy sources

The latest program on renewable energy sources 2023-2027 envisions to increase the production capacity of the country's energy system by 32.2 MW due to the use of energy resources from renewable energy sources (water, sun and wind). These include 11 small hydroelectric power plants with a combined capacity of 0.760 MW in remote and highland villages of the Gorno-Badakhshan Autonomous Region (assumed to be off-grid), solar power plants with a capacity of 14.374 MW, and wind power plants with a capacity of 3.084 MW. The rest was assumed to be the grid-connected hydro plants.

Table 9 shows the individual assumptions for measures in terms of installed capacity by 2030, and the results expected in terms of GHG emission reductions.

Table 9. Mitigation Option in GACMO with assumption on activity levels by 2030 and resulted emission reduction for measure #1.

Type	Reduction option	Sub-type unit	Units penetration by 2030	Emission reduction in 2030 per option, $ktCO_2e$/year
Hydro	Hydro power connected to main grid	1 MW	13.98	6.33
	Mini hydro power off grid	1 MW	0.76	2.46
Solar	Solar PVs, large grid	1 MW	14.374	3.00
Wind	Wind turbines, on-shore	1 MW	3.084	0.88
Total				12.67

Table 10 below shows other set of important assumptions, taken as default values from GACMO:

Table 10. Relevant important parameters for measure #1.

Parameter	Unit	Value
Capacity factor of grid-connected hydro power plants	Full time hours	3 960
Capacity factor of off-grid hydro power plants	Full time hours	4 000
Capacity factor of grid-connected solar power plants	Full time hours	1 825
Capacity factor of grid-connected wind power plants	Full time hours	2 500
Efficiency of diesel generator used as reference point for off grid power plants	%	33

Measure #3. Modernization of electric grid

The National Development Strategy (NDS) of the Republic of Tajikistan for the period up to 2030 sets the target to modernize the electric grid in order to reduce losses, improve the reliability of power supply and the support the increased use of various renewable energy sources. The aim of the action is to reduce power losses (both technical and economic) to 10% in the country by 2030.

Table 11 shows the individual assumption for this measure in terms of reduced electricity demand, and the expected results in terms of GHG emission reductions.

Table 11. Mitigation Option in GACMO with assumption on activity levels by 2030 and resulted emission reduction for measure #2.

Type	Reduction option	Sub-type unit	Units penetration by 2030	Emission reduction in 2030 per option, $ktCO_{2e}$/year
Energy distribution	Efficient electric grids	1 GWh loss reduction	2 637	301.46

Table 12 below shows the calculation of reduced electricity demand from GACMO.

Table 12. Calculation of the reduction in electricity demand (loss reduction)

Reduction option: More efficient grid	Unit	Value
Grid loss		10.0%
Electricity consumption in 2022	GWh	14 596
Loss of production	GWh	1 622
Loss reduction	GWh	2 637
Reference option: Old grid		
Grid loss		22.6%
Loss of production	GWh	4 259

Grid losses in existing grid and 2022 electricity consumption are taken from 2022 electricity balance (see Table 4).

Measure #4. Modernise and expand energy-efficient city-wide street lighting in Dushanbe

Dushanbe plans to substitute 2,377 old, inefficient lamps with LED lamps and introduce additional features including smart control and monitoring systems and retrofitting of selected lamp posts to integrate EV charging points.

Table 13 shows the individual assumptions for this measure in terms of number of replaces bulbs, and the results expected in terms of GHG emission reductions.

Table 13. Mitigation Option in GACMO with assumption on activity levels by 2030 and resulted emission reduction for measure #4.

Type	Reduction option	Sub-type unit	Units penetration by 2030	Emission reduction in 2030 per option, $ktCO_{2e}$/year
EE Service	Efficient street lights	1000 lights	2.377	0.23

Table 14 shows the other set of important assumptions, taken as default values from GACMO.

Table 14. Relevant parameters for measure #4.

Parameter	Unit	Value
LED Lamp Wattage	W	100
Sodium Lamp (reference) Wattage	W	250
Daily usage	hours	12

Measure #6. Support to E-mobility (electric taxi fleet and charging stations in Dushanbe)

Shifting to electric taxis in the city of Dushanbe started in 2021 facilitated by the Electric Transport Development Program and initiatives from private sector and donor support. Currently, there are 12 taxi rental companies in Dushanbe, with 4,350 vehicles. As of June 6, 2024, out of 4,350 vehicles, 2,451 are electric. On July 15, 2024, BAIC, a Chinese automotive brand, announced the delivery of the first batch of 1,000 brand-new BAIC EU5 vehicles to Dushanbe, where they will serve as taxis for local residents.

To assess the impact of this measure by 2030, it is assumed that all 4350 taxis will be electric in Dushanbe by 2030.

Table 15 shows the individual assumption for this measure in terms of number of electric vehicles by 2030, and the results expected in terms of GHG emission reductions.

Table 15. Mitigation Option in GACMO with assumption on activity levels by 2030 and resulted emission reduction for measure #6.

Type	Reduction option	Sub-type unit	Units penetration by 2030	Emission reduction in 2030 per option, $ktCO_{2e}$/year
Transport	Electric cars	1000 cars	4.350	6.02

Table 16 below shows other set of important assumptions. The methodology assumes that electric vehicles replace the gasoline fuelled conventional vehicles. The default value for annual distance in GACMO was 12,000km, however it was changed to 90,000km to account for the fact that taxis drive more than average cars.

Electricity consumption and gasoline consumption were also adjusted to reflect the characteristics of Tajikistan's vehicle fleet.

Table 16. Relevant important parameters for measure #6.

Parameter	Unit	Value
Annual distance	km	90 000
Electricity consumption of electric vehicle	km/kWh	7.1
Energy consumption of alternative gasoline conventional vehicles	km/l	7.7

Measure #10. Afforestation/reforestation activities and development of forest plantations

Forestry sector program for 2022-2026 includes actions, among others, to plant new forests in the amount of 1 000 hectares per year (which makes the total of 5 000hectares) and restore degraded forests (sowing, planting, measures to protect and guard the forest) in the amount of at least 2 000 hectares per year (total of 10 000 hectares). Further forest improvement targets include assistance in natural regeneration, enhanced protection and measures to protect degraded forests in the amount of at least 8 000 hectares per year (total of 40 000 hectares) and care, creation and restoration of forests within 5 years (32,400 hectares). These all have been aggregated into the single GACMO option of "Assisted Forest regeneration".

Table 17 shows the individual assumptions for measures in terms of installed capacity by 2030, and the results expected in terms of GHG emission reductions.

Table 17. Mitigation Option in GACMO with assumption on activity levels by 2030 and resulted emission reduction for measure #10.

Type	Reduction option	Sub-type unit	Units penetration by 2030	Emission reduction in 2030 per option, ktCO2e/year
Forestry	Reforestation	Reforestation of 1000 ha	5	18.33
	Assisted forest regeneration	Restoration of 1000 ha	82.4	302.13
Total				320.46

Table 18 below shows the other set of important assumptions, taken as default values from GACMO:

Table 18. Relevant important parameters for measure #10.

Parameter	Unit	Value
Forest density	t dry matter/ha	100
Time for forest growth	years	50

Recommendations

To improve the estimates shown in this report, the values of individual parameters for each action can be updated to better reflect Tajikistan's context, instead of using GACMO's default values. To do this, some additional data collection may be needed.

In addition, the activity data changes for each measure can be done for individual years (2025, 2030, 2035), instead of just one year as it was done in this assessment. To do this, quantitative goals need to be developed for each of these actions for these years.

The purpose of this assessment is to illustrate the possibility of using relatively simple tools such as GACMO, to assess the impacts of mitigation actions. While the GACMO tool can be easily applied to perform rapid assessment of mitigation actions, it has some limitations. The main limitation of GACMO is that the mitigation options are predefined, and their methodologies are fixed. The user needs to investigate and understand the methodology behind each mitigation action to be able to properly and correctly match it with the action that he intends to assess. Such example would be the GACMO option "modernization of district heating system" which doesn't match with the "Modernization and expansion of district heating network and infrastructure In Dushanbe" from Tajikistan's BTR. The methodology of the former assumes the replacement of oil-fired boilers with biomass fired ones, whereas the Dushanbe measure relates to modernization and expansion of district heating network and infrastructure and phasing out the coal-fired boilers.

For complete reporting in the next BTR of achieved and expected results of PaMs, together with the projections, it is recommended to use more comprehensive tool which would allow more flexibility in developing scenarios, assessment of power sector measures, as well as adding any type of mitigation action of interest and assessing combined effects of several actions.

In certain cases (for example to assess the HFC emissions reduction potential), the calculations can be easily made in Excel, outside of any tool.