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Greenhouse Gas Abatement Strategy

8.1. Strategy's objectives

In order to implement the national commitments to the UN Framework Convention (articles 4 and 12 of the Convention), the Tajik Government provides development, acceptance and realization of measures aimed at addressing the problem of anthropogenic emissions by sources and removals by sinks of greenhouse gases.

Such measures are developed in accordance with long-term national priorities of the Republic of Tajikistan, which include improvement of population well being on the basis of sustainable development, infrastructure enhancing and ecological security. The realization of these measures is a complex task on a nationwide scale and requires the coordinated actions of governmental ministries, departments, non-governmental organizations and the general public.

The strategic objective is to develop a set of effective measures to reduce GHG emissions, enhance the state of carbon natural sinks in the relevant sectors of the national economy, improve energy efficiency, develop renewable energies and reduce fossil fuel consumption.

Based on the appropriate decisions of the Conference of the Parties to the UN Framework Convention, the Government determines the following basic tasks as part of this strategy:

- Enhancement of energy efficiency in relevant sectors of the national economy;
- Application of effective technologies and use of energy sources in the national economy that promote high rates of economical growth and reduce or limit greenhouse gas emissions;
- Protection and enhancement of natural sinks and reservoirs of greenhouse gases;
- Promotion of sustainable forest management practices, forestation and reforestation;
- Promotion of sustainable forms of agriculture in light of climate change considerations;
- Research on, promotion, development and increased use of, new and renewable energies, advanced, innovative, and environmentally sound technologies;
- Encouragement of appropriate reforms in relevant sectors aimed at promoting policies and measures, which limit or reduce the emissions of greenhouse gases.

8.2. Strategy's priorities and frameworks

The selection of measures on limitation and reduction of GHG emissions in relevant sectors is based on expert assessments, specific needs of national ministries, and international avant-garde scientific achievements.

The national and sectoral programs, plans and strategies on environmental protection and socio-economic development of the republic were analyzed to ensure adequate coverage of all influencing factors.

A set of measures of this strategy and its priorities were discussed on a series of meetings for experts involved in relevant fields, round tables and national workshops.

State policy and concrete measures aimed at limitation or reduction of GHG emissions that provide cost efficiency and maximum effect are based on:

Application of economic regulation tools;

Institutional strengthening of structures responsible for realization of nature protection measures;

Implementation of technical measures aimed at direct GHG emissions reduction, improvement of energy efficiency, etc.

The developed measures are focussed on republican, regional, local, and also on sectoral, institutional, public and individual levels.

8.3. Measures on energy efficiency, energy conservation and reduction of GHG emissions in the Energy sector

The analysis of GHG inventory in the Energy sector shows that greenhouse gas emissions in Tajikistan occur mainly as a result of fossil fuel consumption, i.e. fuel use and combustion in transport, residential, industrial and other sectors.

Hence, it is necessary to consider the measures on GHG emission reduction in the Energy sector, first of all in the sphere of fuel consumption. The basic measures in this direction are:

State regulation of rational fuel and energy use in all spheres and on all levels of production and consumption;

Formation of new and improvement of existing legislative bases, and also appropriate structures of management, training and control, which will allow further maximum involvement of tools for GHG emission reduction to minimal possible level. Thus, it is important to maintain the instrumental control over greenhouse gas emissions and electricity consumption in various sectors of the national economy and residential services;

Development and realization of the programs on energy supply improvement at industrial and agricultural enterprises with application of new energy saving technologies, and use of secondary energy and thermal resources for own consumption.

Basing on these principles, in this strategy the following priorities on energy efficiency and GHG emission reduction are determined:

Production, processing, storage and transportation of fuel:

Improvement of ventilating systems in underground mines and utilization of methane;

Modernization of the petroleum storage facilities;

Modernization of the flare facilities;

Outflow reduction in main gas pipelines;

Utilization of excess pressure in main gas pipelines;

Replacement of out-of-date gas distributing equipment;

Accident risk decrease at gas pipelines;

Natural gas clearing efficiency increase with regard to sulphur content and gas dehydrating.

Energy:

Reconstruction and improvement of electrical networks, substations, transformers and cable production, that can potentially reduce electricity loss of by 30-40%;

Improvement of thermal systems and insulation of buildings, that can save about 25-30% of energy;

Introduction of independent heating systems and closed circuit hot water supply;

Rehabilitation of equipment at large and small hydropower plants;

Construction of mini and microhydropower plants, especially in remote high-mountain regions with lack and/or deficiency of electricity that will considerably reduce the use of coal and wood fuel for meeting energy demands and will improve social development level.

According to expert estimates, the construction of large hydropower plants such as Rogun hydropower plant, Sangtuda hydropower plant, hydropower installations on the Zeravshan and Kafirnigan rivers with the development of appropriate infrastructure have the greatest potential for CO₂ emission reduction in the Energy sector, which could total 6-9 million tonnes of CO₂ a year in the mid-term prospect. At the same time GHG emission reduction costs are minimal. The increase in the number of large hydropower plants is a priority for the energy sector development in Tajikistan.

However, negative influence from construction and operation of large reservoirs on ecological conditions of surrounding regions (ground water level raising, biodiversity loss, increase of seismic risk) is a cause of concern voiced by scientists and the general public.

Therefore, alongside the construction of large hydropower plants, other activities should be implemented that also have significant effects on both GHG emissions reduction and energy efficiency.

Transport:

Construction of new and unification of existing roads and communications, in particular tunnels under mountain passes, that can reduce the extent of motorways, improve their quality and reduce fuel consumption by 25-30%;

Introduction of technologies for improvement of fuel quality aimed at reducing harmful substance emissions;

Encouragement of use of motor vehicles with more economic gasoline internal combustion and diesel engines;

Switching of public transport to alternative fuels, in particular liquefied gas;

Electrification of railway and development of urban electrical transport;

Development of alternative transport;

Optimization of cargo and passenger traffic circuits;

CO₂ emission reduction amongst light vehicles, which are most popular in the republic, to a level of 120-150 gram CO₂/km;

The control of volume and concentration of exhaust emissions;

Expansion of the application of exhaust emission rationing tools and mechanisms.

Residential services and commercial sector:

New approach in planning, design and construction of residential and commercial buildings, with application of high-tech materials for walls, roofs, windows, etc;

Transition to modern lighting equipment, in particular luminescent lamps, halogen infrared lamps, automatic systems of street illumination, etc;

Improvement of heating systems efficiency, enhancing conditioning and maintenance to microclimate of residential buildings;
Installation of gas consumption control systems and development of advanced consumption norms;

8.4. Promotion of the development of renewable energies

The unique nature-climatic conditions of Tajikistan favor a high potential and diversity for the possible use of renewable energies: solar, wind, biogas, and hydropower.

Most of the population resides in rural areas, and the adequate provision of environmentally friendly energy is a basis for sustainable development of rural and mountain regions, which also ensures a rational use of natural resources. The complex use of non-traditional renewable energies would help to solve many problems of nature protection, including GHG emission abatement and prevention of forest cuttings.

Solar energy. Due to its geographical conditions, Tajikistan is one of the most appropriate regions for applying solar power. There are 280-330 sunny days a year; intensity of solar radiation reaches 1 kW/sq.m and more.

Solar irradiation on a horizontal surface, when the sky is clear, in midday reaches 0.33-0.81 kW/sq.m in the valleys, and 0.46-1.02 kW/sq.m in the mountains. Clouds reduce solar radiation. On average, clouds lower radiation by 32-35% in lowlands and 50% in highlands.

Total solar irradiation is calculated on the basis of incoming and dispersed radiation on a horizontal surface. Total solar irradiation reaches its maximum in May-July. The intensity of total solar irradiation varies from 280 to 925 MJ/sq.m in piedmont regions, and from 360 to 1120 MJ/sq.m in highlands.

Conversion of solar irradiation into electricity is based on the use of photovoltaics. Conversion efficiencies of silicon cells continue to improve with 24.4% efficiency obtained in the laboratory for monocrystalline cells and 19.8% for multicrystalline, though commercial models are only obtaining 13-17% efficiency. Modules currently retail for around US\$ 4,000-5,000/kW. Present generating costs are relatively high (US\$ 0.2-0.4).

At present, the national Academy of Sciences researches the potential of solar energy use and develops prototypes. According to expert estimates, a typical solar station produced in Tajikistan can potentially avoid 0.30-0.35 tonnes of CO₂ a year.

However, at the moment the high potential of solar energy in Tajikistan remains unutilized. According to estimates of the Physical-Technical Institute, Tajik Academy of Sciences, utilization of solar energy available in Tajikistan could satisfy national energy demands by 10-20%.

Wind energy. Theoretical wind power potential in Tajikistan, according to different estimates, amounts at some 30-100 billion kWh/year, and is comparable with hydropower potential.

Mean annual wind speed in Tajikistan varies from 0.8 to 6.0 m/sec at 10 meters above ground. Wind direction and speed greatly depends on atmospheric circulation and landscape. The strongest winds blow in highland areas (Fedchenko Glacier, Anzob mountain pass, etc.) and in the areas where landscape favor to convergence of air flows (Khujand, Fayzabad). Mean annual wind speed in these areas reaches 5-6 m/sec. In the open lowlands and wide valleys - little bit less (3-4 m/sec). In closed lowlands mean annual wind speed does not exceed 1-2 m/sec.

During the year, the highest wind speeds are observed in spring and winter, under cyclones. The lowest wind speed occurs in summer and autumn. Meteorological observations show that the wind speed 1-5 m/sec has the highest recurrence (70-90%) in most regions. Wind velocities higher than 10 m/sec are rare, and their occurrence does not exceed 10%. In the valleys and intermountain depressions, there are 5-15 windy days per year (Istravshan, Dushanbe, Iskanderkul). In other regions, the number of windy days reaches 40-60 (Khujand, Shakhristan and Anzob passes, glacier Fedchenko etc.).

The use of wind power is promising in some regions of the republic where the wind speed is relatively high (more than 5-6 m/sec at 10 m above ground: Khujand, Kayrakkum, Faizabad, the passes of Khaburabad, Shakhristan, Anzob, and other places). The power of wind can be applied for electricity generation, elevation of water for irrigation, grain grinding etc. Typically wind turbines have a capacity of 250-270 kW. The generating costs depend on mean annual wind speed, and varies within \$0.03 (10 m/sec) - \$0.12 (5 m/sec).

Although hydropower energy prevails, application of wind power as an autonomous supplementary small-capacity source of energy is justifiable in certain regions.

It should be noted that wind energy production on an industrial scale requires the exploitation of large territories. It is therefore important to conduct research of all related aspects.

Biogas. Agriculture and forestry wastes can become additional power sources by means of generating biogas, whereas raw material would be an effective fertilizer for agriculture. In conditions of large cattle-breeding complexes and poultry factories, totaling 20 in Tajikistan with the number of animals ranging from 400 to 800, it is possible to produce electrical and thermal energy and reduce methane emissions.

Biomass decay leads to the formation of by-products such as methane, liquid methanol, and wood charcoal. The most promising option of biomass utilization in Tajikistan's condition is biogas generation by means of anaerobic fermentation of manure. Such biogas contains both CH_4 and CO_2 . Final energy can reach 60-90% of initial energy. The output of gas makes 0.2-0.4 cub.m on 1 kg of dry manure under normal conditions. A biogas generator with a capacity of 1-3 cub.m and daily consumption of about 8 kg of manure produces up to 2 cub.m of biogas. The costs of biomass generator range from US \$300 to \$600.

In addition, there is the potential opportunity to produce energy by thermo-chemical method of biomass conversion using cotton residues, which is the basic crop in Tajikistan.

Hydropower resources. Potential hydropower resources of Tajikistan are estimated at 527 billion kWh a year. At present, only 5% of this potential is being used. More than 95% of all generated electricity (about 15-18 billion kWh/ year) is being produced by hydropower plants (HPP). Most of the hydropower resources are concentrated on big rivers such as Vakhsh, Pyanj, Obihingou and others, flowing in deep rocky canyons.

For Tajikistan, in the context of climate change mitigation, the greatest interest is represented by small hydropower engineering, opportunities for developing such are available in most of the mountain regions.

According to estimates, the utilization of 10% of hydropower potential of small rivers in mid- and high-mountain regions could provide electricity to 70% of settlements and rural infrastructure that suffer from an energy resource deficit. A feasibility assessment has confirmed the efficiency of micro and small hydropower stations in remote regions.

During wintertime, hydropower plants cannot generate enough power due to water conservation, and harsh climate i.e. ice events etc. In this time the national power supply network is overloaded. Nurek HPP is the biggest in Tajikistan, with an operating capacity of 3,000 MW. During the summer, HPPs produce an abundance of electricity with enough excess water to be used for irrigation. It should be noted that big HPPs and thermal power plants supply electricity to the cities and industrial enterprises. Small settlements in remote regions face lack of electric power.

In rural areas of Tajikistan, annual consumption of electricity comprises 200 kWh, whereas in neighboring countries this indicator rises to 300 kWh. Some 80% of electricity consumption in highland areas is used for lighting. In some places population does not have access to electricity at all: Komarow, part of Romit canyon, highland Matcha, and others. Major energy sources for these regions are wood, coal, and oil products.

At present, development of small hydropower engineering is an important factor for improvement of socio-economic conditions in mountain regions and the prevention of forest cuttings. In the republic, there are some 20 small hydropower stations in operation.

The regions with the greatest prospects for installation of a micro and mini HPP in the Pamirs are middle and high mountain areas, i.e. Kalai-Khum, Vanch, Rushan. Some 20 micro and mini HPPs with total a capacity of 18 thousand kW can be installed here.

Additionally there is an opportunity to install some 100 small HPPs in Karategin region.

The abundant hydropower resources of the Zeravshan river basin are as yet unused, mainly because little investigation to discover the potential for hydropower development of this region has taken place.

Small hydropower stations have several advantages over large ones, these are: smaller capital investment during design, construction and operation, few ecological risks, affinity to the consumers. These are important conditions for a country like Tajikistan.

The costs of small HPPs vary from US \$800 to \$1500/kW. It is interesting to note that the cost of Nurek HPP was US \$300/kW. Present generating costs for hydropower are low (US \$ 0.04). The pay back period for a micro HPP is 3-5 years.

On the basis of the above-mentioned analysis, the following measures on development for renewable energies in the national economy and livelihoods of Tajikistan can be identified:

Development of state policy in the sphere of development of renewable energies and promotion of electricity supply in remote mountain regions;

Monitoring, zonation and assessment of renewable energies potential;

Development of a database and access to international databases on renewable energy equipment; selection and application of effective devices for Tajikistan's conditions (mini- and micro hydropower plants, photo-voltaic converters, solar water heating equipment, wind energy turbines, biogas devices);

Creation of a new and strengthening of existing industrial and research capacities for development, manufacturing and research on efficiency of renewable energy equipment;

Improvement of legislative mechanisms that promote the development of renewable energies, including energy saving, privileges to the producers and consumers of renewable energy etc.

Training and preparation of experts in the field of renewable energy, exchange of experience with developed countries' specialists;

Raising public awareness on the application of renewable energies and demonstration their advantages in comparison with traditional fuels.

8.5. Measures on energy efficiency and GHG emissions reduction in Industrial sector

The limitation and reduction of GHG emissions that occur as a result of industrial processes are possible by updating of existing out-of-date technologies and introducing new modern energy efficient technologies with low parameters of GHG emissions and other harmful gases.

The main greenhouse gases in industry are CO₂ and perfluorocarbons. Additionally there are emissions of such gases as CO, NO_x, SO₂ etc. The industry is responsible for 20-30% of all national harmful emissions.

At the Tajik Aluminum Plant all technological installations that emit harmful gases into the atmosphere are supplied with purification systems. Fluoride-containing gases are transported to the fluoride handling room and return for electrolysis after regeneration. The efficiency of existing methods of harmful emission purification makes around 80-90%.

Nevertheless, concerning the climate change problem the Tajik Aluminum Plant represents itself as the main stationary source of pollution. Aluminum smelting leads to the emissions of perfluorocarbons (CF₄ and C₂F₆) in the amount of 1.2-1.4 kg per 1 tonne of raw aluminum.

The emissions of perfluorocarbons greatly contribute to the effect of global warming. The gas CF₄ affects global warming by 6,500 times more than the main anthropogenic greenhouse gas CO₂. Aluminum smelting surpasses in emissions of CO₂-equivalent such sectors as transport, chemical industry etc. Therefore, the reduction of emissions from aluminum smelting is of high priority for climate change mitigation. The reconstruction of gas purification facilities at electrolysis rooms and computerization of technology are necessary.

At the "Tajik Cement" enterprise the reconstruction of the basic manufacturing process is necessary to incorporate the "dry method" with replacement dust cleaning filters and gas purification facilities. Considering the present status of cement manufacturing, and also taking into account the high recreational potential of the Varzob area, which borders the plant, it is feasible not to restore the plant with former technology, but modernize this industry with new technology. This will considerably reduce energy consumption, water use and emissions of particles. Besides, to decrease ecological pressures it would be advisable to lower the capacity of the plant to 400-600 thousands tonnes of cement a year, and construct a new cement plant of the same capacity in the south of republic, taking into consideration the wind factor.

At the enterprise "Azot" (Vakhsh nitrogen fertilizer plant) it is necessary to complete construction of a biological sewage disposal plant that will reduce GHG emissions from industrial wastewater and solve the problem of communal wastewaters of Kurgan-Tube and Sarband towns. In the long-term, the replacement of copper-ammoniac clearing of converted gas by a more efficient system is necessary, that will reduce CO and CO₂ emissions, prevent copper discharge into surface waters, and save energy.

The measures of energy efficiency in industry include:

Use of highly effective electric motors, mechanisms and electric drives in all industries;

Improvement of drying systems in textile industry;

Improvement of furnaces in metal smelting, with introduction of "know-how" technologies;

Utilization of heat from clinker production in cement industry.

The basic measures on limitation and reduction of CO₂ emissions in industry are:

Modernization of technological machines and equipment in construction sector;
Transition from "wet" method of cement production to "dry" method, where the economy of energy resources up to 30% and essential CO₂ emission reduction is possible;

Reconstruction of gas purification facilities and dust filters at cement plant;

Modernization of gas purification facilities and application of electrolysis protective housings at aluminum plant;

Utilization (compression) of CO₂ which occur in the process of ammonia production for further use in food and drink industry, etc.

The basic measures on reduction of PFC emissions in aluminum industry are:

Computerization of electrolysis process of prebaked anodes;

Research on new technologies of aluminum production on non-carbon anodes that can completely avoid PFC emissions. Such technology at an existing level of scientific research is likely possible for use by 2015-2020.

8.6. Energy efficiency and GHG emission reduction in Agriculture

The CH₄ emissions in agriculture of Tajikistan occur as a result of intestinal fermentation of agricultural animals, anaerobic decomposition of manure, rice cultivation on irrigated fields, and burning agricultural residues.

Advanced scientific knowledge in the field of genetics and experience in agricultural animals selection in Tajikistan is the basis for creation of new breeds, especially cattle, with smaller intensity of intestinal fermentation and methane emission.

Analyzing the technologies of manure storage and use, it is possible to note that there is an opportunity to potentially reduce methane emissions in this sector by 10-20% by applying advanced technologies, including biogas generation.

The last years have been characterized with the substantial growth of rice production and expansion of irrigated rice fields, which are the sources of methane emission.

At the basic rice sowing in the republic, it is usual to crop late growing sorts of rice, and repeated sowing intermediate growing and early growing sorts. From the point of view of methane emission reduction, it is favorable to cultivate the early growing sorts of rice in the basic rice sowing period, but the practice shows, that they are less productive than late growing sorts. Therefore, in Tajikistan late growing sorts of rice are wide spread; its vegetation period takes 130-145 days.

For methane emission reduction in this category, it is necessary to move from a traditional method of rice cultivation to a more progressive transplanting method. The soil-climatic conditions of Tajikistan allow growing rice by this method. This method enables cultivation of two crops a year and reduction of vegetation period, that has huge value in terms of food provision in the conditions of land scarcity and methane emission reduction by 20-30%.

The N₂O emissions occur from agricultural soils as a result of application of organic and mineral fertilizers. Gaseous losses of nitrogen that is contained in fertilizers are formed by nitrification and subsequent denitrification, and are the basic reasons of nitric fertilizers efficiency reduction and N₂O emission.

For reduction of nitrogen losses and increased efficiency of mineral fertilizers application it is necessary to apply them in optimum terms and norms, in accordance with other fertilizers and in combination with a rational system of land cultivation, crop turnover and correct mode of irrigation.

The application of nitrification inhibitors is one of the basic ways for reduction of N₂O emission from agricultural soils, especially cotton crops. Other ways for N₂O emission reduction include the applying of fertilizers by band method, localization of fertilizers in soil and the application of capsule fertilizers.

The basic measures on energy efficiency in agriculture are:

- Application of economic stimulus on energy saving and use of renewable energies;
- Increased efficiency of irrigation systems, reduction of energy consumption by water pumps and agricultural equipment;

The basic measures on GHG emission reduction in agriculture are:

- Improvement of practices in the cattle breeding industry, rational feeding and regulation of the number of animals;
- Use of agricultural biomass for energy generation and the recuperation of methane from manure;
- Enhancing of rice cultivation technology;
- Optimization of agricultural crops location along with improvement of methods and norms of mineral and organic fertilizers application;
- Training of farmers on usage of new methods and technologies.

Implementation of indicated measures will promote GHG emissions reduction, the increase of agricultural productivity with reduction of water consumption, the increase of soil fertility on the basis of introduction of advanced technologies in all sectors of plant growing and cattle breeding. Realization of measures on GHG emissions reduction in agriculture will promote significant savings and reduction of anthropogenic pressures on the environment.

8.7. Enhancing natural sinks of carbon including forests and soils

Agricultural soils, where intensive agriculture is practised, and also forests and other woody biomass are sinks and absorbers of carbon. Degradation and dehumification of soils and forest cutting lead to carbon losses. The dynamics of these processes depends on human activity, management issues, manifestation of erosion processes, extent of soil ploughing, observance of cultivation technology, state of forests and annual volumes of afforestation.

Since the 1990s as a result of forest cuttings and reduction of forestation volumes the absorption of carbon by forests has reduced by 30%. This tendency continues today.

Government measures on the increase of CO₂ absorption in LUCF sector include and can be further aimed at:

- Combatting erosion processes, including salinization and swamping;
- Supplying of rural population with renewable energies and replacing consumption of wood fuels;
- Prevention of illegal forest cuttings;
- Reforestation and afforestation;
- Planting of protective forests along the motorways and agricultural fields;

Panting of trees in urban areas;
 Protection of forests from pests, diseases and fires;
 Conversion of low-density tree plantations to normal compactness with the purpose of increasing forest productivity.

The specified measures should be implemented in the context of acting and/or planned national strategies and action plans on rational use of natural resources. In addition to socio-economic and ecological benefits, these measures will promote the effective absorption and accumulation of CO₂.

8.8. GHG emission reduction in the process of waste disposal

Solid waste disposal sites in the cities and sewage disposal plants that treat communal and industrial wastewaters are the sources of methane emissions into the atmosphere. Greenhouse gas emissions, including CH₄, CO₂, non-methane volatile organic compounds, occur as a result of anaerobic decomposition of the organic fraction of wastes and have a negative impact upon the climatic system and local sanitary-ecological conditions.

In Tajikistan the contribution of this emission source makes less than 10% of the total CH₄ emissions, whereas trends of growth are insignificant. Therefore, an acceptance of only technical measures on reduction of CH₄ emissions is not economically feasible because of high costs.

For improvement of ecological and sanitary conditions of the cities, and methane emissions reduction from solid communal wastes, it is necessary to develop capacities on waste recycling in Dushanbe and Khujand cities. The volume of solid communal waste formation in these urban areas makes around 40% of national household wastes, and implementation of specified measures can reduce CH₄ emissions by 30-40% by 2015. One of the feasible measures in ecological regard is the recycling of active silt at sewage disposal plants.

The incineration of solid wastes, including energy co-generation, most of experts recognize as an unfeasible option. On the one hand it does not meet the requirements of national nature protection legislation; on the other hand, it can considerably aggravate the ecological situation in the cities if separation of wastes is not undertaken. Besides, this measure is technologically ineffective; the efficiency of the system reaches only 10-20%.

The basic measures on reduction of methane emissions in the waste sector are:

- Recycling of solid communal wastes in the cities, recirculating of metals, plastics, glasses and paper, which also considerably reduces primary energy consumption;
- Composting of wastes with high contents of organic matter, mainly in small dumps;
- Electricity and thermal energy production on the basis of biogas from active silt at sewage disposal plants;

8.9. Perspectives of adopting Kyoto Protocol to the UNFCCC

At the third session of the Conference of the Parties to the UN Framework Convention, which took place in 1997 in Kyoto (Japan) Kyoto Protocol was accepted. This document obligates developed countries, which are the Parties to the Protocol to reduce by 2008-2012 cumulative greenhouse gas emissions by 5% in comparison with 1990 levels.

For the Parties included into Annex "B" of the Kyoto Protocol, which are developed and transition countries, there are quantitative obligations on the limitation or reduction of GHG emissions. These obligations can be achieved both inside group of developed countries, and with quotations of emissions in developing countries. For developing countries, including Tajikistan, the quantitative obligations on GHG emission reduction are not stipulated. As of June 2002, the Kyoto Protocol was signed by 74 states of the world.

In the Kyoto Protocol, three major mechanisms on implementation of obligations under the UN Framework Convention are specified: (1) joint implementation, (2) emission trading and (3) clean development mechanism.

According to Clean Development Mechanism of the Kyoto Protocol (CDM), Parties not included in Annex I, will benefit from project activities resulting in certificated emission reductions. Developed countries for achieving compliance with their quantified emission limitation and reduction commitments assist Parties not included in Annex I in GHG emission reduction and/or enhancing natural sinks. Activities related to CDM can be implemented on the condition that participants of the project are the Parties to the Kyoto Protocol.

For Tajikistan, Clean Development Mechanism is one of the main sources of financial-technological assistance for implementation of measures on GHG emission reduction and enhancing natural sinks of carbon that were indicated in the National Action Plan. In light of this, the acceptance of the Kyoto Protocol to the UNFCCC is the key factor and necessary condition for successful fulfillment of national commitments under the UNFCCC and participation in Clean Development Mechanism.

For implementation of NAP measures, including investment projects and CDM projects it is necessary to:

- Accept the Kyoto Protocol to the UN Framework Convention on Climate Change;
- Develop appropriate legislation and rules that promote transfer of reduced volumes of emissions, as requested by relevant decisions of the Conference of the Parties to the UNFCCC;
- Build institutional capacity for registration and implementation of CDM projects;
- Strengthen cooperation with the CDM executive board and operational entities that certificate emission reduction;
- Promote sharing of information at private and/or state subjects on issues related to the attraction of investments into CDM projects.

8.10. Cost of measures and potential financial sources

Total cost of strategy implementation is estimated about \$US 500 millions, not including large projects. The potential sources of funding could be GEF operational programs, CDM, budgetary funding within the approved limits, and non-budgetary sources.

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