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Scenarios of Anthropogenic Emissions by Sources and Removals by Sinks of Greenhouse Gases till 2015

5.1. Methodology

The projection of macroeconomic development till the year 2015 has been prepared to determine greenhouse gas emission scenarios.

The scenarios were based both on the national methods, available information and international experience, including IPCC and UNEP recommendations.

All scenarios consider:

State policy priorities in the given sector;

The dynamics of the population number and employment;

The dynamics of GDP and deflator;

The dynamics of capital investments and investment activity;

Energy efficiency of national economy and GDP;

Leading experts and officials from the Academy of Sciences, Tajik Technical University, Tajik Met Service, Ministry for Nature Protection, Ministry of Economy and Trade, Ministry of Agriculture, Ministry of Energy, State Committee on Land Resources, Ministry of Industry, State Forest Authority have taken part in the research.

5.2. GDP and macroeconomics

During the years of independence and the reform of the public and economic system, Tajikistan created the basis for the principles of democratic development. However, the initial reformation period coincided with the economic crisis.

In the period of 1991-1996, GDP decreased by more than 60%. For the period under review, coal production reduced by 23.8 times, petroleum by 5.5 times, gas by 2.4 times, cement production by 21.6 times. A difficult situation has subsequently arisen in the agricultural sector, especially cotton growing and livestock industries.

As a result, the crisis has not only had an economic impact, but also a technological one. General assets have become considerably dated and unsuitable for effective use. With the significant reduction of industrial activity, and a decreased level of concern for energy conservation by the consumer, the energy consumption by manufacturers has increased by more than 4 times. This issue in addition with other factors, has had negative consequences on the state of education, public health services and other social spheres. The economy's decline has led to a deterioration in the quality of life experienced by the population's majority.

The implementation of economic reforms in the country has promoted a decrease of manufacture recession rates and economic stability, reducing the budget deficit. Since 1997, GDP has had consistent positive rates of growth. The economic tendencies in 1997-2001 give the rise to the belief that macroeconomics of the republic will develop in forthcoming years.

According to expert estimates, taking into account the economic development tendencies of the previous years and socio-economic development in the mid-term, GDP could increase by 3.5 times by 2015 in comparison to the level of 2000. Thus, the rates of GDP growth are projected at a level of more than 6% a year (fig. 5.1).

The increased production of petroleum, gas condensate and natural gas is possible under the reconstruction of oil and gas wells. It has been planned to restore and start operating 34 oil and gas wells by 2015, which will allow the production of oil products, including gas condensate, at an annual rate of 80 thousand tonnes, and natural gas up to 265 million cub.m. It would exceed year 2000 production levels by 3.6 and 7.2 times, accordingly. The recommencement of operational oil refining factories will allow processing of crude oil in the republic.

The construction of new oil refining factories with a capacity 500 thousand tonnes, both in the north and the south of the republic, and Khudja Sartezi gas-field development for liquefied gas production is supposed. The implementation of these measures will improve the supply of energy resources to the population (fig. 5.2).

It is planned to increase coal production in the republic to a level of 200 thousand tonnes a year by 2015. It is likely that in the long term coal mining will be conducted in a greater volume by open-air method.

According to forecasts, by 2015 the aluminum production in Tajikistan will increase by 1.9 times in comparison with that of 2000 and will exceed the level of 1990.

High industrial parameters in the aluminum industry are planned to be achieved by:

The increase of electrolysis efficiency;

The introduction into operation of conserved electrolyzers and annual repair of operating electrolyzers;

Involving of secondary resources into industrial production (recycling).

The modernization of technology and expansion of the chemical product market will stipulate growth of this branch by 2015, especially ammonia manufacturing. According to expert estimates, the volume of chemical product manufacture will increase 10 times in comparison with 2000 levels and exceed that of 1990.

The republic's agricultural potential can be increased by reforming ineffective collective farms and state farms and replacing them with rental based farms, cooperative societies, associations and joint-stock companies. Now, there are more than 14 thousand large, average and small farms and agriculture organizations in the republic.

The following basic tasks are planned to be achieved within the agricultural sector by 2015:

Complete supply of needed products for the republic, where the capacity for their manufacture is available (vegetables, potatoes, fruit, grapes, etc);

Double 2000 levels of cotton production, rising the production volume to a level of 800 thousand tonnes a year;

Satisfy the needs of the population and the national economy in cereal products to increase grain production to 1.1 million tonnes;

Increase the number of cattle and poultry on average by 15-30%.

Thus, Tajikistan having sufficient agricultural-industrial potential contributes at some level to global climate change. Hence, macroeconomic development forecasts and GHG emission projections are the basis for the development of measures on GHG emission reduction and increased efficiency of resource use (fig. 5.3).

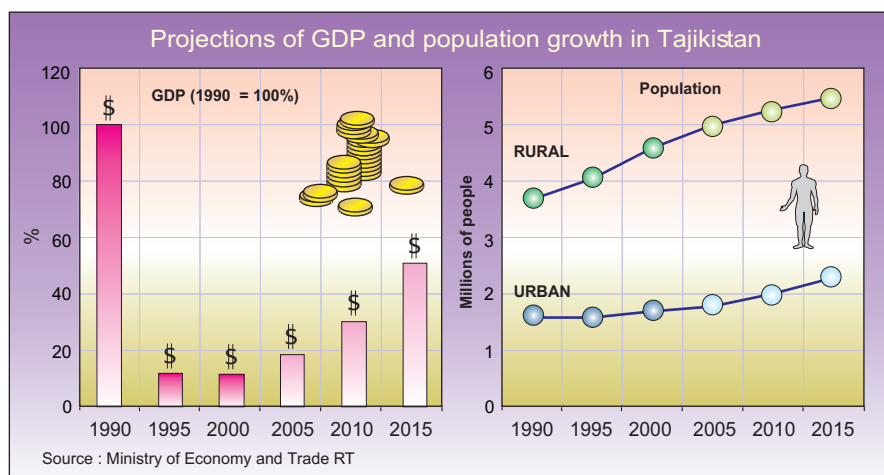


Fig. 5.1.

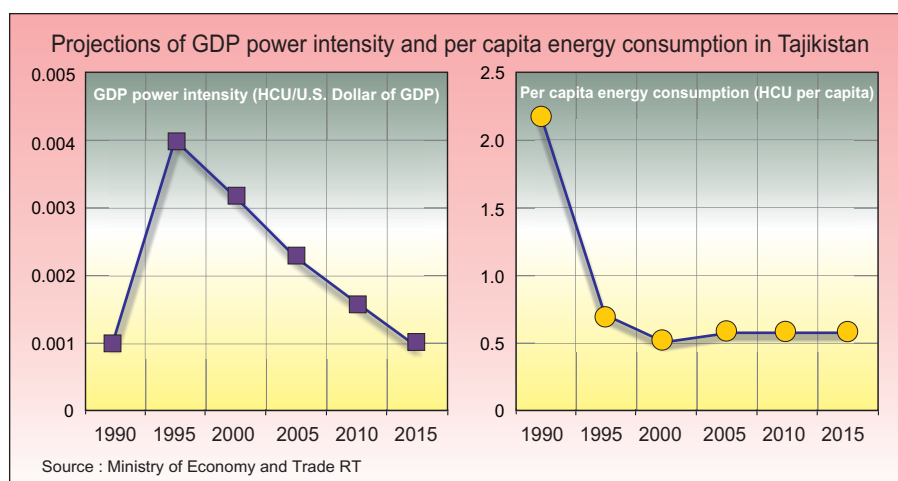


Fig. 5.2.

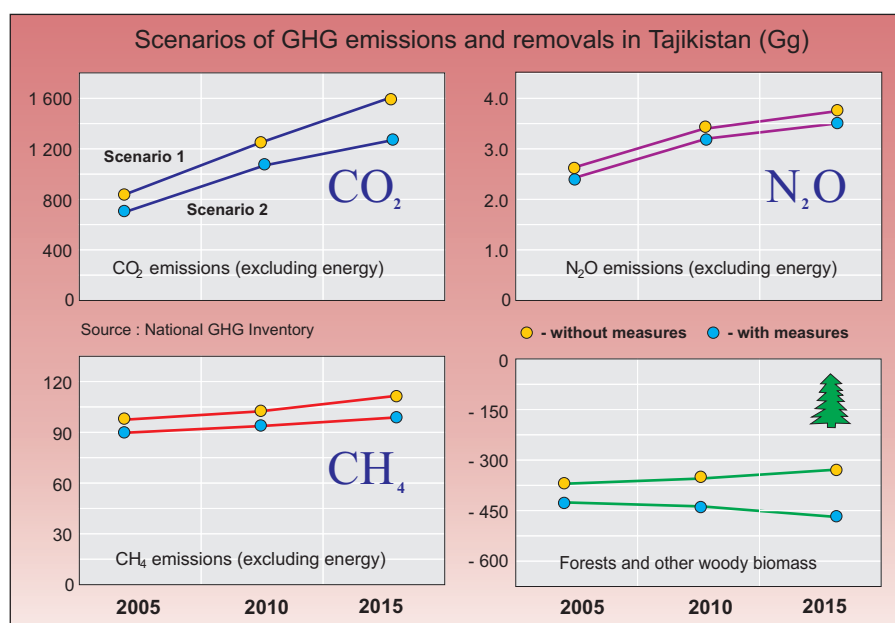


Fig. 5.3.

5.3. Energy sector

According to the national GHG inventory of Tajikistan, the main source of CO₂ emission is anthropogenic activity related to energy production and consumption. The energy sector contributes about 80% of all CO₂ emissions. Most energy-related CO₂ emissions are formed by gaseous fuel combustion, a lesser amount by liquid and an insignificant amount by solid fuel combustion. Most CO₂ emissions occur in residential, industrial and transport sectors.

According to expert estimates, energy consumption levels in Tajikistan will increase by 2015 compared to that of 2000. Taking into account the current level of fossil fuel production cannot meet the country's growing demands, this problem will have to be solved through imports.

The dynamics of GHG emissions in the energy sector will depend on the comprehensiveness of measures on energy efficiency, energy saving and emission reduction. There is a large potential for GHG emissions reduction, which is estimated as much as 30-60% in comparison with the scenario "without measures".

The scenario "without measures" includes:

Maintaining of existing parameters of energy efficiency in sectors of the national economy;

Use of non resource saving technologies;

Wood and coal fuel use in rural (basically mountain) regions;

Excessive natural gas consumption in industry and residential sector caused by the absence of monitoring systems and the ineffectiveness of gas distribution networks;

Use of poor-quality fuel and ineffective internal combustion engines in the transport sector;

Absence of measures on enhancing thermal insulation and climatic comfort in residential and commercial buildings.

The scenario "with measures" (intermediate and optimistic) assumes:

Increase of energy efficiency in all sectors of the national economy;

Energy saving in residential, commercial and other sectors;

Putting into operation of large hydropower plants, which are currently under construction (Sangtuda and Rogun HPPs);

Development and increased use of alternative and renewable energies;

Improvement and optimization of transport infrastructure, including development of electrified transport;

Reduction of GHG emissions in industry, transport, residential sectors, etc.

5.4. Industrial processes

The industrial sector of Tajikistan is responsible for the emissions of such gases as carbon dioxide, perfluorocarbons and others that have a direct and indirect impacts on the climate system and environment. Aluminum smelting contributes the greatest portion of industry-related greenhouse gas emissions.

For the period of 1990-1998, in all industries the observed reduction of GHG emissions was caused by:

Sharp decrease of manufacture volumes;

Damage and secession of technological equipment, in particular ammonia and cement;

Irregular supply of electricity and natural gas.

By 2015, the increase of non-ferrous metallurgy production volumes up to the level of 1990 is projected. By 2015, the chemical industry's ammonia production volumes will exceed the level of 1990 by 1.8 times. Large growth is expected in the textile industry, namely in cotton and raw silk processing. In the field of mechanical engineering it has been planned to develop the industry's potential by manufacturing new kinds of production (automobiles and lorries, electrical engineering etc.), and renewing previously manufactured products. The introduction of metallic waste recycling and technology modernization is planned at the Tajik Aluminum Plant (capacity 100,000 tonnes a year).

According to expert estimates, the increase of GHG emissions in the industrial sector is expected to be caused by:

Restoration and development of the production and processing of minerals, metals, chemicals, machines, textile, food and other goods;

Putting into operation new industrial objects and reconstruction of existing capacities without taking measures on GHG emissions reduction.

According to the above mentioned scenario, CO₂ emissions in the given sector will be increased proportionally to the industrial manufacture volumes and by 2015 will reach about 1.6 millions tonnes. The basic share of CO₂ emissions will be aluminum (44%), cement (23%) and ammonia (18%) production. In comparison with 1990, CO₂ emissions will be 102% by the year 2015. Perfluorocarbon emissions that have very high global warming potential will considerably increase in aluminum industry.

The CO₂ emissions can be reduced by 250 Gg (16%) by implementing reduction measures in comparison to the scenario "without measures", including emissions from cement production by 1.3 times, and ammonia production by 1.7 times.

Great potential on PFCs emission reduction hypothetically exist. Thus, it is possible to reduce PFCs emissions by several times or avoid them at all (non-carbon anode technologies). For precise recording of PFCs emission trends instrumental monitoring is needed.

5.5. Agriculture

Providing projected increase of the number of cattle and poultry, as well as expansion of rice cultivation on flooded fields, the emission of methane without taking measures will increase to 98-100 Gg by 2015. In comparison with the year 1998, the projected methane emission in agriculture will increase to 125% between the present time and 2015, and will equal 1990 levels.

By 2015, the nitrous oxide emission under scenario "with measures" will comprise 3.5 Gg. This will be equivalent to 88% from 1990 levels or 178% from 1998 levels.

According to expert estimates, under the scenario "without measures" the increased application of nitric fertilizers and expansion of agricultural lands will favor growth of nitrous oxide emissions by a factor of 1.7-1.8.

The total GHG emissions in CO₂-equivalent in agriculture will reach 3.2 million tonnes (139% of 1998 levels), of which methane will comprise 64%, and nitrous oxide 36% of aggregated emissions if abatement measures will not be implemented.

Under scenario "with measures", the trend of methane emissions in agriculture will depend on how complete the measures are implemented. The rate of emissions growth under scenario "with measures" will not exceed 0.7-1.1% a year, whereas under scenario "without measures" it will range from 1.2 to 1.6% a year.

5.6. Land use change and forestry

Recently, the reduction of CO₂ absorption by soils has been caused by the overall deterioration of land resources and the loss of soil humus. According to expert estimates, annual wash out of soil humus in rain-feed lands in the republic amounts to about 1 million tonnes. As a result, by 2000, CO₂ emissions from intensively used soils in comparison to the previous period has increased by 4.5 times. Under scenario "without measures", CO₂ emissions in this category would increase up to 300 Gg a year by 2015, and CO₂ removal will further reduce by 30-40% in comparison with the year 2000.

Deforestation, mainly forest cutting, near settlements and in mountainous areas has aggravated the problem of desertification. Furthermore, it has affected surface runoff and the state of biodiversity. Deforestation has become the basic reason for the reduction of annual biomass growth and, consequently, a smaller volume of CO₂ accumulation.

In the year 2000, the volume of carbon accumulation by forests decreased by 35% in comparison with that of the 1990's. The cutting down of fast growing trees and reduction of tree density has triggered this situation. Under scenario "without measures" i.e. without improvement works, sustainable forest management, forestation, reforestation, protection of forests against pests and fires, carbon accumulation will be lowered to 327 Gg by the year 2015, that will comprise only 80% of 2000's level.

5.7. Wastes

Wastes are the sources of methane and other greenhouse gas emissions. In the period of 1990-2000, total methane emission in this sector has decreased by 10%. It has been caused by the abrupt reduction of industrial manufacture volumes and wastewater discharges, and the alteration in the number of urban population and in the system of waste disposal.

Projected urban population growth for the period until 2015 will average 1.5% per annum. Under scenario "without measures" the total methane emission from waste will likely increase. In this way, methane emission from solid communal waste disposal sites will grow by 4-5% in comparison with 1990's level, and emission from communal wastewater will increase by 25%. The expected growth of aluminum and nitrogen fertilizers production will not considerably change the methane emission from industrial wastewater.

Under scenario "with measures", with emphasis on utilization and recycling of solid communal waste, sanitary and ecological conditions will be considerably improved and methane emission will be limited to 2000's level and even lower reduced.