

POSSIBILITIES FOR IMPLEMENTATION OF THE KYOTO PROTOCOL IN THE TERRITORY OF THE TOMSK REGION

V. Litvak, V.Ya.Ushakov, N.N. Harlov

Regional Recourses Saving Centre at Tomsk Polytechnic University, Tomsk, Russia

ABSTRACT

In article the data about possibilities for implementation of the Kyoto Protocol in the territory of the Tomsk Region are presented.

Keywords: Kyoto protocol, quotas, harmful gases, organic fuel, emission, pollutants.

I. INTRODUCTION

The Protocol of the Third Conference of Countries-Participants of the United Nation Framework Convention on Climate Change of December 10, 1997 (Kyoto, Japan) establishes quotas of emission of anthropogenic greenhouse gases CO, CO₂, SO_x, NO_x, and C_xH_x (more than 10 compounds altogether) for each country. By 2010, highly developed countries will have to decrease the equivalent pollutant concentration (the parameter taking into account emissions of different pollutants, not only CO₂), on average, by 6-8%. Because limitations on emissions are taken to mean not only limitations on harmful emissions but also limitations on the economic (primary industrial) activity, provision is made in the Protocol to trade in emission quotas

with other countries. By a number of understandable reasons, Russia is among the potential sellers of quotas. Russia may sell at least 15% of the allocated quota to such countries as Japan, Korea, and EC countries. After signing Kyoto Protocol by Russia we must seek for methods and mechanisms of implementation of international and intergovernmental agreements on quota realization.

II. MAIN TEXT

The Tomsk Region is one of the subjects of the Russian Federation located in Western Siberia. It has considerable resources that can be realized as quotas of International Emission Trading (IET).

The organic fuel consumption by economic subjects and population is characterized by the amounts given in Table 1.

Naturally, the organic fuel consumption is accompanied by emissions of greenhouse gases (see Table 2).

Table 1. Consumption of fuel in the Tomsk Region

| No. | Fuel | 1980 | 1990 | 1995 | 2000 | 2005 |
|-----|--------------------------------------|------|------|------|------|------|
| 1 | Gas, million m ³ | 481 | 1709 | 1515 | 1928 | 2450 |
| 2 | Oil and petroleum, thousand ton | 33.6 | 69 | 464 | 604 | 650 |
| 3 | Coal, thousand ton | 2129 | 3707 | 2932 | 2948 | 1950 |
| 4 | Peat, firewood, etc., thousand ton | 2520 | 1031 | 772 | 351 | 170 |
| 5 | Total, thousand ton of standard fuel | 5895 | 7360 | 7353 | 7440 | 7020 |

Table 2. Amounts (in thousand ton) of gas emissions in the indicated branches of economy

| Greenhouse gases | Industry | | Transport | Municipal services | Agriculture | Others |
|------------------|----------|-----------------------------|-----------|--------------------|-------------|--------|
| | Total | Including power engineering | | | | |
| Carbon oxide | 178 | 48 | 15 | 30 | 20 | 7.5 |
| Carbon dioxide | 12750 | 3671 | 1817 | 2314 | 1569 | 579 |
| Sulfur dioxide | 95 | 25 | 8 | 16 | 10,7 | 4 |
| Nitrogen oxides | 84 | 61 | - | - | - | - |
| Total | 13110 | 3805 | 1840 | 2360 | 1600 | 610 |

Gaseous emissions from objects located in the territory of the Tomsk Region comprised 97.7% of carbon dioxide, 1.3% of carbon oxide, 0.6% of sulfur dioxide, 0.4% of nitrogen oxides.

Table 3 illustrates the dynamics of greenhouse gas emissions in different branches of economy in the last one and half decade.

Table 3. Changes in the annual amount of emissions (thousand ton)

| Branches of economy | 1990 | 1995 | 2000 | 2005 |
|--------------------------------------|-------|-------|-------|-------|
| Industry including power engineering | 15020 | 13824 | 14964 | 13110 |
| Transport | 1300 | 1200 | 1250 | 1840 |
| Municipal services | 2600 | 2540 | 2513 | 2360 |
| Agriculture | 1700 | 1500 | 1675 | 1600 |
| Others | 600 | 570 | 580 | 610 |
| Total | 21220 | 19634 | 20982 | 19520 |

In 2005, emissions of greenhouse gases decreased by 1500 thousand ton compared to 1990 due to the total reduction of commercial production and the corresponding decrease of the fuel consumption. From Table 3 it follows that industrial emissions are dominant. They make 71% of total emissions from objects located in the territory of the Tomsk Region. Moreover, power engineering accounts only for 30% of industrial emissions.

The lifetime of gaseous nitrogen-containing compounds in emissions produced in the combustion of organic fuels is short (of the order of 30-100 h). At an altitude of 10 km, the concentration of NO produced in the combustion of 5 million ton of gas fuel will make 0.027 mg/m³ given that it is distributed uniformly over the territory of the region.

The emissions of sulfur oxides lead to the formation of aerosols. Their lifetime in the atmosphere is several days. It decreases in the presence of moisture and solar radiation. The surface concentration of perceptible sulfur dioxide aerosols in the territory of the region is 0.43 g/m². The extremely high absorptivity of the natural environment of

the Tomsk Region is provided with forests and bogs. The territory of the Tomsk Region is 314,4 thousand square kilometers. Forests occupy 195 thousand square kilometers or 62% of the territory. Coniferous trees predominate in the forests; their area exceeds 54% of all forests. Regional forests absorb 5.5 million ton of carbon per year.

The total area of bogs in the region is 92 thousand square kilometers. The largest Vasyugan bog is located here. The annual absorptivity of carbon is 4.4 million ton. As a whole, the natural environment of the region is capable to absorb annually:

9.91 million ton of carbon,
1.9 million ton of sulfur oxides,
1.3 million ton of nitrogen oxide.

Thus, the absorptivity of the territory exceeds the total amount of anthropogenic gas emissions more than 20 times. For this reason, the Tomsk Region can become one of the largest Russian sellers of greenhouse gas quotas in the nearest years. The quotas calculated for current efficiency of power resources are presented in Table 4.

Table 4. Predicted quotas of greenhouse gases

| Characteristics | Years | | | |
|----------------------------------|-------|------|------|------|
| | 2005 | 2010 | 2015 | 2020 |
| Amount of emissions, million ton | 6.0 | 8.0 | 9.0 | 10.0 |
| Absorptivity, million ton | 13.1 | 12 | 12 | 12 |
| Quota, million ton | 7.0 | 4.0 | 3.0 | 2.0 |

According to the Power Engineering Strategy of Russia till 2020 yet to be implemented, the amounts of emissions given in Table 4 should be considered as maximum ones, and the corresponding quotas are minimum ones. The Strategy involves regional and branch activities aimed at

increasing the efficiency of utilization of power resources. According to this document adopted at the governmental level, saving of power resources planned for the Tomsk Region can be illustrated by Table 5.

Table 5. Saving of power resources planned for the Tomsk Region

| Saving of power resources | 2010 | 2020 |
|--------------------------------------|------|------|
| Gas, million ton | 220 | 450 |
| Coal, thousand ton | 480 | 900 |
| Petroleum products, thousand ton | 50 | 70 |
| Total, thousand ton of standard fuel | 700 | 1500 |

The Power Saving Program adopted among the first Russian programs allowed the consumption of primary power resources in the Tomsk Region to be decreased by 3.1% in the first stage of its implementation already in 2002. The rate of decrease of the specific power consumption will depend on the rate of economic development of the Tomsk Region and on the amounts of internal and external investments. It is well to bear in mind that each kW of reduced power consumption requires, on average, the investment of a capital of 300-500\$. At present, regional sources of capital are rather limited.

III. CONCLUSION

International cooperation in the implementation of the Kyoto Protocol can be directed toward counting of the amount of carbon dioxide absorbed as a result of forestry measures undertaken in the territory. Russia has been allocated the largest

amount of counting of carbon dioxide absorbed as a result of forestry measures, namely, 33 million ton of carbon per year, that is, about 4% of the total amount of emissions in Russia (the data are as of 1990 from which quotas are counted). The Joint Implementation Projects are aimed at:

- development of inventory systems of greenhouse gas emissions,
- emission forecasts,
- evaluation of the influence of climate change on the economy, social problems, and ecosystems,
- execution of research, educational, monitoring, and other programs.

Their main aim is the accumulation of experience in international cooperation for the implementation of the mechanism of quota trading. This experience will be especially important when the Kyoto Protocol comes into force.