

## **RUSSIA AND THE KYOTO PROTOCOL: HOW TO MEET THE CHALLENGES AND NOT TO MISS THE CHANCES**

On February 16, 2005, the Kyoto Protocol to the United Nations Framework Convention on Climate Change (FCCC) came into force. The Kyoto Protocol was passed in 1997 in the city of Kyoto (Japan) by the 3rd Conference of the Parties to the Convention. As of now, the parties to the Protocol include more than 140 countries, of which 22 industrial countries, 12 countries with economies in transition (including Russia), and over 107 developing countries, including India and China. Among developed countries, USA, Australia and Monaco have not acceded to the Kyoto Protocol yet. They signed the Kyoto Protocol at the beginning, but then refused to ratify it. Among economies in transition Croatia did so. However, being an EU-candidate country Croatia seems to join the Kyoto Protocol soon.

Russia has ratified the Kyoto Protocol in November 2004, and thus become 128<sup>th</sup> country who acceded to the Protocol. However, it was due to decision of Russia that the Kyoto Protocol has finally entered into force.

The motives and expediency of this decision have been assessed differently by experts. Some of them regard this only as a political move, trying to guess what exchanges are implied and what could be the possible benefits or losses for Russia. Others insist that by all means the Kyoto Protocol is detrimental for Russia because it nullifies its prospects for economic growth and allege that it can drive all of us to a concentration camp. Still others, on the contrary, say the Kyoto Protocol is beneficial for Russia, because it gives additional incentives and opportunities for attraction of investment and modernization of Russian economy.

Whatever that may be, now, that the historical decision has made and the Protocol has come into force, the focus should be placed on practical actions aimed at its implementation in Russia. And to this end, it is primarily important to clearly understand what the commitments of Russia are, what challenges it may face, what new opportunities are before it and what should be done to make a worthy response to these challenges and the best use of these opportunities.

This article is just an attempt to answer these questions.

### **1. THE KYOTO PROTOCOL: REQUIREMENTS AND MECHANISMS**

#### **Targets and emission limitations**

The target of the Kyoto Protocol is to mitigate global climate changes by limiting and reducing anthropogenic emissions of greenhouse gases.

According to Annex A to the Kyoto Protocol, greenhouse gases include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulphur hexafluoride (SF<sub>6</sub>). These gases, accumulated in the atmosphere, retain excessive heat radiated from the surface of the Earth, thereby creating a global greenhouse effect. Hence, they are called greenhouse gases.

During the first period (from 2008 to 2012), limitations for greenhouse gas emissions are established for the developed countries and the countries with economies in transition (Annex B to the Kyoto Protocol). The amount of permitted emissions is determined in percentage of the base year which for the majority of countries and types of greenhouse gases means 1990. It is allowed to include into the emission limitation commitments, additional sinks of carbon from atmosphere related to improvement of land and forest use (Article 3, item 3).

As of now, developing countries being parties to the Kyoto Protocol have no limitations on the greenhouse gas emissions. The exception is Kazakhstan who has declared its intention to take commitments on greenhouse gas emissions limitation on a par with industrial countries. For the next budgetary period limitations can be also set for other developing countries.

<b>Annex B to the Kyoto Protocol</b>	
<b>Quantified emission limitation or reduction commitments</b>	
(percentage of base year or period)	
Australia	108.0
Austria	87.0
Belgium	92.5
Bulgaria *	92.0
Hungary *	94.0
Germany	79.0
Greece	125.0
Denmark	79.0
European Community	92.0
Ireland	113.0
Iceland	110.0
Spain	110.0
Italy	93.5
Canada	94.0
Latvia *	92.0
Lithuania *	92.0
Liechtenstein	92.0
Luxembourg	72.0
Monaco	92.0
Netherlands	94.0
New Zealand	100.0
Norway	101.0
Poland *	94.0
Portugal	127.0
Russian Federation *	100.0
Romania *	92.0
Slovakia *	92.0
Slovenia *	92.0
United Kingdom of Great Britain and Northern Ireland	87.5
United States of America	93.0
Ukraine*	100.0
Finland	92.0
France	92.0
Croatia *	95.0
Czech Republic *	92.0
Switzerland	92.0
Sweden	104.0
Estonia *	92.0
Japan	94.0

*\* Countries that are undergoing the process of transition to a market economy*

**Source: Kyoto Protocol to FCCC, reallocation of AA within European Community included**

Negotiations on commitments of the member countries for the period after 2012 should start in 2005.

## Policy and measures

The Kyoto Protocol specifies commitments for all countries which have, according to Annex B, national quantified emission limitation or reduction commitment – these countries have to exercise policies and apply measures for emission limitation and reduction as well as measures for protection and enhancement of sinks and reservoirs of greenhouse gases (Article 2).

Such measures include enhancement of energy efficiency, promotion of sustainable forest management practices, afforestation and reforestation, promotion of sustainable forms of agriculture, research on, and promotion, development and increased use of, new and renewable forms of energy, carbon dioxide sequestration technologies and of advanced and innovative environmentally sound technologies.

Also, it stipulates measures to limit and/or reduce emissions of greenhouse gases in the transport sector, as well as limitation and/or reduction of methane emissions through recovery and use in waste management, as well as in the production, transport and distribution of energy.

In addition, it stipulates progressive reduction or phasing out of market imperfections, fiscal incentives, tax and duty exemptions and subsidies in all greenhouse gas emitting sectors that run counter to the objective of the Protocol, and application of market instruments and encouragement of appropriate reforms in relevant sectors.

## Flexibility mechanisms

To optimize their costs related to implementation of the commitments on greenhouse gas emissions limitations and reduction, the Kyoto Protocol permits fulfilment of their commitments under the Protocol jointly (Article 4); as well as emissions trading (Article 17) and joint project for the reduction of emissions (Article 6). Emission trading means that some countries that according to Annex B have commitments on the limitation of emissions may buy from other countries, included into Annex B, unused quotas for emissions. Joint projects allow investors from countries, included into Annex B, to invest into projects of emission reduction and increase of sinks in other countries from Annex B; to buy such emission reductions (sink increase) resultant from such projects, and to account them as fulfilment of their own commitments on emissions limitation and reduction.

In addition, the Kyoto Protocol stipulates a special mechanism called a clean development mechanism (Article 12), which allows developed countries and countries that are undergoing the process of transition to a market economy to invest into projects related to reduction of emissions and enhancement of sinks and reservoirs of greenhouse gases in developing countries and account such reductions as fulfilment of their commitments.

Thus, the Kyoto Protocol and the related mechanisms stipulated by this protocol establish an international carbon market for quotas on greenhouse gas emissions and emission reductions.

## Marrakech Accords

The conditions and the procedure of application of flexibility mechanisms stipulated in the Kyoto Protocol were identified by the decision of the 7<sup>th</sup> Conference of the Parties to the Convention, which was held in 2001 in Marrakech (Morocco). The respective document was called the *Marrakech Accords*. It also identified the maximum allowed amounts of account of carbon sink from forest management practices, afforestation and reforestation, the procedure for keeping national registers and a number of other practical issues related to the implementation of the Kyoto Protocol.

## Decision 11/CP.7

### Land use, land-use change and forestry Maximum norms of carbon sinks clearing off as commitments on the limitation and reduction of greenhouse gas emissions

(Mt C /year)

Australia	0.00
Austria	0.63
Belarus	0.00
Belgium	0.03
Bulgaria	0.37
Canada	12.00
Croatia	0.00
Czech Republic	0.32
Denmark	0.05
Estonia	0.10
Finland	0.16
France	0.88
Germany	1.24
Greece	0.09
Hungary	0.29
Iceland	0.00
Ireland	0.05
Italy	0.18
Japan	13.00
Latvia	0.34
Liechtenstein	0.01
Lithuania	0.28
Luxemburg	0.01
Monaco	0.00
Netherlands	0.01
New Zealand	0.20
Norway	0.40
Poland	0.82
Portugal	0.22
Romania	1.10
Russian Federation	33.00
Slovakia	0.50
Slovenia	0.36
Spain	0.67
Sweden	0.58
Switzerland	0.50
Ukraine	1.11
United Kingdom of Great Britain and Northern Ireland	0.37

**Source: Marrakech Accords, 2001**

In particular, the Marrakech Accords introduced the notion of carbon units emitted by the Parties to the Convention in their national registers and used both for account of emissions and as commodities of the international carbon market. Each carbon unit has its own name, letter designation and a unique number assigned to it at the time of emission and equal to one ton of CO<sub>2</sub> equivalent. Lawyer still continue discussion about then nature of carbon units; however in

fact they represent especially valuable papers that confirm the right of the holder to emission of greenhouse gases.

Unfortunately, yet there are no good Russian names for such units, therefore specialists are using, most often, English letter designations of such units or some derivative professional terms.

There are four types of carbon units:

**AAU** - assigned amount unit, i.e. a carbon unit reflecting the right of the emitting country to greenhouse gas emissions according to the national quota, as specified by the Kyoto Protocol. In the Kyoto Protocol, this quota is called “the assigned amount”, hence the name of the carbon unit. The AAU amount is the precise amount of the national quota of the country, as specified in the Kyoto Protocol. When emission trading is mentioned, usually it means the transfer of some AAUs amount from one country to another.

**RMU** - removal unit, i.e. the carbon unit reflecting additional absorption of carbon from atmosphere resultant from improved land or forest practices. The RMU amount is determined every year by calculations based on the policies and measures implemented by the country in land or forest practices. The higher the number of RMUs in the country, the higher the greenhouse gas emission allowed for the country in excess of the quota assigned by the Kyoto Protocol.

**ERU** - emission reduction unit, i.e. the carbon unit reflecting the reduction of greenhouse gas emissions or increase of carbon sinks from atmosphere resultant from implementation of the respective investment project. The amount of ERUs is calculated every year by the outcomes of the implementation of the project based on the so-called basic emissions (sink) level that would take place in the absence of the project and the actual emissions (sink) after the implementation of the project. It should be noted that production of ERUs does not lead to the increase of the total amount of carbon units in the country. Depending on the type of the project, such units are emitted by way of conversion from the respective amount of AAUs and RMUs emitted before. Thus, the total amount of carbon units in the country’s budget remains unchanged. However later on, some ERUs are transferred to a foreign investor based on the agreement on the joint project implementation, following which the number of carbon units in the budget of the project country is decreased, while it is increased in the budget of the investor country;

**CER** - certified emissions reduction, i.e. the carbon unit reflecting the reduction of greenhouse gas emissions or the increase of carbon sinks resultant from the project implemented through the clean development mechanism. The amount of CERs is determined as the difference between the basic and the actual levels of emissions and sinks for each project and is added to the budget of the country which provided resources for the project implementation.

It should be noted that carbon units are not fully equivalent. Thus, for instance AAUs emitted in one period can be accumulated and transferred to the following periods without any restrictions. On the contrary, RMUs and RMU-based ERUs can be counted only in the period when they were actually produced and may not be transferred to following periods.

## **Inventory of GHG emissions and removals. IPCC requirements**

In conformity with the Kyoto Protocol (Article 7), all countries which, according to Annex B, have commitments on limitations and reduction of emissions should present its official information on its emissions to the FCCC Secretariat. To this end, they have, before 1 January 2007, set national systems for inventory of greenhouse gas emissions and removals (Article 5), and submit information about greenhouse gas emissions and removals, starting from 1990. These data are used to determine quotas for emissions for the first period (2008-2012) and establish the national carbon registry.

Deviations from these requirements, just as submission of wrong data on emissions is a serious violation which will result in banning of the country’s participation in emissions trading and joint implementation of project on emissions reduction and/or removals increase.

According to IPCC<sup>1</sup> guiding document, reports (inventories) on emissions must include two parts. The first part, the so-called Common Reporting Format (*CRF*) represents a set of standard tables which contain, mostly, quantitative data about greenhouse gas emissions and removals. The second part is the National Inventory Report (*NIR*). This report provides exhaustive description of the used methods, assumptions, basic data sources, estimates of uncertainties, and the procedures for quality assurance and control of the involved institutional entities. The Inventory Reports in the format CRF+NIR should be submitted to the FCCC Secretariat before 15 April for the year before the last year. For instance, by 15 April 2005, it is required to submit the report for the year 2003. According to the requirements of the Kyoto Protocol, all such reports (inventories) should pass the procedure of verification for compliance with the guidelines of FCCC and IPCC.

The inventory reports should meet the following standard requirements:

- *transparency*. This means that the data submitted on emissions and removals must be reproducible and verifiable, i.e. there should be an opportunity for verification of these data through standard procedures. To this end, the report must include comprehensive clarification about the basic data and their sources as well as about the adopted assumptions and methodologies used;
- *coordination*. It demands that data on emissions and removals for the given year should be internally consistent, in all their aspects, with the data for the previous years;
- *comparability*. Data about greenhouse gas emissions and removals, provided in the national inventory report, must be comparable with similar data provided by other countries;
- *completeness*. It assumes a full geographic coverage of emissions by sources and removals by sinks of all greenhouse gases;
- *precision*.

Data about greenhouse gas emissions and removals should be provided in natural units (usually in gigagrams, 1 Gg = 1,000 tons) and recalculated as CO<sub>2</sub>-equivalents. To make such recalculations, they use conversion coefficients the so-called Global Warming Potential (*GWP*) of some greenhouse gas compared to carbon dioxide (CO<sub>2</sub>). The value of GWP for carbon dioxide (CO<sub>2</sub>) is taken as 1, for methane (CH<sub>4</sub>) - 21, for nitrous oxide (N<sub>2</sub>O) - 310, for hydrofluorocarbons (HFCs) - 140...11700, depending on the gas formula, for perfluorocarbons (PFCs) - 6500...9200, and for sulphur hexafluoride (SF<sub>6</sub>) - 23900.

In addition, it is required to assess emissions of gases with indirect greenhouse effects, such as; carbon oxide (CO), nitrogen oxide (NO<sub>x</sub>), non-methane volatile organic compounds (NMVOCs), and sulphur oxides (SO<sub>x</sub>).

Greenhouse gas emissions are rarely determined by direct measurements. End-of-pipe measurements are applied in exclusive cases for individual industrial sources. Mainly, data on emissions and removals are obtained by calculations according to the IPCC methodologies.

**Fig.1. Basic equation for calculation of emissions**

$$E = A \times EF,$$

whereas:

**E** is greenhouse gas emissions

**A** is intensity of activity resultant in greenhouse gas emissions (activity)

**EF** is the emission factor

<sup>1</sup> IPCC or Intergovernmental Panel on Climate Change is the special FCCC body for assessment of anthropogenic impact on global climate changes and for development of relevant countermeasures.

Generally, calculation of emissions is made by multiplying the quantitative indicator characterizing intensity of some activity resultant in emissions of greenhouse gases by the relevant emission factor (Fig. 1).

The IPPC office requires collecting and submitting data about greenhouse gas emissions and sinks for the following sections:

- energy,
- industrial processes,
- use of solvents,
- agriculture,
- land use change and forestry,
- waste management.

Each section identifies typical groups of emission sources.

For each group of sources, the IPPC methodologies suggest emission factors based on average results of greenhouse gas emission measurements for respective types of activities. These factors may reflect specific features of the region, type of fuel, production process, etc, sometimes they represent some average global values. If more precise data are available about emissions, then it is allowed to use, instead of the factors stated in the IPPC guidelines, alternative factors, provided they do not contradict the IPPC guidelines, are substantiated scientifically, and are supported by the required documents.

Special attention is paid to the “Energy” section, which accounts for 70-80% of all anthropogenic greenhouse gas emissions. For the purposes of the Kyoto Protocol, the energy section means not the energy sector in the national economy, but any economic activities related to the production, transportation and combustion of fuel and energy resources, including also combustion of fuel by households.

The “Energy” section is subdivided into two parts: combustion of fuel and leakage of fuel during its production and transportation.

It is recommended that calculations of emissions from fuel combustion should be made in parallel using two methods: a) for the country as a whole, according to the data about the total output, import and export of fuel; and b) for each separate group of sources, by the known amounts of burnt fuel, followed by their addition. Ideally, the calculations results must coincide. In practice, however, this is not the case, which can be explained by number of objective factors, let alone the notorious human factor. Therefore, the minimum difference is considered the norm and is allowed as an error of measurements. However, if the difference is significant, it requires explanation of its nature, making of verifications and adjustments of the basic data as well as alternative assessments.

The obtained data are recorded in the respective cells of the Common Reporting Format. In case it is not possible to enter the figure (for example, if there are no emissions or removals, or because there is no required information for their assessment, or for some other reasons), special conventional notations are provided that must be recorded in the respective cells of the table, namely;

- NO – no emissions/sinks;
- NE – no evaluation of emissions/sinks made;
- NA – not applicable for this type of activity or process since it does not result in emissions/sinks of the given gas;
- IE – included in another place for emissions/sinks which have been evaluated together with other emissions/sinks, and accounted in another part of the inventory report;
- C – for emissions/sinks the data for which may disclose confidential information for the country.

It is considered that the inventory report is fuller and more precise, and better meets the requirements, if it included less gaps of NE or IE types.

## 2. RUSSIA IN THE COORDINATES OF KYOTO

### Emission quotas: surplus is evident

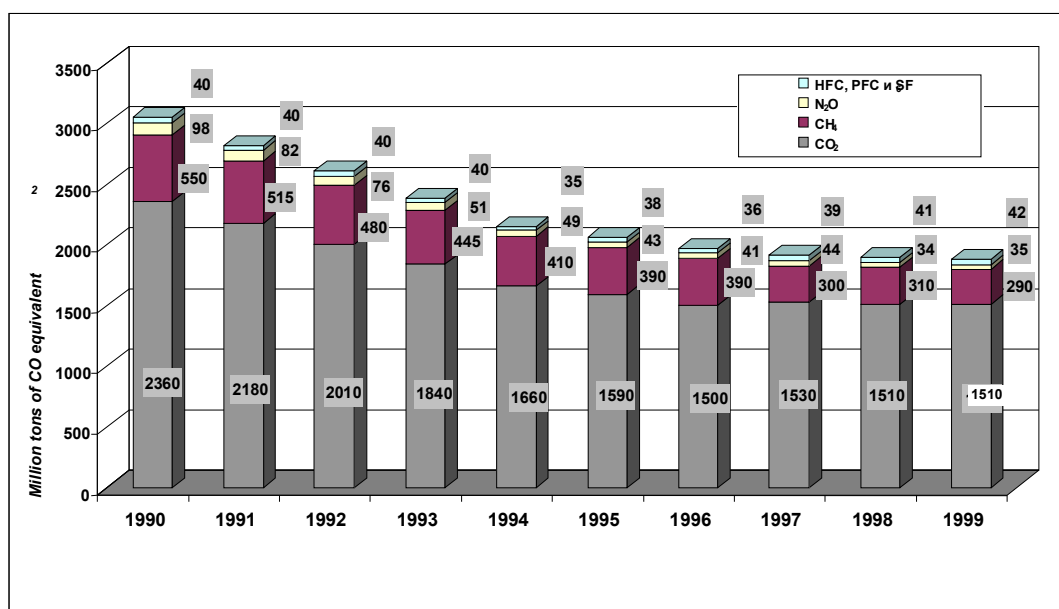
According to Annex B to the Kyoto Protocol, limitations on the greenhouse gas emissions for the first budgetary period (2008-2012) have been set for Russia at 100% of the emissions in 1990. This means that over this period anthropogenic greenhouse gas emissions in Russia should not exceed, on the average, the level of 1990.

According to the available official data<sup>2</sup>, anthropogenic greenhouse gas emissions in Russia in 1990 made 3,048 million tons of the CO<sub>2</sub>-eq. Multiplying this figure by 5, according to the number of years of the budgetary period, we will get 15 240 million tons of the CO<sub>2</sub>-eq. This means the Russian emissions quota as specified in the Kyoto Protocol<sup>3</sup>. On this ground, Russia may emit, in its carbon inventory registry, 15 240 million *AAUs*.

Besides, according to Marrakech Accords, Russia has the right to account additional carbon removals by sinks from improvement of land and forest management practices in the amount up to 33 million tons of carbon annually. Converted into the CO<sub>2</sub>-eq., this means 121 million tons annually. Multiplying by 5, we will get 605 million tons of the CO<sub>2</sub>-eq. This means that Russia may emit, additionally, in its registry 605 million *RMUs*, adding them to its budget of emissions in excess of the set quota. However, to do this, it will be necessary to prove the respective actual increase of carbon sinks as a result of targeted policies and measures in the field of land and forest management practices.

The actual greenhouse gas emissions in Russia are assessed today at about 2 billion tons of the CO<sub>2</sub>-eq. annually (see Fig. 2)<sup>4</sup>.

**Fig. 2. Anthropogenic greenhouse gas emissions in Russia in 1990-1999 (without the net sink of CO<sub>2</sub> in forests)**



**Source:** Third national inventory report of the Russian Federation, 2002

<sup>2</sup> See the Third national inventory report of the Russian Federation submitted to the FCCC Secretariat.

<sup>3</sup> The figure is not official and should be detailed.

<sup>4</sup> According to official data, emissions in 1999 accounted 1,877 million tons of CO<sub>2</sub>-eq. Official data for continuous years are missing.

A further growth of the economy will lead, probably, to increase of emissions, though this is not absolutely necessary. There are many examples when economic growth has not results in increased emissions and even has been accompanied by the absolute reduction of emissions. In any case, emissions growth occurs slower than growth of GDP. For instance, in 2003, the Russian GDP grew by almost 8.5% but it was accompanied by the reduction of its carbon intensity (the ratio of CO<sub>2</sub> emissions to the GDP value) by more than 7%<sup>5</sup>.

If the current trends remain in the future, in 2008-2012 greenhouse gas emissions in Russia will make, on the aggregate, 11.5-12.0 billion tons of the CO<sub>2</sub>-eq. Thus, Russian will be within the set emissions budget and will even have a surplus of 3.2-3.7 billion tons of the CO<sub>2</sub> equivalent.<sup>6</sup> And if we take into account maximum possible additional sinks from improved land and forest management practices, then the surplus will make 3.8-4.3 billion tons of the CO<sub>2</sub>-eq.

The majority of the developed countries have stricter commitments. For instance, countries of the European Union and Switzerland have committed themselves to reduce emissions by 8% on the average, and Canada and Japan by 6% to the level of 1990. Incidentally, today these countries emit much more greenhouse gases than in the basic year 1990, and their specified limit amounts of account of carbon sinks as a result of improved land and forest management practices are lower than for Russia. For instance, the value for Canada was set at only 12 million tons of carbon per annum, while for countries of the European Union it was set at 8.18 tons per annum, on the aggregate.

According to predictions, these countries, unlike Russia, will have a deficit of carbon units needed to cover their emissions. This opens opportunities for mutually beneficial trade in emissions and for joint implementation of project for emission reduction. For example, Denmark and Ireland, plan to buy on the market 18.5 million carbon units each; Austria is planning buying 35 million units and Netherlands 100 million units.

However, this does not mean that Russia will have nothing to worry about, but how to sell at a better price its quotas in the carbon market, represented by *AAUs* or *ERUs*. Russia has some other problems to be solved as soon as possible to meet the requirements of the Kyoto Protocol and the new challenges related to it.

## **Emissions account: more thorough approach is needed**

Russia has not created a system for inventory of greenhouse gas emissions and sinks which should include procedures, institutional and legal mechanisms for evaluation, presentation and storage of data about emissions/sinks anthropogenic emissions and sinks. Moreover, unlike other majority of countries Russia has not yet submitted to the FCCC Secretariat reports on inventory of emissions and sinks in the CRF format, as required by the guidelines documents of the IPPC. Without this, the Russian quota for emissions may not be defined officially.

Data on emissions and sinks, reflected in three national communications submitted by Russian to the FCCC Secretariat, cannot substitute the above, since they are mostly aggregated, while the CRF format requires more detailed data by different groups of sources and sinks of emissions. Besides, the last official data about emissions and sinks were dated by 1999, although one year ago it was necessary to submit data for 2002 and this year for 2003.

Our inventory does not meet other requirements, too. Thus, for some groups of sources data on emissions are not available at all. A low level of detailing is another serious drawback. Thus, for GHG emissions from combustion of fuel, the reports differentiate only emissions from power plants and boiler houses owned by the RAO "UES", whereas emissions from combustion of fuel in industry, in the communal sector and transport are not shown.

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<sup>5</sup> Source: Environmental Defense (CIHA) and the Russian centre of Environmental Policies, 2004.

<sup>6</sup> A more conservative prediction gives emissions in the range of 12.5-13.0 billion tons of the CO<sub>2</sub>-eq. Accordingly, evaluation of the surplus without additional removals by sinks gives 2.2-2.7 billion tons of the CO<sub>2</sub> -eq.

Generally speaking, even the latest report for 1999 included, in the summary tables, 69 gaps (NE) and 8 non-detailed evaluations (IE). This means over half of cells (53%) which, in principle, should include figures (i.e. without the cells which, by definition, should include conventional NO and NA).

Accordingly, at such level of knowledge about own emissions and sinks we cannot speak about any emission trading at all, or about projects on the reduction of emissions, or even about adequate emissions management.

However, Russia has experience related to high quality inventories. For instance, in the Archangelsk Oblast they have made inventories of greenhouse gas emissions in the "Energy" section for 2000, in full compliance with the IPCC requirements and standards (see table 1).

**Table 1. Greenhouse gas emissions in Archangelsk Oblast in 2000, "Energy" section, according to the IPCC classification, Gg CO<sub>2</sub>-eq.**

Categories of greenhouse gas sources	CO <sub>2</sub> (GWP=1)	CH <sub>4</sub> (GWP=21)	N <sub>2</sub> O (GWP=310)	Total
<b>Total for the sector</b>	<b>13 364.69</b>	<b>738.09</b>	<b>80.49</b>	<b>14 183.27</b>
<b>A. Fuel combustion</b>	<b>13 364.69</b>	<b>82.72</b>	<b>80.49</b>	<b>13 527.90</b>
<b>1 Energy production</b>	<b>4 096.41</b>	<b>3.99</b>	<b>16.47</b>	<b>4 116.87</b>
a. Individual power plants and boiler houses	4 077.14	3.98	16.46	4 097.57
b. Oil refining	NO	NO	NO	NO
c. Production of solid fuels, oil and gas	19.28	0.01	0.01	19.30
<b>2 Industry and construction sector</b>	<b>5 188.056</b>	<b>26.34</b>	<b>48.86</b>	<b>5 263.25</b>
a. Ferrous metallurgy	0.24	0.00	0.00	0.24
b. Non-ferrous metallurgy	3.44	0.00	0.01	3.45
c. Chemical sector	0.94	0.00	0.00	0.94
d. Wood pulp and polygraph sector	4 205.94	23.24	42.20	4 271.38
e. Food and tobacco sectors	50.65	0.11	0.22	50.98
f. Other industries, construction	926.85	2.98	6.43	936.26
<b>3 Transport</b>	<b>2 759.93</b>	<b>3.10</b>	<b>4.93</b>	<b>2 767.96</b>
a. Civil aviation	91.54	0.01	0.80	92.36
b. Motor vehicles	575.56	2.04	1.51	579.10
c. Railway transport	421.61	0.61	1.08	423.29
d. Water transport	317.89	0.44	0.78	319.11
e. Other types of transport (pipeline)	1 353.33	IE	0.77	1 354.10
<b>4 Other industries</b>	<b>827.77</b>	<b>37.70</b>	<b>8.51</b>	<b>873.97</b>
a. Services, trade, institutions	281.95	16.06	4.05	302.07
b. Population	165.56	12.45	2.39	180.40
c. Agriculture, forestry, fishery	380.25	9.18	2.07	391.50
<b>5 Other sources</b>	<b>492.54</b>	<b>11.59</b>	<b>1.72</b>	<b>505.84</b>
<b>B Emissions related to fuel leaks</b>	<b>NE</b>	<b>655.37</b>	<b>NE</b>	<b>655.37</b>
<b>1 Solid fuels</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>
a. Coal production	NO	NO	NO	NO
b. Solid fuel processing	NO	NO	NO	NO
c. Other	NO	NO	NO	NO
<b>2 Oil and natural gas</b>	<b>NE</b>	<b>655.37</b>	<b>NE</b>	<b>655.37</b>
a. Oil	NO	12.97	NO	12.97
b. Natural gas	NO	634.08	NO	634.08
c. Ventilation and combustion in flares	NE	8.31	NE	8.31

NE = not evaluated; NO = not available; 0.00 = evaluated and negligible; IE = evaluated in other columns  
1 Gg = 1 thousand tons

**Source:** Environmental Investment Centre, A. Samorodov, 2002.

There are also examples of high quality inventories made in some other regions, even at some individual companies. At RAO “EES”, Archangelsk and Solombala pulp and paper mills, for example. Reports on inventory of greenhouse gas emissions provided by these companies since 1990 till today have passed independent international expertise and have been recognized as meeting the IPPC requirements and the best world practices.

Indicating the drawbacks of our inventory, international experts in their in-depth evaluation report on the Third national communication of Russia, submitted to the FCCC Secretariat, stated that the main causes included insufficient funding as well as incomplete and untimely submission of the basic information by the federal ministries and department, which, in opinion of the experts, was related to low financial motivation.

In reality, the problem is, probably, deeper and more systemic. It is revealed not only in the inventory, but in other issues as well related to the implementation of the Kyoto Protocol.

## **Policy and measures: still absent, regretfully**

At present, Russia does not have any more or less clear governmental policy aimed at limitation and reduction of GHG emissions. According to “Complex Action Plan for Implementation of the Kyoto Protocol to UNFCCC in the Russian Federation”, recently developed by the Ministry of Economic Development and Trade (MEDT), includes only these measures that have already been approved earlier, before and without the Kyoto Protocol ratification. Among them, for instance, are measures included in the federal targeted program “Energy-Efficient Economy”, in the programs of utilization of coalmine methane and associated gas.

However, these programs cannot be taken seriously. They do not contain approximate targets for reductions of greenhouse gases emissions. Implementation of these programmes is at a very low level, giving no noticeable outcomes. At least, there is no any official information about them – the Russian national communications submitted to the FCCC Secretariat do not include such information.

Speaking about national measures provided in “Complex Action Plan” one should mention reform of RAO EES and transition to full cost recovery of communal services. These reforms have been in the center of policy agenda for several years, and it still remains to be seen how well they are going to be implemented. “Monetization of benefits” has also been envisaged with happy thought, but we all know what came out of it.

In these conditions, Russia risks not only to become among those who are sanctioned for the violations of the rules set by the Kyoto Protocol. The consequences may turn out to be much more serious.

In the absence of a clear state policy and of measures to limit and reduce emissions, quite opposite trends may become prevailing in Russia. For example, they started to discuss seriously possible switching of the Russian energy sector back to coal. In conditions of the expected more rapid growth of prices for gas and oil products this may become a massive phenomenon. Meanwhile, when converted into 1 ton of equivalent fuel greenhouse gas emissions as a result of coal combustion are 22% higher than from combustion of heavy oil fuel, and 56% higher than from combustion of natural gas. The wear of pipelines leads to direct loss of heat from heating mains and uncontrollable increase of methane leakages during transportation of energy resources, i.e. oil and gas.

The case with natural carbon sinks is not better at all. After 1990, the situation in the forestry sector has worsened significantly. Forest fires and pests destroy, every year, millions cubic metres of standing wood, including undergrowth. However, cases of illegal tree felling are registered more frequently. According to the available data, the scope of illegal logging in Russia has increased 3.6-fold in the last 15 years.

Further development of these trends may deprive Russia of the advantages that it has today. Russian will have a guaranteed surplus in the first period (2008-2012). But then the second period will follow, and the outlines of this second period will start to emerge already in

2005. And then, probably, other budget periods will follow – and today no one will venture to predict them. Therefore, avoiding risks and uncertainties, it would be advisable to save a part of the quota in the first period and transfer it to the subsequent periods. And to do this, a rather strict policy on limitation and reduction of emissions is required.

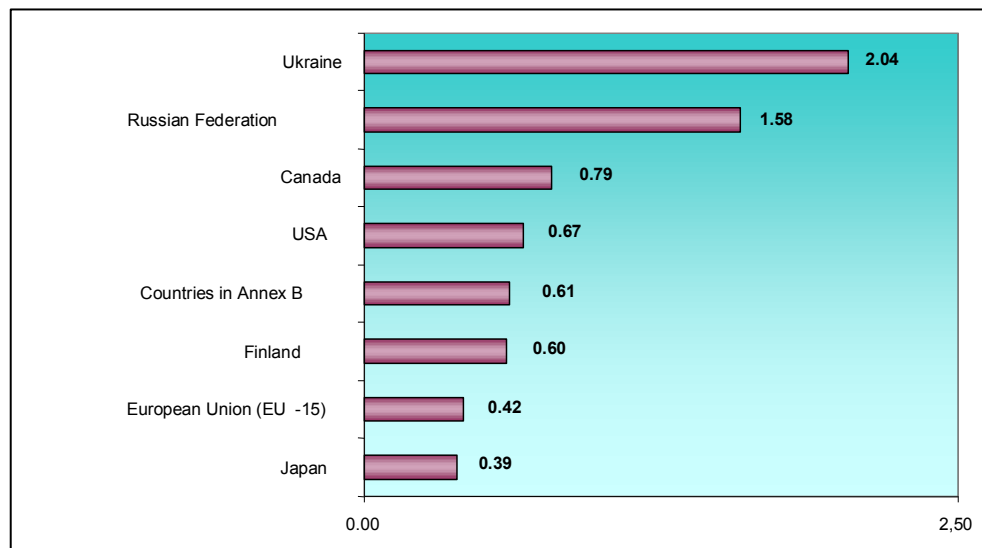
The international situation should also be taken into consideration. The implementation of measures for the limitation and reduction of greenhouse gas emissions becomes all the more global. This has been declared the main issue of G8 agenda for 2005. Trying to solve this issue, the countries of the European Union started on January 1, 2005 an unprecedented programme stipulating emissions quoting and trade. Very soon they may be joined by other countries of Western and Central Europe, Japan and Canada.

Countries that are not formally participating in the Kyoto Protocol are not sitting idle. For instance, half of the USA states have started programmes on the limitation of greenhouse gas emissions, and the first in the world carbon exchange operates in Chicago. Australia has adopted the relevant national programme.

Introduction of limitations on greenhouse gas emissions will inevitably aggravate the market competition and result in a shift of the demand towards goods that are less hazardous for the climate. And on the contrary, goods associated with high greenhouse gas emissions, either at production or at consumption, will be ousted from the market. The same will concern goods produced in conditions where no limitations on greenhouse gas emissions are in place.

Meanwhile today, converted to 1 dollar of PPP GDP, Russia emits 3.8-fold more greenhouse gases than the leading European countries, 2.6-fold more than the developed countries and countries in transition on the average, 2.4-fold more than USA and 2-fold more than Canada. Of all developed countries and the countries in transition taking part in the Kyoto Protocol, only Ukraine emits more greenhouse gases per unit of its GDP (Fig. 3). It means that if the current state of things remains, we risk facing boycott of our goods and discrimination of our companies in the world markets.

**Fig. 3. Greenhouse gas emissions per dollar of GDP, kg of CO<sub>2</sub> equivalent/dollar (data for the Russian Federation are given for 1999, data for other countries are given for 2002)**



**Source:** Calculations by A. Samorodov using the data of the FCCC Secretariat, 2004

Absence of clearly formulated state policy on the limitation of greenhouse gas emissions deprives Russian businesses from a very important additional investment incentive. As a result, we give the garland to foreign companies that will start switching over, by accelerated speed, to more advanced and perfect technologies in conditions of severe emission limitations, leaving

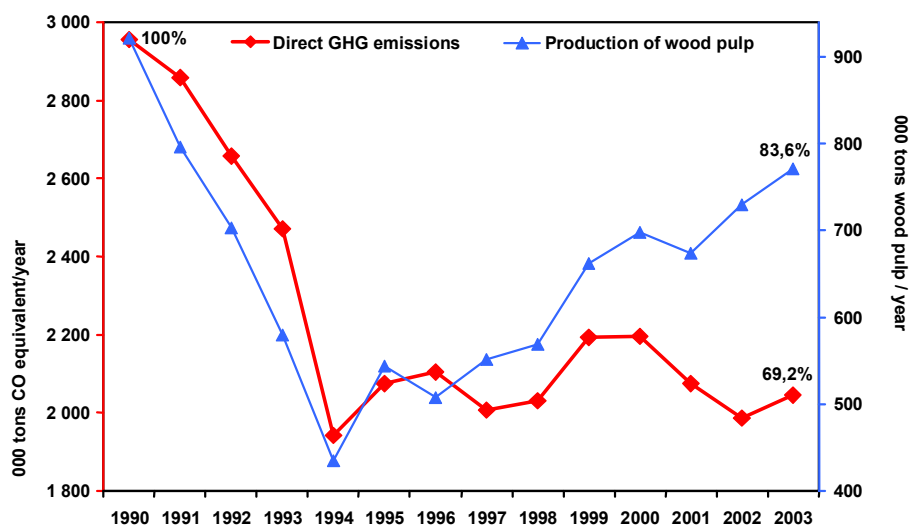
behind their Russian competitors, and will export capital to developing countries, thereby taking over their economic space before us.

In such conditions, we should not think that by reducing climatic and – on a broader base – environmental requirements, we will attract foreign capital to our country. On the contrary, lack of a clear state policy and of the state-imposed rules and their non-compliance with the status of the country will bring about additional risks for businesses and will not stimulate inflow of capital.

Another broadly circulating opinion that environmental restrictions in general and limitation on the greenhouse gas emissions in particular allegedly prevent the development of the economy and the production growth are equally fallacious. The world experience as well as experience of Russian companies indicates to the opposite.

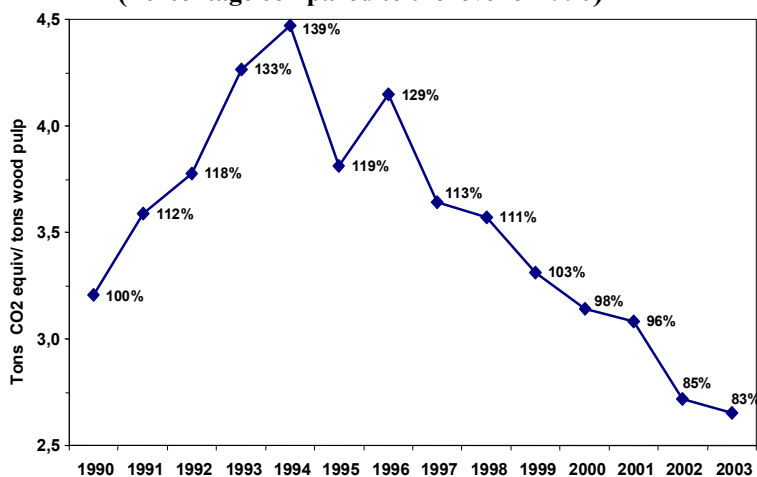
Let us take the example of the Archangelsk pulp and paper mill. Since 1994, when the production drop caused by the crisis was record low, the production of pulp went up by 77%, while greenhouse gas emissions went up by only 5% (see Figs. 4 & 5).

**Fig. 4. Pulping and greenhouse gas emissions at Archangelsk pulp and paper mill in 1990-2003**  
(Percentage compared to the level of 1990)



*Source:* Environmental Investment Centre, 2004

**Fig. 5. Specific greenhouse gas emissions per ton of wood pulp at Archangelsk pulp and paper mill in 1990-2003**  
(Percentage compared to the level of 1990)



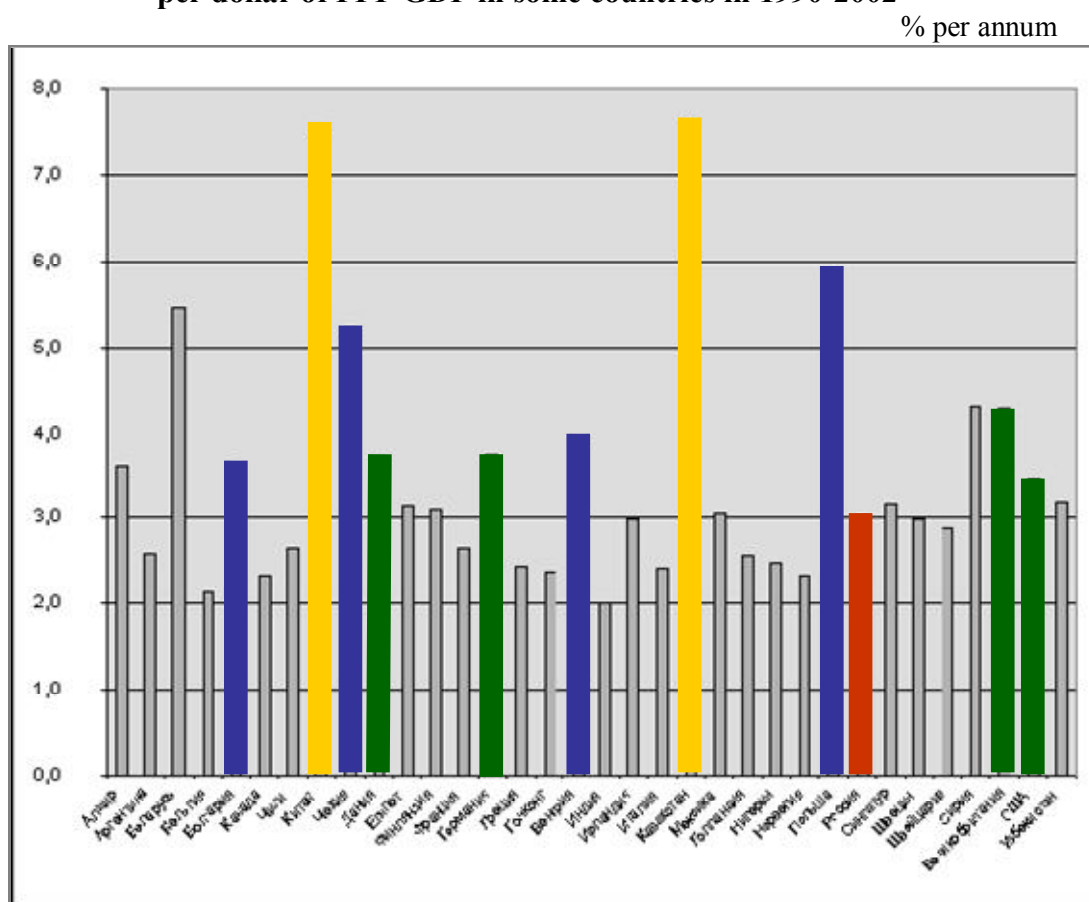
*Source:* Environmental Investment Centre, 2004

Moreover, according to the General Director of the mill Mr. Vladimir Beloglazov, the mill has reserves and capacities to further increase the production output, in fact without increasing greenhouse gas emissions, provided the required investment is brought in, including also through the Kyoto Protocol mechanisms.

A similar situation is seen at other Russian enterprises. They did not spend their efforts in vain by increasing energy efficiency and energy saving and using secondary and renewable sources of energy.

There is even a point of view that quality of social and economic development can be judged, to some extent, by the rate of reduction of carbon intensity of GDP. This is because reduction of greenhouse gas emissions means also reduction of production costs and more efficient use of resources and decreased harmful environmental impacts, and therefore, harmful impact of risks on the population morbidity and mortality.

**Fig. 6. Average annual decrease rates of carbon dioxide emissions (CO<sub>2</sub>) per dollar of PPP GDP in some countries in 1990-2002**



**Source:** Environmental Defence (USA), Russian Centre of Environmental Policy, 2004

(List the countries, left to right: Algeria, Argentina, Belarus, Belgium, Bulgaria, Canada, Chile, China, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Ireland, Kazakhstan, Mexico, Holland, Nigeria, Norway, Poland, Russia, Singapore, Sweden, Switzerland, Syria, Great Britain, USA, Uzbekistan)

Unfortunately, having a too high level of carbon intensity of GDP and a huge potential for its reduction, Russia lags far behind – by the rates of its reduction – not only developed countries like USA, Great Britain, Germany and Denmark, but also behind countries in transition such as Poland, Czech Republic, Bulgaria, Hungary, and even behind China and Kazakhstan, which are classified as developing countries (see Fig. 6).

## Russian business: first steps towards Kyoto

Despite the absence of a well-formulated government policy, the Russian businesses do implement some measures prescribed by the Kyoto Protocol. This especially concerns energy efficiency and energy saving and the use of secondary and renewable energy sources. They do this because this is beneficial for the businesses. This allows them to reduce costs and increase competitiveness of their production entities. At macro-level it results in decrease of GDP carbon intensity.

However, in the recent time, the economic climate in Russia is becoming less attractive for investment and technical update. Therefore, one cannot be assured that businesses will go on doing something in the future, and will not curtail its investment activities to be on the safe side. And there are symptoms of this. Many Russian companies have frozen already initiated projects and rejected investment opportunities. Despite high investment ratings of Russia, reported by several leading international agencies, capital flow out of Russia in 2004 was estimated by various authors between 30 and 40 billions of USD. This testifies against development of Russian business towards the Kyoto Protocol.

But no doubt that the first signs of economic recovery will again stimulate investments, and cumulative vector of such investments will inevitably coincide with the goals and objectives of the Kyoto process.

That's why many Russian companies express interest for «capitalization» of climatic benefits of their activities, in the form of investments or profits from emissions trading, including RAO «EES», Gazprom, EurazHolding, RusAl, AFK «Systema» and others. Energy Carbon Fund of RAO «EES» every year submits several emission reduction projects for consideration of potential foreign investors. In 2003 - 2004, such projects were proposed, for the first time, by several Russian pulp and paper companies: Kotlas pulp and paper mill (belongs to «Ilim Pulp»), Syassky pulp and paper mill, Solombala pulp and paper mill, and Pitkyaranta pulp mill.

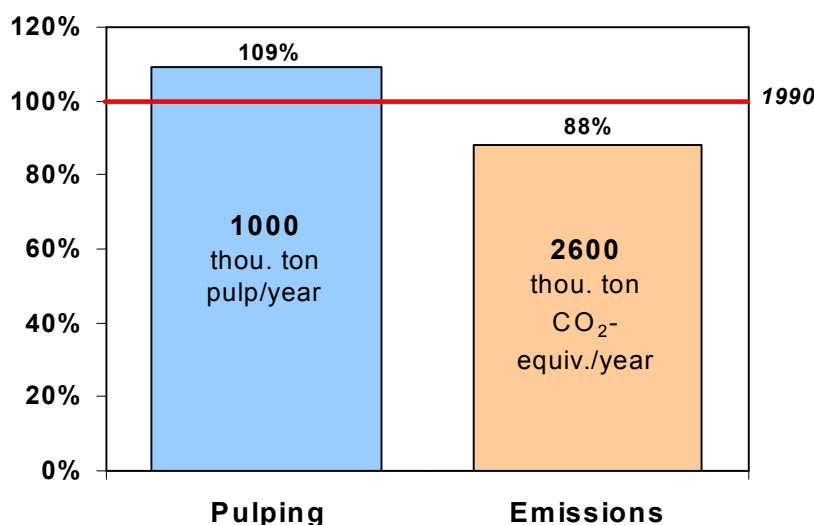
Archangelsk pulp and paper mill takes the most comprehensive position. Center for Environmental Investments conducted GHG emission inventory at this enterprise for the period 1990 - 2003 on annual basis, and calculated inputs of different industrial subdivisions, using original methodology, and taking into account flows of electricity and heat energy between these subdivisions. Automated system of emission calculation from all sources according to IPCC classification has been implemented, and “Directive on GHG emission inventory, management and monitoring” has been approved by the management of this enterprise.

In 2003, Archangelsk pulp and paper mill was the first among all Russian enterprises which accepted voluntary GHG emission reduction obligations. This company pledged to keep its annual GHG emissions under 2.6 million tons of CO<sub>2</sub>-equivalent until 2012. This is 12% lower than its emissions in 1990. At the same time, pulping will be increased at least to 1 million tons per year, which is 8.5% more than in 1990 (see Fig. 7). This decision was announced by General Director of the mill Mr. V. I. Beloglazov at the 9th Conference of Parties to UNFCCC in Milan (Italy) on December 10, 2003.

To achieve this goal, APPM developed climate strategy, which includes implementation of energy-saving technologies, increase of efficiency of power stations owned by APPM, prevention of heat losses, further increase of share of biofuels, and improvement of technical characteristics of biofuels (cooking liquors and wood waste).

APPM management considers its climate strategy as a constituent part of long-term business strategy. Consequently, APPM plans to mobilize at least 25-30 million USD by participating in the flexibility mechanisms of the Kyoto Protocol, and these money are viewed as investment source for technological modernization.

**Figure 7. Voluntary GHG Emission Reduction Obligations of JSC «Archangelsk Pulp and Paper Mill» towards 2012 (in per cent of 1990 level)**



Source: JSC «Archangelsk pulp and paper mill»

On the whole, however, positive examples of conscious activities of Russian companies in the area of climate change and GHG management are still notable exceptions rather than general trend. This is not surprising, if we consider situation with ratification of the Kyoto Protocol in the Russian Federation. Purposeful state policy is needed to transform these single examples into irreversible trend.

### 3. WHAT SHOULD BE DONE AND WHERE TO START

#### Account and registration

The first urgent step should be the establishment – by mid 2006 – a system for emissions inventory that will allow a rather high precision of data about emissions, as well as carbon inventory register which should include emissions, acquisition, transfer and use of carbon units, certifying the right to greenhouse gas emissions.

#### Strategy

To manage something, a clear target is needed. It is advisable that such target should be achievable and countable (i.e. quantifiable and verifiable). For example:

- To retain emission within **E** tons of CO<sub>2</sub>-equivalent;
- To sell in the carbon market **T** carbon units (ERUs and AAUs);
- To transfer to the next budgetary period **S** carbon units;
- To ensure additional carbon sinks through improvement of land and forest practices in the amount of **R** tons of CO<sub>2</sub>-equivalent.

In so doing, one should fulfil the apparent equation (see Fig. 8): the sum of the first three equals the national assigned amount plus additional carbon sinks (**R**).

The key values here are the maximum emission value (**E**) and the additional carbon sinks resultant from improved land and forest practices (**R**), which, in fact, express the essence of the state policy on the limitation and reduction of greenhouse gas emissions.

**Fig. 7. Basic emissions equation. Kyoto model.**

$$E+T+S = AA+R,$$

where: <b>E</b>	– greenhouse gas emissions (emissions)
<b>T</b>	– carbon units trading (trade)
<b>S</b>	– carbon units saving(savings)
<b>R</b>	– additional removals by sinks as a result of land and forest practices
<b>AA</b>	– maximum level of emissions, assigned by the Kyoto Protocol (assigned amount)

The compromise between trading (**T**) and saving (**S**) of carbon units is set taking into account the measures and projects on reduction of emissions that cannot be implemented by the state and businesses by themselves.

To develop the strategy, it is important to take a definite stand towards the fulfilment of commitments for the second period after the year 2012. This will define all essential parameters of the suggested climatic strategy model, above all, the requirements for the limitation of emissions (**E**) and saving of carbon units (**S**) so as to transfer them to the next budgetary period.

It can be suggested, for example, that Russia may transfer to the second period the same commitments which it had in the first period, i.e. not to exceed the level of 1990.

## **Regulation of emissions. Policy and measures**

For the purpose of state regulation of greenhouse gas emissions, all sources of emissions should be divided into two groups. The first group should include sources controlled by enterprises and companies; the second should include small, isolated sources, for instance, transport, individual stand-alone communal boiler houses, etc.

The first group emissions must be regulated by quotas, i.e. by giving to enterprises and companies permits for greenhouse gas emissions from the sources controlled by them. In the second group, emissions must be regulated indirectly, through a system of technological norms and standards.

Technological norms and standards should be applied to individual units of technologies and equipment. They must regulate greenhouse gas emissions and leakages, as well as use of fuel and energy by machinery and equipment and, thereby, indirectly limit greenhouse gas emissions.

Permits give the right to emit greenhouse gases in the amount of one (1) ton of CO<sub>2</sub>-eq. Such permits can be sold, bought and accumulated (transferred to the next period).

Depending on the actual amount of emissions, permits are cleared off (withdrawn) every year on the basis of the emissions reports provided by the emitters. These reports should be audited and those enterprises that provided underestimated data on emissions should pay fines. Such enterprises must transfer to the authorized bodies for clearing additional amount of permits, taking into account the auditing results.

In case of excessive emission above the quota limits (i.e. the total amount of permits available for enterprises both from the state and purchased in the market, including also carbon units from other countries, i.e. AAUs, ERUs and CERs), the enterprises must pay fines.<sup>7</sup> Besides, it is necessary, probably, to consider fines on the violators so as to set off the exceeded amount, in the double amount (double rates). In fact, this will mean that the violating enterprise

<sup>7</sup> Under EU ETS, the fine charged is 40 Euro per ton of CO<sub>2</sub>-eq. in 2005-2007, and 100 Euro per ton of CO<sub>2</sub>-eq. in 2008-2012

will receive for the next budgetary period a quota diminished by the double exceeding of emission in the previous period.<sup>8</sup>

The key question here is allocation of emission permits. This can be done as follows. At first, the basic emissions level should be calculated, not the level of 1990, but the average level of the last 5 to 7 years. Then this basic level of emissions should be adjusted taking into account the expected production growth rates. Thus, we calculate the permitted emissions for every year of the budgetary period. Finally, the amounts of permitted emissions calculated for every year should be summed up, and thus, the quota for the company is calculated for the entire period.

This scheme should be supplemented by two preconditions. Firstly, when calculating for annual permitted emissions, it is recommended to use an adjustment factor (or even a system of sectoral factors) to consider for the relative reduction of emissions per production unit due to the scale effect and investments. Secondly, it should be specified that if the actual production growth rates are below the predictions, then in the following budgetary period, the quota would be adjusted accordingly given the excessive amount provided to the emitter in the current period.

These two conditions would stimulate the enterprises to invest more intensively and to introduce best available technologies as a prerequisite for increasing production. Alternative option for them is to purchase additional permits in the market and/or to obtain carbon units issued by other countries.

In any case, the Russian domestic market of greenhouse gas emissions should be made open for foreign companies as much as possible. This will boost the market demand and will stimulate Russian emitters to save quotas and reduce emissions. To this end, it is necessary to allow foreign companies to purchase and sell emission permits in the Russian market, as well as to stipulate conversion of permits into carbon units (AAUs) to export them from Russia.

**Table 2. Methods of state regulation of greenhouse gas emissions**

Policy and measures	Regulated facilities/emissions sources
Setting quotas by giving permits for emissions and emission trading	Large and medium sources as well as uniform groups of small emission sources controlled by enterprises and companies
Technological regulations	Specific technological units, such as: transport facilities, water, railway, pipeline, agricultural, construction and other mobile machinery and equipment, and energy-consuming and energy-generating equipment.
Tariff and tax policies	Such policies should be aimed, basically, at saving of fuels and energy by population and small businesses
Policies related to land and forest practices	Protection and improvement of natural carbon sinks and accumulators. Elimination of illegal; and unauthorized tree felling, marking of timber, improvement of technological norms and requirements in land and forest management practices, reformation of land and forest management relations, early detection and extinguishing of forest fires, afforestation and reforestation, land tillage, etc.
Investment policy	Supporting of investment in the housing and communal sector so as to update it at the modern technological level, reducing consumption of fuel and energy production and distribution losses, using projects of disposal of communal waste, casinghead gas and mine methane, as well as improvement of land and forest management practices.

<sup>8</sup> Under EU ETS, the surplus must be offset in the next year one to one. But initial limitation for GHG emissions is more tight.

Besides technical norm-setting and quotation, the Government may provide fiscal and tariff incentives for GHG emission reductions, improvement of land use and forestry practices, for investments in the framework of flexibility mechanisms of the Kyoto Protocol.

There are two forms of investment policy: (1) «green investment scheme» (reinvestment of proceeds from emission quota sales under Article 17 of the Kyoto Protocol in emission reduction projects), and (2) implementation of JI projects under Article 6. In both cases, transparent procedures of selection, approval and control of investment projects are needed to prevent corruption. These procedures should be open for control by authorized organs of FCCC and the Kyoto Protocol, by public organizations and other interested parties.

## **Institutional issues**

According to the principles adopted in the administrative reform, it is necessary to distinguish between three levels of decision-making in the field of greenhouse gas emissions regulation, i.e. regulatory, executive and supervisory levels.

The issues of regulation (law-making) must be, probably, concerned by the ministries and departments who are directly responsible for these issues. However, the main regulatory documents in emissions management which are the procedure of inventory, the procedure of primary allocation of emissions permits, etc., must be considered by the Government of the Russian Federation.

The executive functions must be performed by some special state authority, ideally the federal agency. The powers of such authority should include:

- (i) Inventory of GHG emissions in accordance with the international principles and standards and in compliance with the instructions approved and endorsed by the Government of the Russian Federation;
- (ii) Receipt and verification of inventory reports on greenhouse gas emissions and sinks submitted by enterprises and companies;
- (iii) Allocation of permits among Russian enterprises and companies according to the principles and procedures endorsed by the Government of the Russian Federation;
- (iv) Receiving and clearing off of emission permits as well as of carbon units issued in other countries as part of the actual emissions of the limitation of emissions;
- (v) Control over timely return by enterprises of their emission permits after the actual emissions account;
- (vi) Imposing of fines on enterprises and their managers for submission of inadequate (underestimated) data on emissions, for untimely return of permits to set off actual emissions as well as for exceeding of the permitted emission levels;
- (vii) Evaluation, certification and registration of joint-implementation projects;
- (viii) Monitoring of emissions and sinks in the course and as a result of jointly implemented projects;
- (ix) Keeping of emissions register, transfer of ERUs to investors on the basis of agreements on joint implementation of projects as well as transfer of AAUs on the basis of purchase and sale transactions;

- (x) Certification and accrediting of organizations dealing with inventory and audit of greenhouse gas emissions, keeping of corporate emissions inventory registers, and the development and expertise of jointly implemented projects.<sup>9</sup>

The issues of supervision over anthropogenic greenhouse gases must be tackled by relevant supervisory authorities. For instance, functions of supervision over emissions sources as regards the observance of technological norms and rules related to such sources should be vested with the Federal service on technological, environmental and nuclear supervision.

## **Regional features of the climate policy**

Global climate changes are characterized by regional differences. It is obvious that consequences of climate changes will be quite different for the south and north of Russia, and for its eastern, central and western parts. Also different are sources and intensities of greenhouse gas emissions.

Unfortunately, no serious research has been made to this effect so far. There are data on emissions for some Russian regions (for example, for Archangelsk Oblast). But it is not known precisely what the share of greenhouse gas emissions of different Russian regions is. Moreover, it is still not known which part of emissions is the responsibility of the region, given account of interregional flows of fuels and energy.

Meanwhile, the regional specifics will inevitably make an imprint on the selection of policies and measures to mitigate climate changes, let alone measures for prevention and elimination of such consequences for the environment, population and economy of the regions.

For example, for the Russian northern part, the key role will be played, probably, by saving of heat energy in production and in the housing and communal sector, the use of biofuels (above all, wood waste), and sustainable land use. For the Russian southern part, of relevance will be the use of solar energy and stimulation of sustainable land use methods. In Kamchatka region, an important role will be played by geothermal energy resources. For the coal-mining regions, an essential task will be the use of mine methane. There are but a few examples, far from representing all regional diversity.

Accordingly, to make the state system of management of greenhouse gas emissions, a powerful regional component is required. Otherwise, there is a risk of duplicating the same typical decisions that will not always be adequate for the situation.<sup>10</sup> Moreover, stemming from the fact that the emissions quota is a sort of a national climatic resource, then, we can rightfully raise the issue about using this resource, primarily, to mitigate climate changes and consequences of such changes that are manifested precisely at the regional level.

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<sup>9</sup> Operation in the carbon market just as in the stock or financial markets requires special training. Therefore, it is expedient for the State to control this market through certification and accreditation mechanisms.

<sup>10</sup> We can give almost an anecdotal case from the Soviet period that has direct bearing on the climate. When buildings and structures were designed for the town of Baikalsk in Irkutsk Oblast, Ukrainian designers provided for a flat roof design, based on the fact that this town is at the same altitude as the town of Kharkov. They did not take into account the fact that this was in Siberia and unlike Kharkov they had a lot of snow in Baikalsk in winter. As a result, they had to modify everything and to design and built slope roofs.

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