

***POSSIBLE APPROACHES AND NEXT STEPS FOR
THE DEVELOPMENT OF A NATIONAL INVENTORY
SYSTEM IN THE RUSSIAN FEDERATION***

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Executive Summary

The Russian case study is part of Annex I Expert Group initiative carried out through the OECD and IEA in order to respond to the new challenges that the countries with economies in transition (EIT countries) are currently facing regarding the implementation of the Kyoto Protocol.

Much work related to the GHG inventories has been carried out in Russia during recent years. This work was implemented at different levels and by various teams.

The Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet) is the leading Russian Federal Agency responsible for development of Russian National Communications and national greenhouse gas inventories in accordance with the common reporting format. RAO «Unified Energy System of Russia», the largest energy producer in Russia, carried out annual inventories for its big heat and power plants (about 370 energy producing enterprises) for the period 1990-1997. A number of Russian regions also carried out annual greenhouse gas inventories.

The main objective of the case study was the proper understanding of the ways for establishment of the national greenhouse gas inventory system functioning in accordance with the requirements of Article 5.1 of the Kyoto Protocol. The development of strategic approach for national inventory activities and working out recommendations on the steps to be taken in the next few years were among the main objectives of the case study as well. The co-ordinated domestic effort and its international recognition should attract attention of the Russian Government, the State Duma (the Russian Parliament) and relevant ministries in order to facilitate decision-making on the matter.

According to the objectives of the case study, the Russian team has worked out the review of current international requirements, the analysis of priority setting, estimates of availability and quality of activity data, possibilities for development of inventories in the country, the financing and experience dissemination issues. On the basis of such a review and its analysis the team identified possible initiatives for consideration by ministries and agencies – stakeholders and the State Duma, as well as a brief analysis of links between greenhouse gas inventory activities and other climate policy issues.

The first section of the case study highlighted general aspects related to the definition and place of the inventory system for implementation of the Kyoto Protocol and objectives and scope of the case study.

The second section of the case study was devoted to the review of current international rules and guidelines and the framework for the national priority setting. The first prior task for the Russian Federation is to prepare the national inventories on an annual basis according to the Common Reporting Format. The main problem and the main labour-intensive task for Russia is preparation for the full-scale implementation of inventories consistent with IPCC Good Practice 2000 Guidance. It requires substantially more resources than the first priority task, especially for collection and analysis of information for uncertainty estimation and implementation of a wide range of quality assurance/quality control (QA/QC) activities.

The third section of the case study provides a review of national circumstances and recommendations on the national strategy for development of a national inventory system.

A lot of inventory work has been fulfilled already in the Russian Federation at national, regional and company levels. The section presents sector-by-sector analysis of the obtained results, availability and quality of the activity data and emission factors. The main milestone for further developments is the synthesis of national, regional and company inventory data and experience in order to work out a joint effective national system.

In general, quite a vast experience in GHG inventory based on use of the *Revised IPCC 1996 Guidelines* has been accumulated. This experience includes general estimates for the national level, detailed estimates for several regions and some sectoral inventories (first of all, in the key electric energy power sub-sector).

Availability and quality of the activity data in most cases are sufficient for relatively low uncertainty estimates consistent to *Revised IPCC 1996 Guidelines*. It is possible to estimate that from 80 to 90% of national inventory can be conducted with satisfactory uncertainty of 5-10% on the level of *Revised IPCC 1996 Guidelines*. Exceptions include some parts of Agriculture and Waste sectors (and LULUCF separately accounted), where uncertainty is still very high.

There is no experience in using the Common Reporting Format, while it looks like a technical problem relevant to institutional arrangements and funding problems, as well as timely submission of annual inventories to the UNFCCC Secretariat.

There is no general experience in using the *IPCC Good Practice 2000 Guidance* (with the exception of uncertainty assessments in Novgorod Oblast, obtained in 1999, and uncertainty assessments of RAO «Unified Energy System of Russia» inventories, obtained in 2000 in the framework of independent inventory expertise).

The fourth section of the case study provides analysis of various sector-by-sector options for development of inventories in the country. A step-by-step strategy for development of inventories was recommended on the basis of this analysis. The recommended actions include the following:

- to undertake urgent institutional and funding arrangements for the national inventory unit, which has to compile timely annual inventories in the Common Reporting Format;
- to establish an official system, where 5 relevant ministries/agencies or nominated national institute(s)/organisation(s) will prepare all chapters in the IPCC format and completely consistent with *Revised 1996 IPCC Guidelines* (in Russian and English);
- to undertake public campaign on voluntary GHG inventories in regions and largest companies (with focus on IEA energy balances of regions); organise technical and methodological support for regional and company specialists;
- to prepare a plan for step-by-step implementation of *IPCC Good Practice 2000 Guidance* in Russia;
- to facilitate the development of national emission factors by promoting of relevant scientific researches and studies.

The fifth section of the case study contains two different sub-sections: financing issues and dissemination of the obtained experience.

On the basis of analysis of financing issues an organisational scheme for activity data development was recommended and the costs for the inventory activities were estimated.

The results of estimations show that the costs will not be very high and that the expected expenses for the inventory activity will not prevent the realisation of the Kyoto Protocol provisions.

The Russian team realises that the public participation in development of greenhouse gas inventories is problematic because of the specificity of the inventory works. In general, the public should be informed on the summary of the inventory results, on the balance between emissions and removals, and other general issues, in order to understand the role of each sector in emissions. In some specific cases the public (or local communities) might be interested in the greenhouse gas emission data on a certain enterprise or territory (e.g. natural reserves or protected areas, such as Baikal Lake), this is essential for integrated environmental assessments. The Russian team also realised the growing interest of Russian NGOs and general public to climate change issues and hence proposed a special subsection for the inventory case study.

The sixth section of the case study discusses options and milestones for necessary institutional arrangements and possible initiatives of governmental and legislative authorities.

The seventh section of the case study provides general conclusions. The main conclusion made as the result of the study is that there are no irresistible barriers for development of Russian national greenhouse gas inventory system until 2007 and for providing its functioning in accordance with the requirements of Article 5.1 of the Kyoto Protocol. At the same time this task will require a lot of efforts to overcome the existing barriers, financial and other problems, which should be implemented on a step-by-step basis.

The Appendixes describe specific issues for better understanding of general text of the case study.

This work was carried out in close co-operation with OECD and IEA experts, who visited Moscow in May 2001 and provided valuable advice in development of the case study during their in-country mission and later providing comments and recommendations, which were very useful for the Russian team.

The team, which developed this case study, hope that the results obtained within the study might assist other IET countries in their domestic priority setting in development of national greenhouse gas inventory systems.

More expanded summary information is contained in the OECD Information Paper “Designing inventory, registry and trading systems in countries with economies in transition”, available on the OECD web site.

1. Introduction

1.1. Definition and the role of national inventory system for implementation of the Kyoto Protocol

Knowledge and timely tracking on the levels of greenhouse gas emissions and sinks are essential and very important requirements of the Kyoto Protocol. The Kyoto Protocol in its Article 5.1 declares that each Party included in Annex I (in our case it is the Russian Federation) should have in place, no later than one year prior to the start of the first commitment period (no later than in 2007), a national system for estimation of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol.

This system refers to all institutional, legal and procedural arrangements made within an Annex I Party for estimating GHG emissions and removals, for reporting and archiving this inventory information. These estimation, reporting and archiving are needed to be made according to relevant international guidelines. This includes:

- Estimating GHG emissions and removals according to IPCC Revised 1996 guidelines, as elaborated by the 2000 IPCC « good practice » guidelines
- Reporting this information annually according to UNFCCC reporting guidelines, which include filling in the « Common Reporting Format » and submitting a « National Inventory Report ».
- Establishing institutional, legal and procedural arrangements according to guidelines under Art. 5.1

With these national systems in place, Annex I Parties will be able to develop national inventories of sufficient quality, so that they can be used to assess compliance with the Kyoto targets. Detailed inventories are also needed domestically to identify priorities for policies and measures. Finally, such national systems are eligibility requirements for participation in the flexible mechanisms, Joint Implementation and International Emissions Trading, which are important priorities for many countries with economies in transition, in particular, the Russian Federation.

It means that the Russian Federation should establish no later than in 2007 a national inventory system for implementation of the Kyoto Protocol. Final guidelines for such national systems shall be decided upon by the Conference of the Parties serving as the meeting of the Parties to this Protocol at its first session, when the Kyoto Protocol will be in force.

Setting up these national systems is, however, a complex, multi-year process. The main objective of the case study is, therefore, to initiate the development of a strategic approach for national inventory activities in the Russian Federation. The study also provides some recommendations on the steps that are needed in the next few years in the Russian Federation to establish such a national system. This co-ordinated domestic effort and its international recognition should attract the attention of the Russian Government, the State Duma (the Russian Parliament) and relevant ministries in order to facilitate decision-making on the matter.

A broad expected application of the results of the inventory activity means that national inventories should:

- be complete and cover all emission sources and sinks sector by sector for all 6 Kyoto Protocol greenhouse gases;
- be comparable with international methodologies on assessment and calculation of greenhouse gas emissions and removals;

- be developed in strong conformity with internationally agreed reporting formats (common reporting format), including sectoral breakdown and the level of summary and sectoral reporting tables;
- be consistent in use of the same methodologies and data sets over the reporting years;
- provide the levels of accuracy required by international regulations;
- be transparent in assumptions and methodologies with necessary explanations clearly documented, so that reviewers and users may replicate the calculations;
- be issued on an annual basis and timely, so that it should allow using inventory activity results for all applications.

1.2. Objectives and scope of the case study

The Russian case study is part of Annex I Expert Group initiative carried out through the OECD and IEA in order to respond to the new challenges that the EIT countries are currently facing regarding the implementation of the Kyoto Protocol.

The overall objective of this EIT support programme is to provide a targeted analysis of existing initiatives, experience and practices in IET countries for implementation of the Kyoto Protocol and to support the exchange of information among Annex I countries. The work under this project, as a whole, aims to cover some of the most important aspects of domestic implementation of the Kyoto Protocol: national GHG inventory systems, national registry systems, domestic procedures and institutions for JI and emission trading, domestic policies and measures.

The Russian case study is devoted to the implementation of the national GHG inventory system because of the following reasons:

1. Much work related to GHG inventories has been carried out in Russia during the recent years. This work was implemented at different organisational levels and by different teams. There is a call in Russia to summarise the existing experience, to develop integrated conclusions and recommendations how to build the national GHG inventory system.
2. In spite of the fact that the sixth UNFCCC Conference of the Parties (COP6) has not approved yet all the decisions related to Articles 5 and 7 of the Kyoto Protocol, it is expected that the Parties' obligations under these Articles will be considered as some of the most important obligations under the Kyoto Protocol.
3. A proper understanding of the national GHG inventory system might stimulate other activities under the Kyoto Protocol in Russia, including the issues of national registry system, JI and emission trading, as well as planning of key domestic policies and measures.

These circumstances motivated the Ministry of Energy of the Russian Federation to propose the issue of the national inventory system implementation, according to the Article 5.1 of the Kyoto Protocol, as the focus of this case study.

In May 2001 four experts Dr. Jos G.J. Olivier (Netherlands), Mr. Jurgen Salay (Sweden), Mrs. Milena Todorova (Bulgaria) and Mr. Stephane Willems (OECD) visited Moscow and had meetings with all Russian key inventory experts and officials from the ministries and agencies – stakeholders. The successful discussion as well as comments of other experts including Bill Irving (U.S. EPA) and Meredydd Evans (PNNL) allowed to identify priorities and to complete this work.

The scope of the final study covers most of important issues related to the establishment of effective Russian national greenhouse gas inventory system. As it is a long-term task to create the system, Russian experts tried to divide it into two stages: short time activities (for two-three years) and next steps towards the establishment of the Russian national greenhouse gas inventory system until 2007.

According to its purposes this paper was divided to several sections devoted to various aspects on inventory institutional, methodological, financial and other corresponding issues.

The logical structure for this work was as follows:

- to review the current and expected international requirements included in IPCC and UNFCCC rules and guidelines that are related to the national inventory system and to suggest priority setting in meeting there requirements (Section 2);
- to review existing experience in inventory activities in Russia and to estimate availability and quality of activity data and emission factors (Section 3);
- on the basis of international requirements and analysis of national circumstances to estimate framework for priority setting in the development of national inventory system in Russia (Chapter 4);
- to assess requirements and options in financing of inventory activities (Section 5);
- to review dissemination of experience and public awareness issues (Section 6);
- to assess required institutional arrangements and to identify priorities regarding initiatives that are required to establish on a step-by-step basis the national greenhouse gas inventory system for their consideration by the key ministries and agencies and the State Duma (Section 7).

2. Review of international rules and guidelines and framework for priority setting

This section of the case study was developed first of all for better understanding of current and existing international circumstances, which is necessary for sound decision-making by appropriate Russian authorities.

One of the commitments of the Russian Federation as an Annex I Party to the United Nations Framework Convention on Climate Change (UNFCCC), is the periodical informing of other countries about the state of greenhouse gas (GHG) emissions in the country. In accordance with Articles 4 and 12 of the Convention, and the relevant decisions of the Conference of the Parties, Parties to the Convention should submit to the secretariat national greenhouse gas inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases, not controlled by the Montreal Protocol. These inventory data are provided in the national communications under the Convention by Annex I and non-Annex I Parties. In addition, Annex I Parties submit annual national greenhouse gas inventories with data for their base year (in most cases 1990) and up to the last but one year prior to the year of submission.

The United Nations Framework Convention on Climate Change gained a new economic trend first of all after the adoption by all the Parties of the Convention of the Kyoto Protocol in December 1997. The economic and investment base of the implemented jointly commitment mechanisms, in particular, the possibility of JI project realisation and emission trading make it necessary to operate with more precise values of emissions. The Article 5 of the Kyoto Protocol reads: “All Parties... shall: develop, periodically update, publish and make available to the Conference of the Parties, in accordance with Article 12, national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies to be agreed upon by the Conference of the Parties.” The Article 7 of the Kyoto Protocol also stresses the necessity of annual inventory according to accepted international methodology.

Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories

As a methodology of greenhouse gases emissions inventory for the first budget period of the commitment implementation under the Kyoto Protocol the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC Guidelines) were adopted. The Revised 1996 IPCC Guidelines include the revised methodologies and typical data on the fuel combustion, industrial processes, agricultural soils, land use change and forestry, waste and methane from rice fields. Some additional methodologies for the estimation of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) ozone and also gases with direct greenhouse effect - carbon dioxide (CO₂), methane (CH₄), nitrous oxide (NO₂) are available in these Guidelines. This methodology implies several “tiers” of emission determination. The simplest one usually supposes minimum of data and analytical possibilities. The more complex tier is based on the detailed data and as a rule takes into account specific circumstances of a country. The highest tier implies the data detalisation to the level of enterprises and direct measurement of the most gas emissions. For example, the first tier is the balance calculation on the base data on common consumption of the main types of fuels in a country (district). The second tier is the calculation of emissions according to the categories of sources. The third one – concrete data on enterprises. There is a set of emission factors for all the calculations in the methodology. The methodology allows to use both any tier of inventory and different tiers

for the different types of activity, etc. On the other hand, the strict requirement is available – to use standard tables – Working Sheets. If necessary it is possible to use any additional tables and insert additional columns or lines into standard forms. However, these standard tables should be used and submitted to the UNFCCC Secretariat.

Good Practice 2000 Guidance for Greenhouse Gas Emission Inventory

In development of the Revised IPCC Guidelines for national greenhouse gas emission inventory (1997), in 2000 the IPCC prepared a supplementary paper called “Good Practice Guidance for Greenhouse Gas Emission Inventory”, which describes advanced approaches of emission inventory. The goal of the *IPCC Good Practice Guidance* is to support the development of National Greenhouse Gas Inventories that “can be readily assessed in terms of quality and completeness.” Good practices would aim to produce inventories which were unbiased and minimised uncertainties. The new Guidance underlines the importance of application of the most advanced approaches to emission inventory in major sources (sectors of the economy).

The Guidance includes a special module devoted to methodology description of the importance of identification of the particular emission sources. A principally important module in the new Guidance is the methodology of emission inventory data uncertainty estimation, to which a special attention is paid. Another important module deals with the methodology of primary data assessment. In this respect the most important task deals with the accurate choice of emission factors and caloric values by a type of fuel. It is recommended in the Guidance to carry out special research for determination of values of the emission factors and detailed approach to the application of different caloric values. Another specific feature of the Guidance is its "dynamic" nature. It is suggested to consider sources not statically (for particular year), but with regard to trends. It recommends creating a time series for all the years since 1990, monitoring and obligatory explanation of "anomalies" in the data, which is actually an additional checking of data quality. More than that, it is recommended to take into account the trend of identifying the importance of particular sources. If the source is relatively small but growing fast (or projected to grow fast), then it should be included in the priority list and assessed in more details.

The Methodology for estimating precision of emission calculation considers all types of uncertainty except the uncertainty of global warming potential factors for calculation of CO₂-equivalent emissions. The Guidance includes two methods: a simpler method of Tier 1 and a more complex one of Tier 2. Users are suggested to make their choice with regard to availability of data, importance of emissions source and technical resources for inventory in general. The last module of the Guidance is devoted to methodology of data quality control.

The *IPCC Good Practice Guidance* (2000) provides detailed instructions on the following major aspects of the national GHG inventory:

- the choice of inventory method,
- the choice of emission factors and calorific values for fuels,
- activity data,
- completeness of estimates,
- development of a consistent time series,
- uncertainty assessment.

The Guidance describes the methodological issues and calculation procedures related to the estimation of both CO₂ and non-CO₂ emissions from stationary and mobile sources.

The Guidance also defines what is a good practice to document and archive all information required to produce national emissions inventory. It is mentioned there that the inventory report should include summaries of methods and references to source data, so that the emission estimates are transparent and the steps of calculation may be retraced.

In addition, the Guidance describes the procedure of the inventory quality assurance/quality control (QA/QC) including:

- Comparison of emission estimates using different approaches;
- Activity data check;
- Emission factors check;
- Evaluation of direct measures.

The Guidance describes the detailed methodology for the choice of inventory method, choice of emission factors, activity data, completeness of estimates, development of a consistent time series, and uncertainty assessment for each particular source of emissions covered by the Guidance.

Common Reporting Format

As the **first priority**, the minimum requirements for the first complete inventory and inventory report refer to UNFCCC Reporting Guidelines on Annual Inventory. Starting in 2000, Annex I Parties must follow the revised UNFCCC reporting guidelines adopted at the fifth session of the Conference of the Parties (COP5), in preparing the inventories. According to these guidelines, Annex I Parties must use a common reporting format (CRF) for reporting their annual greenhouse gas data.

The main principles for national inventories, set by these Guidelines are:

- *complete*, i.e. all sources and sinks (as far as possible), and, in particular, all 6 gases;
- *consistent*, using same methodologies and data sets over the years;
- *transparent*, assumptions and methodologies should be clearly documented (in an inventory report), so that it is possible for reviewers/users to replicate calculations;
- *comparable*, i.e. using the methodologies, and, in particular, the reporting formats agreed internationally (common reporting format), with the agreed sectoral breakdown, at the level of summary and sectoral tables;
- *on an annual basis* to be submitted by 15th April each year; the inventory should be formally submitted in both an electronic form and a hard copy.

In terms of complete, the UNFCCC reporting guidelines on annual inventory set requirements for annual inventory prepared on gas by gas bases using the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories or any compatible and well documented national methodology. If the Party use national approach then only the emissions from fuel combustion have to be estimate in both - reference and national approach. The inventory should use any good practice and uncertainties methods estimates.

In general, the required information in the National Inventory Report (NIR) is transparent and contains the detailed explanation of the process of inventory preparation, such as emission factors used, activity data, methods, information on quality assurance/quality control procedures, uncertainties as well as any assumptions made and rationale for their selection. Important obligation in consistent way of preparing and reporting of inventarisations through the years till the base year.

The common reporting format is a part of the national inventory report. It is a standardised format for reporting estimates of greenhouse gas emissions and removals and other relevant information. It will be provided to Parties by the secretariat and will also be available on the UNFCCC web site. The common reporting format allows improved handling of electronic submissions and facilitates the processing of inventory information and the preparation of useful technical analysis and synthesis documentation.

The common reporting format consists of:

- (a) Summary and sectoral tables;
- (b) Sectoral background data tables for reporting of aggregate emission factors and activity data;
- (c) The IPCC worksheet 1-1 containing estimates of CO₂ emissions from fuel combustion using the IPCC reference approach and a table for comparing estimates under this reference approach with national estimates, as well as providing explanations of any significant differences;
- (d) Tables for reporting about aggregate CO₂ equivalent emissions and removals, recalculations, completeness of the inventory, uncertainty, feedstocks and non-energy use of fuels, international bunkers and multilateral operations, emission trends, and a check-list of the main inventory information requested by these UNFCCC reporting guidelines on annual inventories.

The common reporting format follows the source/sink category split of the IPCC sectoral tables. Following these guidelines the Party should achieve:

- first *complete* (as far as possible) and *comparable annual* inventory, reported in *transparent* manner for the recent year (CRF and NIR)
- completed recalculation table 8a for every year from the base year and table 8b
- completed tables in the common reporting format, which have changed for the base year.
- published National Inventory Report (CRF is a part from NIR) or keep it on national web sites
- achieved and stored inventory information and paper trail enabling tracing back to the original desegregated emission factors and activity data in one or minimum facility.

The information provided by the common reporting format is aimed at enhancing the comparability and transparency of inventories by facilitating activity data and aggregate emission factor cross-comparisons among the Parties, and an easy identification of possible mistakes, misunderstandings and omissions in the inventories.

Guidelines for National Systems for the Estimation of Anthropogenic Greenhouse Gas Emissions by Sources and Removals by Sinks under Article 5.1 of the Kyoto Protocol

The objectives of national systems under Article 5.1 for the estimation of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, referred to below as national systems, are:

- (a) To enable Annex I Parties to estimate anthropogenic GHG emissions by sources and removals by sinks, as required by Article 5, and to report these emissions by sources and removals by sinks in accordance with Article 7.1 and relevant decisions of the Conference

of the Parties (COP) and/or the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (COP/MOP);

- (b) To assist Annex I Parties in meeting their commitments under Articles 3 and 7;
- (c) To facilitate the review of the information submitted under Article 7 by Annex I Parties, as required by Article 8;
- (d) To assist Annex I Parties to ensure and improve the quality of their inventories.

National systems should be designed and operated to ensure the transparency, consistency, comparability, completeness and accuracy of inventories.

National systems should be designed and operated to enable Annex I Parties to consistently estimate anthropogenic emissions by all sources and removals by all sinks of all GHGs, as covered by the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories and *IPCC Good Practice Guidance*, in accordance with relevant decisions of the COP and/or COP/MOP.

In the implementation of its national system, each Annex I Party shall:

- (a) Establish and maintain the institutional, legal and procedural arrangements necessary to perform the functions defined in these guidelines for national systems, as appropriate, between the government agencies and other entities responsible for the performance of all functions defined in these guidelines;
- (b) Ensure sufficient capacity for timely performance of the functions defined in these guidelines for national systems, including data collection for estimating anthropogenic GHG emissions by sources and removals by sinks and arrangements for technical competence of the staff involved in the inventory development process;
- (c) Designate a single national entity with overall responsibility for the national inventory;
- (d) Prepare national annual inventories and supplementary information in a timely manner in accordance with Articles 5, 7.1 and 7.2 and relevant decisions of the COP and/or COP/MOP;
- (e) Provide information necessary to meet the reporting requirements defined in the guidelines under Article 7 in accordance with the relevant decisions of the COP and/or COP/MOP.

In these guideline the procedures of inventory planning and preparation are also describes.

Draft Guidance on Methodologies for Adjustments under Article 5.2

The objectives of the Guidance on methodologies for adjustments under Article 5.2 are to ensure the use of adequate methods for adjustments for inventory problems and to ensure that adjustments are calculated in an objective, transparent and comprehensible manner. Adjustments should be applied only when inventory data submitted by Parties are incomplete and/or are calculated in a way that is not consistent with the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, as elaborated by any good practice agreed upon by the Conference of the Parties (COP).

Adjustments are not intended as a substitute for national emission estimates to be developed and reported by Parties in accordance with the IPCC Guidelines, as elaborated by any good practice agreed upon by the COP. Adjustments are intended to provide an incentive for Parties to provide annual inventories prepared in accordance with these guidelines, which do not need adjustments. Adjustments should be a last resort and should be applied only when other attempts to correct a problem have failed. Parties should make

every effort during the review process under Article 8 to correct identified problems in consultation with the expert review team before an adjustment is considered.

Guidelines for Reporting of Supplementary Information under Article 7.1

The objectives of these guidelines conclude in the meeting by the Parties of their commitments for reporting information in accordance with Article 7.1 and in the promoting of the reporting of consistent, transparent, comparable, accurate and complete information by Annex I Parties. According to these Guidelines Each Annex I Party shall annually submit to the secretariat a [single report] [report to be incorporated in the annual inventory] containing the information required by these guidelines. (Text in square brackets, here and further, will be considered at a later stage).

Each Annex I Party shall submit greenhouse gas inventory information on:

- the anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol, prepared in accordance with Article 5.2 and decisions of the COP/MOP, taking into account any relevant decisions of the COP;
- the estimation of emissions and removals from land-use, land-use change and forestry relevant to Article 3.3 and 3.4;
- the net changes in greenhouse gas emissions by sources and removals by sinks resulting from afforestation, reforestation and deforestation in the base year and commitment years.
- the assigned amount of ERUs, CERs and AAUs, PAAs
- the national systems in accordance with Article 5.1, any changes that have occurred in its national system, compared to information reported in its last submission, including information submitted under Article 7.2;
- any changes that have occurred in its national registry, compared to information reported in its last submission, including information submitted under Article 7.2;
- the adjustments in accordance with Article 5.2 occurred during the previous year and information concerning the implementation of Article 3.14 related to national policies and measures to minimise the adverse effects on international trade, and social environmental and economical impacts on other Parties, especially developing country Parties, information on activities under Articles 6,12, and 17 regarding uniform resource locator (URL) on the Internet from which information on projects having generated ERUs or CERs during the relevant year is available, etc.

Guidelines for Reporting of Supplementary Information under Article 7.2

The objectives of these guidelines are: to enable Annex I Parties to meet their commitments for reporting information in accordance with Article 7.2 and to promote the reporting of consistent, transparent, comparable, accurate and complete information by Annex I Parties;

Each Annex I Party shall provide a description of its national registry. The description shall include the following information:

- (a) The name and contact information for the designated representative responsible for the Party's national registry;
- (b) A description of the database structure used in the Party's national registry;
- (c) A list of and the electronic format of the information transmitted electronically from the Party's national registry to an acquiring Party's national registry when transferring assigned amount;

- (d) A list of and the electronic format of the information that would be transmitted electronically from the Party's national registry to the independent transaction log when issuing, transferring, acquiring, retiring and cancelling assigned amount;
- (e) An explanation of the procedures employed in the Party's national registry to prevent discrepancies in the transfer, acquisition, and retirement of assigned amount;
- (f) An overview of security measures employed in the Party's national registry to deter computer attacks and minimise operator error;
- (g) A list of publicly accessible data elements available through the electronic interface (e.g. worldwide Web site) to the Party's national registry;
- (h) An explanation of how to access information through the electronic interface to the Party's national registry.

Besides supplementary information should be submitted:

Relevant to implementation of Articles 6, 12, and 17: Each Annex I Party that participates in Kyoto Protocol mechanisms under Articles 6, 12 or 17 shall report about: a description of any institutional arrangements and decision-making procedures to co-ordinate activities related to participation in the mechanism(s), including the participation of legal entities; general information on projects under Article 6; project activities under Article 12, etc. and;

Implementation of Articles 2 and 3: Information on the base year it uses for HFCs, PFCs and SF₆, for the purpose of calculating its commitments under Article 3.7;

Information on the implementation of Article 3.2 of the Kyoto Protocol showing what demonstrable progress has been made in achieving the commitment under this Protocol by the year 2005, and how.

A regional economic integration organisation that becomes a Party to this Protocol shall include in its national communication information on the joint fulfilment of commitments in accordance with Article 4

Each Annex I Party shall provide a description of how it is performing the general and specific functions defined in the guidelines for national systems under Article 5.1.

In providing information under part II, section V, of the guidelines for the preparation of national communications by Parties included in Annex I to the Convention (FCCC/CP/1999/7), each Annex I Party shall specifically address in accordance with Article 2 policies and measures implemented and/or further elaborated in order to reduce or limit emissions of greenhouse gases (GHGs) not controlled by the Montreal Protocol.

Each Annex I Party shall report any relevant information on its domestic legislative arrangements and enforcement and administrative procedures, according to its national circumstances, information on what and how technologies have been transferred by developed country Parties under Article 10 of the Protocol and information on the implementation of Article 11 of the Kyoto Protocol, in particular, information on how the additional financial resources have been provided. A uniform reporting format could be designed for this purpose.

Modalities for Accounting for Assigned amount under Article 7.4

Article 7.4 is the most important goal for Russia due to the requirement for establishment of its initial assigned amount under article 7.4. meeting Good Practice standards before the start of the first commitment period. This is actually the primary Kyoto Protocol

requirement to face Parties, and no country will be permitted to trade without an initial assigned amount. It is also important because a country that can meet the initial assigned amount requirements under 7.4 will likely be able to meet the annual inventory requirements under Article 7.1.

Under Article 7.4, each Annex I Party shall individually submit to the secretariat a report to establish its initial assigned amount and to demonstrate its capacity to account for its emissions and assigned amount during the commitment period. This report shall include the following information:

- (a) A greenhouse gas inventory and national inventory report containing complete inventories for all years from 1990, or other approved base year under Article 3.5, to the most recent year available, including emissions and removals from land-use, land-use change and forestry, in accordance with paragraph 3 of these guidelines;
- (b) Identification of its selected base year[s] under Article 3.8;
- (c) Calculation of its initial assigned amount, pursuant to Article 3.7;
- (d) Serial numbers for its entire initial assigned amount, in accordance with relevant decisions of the COP/MOP;
- (e) A description of its national system for greenhouse gas estimation reported in accordance with paragraphs 38-39 of these guidelines;
- (f) A description of its national registry for tracking its assigned amount reported in accordance with paragraph 30 of these guidelines.

Reporting issues related to national registry requirements and modalities for the issuance and cancellation of assigned amounts related to Article 3.3 and 3.4 will be considered at a later stage.

The document FCCC/CP/2001/2/Add.4 ***“Decisions concerning guidelines under Articles 5, 7 and 8 of the Kyoto Protocol”*** prepared for the resumed sixth session of the UNFCCC Conference of the Parties was addressed in Bonn on 18-27 July 2001, however it was decided to work with that after completion of work on some other issues related to implementation of Kyoto Protocol supposed to be achieved by COP7.

Conclusions

Thus the first priority task for the Russian Federation is to prepare the national inventories of greenhouse gases on an annual basis. These inventories are to be presented with respect to requirements of the Common Reporting Format.

The task of second priority, however still very important for Russia, is preparation to the full-scale implementation of inventories consistent with the *IPCC Good Practice Guidance*. It requires substantially more resources than the first priority task, especially for collection and analysis of information for uncertainty estimation and implementation of a wide range of QA/QC activities. Priorities in the frame of the IPCC Good Practice Guidance might be identified at the next steps toward the National inventory system according to available financial resources. It is clear now that the first efforts will be done for energy sector, because this sector is a biggest emitter, uncertainties are not so high. Moreover, there are quite clear sources of funds for such work (for instance, energy company voluntary funding, involvement of potential external resources like under the Energy Dialogue between Russia and the Europe, Green Investment Scheme, etc.).

3. Review of current national circumstances for development of national inventory system and recommendations on national strategy

After the analysis of international requirements, it is reasonable to estimate and describe Russian background and experience accumulated until present. In the given Chapter we would like to answer to the question “What do we have in Russia now?”.

Climate Change policy in the Russian Federation has been characterised so far by the lack of a stable institutional framework. The *Interagency Commission of the Russian Federation on Climate Change Problems* is entrusted with the co-ordination of all domestic climate measures, as well as the fulfilment of national obligations under the UNFCCC, including the official submissions of the national inventories and the national communications. However, the Commission is only a co-ordinating body and has no financial resources. The structure and activities of ministries and agencies, that deal with climate change, have also changed over time. The State Committee for Environmental Protection and the Federal Forestry Service were dissolved. Their functions were taken over by the Ministry of Natural Resources without adequate transfer of resources.

Currently, three ministries play a major role in the development of climate change policy: the Ministry of Economic Development and Trade, the Ministry of Energy and the Russian Federal Service for Hydrometeorology and Environment Monitoring (Roshydromet).

The Ministry of Natural Resources is also expected to play an important role in the future. It is becoming especially important in view of adoption of the *Federal Targeted Programme on Ecology and Natural Resources* (start from the year 2002) with a block on climate, which replaced *Federal Targeted Programme on Prevention of Climate Change and its Negative Consequences* (it will be cancelled from 2002).

In this context:

- firstly, the history of Russian inventory activities is briefly described;
- secondly, estimates of availability and quality of data and emission factors are summarised in the tables;
- additionally, a brief summary of inventory data from the last Russian National Communication (the latest official data available) is presented below as an Annex to illustrate relative importance of emission sources and gases. According to Chapter 7 of the *Good Practice Guidance* it is expected that such analysis should be conducted, but in Russia nobody has tried to conduct such work before.

The first part is really a basic description of the situation and national circumstances in Russia (national inventory, regional inventories and sectoral experience in GHG inventory), while the second one is specially conducted summary estimates, which can be considered as the key material for priority setting.

3.1 Experience in inventory development

National inventory

The general assessments of GHG emissions in Russia were made in 1995 and 1998. They were presented to FCCC Secretariat as separate chapters of the First and the Second National Communications. The First National Communication comprised the data as of 1990, whereas the data as of 1994 was included in the Second National Communication.

The background for the activities was formed in 1994-1995, when the appropriate GHG inventory tasks were carried out within the framework of USA-Russian Country Studies Program. The work was conducted within the Federal Target Program "Prevention of Dangerous Climate Change and Its Negative Consequences". The Program and a subprogram dealing with GHG inventory activities were approved in 1996. Unfortunately, the Program had very limited funds, which enabled implementing customary and approximate assessments only. No regional assessments or evaluations on the enterprise-base level were performed in either the First or the Second National Communications.

The Energy sector and, first of all, fuel combustion are the dominant GHG source in Russia. In the Second National Communication the emissions in the Energy sector are estimated according to the detailed fuel country balance developed in 1994 by the State Committee of Russia for Statistics. However, they present only aggregated estimates included in one column of the summary table. Detailed assessments and filling in standard tables are planned in the future. The source category-based evaluations have not been performed yet.

The National Communications also include general assessments of methane emissions (leakage) during extraction and gas, oil, and coal transportation. However, they are implemented with the use of greatly approximate default emission factors and do not consider specific Russian features. Meanwhile, the latter is strongly desirable.

Non-relevant to fuel combustion industrial GHG emissions, first of all, include CO₂ emissions released during clinker production (that is the intermediate product in the cement processing), N₂O from production nitric acid and fertilisers and some other chemicals. The estimates of these fluxes were performed based on summary statistical data on appropriate production in 1990 and 1994. The applied technology was not considered, and the calculations for other years than 1990 and 1994 were not performed.

Another large section of GHG industrial emissions includes the so-called "new gases", which are all greenhouse gases other than the "old" greenhouse gases (CO₂, CH₄, and N₂O) and gases regulated under Montreal Protocol and Vienna Convention of Ozone Layer Protection. During preparation of the Second National Communication, the Institute of Global Climate and Ecology performed the first expert assessments of the emission of CF₄, C₂F₆, HFC-23, and HFC-134a for 1990 and 1994. The SF₆ emissions were considered qualitatively less significant, and their quantitative assessments were not undertaken. CF₄ and C₂F₆ were estimated based on the gross data on aluminium production without detalization of the types of processes. The HFC-23 release was estimated based on statistical data for total HCFC-22 production. Expert estimate of HFC-134a release was made according to Russian per capita average data for amount of refrigerators, and it has the accuracy of an order of magnitude. Not detailed assessments were made according to the types of refrigerator equipment.

The section "Use of Solvents and Other Production" comprised the assessment of application of pure N₂O for medical purposes (anaesthesia), which was obtained from the gross sales of production.

The Agriculture Section provided the assessment of methane output from livestock. The emission relevant to burning of agricultural residues and rice farming were estimated as extremely low. The N₂O emissions from application of fertilisers and manure storage were calculated with the use of simplified assumptions for 1990 and 1994 only. A review of possible losses of soil carbon was carried out. However, it was found possible to make only a qualitative conclusion on the lack of CO₂ net-emission/sink in agriculture as a whole.

The Section "Land Use and Forestry" comprised evaluations of CO₂ sources and sinks together with the estimates of CH₄ and N₂O emissions caused by forest fires. The assessments were specified for different levels of various nature and climate regions and in general they seem to be the best possible at present. However, they have two important constraints. The estimates are exclusively performed based on the data on forest inventory of 1993; and they cannot enable subdividing "Kyoto forests" input.

The last Section of inventory deals with waste treatment and storage. It comprises assessments based on the national statistical data on municipal solid wastes and approximate estimates of methane emissions from sewage management. It was assumed that no GHG emissions occur from the waste in rural areas and small towns that are not involved in municipal systems of waste management. Besides, *1995 IPCC Guidelines* were applied for assessments because of the lack of appropriate data; and it differs from the *Revised 1996 IPCC Guidelines*. Significant sources of uncertainty were found during the assessments (such as actual waste burning instead of landfill deposition and etc.) and need additional detailed consideration.

In the end of June - beginning of July 1999, special In-Depth Review Team of the UNFCCC Secretariat visited Moscow to review the Second Russian National Communication. Moscow participants of our project took a very active part in the work with the Team because they were among the authors of the draft version of the Communication, which has been prepared in the IGCE.

International experts noted that, in general, the level of the work was satisfactory. At the same time they expressed some comments.

- There are gaps in inventories, in particular, it is difficult to estimate emissions by separate economic sectors, including transport, liquid waste, land use change and forestry. Russia did not present annual inventories to the UNFCCC Secretariat. The outstanding work of RAO «EES Rossii», which covers 370 power plants, was highlighted;
- The Second National Communication contains only general information on policies and measures. The effectiveness of policies and measures was not considered there. There was not enough financial support for implementation of the Federal target program «Prevention of dangerous climate changes and their negative consequences»;
- The Second National Communication was not available for general public. Representatives of NGO are not members of the Interagency Commission of the Russian Federation on Climate Change Problems, etc.

Roshydromet and other Russian ministries and agencies are planning to finish preparation of the Third Russian National Communication until November 2001.

According to the information of the Institute of Global Climate and Ecology (IGCE) the national information system on greenhouse gas inventories, operated by IGCE, has been improved significantly during 2001. Now the system includes a framework database on major greenhouse gas sources and sinks and activity data for different sectors of national

economy since 1990, as well as adjusted to national conditions version of IPCC software, that enables to compile national inventories in accordance with 1996 Revised IPCC Guidelines. In general, the information system allows to follow the Common Reporting Format, moreover, it includes parts adjusted to the 2000 IPCC “Good Practice” Guidance level of details and it may be developed to the full extent under the 2000 IPCC “Good Practice” Guidance. Besides, case studies have been undertaken in agricultural and forestry sectors. These studies were carried out with financial support from the U.S. EPA (under the regional inventory project) and the Russian Foundation for Basic Research. The studies were aimed to derive country-specific emission factors, to improve activity data collection and to increase accuracy of sectoral inventory estimations.

The information system might be a good tool to implement inventory activity in the nearest future. What are perspectives for further development of this system? It’s not so easy to predict. The Federal Targeted Programme “Prevention of Dangerous Climate Change and Its Negative Consequences” will be finished in 2001 and will not exist in future. It’s very important to secure progress in IGCE works by any other federal programme which was approved by the Russian Government for 2002 and forthcoming years. One of the options might be using of the Federal Targeted Program on Ecology and Natural Resources, which was developed by the Ministry of Natural Resources and will start from 2002. The other option is to use, at least, for energy sector the Federal Targeted Program “Energy Efficient Economy” for 2002-2005 and with perspective to 2010, which was developed by the Ministry of Energy and considered positively by the Russian Government and now is under final revision.

Regional inventories

The Russian Federation has two-level systems of administration, statistics, environment protection, taxation, etc. The top level is the Federation as a whole. The lower level consists of Subjects of the Federation - Regions (originally named as Oblast, Capital City, Krai, and Republic). Primary data are usually collected on lower levels and then transferred to the Federal Level for aggregation.

In principle, the national GHG emission inventory system may be based on the regional inventories. This would make it possible to elaborate the inventory system with high-quality activity data, as well as to identify the emission reduction measures at the level of particular Subject of the Federation more correctly.

The first pilot GHG inventory was carried out in Novgorod region in 1999. The major goal of that study was to investigate the possibilities of Russian regions in carrying out GHG emissions inventory using the methodology consistent with the *Revised 1996 IPCC Guidelines*, develop and test cost-effective system of GHG monitoring and reporting, create methodological and institutional background for further GHG emission accounting.

The principally important element of work on the project was the practical approbation of institutional system of data collection and emission calculation in the region. It was not an attempt to create a principally new system, but the augmenting of the existing system of environmental pollution control with additional functions.

It was found out in Novgorod study that practically all the data required for the inventory is available at the regional level and it is possible to calculate regional GHG emissions using the methodology consistent with the *Revised 1996 IPCC Guidelines*.

At the first stage of the pilot regional inventory project the GHG emissions were estimated for 1990-98. The inventory was based not only on aggregated approach, but source categories as well. Also the software for emission calculation was adopted for the

circumstances of the Russian region, so that the people conducting regional inventory are able to carry out further inventories.

The second stage of regional inventories started in 2000 and covered 3 additional Russian regions (Sakhalin Oblast, Chelyabinsk Oblast, and Khakassia), and updated the inventory for Novgorod region. The inventories included estimation of emissions in 1990-1999. The results of this work were rather promising: quite high quality emission data were obtained, the institutional basis for inventories was established with regards to their further development in the regions.

At the same time Arkhangelsk region initiated its own GHG emission inventory in the end of 2000. With some methodological assistance from Moscow experts, the methodology consistent with the *Revised 1996 IPCC Guidelines* was approved there and regional emissions for 1990-2000 were calculated. A special agency was established for this purpose by Arkhangelsk Centre for Environmental Investments (established by the regional authorities).

The third stage of the project on regional inventories started in 2001 and covered 2 more regions: Nizhny Novgorod Oblast and Sverdlovsk Oblast. The institutions that are able to carry out inventories were determined and they already started collection of data and calculation of emissions.

In addition to full-scale inventories in particular regions, the emissions from fuel combustion in all Russian regions were calculated by the Moscow Center for Energy Efficiency (CENef). This partial inventory presents a very interesting picture of emissions distribution throughout the Russian Federation and provides an opportunity to determine the most important emitting regions in the country.

It should also be mentioned that a number of other regions expressed their willingness to carry out regional inventories and develop regional strategies for GHG emission reduction and increase of carbon sinks by forests. These include such regions as Karelia Republic, Saratov Oblast, and Moscow Oblast. They have already initiated the process of fundraising for such work and identified institutions that are able to participate in the inventories.

Summarising the experience of regional inventories in Russia, it could be concluded that there is a very good potential for such work in most of them, almost all the required data is available at the regional level and there exist institutions able to carry out the inventories.

The following regions are most of all prepared and ready to implement inventories:

- Novgorod Oblast,
- Nizhegorodskaya Oblast,
- Sverdlovsk Oblast,
- Sakhalin Oblast,
- Chelyabinsk Oblast,
- Khakassia Republic,
- Arkhangelsk Oblast.

Saratov Oblast, Leningrad Oblast, Kemerovo Oblast, Karelia Republic, and Moscow Oblast seem to be ready to start regional inventory soon, so they can also be considered as potentially prepared for this work.

Other regions are still unaware or not ready for full-scale inventories. However, as it was mentioned above, in general, the informational and institutional basis for this exists in most of them.

Sector inventories

Thermal power and heat sector

The heat and electricity production industry is the dominant GHG emission source in Russia. The Russian Joint-Stock Company RAO «Unified Energy System of Russia» (RAO UESR) is one of the world's largest electricity companies. It integrates in a holding more than 360 large thermal power plants located in almost all regions of the Russian Federation.

In 1998-99 RAO UESR developed voluntarily corporate inventory of CO₂, CH₄ and N₂O emissions from fuel combustion for the purposes of electricity and heat generation from 1990 through 1997 (in addition, RAO UESR held a special study of SF₆ emissions). According to RAO UESR estimates, its GHG emissions in CO₂ equivalent terms declined from 710 million metric tons in 1990 to 493 million metric tons in 1997. RAO UESR emissions level is globally significant and constitutes about 30% of total Russian CO₂ emissions.

From August 2000 to January 2001, a non-profit, non-governmental organisation Environmental Defence, with participation of the Centre for Preparation and Implementation of International Projects on Technical Assistance (CPPI), conducted an independent expert review of the RAO UESR GHG emissions inventory. That was an independent examination of the inventory methodology, which took into account various methodologies or practices for GHG emissions inventory preparation in the electric power sector. In undertaking the review, the reviewers examined RAO UESR methodology particularly in light of the Revised 1996 IPCC Guidelines: Reference Manual and the *IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (2000).

The expert reviewers, taking into account the IPCC Reference Approach for greenhouse gas emissions from the electric power sector, and taking into account IPCC Good Practices with regard to calculating emissions and uncertainties:

- Examined the inventory methodology utilised by RAO UESR.
- Examined the systems that RAO UESR used to collect and process primary data on fuel consumption.
- Examined practical implementation and enforcement of data collection and processing systems for sampling of power stations.
- Identified critical factors that give rise to uncertainties in inventory results.
- Estimated uncertainties for CO₂ emission data for the three types of fuel.
- Reached certain conclusions about the estimated uncertainty of the overall inventory.
- Based on the above, formulated recommendations to RAO UESR for future steps for developing corporate inventory practice.

However, in preparing an independent expert review, expert reviewers did not try to undertake an audit of the inventory, and it does not constitute an audit. It is not a certification of RAO UESR baseline emissions for 1990; not all the requisite forms and data were reviewed since such a review is beyond the scope of this effort.

Expert reviewers found that the greenhouse gas emissions inventory presented by RAO UESR is the first inventory of greenhouse gas emissions conducted by one of the world's largest national electric power and heat companies using the methodology consistent with the *Revised 1996 IPCC Guidelines*. RAO UESR used a combined "bottom-up" and "top-down" approach for the inventory. The initial data on quantity of fuel consumption and carbon unoxidization were taken from the reports of each particular plant covered by the inventory, while the data on carbon content of fuel, calorific value of fuel, and other data

were taken from published reference books. Calculation of aggregate emissions was done at the level of RAO UESR as a whole.

The distinguishing feature of the inventory is that RAO UESR calculated the national specific CO₂ emission factors for coal, residual fuel oil, and natural gas combusted at large thermal power plants of Russia. RAO UESR estimates of the emission factor values appear to be more precise than default values provided in the *Revised 1996 IPCC Guidelines*.

Under the review, expert reviewers analysed the system of data quality control in RAO UESR and made some preliminary estimates of the inventory uncertainty. Furthermore, the experts reviewed the methodology for data quality control and fuel consumption reporting. The field visits to several selected utilities showed that the enforcement system for data collection and processing is well established in RAO UESR.

The experts preliminarily estimated RAO UESR inventory uncertainty as approximately 4%. However it was underlined that there are a number of uncertainties uncovered in the review, which should be addressed in further inventories by RAO UESR and in a full-scale inventory audit.

The review concludes that the emissions inventory presented by RAO UESR and the methodology and means of its implementation could be considered as an example of Good Practice for calculating emissions from the electricity generation and heat sector.

It is known that RAO UESR has already implemented GHG inventories for 1998-2000 and is ready to continue this work further on. It is expected that RAO UESR will work on improvement of the inventory methodology based on the plant-by-plant inventories.

All this makes it possible to conclude that emissions by RAO UESR sources are well calculated and large enterprises of electricity and heat production sector are ready for full-scale inventories.

Coal mining and handling

The inventory of GHG emissions from coal mining and handling in Russia was done under the GEF-UNDP Coalbed Methane Project in Kuzbass Region, carried out by the Russian Methane Centre (RMC, Kemerovo) with participation of ICF Kaiser (USA). Under this project the national methane emissions in coal industry were assessed according to the following major sources of emissions:

- Deep-mined output
- Digging
- Subsequent activities on coal processing

Currently, the Russian Methane Centre is working on further inventories of emissions from coal activity, both at aggregate and regional levels. So this sector appears to be quite ready for the inventory.

Forestry and agriculture

The inventory for the LUCF (Land-Use Change and Forestry) sector has a quite specific character. The use of forestry statistical data for 1998, 1993 and 1998 -there were only 3 official forestry inventories in Russia and the next will be in 2003- allows to get approximate assessments, but this information seems to be sufficient in view of the UNFCCC requirements.

The International Forestry Institute (Moscow) has done the biggest part of the work on inventory of GHG emissions and sinks in forests. This institute has undertaken an analysis of carbon emission and sinks in the Russian forest based on the official forest inventories

data and its own specific studies. It was found out that the forest inventories were well done in some of the Russian regions, while in other regions the inventories were not very precise.

It appears that the aggregate GHG forest inventory could be done with relatively high uncertainty, however the inventory can be quite precise in some regions (e.g. located in the European part of Russia, South and Middle Russia). A high quality GHG inventories of afforestation and reforestation are also rather easy to undertake in many regions of Russia.

Other sectors

Some of the most important sources of GHG emissions have already expressed willingness to carry out emission inventories. These include:

- the Russian gas monopolist "Gazprom" company, which extracts more than 90% of total gas production in the country;
- several Russian metallurgical companies, including aluminium producer "RusAl" company;
- some oil and gas companies, mainly concerned about the project-based inventories, e.g. Yukos, "LUKoil", "Tyumen' Oil Company";
- pulp and paper plants, especially those that undertake projects on substitution of traditional fuel (coal, gas, residual fuel oil) by biomass fuel, e.g. Arkhangelsk pulp and paper plant, Solombalsky pulp and paper plant (Arkhangelsk region);
- chemical industries, e.g. the largest Russian fertiliser producer "Akron" (Novgorod region) has already carried out GHG inventory, etc.

The situation with GHG inventories in many other sectors requires undertaking special studies. In general, the aggregate data on emissions in some of these sectors could be obtained from the State statistics, but not the detailed estimates compatible with the IPCC requirements (e.g. accounting for international bunkers, etc.).

These "problematic" sectors include:

- transport: aviation, road transport, navigation, rail transport, pipelines, etc.;
- municipal and residential fuel consumption;
- agriculture;
- waste disposal and handling, etc.

Inventory problems in many sectors deal not only with activity data, but also with emission factors. Currently, most of the emissions can be calculated primarily using IPCC default values of emission factors. However, it is necessary to carry out a series of special studies in Russia in order to reduce uncertainty of inventories.

3.2 Assessment of data availability and quality

Energy

As it was noticed before, RAO UESR has conducted inventory of large power and heat plants. The activity data for other source categories of the Energy sector (energy units of industrial enterprises, transport, municipal and residential sectors) are available but the quality of data could not be assessed as high. Still, the existing statistical accounting system does not provide easy-to-use data and substantial efforts should be made to "extract" the required data. The issue of emission factor estimation for the energy source categories except for large power and heat stations has not yet been investigated in Russia.

The coal related emissions were calculated by the Russian Methane Center (RMC, Kemerovo). The activity data on extraction and handling of coal are available from the national statistics, though the quality of that data could not be very good, depending on the region. The emission factors are estimated by RMC and reflect specific conditions of Russian coals and technological processes.

Both the activity data and emission factors for oil and gas activities are not sufficiently good in Russia. Though there are some standards of fugitive emissions from such activities, they hardly reflect the real situation with emissions in this source category. It is unlikely that full-scale work in this direction can be done in the near future, but only in the medium-term perspective. Anyway, it would be advisable to start such work together with the Russian oil and gas companies, such as Gazprom, LUKoil, Yukos, etc.

Emission source category	Activity data A- availability, Q- quality Y- yes, N- no, H-high, M-middle, L-low			National (country specific) Emission Factors	
	A	Q	Source/ Notes	A	Q
Large power and heat plants	Y	H	National statistics, RAO UESR	Y ¹	H ¹
Energy units in industry	Y	M	National statistics	N	-
Transport	Y	L	National statistics	N	-
Municipal sector	Y	L	National and regional statistics	N	-
Residential sector	Y	L	National and regional statistics	N	-
Coal mining and handling	Y	M	National and regional statistics, special studies	Y	M ²
Oil and gas activities	N	-	Oil and gas companies statistics, Ministry of Energy	N	-

1 – only CO₂ emission factor was estimated by RAO UESR, not CH₄ and N₂O emission factors.

2 – the emission factors for coal related activities are estimated by the Russian Methane Center (Kemerovo).

Industrial processes

The activity data on almost all-industrial processes are relatively well collected in Russia. The national statistical system reflects production of major related products, though the use of some products resulting in GHG emissions is not perfectly covered by the national statistics. In such cases the regional data could be used, however it might not be easy. It is obvious that existing statistical system does not provide information for calculating emissions related to consumption of HFCs, PFCs and SF₆.

Emission source category	Activity data A- availability, Q- quality Y- yes, N- no, H-high, M-middle, L-low			National Emission Factors	
	A	Q	Source/ Notes	A	Q
	Cement Production	Y	H	National statistics	N
Lime Production	Y	H	National statistics	N	-
Limestone and Dolomite Use	Y	M	National and regional statistics	N	-
Soda Ash Production and Use	Y	M	National and regional statistics	N	-
Production and Use of Miscellaneous Mineral Products	Y	M	National and regional statistics	N	-
Ammonia Production	Y	H	National statistics	N	-
Nitric Acid Production	Y	H	National statistics	N	-
Adipic Acid Production	Y	H	National statistics	N	-
Carbide Production	Y	H	National statistics	N	-
Production of Other Chemicals	Y	M	National statistics	N	-
Metal Production	Y	H	National statistics	N	-
Pulp and Paper Industries	Y	H	National statistics	N	-
Food and Drink	Y	M	National statistics	N	-
Production of HFCs, PFCs and SF ₆	Y	M	National statistics	N	-
Consumption of HFCs, PFCs and SF ₆	N	-	There is low quality regional statistics that could be used for indirect estimate of emissions	N	-

Agriculture

In the First and the Second National Communications as well as in the recent regional inventory activities of 1999-2001 all calculation of emissions was conducted according to simple options of *Revised 1996 IPCC Guidelines* only, while it was decided that it is too early to try to use *IPCC Good Practice Guidelines* because there are big problems to implement *Revised 1996 IPCC Guidelines* completely. It is a big problem to collect activity on livestock in Russian conditions. There was solid system of accounting and only a small part of animals was private in the Former USSR. Currently, almost all collective farms had died completely and almost all animals are private, while there is no system of reporting or accounting of animals at all. State statistics system is still continuing to report on numbers of different animals and poultry, but uncertainty of numbers is very high.

On the other hand, national nitrogen excretion from domestic livestock and poultry manure factors, which were developed and officially adopted in USSR, was used. In contrast to the Former USSR, mineral fertilisers are not widely used due to high cost and organic manure fertilisation became the main, on the other hand, there are no more or less reliable activity data here.

There were only approximate data on manure management system used, therefore it was decided to use typical values “universal” for all or almost all regions.

- Anaerobic systems in the form of special lagoon – 0%, they are not available or very rare in Russia
- Liquid anaerobic systems – 20% of swine (usually this is storage of large swine-breeding farms, in average in the country it is about 20% of population).
- Manure collection (poultry excrement) in solid phase in the farms and other places is the main system in Russia: 75% of non-dairy cattle population and 85% of dairy cattle, up to 100% of poultry, 80% for swine, sheep and horses.

- Daily spread over the fields without any storage – 0%, they are not available or very rare in Russia.
- Manure left on pasture ranges and paddocks: 25% of non-dairy cattle population and 15% of dairy cattle, 20% for sheep and horses.)
- Other systems of manure management (nothing in Russia).

CO₂ emissions caused by ploughing up of virgin soils and soil carbon changes (included in LUCF section but directly caused by agriculture) were not numerically estimated in any GHG inventories. A virgin soil ploughing is not actual for Russia after 1990 (in contrary to the Former USSR). Soil carbon change is a big question for Russia now. There are only data on soil carbon loss during 30-year period of 1950-1980, but it absolutely can not be used for our purposes because expansion of agriculture fields in USSR has been replaced by abandonment of fields in Russia now, moreover these data on soil carbon do not reflect read humus decomposition, but wind and water erosion and deposition of carbon in ravines and river sediments.

IPCC Sector and emission category Agriculture	Activity data A- availability, Q- quality Y- yes, N- no, H-high, M-middle, L-low			National (country specific) Emission Factors	
	A	Q	Source/ Notes	A	Q
Enteric Fermentation	Y	L	National statistics ¹	Yes	M
Manure Management	N	L	National statistics ³	No	-
Rice Cultivation	Y	M	Non-important ²	No	-
Agricultural Soils	N	L	National statistics ³	No	-
Prescribed Burning of Savannas	-	-	Absent in Russia	-	-
Other	-	-	Absent in Russia	-	-

1- Statistics is very approximate and does not properly account for private sector, where the majority of animals inhabit.

2 - May be essential for a few regions only.

3 - Very approximate estimates only, real abandonment of agriculture fields is not taken into account.

Waste

In the First and the Second National Communications as well as in the recent regional inventory activities of 1999-2001 all calculation of emissions was conducted according to *Revised 1996 IPCC Guidelines* only, while it was decided that it is too early to try to use *IPCC 2000 Guidelines*. In Russian conditions, it includes, first of all, methane emissions from solid waste disposal in landfills. There are two other emissions sources: methane of wastewater and sediment treatment; and emissions of N₂O connected with human sewage. However, these two sources are approximately ten times smaller than the first one and actually they are only small amendments to the total sum emission. Note that CO₂ emissions are not calculated in this section, according to IPCC methodology, CO₂ release from waste disposal has been already considered during production.

In contrary to other sectors and GHG emissions, waste management is not covered by national statistics system. Therefore special data collection on “managed” landfills is required. Without special work (e.g., in the 1st and the 2nd National Communications) emissions were estimated by extremely simplified IPCC methodology by multiplying of urban population by default emission factor recommended by the IPCC.

In recent regional inventories in 4 regions the importance of waste as GHG source was preliminary estimated. Then it was decided that in Chelyabinsk and Novgorod it is reasonable to study large and middle-size landfills one-by-one. But in two other regions (Sakhalin and Khakasia) the importance of this source is so small that there is no reason to spend funds for such study and other sources should be prioritised. While it is necessary to highlight that there were no principal problems in conducting such *in-site* studies in all regions. In the result full lists of landfills with full data on current state-of-the-art were completed in 2 regions, while data on urban (largest cities) population were used for approximate estimates.

Waste	Activity data A- availability, Q- quality Y- yes, N- no, H-high, M-middle, L- low			National (country specific) Emission Factors	
	A	Q	Source/ Notes	A	Q
<i>Solid waste disposal to managed landfills</i>					
Tier 1, very approximate estimates by population	Y	M	National statistics on population ¹	No	-
Tier 1, actual waste deposition and management	Y	M	Data can be collected in regions only ²	No	-
Tier 2, actual emission due to gradual decomposition	N	L	Data availability depends on region	No	-
<i>Wastewater treatment</i>					
Domestic wastewater	Y	L	Data can be collected in regions only ²	No	-
Industrial wastewater	N	L	Data can be collected in regions only ³	No	-
<i>Waste incineration</i>	Y	M	Only 6-7 plants in country, data can be collected in regions ⁴	No	-
<i>Human sewage</i>	Y	L	very small source	No	-

- 1- only this extremely simple approach was used in national scale
- 2- there is not any national system for collection of such data
- 3- industrial wastewater in majority cases can not be separated from domestic
- 4- there are only 6 or 7 plants in 5 regions and their importance is very small in national scale as well as in regional scale.

The situation with historical data on solid waste deposition was not so clear. In some landfills (or regions) it was potentially possible to collect historical data required for FOD (Tier 2) approach, in some cases some data were lost and restoring seems as a very rough approximation. So, nowhere Tier 2 FOD method was used yet and its' use strongly depends on the situation in region(s) because there is no national statistics for activity data.

Speaking about wastewater, in all estimates it was suggested that industrial wastewater should be treated together with municipal one, but the content of organic matter in industrial wastewater is very low and does not contribute a significant input into total emission of the sector. In all cases the simplest approach was used, data on population were multiplied by the sequence of default factors in full accordance with *Revised 1996 IPCC Guidelines*.

Draft versions of *IPCC Good Practice Guidelines* were already available during 1999-2001 work in 4 regions. On the other hand, it was not used at all due to the following

reasons. Firstly, the “potential” of “old” guidelines is not used in Russia yet and we have a lot to improve under “old” guidelines. Secondly, there is no waste incineration plant in the given 4 regions. And, thirdly, uncertainty and QA/QC analysis are an absolutely new activity for Russia and it was decided to start it from energy and industry sector in a region (Novgorod was selected as the region, where inventory is being conducted already for 2 years).

Land Use, Land Use Change and Forestry (LULUCF)

In the First and the Second National Communications as well as in the recent regional inventory activities of 1999-2001 all calculation of emissions was in general conducted according to *Revised 1996 IPCC Guidelines*. On the other hand, the situation during preparation of the First and the Second Communications (1995-1998) was different from the context of the recent years. Five years ago, before “disturbance” of the problem by Kyoto Protocol, people waited for soon improvement of methodology of solid scientific basis.

Therefore, in Communications Russian experts tried to follow the best scientific knowledge and only partially followed the *Revised 1996 IPCC Guidelines*. In particular, the actual emission from forest fires (taking into account gradual post-fire decomposition) was estimated instead of IPCC suggestion that all CO₂ is emitting immediately to the atmosphere at the year of fire. Forests were subdivided into natural zones and increments were calculated in accordance to species composition and the age of forests of different natural zones. A lot of national coefficient developed by the Russian Academy of Science has been used.

LULUCF	Activity data A- availability, Q- quality Y- yes, N- no, H-high, M-middle, L-low			National (country specific) Emission Factors	
	A	Q	Source/ Notes	A	Q
Changes in Forest and Other Woody Biomass Stocks	Y	M	National statistics is non-compatible to IPCC ¹	Yes	M
Forest and Grasslands Conversion	N	L	Data can be collected <i>in-situ</i> only ²	Yes	M
Abandonment of Managed Lands	N	L	Data availability depends on region	Yes	M
Other (e.g. forest fires)	Y	M	National statistics is non-compatible to IPCC ¹	Yes	M

1- Statistics includes forest inventory data, which conducted every 5 years: 1988, 1993, 1998; annual forest fire data and annual timber harvest information. Statistics covers the main part of forests (Federal Forest Fund); other parts (10-20%) are not covered by statistics.

2- Only very approximate data are available from land-use statistics forms of the Russian Statistics Committee.

In recent years as well as in preparation of materials for the Third Communication Russian experts were under pressure of political consequences of different approaches to LUCF. Therefore, they chose the only possible way, to follow *Revised 1996 IPCC Guidelines* as strictly as feasible even if it is in some contradiction with real processes. In regional work of 1999-2001 a very simplified approach was used. It was based on some adjustment or recalculation of Russian forestry statistics data into IPCC categories. In general, Russian land-use statistics and forest inventory are rather non-compatible to IPCC source/sink categories. In the result only very approximate estimates were obtained, which actually served as indicators of importance or non-importance of LUCF as a whole.

The “Methodology of compatibility” or the method of unified recalculation of Russian activity data into international has to be developed and adopted by Russian forestry officials. Currently, such work was successfully carried out in the Institute of Global Climate and Ecology of the Russian Academy of Science and Roshydromet, but it has no official adoption by forestry officials because federal forestry management system is under permanent reconstruction and it is not clear who and how should make a decision.

Conclusion

In general, quite large experience in GHG inventory based on use of the *Revised IPCC 1996 Guidelines* has been accumulated. This experience includes general estimates for national level, detail estimates for several regions and some sectoral inventories (first of all, in key electric energy power sub-sector).

Availability and quality of activity data in majority of cases are sufficient for relatively low uncertainty estimates consistent to *Revised IPCC 1996 Guidelines*. It is possible to estimate that from 80 to 90% of national inventory can be conducted on the level of *Revised IPCC 1996 Guidelines* with satisfactory uncertainty of 5-10%. Exceptions include some parts of Agriculture and Waste sectors (and, of course, LULUCF separately accounted), where uncertainty is 50-100% or even larger.

National inventory on the level of *Revised IPCC 1996 Guidelines* does not require any outstanding activity data collection, in majority of cases activity data are in national statistics or energy sector statistics.

Only in a few cases national (country specific) emission factors have been used.

There is no experience of annual inventories (obligatory for Annex 1 countries), but only inventory chapters in the First and the Second National Communications. It seems that the absence of institutional arrangements and funding problems are the barriers for annual reporting.

There is no experience of using of the Common Reporting Format, while it looks like a technical problem relevant to institutional arrangements and funding problems.

There is no experience of using of the *IPCC Good Practice Guidelines* (with one exception of uncertainty assessment in Novgorod Oblast).

4. Possibilities for inventory development in the country

The analysis of Russian current background and experience indicates that, first of all, two directions of development should be considered. The first one is institutional arrangements of the different levels: national, provincial, regional. The second one is national methodological improvements (emission factors) and in some cases additional activity data collection relevant to specific features of different parts and regions of the country.

Thus, in the given Chapter we are answering to the question “What are our possibilities for development in near future?” and really this is a review of institutional options and review methodological and data collection issues. On this basis general strategy for development is proposed in the end of the chapter.

4.1 Options for inventory development relevant to different levels of institutional arrangements

In contrast to the Former USSR with strong centralised dictatorship, the Russian Federation indeed is a federal state, where relation of center and a region are inscribed in the Constitution, federal and regional legislation and special bilateral agreements. In particular, central government can not order the regions to collect and send data for GHG inventory without certain law and before correction of regional legislation after adoption of this federal law. Any federal ministry or agency can not order the governor elected by region. It is evident that a federal minister can order regional division of this ministry, however, implementation of an order depends on regional legislation and regional decision-making as well. Therefore consideration of regional level of GHG inventory system seems as quite specific Russian feature, which is not required for majority of other countries.

On the basis of experience of the First and the Second Russian National Communication it is possible to see that regional level is not required for approximate estimates of emissions (without “bottom-up” assessment of course). However, the improvement of estimates, step-by-step involvement of “bottom-up” approach and, first of all, quality control and uncertainty analysis required for *Good Practice Inventory* can not be implemented without participation regional organisations or bodies in national GHG inventory.

The view on this option, first of all, depends on the level of readiness of a national-wide inventory system in Russia. The development of the system can only be a step-by-step process. When we have very general top-down national estimates done by few experts in Moscow, it is feasible to allocate only relatively small part of inventory at regional level. When we have a developed well-operated system with proper financial resources, it reasonable to transfer more responsibilities to the regions.

Another key question is related to the so-called provincial level. According to the Constitution, Russia consists of 89 regions (Subjects of the Federation). In 2000 President Putin has made a step to aggregation of regions in some clusters and Russia was subdivided into 7 large Federal Provinces (Okrugs). Sharing of responsibilities among Regions and Provinces is still an open question. It is evident that 89 regions are too many in number to be handled properly. Many of the regions (first of all, the so-called “autonomous districts”) are very small and weak, in the former USSR they were not independent, but were parts of larger regions. On the other hand, there are subjects of federation called “Republics” and “Krais”, which have quite large power and independence. Generally speaking, we have a level of 15-20 quite large and powerful Republics and Krajs plus very powerful Moscow and St. Petersburg Cities. We have

intermediate level of about 50 regions with the name “Oblasts”, and we have about 20 weak and small (low populated) regions. Therefore, the discussion about reconstruction of the Federal system takes place presently, while the main idea is not to use the 7-province structure, but to aggregate in small Oblasts in some larger administrative units and inclusion of weakest into larger Krai, Republics or large Oblasts.

Thus, we have a two-dimension metric (see Table below) for consideration of options. The first dimension is the level of development of a national system and the second dimension is the federal structure of the country. In almost all cells of the table it is possible to identify a certain level of inventory sharing between centre and regions, i.e. certain part work allocated at regional level. On the other hand, some cases are considered as non-feasible combination of conditions.

		<i>Development of a national system</i>		
		1. Only a few experts in Moscow, absence of working links with regions (like today)	2. Well-experienced unit in Moscow, but shortage in funds. Regional parts of inventory are covered from central funds by 50%	3. Well-developed and properly financed federal body. Network of relations with subjects of federation completely established and funded
<i>Structure of the Russian Federation</i>	7 Provinces	“IEA Energy balance only”	“Reasonable optimum”	“Ideal”, but limited “bottom-up” approach
	about 40 Subjects of Federation of relatively “equal size”	“Non-feasible”	“Reasonable optimum”	“Ideal”
	89 Regions	“Non-feasible”	“IEA Energy balance only”	“Ideal”, but more resources and training required

Below options are considered consequently from the simplest to the most developed ones.

“Non-feasible” means that if national inventory system is formally established but has no power and resources (like today), it is non-feasible to attract more that few subjects of federation to provide central body with data and estimates.

“IEA Energy balance only”. This option reflects two specific features of Russia. Firstly, fuel combustion contributes a lot, about 98% of the total CO₂ emission or about 80% of the total GHG emission; but secondly, energy statistics can not be directly used for GHG inventory because it is not consistent with IPCC and International Energy Agency (IEA) methodology. Non-consistency with IEA is a serious problem, which requires solution even without any GHG inventory. IEA statistics is really required for regional authorities to manage energy resources better and follow requirements of current and/or investors in regional economy. In view to optimise the use of limited available resources it is reasonable to combine the achievements of two goals: *GHG inventory with “bottom-up” approach* and *IEA energy data for regions*.

On one hand, development of “IEA compatible energy balance” of a region plays the key role in the GHG inventory quality. On the other hand, just this part of GHG inventory is

required for regional leaders to manage region better. In majority of cases they are ready to support this work as much as possible. It means that they are ready to provide all activity data, working place and computers to extent possible, in some cases they are even ready to provide matched funds for work.

Thus, this option means that all GHG inventory is conducted at the federal level only, but the key part – energy balance (i.e. “bottom-up” approach of energy sector) is conducted in regions and then estimates are being incorporated together by federal-level experts responsible for energy chapter of the national inventory.

It is evident that the development of “IEA compatible energy balance” is rather expensive, but the importance of this element of GHG inventory is so high that our recommendation is the following:

“IEA compatible energy balance” of a subject of federation is the key regional contribution into national data. Any regional work related to GHG inventory should be started from this element. There is no reason to allocate other parts of GHG inventory at regional level and spend resources before energy balance compatible with IEA is not completed.

At the first stage of national system development it seems feasible to get only province-level balances in 7 currently existing provinces (plus in a few regions, where IEA energy balance are already completed, e.g. Sakhalin, Chelyabinsk, etc.). It means that relevant responsibility should be allocated for Energy Commissions (or similar bodies) of provinces. In this context, training and equipment do not seem as a problem because 14-21 people are required only (2-3 people x 7 provinces) and the same number of computers. Moreover quite large intellectual potential, specialists and computers usually exist in quite large and rich 7 capitals of provinces: Moscow, St. Petersburg, Rostov, Nizhny Novgorod, Ekaterinburg, Novosibirsk and Khabarovsk.

At the next stage, energy balances should be completed for all subjects of federation. On the second level of national system development (“Well-experienced unit in Moscow, but shortage in funds. Regional parts of inventory are covered form central funds by 50%”) it looks like feasible to learn people of all regions and to organise matched funds with regional budgets to implement option in all regions. About 200 people trained and 200 working places and computers are required, while probably about ½ of computers and working places exist now in regional energy Commissions, the other half should be paid for.

In this context, if 89-region system is non-feasible to step beyond option “IEA Energy balance only” with rather limited funds. However if Russia is properly subdivided into 7 provinces or 40 “new regions” it is possible to step forward to the next option “Reasonable optimum”.

“Reasonable optimum” means a compromise between resources potentially available for GHG inventory and recommendations of the IPCC Good Practice Guidelines. In general, this option is based on experience of work done in 1999-2001 in 4 regions and some national-scale activities undertaken under support of PNNL/US EPA. We used metric of the IPCC Revised Guidelines 7A Summary table to summarise experience. In each cell of the Table 3.2.2.2 below the second indicator means potential importance of regional contribution into national inventory and the first one means the level of regional work recommended as the “reasonable option”. Actually “importance” reflects “Ideal” or potentially desirable option, while level recommended as “reasonable option” is our opinion about feasible and reasonable activity at the second stage of national system development. Notes (numbers in cells) with clarification are provided below.

*Regional contribution recommended for option “Reasonable optimum”
(first letter, + or -) and potential importance of regional contribution into national
inventory (option “Ideal” - second letter)*

	CO ₂	CH ₄	N ₂ O	New GHG
I All Energy (Fuel Combustion+Fugitive)				
A Fuel Combustion				
I Energy & Transformation Industries	+ / + 1	N	N	N
2 Industry	+ / + 1	N	N	N
3 Transport	+ / + 2	N	N	N
4 Small Combustion	- / + 3	N	N	N
5 Other	N	N	N	N
6 Traditional Biomass Fuel for Energy	- / + 3	N	N	N
B Fugitive Emissions From Fuels				
I Solid Fuels	N	+ / + 4	N	N
2 Oil and Natural Gas	N	+ / + 5	N	N
2 Industrial Processes	+ / + 6	N	+ / + 6	+ / + 7
3 Solvent and Other Product Use	N	N	- / + 8	N
4 Agriculture				
A Enteric Fermentation	N	- / + 9	- / + 9	N
B Manure Management	N	- / - 9	- / - 9	N
C Rice Cultivation	N	- / + 9	N	N
D Agricultural Soils	N	- / - 9	- / - 9	N
E Prescribed Burning of Savannas	N	N	N	N
G Other	N	N	N	N
5 Land Use Change and Forestry				
A Changes in Forest and Other Woody Biomass Stocks	- / + 10	N	N	N
B Forest and Grasslands Conversion	- / + 11	N	N	N
C Abandonment of Managed Lands	- / + 11	N	N	N
D Other (e.g. forest fires)	+ / + 12	N	N	N
6 Waste				
A Solid Waste Disposal on Land	N	+ / + 13	N	N
B Wastewater Treatment	N	- / + 14	N	N
C Waste Incineration	N	N	N	N
D Other Waste	N	N	N	N
International Bunkers	- / + 15	N	N	N

N – non applicable (in general or in Russian conditions) or non-important for national inventory system as a whole

- 1- it is the main part of the regional energy balance, which is required even earlier by option “IEA Energy balance only”.
- 2- fuel-use by transport is, in general, a part of regional energy balance. On the other hand, the information on vehicle fleet can be collected on regional level only and it requires additional and relatively expensive regional study. It is principally impossible to conduct detail national estimates of fuel-use in transport without detail regional data.
- 3- information on small energy and heat fuel combustion as well as biomass-use (in Russia it is mainly firewood and woody waste, in some regions peat is also essential) can be properly collected and estimated on regional level only. This GHG source is not among

the main or largest priority sources; moreover uncertainty is rather high there. On the other hand, a detailed study of this source is very desirable for planning the regional emission reduction measures in priority sector of renewable energy (replacement of small combustion by renewable is among such measures as well). Therefore, this source is recommended for regional activities, but on “Ideal” option only.

- 4- coal mine methane has been studied on national level in the recent UNDP/GEF project and, in general, all information is available in Russian Ministry of Energy as well as in the leading Coal Mine Institute in Kemerovo City (Kuzbass coal basin of Western Siberia). On the other hand, regional activity to correct, update or check data is very desirable, especially taking into account that information usually collected in a region and only small additional activity is required.
- 5- natural gas leakage from pipelines consists of two types. The first is leakage from high-pressure pipelines of Gazprom grid and the second is emission from municipal low-pressure grid supplying end-users. The both require specific regional data collection. On national level Gazprom usually operates with average data on gas leakage, which can not be used for bottom-up studies and planning of emission reduction projects. Unfortunately Gazprom has no detailed centralised inventory system and relevant measurements yet and calculations can be conducted in regions only. The data on local municipal grids are usually available only inside region and it usually requires additional studies.
- 6- cement, metals, nitric acid and other chemicals are manufactured on large enterprises and statistic production data are available, of course, on federal level. On the other hand, real emission depends on technological process, air protection and venting systems of the enterprises, etc., which can be specified at the regional level only. A region usually has only a few such enterprises and local administration has usually good working relations with their top management. Therefore, it is usually quite simple to collect detailed information, but it is possible by regional activity only.
- 7- emission of new gases in Russian conditions can be sub-divided into 3 main sub-sources. The first one is the use of new household and industrial refrigerators. More or less detailed data can be collected only in the region. The second one is SF₆ in electric utilities and again more or less detailed data can be collected only in the region (while some data is being collected in RAO UES Rossii). The third one is production of aluminium, refrigerators and some chemical substances. In this case we have the same situation as for point 6 above, regional activity is desirable, while national statistics handbooks can easily conduct approximate estimates.
- 8- use of N₂O for medical purposes is typical for Russia. Only regional estimates can provide us with more or less certain data, while this source is very small and is not among priorities.
- 9- agriculture sector has huge problems now and it is very difficult to collect precise data. Approximate activity data are available in national handbooks (including estimates for each of regions) and they are enough for routine estimates. Achievement of Good Practice level seems as a very difficult task, while, firstly, it can be done only on the level of regions, of course. Situation with livestock numbers is relatively better than with manure management. Data on nitric fertilisers are available, but in contrary with the Former USSR this source became almost non-significant.
- 10- Russian forest statistics is not compatible with IPCC approaches and some recalculation and suggestions are required. In this context more detailed regional information on forest age, species, increment, etc. is very desirable. On the other hand, institutional problems of Russian forestry sectors, high uncertainty of information, problems with IPCC methodology in the given sector do not allow to categorise this source (this is mainly sink) as priority inventory item.

- 11- some information on land conversion is available on federal level, but it is usually very approximate and requires in-site checking. It is not a priority source (see clarification in point 10 above).
- 12- forest fires are a very important Russian problem and in some dry years it is a very significant GHG source. National data are usually aggregated and provide only the information on total area and number of fires, while it is not enough to estimate the volume of wood burned out during the year and volume of biomass decomposed due to fires in the past. Regional data have a principal importance here.
- 13- methane emission from solid waste landfills can be estimated on federal level only very approximately by data about urban population. Data on number of landfills, volume of waste deposition and management can be collected on the regional level only.
- 14- water treatment data are available on regional level, while this source is not a prior one.
- 15- on one hand, this emission category is principally federal, on the other hand, it is very difficult to get proper data in Moscow and probably it is easier to get more reliable information in regions.

“Ideal” means as full as potentially possible following the IPCC Good Practice Guidelines. In general, this option is described above in the notes to the table, in our opinion; it is not reasonable to try to specify this option in full details now. We are too far from its practical implementation; it should be done later on, when the previous one “reasonable optimum” has been conducted. On the other hand, it is necessary to draw attention that “Ideal” option has 3 sub-options. In the first collection of “bottom-up” data from enterprises is conducted from provincial inventory center. Such centres do not exist yet and their establishing will require some funds and time (however only 7 centres). At the beginning these centres may have problems with bottom-up calculations, until good working relation are organised with all large enterprises of a province. If the data from all 89 subjects of Federation is collected separately, it is more expensive and also requires a rather long time to complete preparations in so many of regions.

4.2 Options for inventory development relevant to methodological improvements and activity data collection

Energy

Potential improvements are not linked to aggregate national fuel consumption data which are quite precise (applicable to Reference Approach), but improvements are linked to the inventory by categories of sources within Energy sector. It was shown above that combustion of fuel by large plants is well documented and reported in Russia (this constitute about 30% of national CO₂ emissions). However, the fuel consumption by the energy units of industrial enterprises, communal and residential sectors, transport, international bunker fuel requires significant improvement in methodology of collection and interpretation of the existing statistics. Thus, most of the activity data by category of sources must be improved.

Secondly, while the national CO₂ emission factors were determined for large power and heat plants under RAO UESR GHG inventory, the emission factors for other source categories and other greenhouse gases are not specified on national level. It is likely that the IPCC default emission factors do not provide high precision of emission calculation. So the methodological work on estimation of the national-specific emission factors is required in Russia, especially in those source categories constituting large shares of total emissions, e.g. transport, communal sector, etc.

Thirdly, the emission related to oil and gas activities is rather poorly investigated in Russia. There are some default emission factors and standards of fugitive emissions, but they are

very far from reality. So it is very important to involve national oil and gas companies (e.g. Gazprom, LUKoil, etc.) into investigation of this issue.

Another important issue is implementation of *IPCC Good Practice* to inventories in the Energy sector. This implies proper documentation of the inventories, QA/QC, uncertainty estimation, crosschecking of data, etc. By now only the inventory of emissions from large power and heat plants of RAO UESR has been preliminarily reviewed with regard to data quality and uncertainty estimation. But the methodology consistent with *IPCC Good Practice* for the rest source categories still has to be developed and implemented.

The methodological improvements mentioned above are especially important taking into account that Energy sector is the dominant source of GHG emissions in Russia.

Summary of improvements in energy sector

Emission source category	Activity data		Emission Factors	
	near future	in 5 years	near future	in 5 years
Large power and heat plants	No	-	Yes ¹	Yes ²
Energy units of industrial enterprises	Yes ³	-	Yes ⁴	Yes
Transport	Yes	Yes	-	Yes
Municipal sector	No	Yes	-	Yes
Residential sector	No	Yes	-	Yes
Coal mining and handling	Yes	-	-	-
Oil and gas activities	-	Yes	-	Yes

- 1- It is required for methodological purposes that the national CO₂ emission factor determined by RAO UESR has to be officially approved.
- 2- It is desirable to work on determination of N₂O and CH₄ emission factors under further inventories by RAO UESR
- 3- Statistics on fuel consumption by the energy units of industrial enterprises is not sufficiently precise now, but could be improved in the near future
- 4- The work on determination of the emission factors for energy units of industrial enterprises could start from identification of the national-specific CO₂ emission factor for this sector in the near future, and continue with identification of N₂O and CH₄ emission factors in longer term period.

Industrial processes

The activity data in this sector are quite well collected in Russia. However, real methodological problems deal here with identification of the types of industrial processes. Most of the information about this is not available to inventory people now. But it is crucial for calculation of emissions in this sector. The type of industrial process actually affects emission factors applicable for each source category so that emission factors can fall in a wide range and differ significantly (10 times and more!). So one of the most important tasks of methodological improvements here is proper identification of the types of industrial processes applicable in different Russian industries.

Another issue is to incorporate *IPCC Good Practice Guidance* into emission estimation process. In contrast to the Energy sector, there is actually nothing done with uncertainty estimation, data quality assurance and control, etc. in this sector. There is very slow movement in the direction of corporate inventories in this sector that could potentially provide some interesting results in implementing *Good Practice Guidance* at the level of large metallurgical companies. But it is quite early to state that this process has started in Russia.

However, it would be reasonable to initiate a series of studies for analysis of the above mentioned issues in the sector of industrial processes as far as this sector is one of the significant sources of emissions in Russia and has potential to grow up substantially in the near future.

Summary of improvements for industrial process

Emission source category	Activity data		Emission Factors	
	near future	in 5 years	near future	in 5 years
Cement Production	Yes	-	Yes	-
Lime Production	Yes	-	Yes	-
Limestone and Dolomite Use	Yes	-	Yes	-
Soda Ash Production and Use	Yes	-	Yes	-
Production and Use of Miscellaneous Mineral Products	Yes	-	Yes	-
Ammonia Production	Yes	-	Yes	-
Nitric Acid Production	Yes	-	Yes	-
Adipic Acid Production	Yes	-	Yes	-
Carbide Production	Yes	-	Yes	-
Production of Other Chemicals	Yes	-	Yes	Yes
Metal Production	Yes	-	Yes	Yes
Pulp and Paper Industries	Yes	-	Yes	Yes
Food and Drink	Yes	-	Yes	Yes
Production of HFCs, PFCs and SF ₆	Yes	Yes	Yes	Yes
Consumption of HFCs, PFCs and SF ₆	Yes	Yes	Yes	Yes

Agriculture

In contrast to energy and industry, agriculture has principal problems with activity data. Approximate activity data are available in national handbooks (including estimates for each region) and they are enough for routine estimates. The achievement of *Good Practice Guidelines* level seems as a very difficult task. The situation with livestock numbers is relatively better than with manure management. Data on nitric fertilisers are available, but in contrary with the Former USSR this source became almost non-significant.

Summary of improvements recommended for agriculture sector

IPCC Sector and emission category	Activity data		Emission Factors	
	near future	after 5 years	near future	after 5 years
Enteric Fermentation	No	Yes ¹	No	Yes ¹
Manure Management	No	No	No	No
Rice Cultivation	No	No	No	No
Agricultural Soils	No	No	No	No
Prescribed Burning	-	-	-	-
Other	-	-	-	-

¹ – collection of data about real animal population in all types of livestock and studies on country specific emission factors (based on former studies in the USSR) may be planned, when the national system will be quite developed.

In general, it is too difficult to recommend undertaking something in methodology field to improve the situation in near future. Not *IPCC Good Practice* level, but even most

developed options of *Revised 1996 IPCC Guidelines* are too difficult for practice in Russia in near future. It is fortunate that this sector contributes only a few percents to the total GHG emission, so negative influence of the inventory as a whole is quite low.

Waste

As it was highlighted above, in contrary to other sectors and GHG emissions, waste management is not covered by national statistics system. Currently, the control of environment pollution caused by waste is the responsibility of the Ministry of Natural Resources, but this ministry does not collect data on volumes of waste deposited, information about waste treatment on landfills. All such activity is under management of local (regional or municipal) authorities and relevant information can be collected only from regions.

The level of implementation of the best options of *Revised 1996 IPCC Guidelines* is rather low. It means that in waste sector we are still very far from starting implementation of IPCC 2000 Guidelines. New section of new guidelines devoted to waste incineration is not important in Russia, where there were only 6 (or may be already 7) plants, which is a very small number in a country like Russia. Local people express great concern about waste incineration and, therefore, there is low probability that waste incineration will be a fast developing method of utilisation.

In this context, activity data on solid waste is the main direction of improvement. Such activity has not any institutional background yet, but it should be established. The activity can not be considered as an expensive deal, because usually regional authorities have information about last year and some people in local administration are usually good specialists in regional solid waste treatment and they can provide a central body with more or less precise information without additional studies. On the other hand, the collection of historical data on solid waste treatment to calculate emissions by FOD method (Tier 2) may be a problem. Decomposition is quite slow in cold climate and it is desirable to collect data on 20 and more years, it means we need access to archives of the Former USSR, archives of different regional agencies and bodies, which do not exist now. This is a big problem, sometimes nobody knows the storage place, sometimes archives do not include waste data, information about old landfills can be lost at all, etc.

The main improvement can be the collection of specific data on large landfills from all the regions (volume of waste deposited annually, thickness of waste layer, type of waste treatment, existence and real work of methane utilisation systems on landfills, etc.). The data of the latest available year can be collected first and relatively easy, then the historical data should be collected to extent possible.

Summary of improvements recommended for waste sector

IPCC Sector and emission category	Activity data		Emission Factors	
	near future	after 5 years	near future	after 5 years
Solid waste disposal to managed landfills	Yes ¹	continue	No	Yes ¹
Wastewater treatment	No	Yes ²	No	No
Waste incineration	No	Yes ³	No	Yes ³
Human sewage	No	No	No	No

1- collection of actual data of solid waste deposition and treatment from regions, then development of decomposition factors relevant to Russian cold climate conditions.

2- separation of data on domestic wastewater from data on industrial one

3- collection of data on waste incineration from regions (where plants are located) and development of factors, which reflect technology used at each plant.

On the other hand, other waste problems do not seem as priority activities. Wastewater is not the priority source category (it is about 10 times less than emission from solid waste), so there is no reason to recommend work on “separation data on domestic and industrial wastewater in regions. Incineration is not important in national scale as well. Thus, the main points can be outlined as follows:

1. Collection of solid waste data to follow Tier 1 Revised 1996 IPCC Guidelines based on actual data on waste deposition.
2. Step-by-step (region-by-region) implementation of Tier 2 method to calculate real methane emission from landfills.
3. Then there will be a background for implementation of *IPCC 2000 QA/QC* and uncertainty analysis in waste sector. Other provisions of *IPCC 2000 Guidelines* may be implemented only after the steps listed above.

Land Use, Land Use Change and Forestry (LULUCF)

As it was highlighted above, in contrary to other sectors, LUCF has not *Good Practice Guidelines*. Moreover national forestry statistics is not compatible to IPCC, this statistics covers main, but not all forests. Land-use statistics does not reflect abandonment of agriculture lands, which is very wide and typical for Russia now. Thus, a lot of improvements required, on the other hand, extremely complicate institutional situation on forestry sector and absence of well-developed international methodology do not allow to plan and implement many improvements in near future.

Summary of improvements recommended for waste sector

IPCC Sector and emission category	Activity data		Emission Factors	
	near future	after 5 years	near future	after 5 years
Changes in Forest and Other Woody Biomass Stocks	Yes ¹	continue	Yes ¹	continue
Forest and Grasslands Conversion	No	Yes ²	No	Yes ¹
Abandonment of Managed Lands	No	Yes ²	No	Yes ¹
Other (e.g. forest fires)	Yes ¹	continue	Yes ¹	continue

1- this information (activity data and emission factors) exists in forest statistics and scientific reports and articles, but statistics is not compatible with IPCC. Development and adoption of recalculation procedure, official adoption of national factors required in near future.

2- it requires principal improvements and changes in land-use statistics system.

General strategy for development of national inventory in Russia

The following step-by-step strategy could be recommended on the basis of analysis of the given case study expressed in the chapters above.

First of all, it is necessary to undertake urgent institutional and funding arrangements for national inventory unit, which has to compile annual inventory (to April 15th of each year) from chapters prepared by relevant ministries and agencies. It means that this unit should prepare summary report in IPCC format and also in Common Reporting Format. On the other hand, any GHG emission estimates or additional studies (e.g., activity data collection, studies of emission factors, etc.) should not overload organisation and work of the unit.

Then it is necessary to establish official system, where 5 relevant ministries/agencies or nominated national institute(s) will prepare chapters (energy, industry, agriculture, waste and LULUCF) in IPCC format and completely consistent with *Revised 1996 IPCC Guidelines* (in Russian and English). Organise more or less satisfactory funding for this activity.

Undertake public campaign on voluntary GHG inventories in regions and largest companies (with focus on IEA energy balances of regions). Organise technical and methodological support for regional peoples (on the basis of Ministry of Energy and relevant organisations, e.g., CENEf). Organise funding of this activity to extent possible.

Prepare plan for step-by-step implementation of IPCC Good Practice Guidelines in Russia (but start implementation of the plan only after completing of more urgent deals mentioned above). Implementation of *IPCC Good Practice Guidelines* in Russia looks like really difficult and relatively costly deal, which requires direct involvement of regions in emission estimation. Therefore it can not be recommended as first priority task, until other more urgent needs are not completed.

Facilitate development of national emission factors by promotion to relevant scientific researches and studies. On the other hand, it is not urgent task and such researches should be based on additional funding or grants. Russian officials can give recommendations to scientific funds and organisation about support of Russian scientists, while these expenses should not be included in budget of Russian national inventory system, until it is not well developed.

Evidently that the questions: “Which institutional options can be recommended?” and “How much is it?” should be addressed, first of all to specify the general strategy listed above. Therefore just these questions are considered in subsequent chapters devoted to institutional arrangements and estimation of cost.

5. Financial issues, dissemination of experience, institutional and legal issues

5.1 Development of options and suggestions on how to attract additional financial resources for the inventory activities

Introductory note

Development of the national GHG inventory system is obligatory for all the Parties to UNFCCC as it is stated in Article 12 (1.a) of the Convention.

The Article 5.1 of the Kyoto Protocol provides further details of the establishment of national inventory system in connection with commitments of the Parties to UNFCCC:

It means that Russian Federation as the Party to UNFCCC is responsible for both institutional arrangements and financial support of activity related to the preparation of national GHG inventories. The question is what kind of sources of financial support could be attracted or what options are available.

Federal Targeted Program “Prevention of Dangerous Climate Changes and Their Negative Consequences” and its financing

In 1996 the Government of Russia (GoR) adopted a Federal Targeted Program “Prevention of dangerous climate changes and their negative consequences”. The Program was designed for implementation in 1997 to 2000 with a total multi-year budget of approximately \$40 to \$50 million dollars (the GoR approved expenditures of 239.4 billion rubbles in 1996 prices so the range listed here reflects volatility in the exchange rate during 1996 between 4800 and 5800 rubbles per 1 USD).

According to the finance plan the proposed allocation of funds had to be broken down by types of activity as follows:

- Climate Change Information system – 12%
- Data Collection System on Sources and Sinks – 12%
- GHG/Aerosol Observation System – 5%
- Adaptation Measures – 35%
- Mitigation - 34%
- Strategic Planning – 2%

The actual level of budget financing for the fulfilment of the Federal Program during 4-year period was extremely low – no more than 4% of Program’s budget was transferred to the involved agencies and organisations.

The estimation of possible alternatives and approaches to mechanisms of financing of activities on of annual GHG inventory is grounded on following positions

Outgoing from principles of organisation of activities on inventory indispensable for opening-up of the annual report to the Secretariat of UNFCCC the collected data are broken down by industrial sector and kinds of activity, i.e. the calculations are carried out "top-down". At the same time, as the primary data on sources of GHG emissions and on parameters of consumption of organic fuel indispensable for a calculations on a IPCC

technique, go in a system of the statistical reporting of locales, and then are accumulated in centre, the organisation of the collecting of such data and calculations on regions (i.e. "bottom-up") can give the same outcomes, allowing thus to form a flexible and transparent carbon credits management system, when each region or industrial company in the region can justify its share in the total quota of Russian Federation.

Following this it is necessary to evaluate a provisional volume of costs on creation of methodical base, strengthening of organisational frame and technical base of organisations, responsible for inventory, i.e. certain initial volume of capital costs. It is also necessary to define a volume of costs indispensable that of a system acted on the constant basis, i.e. to evaluate, conditionally speaking, "operation costs".

The experience of preparation of GHG inventory in a regional scale in frameworks of the "Regional pilot project on development of GHG monitoring and reporting system in Russia", financed by US EPA, has shown that the costs of the collecting and data processing, opening-up «Manual on GHG inventory in Russia at a regional level», adjusting of the IPCC software for filling of the tables of the national reporting on GHG emissions, including partial translation of the software on Russian, training of personal, filling of standard formats of the reporting pursuant to the IPCC requirements, are about 35 thousand US dollars for one region (Novgorod oblast), and for three regions – Sakhalin oblast, Chelyabinsk oblast and Khakassia Republic - 46 thousand US dollars (table 1).

It means that increase of the number of regions allows to reduce inventory costs due to the "economies of a scale" under the articles of costs bound with direct opening-up and inventory activity, at a rate of 8-10 thousand US dollars on for region. Further absolute reduction of costs will not be so considerable, as additional expenses connected with development of technical base, transportation costs, training of staff can arise. Nevertheless, the expenses under the articles "Collecting and data processing ", "Business trips for data collection" will be minimised in connection with usage of electronic communications tools and IPCC software adapted for Russia.

Expenditures for GHG inventory in framework of "Regional pilot project on development of GHG monitoring and reporting system in Russia", USD

	Cost on central group of experts responsible for general management	IEA energy balance completion	Collecting and data processing, calculations	Staff training, seminars	Total
Novgorod region	15 000		10 000	10 000	35 000
Sakhalin region	4 000	5 000	8 000		17 000
Chelyabinsk region	4 000	5 000	8 000		17 000
Khakassia Republic	4 000	-	8 000		12 000

Base floor of costs at an initial stage of organisation of activities on inventory, bound, basically, with activity of a central group of experts ensuring of scientific - methodical and administrative management, is above, than in case of prolongation of activities on the

constant basis by local specialists, i.e. at a minimum administrative role of central group (see Appendices 1 and 2).

Confrontation of the cost of activities on creation of a system of national GHG inventory and maintenance of its operation on version "bottom-up" (i.e. on the basis of regional inventories) with version of organisation of activities, which was envisaged in a Federal Targeted Program, demonstrates advantage of the "bottom-up" version from financial point of view since capital costs for this version are around 700 thousand USD, and the current annual costs make no more than 150 thousand USD. So the planned but not allocated sum of money for inventory system under Federal Targeted Program (for 4 years) estimated as 5,7 million USD is much higher than 1,3 million US dollars required for inventory on regional version (for the same number of years – see table on p.48). These calculations were based on some assumptions coming from regional inventory experience and possible measures aimed on costs reductions (such as application of modernised IPCC software, electronic communications instead of on-site trips). It was also envisaged that options on responsibility sharing between federal and regional authorities proposed in Part 3.2.2. of this report are used, so that, for example, calculations on energy balance are conducted in selected regions.

Both approaches have advantages and disadvantages. Regional approach can lead to aggregate inaccuracy resulted from separate accidental errors coming from incorrect calculations or data loading since 89 regions always will have different conditions for fulfilment of this work. It is difficult to check if calculations are wrong since not primary parameters but only final data on GHG emissions are presented in regional reporting. The obvious advantages are connected with financial matters: firstly, it is probably cost effective approach as it is possible to reduce total expenses, and secondly, it is more realistic way to find required financing for inventory activity when being shifted off from federal budget to regional one.

The "top-down" approach is more expensive in case of big organisations are financed so that overhead expenses redouble total sum. In the same time aggregate deviation in calculations is supposed to be less as compared with integrated results of regional calculations.

Problem of public funding

In 1994-1996 Russia faced serious problems with federal budget which suffered significant deficit. That time was rather inappropriate for funding federal programs including Federal Targeted Program "Prevention of dangerous climate changes and their negative consequences".

Since late 1998 and especially last two years the Parliament of Russia approved non-deficit budgets. Moreover, the outturn of the budget for 1999 and 2000 demonstrates considerable extra budget revenues resulted from drastic increase for oil prices in the world market. It gives the basis to suppose that the so-called «budget of development» will act since 2002 and inventory activity at the governmental agencies level could be financially supported subject to appropriate Ministry is authorised by the GoR for such work.

Current governmental policy on federal programs funding is aimed on sharp cutting both in number of programs and in financing of the programs which were not able to demonstrate progress in completion (in case of funds were allocated and spent).

Resources of the regional budgets look more attractive since regional authorities have enough power to include relatively small and well-grounded sums of money into account part of budget. The main problem with regional funding is connected with allocation of

subsidies from federal budget because only few regions are the donors while remaining receive the grants from federal centre.

Options of attracting non-budget internal and external recourses

Nowadays Russia has not special financial institutions that are able to grant financial assets on favourable terms. Commercial banks do not eager to make long-term credits yet; current interest rate (18-22%) does not look very attractive for potential borrowers.

Before 1997 Federal Environmental Fund acting as non-budget fund had right to finance investment project and provide technical assistance on commercial terms and grant term as well. Now revenues of all the non-budget funds previously established by federal agencies are consolidated in the federal budget so that in case of requesting for money from these funds applicants should pass a procedure as if he applies for budget financing.

The most prospective way of financial flow management for the purposes of environmental projects and programs support is connected with co-operation with technical assistance programmes and international financial institutions (IFI). Russia is dealing with number of such institutions, including:

- Global Environment Facility (GEF)
- World Bank Group
- EBRD
- Nordic Environmental Finance Corporation (NEFCO)
- TACIS
- Bilateral agreements with interested Annex I Parties
- Funding from big Russian companies - stakeholders (RAO "Unified Energy System of Russia", "Gazprom", etc.).

We are not trying to estimate priorities in involvement of external financial sources in the frame of this work. It is clear, that inventory activities will not provide direct profit for external participants and, probably, the World Bank or EBRD might be not interesting to finance such kind of activities. In such cases there might be some interest to finance some of inventory works as a part of background required, as an example, for certain joint implementation, clean development mechanism or emission trading activities.

In the last 10 years USAID, SIDA, CIDA, the Finnish and Norwegian governments have funded a number of environmental programs and projects in Russia.

There are also several bilateral and multi-lateral programs of Cupertino (Barents Region Council, etc.) where financial support is possible on appropriate agreed basis.

The total amount of financial support from IFIs received by Russian Federation during last 10 years is estimated as several billion dollars. For example, only GEF grant for ODS Consumption Phaseout Project is 60 million USD. In 1998 Russia's portfolio in the World Bank Group consisted of about 40 operations including loans, GEF grants and guarantee project. World Bank operation for Russia estimated as more than 6,7 billion USD (source: *Fourth Country Portfolio Performance Review, WB, 1998*).

Speaking about resources of IFIs it is necessary to take into consideration the fact that arrangements connected with preparation of new grant or loan from IFIs usually takes a lot

of time and average preparatory period is 1,5 –2 years. That is why we'd propose to use resources of the current projects and programs financed from World Bank loans and other IFIs in order to ensure creation of inventory system timely.

Apparently, the external sources should not cover current costs required to system maintenance. That is why for creation of inventory system we need to make sure that such system once built will be properly managed later by any governmental agency (or by quasi-governmental but authorised by GoR).

When applying for financial support from a.m. IFIs we should recognise the final outputs which have to be mainly oriented on development of the national capacity and methodological basis allowing to reach some triggers like authorisation of legal entity responsible for systematic data collection, creation of system of electronic communication, etc., and we should make sure that Russia meets requirements under UNFCCC and Kyoto Protocol provisions.

Conclusions

It is hard to anticipate during the nearest 2-3 years any significant changes in the system of inventory management, which is being provided now by IGCE as illustrated above. This period of time should be used for some measures aimed on institutional system development allowing to create inventory system consistent not only to Revised IPCC Guidelines but Good Practice IPCC Guidelines as well. National inventory system should also be stable; i.e. its functioning should be financed on the constant base.

According to above proposed scheme of sharing of the work between agencies and organisations required for preparing of information by sectors (IPCC Sector Tables) Roshydromet is to fill Common Reporting Format and IPCC Summary Tables as well as IPCC Sector Tables could be prepared by other agencies in following way:

- Energy – Ministry of Energy; Centre for Environmental Economic Research and Information (CEERI) serving the Ministry of Energy
- Industry – CEERI, “new gases” – R&D Institute «Atmosphere»;
- Agriculture – Ministry of Agriculture in Co-operation with IGCE;
- LULUCF – MNR (Forestry Service) in Co-operation with IGCE;
- Waste – MNR (R&D Institute «Atmosphere»).

As regard to financing of these works it is necessary to note following. Usually work of scientific character (like R&D) provided by agencies is financed in the frames of relevant sums from federal budget. Application for financing from the federal budget should content information about topics and required funding. So an initial task for arranging of inventory by sectors is to make co-ordinated decision in order to include this theme in each agency plans of works.

Interagency Commission of the Russian Federation on Climate Change Problem could serve as mechanism of co-ordination of activity of the agencies under frameworks of proposed scheme of works. In the same time recommendations of Interagency Commission on Climate Change Problem will probably be insufficient since each agency is interested in additional financing and therefore new budgetary funding for new research is likely to require special governmental decision.

Further frame of inventory works with application of Good Practice IPCC Guidelines predominately requires direct participation of regions in inventory.

Possible organisational scheme of financing of regional inventories is supposed to be as following. It is envisaged that regional authorities (executive branch) in Co-operation with regional units of Ministry of Natural Resources will use existing centres of energy efficiency or other similar structures for inventory. The most effective way of work arranged by such centres could be activity on inventory in the frames of 7 Federal Districts, which have been recently established by Presidential Act. For instance, in the Ural Federal District regional inventory could be arranged in the shortest time taking into account gained experience of inventory for Chelyabinsk oblast and continuation of inventory works in Sverdlovskaya oblast as well.

In order to introduce a.m. scheme we need some initial sum of money for personal training, purchase of equipment, expert wages. As mentioned above the total sum of the so-called "initial capital investments" is estimated from 10 to 30 thousand USD per region (oblast). In case of regional inventory arranged under 7 federal districts scale of savings could be pretty significant and total funds required for creation of basement for further annual inventory is estimated as 350-700 thousand USD (compiling, checking data, archiving and reporting provided by Roshydromet are excluded. Since such work is being executed now a continuation won't require significant additional expenditures).

It seems the most preferable to attract funding from IFO's programmes being implemented in Russia now as well as technical assistance programs (like TACIS) for initial financing aimed on institutional arrangements.

Current functioning of the system will cost less as only wages and overhead expenses should be covered.

Minimum level of costs for the work without region's participation (when only 1996 Revised IPCC Guidelines is used) is estimated as 45-74 thousand USD per year. This sum includes costs of calculations made by IGCE as well as costs of compiling of information made by agencies at their own expense (budgets of agencies) for IGCE and Roshydromet.

Summarizing all approaches and organizational schemes of possible National GHG Inventory system creation we can conclude that combination of regional and federal activities would be the most effective since some cost savings is available due to integration of human resources and technical equipment under the frameworks of provincial system of management and coordination. The role of provincial authorities should consist in coordination of information flows coming from regional stuff of environmental bodies (local committees for environmental protection/natural resources use), providing for administrative support.

	Capital costs	Annual costs
Federal level	\$ 4.600.000	\$ 275.000
Sharing costs between Regional and Federal authorities	\$ 700.000	\$ 150.000 - regional inventory group \$ 75.000 – federal inventory group

Comments: federal level costs in sum 5,7 million. USD were accounted as 4,6 million + 0,275 million annually during 4 years of duration of Federal Program. These costs were

taken from Federal Program and it means that these are requested sums (Hydromet requirements).

700 thousand USD is sum required for local inventory groups equipment, and 150 thousand USD for annual salaries.

In each variant 75 thousand USD is required for central group of experts summarizing inventory data.

5.2 Development of options for experience dissemination and awareness raising

By the middle of 1990th the concern of the governmental structures about public attitude towards their activities increased. Companies and state organisations started to pay much more attention to Co-operation with public and to public awareness.

Environmentally sound projects connected with global climate change, first of all projects on energy efficiency, energy saving and alternative energy use, are not an exception. The success of such projects depends highly on public attention to economic activities both regarding the general economic situation in the country and environmental aspects.

Unfortunately insufficient information dissemination and underestimation of the role of public resulted in past in inefficient public information and involvement into the elaboration of national policy focused on UNFCCC and Kyoto Protocol implementation in Russia.

GHG inventory is a key element of the whole process of climate change mitigation. The results of GHG inventory should be shared between state structures responsible for decision making on climate change mitigation and the public.

It is a responsibility of federal authorities to form a national GHG inventory system and to prepare national reports on GHG inventory that should be regularly submitted to the UNFCCC Secretariat. For co-ordination of activities of Russian ministries, agencies and organisations in the field of climate change issues the Interagency Commission of the

Russian Federation on Climate Change Problems was formed in Russia in 1994. In fact, this is a co-ordinating structure and it has no financial resources to form effective system for public information. At the same time the Interagency Commission seems to be a key governmental body to provide Co-operation with public.

The public participation in development of greenhouse gas inventories seems to be problematic. The OECD/IEA review team confirmed the same in other countries. At the same time it is the public and mainly non-governmental organisations (NGO) (as the more organised groups of people) that can play an important role in analysing and disseminating the data received during GHG inventory process. They can bring the information to the general public, they can use this information further in their energy saving and alternative energy use projects or during information campaigns aimed to cover issues of GHG emission reduction. This information can help them to influence state officials on key climate change issues, including the need to form national GHG inventory system.

Information dissemination strategy on climate change

How to make the information on climate change and GHG inventory process in particular accessible for the public? How to achieve active public involvement into the elaboration of national policy on climate change? This is a complicated process consisting of several steps. It includes:

- I. Providing public with timely and truthful information on global warming;

II. Collecting and analysing public opinion on climate change and related issues;

III. Involving the public into the decision- making process on climate change.

Active public involvement into environmental decision making and especially decisions in the field of global warming demands the provision of truthful information to the public. Keeping in mind that grass roots interested in climate change problems have no specialised knowledge in global warming, it is important to disseminate information in two steps: short announcement of the proposed project/program/activities and more detailed description of results of activities.

Information materials for public might include short information papers and booklets, brochures and information bulletins, press-releases and more fundamental publications like monographs for public, summaries of data obtained, etc.

Channels of information dissemination on climate change issues might be:

- E-mail
- Internet
- Conferences and seminars
- Information and resource centres of NGO
- On demand
- Mail
- Posters
- Media (newspapers, radio, television)
- Public relations offices of the organisations dealing with climate change

Ideally it is important to use all the information channels to better disseminate information on climate change. However it is not always possible. Nevertheless it is important to know the main principles of working with these channels. For example, not all Russian NGO and environmental activists have an easy access to the Internet; it is not advisable to rely fully on Internet.

Main result of work with Russian NGOs on the issues of global climate change during the recent years is their increasing involvement in the climate change process.

The further steps might be as follows: to include representatives of interested public groups in advisory councils, to involve them in the activity of working groups, which elaborate programs, projects draft bills on issues associated with climate change. In order to make public participation in decision-making on issues of climate change efficient, it is important in Russia to establish closer contacts and Co-operation between public representatives and the following bodies:

- Interagency Commission of the Russian Federation on Climate Change Problems;
- Working group on climate of the Ecological Committee of the State Duma;
- Regional Centres on Environmental Investments and/or Energy Efficiency, as well as regional branches of Roshydromet and the Ministry of Natural Resources.

Such joint activities of decision-makers and public representatives will help to resolve possible conflicts and reach consensus on disputable issues.

5.3 Institutional analysis and identification of possible initiatives for consideration by key Ministries and agencies and the State Duma

There is no need to argue that forming and implementation of high quality National inventory system requires proper constructed institutional system for appropriate data collection, analysis and preparation of necessary reports. This system that has to be constructed on the basis of existing institutional relations among governmental bodies, private companies and organisations and public has to have in view the basic principles and approaches of the IPCC and UNFCCC principles and guidelines. So national circumstances and particularities have not only to be taken into account, but also sometimes have to be transformed in a way that will enable a Party to fulfil obligations on establishment of monitoring and inventory systems under the UNFCCC and the Kyoto Protocol.

At the moment the existing structure of the Russian Government and a system of relations between governmental bodies and companies is not yet adequate to establish an effective Russian national greenhouse gas inventory system, as required by the Article 5.1 of the Kyoto Protocol, within next few years.

It is possible to expect that there will be a preparatory period in the Russian Federation with segmentary but most close to international requirements inventory activities (like inventory works of RAO UESR and regional experience) and general national inventory works with some gaps prior the country will establish a comprehensive Russian national greenhouse gas inventory system, which will satisfy all the international requirements.

Two main institutional problems prevent the establishment of high-quality inventory system in Russia in the nearest future. The first of them was related to often changes in the general governmental structure during last decade.

The second is necessity to develop and to approve an appropriate national legislation. First steps in this field were done at the parliamentary hearings in State Duma on 18 June 2001. The Ecological Committee of the State Duma decided to develop an Action Plan on legislative works on climate change issues. The other motivation for activities might be a special Act of the President of the Russian Federation, which will request ministries and the State Duma to activate climate change activities. Such a recommendation also has been done at the parliamentary hearings on 18 June 2001

Ministries responsible for implementation of Russian climate change policy

INTERAGENCY COMMISSION OF THE RUSSIAN FEDERATION ON CLIMATE CHANGE PROBLEMS			
Ministry of Economy	Ministry of Energy	Roshydromet	Ministry of Natural Resources
↓	↓	↓	↓
General Economic issues	Energy sector issues	Co-ordination & Monitoring	Sinks and ecological issues

For the next few years it is possible to expect that the existing sharing of responsibilities between ministries and agencies will remain the same as it is now. Roshydromet will provide general co-ordination of inventory activities, preparation of national

communications and summary inventory reports and submission of the reports to the UNFCCC Secretariat. The Ministry of Energy will develop sectoral inventory system, which might provide high quality activity data for the whole energy sector, which might be incorporated to national inventory reports. The Ministry of Natural Resources will provide appropriate activity data on carbon dioxide removal by sinks and, probably, on new gases, to national inventories. The State Committee on Statistics will provide available data, which might be improved. The Ministry of Economic Development and Trade will supervise economic issues, including registry requirements. It is necessary to identify and fix federal targeted programmes which will cover inventory issues since 2002. Inventory activity data from companies and regions might support national inventory reports by high quality activity data, which might be used directly for application of the Kyoto Protocol mechanisms under the Articles 6, 12 and 17 of the Kyoto Protocol.

As a long-term strategy towards establishment of a National greenhouse gas inventory system under the Article 5.1 of the Kyoto Protocol the Russian Federation should solve three general problems:

- legislative and normative,
- institutional,
- methodological.

Legislative problems seem to be the most difficult for overcoming because any change in legislation requires a lot of time and consensus by a lot of governmental bodies and parliamentary committees. Definitely there will be a need to change legislation to the extent that will provide access (not interference) of the State bodies to the information on GHG emissions at private-owned and semi-private companies.

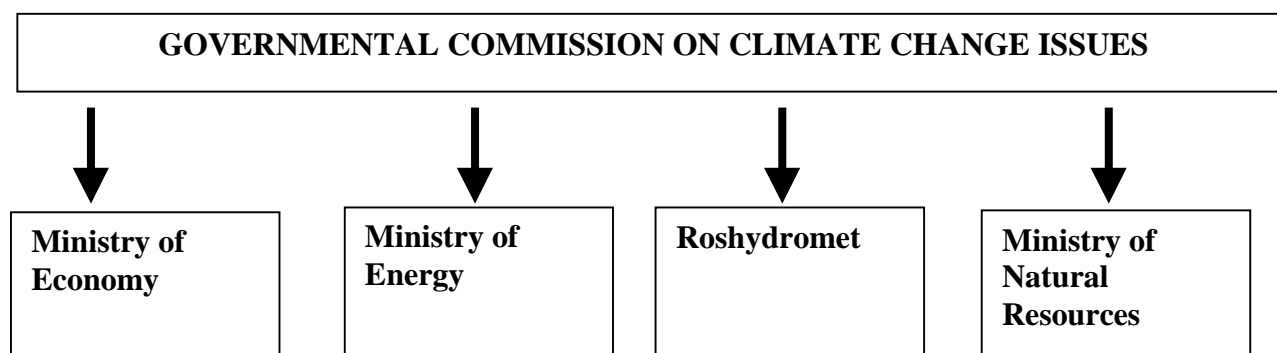
The problem is that under the existing legislation all (except state-owned) Russian entities have no stimulation (or obligatory) to be open and provide information on emissions (or consumption of specific types of fuels). The existing situation is that there is practically no problem to get information on energy production in Russia at the moment, but lot of efforts is paid by ministries (by the Ministry of Energy, for example) to get information on energy consumption.

For example “Gazprom” is still one of the most closed energy sector companies regarding an access to its information, and it is not so easy to get (and furthermore, to check) information that is needed for preparation of high quality inventory. One of the options to overcome such circumstances might be existing experience of RAO UESR, which carried out its annual inventories and later organised an international expertise of its inventories carried out by the Environmental Defence and the Centre for Preparation and Implementation of International Projects of Technical Assistance (CPPI).

The first official steps towards solving of legislative problems were done by the decisions of parliamentary hearings on 18 June 2001. The Ecological Committee of the State Duma decided to develop in Autumn 2001 a plan of legislative initiatives under the UNFCCC and the Kyoto Protocol.

Institutional arrangements in this field might be done also. The recognition of possible positive economic effect of Kyoto arrangements on Russian economy and energy sector in particular is becoming wider. At the moment the idea to rise the level of the Commission from Interagency to Governmental is under consideration at the highest level of the Russian Government. Ministries of Economy and Energy as well as Roshydromet supported this idea, however it is likely that it can be realised only in case of ratification of the Kyoto Protocol by the Russian Federation and coming it into force.

Possible scheme of top-down approach realisation



Under this scheme the Government will be able to bear full responsibility for the operation of State GHG inventory system. The ministries will have to provide all the required information to the governmental commission and they will be obligatory responsible for the creation of inventory subsystems in the fields they operate in.

Definitely this approach will not cancel the bottom-up approach under which the initiatives from regions and companies are expected. Data from regions and companies traditionally are used for national statistics and provide a background and supplementary information for national statistics.

The establishment of a comprehensive national inventory system, which will combine both top-down and bottom-up approaches in most effective (including cost-effective) way is a responsibility of the Federal Government and the State Duma and in any case should be determined in the framework of preparation to ratification of the Kyoto Protocol and solved after ratification.

Methodological problems are not the most difficult among others. Definitely the IPCC methodology, which was translated into Russian, has to be used as a cornerstone. At the same time there is quite enough room for improvements and making necessary corrections (according to national circumstances) of this methodology. Priorities in methodological issues were already discussed in this paper.

Possible initiatives for consideration by the Russian ministries and agencies – stakeholders and the State Duma

The nearest and most important goal is initiation of the process for preparation to ratification of the Kyoto Protocol by the Russian Federation. The current situation of the international negotiations and positions of the UNFCCC Parties shows that the Russian Federation has a unique responsibility, because Russian ratification of the Kyoto Protocol is critical for the Protocol.

Greenhouse gas inventory issues and establishment of the Russian national greenhouse gas inventory system should be incorporated to appropriate national analytical and background tools and national work plans as a significant and essential part of national activities under the UNFCCC and the Kyoto Protocol.

It will require just now to provide necessary improvements in co-ordination of national inventory works, implemented now by various ministries, agencies, organisations and teams of experts under the existing share of responsibilities and experience, obtained by different organisations and teams. A special responsible co-ordinating organisation, which

will collect all the data and provide transparent dissemination of the data and experience, should be nominated by a special governmental decision. To assist new inventory players, like new regions and companies, a special small advisory (consulting) group, which will be responsible for dissemination of methodologies and their applications in specific sectors and types of activity data, might be very useful. These activities might be carried out under the supervision of the Interagency Commission of the Russian Federation on Climate Change Problems and (in future) under the supervision of the Governmental Commission on Climate Change Issues.

The State Duma in Co-operation with key ministries and agencies, responsible for environmental data collection and national statistics on economic activities should initiate preparation of appropriate legislative and regulatory arrangements. Establishment of the Russian national greenhouse gas inventory system should be fixed in governmental and legislative plans as an obligatory task.

Appropriate capacity building initiatives on the permanent basis should be organised with involvement of independent organisations, which could provide attraction of financial resources, assembling of specialist teams, independent reviews and expertise of obtained activity data and applied methodologies, etc.

6. Conclusions and next steps

1. In respect of international methodologies the Russian Federation has necessary abilities to provide timely (to 2007) inventory data required for national greenhouse gas inventory systems under Article 5.1 of the Kyoto Protocol. Even now the Russian Federation is able to organise development of annual inventories for 90 % of total emission in accordance with 1996 Revised IPCC Guidelines. The rest part of emissions (agriculture, waste) may be estimated now only at the level of simple calculations, which, nevertheless, might be appropriate for simple calculations recommended by the 1996 Revised IPCC Guidelines.
2. Prior the Russian national greenhouse gas inventory system is established (for next few years), the 2000 Best Practice IPCC Guidelines might be used only for some sectors and cases when additional costs will be low and inventory works will not require significant efforts. Later, when the Russian national greenhouse gas inventory system will be developed with appropriate institutional and legislative arrangements, the 2000 Best Practice IPCC Guidelines will be used in full scale with direct participation of the regions in inventory activities according to the traditional scheme of statistic data collection in the country.
3. For the next few years institutional scheme of inventory works will remain the same as it is now. Later, according to the process of ratification of the Kyoto Protocol by the Russian Federation, it is possible to expect that the level of decision-making for all climate change issues, including inventory activities, will increase and the main general decisions will be made at the level of the Government and the State Duma.
4. Development of legislative support for national climate change activities is expected during next few years, which might assist to develop national guidelines and rules for economic instruments (planning of domestic policies and measures, involvement of flexible Kyoto Protocol mechanisms to economic processes). It seems to be a critical incentive for the Russian Government and the State Duma to accompany these activities by appropriate developments of National greenhouse gas inventories and National registry.
5. Expected expenses for development of the Russian national greenhouse gas inventory system will not be very high to prevent its establishment timely and to create barriers for ratification of the Kyoto Protocol by the Russian Federation.
6. As a next stage it might be suggested to develop a National Action Plan regarding Russian greenhouse gas inventory activities with involvement of all key national players, which provide further step-by-step development of the Russian national greenhouse gas monitoring system in accordance with the Article 5.1 and other provisions of the Kyoto Protocol.

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