

IV. GUIDELINES FOR INVENTORY OF GREENHOUSE GAS EMISSIONS ON REGIONAL LEVEL IN RUSSIA

This «Guidelines for Inventory of Greenhouse Gas (GHG) Emissions on Regional Level» is a revised and tailored to conditions specific for Russian regional level version of the «*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*».¹ The need for preparation of such a document stems from growing demand for establishment of a comprehensive system of GHG emission control and monitoring at regional level in Russian Federation.

The Guidelines is one of the «products» of the project. It's full text has about 270 pages and it is too many to include Guidelines in the Final Report. Therefore the Guidelines is Annex 1 (set of about 15 files) to the Report. The draft version was presented at the Project's Workshop in Novgorod City on 14 December, 1999. At the Workshop as well as in the consequent several weeks we received a lot of useful comments and recommendations for improvement and future development of the Guidelines. Aspects of the future development and future practical use of the Guidelines are considered below in Section IV (Report of the Workshop). Recommendations and corrections proposed to current version of the Guidelines were taken into account completely right now.

It was decided to include in the Final Report a summary of the Foreword to the Guidelines and description of the main principles and specific features as well as some differences from the international IPCC methodology. It allows a reader to get brief information on the Guidelines without reading of about 15 files and 270 pages of the Annex.

Summary of the Foreword to the Guidelines

The economic development has led to increased influx of greenhouse gases in the Earth's atmosphere. Extensive and relatively inefficient combustion of fossil fuels, deforestation and other factors have amplified global warming and have led to a negative feedback when adverse climatic changes negatively affect economy, ecosystems and conditions of human life.

These Guidelines refer to all greenhouse gases which are regulated by the Kyoto protocol: carbon dioxide (CO₂) and methane (CH₄) at the first place, and other GHGs which contribute much less to the total GHG emissions – nitrous oxide N₂O, fluorocarbons (HFCs, PFCs, SF₆). Ozone depleting substances (though making small contribution to global warming potential) are not considered by the Guidelines because they are monitored and banned according to countries' commitments to the Montreal Protocol.

It is important to note that after the Kyoto Protocol the Framework Convention have taken a very practical and economic direction. The economic mechanisms of international co-operation approved by the Protocol are based on the assumption that the climatic consequences remain the same no matter where a GHG emission source is located. Therefore,

¹ IPCC (Intergovernmental Panel on Climate Change) co-ordinates climate experts of all countries and provides scientific expertise for UN Framework Convention on Climate Change (FCCC).

to achieve global efficiency of climate control, the emissions should be reduced at those sources where it is least expensive to do. Countries participating in the Protocol may opt for joint implementation of GHG emission reduction projects implemented within one country and then «share» or «trade» acquired «emission reduction units» (ERUs). Moreover, if a country have not used its GHG emission quota completely, it can transfer or sell the unused portion of its quota to another country. A country may choose to buy the unused portion of someone else's quota if it is less expensive to do than to reduce its own emissions domestically. Such mechanisms of international co-operation are known as «flexibility mechanisms» meaning that the Kyoto Protocol provides certain flexibility in terms of how and where the GHG emissions are to be reduced.

During the first commitment period 2008 - 2012 it is very unlikely that Russia will use its emission quota (set at 100% of its 1990 emissions) completely. This opens up unique opportunities to use international co-operation mechanisms for implementation of environmental protection measures in energy production sector, forestry, and other sectors of Russian economy.

In order to take advantage of these opportunities Russia must observe all rules established for FCCC members. If Russia is to take part in international co-operation in the Kyoto framework, a comprehensive and consistent with international standards GHG monitoring system must be established. (Monitoring means GHG emission calculation based on economic activity data, while direct measurements of emissions may be done only in very special cases.) It is not quite necessary to develop such a monitoring system immediately (prior to 2007), but in the absence of such a system Russia will not be able to participate in early emission trades and other mechanisms of international co-operation. This is why it is desirable to develop such a system as soon as possible. Most of the developed countries have already established national GHG emission monitoring systems.

According to FCCC rules, Russia should report annually its «GHG emission inventory» (annual report for a previous year is to be delivered no later than April 15 next year, e.g. data for 1999 are to be reported by April 15, 2001). Moreover, the countries, which have not reported yet their GHG emissions for past years since 1990, should do so *aposteriori*.

Besides this requirement, once every three years Russia has to prepare special reports called *National Communications to the UN FCCC*, GHG emission inventory being one of key chapters of these. The first Russian National Communication was prepared in 1995, the second in 1998. These reports contain preliminary estimations of GHG emissions in Russia, their level of accuracy was probably quite enough for pre-Kyoto stage of FCCC activities. Now, after Kyoto, when more precise and detailed emission estimates are needed to participate in flexibility mechanisms, GHG emission inventory must be completely reworked out.

It is necessary to highlight, that good quality and detail GHG inventory is evidently required without any context of the Kyoto Protocol. Any people would like to know about their country – «own house» – inventory is natural obligation of any country for people and for the World Society. No given Guidelines nor inventory are not focused on Kyoto Protocol only and they will continue to be very useful in any case, even if the Protocol does not entry into force or is replaced with an another international agreement.

BASIC PRINCIPLES AND SPECIFIC FEATURES of the international methodology and Guidelines for GHG inventory on regional level in Russia

International Methodology

The «*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*» were adopted as methodology for GHG emission inventory for the first commitment period under Kyoto Protocol of the United Nations Framework Convention on Climate Change (up to the year 2012). In doing so we intended to «freeze» the rules of GHG emission inventory compilation. This may lead to certain discrepancy between actual anthropogenic GHG emissions and Emissions as defined by the Protocol. Nevertheless, the Parties to the protocol have concluded that this discrepancy as the price one has to pay for ability to adopt legally binding decisions about emission control.

On the other hand, the IPCC methodology is inherently flexible. It almost always contains several «levels» of accuracy in emission estimation. The basic level requires only a minimum of data and analytical skills. More complex one is based on detailed data and, as a rule, takes into account country-specific information. The highest level usually implies very detailed data on the level of industrial enterprises, and direct measurements of most GHG emissions. For example, if we take power and heat generation (the most important source of GHG emissions), the first level means mass-balance calculations based on aggregated country-wide (or regional) statistics on consumption of basic fuels. The second level - emission calculation by source types, based on fuel use for each industry and sectors of the economy. The third level utilises source-specific data, it can be used only for a small number of principal emission sources.

In a most general case the inventory is constructed as follows:

(data on a certain type of activity) * (emission factors) = emissions.

IPCC methodology lists conversion factors for all calculations. These factors reflect sometimes regional specifics, fuel or industrial process type, and so on. Sometimes world average values are used instead. IPCC methodology requires usage of these emission factors if country-specific data are unavailable. If a country is not satisfied with IPCC emission factors, it may go ahead and measure emissions directly at the sources (power plants, factories, etc.), to derive its own coefficients for future use.

It is allowed to use different levels of detalization at a country's discretion, as well as to use different levels for different types of economic activity. On the other hand, it is required to use standard worksheets for reporting data. A country may also include additional tables or add on optional columns or lines in the worksheets. Nevertheless, standard worksheets should always be used both on paper and in electronic format suitable for use by FCCC Secretariat. Reporting tables are available in WinWord 6/7 format while worksheets and software are available in Excel 5.0².

² Unfortunately it was obtained during the project, that work with Russian language version of Excel and Worksheets translated into Russian lead to serious computer problems. It is problem of joint work of different multi-language software. Therefore it is practically possible to work only with English language software.

Russian Guidelines

Overall Structure of Guidelines.

Russian Guidelines is a revised and tailored to Russian regional conditions version of international methodology. Russian version inherits ideology and calculation methods of the international methodology. It uses the same reporting format, including software. Thus, Russian version is fully compatible with international methodology. It also contains information on data collection, employs specific Russian emission factors and Russian traditional statistical reporting forms³.

For ease-of-use, three books of *IPCC International Guidelines* are comprised in one volume in Russian. This volume contains only information which is important for Russian conditions, it does not lists all information specific to another countries, as the original *International Guidelines* does. There is a number of GHG emission sources (such as rice fields) which one may in principle find in Russia, but which are not important for the vast majority of Russian regions. Such sources are not described in the Guidelines, but references to *International Guidelines* are available in all cases. If your region has such emission sources, we recommend to contact the Central GHG Inventory Group located in Moscow, if not specified otherwise (for instance, methane emissions are calculated by the Methane Center in Kemerovo).

The worksheets in Excel (software and reporting forms are included in the Guidelines) must be sent to the Central National GHG Emission Inventory Group located in Moscow. They will be used in the process of compilation of the National Inventory, which is to be sent to FCCC Secretariat. At the same stage it is planned to use Common Reporting Format proposed by the UN FCCC Secretariat (testing among EIT countries in 2000-2001).

To ensure consistency with IPCC reporting format, we keep the numeration of Excel worksheets, modules and chapters the same as in the original *IPCC Guidelines*. This is essential for software compatibility. Double-digit chapter numbers (e. g. 1.3) are the same. Some chapters from the original *IPCC Guidelines* which are not important for Russia are omitted. For instance, we skipped the chapter 4.4 devoted to savanna burning, with its corresponding number. On the other hand, questions which need more detailed attention in Russian conditions are supplemented with subdivisions like 1.2 A, 1.2 B.

The present *Guidelines* actually consists of four principal modules:

Module 1: Energy

Module 2: Industrial Processes

Module 3: Solvent and Other Product Use (this module is very small)

Module 4: Agriculture

Module 5: Land-Use Change and Forestry (this module is absent yet)

Module 6: Waste

We could not include the chapter on greenhouse gas emissions and removals associated with forestry and land use change because of two reasons. Firstly, this module of the international

³ This Guidelines is considered as the first version only and it does the first step to full adjustment of reporting, in particular, in the further development of the Guidelines it is planned to include Russian codes of pollutants and provide direct references to statistical forms currently used.

IPCC Guidelines is now being revised. Secondly, it looks like Russian Federal Forestry Service should be a lead agency in developing of this module. For additional information on forestry and land use the users of this document should contact the Central National GHG Emission Inventory Group.

Each chapter is subdivided according to different emission sources or greenhouse gases (for instance, CO₂, methane, and so on).

A short introduction precedes main body of each chapter. Introductions contain technical information on physical nature of the principal industrial processes which lead to GHG emissions. Introduction is followed by «*Data Sources*» subchapter, where possible information sources available in your region for emission calculations are discussed. (These subchapters have been completely rewritten for Russian Guidelines). The following subchapters provide step-by-step directions for emission calculations and reporting in worksheets.

The attempt to keep uniform structure of the reporting worksheets for all countries led to a situation where most lines (devoted to different fuel types, domestic animals, industry products, etc.) in a worksheet would remain blank. In fact, you will typically have to fill out only about 10 to 20 per cent of the worksheet space.

International Guidelines is intended for use by untrained personnel. This is why special attention is given to correct usage of units and conversion factors (thousand tonnes, kilograms, cubic meters), and to correct conversion between units (e.g. from tonnes of carbon to tonnes of CO₂, etc.) Final results are expressed in Gigagram (same as thousand tonnes) of a greenhouse gas emissions. In Russian version we decided to keep such a detailed approach to units and conversion procedures. This is why a user will find special columns in the worksheets and special steps in the directions, devoted to conversion procedures.

Frameworks of the Guidelines.

IPCC Guidelines for National Greenhouse Gas Inventories are developed for calculation and reporting of all *antropogenic* GHG emissions and removals. In general terms «antropogenic» refers to greenhouse gas emissions and removals that are a direct result of human activities or are the result of natural processes that have been affected by human activities. Users may include any human-induced emissions and removals in their inventory as long as they can be clearly documented and quantified. In this sense the Guidelines are «open».

On the other hand, as we mentioned in the Preface, the driving forces behind emission reduction agreements and international reporting stem from near future and in some extent the Kyoto Protocol. This is why all direct and indirect emissions sources are subdivided by two unequal categories. The category of «main sources» covers all sources regulated by the Protocol, while the second category consists of not-so-well defined sources, where it is difficult to subtract antropogenic component (e.g. permafrost melting, peat formation).

Another limitation of the Protocol is that it regulates only six «direct action» greenhouse gases (CO₂, CH₄, N₂O, HFCs, PFCs, SF₆), while «indirect action» greenhouse gases are not covered (SO₂, CO and others). It should be noted that many of these gases are already regulated by other international agreements. It is also very essential that Russian had developed and implemented monitoring system on atmospheric pollution control, which include all «indirect» GHG (SO₂, CO and others). It operates quite good, data are available (see annual State Reports on Environment Pollution prepared by SCEP) and can be used in Russian National Inventories and National Communications to the UN FCCC. Their format

and level of details are completely consistent with new Common Reporting Format. Thus there is no reason to re-establish or even change the national system. Therefore this version of *Guidelines* consider only greenhouse gases regulated by the Kyoto Protocol.

Subsequent versions will probably cover other sources or sinks of greenhouse gases, including such important as permafrost melting and peat accumulation.

Specific Features of the *Guidelines*.

Fossil Fuel Combustion

Here we will discuss in some detail the first sub-module of «Energy» Module which is devoted to estimation of emissions from fossil fuel combustion. Usually this process accounts for about three fourths of all GHG emissions, this is why it requires special attention.

1. In line with international methodology, there are two levels of emission inventory here: 1) *Basic approach* - a crude estimation based on regional fuel consumption statistics, and 2) more detailed calculations based on data about individual sources. More detailed information one may find in Introduction to Chapter 1.
2. CO₂ emissions from firewood combustion are excluded from total CO₂ emissions (though methane and N₂O emissions accompanying this process are included). We do so because we assume sustainable character of wood use: the rate of wood consumption equals to the rate of wood production. CO₂ emissions from firewood combustion are given as additional information for reference.
3. Greenhouse gas emissions from major power plants have been already covered by emission inventory made by Russian JSC «Unified Energy Systems of Russia». The emissions for 1990 - 1997 have been calculated, and will be consistently calculated for the subsequent years. They account for approximately 30% of total CO₂ emissions (or 25% of total GHG emissions), therefore a special subchapter is devoted to these emissions.
4. Emissions based upon inter-regional railway network and aircraft operation are attributed to those regions where headquarters of transport companies are located. This seems to be logical because emission transactions and emission control measures will take place in the companies' headquarters.

Emissions on Transport

1. Emissions based upon fuel sold to ships or aircraft engaged in international bunker transport should not be included in national totals but reported separately.
2. Emissions from road vehicles should be attributed to the country where the fuel is loaded into the vehicle. The error in national emissions introduced in the case of road transport is expected to be small.

Determination of national origin of emissions

In line with the principle of national emissions, the IPCC methodology accounts for the bulk of greenhouse gas emissions related to fuel combustion in the country in which those emissions are released.

1. The IPCC methodology for carbon stored in non-fuel products manufactured from fuels as raw materials takes into account emissions released from those products during

their use or destruction. Emissions are attributed to the country where the conversion to non-energy products takes place, even when the products are traded internationally. This is believed to be a relatively small net error, but it is also a priority for future work.

2. Emissions from the combustion or decay of wood and wood products are assumed to take place in the country in which the wood was harvested and within a year of harvesting. This is because it has been determined that the most workable approach to estimating CO₂ emissions and removals from forests is to account for changes in stocks of standing biomass in forests and other locations. The simple assumption is that wood removed from stocks releases CO₂ emissions in the year and in the country where the wood was removed. While the IPCC method allows for accounting of exports and carbon stored in products, it does not yet provide a methodology, which is a priority for future work.

Data Averaging and Uncertainty

The data available to estimate anthropogenic greenhouse gas emissions resulting from fuel combustion are generally of a better quality than the data available to estimate greenhouse gas emissions and removals in the areas of agriculture and land use change/forestry. Accordingly, while the IPCC *Guidelines* request an emission figure for a single year in most source/sink sectors, three-year averages (with the base year in the middle) are preferred in the areas of agriculture and land use change/forestry. In addition, the IPCC *Guidelines* recognise that greenhouse gas emissions and removals in the area of land use change/forestry can occur over an extended period of time once the activity has been completed.

Many of the categories of greenhouse gas emissions and removals can be estimated only with large ranges of uncertainty. Quite naturally, some national experts have developed methods which are designed to produce ranges of estimates rather than point estimates for highly uncertain categories. The IPCC *Guidelines*, however, require that users provide a single point estimate for each gas and emissions/removal category. This is simply to make the task of compilation, comparison and evaluation of national reports manageable. Users are encouraged to provide uncertainty ranges or other statements of confidence or quality along with the point estimates. The procedures for reporting uncertainty information are discussed in the *Greenhouse Gas Inventory Reporting Instructions*. As Russian version of the *Guidelines* is being reworked and local Russian experience in GHG emission inventory compilation becomes available, we plan to include in the *Guidelines* special modules devoted to estimation of uncertainties.