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Report on the in-depth review of the national communication of
the Russian Federation

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Under Articles 4 and 12 of the Convention, Parties are required to prepare national communications on their implementation of the Convention. Guidelines for the preparation of national communications and the process for their review were agreed upon by the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, by its decisions 9/2 and 10/1, and by the Conference of the Parties, at its first session, by its decisions 2/CP.1 and 3/CP.1 (see FCCC/CP/1995/7/Add.1). In accordance with these decisions, a compilation and synthesis of the first 33 national communications from Annex I Parties was prepared (FCCC/CP/1996/12 and Add.1 and 2).

When reviewing the implementation of the Convention by Parties, the subsidiary bodies and the Conference of the Parties will have this report available to them in English as well as the summary of the report in the six official languages of the United Nations. (These bodies will also have before them the executive summary of the first national communication of the Russian Federation and country-specific information drawn from a compilation and synthesis report covering all countries that have submitted national communications.)

Summary^{1/}

1. The in-depth review was carried out between April and December 1996 and included a visit to Moscow from 22 to 26 April 1996. The review team included experts from the Czech Republic, Cuba, Norway and the International Energy Agency.
2. Due to the overall macro-economic instability and deep recession which has persisted since the early 1990's, the energy-related CO₂ emission level in the Russian Federation in 1995 was roughly 26 per cent lower than the 1990 level. As a result of the transition to a market economy, the Russian Federation has experienced a sharp deterioration of all major economic and social indicators since 1990, including a decrease in real gross domestic product (GDP) of roughly 38 per cent from 1990 to 1995. A drastic reduction of the government budget followed, which included a dramatic cut in defence expenditure and severe cuts in the social and environment areas. The sharp decline in industrial activity and the ongoing restructuring in the Russian economy make it likely that energy-related CO₂ emissions will only return to 1990 levels after 2010. These projections do not take into account the effects of any yet to be implemented special mitigation measures related to climate change, although they do include the effects of energy conservation measures of the Russian energy policy (not described in the communication) and an expected increase of the share of natural gas in total primary energy supply (TPES) from 40 per cent in 1990 to 54 per cent in 2000. In spite of the fact that per capita TPES has in recent years been lower than the OECD average, Russian Federation's energy-related CO₂ emissions in 1990 amounted to over 16 tonnes per person compared with the OECD and EU averages of 12 and 9 tonnes, respectively.
3. The review team appreciates the difficulties faced by the Russian Federation to present a 1990 greenhouse gas (GHG) inventory due to the fact that in 1990 the Russian Federation did not exist as an independent state and the existing statistics do not allow for a clear breakdown of emissions among independent states which then formed the Soviet Union.
4. In the Russian Federation's national communication, emission data were not reported in accordance with IPCC standard tables, nor was full documentation provided about the methodologies used to determine GHG emission levels from different emission sources and CO₂ removal by sinks. Hence, the transparency and the comparability of the emission inventory was not sufficient. During the in-depth review, however, government officials provided additional information which substantially improved the transparency of inventories. Despite the improvements made, the team wishes to note that in accordance with the adopted reporting guidelines future GHG inventories should use IPCC standard data tables and provide the necessary background to enable the reconstruction of the inventories. In general, the uncertainty levels associated with GHG inventories were not provided. Government officials

^{1/} In accordance with decision 2/CP.1, the full draft of this report was communicated to the Government of the Russian Federation, which had no further comments.

recognize that methane emission levels from the natural gas industry are highly uncertain. The review team strongly recommended that an assessment of the uncertainty of emission level estimates be provided with the next communication.

5. Total CO₂ emissions amounted to 2,387,000 Gg in 1990, which represented 11 per cent of the global CO₂ emissions, making the Russian Federation the world's second highest emitter of energy-related CO₂. The 1990 emission level was reviewed in depth and confirmed during the visit. Fuel combustion emissions represented 98 per cent of the total, while the remaining 2 per cent originated in industrial processes, particularly in cement production. No sectoral breakdown of CO₂ emissions from fuel combustion was made available. Methane emissions amounted to 27,000 Gg in 1990 which represented 7.2 per cent of the global emissions. Fugitive fuel emissions from production, final use and transport of natural gas as well as from coal mining and oil extraction represented 72 per cent of the total methane emissions. Total N₂O emissions of 820 Gg in 1990 were corrected during the in-depth review to 230 Gg. N₂O emissions from agricultural sector represented roughly 87 per cent of the total N₂O emissions. Using 1994 IPCC global warming potentials (100-year time horizon), 1990 CO₂ emissions (excluding land use change and forestry) represented 72 per cent of total GHG emissions, while methane accounted for 20 per cent.

6. GHG inventories for years other than 1990 were not provided during this review, making it difficult to assess GHG emission trends. The team strongly recommends that an attempt be made to fulfill Annex I Party commitments -- as agreed on in decision 3/CP.1 of the Conference of the Parties -- to submit GHG inventories for recent years, following IPCC reporting guidelines and the sectoral breakdown adopted by other Annex I Parties. Additionally, emissions arising from international bunker fuels have not been reported separately from other emission sources. The communication did not include emission figures for hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) and only aggregated emission levels for precursor gases were provided. The Russian Federation is encouraged to report emission data for these gases in the next national communication, particularly in view of the large production of aluminium and magnesium in the country.

7. The Russian Federation has a very large CO₂ sink capacity in its forests compared to other Annex I Parties, amounting to 587,000 Gg per year and representing roughly 25 per cent of its total CO₂ emissions. Although, forests which timber is not properly harvested or which are in a pristine state without any forest management are included in this estimate, the team considers that the methodology used in estimating this forest sink capacity to be a result of a detailed and rigorous scientific work. A substantial potential for the enhancement of CO₂ sinks has also been identified in afforestation of abandoned land. Russian Federation's first communication reported a very large CO₂ sink capacity in Russian peatlands (147,000 Gg/year). The methodology used deviates from the IPCC inventory guidelines since CO₂ sink

capacity in peatlands is considered to be essentially non-anthropogenic, hence not included in GHG inventory totals^{2/}.

8. Although a major potential for energy saving in the Russian economy, in the order of 40 to 45 per cent, has been identified, very limited information is available on the status of energy saving measures. The team felt that the climate change issue in the country could usefully be promoted in conjunction with the recognized need to promote improvements in energy use as well as energy savings and to introduce new energy efficient technologies and management practices in industry, in the transport infrastructure, in the residential and commercial sectors. There seems to exist real opportunities to introduce energy efficiency measures which can at the same time result in net economic gains to the society.

9. The lack of detailed information on recent federal laws and programmes makes it difficult to understand the full context in which FCCC-related policies and measures could be implemented. The team strongly recommends the inclusion in the second national communication of information on these recent developments -- such as the energy strategy and the federal energy efficiency programme -- which would serve to mitigate GHG emissions even if that was not their primary or sole objective. The inclusion of information on their status of funding, level of implementation and management responsibilities would greatly improve understanding by all Parties of the challenges being confronted by and policy options available to the Russian Government. During this review, the team noted that several initiatives related to climate change seemed dependent on approval of the special federal programme entitled "Prevention of dangerous climate changes and their negative consequences." It seemed that its approval could greatly improve the Russian Federation's ability to implement Articles 4.1, 4.2 and 12.1 of the Convention. Subsequently, it was confirmed that the programme had been approved on 19 October 1996, although its full funding is not yet guaranteed.

10. The team advocates a more proactive role by the Interagency Commission of the Russian Federation on Climate Change (established in 1994) in increasing awareness of GHG issues and opportunities for cost-effective measures consistent with local development objectives among policy- and decision-makers in the Russian Federation, both at the federal and regional levels. It was felt that its role could be enhanced by usefully increasing its involvement in the actual monitoring of climate-related measures.

11. The team finds it imminently reasonable that the Russian Federation considers the prevailing economic situation as the basic context for viewing policies and measures, along with the need to take action in line with overall economic and energy policies. The review team feels, however, that it is possible to pursue several "no regrets" options that respond to economic and energy goals as well as climate ones without being inconsistent with the

^{2/} The same procedure of excluding peatland sinks has been adopted in the in-depth review of communications submitted by other Annex I Parties to the Convention, such as Finland, Ireland and the United Kingdom, which also have large areas of peatland in their territories.

underlying principles adopted by the Russian Federation. Indeed, these principles would seem to argue for giving some "no regrets" options high priority in the present Russian Federation.

12. Measures were not described in the communication or in documentation provided to the review team in sufficient detail to show how they would work, to determine what their status of implementation might be or to assess in a reliable fashion their specific impacts in terms of climate change mitigation. The majority of measures described are part of Russian Federation's energy strategy that was developed in 1993-1994 and adopted in 1995 by special presidential decree, though it is unclear who remains responsible for their overall implementation in the context of FCCC. It would seem that there is a consensus that GHG mitigation options cannot be given priority until the state of the economy improves. On the other hand, in contrast to previous energy programmes in the Soviet Union oriented towards large-scale growth in energy output, the 1995 energy strategy gives priority to increasing efficiency in energy production and consumption and promoting energy conservation. Finally, the national communication does not describe any mitigation measures targeting CH₄ and N₂O emissions, although limited information was provided during the country visit on Gazprom's project to identify ways to reduce emissions both at the gas production and the final gas consumption stages. It would seem that the biggest challenge to the gas industry lies in the refurbishment of the trunk line system, including both pipelines and compressor stations. Action in this regard would necessarily have a mitigation effect and should, if taken, be reported in future communications.

13. The national communication projected energy-related CO₂ emission levels for 1995, 2000 and 2010 which were, respectively, 18, 13 and 4 per cent lower than the 1990 levels. These emission scenarios refer to energy-related (fuel combustion) CO₂ emissions only (i.e. projections for CH₄ and N₂O were not provided during this review) and derive directly from projections made for key macroeconomic variables as part of the energy strategy. Such projections do not incorporate the effects of any of the measures described in the communication or undertaken elsewhere but not described and assume that total energy consumption will increase by 0.8 to 0.9 per cent annually until 2000. During the review, the team was presented with a revision of the original projections which takes into account scenarios based on the new energy strategy, as well as recent developments in the energy sector. Based on these new estimates, energy-related CO₂ emissions in 1995 were 26 per cent lower than in 1990 and are expected to be roughly at the same level below 1990 levels in 2000. By 2010 (though very preliminarily estimated), these emissions are expected to be roughly 20 and 10 per cent lower than in 1990, assuming an annual GDP growth rate of 1 to 2 per cent in the 2000-2010 period. The team suggested that a full description be provided of how projections were made and strongly recommends that non-energy CO₂ as well as CH₄ and N₂O emission projections be included in the next communication.

14. The Russian Federation has carried out commendable work in assessing the potential impacts of climate change on its economy and ecology. During the review, the team had the opportunity to appreciate the high-quality work carried out by the Institute of Global Climate and Ecology. Results of several studies were well described in the national communication. The potential impacts of climate change in the Russian Federation include: (a) a substantial

shift to the north of the permafrost zone, which currently occupies 58 per cent of the national territory; (b) a sea-level rise, particularly in the Caspian Sea, which allegedly has already flooded coastal arable lands and caused significant economic losses; (c) important changes in precipitation levels and amounts of soil moisture, with both negative and positive consequences, such as an increase in crop productivity in some areas and desertification in the south; and (d) depletion of freshwater resources. Lack of funds appears to be a major obstacle to the Russian Federation's continued work on the assessment of the impacts of climate change and consideration of options for adaptation measures.

15. The Russian Federation is not an Annex II Party to the Convention, although it is a member of the restructured Global Environment Facility since 1994. A considerable amount of technical knowledge is still shared with other countries of the Commonwealth of Independent States. Limited information was provided on technology transfer from OECD countries to the Russian Federation, although it is known that the level of international cooperation for nuclear plant safety in Russia has recently decreased. The Russian Federation follows with keen interest the pilot phase of activities implemented jointly (AIJ) and, at the time of this review, 6 AIJ projects had been approved by the Inter-Agency Commission on Climate Change.

16. Through the years, the scientific community in the Russian Federation and formerly in the Soviet Union have made invaluable contributions to research on climate change causes and impacts, including early active participation in the IPCC activities. High calibre research on, for example, climate change impacts on terrestrial ecosystems are being carried out by such world standard institutions as the Institute of Global Climate and Ecology.

17. Despite the fact that climate change and environmental issues do not appear to be matters of priority to the general public in the Russian Federation, the implementation of policies and measures could be greatly enhanced by better public awareness of their environmental and economic benefits. The review team felt that future cooperation of the Inter-Agency Commission on Climate Change with national non-governmental organizations and the mass media could play an important role in supporting energy efficiency policies as well as future climate change measures.

I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

18. The Russian Federation ratified the Convention on 28 December 1994. The secretariat received the Russian Federation's first national communication on 5 December 1995. The in-depth review of the national communication was carried out during the period April to December 1996, including a country visit from 22 to 26 April 1996 to Moscow. The review team consisted of Mr. Lubomir Nondek (Czech Republic), Mr. Roberto Acosta Moreno (Cuba), Mr. Audun Rosland (Norway), Mr. Lee Solsbery (International Energy Agency (IEA)), Mr. Andrea Pinna (UNFCCC secretariat) and Mr. Lucas Assunção (UNFCCC secretariat, Coordinator). The team met with representatives of several ministries as well as

with members of the scientific and academic communities and a representative of a non-governmental organization.

19. As a result of the transition to a market economy, the Russian Federation has experienced a sharp deterioration of all major economic and social indicators since 1990, including a decrease in real gross domestic product (GDP) of roughly 30 per cent in the four-year period 1990 to 1993^{3/} (or 1.5 times the fall in gross national product that occurred in the United States during the great depression of the 1930s) and 38 per cent from 1990 to 1995. A drastic reduction of the government budget followed, which included a dramatic cut in defence expenditure in 1992, with a 68 per cent cut in procurement and resulting impacts on employment and economic activity^{4/}. This austerity imposed particularly severe cuts in the social and environment areas -- the latter generally considered to be of low priority in light of prevailing economic conditions. In 1995, the share of government expenditure devoted to in environmental protection was roughly 0.1 per cent of GDP and, in 1996, total environmental expenditures amounted to 0.5 per cent of the state budget, down from 0.6 per cent in 1995.

20. Russian Federation's energy sector, also described as the "fuel and energy complex", is the most important structural component in the economy. It directly accounts for more than a quarter of industrial output and roughly half of the country's exports (44 per cent in 1995), and employs a sizeable share of the workforce. Until 1988, the then Soviet Union produced around 13 per cent of total world energy output, though its population represented less than 3 per cent of the world's population.

21. Owing primarily to the macroeconomic instability and deep recession which has prevailed since the early 1990s, the energy-related carbon dioxide (CO₂) emission level in the Russian Federation in 1995 was 26 per cent lower than in 1990. The sharp decline in industrial activity and the ongoing restructuring in the Russian economy make it likely that energy-related CO₂ emissions will only return to 1990 levels after 2010. These projections do not take into account the effects of any yet to be implemented GHG mitigation measures, although they do include an expected increase of the share of natural gas in total primary energy supply (TPES) from 40 per cent in 1990 to 54 per cent in 2000.

22. In spite of the fact that per capita TPES has in recent years been lower than the OECD average, Russian Federation's energy-related CO₂ emissions in 1990 amounted to over 16 tonnes per person compared with the OECD and EU averages of 12 and 9 tonnes, respectively.

^{3/} Source: *Russian Statistics Yearbook 1994*. Figure provided during the in-depth review.

^{4/} According to the 1995 OECD Economic Survey on the Russian Federation, "Before 1990, the share of defence spending in GDP was variously estimated at between 20 to 35 percent. Some 80 per cent of Soviet defence industries were located in Russia. The defence sector was responsible for 60 per cent of all machine products and over 80 per cent of all Soviet electronics production, including a considerable production of civilian goods."

23. At the same time, CO₂ emissions per unit of GDP have increased, indicating that energy intensity may also have increased over the 1990-1995 period or, rather, that the decline in national income was larger than the drop in CO₂ emissions due, *inter alia*, to high inefficiency levels in energy production and use and highly subsidized domestic energy prices. While between 1990 and 1995 energy-related CO₂ emissions dropped by 26 per cent and TPES fell by 25 per cent, total final energy consumption per unit of GDP increased by over 20 per cent and CO₂ emissions per unit of GDP in 1990 were twice as high as the average in countries both of the Organisation for Economic Co-operation and Development (OECD) and of the European Union (EU). This high carbon intensity is explained more by the high energy intensity of the economy, and less by a high carbon intensity of the fuel mix, since almost half of TPES is natural gas.

24. The high intensity of energy use in the Russian Federation is due to the structure of the country's economy, largely dominated by energy-intensive industries such as raw material processing, heavy machinery building and building material manufacturing, as well as systemic inefficiencies of energy use throughout all consuming sectors. The latter is a direct result of artificially low energy prices, high obsolescence levels in industrial infrastructure, lack of consumption metering and controls, lack of market discipline to reduce costs and a pre-eminent focus by industry on meeting production goals. As a result, the present energy intensity of the Russian economy is more than nine times the average for European countries of the OECD. Primary energy consumption has fallen over the past few years, but GDP fell much faster at the same time.

25. In 1993, TPES was 680 million tonnes of oil equivalent (Mtoe), down 23 per cent from the 1990 level of 887 Mtoe. Natural gas made up 46 per cent of TPES, followed by oil (30 per cent); coal and other solid fuels (19 per cent); nuclear energy (4.6 per cent) and hydropower (2.2 per cent). Total final energy consumption was 472 Mtoe, down 22 per cent from the 1990 level (603 Mtoe). The Russian Federation is a net exporter of energy and the owner of the largest "proven" gas reserves in the world (with 35 per cent of world reserves): in 1993, it exported 44 per cent of its oil production and 28 per cent of its natural gas production. Regarding electricity generation in 1995, 44 per cent was produced from natural gas, 20 per cent came from coal, 19 per cent was hydropower, 11 per cent was nuclear power and 6 per cent was produced from mazut. Russian electricity use is characterized by the high proportion of industrial demand (60 per cent) and low demand levels in the residential and service sectors.

26. Although government and independent academic institutions have identified a major potential for energy-savings in the Russian economy, in the order of 40 to 45 per cent, very limited information is available on the status of energy savings measures. A federal energy savings law has already been approved by the State Duma though no information was provided to the review team on the status of its implementation and funding. The team felt that the climate change issue in the country could usefully be promoted in conjunction with the recognized need to promote improvements in energy use as well as energy savings and to introduce new energy efficient technologies and management practices in industry, in the transport infrastructure, in the residential and commercial sectors etc. The team remarked that

the official approach to climate change issues has not yet been associated with the goal of achieving sustainable economic development and improving the management and use of national natural resources.

27. The team is convinced that there are real opportunities to introduce measures which could at the same time result in net economic gains to the society, by reducing inefficiencies in energy production and use, while limiting growth in greenhouse gas emissions. In this sense, the goals of the Framework Convention on Climate Change are fully compatible with the pressing need for sustainable economic growth and development in the Russian Federation.

28. There have been rapid changes in the legislative and administrative spheres (e.g. new federal acts and programmes) in the Russian Federation. The lack of detailed (translated) information on these recent developments makes it difficult to understand the full context in which FCCC-related policies and measures could be implemented. The team strongly recommends the inclusion in the second national communication of information on recent acts and programmes such as the energy strategy and the federal energy efficiency programme, which would serve to mitigate GHG emissions even if that was not their primary or sole objective. The inclusion of information on their status of funding, level of implementation and management responsibilities would greatly improve understanding by all Parties of the challenges being confronting by and policy options available to the Russian Government. Also, a clear distinction should be made between planned, approved and implemented measures. The team felt that a higher level of transparency in describing the national circumstances could become an important factor for foreign investment (through activities implemented jointly (AIJ) and through projects of the Global Environment Facility (GEF), the World Bank, the European Bank for Reconstruction and Development (EBRD), etc.) as well as for further bilateral cooperation.

29. The team noted that in the Russian Federation climate change is still perceived mainly as a problem of climatology. The team supports the view that climate change mitigation and adaptation is a matter of sustainable economic development. The team advocates a more proactive role by the Interagency Commission of the Russian Federation on Climate Change (established in 1994) in increasing awareness of GHG issues and opportunities for cost-effective measures consistent with local development objectives among policy- and decision-makers in the Russian Federation, both at the federal and regional levels.

30. During this review, the team noted that several initiatives related to climate change seemed dependent on approval of the special federal programme entitled "Prevention of dangerous climate changes and their negative consequences." It seemed that its approval could greatly improve the Russian Federation's ability to implement Articles 4.1, 4.2 and 12.1 of the Convention. Subsequently, it was confirmed that the programme had been approved on 19 October 1996, although its full funding is not yet guaranteed. The programme's budget has been approved for the 1997-2000 period. The funding request for 1997 has been submitted for consideration by the federal budget commission, has not been confirmed yet. For subsequent years, new funding application should be submitted each year to the state

budget commission. In this context, government bodies could be made more responsive to the Convention's objectives by strengthening the Inter-Agency Commission of the Russian Federation on Climate Change. At the time of this review, the Commission was chaired by the head of Roshydromet^{5/} and composed of 33 ministries and departments as well as leading Russian scientists and experts. It was felt that its role could be enhanced by usefully increasing its involvement in the actual monitoring of climate-related measures. At present, the commission has been generally charged with the coordination of activities under the federal climate programme, with preparing the country's national communication and with organizing its participation in AIJ projects. The involvement of various ministries, agencies and institutions in the preparation of the first communication ensured a high degree of scientific integrity. All materials with statistics and emission projections, including those in the energy sector, were reviewed and presented for approval to the Commission. Roshydromet's scientific programme "Assessment and prediction of climate change and its impact", carried out under the guidance of the Director of the Institute of Global Climate and Ecology (IGCE), involves the preparation of consolidated analytical materials for periodical national reports under the Convention.

II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

31. The review team appreciates the great difficulties faced by the Russian authorities in presenting the GHG inventory for 1990 since in that year the Russian Federation did not exist as an independent state and the existing statistics do not allow for a clear breakdown of emissions among independent states which then formed the Soviet Union.

32. In the Russian Federation's national communication, emission figures were not reported in accordance with Intergovernmental Panel on Climate Change (IPCC) standard data tables, nor was full documentation provided about the methodologies used to determine GHG emission levels from different emission sources. Hence, the transparency and the comparability of the national GHG emission inventory were not sufficient. During the in-depth review, however, government officials provided part of the missing information, substantially improving the transparency of GHG inventories. Some of the original GHG emission figures were revised during the country visit, although they were not submitted as new official GHG emission estimates. An important revision was made to total 1990 nitrous oxide (N₂O) emissions, which amounted in 1990 to 230 Gg instead of the originally reported 820 Gg. In spite of the improvements made, the team wishes to note that, in accordance with the adopted reporting guidelines, future inventories should use IPCC standard data tables.

33. Emissions arising from international bunker fuels were not reported separately from other emission sources, as requested in the approved GHG inventory guidelines. At the time

^{5/} The Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet) has been given responsibility for the coordination of climate change-related activities, including the participation of the Russian Federation in the international climate negotiations.

of this review, statistical problems precluded estimation of bunker fuel emissions. Russian Federation officials expressed their intention to estimate such emission levels for the next national communication.

34. The communication did not include emission figures for hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). The Russian Federation is encouraged to report emission data for these gases in the next national communication, particularly in view of the large production of aluminium and magnesium in the country. Russian officials pointed out to the need for more reliable emission factors regarding these emission sources. As a consequence of the way the Russian statistical system is structured, only aggregated emission levels were provided for precursor gases. The approved GHG inventory guidelines also encourage the submission of information disaggregated by sectors.

35. In general, uncertainty levels associated with GHG inventories were not provided. The Government acknowledges that estimates of methane emissions, particularly from the natural gas industry, are highly uncertain. The review team recognized the great need for better and more detailed documentation on significant GHG emission sources such as this one. The review team strongly recommended that an assessment of uncertainty levels related to the national GHG emissions be provided in the second communication.

36. The review team appreciates the hard work done by the Russian authorities to provide the requested information in a short period of time. In the course of the review visit many improvements were made in relation to the transparency and coverage of the national inventories.

37. During the review, the team was informed that, for several areas of the national GHG inventories, results and estimates were drawn from material prepared under the United States Country Studies Programme on Climate Change launched in 1994.

A. Carbon dioxide

38. In its national communication, the Russian Federation reported that total CO₂ emissions amounted to 2,387,000 Gg in 1990, which represented 11 per cent of the global CO₂ emissions, making the Russian Federation the world's second highest emitter of energy-related CO₂. The 1990 emission level was reviewed in depth and confirmed during the visit. Fuel combustion emissions represented 98 per cent of the total, while the remaining 2 per cent originated in industrial processes, particularly in cement production. Fuel combustion emissions were calculated on the basis of net national energy consumption figures (TPES minus exports) and default IPCC emission factors by type of fuel. No sectoral breakdown of CO₂ emissions from fuel combustion was made available during this review^{6/}. By type of

^{6/} According to an IEA report, "By sector, the largest share in total emissions in 1993 came from electricity generation and CHP (41 per cent). Transport accounted for 12 per cent of CO₂ emissions, industry for 8 per cent, the residential sector for 7.5 per cent and district heating for 5 per cent" (source: *Climate Change*

fuel, natural gas accounted for 36 per cent of total energy-related CO₂ emissions in 1990, followed by coal, 32 per cent and oil, 29 per cent. Total CO₂ emissions (excluding land-use change and forestry) represented 72 per cent of total GHG emissions, using 1994 IPCC global warming potential (GWP) values a for 100-year horizon.

39. In the original inventory submitted with the national communication, only CO₂ emissions from the energy and transformation industries and industrial processes (cement production) categories were disaggregated. Emissions from the transport, industry-ISIC commercial and institutional, residential, and agriculture and forestry sectors were presented in aggregate form. An IPCC summary table was provided during the in-depth review, but without the disaggregation of source categories, as requested in the IPCC GHG inventory reporting guidelines.

40. In the case of the energy sector, only very limited information was available on estimation methods used, sources of data, treatment of feedstocks, heating values, percentage of carbon oxidized and other assumptions made. During the in-depth review, additional information on these aspects was provided (i.e. Russian Federation Climate Change Country Study supported by the United States of America). However, as a result of refinements made the emission totals from this new information source are not exactly the same as those submitted in the communication.

41. CO₂ emissions from industrial processes are not separated from CO₂ from energy production and consumption, except for cement production. This approach is acceptable and has been commonly applied by Parties using a "top-down" estimation method as in the Russian Federation.

42. CO₂ emissions from the incineration and decomposition of waste have not been estimated and were not included in the inventory as suggested in the IPCC guidelines.

B. Methane

43. Methane (CH₄) emissions amounted to 27,000 Gg in 1990, which was reported in the communication as representing 7.2 per cent of global CH₄ emissions. Fugitive fuel emissions, originating particularly in the production, transportation and final use of natural gas as well as in coal mining and oil extraction totalled 19,600 Gg and represented 73 per cent of total methane emissions. Emissions from livestock enteric fermentation and wastes accounted for 18 per cent and solid landfill wastes for 9 per cent. CH₄ represents 20 per cent of the Russian Federation's total GHG emissions, using 1994 IPCC GWP values for a 100-year horizon.

44. Methane emissions from the production, transportation and final use of natural gas were estimated at 16,000 Gg in 1990. This estimate is considered highly unreliable since it is

based upon hypothetical assumptions instead of real measurements. The review team recognizes the technical difficulties in obtaining reliable data on these emissions caused by the extensiveness of the country's territory and the size of its production (and distribution) of natural gas. However, the team strongly recommends that better documentation and disaggregated data be provided, in accordance with IPCC reporting guidelines, for this important GHG emission source.

45. During the in-depth review, Gazprom (the privatized company which produces 95 per cent of the Russian Federation's gas and owns all of its high-pressure transmission lines and associated infrastructure) provided the team with an emissions estimate of 9.2 billion cubic meters of CH₄ or 6,200 Gg in 1990 from the natural gas industry alone. This estimate assumes a loss of 1.34 to 1.4 per cent of the total output of natural gas in the country, which is a considerable underestimate according to the IPCC default emission factors. The Institute of Global Climate and Ecology (IGCE) also provided the review team with some preliminary estimates of CH₄ emissions from the natural gas industry, which were considerably higher. Based on the IPCC guidelines and default emission factors, and taking into account the difference between "apparent" and "real" consumption of natural gas, 1990 emission levels from this source are estimated (by the IGCE) to have been between 11,800 and 32,900 Gg. This could be a more realistic estimate given the fact that pipeline maintenance does not seem to be obligatory and that there has been a reported increase in methane leakages since 1990.

46. The review team was informed that there could have been an increase in losses from the natural gas system in the period 1990-1994. Further detailed or quantified information on this new estimate was not provided.

47. The methane emission estimate of 1,700 Gg from oil production in 1990 seems to be one order of magnitude (or 10 times) higher than it would have been if the IPCC emission methodology had been used. The team remarked that more detailed documentation on these emissions is needed.

48. Methane emissions from coal mining in 1990 have been estimated at 1,900 Gg. Compared with IEA estimates for global methane emissions from the coal industry (CIAB/IEA,1994) this level seems to be relatively low. IEA estimated emissions in the former USSR in 1990 at 4,800 Gg, using recommended IPCC methodology. However, the review team was told that emission figures submitted with the first communication were based on measurements made at every mining site. More background documentation of the methodology used to prepare such estimates is required. This information could be useful for the improvement of IPCC methodologies.

49. Estimates of methane emissions from solid waste disposal in landfills were made according to IPCC inventory guidelines. However, during the review, the Institute of Global Climate and Ecology revised the emission data based on its better understanding of the waste disposal structure in Russia, taking into account for example the fact that a lesser amount of waste is disposed of at sites where anaerobic conditions occur. The new revised emission level, though not an official figure, amounts to 1,800 Gg of CH₄, which is 25 per cent lower

than the value provided in the inventory (2,400 Gg). These figures include only the disposal of urban municipal waste.

50. The first communication did not include methane emissions from waste water treatment. The Institute of Global Climate and Ecology has made some preliminary estimates which show 400 to 500 Gg and 1,500 Gg of CH₄ from municipal and industrial waste water treatment, respectively.

C. Nitrous oxide emissions

51. In the first communication only total nitrous oxide (N₂O) emissions were reported, without a breakdown of emissions by individual emission sources in the energy, agriculture and industrial sectors. The total emission figure was overestimated at 820 Gg in 1990. During the in-depth review this level was substantially revised and updated. The new estimate is 230 Gg in 1990, which is considerably lower than the original one. Additionally, the Russian officials provided disaggregated emission levels for all sources. In most cases, emission factors and activity data used were also provided, allowing for the reconstruction of the N₂O inventory. The review team considered that this update and revision enhanced the quality and the transparency of the GHG inventory.

52. The agricultural sector constitutes the main source of N₂O emissions in Russia with an emission level of roughly 200 Gg in 1990, representing approximately 87 per cent of the total. N₂O emissions from fuel combustion are the second largest source with almost 12 per cent of the total. In this category, emissions from stationary combustion (16.9 Gg) were greater than from transport (9.4 Gg). Industrial processes (i.e. nitric acid production) emitted another 3 Gg in 1990.

D. Precursors

53. Russian Federation's national communication only included emission totals for nitrogen oxides (NO_x), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOC), with virtually no information on the sources of these emissions. More detailed and disaggregated data are necessary on these emission levels, even though during the in-depth review an IPCC summary table was provided, indicating that the main sources of precursors are the energy, industrial processes and waste emission categories.

E. Land use change and forestry

54. The Russian Federation has a very large CO₂ sink capacity in its forests compared to other Annex I Parties, amounting to 587,000 Gg per year. Such a CO₂ uptake is equivalent to roughly 25 per cent of total CO₂ emissions.

55. The team considered the methodology used by the Russian Federation in estimating forest sink capacity to be a result of detailed and rigorous scientific work carried out by the IGCE. During the review, additional background information was provided and estimates

were presented using IPCC standard reporting tables. These improvements to the inventories allowed a distinction to be made between CO₂ emissions (from commercial harvesting) from CO₂ removals. The review team believes that the methodology could be useful for other Parties and suggests that in future communications detailed information be provided using the standard IPCC reporting format for emission sources and sinks.

56. The review team, however, expressed concern at to the fact that all Russian forests seem to be included in the sink estimate, including those forests whose timber is not harvested or which are in a natural state and already mature. Russian officials explained that they included all existing forests in sink estimates since, because of their specific ecosystems and age distribution, forests are still growing and absorbing CO₂. The team noted that differences in the assumptions used to define anthropogenic activities in forest management and lack of consistency in reporting emissions in this category is a problem common to many Parties, and not peculiar to the Russian Federation.

57. The subcategories "forest and grassland conversion" and "abandonment of managed lands" were not included in Russian Federation's inventory. Russian officials consider that these are not significant GHG sources at present. The review team recommended that more in-depth analysis be made to substantiate this assumption. In view of the vast extent of Russian Federation's territory, emissions from these sources could well be very significant.

58. Russian Federation's first communication reported a very large CO₂ sink capacity in Russian peatlands (147,000 Gg/year). The methodology used deviates from the IPCC inventory guidelines since CO₂ sink capacity in peatlands is considered to be essentially non-anthropogenic, hence not included in GHG inventory totals. The team acknowledges the scientific validity of the method used and considers that it could be useful for estimating GHG emissions from peatlands stressed by human activities.

III. POLICIES AND MEASURES

59. The team found that the communication drew heavily in many cases on material previously prepared for other purposes and was therefore often uneven in the treatment of its different sections. Although they are referred to as measures, several elements included in the policies and measures section of the national communication (such as improving energy efficiency and energy market performance) seem to be much more like strategic objectives than specific initiatives or targeted programmes in the implementation stage.

60. The team finds it imminently reasonable that the Russian Federation considers the prevailing economic situation as the basic context for viewing policies and measures, along with the need to take action in line with overall economic and energy policies. The review team feels, however, that it is possible to pursue several "no regrets" options that respond to economic and energy goals as well as climate ones without being inconsistent with the underlying principles cited by the Russian Federation. Indeed, these principles would seem to argue for giving some "no regrets" options high priority in the present Russian Federation.

61. The major restructuring under way in the Russian economy and the resulting substantial drop in GHG emissions since 1990 have eroded any sense of urgency for the implementation of measures specifically designed to reduce or limit the growth of GHG emissions. However, a few measures in the energy sector were described in the communication. Measures were not described in the communication or in documentation provided to the review team in sufficient detail to show how they would work, to determine what their status of implementation might be or to assess in a reliable fashion their specific impacts in terms of climate change mitigation.

62. The majority of measures described are part of Russian Federation's energy strategy that was developed in 1993-1994 and adopted in 1995 by special presidential decree, though it is unclear who remains responsible for their overall implementation in the context of FCCC. Given the little heed paid to the environmental impacts of the energy sector, the strategy would seem to reflect an attitude that GHG mitigation options cannot be given proper attention until the state of the economy improves. On the other hand, in contrast to previous energy programmes in the Soviet Union oriented towards large-scale growth in energy output, the 1995 energy strategy gives priority to increasing efficiency in energy production and consumption and promoting energy conservation. The underlying motivation for these objectives appears to be a general concern about the lack of competitiveness of Russian goods in foreign markets.

63. During the review, the team was given access to additional information on the country's energy strategy, which predicts an improvement in the environmental situation in the energy sector thanks to "ongoing structural changes in the economy, plus some expected fuel switching and an expected increase in energy efficiency in the industry, services and energy transformation sectors". The strategy acknowledges that its objectives may only be achieved through a gradual move towards a more competitive energy market in which the state would create a system of incentives for energy conservation and higher efficiency in energy production and use, deregulate exports and imports of energy equipment and promote private and foreign investment in Russian energy companies.

64. The team felt that coordination among the relevant ministries could be improved with the objective of better describing existing sectoral policy options -- primarily in regard to the "fuel and energy complex" -- which would ultimately impact (positive by or negatively) on the country's GHG emission profile. The national communication does not describe in any detail the status of implementation of any policies or measures contained in the energy strategy. It highlights the sizeable potential for energy savings in the country -- estimated to be as high as 45 per cent of current energy consumption -- but does not address the question of how and whether this potential will be fully realized.

65. The national communication does not develop in any detail specific opportunities for implementing "no regrets" measures. It emphasizes energy efficiency and structural reform as the most important areas for action, but does not spell out actual measures to attain this, even though the review team learned that a number of policies and programmes are currently planned or already in place and could have been usefully cited in this context.

66. The review team strongly recommends that a more systematic effort be made under the Inter-Agency Climate Commission to survey all relevant actions under way in the Russian Federation which may, even indirectly, mitigate GHG emissions. The programmes identified in such a survey should be analysed in a comparable manner to determine their greenhouse gas mitigation potential and to see what additional actions might be appropriate. Such an approach could prove highly rewarding in view of the rapidly changing character of the Russian economy and the expectation of a sound economic recovery in the first decade of the next century, which is likely to increase GHG emissions. The adoption and adequate funding of the new federal climate programme would appear to be a critical step in ensuring that such a survey and analysis is prepared.

67. It appears to be urgent to put in place an effective federal climate programme which has sufficient scope and authority to mobilize and report upon activities by all relevant contributors at the federal, regional and local levels, including outside experts and non-governmental organizations.

68. In the absence of the administrative and budgetary framework which the proposed federal climate programme is intended to provide, there does not appear to be a detailed, systematic activity to build upon the first national communication and add new analysis directed towards identifying mitigation options in all key GHG emission sources, as called for in the reporting guidelines adopted by the Conference of the Parties.

69. The Russian Federation, through its Federal Forest Service, has a long tradition of forest management and monitoring. Each year (since the 1970's), the Service has carried out major forest management measures each year which, through the planting of new seedlings and protection of old ones in existing forests, have covered roughly 1.5 million ha per year. A very substantial potential for the enhancement of CO₂ sinks has been identified in the Russian Federation. Several potential new afforestation measures were described during the review, although most seemed to be still at the planning stage. Two new afforestation projects in the Saratov and Vologda *oblast* regions seem to be under way to reclaim abandoned agricultural lands. Although only scattered information was available during the review, both projects seem to have attracted external funding as pilot "activities implemented jointly" projects. At the time of this review, actual tree planting has reportedly started in the Saratov project.

70. Finally, the national communication does not describe any mitigation measures targeting CH₄ and N₂O emissions. Given Russian Federation's relatively high level of CH₄ emissions originating from leakages in the natural gas distribution system, gas venting and flaring and from coal- mining activities, the team highly recommends that information be provided on current activities and/or plans in this regard, such as Gazprom's project to identify ways to reduce emissions both at the gas production and the final gas consumption stages. It would seem that the biggest challenge to the gas industry lies in the refurbishment of the trunk line system, including both pipelines and compressor stations. Action in this regard would necessarily have a mitigation effect and should, if taken, be reported in future communications.

IV. PROJECTIONS AND EFFECTS OF POLICIES AND MEASURES

71. The projection section presents three different scenarios for CO₂ emissions in 2000 and 2010 based on different expectations for GDP and total energy consumption in those years. The projection scenarios account for energy-related (fuel combustion) CO₂ emissions only and derive directly from projections made for key macroeconomic variables as part of the energy strategy. Such projections do not incorporate the effects of any yet to be implemented mitigation measures, but do incorporate energy efficiency measures not described in the communication and assume that total energy consumption will increase by 0.8 to 0.9 per cent annually until 2000.

72. Projections were made using an input-output model, without the use of modelling for the energy sector, and assuming fixed shares for different economic sectors based on past experience. A "realistic" combination of these scenarios was then prepared in order to determine total energy requirements in Russian Federation's economy in 1995, 2000 and 2010. Such requirements specified future per capita energy consumption levels, including the expected consumption of heating energy and motor fuel. Based on the existing characteristics of the Russian energy market and incorporating technical and economic changes foreseen in the energy strategy -- including the expected increase in the share of natural gas in TPES -- the required total demand for fossil fuels (i.e. solid fuel, oil and natural gas) was calculated for 1995, 2000 and 2005. By using standard (1994) IPCC emission factors for these fossil fuels, energy-related CO₂ emissions were projected for these three years.

73. The national communication projected energy-related CO₂ emission levels for 1995, 2000 and 2010 which were, respectively, 18, 13 and 4 per cent lower than the 1990 levels. During the review, the team was presented with a revision of the original projections which takes into account scenarios based on the energy strategy, as well as recent developments in the energy sector. Based on these new estimates, energy-related CO₂ emissions in 1995 were 26 per cent lower than in 1990 and are expected to be roughly at the same level below 1990 levels in 2000. By 2010, these emissions are very preliminarily expected to be between 20 and 10 per cent lower than in 1990, assuming an annual GDP growth rate of 1 to 2 per cent in the 2000-2010 period.

74. Very little official information (other than that contained in the communication) was made available to elucidate how and whether the Russian Federation's fuel and energy complex is projected to change or how individual economic sectors are performing or might perform until 2000. During the review, additional information was made available from unofficial academic sources^{7/}, as well as from the OECD and the IEA, which threw light on recent and expected developments in the Russian economy, particularly on its energy sector. Scant information is available on GHG emission trends in sectors other than the "fuel and

^{7/} The review team is particularly grateful to Mr. A.A Makarov and his staff at the Energy Research Institute of the Russian Academy of Sciences.

energy complex". The team requests that a full description be provided of how projections were made and strongly suggests that non-energy CO₂ emission projections be included in the next communication.

75. Projections for CH₄ and N₂O were not provided during this review. Only partial projections for CH₄ fugitive emissions were made available to the team during the country visit. Given the relative importance of these sizeable emissions in the Russian Federation, the team strongly recommends that preliminary estimates of CH₄ and N₂O emission trends be duly included in future communications in accordance with the agreed reporting guidelines, which require the submission of projections for 2000. During the country visit the team was presented with unofficial estimates which seem well based on sectoral analysis. It felt that drawing upon these additional analyses could greatly improve the emission scenarios covering all GHGs. During the visit, new estimates of an increased sink capacity in 2020 was provided by IGCE.

V. PROJECTED PROGRESS IN GREENHOUSE GAS MITIGATION

76. No official GHG inventories for years other than 1990 were provided during this review, making it difficult to assess GHG emission trends. The team strongly recommends that an attempt be made to fulfill Annex I Party commitments -- as agreed on in decision 3/CP.1 of the Conference of the Parties -- to submit new GHG inventories for recent years, following the standard IPCC reporting guidelines and the sectoral breakdown adopted by other Annex I Parties. Given the dynamism and size of the Russian economy and the expectations of an economic recovery by the end of the century, it will be very important to closely monitor GHG emission trends in the country and assess possible energy efficiency gains in different economic sectors.

VI. EXPECTED IMPACTS OF CLIMATE CHANGE AND ADAPTATION

77. The Russian Federation has carried out commendable work in assessing the potential impacts of climate change on its economy and ecology. During the review, the team had the opportunity to appreciate the high-quality work carried out by the Institute of Global Climate and Ecology. The long and established scientific tradition in the fields of meteorology and weather monitoring and forecasting, a legacy from the times of the former Soviet Union, plays a role in this.

78. Results of several studies were well described in the national communication. The potential impacts of climate change in the Russian Federation include: (a) a substantial shift to the north of the permafrost zone, which currently occupies 58 per cent of the national territory; (b) a sea-level rise, particularly in the Caspian Sea, which allegedly has already flooded coastal arable lands and caused significant economic losses; (c) important changes in precipitation levels and amounts of soil moisture, with both negative and positive

consequences, such as an increase in crop productivity in some areas and desertification in the south; and (d) depletion of freshwater resources.

79. Lack of funds appears to be a major obstacle to the Russian Federation's continued work on the assessment of the impacts of climate change and consideration of options for adaptation measures. According to statements made to the team during the review, the availability of such funds is tied to the approval of the aforementioned federal programme entitled "Prevention of dangerous climate changes and their negative consequences." The review team recognized the importance of this programme, even though a detailed description of its content was not provided.

80. During the review, government officials remarked that climatic changes due to increased concentrations of GHGs in the atmosphere may have both negative and positive consequences for the Russian economy, ecology and population. New findings also indicate that climate change will probably affect the Russian Federation's freshwater resources.

VIII. FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER

81. As a country with an economy in transition, the Russian Federation is not an Annex II Party to the Convention, although it is a member of the restructured Global Environment Facility since 1994. No flows of official development assistance from the Russian Federation to other countries have been reported, although a considerable amount of technical knowledge is still shared with other countries of the Commonwealth of Independent States.

82. Virtually no information was provided on technology transfer from OECD countries to the Russian Federation, although it is known that the level of international cooperation for nuclear plant safety in Russia was down 20 per cent in 1996. Over the past five years, the Russia Federation has received about US\$ 500,000 a year to make safety improvements in its nine nuclear plants, which account for roughly 13 per cent of the country's electricity production.

Activities implemented jointly

83. The Russian Federation follows with great interest the current pilot phase of activities implemented jointly (AIJ). It considers AIJ to be fully consistent with the objective of the Convention. At the time of the review, 6 AIJ projects had been approved by the Inter-Agency Commission on Climate Change. The Russian Federation advocates larger and more numerous AIJ projects. While recognizing the important role played by the Commission in organizing the participation of the Russian Federation in AIJ projects, the review team felt that the Commission could play a more proactive role in promoting AIJ among potential users in the business and public sectors.

84. In the view of the Russian Federation, any bilateral or multilateral project involving Parties to the Convention and contributing to the Convention's ultimate objective will

undoubtedly be of great value. It is felt that carrying out AIJ under the Convention will lead to an optimal utilization of resources, minimizing the financial, economic and political costs of implementing of the Convention. In this context, the Russian Federation seems ready to discuss any proposals regarding AIJ projects. It stresses, however, that mutual consent of all the participants in this process is a precondition.

IX. RESEARCH, MONITORING AND SYSTEMATIC OBSERVATION

85. Through the years, the scientific community in the Russian Federation and formerly in the Soviet Union have made invaluable contributions to research on climate change causes and impacts, including early active participation in the IPCC activities. High calibre research on, for example, climate change impacts on terrestrial ecosystems are being carried out by such world standard institutions as the Institute of Global Climate and Ecology. A series of research activities related to climate change and its impacts were described during the review. Some of the research findings were described in the communication.

86. Another area in which the Russian Federation has in the past made important contributions is systematic climate observation. Given its vast territory and experience of pure scientific work on climate change, it is important that the Russian Federation should remain a participant in international scientific efforts to improve knowledge of the world climate. However, further monitoring and observation of climate change by Roshydromet may be impeded by serious budgetary constraints currently being imposed.

87. Relatively low priority is given in the federal research budget to environmental research and development. However, a number of federal scientific and technical programmes which are expected to contribute to the implementation of Russia's commitments under the Convention are currently under way. They focus on issues such as energy and resource conservation, technological development, improved transport systems and renewable energy sources.

X. EDUCATION, TRAINING AND PUBLIC AWARENESS

88. Despite the fact that climate change and environmental issues do not appear to be matters of priority to the general public in the Russian Federation, the implementation of policies and measures could be greatly enhanced by better public awareness of their environmental and economic benefits. In addition to the emphasis given in the national communication to university curricula on meteorology and climatology, the team strongly suggests that the launching of a public campaign be considered, particularly in conjunction with future mitigation and energy savings measures. The review team felt that future cooperation of the Inter-Agency Commission on Climate Change with national non-governmental organizations and the mass media could play an important role in supporting energy efficiency policies as well as future climate change measures.
