

EXECUTIVE BODY FOR THE CONVENTION ON
LONG-RANGE TRANSBOUNDARY AIR POLLUTION

THE 2000 REVIEW ON STRATEGIES AND POLICIES
FOR AIR POLLUTION ABATEMENT

RESEARCH AND MONITORING
REPLIES TO QUESTIONS 61 - 62 OF THE 2000 QUESTIONNAIRE

Prepared by the secretariat from submissions by the Parties

Introduction

1. This document is the basis for part of the 2000 Review of Policies and Strategies requested by the Executive Body at its seventeenth session in December 1999. It provides the answers as received from Parties in response to the questionnaire circulated in January 2000. It is in English only, non-English submissions were passed to the UN translation services, and are incorporated as translated. Answers have been reformatted for the document but have been subjected to minimal editing. Indication is given where responses have been altered, e.g. moved where an answer appears to be for a different question.

2. The document is intended as a reference for the summary to be found in the 2000 Review of Strategies and Policies (EB.AIR/2000/1/Add.3) and will be provided to the Executive Body, the Implementation Committee and will be made available through the Executive Body document Web site. The document is one section of the questionnaire.

3. This section summarizes the answers received to questions 61 to 62 of the questionnaire. The questions in this section are of a general nature and optional. Their purpose is to provide further information that will enable the secretariat to analyse the current situation regarding air pollution abatement in the region, and provide information that the Executive Body would like the Parties to the Convention to share to identify air pollution abatement. Parties may wish to recall that under article 4 of the Convention they have committed to exchanging information on their policies aimed at abating air pollution.

4. **Q.61 Parties are invited to provide information on research and monitoring activities undertaken pursuant to article 6 of the Nitrogen Oxides Protocol.**

5. **Austria.** Monitoring of ambient air concentrations of nitrogen oxides is performed at about 150 monitoring stations in Austria, three of them part of the EMEP network. Research projects also dealt with e.g. improvement of data on Critical Loads, improvement of the spatial resolution of emission data, deposition of nitrogen compounds, integrated monitoring of air pollution effects on ecosystems (within the relevant CLRTAP network), dispersion and receptor modeling of air pollutants.

6. **Belgium.** Nitrogen oxides are subject to annual emissions inventories conducted by the Corinair method and to air quality monitoring procedures. Particular attention is given to nitrogen oxides in modelling for the purposes of tropospheric ozone monitoring. Technical and economic

studies of emissions inventories, medium-term forecasts and appropriate reduction measures have been conducted at both regional and federal levels in order to improve the inventories and to identify appropriate reduction policies and measures.

7. **Wallon region.** The mapping of excess loads of acidifying pollutants has been carried out for forests, surface water and materials, following the methodology set forth under the LRTAP Convention. The effects of acidification are being studied in Wallon forests.

8. **Bulgaria.** The National air quality control network comprises of 99 monitoring and control stations spread around 14 regions, where emission levels exceed the limit. 83 of them are manually operated and 16 are automatic.

9. **Canada.** Canada carries out some research on the nitrogen cycle at integrated monitoring sites. The overall goal is to determine the physical, chemical and biological factors controlling the magnitude of key nitrogen pools, processes and fluxes that influence water acidification, and develop, test and implement predictive models. There are, however, significant gaps in the current program and we are undertaking an examination of costs and funding options for a fuller program.

10. **Czech Republic.** Every year, the Ministry of the Environment of the Czech Republic announces projects in the Program of Care for the Environment and projects in the ME Program of Research and Development. Top-priority projects following from the individual Protocols to CLRTAP are also carried out in the framework of these programs. Financial means for work on these programs are partly or completely paid out of the state budget. The priorities of research and development in the area of transportation include:

- (a) The development of mobile means of transportation with environmentally sound parameters;
- (b) decreasing pollutant emissions;
- (c) development and application of alternative automotive fuels.

11. The national emission monitoring system of air pollutants is ensured by The Register of Emissions and Air Pollution Sources (REZZO) operated by the Czech Hydrometeorological Institute (CHMI). Register serve for archiving and presenting data on stationary and mobile sources (emissions and additional information on boilers, fuels and technologies), and for national emission inventory. REZZO system is in operation from 1980, and the database is updated yearly for large and medium-sized sources in cooperation with Czech Environmental Inspection Office, and relevant district authorities' environmental departments. In present time contains REZZO individual data on about 2300 large emission sources (combustion sources > 5MW_{th} output and selected technologies) and 30 thous. medium-sized pollution sources (22 thous. fuel burning sources 0,2 - 5 MW_{th} and 8 thous. technological sources).

12. **Germany.** Research and Development: In the second half of the 1990s, the Federal Government provided annual support worth DM 130 million for about 90 projects per year in the field of air quality control. Concerning technical development projects, also see Q.25 and Q.57. Main fields of research were:

- (a) use of renewable energies, use of waste heat in industrial installations;
- (b) reduction of NO_x and VOC emissions with a view to the formation of ground-level ozone;

(c) monitoring of air pollution and changes to the atmosphere.

13. There are three major fields of monitoring:

(a) Emissions: all plants subject to permitting (major sources) have to monitor emissions including SO₂, NO_x, VOC and make the data available to the responsible authorities;

(b) Air quality in densely populated areas: communities and Länder operate measuring networks at local level, comprising some 500 stations;

(c) Air quality in rural areas and long-range and transboundary air pollution: the Federal Environmental Agency (UBA) operates a measuring network in the framework of EMEP with 8 stations and 14 containers in order to monitor background concentrations of air pollution and Air pollution in forests.

NO₂, NH₃, NH₄⁺ and NO₃ are at present measured at 5 UBA stations according to EMEP methods.

14. **Greece.** The annual inventory of NO_x emissions uses the Corinair.

15. **Hungary.** Nitrogen oxides in the ambient air are measured continuously at each urban and background monitoring station. Critical loads and levels have been studied with the coordination of the NFC.

16. **Italy.** Italy developed research and monitoring programmes in order to participate to the international efforts to determine an effects based approach to reduce nitrogen oxide emissions, contributing to activities which led to the protocol to abate acidification, eutrophication and ground level ozone.

17. **Latvia.** The legal basis of the environmental monitoring state system in Latvia forms the Concept of Environmental Monitoring which was approved by Cabinet of Ministers on February 1997. The environmental monitoring is implementation of systematic observations in different environments of the nature to state and assess the changes that are caused by nature processes or anthropogenies impacts. It defines four closely linked blocks:

(a) Monitoring of the state of the environment;

(b) emission monitoring;

(c) early warning monitoring;

(d) environmental policy implementation monitoring.

The monitoring system consists of the state environmental monitoring, consolidated under the Ministry of Environmental Protection and Regional Development and financed by special state monitoring budget, and monitoring carried out by municipalities, research institutions, other ministries and financed from other sources. The coordination and information exchange will be reached through the Interministerial Environment Monitoring Council as it is stated in the concept. Such Council was established on March 1997.

18. "Regulations on Air Quality" were adopted by the Cabinet of Ministers on 15 June 1999. Ambient air quality standards (related to health effects and related to ecological effects) for sulphur dioxide, nitrogen oxides, ozone, particulates and lead, methodology for measurement and monitoring, assessment levels for releases in air (maximum permissible single concentration determined within 20 minutes time and maximum permissible concentration within a day-night=s time) related to health effects for 377 chemical substances and compositions, and information

indicators for public information are included in the regulations. "Regulations on Air Quality" are prepared in accordance with provisions of EU Directives: 96/62/EC; 80/779/EEC; 82/884/EEC; 85/203/EEC; 92/72/EEC; 97/0266 (SYN).

19. **Monaco.** The urban air monitoring network systematically records Nitrogen Oxides emissions (unofficial translation).
20. **Netherlands.** Please refer to Q8.
21. **Poland.** Within the framework of the State Environmental Monitoring System a sub-system has been established to monitor the chemical properties of atmospheric precipitation and deposition. Data on oxidised and reduced forms of nitrogen, gained from this monitoring, serve as an experimental background for a number of regularly carried out research surveys on the health and ecological aspects of deposition of selected groups of air pollutants, including nitrogen compounds.
22. **Republic of Moldova.** The Republic of Moldova is not Party of the Protocol concerning Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes. At the same time monitoring and laboratory control of air pollution with Nitrogen Oxides is undertaken for many years in our country. In conformity with information presented by Hydrometeorological Service monitoring is effectuated in 5 industrial cities at 16 stationary posts (solid substances, nitrogen oxides, sulphur oxides, carbon oxides, phenol, formaldehyde). Also, The Republic of Moldova has one post for monitoring of transboundary air pollution. At the same time the difficult economic situation in which we have been put now only selection of samples of atmospheric precipitation with their further analysis in laboratories for monitoring of atmospheric pollution of Hydrometeorological Service is made. Presently the Ministry of Environment and Territorial Development studies all the possibilities to enhance the level of quality of monitoring activities. Also, presently the following documents are under development in our country:
 - (a) Draft of the New Concept of Environmental Policy of the Republic of Moldova and one of the points of this concept will be the main directions of resolving problems on research and monitoring;
 - (b) Draft of Programme of Integrated Monitoring of Quality of the Environment;
 - (c) Project proposals "Consolidating the institutional bodies in calculating Critical Loads of pollutants and further mapping by the EMEP grid for different ecosystems";
 - (d) Project proposals "Consolidating the institutional bodies in elaboration and implementation of the system PRTR";
 - (e) National Strategy on Sustainable Development "Moldova 21";
 - (f) First National Communication in the framework of UNDP project "Enabling Moldova to prepare its first National Communication in response to its commitments to the UN FCCC".
23. **Slovakia.** There are 23 monitoring stations for local air quality monitoring. All of them measure SO_x and NO_x concentrations and solid particulates. 12 monitor O₃ and 7 measures CO. Emissions are monitors by large sources themselves according to the Regulation of MoE Nr. 41/1997 on determination of amounts of polluting substances and data on meeting specified limits of pollution. There are 4 regional monitoring stations, included to EMEP.

24. **Switzerland.** Systematic monitoring of air pollution started in Switzerland in the mid-sixties. Since 1991, the National Air Pollution Monitoring Network (NABEL) comprises 16 monitoring stations located in different parts of Switzerland. The network was established with the aim of recording pollution levels at different characteristic sites of the country. Moreover, it serves to assess the long-term efficiency of air pollution control measures. Beside this national network, about 100 monitoring stations are now operated in Switzerland by various institutions, for example cantonal authorities, cities and research institutes. Air pollutants that are measured on a continuous basis include sulfur dioxide (SO₂), nitrogen monoxide (NO), nitrogen dioxide (NO₂), carbon monoxide (CO), ozone (O₃), total suspended particulates (TSP) and fine particulate matter (PM10), dust deposition, lead and cadmium in TSP (new in PM10), lead, cadmium, zinc and thallium in dust deposition.

Heavy metals were also assessed by biomonitoring in mosses. VOCs are usually not measured on a continuous basis, but results from short-term measurement campaigns and research programmes are available.

10 years evolution of air pollution in Switzerland as measured in NABEL network	Reductions between 1988 and 1997 (order of magnitude)
NM VOC	50%
Nitrogen oxides (NO and NO ₂)	33%
Nitrogen dioxide (NO ₂)	25%

25. Research into air pollution effects and assessment of critical loads and levels: High priority was given from 1991 to 1993 to mapping critical loads of acidity for forest soils and alpine lakes at a high spatial resolution of 1 x 1 km². The critical loads of acidity have been calculated with the steady state mass balance approach (SMB) adapted to alpine areas with high precipitation amounts. In 1992 work was started to apply more complex steady state multi-layer soil models for assessing critical loads of acidity for forest soils. Results of this work are now published. The applied multi-layer soil model PROFILE generally predicts lower critical loads than the SMB. Thus SMB-results have to be considered as conservative estimates with respect to their use for the development of effect-oriented emission reduction scenarios in Europe.

26. The dynamic perspective of acidification was evaluated for 622 forest sites in Switzerland for the time period 1850 - 2050. The objective was to clarify, how the chemical status of forest soils has changed in the past due to acid deposition and if and when it will improve, given the current air pollutant emission reduction plans in Europe. The results indicate an improvement in the chemical condition of upper forest soil layers and a halt of acidification of the lower soil layers during the first half of the next century. However, persisting violation of critical chemical parameter values in the soil solution at many sites towards the end of the simulation period in 2050 points to the fact that recovery is for some critical parameters very slow and that far-reaching reductions of acidifying deposition are needed to improve the status of the ecosystems.

27. Critical loads for nitrogen have been calculated and mapped by applying the mass balance approach for forests and the empirical approach for (semi-)natural ecosystems. Overall both types of receptors show similar sensitivities to nitrogen and the exceedances of critical loads range from zero to more than 40 kg N/ha.yr.

28. Critical levels for ozone and their exceedances have been mapped for agricultural crops and for forests. In addition, the population exposure with respect to exceedances of WHO Air Quality Guidelines has been assessed.

29. **Turkey.** (given as an answer to question 61 but appears to be answer to question 63) Voluntary agreements were first introduced in 1993 for the prevention of pollution caused by cement industry emissions of which directly result in particulate matter pollution. An Environment Declaration, which dictates the achievement of lower emission limits than those stipulated in the Regulation, was signed between the Ministry of Environment and Cement Producers' Association. Negotiations with the iron and steel producers on a similar declaration are still being carried out.

30. In order to minimize air pollution of motor vehicles the Ministry of Environment and Turkish Automotive Industry have been working together. In this frame, the production of cars equipped with catalytic converters was started at the beginning of 1995 within the framework of a voluntary agreement, which was signed between the Ministry of Environment and the Turkish Automotive Manufacturers Association. This voluntary agreement covered an adaptation programme as well. According to the adaptation programme, which was based on EURO 93, catalytic converters were first installed in new cars with a 1800 cc engine capacity in 1995. Cars with lower engine capacities (below 1800 cc) followed, and the programme was completed at the end of 1999. In Turkey all imported and domestically produced cars have been produced with catalytic converter since 01 January 2000.

31. **United Kingdom.** The Government sponsors various research projects monitoring levels of nitrogen in the air and in waters. It also has projects intended to elucidate the fluxes of oxidised and reduced nitrogen between the various environmental media and vegetation. Models have been developed to describe and predict the movement of nitrogen and its likely environmental impacts. The Natural Environment Research Council has also chosen nitrogen as a priority area for basic research. Its GANE programme is intended to provide better explanations for and characterisations of the nitrogen cycle.

32. **United States.** Activities related to article 6 of the Nitrogen Oxides Protocol and article 5 of the VOC Protocol can be divided into monitoring, emissions, modelling, assessment, and research. Each of these topics is discussed in separate paragraphs.

33. The U.S. operates eight national networks for monitoring air pollution related to nitrogen oxides and VOC emissions, including ozone, fine particles, and dry and wet deposition. These networks consist of approximately 5000 sites nationwide, operated by Federal, State, and local government agencies [see <http://www.nnic.noaa.gov/CENR/aqmonit.pdf> and <http://www.epa.gov/ttn/amtic/>]. In addition, State and local governments operate their own air pollution monitoring networks. These ongoing monitoring efforts are supplemented by ad-hoc intensive field studies often involving cooperative efforts of government and industry scientists. [<http://www.epa.gov/airsdata/monitors.htm> and <http://www.epa.gov/ttn/airs/>]

34. The EPA has an ongoing programme to update emissions testing methods, emission factors, and emissions estimation guidance based on the best available data [see

<http://www.epa.gov/ttn/chief/> and <http://www.epa.gov/ttn/emc>]. In addition, the EPA works with State and local air quality agencies to improve emission inventory activities through the Emission Inventory Improvement Project [see <http://www.epa.gov/ttnchie1/eiip/>].

35. Models for predicting the fate of air pollutants are developed under a number of different programmes within the U.S. The EPA maintains a clearinghouse of models that have been approved for specific applications [see <http://www.epa.gov/ttn/scram/>]. Under EPA's Models-3 development programme, EPA has developed the Community Multi-scale Air Quality model, a state-of-the-science model that is capable of addressing transboundary flows of air pollutants. The model is currently undergoing evaluation for use in predicting ozone formation, but will also be capable of predicting acid deposition and nitrogen deposition, as well as fine particle formation and mercury transport.

36. The impact of nitrogen oxide controls has been assessed through a variety of studies, including the Regulatory Impact Analysis for the NO_x SIP Call [see <http://www.epa.gov/ttn/rto/>], biennial assessments of the National Acid Precipitation Assessment Program [<http://www.oar.noaa.gov/NAPAP/>], and analyses conducted under the 1990 US-Canada Air Quality Agreement [<http://www.epa.gov/ardpublic/acidrain/lawsregs/uscanada.html>].

37. There are a number of efforts to coordinate research planning within the U.S. and across North America. The National Science and Technology Council's Committee on Environment and Natural Resources Air Quality Research Subcommittee coordinates the research efforts of Federal government agencies [see <http://www.nnic.noaa.gov/CENR/>]. Coordination also occurs as part of NARSTO, a trilateral public-private partnership that coordinates research activities on tropospheric pollutants in the U.S., Canada, and Mexico [see <http://www.cgenv.com/Narsto/>].

38. Q.62 Parties are invited to provide information on research and monitoring activities undertaken pursuant to article 5 of the VOC Protocol.

39. **Austria.** Monitoring of ambient air concentrations of ozone is performed at more than 100 monitoring stations in Austria, three of them part of the EMEP network. Research projects also dealt with e.g. development of a transport and photochemical model for ozone in eastern Austria, improvement of the spatial resolution of emission data, NO_x emissions from agricultural soils, VOC emissions from natural sources, ozone transport phenomena in the alps, development of bioindicator methods for ozone, environmental effects of ozone (human health, forests, alpine ecosystems, improvement of data on Critical Levels).

40. **Belgium.** NMVOCs and CH₄ are subject to annual emissions inventories using the CORINAIR method and to air quality monitoring procedures. On the basis of these data, an interregional coordination unit has been entrusted with monitoring the formation of ozone in Belgium, conducting research into this issue, applying an ozone level prediction model and disseminating information on the predicted levels and cases where emissions standards have been exceeded. The impact of ozone on human health has been studied and maps are being prepared showing where health protection standards have been exceeded and fragile ecosystem areas, based on the critical level approach.

41. Technical and economic studies of emissions inventories, medium-term projections and appropriate reduction measures have been conducted at both regional and federal levels in order to improve the inventories and to identify appropriate reduction policies and measures.
42. Where methane emissions are concerned, more and more waste dumps are being fitted with flares. Agricultural emissions are being addressed through reduction measures under regional plans. Belgium is required to reduce its emissions of the six greenhouse gases, one of which is methane, by 7.5% by the period 2008-2012.
43. **Canada.** Canada conducts monitoring of ambient VOC from a national network which includes urban and rural monitoring sites. The program of systematic year-round measurements began in 1989 at the urban sites and the rural sites were added in 1993. The measurement program concentrates on the 50 to 150 most abundant C₂ to C₁₂ hydrocarbons consisting of the general formula C_xH_y and on the C₂ to C₆ carbonyls. The systematic measurements are complemented with data from occasional, short term, specialised field studies. Data are made public via regular reports and publications.
44. **Czech Republic.** See Q.61
45. **Germany.** For research and monitoring in general see Q.61. VOC concentrations are measured at 5 UBA stations and carbonyl is measured at 1 UBA station, both in cooperation with NILU. O₃ is measured at 22 UBA stations.
46. **Greece.** The annual inventory of NO_x emissions uses the Corinair methodology.
47. **Italy.** Italy developed research and monitoring programmes in order to participate to the international efforts to identify ozone standards to protect human health and the environment and to reduce VOC emissions by means of an effects based approach, contributing to the activities which led to the protocol to abate acidification, eutrophication and ground level ozone.
48. **Latvia.** See answer to question 61
49. **Netherlands.** Presently a study on the effects of ozone are being performed at the National Environmental Research Institute (RIVM). Also during the evaluation of the acidification theme an extensive literature search have been performed on research and monitoring of VOC.
50. **Poland.** Within the State Environmental Monitoring System and the EMEP monitoring network a regular monitoring of VOC imissions (ambient air pollution concentrations) are executed. Under officially promoted research programs the emission inventory procedures as well as the emission projections resulting from future macroeconomic factors are developed. Another group of research surveys aims at the identification and quantification of VOC emission effects to human health and the environment.
51. Additional information on monitoring related to all protocols. There are two monitoring systems of air pollution in Poland: the Inspectorate for Environmental Protection network (consisting of over 90 basic monitoring stations, including 4 EMEP stations) and the Sanitary Inspectorate network (consisting of over 450 measurement sites).

52. The Institute of Environmental Protection, on behalf of the Inspectorate for Environmental Protection, supervises the operation of the basic national system of air pollution monitoring stations, which was developed in 1991 by the Chief Inspector for Environmental Protection. Within the system measurements of SO₂, NO₂, dust, ozone and CO concentrations are carried out. Three stations are responsible for road traffic emission measurements. The Institute operates the central data base for the basic air pollution monitoring system collecting measurement results from all over Poland. All stations are supervised by the Inspectorate for Environmental Protection, the Sanitary Inspectorate and selected scientific research units. Reports on air pollution are published within the Environmental Monitoring Series by the Inspectorate for Environmental Protection.

53. The Institute also conducts activities and is responsible for emission balances preparing emission inventories of SO₂, NO₂, CO, CO₂, CH₄, NH₃, particulates, POPs, and in co-operation with the Institute for Ecology of Industrial Areas – VOCs and heavy metals. The results are provided by Poland in conformity with the 11 activity categories of the CORINAIR programme of the European Environmental Protection Agency and EMEP. Inventory reports on a national and regional level are included in annual publications of the Main Statistical Office. They are also submitted to EMEP fulfilling the Polish obligation within the Convention on Long-range Transboundary Air Pollution.

54. **Republic of Moldova.** The Republic of Moldova is not Party of the Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes. Unfortunately, monitoring of VOC air pollution isn't undertaken in our country. At the same time presently the Ministry of Environment and Territorial Development studies all the possibilities to enhance the level of quality of monitoring activities. We've signed already the 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone in conformity with art.14 of the mentioned protocol. We included in this Protocol our obligations regarding emission ceilings on VOC for 2010. The next step after the signing of the mentioned Gothenburg Protocol will be the effectuation of necessary procedures in order to ratify it and the elaboration of National Programme of Activities regarding its implementation in the framework of our obligations, including the achievement of research and monitoring on VOC. Also, the Ministry of Environment and Territorial Development of our country developed a draft of the New Concept of Environmental Policy of the Republic of Moldova and one of the points of this concept will be the main directions of resolving problems on research and monitoring. The following documents, which are under development, are in Q.61.

55. **Slovakia.** See answer to question 61

56. **Switzerland.** See Q.61 for monitoring activity of VOCs.

57. **Turkey.** (given as an answer to question 62 but appears to be an answer to question 64): Turkey has bilateral agreements with the Turkish Republic of Northern Cyprus¹, Hungary,

¹ Quotation of the reply submitted by Turkey does not constitute any official recognition by the United Nations of this part of Cyprus as a separate entity. Security Council resolution 541 (1983) and 550 (1984) formulate the policy of the United Nations.

Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. In order to prevent acid rains and to protect atmosphere from transboundary air pollution, common purpose of these agreements are enhancing, further cooperation, ensuring the highest level of protection from the potentially damaging effects, exchanging technology and experience, formulating a mechanism to continue a dialogue and organising education programmes for experts ,etc.

58. Furthermore, The Atmospheric Monitoring Project conducted within the Framework of the MED POL, Phase II, National Monitoring Programme. In May 1988, despite a limited data base existing for the region, with the realization of importance of atmospheric pollution transport on marine ecosystems especially for the semi-closed seas, airborne pollution studies were initiated within the framework of national MED POL monitoring programme with the coordination of the World Meteorological Organization (WMO). Within the MED POL national monitoring programme, the airborne pollution studies have been initiated at the beginning of 1992 in the south of Turkey. The samples collected from a monitoring site located at the Mediterranean coastal site near Antalya were analysed for the range of inorganic species. The main objective of the work has been summarized as to determine the levels of atmospheric concentration of aerosols and concentrations of pollutants in rainwater in the eastern Mediterranean, to measure the acidity and study factors affecting the acidity of rainwater in the eastern Mediterranean region, to study long-range transport of pollutants to the eastern Mediterranean region, to characterize the Saharan dust component of the Mediterranean aerosols, assessment of airborne pollution load of the Mediterranean sea and to estimate fluxes of the metals in the bio available form. This project has been carried out since 1995.

59. **United Kingdom.** The UK has an extensive hydrocarbon monitoring network, providing real-time monitoring of 26 compounds at 13 locations. This, together with 71 monitoring stations for ozone and the development of sophisticated models for ozone transport and formation, is enabling the UK to better understand the occurrence of ozone in the UK. The UK takes particular pride in the continuing research designed to describe the chemistry leading to the formation and removal of ozone, and its incorporation into models. Model development is now most apparent in accounting for ozone transport across transcontinental distances. The UK leads the Convention's ICP Vegetation, whose main focus is on assessing the vegetation stock at risk from ozone.

60. **United States.** See response to Q.61. Much of the research conducted relevant to nitrogen oxides is also applicable to our commitments under the VOC protocol. In addition, the EPA is also a participant in NARSTO=s Reactivity Research Working Group which is identifying science questions and research opportunities related to differentiating VOCs based on their contribution to ozone formation.