



*Convention on Long-range
Transboundary Air Pollution*



European Commission
Clean Air for Europe

Air pollution and its relationship to climate change and sustainable development

Linking immediate needs with long term challenges

"Saltsjöbaden 3"

Gothenburg 12-14 March 2007

Main conclusions

Peringe Grennfelt¹, Lars Lindau², Jenny Arnell¹

¹Swedish Environmental Research Institute

²Swedish Environmental Protection Agency

30 May 2007



INTERNATIONAL AND NATIONAL
ABATEMENT STRATEGIES FOR TRANSBOUNDARY AIR
POLLUTION



norden



ACCENT

ATMOSPHERIC COMPOSITION CHANGE
THE EUROPEAN NETWORK OF EXCELLENCE

Background

Air quality is a common issue of large concern all over the world. Threats to health and ecosystems have initiated policy measures ranging in scale from local to international. Though significant steps have been taken in many countries, the problems are not solved and are also increasing in many areas.

In 2000 the Swedish ASTA¹ research program organised a workshop directed towards future needs in air pollution strategies in view of the recently signed Gothenburg Protocol and the corresponding process under the European Commission. The outcome of the workshop contained conclusions and recommendations which served as guidelines for further scientific and policy work. In 2004 a follow-up workshop was held, at which further developments in science and policy were evaluated in view of expected policy recommendations.

The third workshop in this series was held in Gothenburg March 12-14, 2007 with 190 policymakers, scientists, experts and stakeholders attending from 35 nations. The main conclusions and recommendations from the workshop are presented in this report. The workshop was organised by the Swedish ASTA program in collaboration with The Convention on Long-Range Transboundary Air Pollution, the European Commission and the EU ACCENT Network of Excellence. The Mistra Foundation, the Nordic Council of Ministers and the Swedish Environmental Protection Agency contributed with financial support.

Scope

The scope of the workshop was to elaborate scientific and policy needs in order to solve air pollution problems in both the short and long term. In particular the workshop considered:

- Linkages between air pollution and greenhouse gas policies
- The scientific understanding of air pollution policies in relation to the EU CAFE program and CLRTAP
- Influences from climate change on air pollution and its effects, and air pollution feedbacks to climate change
- Intercontinental transport of air pollution and the possible development of a hemispheric approach to air pollution policies
- The importance and policy needs with respect to emissions from shipping,
- The importance and policy needs for nitrogen
- The involvement of countries in transition in the further development of air pollution policies
- The further development of international regimes (in particular CLRTAP) in relation to new air pollution challenges.

The workshop comprised a series of plenary lectures giving the framework of the meeting, followed by eight parallel working group sessions on the eight scope themes. Each working group had the objective to discuss present knowledge and arrive at conclusions and recommendations on ways forward. The recommendations included suggestions on which communities should take responsibility for a recommendation. The reports from each of the working groups and other material from the workshop can be found at <http://asta.ivl.se>.

This report contains a condensed common report representing the main outcomes of the workshop. The general conclusions and recommendations have been examined by the organisation committee and the chairpersons and rapporteurs of the working groups.

¹ <http://asta.ivl.se>

Workshop Conclusions and Recommendations

Linking air pollution and greenhouse gas policies - policy issues

Background

There are today a few but increasing number of initiatives in the world aimed at combining air pollution and climate change policies (a few US states, European Commission and some EU member states). The benefits of combined policies are obvious in terms of achieving combined improvements at less cost. The possibilities for combined control policies on air pollution and climate change are however poorly considered, all the way from local measures to the development of new international frameworks and agendas within the international UNFCCC system.

Present air pollution policies are to a large extent directed towards technical measures. Such measures are applied in Europe through EU legislation (IPPC, LCP, mobile source directives) and they cover many of the main sources. Even if there is room for improvement with respect to technical measures, there is also an increasing need to consider other measures mainly influencing the activities leading to emissions, often referred to as Non-Technical Measures (NTM). In the view of the development of climate change policies these measures have become increasingly important.

Conclusions

- There is increasing evidence that there are large benefits (costs versus environmental and climate benefits) in linking air pollution and climate change policies.
- It is important to look at policies beyond 2020, since decisions taken today will influence emissions of air pollution and greenhouse gases for several decades.
- There is a danger in not linking the policy processes to thorough assessments - i.e. of not promoting synergies and not identifying trade-offs. For example, the air pollution implications of carbon capture and storage (CCS) and integrated gasification combined cycle (IGCC) technologies need to be looked into.
- There is a commonly held perception that we tend to systematically underestimate the benefits and overestimate the costs of environmental policy measures.

Recommendations

For better development and implementation of linked air pollution and climate change policies the workshop recommends to:

- focus on early identification of synergies and trade-offs between air quality and climate change policies and measures. (countries, EU, TFIAM, WGSR, scientific community)
- use combined air pollution/climate change policies on local, country and EU levels. Combined strategies should be considered with some caution on regional (CLRTAP) and global levels. (countries, EU)
- promote the development of integrated assessment tools for combined strategies, taking into account the importance of balancing the complexity of introducing more information into the models/tools vs. the benefits. (TFIAM, EU)
- investigate possibilities to use new innovative solutions (e.g. urban planning and agricultural practices), in particular in the developing countries. (countries, scientific community)
- promote further investigations and exchange of experience from the use of economic instruments in combined strategies. (TFIAM, EU, EGTEI).
- improve our understanding of socio-economic aspects and possibilities in the view of increasing demands for measures influencing ways of living. Consider the needs for a new group or task force under CLRTAP. (CLRTAP, FP7, EU)

- consider climate and air pollution consequences of further liberalisation of markets (energy, needs for transportation etc.) (EU, EGTEI)
- develop common data sources for air pollution and climate change in support of policies. (emissions, activity levels, control costs etc.). (EMEP, WGSR, TFIAM, scientific community, JRC)
- consider other aspects like energy security, competitiveness, public health etc. in relation to the environmental drivers. (CLRTAP and the CSD)
- consider in particular the developing countries, in which environmental policies may be in a different stage. (CLRTAP, UNEP, other regional initiatives, e.g. the Male declaration)

Linking air pollution and greenhouse gas policies - scientific issues

Background

Air pollution problems are, in addition to emissions, to a large extent dependent on weather patterns and climate. Changes in climate will thus potentially cause changes in the behaviour of atmospheric pollutants as well as their effects. Climate change may also change emissions such as VOC from vegetation, sea salt spray, etc. In addition changes in air pollution emissions may influence regional climate development, in particular through particulate matter.

The climate change community has up to now focused on how weather elements will change with time and location as a consequence of increasing radiative forcings from greenhouse gas and particulate matter concentration changes. In addition, the climate change community has focused on the societal implications of the changed climate, but up to now air quality has usually not been part of the picture.

Conclusions

- Future revisions of international air quality legislation (e.g. the NEC Directive and the Gothenburg Protocol) have to take climate change into account - in the goal-setting accounting for how climate change contributes to air quality changes and how air quality changes contribute to regional climate change.
- Climate change measures include important air quality parameters, so the outcome of air quality measures and climate change measures has to be considered simultaneously.
- The scientific community has to quantify the air quality-climate change relationships.

Recommendations

- Integrate climate change and air quality communities with respect to scientific research, monitoring and modelling. (EMEP, IPCC with support from CLRTAP and UNFCCC-SBSTA)
- Explore climate/air pollution observations further through joint evaluations of long term data; integrate air quality-observations and meteorological observations to improve the information and evaluation capabilities. (CLRTAP, EMEP, CEC, IPCC)
- Establish a joint assessment IPCC + global air quality-body. (CLRTAP + others to make it global and rooted in the science plus policy arena)
- Develop coupled climate-chemistry models that have the ability to consider relevant air quality aspects. An important milestone will be the next IPCC assessment expected to start its work in 2009. (IGBP, WCRP/WMO, EMEP, IPCC, scientific community)
- Promote research agendas (in particular within FP7) to include linked aspects between air quality and climate change. (CEC, CEC-experts and national delegates)
- Publish findings of air quality - climate change inter-linkages in publications that are common ground to both air quality and climate change research communities. (Science Community)

- Harmonise emission estimates and scenarios for greenhouse gases and atmospheric pollution, in particular beyond 2020. As climate and air quality models are being coupled, the demand for resolution of emission estimates increases. (TFEIP, TFIAM, EU, UNFCCC, IPCC, JRC)

Effects of air pollution and linkages to climate change

Background

Air pollution policies under CLRTAP and EU are unique in the sense that emission control requirements are related to quantitative estimates of improvements of effects. The science of air pollution effects is well advanced in general and has proven useful for policy purposes. However, uncertainties exist in specific areas. Interactions with climate change will add complexity to the effects estimates, since many biological processes are climate-dependent.

Conclusions

- Models are essential to interpret and predict the direction and rate of air pollution and climate change effects.
- Due to the complexity of response between the nitrogen and carbon cycles and soils and vegetation, there is a strong need for improved integration of monitoring, which combines receptor responses, and development of ecosystem modelling.
- Multi-factor experiments are needed to test and help develop models for ecosystem responses to deposition of atmospheric pollutants.
- There is a strong need to get better access to datasets on changes in spatial patterns of land cover and agricultural practices.
- Complexity of interactions between climate, ozone, elevated CO₂ and other pollutants require large-scale and long-term experiments to be resolved.
- Increased wind speeds in Northern Europe will increase the importance of resuspension of surface derived aerosols. It will therefore increase suspended PM levels, thus making it harder to meet air quality guidelines with anthropogenic emission controls.
- The risk for boreal forest fire frequency is expected to increase (along with biomass fires at all latitudes), which increases human health risk through the exposure to higher PM levels.

Recommendations

Acidification and nutrient N (see also under Nitrogen)

- Integrate ongoing ecosystem monitoring and modelling and initiate multi-factorial ecosystem experiments and model development in order to further elaborate our understanding of acidification and nutrient processes under climate change and more intense land use. (WGE, ICP-F, ICP-W, ICP-M&M, IM, ICP-M, JEGDM)

Ozone

- Develop and establish monitoring systems capable to detect and quantify changes in (semi-)natural vegetation at the ecosystem and regional scale, and multi-factor analysis to quantify ozone impacts. (WGE, ICP-F, ICP-V, science community)
- Investigate the combined impacts of ozone and climate change on distribution of (semi-)natural vegetation, and on choosing crop and tree species and cultivars. (science community, FP 7)
- Further develop flux modelling methods to include CO₂, meteorological parameters and climate-dependent plant factors. (science community, FP 7)
- Develop dynamic modelling of ozone interactions in a changing climate. (science community, FP 7)
- Investigate feedback mechanisms for climate (e.g. potential of reduced stomatal flux of ozone to increase ozone-induced radiative forcing, ozone-induced reduction in C sequestration, etc.). (science community, FP 7)

Particulate matter.

- Investigate the consequences of increased boreal forest fire frequency. (science community, FP 7, EMEP)
- Investigate how changes in land cover due to climate change may influence wind-driven emissions of PM. (science community, FP 7, EMEP)

Heavy metals and POPs.

- Reconcile heavy metals emission inventories and observed concentrations and deposition in Europe. (MSC-E, TFEIP, EMEP)
- Further improve joint efforts to understand and quantify the global cycle of mercury, which is a remaining problem. (EMEP, MSC-E, TFHTAP, science community)
- Quantify the climate change feedbacks in POP mobilization, transport and effects in the Arctic. (MSC-E, EMEP, science community)

Nitrogen

Background

Fixed or reactive nitrogen is of increasing environmental concern. At the same time as it is a prerequisite for life and our supply of food, it is also causing a series of environmental threats and damages on local, regional and global levels. There are several research and scientific assessment initiatives with respect to nitrogen. There is however a lack of policy arenas able to take a wider perspective on nitrogen. At the workshop the possibility of adopting such a wider view in support of policy development was considered.

Conclusions

- Presently, there are several science-driven international initiatives and activities (INI, COST729, ESF NinE, NitroEurope etc.) set up in order to form a holistic approach on nitrogen.
- There are also upcoming policy demands. In addition to policy demands related to the various effects of the nitrogen cascade, these include needs for more intense use of ecosystems for food and energy production, and also needs for re-decisions on already existing agreements (e.g. for the EU agricultural sector).
- A holistic approach to policy development may help policy-makers to include a wider set of aspects in these decisions than normally being done.
- Since several of the nitrogen problems are related to atmospheric emissions, the workshop considered CLRTAP to be a suitable arena for further science-based policy development.

Recommendations:

An overall recommendation from the workshop is that the CLRTAP should take a leading role in using the outcome of ongoing assessments and further investigate how a holistic policy approach could be developed. In addition the following more specific recommendations were given:

- establish an expert group on nitrogen under the Convention to provide a framework on integrated N approaches and policy options. (CLRTAP EB, WGSR, TFIAM)
- enhance integration and synergies between the existing bodies of CLRTAP relevant to the nitrogen issue. (EB)
- draw from and link to other Conventions (UNECE Helsinki Convention on Waters, CBD, FCCC, UNECE Espoo Convention on Transboundary EIA) : e.g. by establishing an (inter-)Convention WG. (EB, EMEP, WGE)
- explore the possibilities of an integrated Nitrogen Protocol, possibly joint with other UNECE Conventions. (WGSR, TFIAM)
- establish a stronger link with agricultural stakeholders (FAO, DG Agri, IFA, ...) and effects-related stakeholders. (CAFE, TFIAM)

- utilize the knowledge, concepts, etc. developed within science-driven initiatives and projects. (INI/NitroEurope IP/ACCENT/COST729/ESF-NinE etc.) (EMEP, WGE, TFIAM)
- develop a monitoring framework for a holistic approach to nitrogen (following the nitrogen fluxes and establishing systems for biomonitoring). (EMEP, WGE)
- develop integrated assessment approaches (e.g. based on RAINS/GAINS) to include the wider scope of N effects. (TFIAM, CIAM, COST729)
- include agri-food chain in the development of "soft" measures. (CAFE)
- identify combinations of specific receptors that are unique to nitrogen effects. (science community, FP 7)

Further development of control options - emerging technologies

Background

Environmental negotiations, commitments and measures are crucially dependent on the availability of cost-efficient technologies. Investments in R&D in new technologies and incentives for implementation of these technologies are therefore crucial factors for successful policy development. For air pollution, policy demands have in most cases been able to be met with relevant technical solutions. Turning interests from handling air pollution and climate change as separate problems to integrated approaches will influence the agenda for technological development and to some extent change priorities in implementing forthcoming measures.

In addition to the development of control technologies, future policies will also require actions that are not associated with industrial technologies but rather with changes in activities generating emissions.

At the workshop, issues related to future development of control options were discussed in particular in relation to the energy sector but also to some extent in relation to land transport (roads and rail). The discussions focused both on short term and long term needs and possibilities.

Conclusions

- Long term perspectives in policy development and commitments are important drivers for technology development.
- The air pollution policy development has benefited from its basis in cost-efficiency.
- Much of the EU legislation on energy and land transport is in place but better coherence is needed.
- New technologies need to be framed in economic terms (cost-efficiency).
- There are new technologies that may become pitfalls without a holistic (lifecycle) view on their performance.
- More cooperation between UNFCCC & CLRTAP on scenario and technology development is needed to exploit win-wins and avoid pitfalls.

Recommendations

- Investigate new technologies in a wider perspective including other environmental aspects and their economy in a lifecycle perspective. (EU).
- Review the control of emissions from biofuels. (EU)
- Clarify the effects on (baseline) scenarios from new EU energy policies. (EU)
- Include the effects from IPPC review. (EU)
- Revise the EGTEI agenda to include combined air pollution and climate change options and use EGTEI more actively in the analyses of new technologies and their costs. (countries, EGTEI)

- Increase the profile of new technologies to high political levels in order to ensure breakthroughs (countries).
- Develop and establish databases on NTMs including their costs, experiences in performance and encourage integration of these measures in integrated assessment models. (EB, TFIAM, CIAM)
- Improve quality and legitimacy of integrated assessment models through systematic reviews and use the outcome of RAINS/GAINS reviews for further development and priority setting in integrated assessment modelling.
- Improve the basis for CBA analysis (EGTEI).
- Establish long-term visions and goals in order to improve industry forward planning. (EU, countries)
- Promote investment support to forerunners. (EU, countries)
- Improve combined databases on costs for climate change and air pollution (EGTEI, TFIAM, CIAM, JRC, countries)
- Investigate in more detail performance, costs and applicability of Non-Technical Measures in order to get them included in integrated assessment models and cost-effective policies. Develop methods for quantification of welfare impacts (employment, competitiveness, income levels etc.). (countries, scientific community)
- Establish a system for review of energy, transportation and agriculture scenario models. (scientific community, EU)
- Encourage greater integration of non-technical measures into integrated assessment models (GAINS). (CIAM, research communities)

Shipping and Air Traffic

Background

International shipping is significantly contributing to air pollution damage to health and the environment. While emissions from most land-based emission sources have come down in EU and North America, and is expected to continue to decline, those from shipping are steadily increasing. Emissions of SO₂ and NO_x from international shipping around EU are estimated to increase by about 45% from 2000 to 2020. Even if there is an increasing concern over the emissions as a significant source, and there are cost-effective techniques to reduce emissions, there are obstacles on the policy side due to difficulties in reaching agreements within the main international body, the International Maritime Organisation (IMO).

Air traffic is another significant source, from which atmospheric emissions are steadily increasing at present at a rate of about 5% per year.

Conclusions

- As a result of the expected growth (about 4% annually) in shipping and associated emissions, in order only to maintain 2002 level of emissions, there is a need to reduce fleet-wide average emissions by at least 60% by 2025 and by at least 85% by 2050.
- Shipping is contributing to air pollution on local (e.g. in port areas), regional, and global scales and also has an impact on climate. All scales are important and impacts should be considered together in order to set the right priorities for abatement.
- Historic developments in IMO have been very slow, and measures agreed so far have been inadequate to solve the problem. Therefore, unilateral action (for example by the EU and/or the US) is needed to push – but not replace – action in the IMO.
- As agreements on and introduction of new or stricter legally binding emission requirements usually takes some time, economic instruments can be used to promote faster emission reductions. Such instruments can also be used as a complement to binding standards, to promote additional emission reductions beyond the minimum requirements.

Recommendations

In order to reduce emissions from shipping the workshop recommended that:

- The EU and/or the US should take unilateral (or bilateral) action and introduce measures to reduce emissions from shipping. (Countries, EU, EB, IMO)
- Such action should be accompanied by initiatives aimed at agreement within IMO to significantly strengthen MARPOL Annex VI short, medium and long term ambitions.

As short term ambition levels the following recommendations were given:

- Lower allowed fuel sulphur level from 1.5% to 0.5% in Sulphur Emission Control Areas (SECAs) and expand the SECA program to cover more areas.
- Introduce stricter NO_x standards for new engines.
- Introduce PM standards for new engines.
- Retrofit of NO_x reduction equipment (SCR) to existing engines.

For the medium term recommendations included to require 0.5% sulphur fuel globally, and to reduce emissions of NO_x and PM by at least 95%.

- Individual countries and/or the EU should introduce economic instruments to promote early and additional emission reductions. (Countries, EU) Such instruments could include:
 - Environmentally differentiated port and fairway dues
 - Environmentally differentiated en-route charging
 - Emission charges/taxes
 - Emissions trading

Future Development of the CLRTAP

Background

The Convention on Long-Range Transboundary Air Pollution (CLRTAP) is facing new challenges. From an internal perspective, the expanding European Union covers an increasing part of Europe that is the heart of the Convention system. Its policy role is therefore under reconsideration and more emphasis is being placed on including EECCA countries as well as looking into the possibility of expanding the Convention area, for example for collaboration on policy development in relation to intercontinental transport. Possible development of common policies on a global or hemispheric scale is also under consideration. The interaction with climate change and climate change policies also adds new challenges. In all this it is important to keep the Convention's strength and to further develop its basis for success; strong dependence in scientific research, monitoring and modelling and forming policies on effects-based, cost-effective approaches.

Some of the conclusions and recommendations related to future challenges for CLRTAP are covered under specific headlines (climate change, EECCA, nitrogen, shipping etc.). Under the specific headline on CLRTAP, mainly issues related to Convention's role as a policy-forming international organisation in general are covered.

Conclusions

The Convention shows a large number of strengths. In particular it:

- has a strong position as a supplier of a scientific basis for the different Protocols as well as for other international agreements and national legislations.
- has shown a high degree of flexibility to address a greater number of pollutants and effects as well as to develop and accommodate different approaches for the international agreements (e.g. the effect-based approach).
- has a strong institutional structure set up on a long-term basis with ability to adapt according to changing environmental priorities.
- has through its Implementation Committee assured compliance with the Protocols.
- is bringing together policy and technical experts from the countries and individual experts from a wide range of institutions.

- is serving as an example for similar arrangements in other regions.
- has been able to keep a high degree of commitment through differentiated responsibilities and obligations.

The Convention has however a number of weaknesses. In particular:

- its limited financial mechanisms to assist with ratification and implementation.
- its different goals and approaches, which may create confusion at the political level and to the public.
- its lack of full commitment from all parties.
- its major focus on transboundary air pollution problems and not on local or urban problems.
- its lack of penalties for failing to comply with the Protocols.
- its limited resources for outreach activities.

Recommendations (CLRTAP EB, WGSR, EMEP and WGE)

The workshop recommended that the Convention should:

- Maintain the active geographic coverage of the Convention, for example by providing technical assistance to EECCA and SEE countries in implementing the Convention.
- Maintain and further promote the involvement of the scientific community in the development of strategies and in policy assessments.
- Address local air pollution problems within the ECE region.
- Consider the additional issues in relation to TFHTAP concerning environmental health effects and possible policy pathways.
- Continue the programme of assessing hemispheric and intercontinental transport.
- prepare an assessment of the total air pollution impact of shipping on air pollution and climate. (EB, EMEP)
- Continue the work on effects-based approaches for policy development including in particular dynamic aspects, climate change and formulation of environmental targets.
- Continue the work with the WHO to improve the scientific basis associated with health effects.
- Consider the revision of the Gothenburg Protocol in a context of short-term (2020) and long-term (2050) timeframes including the links with climate change and policies to reduce greenhouse gases emissions.
- Consider developing a common framework between the Convention and other regional agreements.
- Provide technical assistance to non-ECE countries to supplement their efforts in addressing air pollution.
- Further develop cooperation with other relevant regional and global programmes and networks beyond ECE including UNFCCC and the Global Atmospheric Pollution Forum..
- Reassess the deployment of resources within the Convention in light of changing priorities.

A closer involvement of the EECCA countries (Eastern Europe, Caucasus and Central Asia) in the CLRTAP processes

Conclusions:

Most of the EECCA countries are today members of the LRTAP Convention. Their role in the participation and development of agreements under CLRTAP and its protocols are becoming increasingly important in relation to the corresponding development within the EU and elsewhere in the world. At the workshop, obstacles for achieving larger interest in air pollution and air pollution measures within these countries, and the role of CLRTAP in such a process were discussed. At these discussions it was realised that there is a need for support directed to air

pollution problems and challenges in the EECCA countries and a more active involvement of these countries in CLRTAP and other international air pollution initiatives.

The workshop concluded that there was a need to revise the Action Plan for the EECCA Countries. Such a plan should include elements from the recommendations below

Recommendations:

The political profile of CLRTAP activities should be raised through the following:

- A high-level meeting on transboundary pollution (EB, EECCA countries). It was suggested that such a meeting could be held in 2009 in connection with the 30-year anniversary of CLRTAP.
- Consider possible co-benefits from climate change policies in the development and implementation of air pollution measures. (EB, EECCA countries)
- Initiate studies on health and environmental effects and consider these effects in the development of abatement strategies. (EB, EECCA countries)
- Highlight the importance of small particles (in particular PM2.5 and PM10). (EB, EECCA countries)
- Highlight high benefit-to-costs ratio for air pollution measures. (EB, EECCA countries)

Facilitate the ratification of Protocols (EMEP, Heavy metals, POPs, Gothenburg) through

- The development of a ratification process with recommended technical annexes or flexible time schedules for compliance. (WGSR, EB)
- Use of the EMEP Protocol as an important first step for all countries. (EECCA countries)
- Support to the EECCA countries in the ratification processes (Belarus is preparing ratification of 2nd Sulphur and VOC Protocols – technical support needed). (CLRTAP Secretariat and donors)
- Use linkages to ratification of the Stockholm Convention – for ratification of POPs Protocol. (CLRTAP Secretariat and EECCA countries)
- Analyse the option of applying PEMA of the Gothenburg Protocol. (EECCA countries)

Support the revision of the Gothenburg Protocol through:

- Expansion of RAINS and GAINS models to include EECCA countries (EECCA countries should contribute with information and nominate a contact person to IIASA, IIASA should try to provide travel funds and give feedback with the developed scenarios). (EECCA countries, CIAM, EMEP, WGSR, WGE)
- Active participation in negotiations. (EECCA countries)

Strengthen the EMEP and WGE systems through:

- Practical, methodological support and capacity building (including assessment of resources needed) for the establishment of new stations and programs in relation to EMEP and WGE activities. (EECCA countries, CCC, donors)
- Provision of emission data. (EECCA countries)
- Extend modelling domain. (MSC-East and MSC-West)

In addition the workshop it is recommended that:

- More material should be available in Russian and use of Russian language. (EB, CLRTAP Secretariat and EECCA countries)
- Joint activities/workshops should be organised for EECCA countries on important technical issues like emission inventories, PM measurements, ecosystem monitoring, emission monitoring etc. Such activities/workshops should include both decision makers and specialists) (EB, CLRTAP Secretariat, EECCA countries).
- MSC-E should be used as a facilitator in the implementation of CLRTAP Action Plan for EECCA.

Program Committee

Markus Amann, Austria
Richard Ballaman, Switzerland
Keith Bull, UN ECE
Francisco Cardoso Ferreira, Portugal
David Fowler, UK
Peringe Grennfelt, Sweden
Bill Harnett, USA
Tor Johannesen, Norway
Andrzej Jagusiewicz, Poland
Lars Lindau, Sweden
Rob Maas, The Netherlands
Frank Raes, JRC/ACCENT
Jürgen Schneider, Austria
Surendra Shrestha, UNEP
Leonor Tarrason, Norway
Matti Vainio, DG Environment
Les White, UK
Martin Williams, UK
André Zuber, DG Environment
Christer Ågren, Sweden

Chairmen and rapporteurs of the working groups

WG 1 - Combined strategies to control climate change and air pollution
Chair: John Rea, Rapporteur: Anna Engleryd

WG 2 - Climate change and air pollution – a long term perspective
Chair: Øystein Hov, Rapporteur: Frank Raes

WG 3 - Future Development of the CLRTAP
Chair: Bill Harnett, Rapporteur: Francisco Ferreira

WG 4 - Air pollution effects on ecosystems, materials and health in a changing climate
Chair: Bridget Emmett, Rapporteur: Matti Johansson

WG 5 - Nitrogen – integrated environmental policies
Chair: Jan Willem Erisman, Rapporteurs: Till Spranger and MA. Sutton

WG 6 - Sector approaches in air pollution control - 1 Stationary sources, in particular energy production
Chair: Suzie Baverstock, Rapporteur: Alec Estlander

WG 7 - Sector approaches in air pollution control – Transport, with special emphasis on shipping and air traffic.
Chair: Axel Friedrich, Rapporteur: Christer Ågren

WG 8 - Air pollution policies in Eastern Europe, Caucasus and Central Asia
Chair: Jan Thompson, Rapporteurs: Valentin Sokolovskii and Bo Libert

Abbreviations

CAFE	Clean Air For Europe (CEC)
CBA	Cost Benefit Analysis
CBD	Convention on Biological Diversity (UN)
CCC	Chemical Co-ordinating Centre (EMEP)
CCS	Carbon capture and storage
CEC	European Commission
CIAM	Centre for Integrated Assessment Modelling (CLRTAP)
CLRTAP	Convention on Long-Range Transboundary Air Pollution
COST729	Assessing and Managing Nitrogen Fluxes in the Atmosphere-biosphere System in Europe
CSD	United Nations Commission on Sustainable Development
DG Agri	Directorate for Agriculture and Rural Development (EC)
EB	Executive Body of CLRTAP
EECCA	Eastern Europe, Caucasus and Central Asia
EGTEI	Expert Group on Techno-Economic Issues (CLRTAP)
EMEP	European Monitoring and Evaluation Programme
ESF NinE	ESF project Nitrogen in Europe: Assessment of current problems and future solutions
FAO	The Food and Agriculture Organization (UN)
FP7	The Seventh Research Framework Programme (CEC)
GAINS	Greenhouse Gas and Air Pollution Interactions and Synergies (IIASA integrated assessment model)
ICP	International Cooperative Programme (CLRTAP)
ICP-F	ICP for Assessment and Monitoring of Air Pollution Effects on Forests (CLRTAP)
ICP-M	ICP for Materials, including Historic and Cultural Monuments (CLRTAP)
ICP-M&M	ICP on Modelling and Mapping of Critical Loads and Levels and Air Pollution Effects, Risks and Trends (CLRTAP)
ICP-V	ICP on Effects of Air Pollution on Natural Vegetation and Crops (CLRTAP)
ICP-W	ICP for Assessment and Monitoring of Acidification of Rivers and Lakes
IFA	International Fertilizer Industry Association
IGBP	International Geosphere-Biosphere Programme
IGCC	Integrated gasification combined cycle
IM	ICP on Integrated Monitoring of Air Pollution Effects on Ecosystems (CLRTAP)
IMO	International Maritime Organisation
INI	International Nitrogen Initiative
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
JEGDM	Joint Expert Group on Dynamic Modelling (CLRTAP)

LCP	Large Combustion Plants Directive
MARPOL	International Convention for the Prevention of Pollution from Ships
MSC-E	Meteorological Synthesizing Centre - East (CLRTAP)
MSC-W	Meteorological Synthesizing Centre - West (CLRTAP)
NitroEurope	The nitrogen cycle and its influence on the European greenhouse gas balance (EU research project)
NTM	Non-Technical Measures
PM	Particulate Matter
POP	Persistent Organic Pollutants
RAINS	Regional Air Pollution Information and Simulation
SCR	Selective Catalytic Reduction - SCR - NO _x Control Systems
SECA	Sulphur Emission Control Area (Regulation under IMO)
SEE	South East Europe
TFEIP	Task Force on Emission Inventories and Projections (CLRTAP)
TFHTAP	Task Force on Hemispheric Transport of Air Pollution (CLRTAP)
TFIAM	Task Force on Integrated Assessment Modelling (CLRTAP)
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFCCC-SBSTA	UNFCCC Subsidiary Body for Scientific and Technological Advice
WCRP/WMO	World Meteorological Organization
WGE	Working Group on Effects (CLRTAP)
WGSR	Working Group on Strategies and Review (CLRTAP)
WHO	World Health Organisation