



**Economic and Social  
Council**

Distr.  
GENERAL

EB.AIR/WG.1/2001/4  
18 May 2001

Original: ENGLISH

**ECONOMIC COMMISSION FOR EUROPE**

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

Working Group on Effects  
(Twentieth session, Geneva, 29-31 August 2001)  
Item 5 (a) of the provisional agenda

**DRAFT LONG-TERM STRATEGY OF THE EFFECT-ORIENTED ACTIVITIES**

Note by the Bureau of the Working Group on Effects  
in collaboration with the secretariat

Background

1. At its eighteenth session the Executive Body for the Convention invited the Working Group on Effects and its Bureau to consider drawing up a long-term strategy for the effect-oriented activities (ECE/EB.AIR/71, para. 58 (d)). The Bureau at its meeting on 12 to 14 February 2001 agreed that the long-term strategy should be drafted on the basis of the approved document on the future development of the effect-oriented activities (EB.AIR/WG.1/2000/4). The Bureau drew up an outline of the document on the understanding that its draft, prepared in close cooperation with the Extended Bureau, would be submitted to the Working Group on Effects for consideration at its twentieth session.

Documents prepared under the auspices or at the request of the Executive Body for the Convention on Long-range Transboundary Air Pollution for GENERAL circulation should be considered provisional unless APPROVED by the Executive Body.

## I. INTRODUCTION

2. The Executive Body agreed that once the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone was adopted, its priority attention would shift to (i) the review and extension of existing protocols; and (ii) the implementation of and compliance with existing agreements. It also defined as its future core activities: (i) atmospheric monitoring and modelling; (ii) assessment of air pollution effects; and (iii) integrated assessment, including modelling and economic benefit evaluation.

3. At its seventeenth session, the Executive Body adopted decision 1999/2 concerning the structure and organization of work, to take effect as of 1 January 2000 (ECE/EB.AIR/68, annex III). It was decided that the Working Group on Effects would remain as it was, coordinating the effect-oriented activities. It would provide the scientific basis for the review of the effects, including recovery of the environment and human health following emission reductions in line with protocols, and carry out damage and benefit evaluations. It would also alert the Executive Body to any perceived additional, or changed, threats caused by air pollution that might require policy response.

4. The adopted mandate of the Working Group on Effects (ECE/EB.AIR/68, annex III, appendix IV) describes its main tasks:

(a) At the request of the Executive Body and as required for the effective implementation of the Convention, the Working Group on Effects collects, assesses and further develops knowledge and information on:

- (i) The present status and long-term trends in the degree and geographical extent of the impact of air pollution, in particular its long-range transboundary impact;
- (ii) Dose-response relationships for agreed air pollutants;
- (iii) Critical loads, levels and limits for agreed air pollutants;
- (iv) Damage and benefits, as a basis for the further development of air pollution abatement strategies.

(b) The Working Group on Effects carries out work to:

- (i) Assess the results and effectiveness of the implementation of the existing protocols to the Convention;
- (ii) Identify the most endangered areas, ecosystems and receptors and the extent of the effects of air pollution on human health and terrestrial and aquatic ecosystems and materials;
- (iii) Provide scientific substantiation for the review and further development of protocols.

(c) The Working Group works in close collaboration with the Executive Body's other subsidiary bodies and with other relevant organizations. The Working Group on Effects provides

information for related scientific activities outside the Convention and/or for joint efforts with other bodies/organizations.

(d) The Bureau of the Working Group on Effects undertakes the detailed planning, coordination, assessment and reporting of activities as defined in the work-plan for the implementation of the Convention and carried out by its subsidiary units.

5. The Executive Body also stressed:

(a) The need for more advanced planning of the effect-oriented activities, which should include, inter alia, the health effects of particulate matter, studies on heavy metals and persistent organic pollutants (POPs), and the impact of air pollution on cultural heritage;

(b) The importance of monitoring and dynamic modelling of recovery;

(c) The need for the continuing assessment of actual damage observed in the environment;

(d) The importance of further studies on uncertainties;

(e) The need for even closer cooperation with other bodies under the Convention, in particular with the EMEP Steering Body; and

(f) The essential need for a stable, long-term financing mechanism.

6. The workshop on future needs for regional air pollution strategies held in Saltsjöbaden (Sweden) on 10-12 April 2000 focused on the environmental problems related to emissions of major air pollutants. Based on a detailed examination of: (i) driving forces for air pollution control for the coming 5-15 years; (ii) advantages and disadvantages of the present concepts and achievements; (iii) alternative concepts and methods; (iv) other policy actions influencing regional air pollution strategies; and (v) scientific needs and further collaboration on scientific research and development, it drew up a list of conclusions and recommendations for improving scientific knowledge in order to support future policy work (see the workshop's report EB.AIR/WG.1/2000/14, and the Executive Body's decision at its eighteenth session, ECE/EB.AIR/71, para. 69 (b)).

7. Some of the conclusions and recommendations are of direct relevance to the activities of the Working Group on Effects. The workshop identified, among the wide variety of scientific needs, the following areas as of particular importance:

(a) Scientific understanding of long-range transport and effects of particulate matter;

(b) Development of environmental indicators;

(c) Methods to monitor environmental changes;

(d) Methods for the assessment of risks to human health and the environment;

(e) Understanding and dynamic modelling of environmental changes (nitrogen cycle, climate change) including the dynamics of environmental effects and recovery, especially at decreasing exposures and loads;

(f) Understanding of the crucial linkages between local, regional and global changes;

(g) The intercontinental and hemispheric transport of atmospheric pollution;

- (h) Development and application of methods for uncertainty analysis and validation of the models, data and assumptions on which the strategies rely;
- (i) Methods for the evaluation of the effectiveness of policies including cost-benefit analysis.

8. The draft long-term strategy for the effect-oriented activities (till 2010) takes into account the decisions of the Executive Body and the Working Group on Effects, the conclusions and recommendations of the Saltsjöbaden workshop, ongoing international activities in Europe, North America and on a wider (global) scale and, in particular, the relevant provisions of the 1979 Convention on Long-range Transboundary Air Pollution and its protocols concerning Parties' obligations to report, exchange available information and cooperate in research, development and monitoring. In its preparation due consideration was also given to the 1998 Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (in particular its provision concerning access to environmental information, and collection and dissemination of environmental information).

## II. AIMS OF THE EFFECT-ORIENTED ACTIVITIES

9. In support of the Convention and its protocols, the effect-oriented activities should:

- (a) Monitor the present situation, generate and collect data and collate the best available information/scientific knowledge (on a regional basis) on the effects of major air pollutants, (in particular acidifying substances, nutrient nitrogen, ozone, volatile organic compounds, heavy metals, persistent organic pollutants and particulate matter);
- (b) Assess their impact on the environment and human health and identify related risks (including risks to endangered species and sensitive receptors in the environment; induced changes in productivity, stability and/or biodiversity of ecosystems; interaction with climate change, etc.);
- (c) Assess trends in impacts/effects; evaluate recorded and estimate potential recovery;
- (d) Communicate these findings to decision makers and to the general public.

10. The orientation of the effect-oriented activities, the prioritization of problems addressed and the timing of the main tasks, the generation, processing and evaluation of data and the presentation of results should provide adequate up-to-date scientific knowledge and information for:

- (a) Political (and practical) decision-making on national and international levels;
- (b) The review and revision of existing protocols (expected in 2004-2005);
- (c) The possible preparation of new protocols (starting in 2005-2006); and
- (d) Continuing communication to stakeholders and the general public on the state of the environment and impacts on human health.

## III. METHOD OF WORK

11. In the past years, the assessment of critical loads for sensitive receptors and their exceedances were used as an indication of regional long-term "risks of effects" to the European

environment. This knowledge became the focus of effect-based approaches to support the negotiations of protocols under the Convention on Long-range Transboundary Air Pollution.

12. The new priorities of the Executive Body and the amended mandates/terms of reference of the Working Group on Effects and its subsidiary bodies would require an extension of this approach:

(a) In addition to the assessment of “risks of effects”, increased knowledge of the “occurrence of effects” (i.e. what kind of damage occurs, when and where) and of possible recovery would be required;

(b) The notion of “effects” should be extended from being primarily an environmental issue, to also including human health.

13. The provision of support to the Convention’s processes will become more complex. While in the past policy development was based on the assessment of the relationship between sources of emissions and potential long-term risks to sensitive receptors in the environment (expressed as critical loads/levels and their exceedances), in the future this analysis need to be extended to assess the time, location and extent of damage, as well as the dynamics of potential recovery due to decreases in exposures and loads. Such an extension of the approach will need improved knowledge of risks, including a simultaneous assessment of different impacts such as acidification, eutrophication, ground-level ozone, particulate matter, heavy metals, persistent organic pollutants and even climate change. Each of these impacts might have different dynamics on the spatial and temporal scale. It will be a big challenge for the Working Group on Effects and its international cooperative programmes to contribute to the development of the scientific knowledge needed for the extension of the approach towards a more dynamic assessment of the damage in the environment and to provide the necessary information to underpin the efforts to include such a dynamic approach in the current tools of integrated assessment modelling.

14. The implementation of the newly focused approach, the development of adequate databases, modelling and mapping methodologies and procedures for a comprehensive assessment would require further enlargement of the scientific and technical activities of the Working Group and its programmes and would require them to provide well targeted results.

15. Although the need for an extended approach towards a more dynamic assessment of the changes in the environment is obvious, the work on critical loads/levels and their exceedances will remain an important element in the long-term risk assessment. The critical loads/levels concept aims at preventing damage over long time periods and seeks to maintain the biodiversity of (semi-)natural ecosystems. Thus it is consistent with the concept of sustainability, since exceedances of critical loads/levels jeopardize future environmental sustainability. There are also links between the static critical loads/levels approach and the dynamic approaches. The dose-response relationships and the effects-oriented critical limits used in both approaches are essentially the same. New scientific knowledge on dose-response relationships and on critical limits will foster progress in the further development of the critical loads/levels approach and in the dynamic assessment of changes in the environment.

16. Future effect-oriented activities will have to focus on the environmental effects of the pollutants covered by the existing protocols to the Convention as well as on their health effects, which are becoming an extremely important driving force. These are, in particular, the pollutants resulting from, or directly related to, long-range transboundary air pollution, including, but not necessarily limited to:

- (a) Acidifying substances (sulphur, nitrogen);
- (b) Nutrient nitrogen;
- (c) (Ground-level) Ozone;
- (d) Volatile organic compounds;
- (e) Heavy metals;
- (f) Persistent organic pollutants; and
- (g) Particulate matter.

17. While the updating of knowledge on the effects of acidifying, eutrophying and oxidizing compounds should continue and further expand (including more work on nitrogen processes and effects on biodiversity), increased attention should be given to heavy metals, persistent organic pollutants and particulate matter.

18. The assessment of the present status and trends in effects of air pollution should be primarily (but not exclusively) aimed at:

- (a) Forest ecosystems;
- (b) Chemistry and biology of surface waters;
- (c) Corrosion/deterioration of materials, including buildings and cultural heritage;
- (d) Natural vegetation and crops;
- (e) Biological, chemical and physical state of selected, well defined ecosystems;
- (f) Human health.

19. Ongoing long-term monitoring/observation of the effects of air pollution should continue. However, the effectiveness of these activities should be further increased, in particular through:

- (a) The streamlining (rationalization) of monitoring networks, data collection and reporting;
- (b) Strengthened cooperation between monitoring activities of individual International Cooperative Programmes (ICPs), including sharing of monitoring stations;
- (c) Improved accessibility of available data to other interested parties (within as well as outside the Convention) and further development of tools to guide users in the interpretation and use of data in (effects) models.

20. Effect-based approaches remain the principal method for developing control measures and for assessing the impacts of their implementation. However, for some pollutants (e.g. POPs) and/or for some specific purposes, determination of any critical limits might be difficult and their use impractical. Therefore, in addition to the further development of critical loads and levels, much more should be done on the development and application of risk assessment methods.

21. To ensure that adequate data and information are available to help review existing/draw up new air pollution control policies and strategies, special attention should be given, inter alia, to:

- (a) Deriving more reliable dose/response relationships (especially under field conditions);
- (b) Assessing trends in damage and recovery and their relation to the implemented control measures;
- (c) Producing validated estimates of stock at risk, improved land-use data and harmonized methods for their mapping, and use of these data in risk assessments;
- (d) Evaluating the benefits of air pollution control and assessing the costs of damage and protection.

22. A comprehensive assessment of the possible impacts of various pollution control scenarios on sensitive receptors of the environment would require, inter alia:

- (a) The continuation of the development of steady-state models, including the use of multiple criteria in relation to chemical and biological indicators;
- (b) The further development and broader application of dynamic models; and
- (c) The application of other appropriate methods, including multi-variate analysis, artificial neural networks, etc. (which might also contribute to weighting the factors influencing a certain impact).

23. The results of these activities could provide more information on the temporal development of damage and recovery, as an input to integrated assessment modelling and a contribution to risk assessment activities on a broader scale.

24. It is assumed that further developed, effects-based regional air pollution control strategies will always be based on, and limited by, a commonly shared platform of scientific knowledge. Therefore, the continued monitoring and the high-quality effect-related basic research over all areas of importance will be crucial. The effective communication of comprehensive and reliable information on the observed changes in the quality of the environment due to impacts of air pollution to all target groups is an essential prerequisite for ensuring continuing political and financial support for the further development of the work under the Convention.

#### IV. ORGANIZATION OF WORK

25. The Working Group on Effects and its elected Bureau are responsible for the detailed planning, coordination and reporting of the effect-oriented activities. The practical/operational aspects of the effective implementation of the work-plan are addressed/dealt with by the Extended Bureau of the Working Group on Effects comprising the Bureau members and representatives of individual programmes/task forces and coordinating centres.

26. There are now seven main international cooperative effect-related activities under the Convention; for each of them, services ensuring efficient international coordination are provided by one institute/institution, approved by the Governments/Parties to the Convention at the annual

sessions of the Executive Body for the Convention. At present, these programmes, their lead countries and the selected and approved coordinating institutes/institutions are:

- (a) The International Cooperative Programme (ICP) on Assessment and Monitoring of Air Pollution Effects on Forests, led by Germany (Federal Research Centre for Forestry and Forest Products, Hamburg, Germany);
- (b) ICP on Assessment and Monitoring of Acidification of Rivers and Lakes, led by Norway (Norwegian Institute for Water Research, Oslo);
- (c) ICP on Effects of Air Pollution on Materials, including Historic and Cultural Monuments, led by Sweden (Swedish Corrosion Institute, Stockholm);
- (d) ICP on Effects of Air Pollution on Natural Vegetation and Crops, led by United Kingdom (Institute of Terrestrial Ecology, Bangor, United Kingdom);
- (e) ICP on Integrated Monitoring of Air Pollution Effects on Ecosystems, led by Sweden (Finnish Environment Institute, Helsinki);
- (f) ICP on Mapping Critical Levels and Loads, led by Germany (National Institute of Public Health and the Environment, Bilthoven, Netherlands);
- (g) Task Force on the Health Aspects of Air Pollution, led by the WHO European Centre for Environment and Health, Bonn Office, Germany.

27. While striving to develop further the effects-oriented activities and, in particular, to ensure effective use of available resources, the Working Group on Effects could also consider possible additional options for bringing together and/or linking more closely related activities and tasks under the Convention. To this end, it might be advantageous to undertake some comprehensive case studies and to model and map effects and assess damage and recovery in a broader context, for instance for terrestrial, aquatic or the built environment.

28. Another option might be to organize, when needed, joint meetings of various programme task forces (e.g. ICP Vegetation and ICP Forests, ICP Forests and ICP Integrated Monitoring, ICP Integrated Monitoring and ICP Waters, or ICP Mapping and ICP Integrated Monitoring) with the participation, when appropriate, of the Task Force on the Health Aspects of Air Pollution.

29. Other options include creating ad hoc joint expert groups to address specific problems, to undertake short-term tasks, or to carry out particular case studies. These ad hoc groups, however, should not be part of the formal structure under the Working Group on Effects, but would require clearly defined tasks and timetables for their work.

30. In the long term, depending on the future development of the activities under the Convention and its Executive Body, the closer cooperation and integration might lead to the regrouping of the effects-oriented activities under fewer subsidiary bodies. However, any possible modification of the Working Group's organizational structure would require cost-benefit and efficiency studies to be undertaken in close collaboration with the Executive Body.

31. Special attention should be devoted to the effective collaboration with other bodies/groups under



cooperation with relevant bodies/programmes outside the Convention. These should include, in particular, cooperation with the European Commission's Clean Air for Europe (CAFE) programme, the activities of the European Environment Agency, the United Nations Framework Convention on Climate Change, etc.

## V. CONCLUDING REMARKS

32. The Executive Body has stressed the importance of a sound scientific basis for the effective implementation of the Convention and noted that it was crucial to maintain and further expand the scientific networks developed during the preparation of the existing protocols. The Executive Body has requested the Working Group on Effects to provide the scientific bases for the review of the effects, including recovery of the environment and human health following emission reductions in line with protocols, and to carry out damage and benefit evaluations. The Working Group was also invited to alert the Executive Body to any perceived additional, or changed, threats caused by air pollution that might require policy response (EB.AIR/1999/5, paras. 4 and 7).

33. It is envisaged that the effect-oriented activities will continue to be carried out by the international cooperative programmes, planned and managed by the task forces and supported by the coordinating centres. Where appropriate, their expertise, technical skills, facilities and capacities should be pooled to ensure the most efficient use of available resources for the work under the Convention.

34. In fulfilling its mandate and in meeting the needs of the Executive Body, the Working Group should give higher priority to assessing the dynamics of past and future changes in acidification and eutrophication and their effects, and to the environmental and health effects of ozone, particulate matter, heavy metals and persistent organic pollutants. While efforts should continue to further improve its geographical coverage of the entire ECE region, more attention should be devoted to the intensified cooperation with North America, to the specific problems of the Mediterranean basin, and to establishing collaboration with new Parties to the Convention.

35. One of the important challenges will be to ensure adequate sharing/exchange of effect-related information and knowledge both on national and international levels. The results of the effect-oriented activities could substantially contribute to raising awareness of important environmental and health problems related to air pollution and, therefore, have to be effectively communicated to stakeholders, policy makers and the general public.

36. The main tasks planned for the 2001 – 2004 period are presented in the draft medium-term work-plan for further development of the effect-oriented activities (EB.AIR/WG.1/2001/5). The further specification of tasks for the implementation of the long-term strategy beyond that period will depend on the outcome of the envisaged review of protocols and on any new priorities of the Executive Body.