

## FINAL REMARKS

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Mr. Chairman, esteemed delegates, ladies and gentlemen,

In Munich, when I offered the Netherlands as host of the first conference, I was aware that I was taking on a big job. At that time, it was not possible to oversee whether a Conference where research was discussed in the presence of policy makers could deliver what we expected. Then, at the start of this Conference, I posed a number of questions. The answers to those questions -or the lack of answers- will show what the output of this Conference is. The extent to which policy and the development of policy have been further strengthened and whether or not policy is moving in the right direction, are of primary importance to me and to the Executive Body.

More than twenty speakers have presented an overview of the state-of-the-art in the various topics. It is clear that insights converge regarding the different aspects of acidification. Only very substantial reductions in air pollution can stop injury to forests, lakes, monuments, archives, and so forth.

The need to strengthen international coordination of research has come clearly to the fore during the Conference. Several examples of bilateral and international research have also been presented. Further, it has become apparent that there is a need for quantified estimates of financial damage in addition to more information about the extent of the various phenomena.

As far as the content of the research is concerned, more attention is emerging for the significance of  $\text{NO}_x$ , hydrocarbons, and ozone, in addition to  $\text{SO}_2$ , and for the complex processes in the soil, whether or not in the framework of the so-called 'integral monitoring'.

A direction in the research that is developing strongly -and that can certainly contribute effectively- is the use of models. Quantifying and

simulating the acidification phenomenon will provide insight into whether or not we are headed in the right direction with international measures.

With these points, the Conference has provided information about how and in what direction research is developing.

More certainty about the relationship between cause and effect has been obtained at this Conference. Several speakers have reported that, where emission limiting measures have reduced the sulphur burden in some regions in Canada and Sweden, recovery of forests and lakes has also indeed taken place, be it to a limited degree. It can be hoped that further reductions will also produce the desired further improvements. This is in itself an encouraging sign, indicating that progress in recovery in a fairly short time is not impossible. Actual recovery is relatively so small and insignificant next to the further damage to forests, lakes, etc. elsewhere, that we cannot yet feel too encouraged about it.

The role of  $\text{NO}_x$ , but especially of ozone and photo-oxidants, has been emphasized by various speakers. It is clear that only controlling  $\text{SO}_2$  will not solve the problem. It is evident that there will also have to be attention for  $\text{NO}_x$  and hydrocarbons. In addition, our colleagues from the U.S.S.R. have also requested attention for the problem of pesticides as an important element in environmental pollution.

We have also found some answers to the question of the tempo with which the effects strike. They are not absolutely accurate, but it is nevertheless clear that the tempo is fast and probably faster than the tempo with which we are currently reducing acidification. This is evident from the extent of effects on forests, water, drinking water, cultural property and materials. The IIASA model development is also an interesting indication. With the  $\text{SO}_2$ -reduction currently intended by the countries -on average, a 25 percent reduction in Europe- acidification of vulnerable soils will still continue in large parts of Europe. That means that further  $\text{SO}_2$  reduction is necessary. Therefore, we will have to increase our tempo.

Few concrete limits have been marked out for the levels of these substances at which possible effects appear and the levels that are acceptable. Figures have been named for nitrogen that are of the same order of magnitude as those mentioned in my opening address. This agreement is, incidentally, not surprising, since a Dutch speaker was involved. But I still want to emphasize

that it is very important that these limits be indicated, so that we can determine how far we need to go with control. I advocate focussing more research on this issue.

The Canadian and Swedish information already mentioned shows that recovery of damaged ecosystems is possible in some cases. As I said before,  $\text{SO}_2$  will have to be reduced more than it is now and  $\text{NO}_x$  and hydrocarbons will also have to be tackled. As far as our cultural monuments are concerned, we have to state that no real recovery is possible. Restoration is possible to a certain degree, but involves high costs. A delayed effect also occurs in cultural monuments, however, so that there is already a lot of future damage stored in the monuments.

Temporary management measures are certainly desirable, but they cost a lot of money and are not always possible. During the Conference, for example, it has come to the fore that 'liming' of acidified lakes does not offer a general solution. Aluminium toxicity is the worst effect in acidified surface waters. Liming of some 4000 Swedish lakes proved to be successful, but has to be repeated every three to five years. If aluminium concentrations are high, liming does not result in better conditions for fish.

The damage to agriculture from air pollution that I mentioned at the start of the Conference, is confirmed by numbers from the U.S. Even higher damage percentages -namely 10 percent- are being mentioned and damage of several billions of dollars per year. Damage is also reported by the Soviet Union. In certain cases, even much higher damage percentages for agricultural crops have been reported.

Models do not solve our problem. They can clarify the problem and also play a role in quantifying the uncertainty. The development of the acidification model by IIASA, based on the EMEP-model adhered to by Eastern and Western Europe together, has given us an idea of the significance of the  $\text{SO}_2$  control currently intended by the countries. It is useful to have this indication from the model, even though it is bad news. It is possible that the development launched by PHOXA (West Germany and the Netherlands) can provide similar information about  $\text{NO}_x$ , ozone and hydrocarbons in the future.

When I see these answers to the questions I posed, I think that this Conference has been cost-effective, even though not everything has been answered conclusively. This, together with the useful contact between science

and policy, makes me believe that a repetition of this Conference once every two or three years can provide meaningful support for the Executive Body.

We need information to prevent experimenting with nature. On that point I agree heartily with Professor Kuenen. Just as I agree with him concerning safety factors. An engineer calculates the necessary strength of a bridge and then builds in a safety factor of three to five. We also try to make that calculation for the environment, but use a safety factor less than one because more does not seem feasible.

Incidentally, in choosing Professor Kuenen to be Chairman of the Bureau, a very high safety factor has been applied to this Conference. I am very grateful to him for being willing to do this. The Dutch participants were already familiar with Professor Kuenen's excellent leadership, but now our foreign guests have also become acquainted with it. He has ensured that the Bureau, in good cooperation, arrived at conclusions and recommendations with which we can jointly go further in the ECE.