

THE EUROPEAN CONFERENCE ON ACID RAIN WAS HELD AT GÖTEBORG SWEDEN IN MAY 1981

THIS REPORT WAS WRITTEN BY JANE DUNMORE
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This international conference of environmental organisations was arranged by four Swedish groups: Miljöförbundet (The Environmental Federation), the Swedish Society for the Conservation of Nature (SNF), Fältbiologerna (Swedish Youth Association for Environmental Studies and Conservation) and the Swedish Anglers National Association. The organisers received some financial support from the Swedish government which was used towards delegates' travelling and accommodation expenses. A limited number of voluntary environmental groups overseas were invited to send representatives, and about 50 such delegates attended, from Austria, Belgium, Denmark, Finland, German Federal Republic, Iceland, The Netherlands, Norway, Poland, the UK, USA, and Canada. The other 50 delegates were from environmental organisations in Sweden.

The purpose of the conference was to alert the international environmental movement to the problems of acidification in Scandinavia and to inform representatives from overseas about the effects of acid rain in Sweden. The organisers felt that pressure from environmental groups in the "polluting" nations would help to create the atmosphere of international co-operation at government level which the Swedes in particular are keen to promote. The background to the conference was the 1979 UN Convention on long-range Transboundary Air Pollution. The Convention was signed by 34 nations but has been ratified so far by only nine countries, among them Sweden and Norway. Also considered significant by the organisers of ECAR was the publication in March 1981 of the OECD study "The Costs and Benefits of Sulphur Oxide Control". This study developed a methodology for estimating the costs and benefits of controlling sulphur oxide emissions from coal and oil-fired plants, concluding that control costs totalling \$4.6 billion dollars (for the European nations of the OECD) would be within the range of estimated savings on improved lake quality, health, crops and building damage.

ECAR was well planned, with sessions for presentation of papers and discussion broken by visits to acid lakes in the Göteborg area and further afield, and by workshop sessions to discuss national and international strategies on the problem of acid rain. The term "acid rain" was widely used during discussions, although inaccurate, as one of the first speakers, Per-Inge Grennfelt from the Swedish Water and Air Pollution Research Laboratory, pointed out. Dry deposition of SO_x and NO_x is greater in Sweden than wet deposition (acid rain/acid snow). Dry particles of SO_x and NO_x fall to earth before they have time to change into sulphuric and nitric acid as they travel in clouds. However, these particles carry molecules which can become acidic when mixed with surface water, rain, fog, dew or mist. The problem is therefore one of acid deposition rather than acid rain.

Discussing the impact of acid rain on soil, forestry and agriculture, Folke Andersson, Professor at the Swedish University of Agriculture, explained the many different factors involved in any attempt to assess damage due to acid precipitation. Forestry methods themselves can lead to increased acidification of soils. Different soils have different buffering systems and it is necessary to understand the biology of the soil and to have a profile of an area from precipitation to bedrock in order to make some reasonable assessment of likely damage due to increased acidity from wet or dry deposition. This point was reinforced by geologist, Bo Lind, during visits to lakes of different buffering capacities in the area of Falbygdén.

The Swedish Fisheries Board have now done a survey of Swedish lakes and have found that 18,000 out of a total of about 90 - 100,000 are acid. These lakes, poor in calcium, magnesium and nutrient, are situated (mainly in the southwest of Sweden) in areas with coniferous forests and pre-Cambrian bedrock. The pH of the acid lakes varies between 4 to about 5.5. Lakes have a natural defence mechanism or buffering capacity caused by the presence of hydrogen carbonate (HCO₃) as major ion. However, the majority of Scandinavian lakes and watercourses have low lime content, and thus a low content of hydrogen carbonate, and are therefore particularly vulnerable to acidification.

Acidification produces sweeping changes to lakes or watercourses, affecting every level of the aquatic ecosystem. Swedish acid lakes are characterised by the invasion of bog moss (sphagnum) which, together with undecomposed organic matter, established a carpet on the lake bottom sediment. The lake waters are unnaturally clear as a result of precipitation of humic substances to sedimentation on the lake bottom. The humus remaining in solution shifts colour with decreasing pH and the two effects result in an increasing transparency, to over 20 metres in some lakes compared with a norm of 6 - 9 metres. The general effect of acidification on lake fauna is a decrease in the total number of species and an increase (almost a population explosion) among those few species resistant to acid water, e.g. water boatmen, diving beetles, dragonfly larva, etc. The population explosion is probably due primarily to reduced fish predation. While some small fish may be directly killed by increased acidity in lakes, fish are most sensitive at the egg and larval stage and the failure of fish reproduction is the most significant result of acidification. Older fish of some species are able to survive in acid water and because of decreased competition for food, they often grow large and may have long, non-reproductive lives in the lake. Different species of fish have a differing sensitivity to acid water. Salmon, trout, arctic char and white fish are all very sensitive and disappear from lakes and streams when the pH is lower than 5 - 6. Perch and pike tolerate somewhat

more acidified water, although they may be affected by increased levels of aluminium in lakes, leached out from soils by acid precipitation; damage to fish gills can result from high Al levels. During an organised visit to Harsevatten lake (an untreated 'reference' acid lake), species of plant and fauna were netted from the middle of the lake while the pH level of the water was metered. No fish were caught and the net merely trapped the sphagnum moss and water beetles typical of acid lakes. Lake pH was 4.5.

Although liming is regarded in Sweden as an 'immoral' palliative, the extent of the acidification problem led the Swedish Government, in 1976, to initiate liming measures for restoring acidified lakes and rivers. This was done in order to save waters of special value and assess the efficacy of liming. Delegates to the Conference were shown liming in action at one lake, with the soft brownish coloured limestone being applied under pressure from a tanker. Different types of limestone, dolomites, lime slags etc. have been tried at various lakes. Methods of application range from the tanker method observed, to workers spreading lime with pressure hoses, and in some cases liming is done by helicopter, particularly where the lakes are inaccessible by road. The colour of the limestone e.g. white for winter, brown for summer, is important for aesthetic reasons, as weekend lodges and holiday homes are scattered in the woods around the lakes, and their owners object to lake shores dappled an unnatural white in the summer. The frequency of liming varies from lake to lake. A single application might produce a neutralising effect for some 5 - 10 years in a lake with a long retention time. However, waters with a very short turnover time might need yearly treatment which could lead to lime overburden on the lake shore or edge of the watercourse.

During presentation of papers to the conference, most speakers avoided emotive arguments, and stuck to factual accounts of sources of emission, technical means of control, and effects of acidification. After hearing these presentations, and seeing some acid lakes for themselves, delegates were asked to participate in Workshops on individual national strategies, international tactics, and a Conference Resolution.

The Swedish working group felt that there was a need for greater knowledge and understanding of the acidification problem among the general public, in Sweden as well as elsewhere in Europe. A substantial reduction in Swedish emissions was called for, and the Government was criticised for not requiring flue gas desulphurisation (FGD), especially on new coal burning plant.

The Netherlands have in recent years switched from natural gas to widespread use of coal. The Dutch Government tried to enforce the application of lime scrubbing to desulphurise flue gases, but the technique proved environmentally unacceptable in relation to lime extraction and slurry disposal. Delegates from the Netherlands felt that low energy use, together with investment in alternative energy sources, provided the only real solution. Britain's so-called "tall stack policy" had come in for criticism from some speakers and delegates, and in common with

other national workshop groups, the delegates from Britain felt that more attention should be paid to the impact of national energy policy decisions on the long range transport of air pollution. While it was agreed that there were many factors involved in the acidification of lakes and soils in Sweden and other parts of Scandinavia, there was no doubt that sulphur and nitrogen compounds resulting from combustion of fossil fuels in Europe were transported over long distances and contributed to the acidification problem in vulnerable areas.

The British delegates considered the effect of emissions on the local (UK) environment, and concluded that the UK Government should seek to establish the detrimental effect of SO₂ emission on gross national product. They also felt that the Government should encourage investigations to establish the frequency with which tall stacks emit above the mixing layer, in order to quantify more accurately the contribution from sources in the UK to deposition at long range. Presenting these conclusions to the conference, the NSCA's representative explained the UK's 'best practicable means' control policy, reminding delegates that tall stacks were not unique to the UK and not the sole component of the British control approach. The British workshop statement called for a Select Committee of Parliament to be established, to re-examine BPM and ensure that they would be applied from the outset on any new development, and as soon as possible on existing fossil fuel burning installations.

The resolution from the Conference as a whole was drafted and re-drafted about six times by the Chairman of the Policy group, Amin Rosencranz (Environmental Law Institute, USA). At the time of writing, the final version has not yet been received. The draft declaration was hotly debated at the last session of Conference; technical issues began to be overlaid by politics, although that element had not predominated in earlier discussions.

Interestingly, the conference discussions revealed a shift in the official Swedish position with regard to international action on limiting sulphur discharges. The Swedish Minister of Agriculture, Mr. Anders Dahlgren, had planned to address the Conference on May 11th. A government crisis prevented him from delivering his address personally; a civil servant did so on his behalf. The speech reflected Sweden's concern to get their own house in order, outlining progress in limiting the sulphur content of fuel, plans to purify and desulphurise flue gases, and the lime application programme (budgeted as Sw. Kr. 23 million for 1981/82). It also expressed Mr. Dahlgren's wish to pursue bilateral negotiations on environmental issues generally and trans-boundary air pollution in particular. Clearly, the Swedish Government accepted that no action would or could be taken immediately to limit emissions. The Swedish Government seemed to recognise that more could be achieved through negotiation with other governments than by maintaining an unacceptable hardline attitude. Finally, Mr. Dahlgren's speech emphasised the importance of the international environmental movement as creator of public opinion and supplier of information. "The acidification issue is a matter demanding environmental consciousness to a high degree as well as solidarity."