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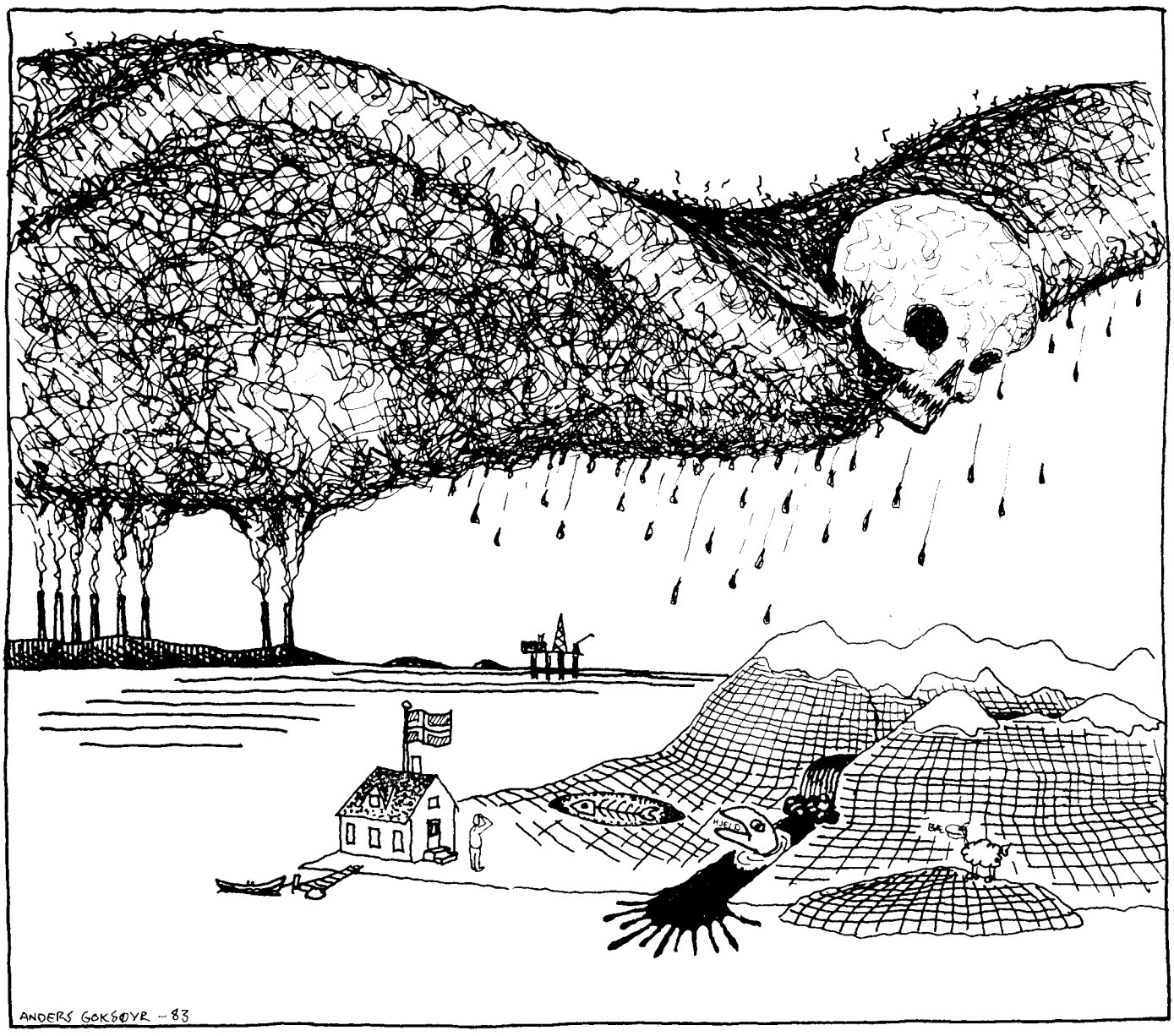
Acid News

A Newsletter from the Swedish and Norwegian NGO Secreteriats on Acid Rain.



EC ACID RAIN HEARING

The European Parliament Committee on the Environment, Public Health and Consumer Protection *recently carried out a* ***public Hearing on Acid Deposition.*** *(April 19-20 in Brussels).*

A great number of experts, researchers and representatives from both industry and environmental organisations participated and was questioned by the Environment Committee. The electricity producers was represented by **UNIPEDE,** and the environmental organisations was represented by **EEB** (European Environmental Bureau).

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EC ACID RAIN HEARING IN BRUSSELS

Some time before the Hearing the Environment Committee had sent out a number of questions, dealing with the whole issue of acid deposition. This questionnaire had been answered by the invited experts and organisations, and the answers had been put together to a synopsis, which constituted a background to the questions during the Hearing.

The main questions dealt with was:
- *Origin of pollutants*
- *Adverse effects on ecology, health and townscape*
- *Possible measures to remove damage and protect the environment*
- *Strategies and costs of measures*

The answers to the questions showed among others;

EMISSIONS

- that the emissions of nitrogen oxides (NO_x) is steadily increasing, while the increase in emissions of sulphurdioxide (SO_2) has decreased during the last ten years. (But there is still a slight increase.)

FORESTS

- that the interaction of air pollutants gives chronic imissions, leading to an accumulation off stress factors, which beyond a certain point (that now has in certain areas been passed?) leads to among others direct damage to trees. Furthermore, normally harmless stressfactors such as periods of drought or frost, insect pests etc, now has serious consequences.

CROPS

- that the lower limit for the combination of SO_2 and NO_2 below which damage on crops is **not** caused, is as low as 15 $\mu g/m^3$ SO_2 and 15 $\mu g/m^3$ NO_2.

SOIL

- that the acid deposition dissolves metal ions from the soil. For example potassium, magnesium and calcium, which are important plant nutrients, are leached out, leading to **impoverishment** of the soil. The concentrations of dissolved aluminium and heavy metals increases in both soil and water, leading to **poisoning of plant roots, microorganisms etc.**

HEALTH

- that a direct causal relationship between the concentrations of airpollutants in the athmosphere (especially SO_2) and the frequency of bronchitis and emphysem has been proven in the USA, Great Britain, Italy and other countries.

CORROSION

- that the economic demages by corrosion on metal structures only, mainly due to air poilutants, are very high. For example it is estimated to in the Nehterlands 40 million DM/year and in the FRG (Federal Republic of Germany) 1000 – 2000 million DM/year.
- that the air pollutants (mainly SO_2 and NO_x) also corrodes other materials, such as concrete, limestone, sandstone, siliceous rock, brick, glass, paper and leather.
- that the costs of conservation of historic monuments in the FRG are estimated to be at least 50 million DM/year.

MEASURES

- that Japan has developed a method of reducing the NO_x emissions from the flue gases. It is called the SCR- (Selective Catalytic Reduction) method, and means that nitrogen oxides are broken down with ammonia, which gives nitrogen and water. Today there are at least six SCR-systems working in coal fired power plants in Japan.
- that the costs for flue gas desulphurisation (80% SO_2-reduction by wet scrubber) in the FRG is estimated to add approximately 1 DPf/kWh to price of electricity for the consumer.

CONCLUSIONS

The conclusions from the press confrence after the Hearing, was that the adverse effects of air pollutants and acid deposition are obvious. So it should not be a question of wether or not to reduce emissions. The main questions to consider now should instead be **how to reduce emissions,**, and how (and by whom) it should be payed.

The "polluter pays principle" is a common way, which in reality means that the consumer pays. However, considering the enormous effects created by air pollutants, the benefits seems quite clearly to overweight the costs. OECD estimated that a 37% reduction of SO_2 emissions in Western Europe over a ten year period, would cost approximately DM 25 per person and year.

Unfortunately the industry and the electricity producers only see the costs, and not the benefits of a reduction of air pollutants. They do not (want to?) see the necessity of fast measures, but does instead point out the need for more and more research.

The environmental organisations (and indeed also most of the experts and researchers) on the other hand, stressed the importance of **urgent actions.** At this hearing they gave specific figures on needed limit values for SO_2, NO_x and O_3. And they also pointed out measures possible to be taken. For example they wanted a reduction of emissions by 50% during the coming five years by first, giving first priority to the **conservation of energy** and secondly to strongly **increase the use of low sulphur fuels.** Furthermore they claimed that electricity should not be used were it is not necessery, that is where it is possible to replace it with other energy sources.

INFORMATION NOTE

In addition there had also been put together a brief but very significant **Information Note,** containing known facts on acid deposition. This had been made by the Rapporteur Mr Munthing.
Here follows some of the points from this information note:

1. FORESTS

In FRG 560,000 hectares of woodland are designated a total damage area, i.e. total loss of productivity is expected. This damage is to be found in all the Federal States but is most pronounced in Bavaria (160,000 hectares), Baden -Wurttemberg (130,000 hectares) and North Rhine-Westphalia (more than 70,000 hectares).

According to an investigation by the German Forestry Association, damage symptoms are apparent in 2 million hectares of pine forests (half of the total German area of pine forest). The related loss of production will bring an estimated loss of 47,000 jobs in the German forestry and wood processing industry*.

* The forestry and wood processing industry in Germany provides 800,000 jobs and produces goods to the value of some 100,000 million DM per year.

This point is also followed by a number of examples of damage on woodlands and forestry in the GDR (German Democratic Republic), the Netherlands, Poland, Czechoslovakia and Yougoslavia.

The first estimates of damage to woodland and woodland soil in Western Germany (560,000 hectares) amount to DM 10,000 million. Another estimate states that an investment of this amount could reduce by half all SO_2 emissions. In view of the overall consequences of air pollution this would be a profitable investment.

2. HEALTH EFFECTS

Acid rain can harm **human health** both directly through inhalation of the pollutant gases, aerosols and particulates (particularly sulphates) and indirectly by the introduction of toxic metals into food and drinking water.

A Dutch research project into chronic non-specific respiratory infections is bringing evidence of significant increases in the number and seriousness of symptoms in the presence of greater air pollution.

The following conclusions are generally accepted:

1. SO_2 and its derivatives can damage health and even cause more deaths,
2. The presence of SO_2 together with dust and above all rust particulates is more damaging than could be assumed from the combination of the separate influences of these two components. The combination of these two materials operates synergetically and they strengthen each other's effect,
3. Sulphuric acid and perhaps even certain sulphates are more damaging for health than SO_2,
4. At all events bronchitic complaints, asthma attacks and increasing respiratory difficulties are influenced by SO_2, sulphuric acid and sulphates,
5. Although there is agreement on the above points there is no general agreement on the concentrations at which certain developments take place.

3. POSSIBLE MEASURES

Given the present state of the art it is possible to cut down emissions of all polluting substances by more than 95%. **The necessary technology exists and is financially feasible.** All that is standing in the way is political decisions and legal and legislative possibilities.

In most anti-pollution techniques the costs of removing the last 5% of the pollution are disproportionately high. For financial reasons the purification can thus best be undertaken in stages via fuel desulphurization, clean combustion techniques and flue gas purification.

Fuel economy through technical innovation can also contribute substantially to the reduction of air pollution. This is possible in transport (engines), power stations (coupling heat and power) and households (active and passive solar energy).

So far, with the exception of Japan, **dilution** (the building of high chimney stacks) is the only method which has been used. This does not in any way cut down the emission. It simply avoids acute regional levels of damage. This is however the reason why in the 70s the accumulated effects began to take on catastrophic dimensions over the whole northern hemisphere.

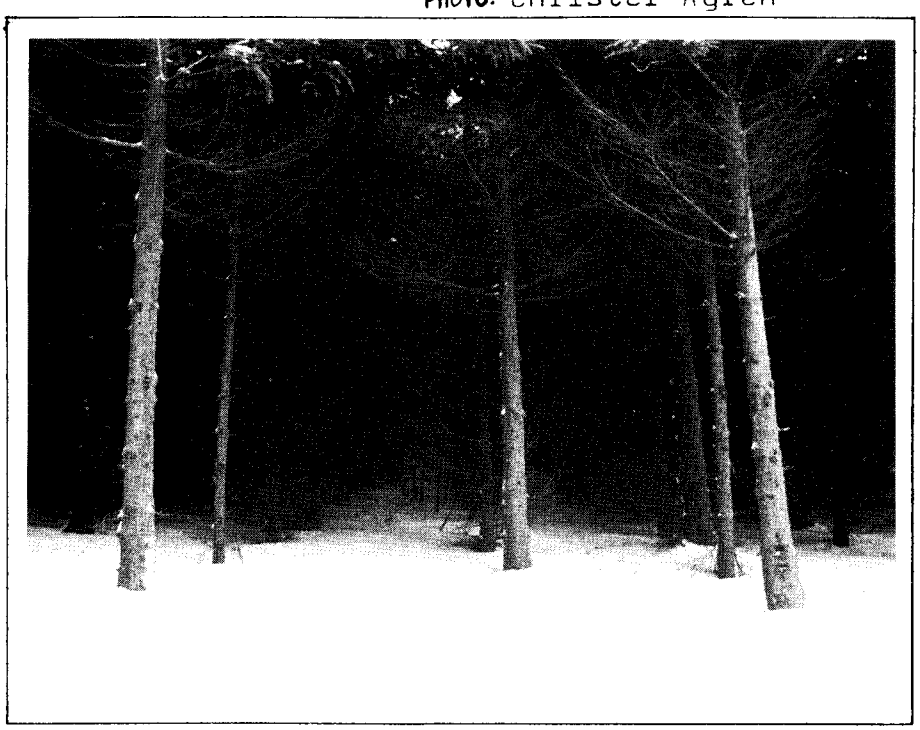
Dilution as a method of combatting high SO_2 concentrations is thus not even a temporary solution and never has been.

Fuel desulphurization can also contribute to the reduction of pollution. The cost of desulphurizing **oil** amounts to approximately 20 guilders to 50 guilders per tonne (1978 price levels).

The sulphur content of **coal** can be reduced by 15-30% at a price of approx. $1 to $20 per tonne by breaking up and washing. Coal is often washed already at the pithead to reduce the ash content.

Effective chemical cleansing methods are not attractive in economic

PHOTO: Christer Ågren



terms. On the one hand 30-50% of the energy content is lost and on the other chemical cleansing also produces its own consequences for the environment.

NO_x can be reduced by using **combustion techniques** with lower combustion temperatures and proper adjustment of the air supply. These techniques often imply **phased combustion** (i.e. on its way through the furnace the fuel is repeatedly dosed with the exact amount of combustion air required). This also avoids the formation of the products of incomplete combustion, for instance toxic carbon monoxide. This method of phased combustion is very useful for fluidized bed combustion.

In the **fluidezed bed combustion process** fine particles of coal or oil float or whirl in an upwards stream of air and very intensive combustion is thus obtained. As the coal is introduced in a mixture with grains of lime a large part of the sulphur (up to 80%) is converted into gypsum. Due to the low combustion temperatures the formation of NO_x in fluidized bed combustion is also limited without the need for any further measures to approximately 50% of the amount formed in other combustion techniques.

Where supplies go to several smaller users for whom it is not feasible to install purification plants **coal gasification** may be a solution although still a fairly expensive one.

Coal gasification produces a combustible gas from which 99% of the sulphur compunds can effectively be removed.

At the present time there are more than 100-200 coal gasification plants in operation, although most of these are for the production of NH_3 synthetic gas.

Flue gas desulphurization has been used since 1929*.

This method is generally used in Japan and since 1977 about 1,000 flue gas desulphurization units have been in operation based on 15 different processes.

Most of these processes are based, by and large, on scrubbing with wet solutions or lye. Lime or calcium carbonate is usually used as a reagent and gypsum is formed in reaction with SO_2.

In the so-called couble alkali (lye) methods a sodium sulphite solution is used as the scrubber medium and later treated with lime or calcium carbonate in order to reobtain the sodium sulphite. These processes are up to 90% efficient.
A process in which suspended particulates are captured and SO_2 removed is the spray-drying process. A watery suspension of lime or limestone is sprayed into the gas stream. The hot combustion gases cause the water to evaporate and the dry salts are usually retained in a filter.

This process is up to 80% efficient. It is a relatively cheap solution if low-sulphur fuel is used.

As regards raw materials and the problem of waste processes during which acid products are neutralized by the fly ash are also very promising.

The quantity of heavy metals in emissions can also be considerably reduced by desulphurizing coal (and using dust filters).

4. STANDARDS AND LIMIT VALUES

Various types of limit values can be set down for air pollution, for instance the permissible quantity of SO_2 (and/or other substances) in (milli) grams per cubic metre of flue gas.

A much more precise criterion is the permissible quantity of SO_2 (or other substance) per amount of electricity generated (in watts) or energy consumed (fuel in joules).

Standards may also apply to a permissible ceiling for emissions for a certain region or the permissible pollutant content in the air outdoors on average per annum and per region.

The aim of any standard is to keep average concentration and peak values in the biosphere below levels which are considered permissible or harmful. In the past the level considered permissible for policy decisions was strongly dependent on the target group. Crops seem to be more sensitive than people. Among the population too certain risk groups seem to be very sensitive.

Knowledge of **long-term effects** of low concentrations will have a growing influence on standards. In the case of **cumulative effects** in the destruction of soil fertility there is in fact no level at which pollution is harmless. If there is it depends on the speed of degradation and the chemical resources of the unaffected soil material. This applies particularly to the soil in woodlands and natural ecosystems.

In the USA for example both the National Academy of Sciences and the National Commission on Air Quality consider that an increase in SO_2 concentrations of at most 2 microgram/m^3 could be tolerated in the natural ecosystems of the national parks. This is approximately one tenth of the concentration usually found in Central Europe.

YOUTH NGO SPEECH

Speech held at the end of the hearing, by the environmental youth organisations from Belgium and the Netherlands. These organisaitons also carried out a number of actions in Brussels during the hearing.

The Belgian and Dutch youth associations for nature study and conservation, working together in the International Youth Federation for Environmental Studies and Conservation, would like to present you (the Environment Committee) on the occasion of this hearing, with a young tree, still unaffected by air pollution.

We hope that this little umbrella and, more importantly, your support for pollution control measures will contribute to stopping the further acidification of our environment.

We also hope that this hearing will not have consisted of only words in the air, but will also lead to concrete steps to effectively stop acid deposition.

Only you as decision makers, both at the national and European level, can ensure that our lives will not be entirely acidified in the future.

Thank you for your attention.

JEUGDBOND VOOR NATUURSTUDIE EN MILIEUBESCHERMING (Belgium) **(JNM)**

ALGEMEEN CHRISTELIJKE JEUGDBOND VOOR NATUURSTUDIE EN NATUURBESCHERMING (Netherlands) **(ACJN)**

NEDERLANDSE JEUGDBOND VOOR NATUURSTUDIE (Netherlands) **(NJN)**

EVERGREEN (Belgium)

INTERNATIONAL YOUTH FEDERATION FOR ENVIRONMENTAL STUDIES AND CONSERVATION **(IYF)**

Acidification and nitrogen oxides

SURVEY OF ACIDIFICATION OF SCANDINAVIAN FRESHWATER SYSTEMS; WATER CHEMISTRY OF (AIRBORNE) NO_x

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ABSTRACT

Thousands of low buffered Scandinavian freshwaters are suffering from acid atmospheric inputs. In precipitation some 70% of the acidity derives from sulfur whereas 30% is estimated to be nitric acid. In lake water sulfur plays a major role and contributes to 90% of the acidification on whole year budgets. But during spring flow more of the nitric acid enters the runoff water and then has great influence on the acidification as well as the mobilisation of aluminium.

INTRODUCTION

Acidification is a process which turns something more acid. The term includes both time and quality.

The acidification of Scandinavia started when land first appeared after the last glacial period. At that time the ground was naked, with large deposits of newly broken rocks, sand and moraine.

The percolating precipitation water became rich in alkali and bicarbonate, and pH was about neutral when the water leached from deposits of hard rocks. Water from lime deposits became lime-saturated, which means a pH of 8-8.5.

Thousands of years of leaching has gradually emptied the base content in the most unreactive soils and today the run off water has a natural pH value of 6-6.5. In lime-rich areas. however, water still remains lime-saturated with pH above 8.

The main buffering substance in water is bicarbonate. Its effect on the pH-value of surface water is shown in Figure 1.

A clear water with very little organic content will have a pH of 7 at 50-100 μequiv/l of HCO_3^-. At pH 8.4 the water is saturated with HCO_3^- which means 2500 μequiv/l if it derives from the weathering of limestone.

$$CaCO_3 + H_2CO_3 = Ca^{2+} + 2HCO_3^-$$

Normally the dissolved amount of HCO_3^- in water represents a very small fraction of the total leachable amount.
Water of pH 5 has hardly any bicarbonate left. Instead the free acid is 10 μequiv/l of H^+.

Organic material in the water behaves as a weak acid: It turns waters with neutral pH-values more acid, but leaves already acid waters at a stable value. Therefore acid clear-water lakes are acidified by stronger acids than organic material; and clear-water lakes of high pH but low alkalinity (bicarbonate) are more sensitive than many humic waters of lower pH.

Let us call this long-term denudation as well as the humic and hydrogen contributions from biological production and decomposition the "natural" acidification of soil and water.

Much of "Today's" acidification has been focussed on the contributions from the atmosphere. This amount can be estimated if values of precipitation and dry deposition are measured.

Today precipitation has a pH of 4.1-4.3 in Central Europe and Southern Scandinivia. This equals 80-50 μequiv/l of H^+ and is about ten times the natural acidity in precipitation. No wonder that naturally low-buffered waters with alkalinity less than 100 μequiv/l become acidified by this load!

HISTORICAL ASPECTS

In Scandinavia the first fish kills due to large-scale manmade acid rain probably occurred about a century ago. At that time the acidifying emissions from Europe were perhaps one fifth of today's load, and caused local effects in the most sensitive areas.

However, the emissions increased gradually. Some of the deposited emissions was accumulated in the soil, some was neutralized and some was not. About 60 years ago a Norwegian scientist (1) wrote: "A small movement in the acid direction may have fatal consequences". Already at that time salmon populations in some major South Norwegian rivers were declining.

After the second world war the acid emissions increased drastically. When the problems became acute among the emitters, purfication by the tall stack philosophy saved the town people, but increased the problems for aquatic life a thousand km away.

Today the acidification has become the most serious environmental problem to low-buffered fresh waters in Southern Scandinavia. The reason is the low ability of the soils to neutralize the acid inputs from the atmosphere. The soil content of calcium is often less than 200

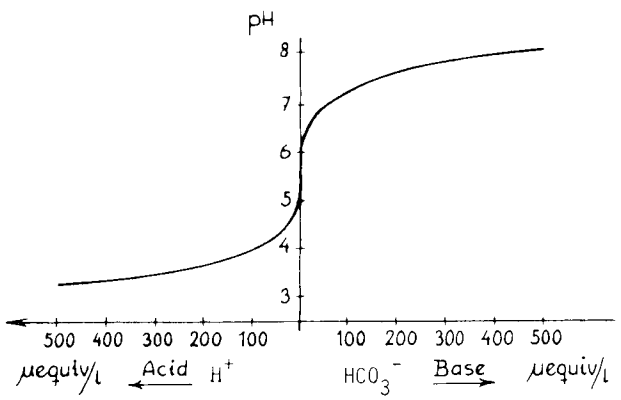


Fig. 1. Relationship between pH and HCO_3 or H^+ concentration in clear waters.

Kg Ca per hectare and dm to be compared to more than 10 000 Kg Ca in the non-sensitive areas in Europe.

The acidification in the past can be measured fairly well by biological tracers if these only tolerate defined pH-intervals. Figure 2 shows the acidification of a Swedish West Coast lake since 1900 as measured by the frequency of different diatom algae in the lake sediment. Since about 1950 the lake water pH has decreased from 6 to 4.5. (ref.2)

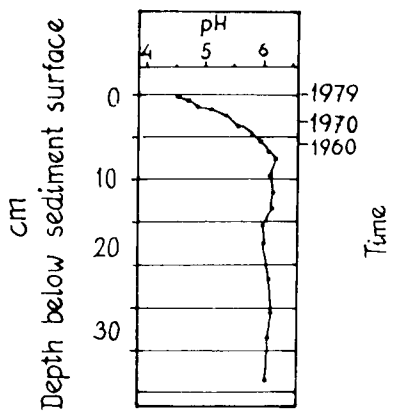


Fig. 2. pH values since the early 1900 analysed by diatom studies of different layers of the sediment (ref.2)

GEOGRAPHICAL DISTRIBUTION OF ACIDIFIED FRESHWATERS IN SCANDINAVIA

The critical pH in lake or river water is not the medium or the median value but the lowest value found or a combination with the highest reactive amount of aluminium. This appears, of course, at high flows. In Southern Scandinavia about half of the total area has a water quality of pH 6 or less during some time of the year. At this value the most sensitive species of plants and animals are already in danger. Below pH 5 the whole natural ecosystem is broken down. In Northern Scandinavia the acid loading is much less and injuries are found only in the most dilute waters which now have pH 5. For Central Europe and Great Britain as a whole the acidification effects are much less dramatic. Nevertheless acidified lakes and brooks with the typical biological injuries are frequent in the low-buffered areas.

Sweden

The number of lakes is about 90.000. These have a total area of 40.000 km^2 and they occupy 9 per cent of the country (450 000 km^2). The acidification of freshwaters is documented since 50 years and a pH decrease in the most acidified waters by 1-2 pH-units is certified by chemical or biological methods like diatom studies in sediments. Extrapolated from measurings in thousands of waters, around 18.000 lakes corresponding to 10 per cent of the total lake surface area, today have pH below 5.5. Brooks and small rivers of a total length of 90.000 km have pH below 6, and 20.000 km have below pH 5. In one fourth of the country the majority of the waters have reached unacceptable acidity during some time of the year. (ref.3)

Norway

The total number of lakes is 230.000 and a large proportion of those are located in a high precipitation area with a geological environment that is extremely resistant to chemical weathering and with very small amounts of glacial deposits. In the four southern-most counties more than half of the fish population has been lost during the last 40 years. Today lakes in more than 13.000 km^2 of South Norway are practically devoid of fish and in an additional 20.000 km^2 the fish stocks are reduced. The acidification has been certified both by chemical and biological methods. (ref.4)

WHAT ACID CAUSES ACIDIFICATION?

In Scandinavia the amount of sulfuric acid in precipitation has been estimated at 60-70 % and nitric acid to 30-40 % of the total acidity. The nitric acid portion is highest during winter.

Table 1 shows some characteristic precipitation values from Southern and Northern Scandinavia 1978-80. (ref.4,5)

Table 1	pH	H^+	SO^{2-}_4	NO^-_3
		μequiv/l		
Southern Sweden	4.1	80	85	40
Southern Norway	4.2	70	80	40
Central Sweden	4.3	50	60	30
Northern Sweden	4.7	20	20	10

When studying the long-term precipitation chemistry one finds that the sulfate increase occured two decades ago, whereas the nitrate is still increasing by about 3 % per year, Table 2. This may be explained by a greater proportion of dry deposited sulfur, which in turn may be due to the fact that the growing acidity of the air counteracts any further increase in oxidation of sulfur dioxide to sulfuric acid. (ref.6)

With the present trends nitric acid will be the major acidifying substance in precipitation after the year 2000.

Table 2. Changes in concentrations of sulfate and nitrate in precipitation in Southern Scandinavia. Each figure is the median of yearly mean values, obtained over 5 years, from about 15 stations. (ref.5)

	1955 -59	1960 -64	1965 -69	1970 -74	1975 -79
		μequiv/l			
SO^{2-}_4	55	90	90	90	85
NO^-_3	15	20	25	35	40

It is not the whole acid deposition *per se* however, that affects the freshwaters, but the part that falls directly on to the water surface and the land deposited part that reaches the runoff water unneutralised.

Normally lakes with small catchment areas are the most vulnerable and the first ones to become acidified.

Because nitrate is a major nutrient for land and water plants much of it will be stored in the ecosystem during the vegetation season.

Whole year budgets of sulfate and nitrate in precipitation and runoff water from different parts of Scandinavia show a greater retention of nitrate, 80-90 %, than of sulfur (Table 3).

Because of the smaller retention of sulfate it remains as the most important anion in the acid lake waters. Figure 3 shows the annual variations of SO^{2-}_4, NO^-_3, H^+ and Al in a small acid lake on the Swedish West Coast. The nitrate portion is highest during winter but never exceeds 10 % of the sulfate level.

But the greater the percentage of lake surface and the area of heath rock barrens, the greater the flux of the deposited nitrate from precipitation to runoff water. Figures of only 74 % retention have been found for whole year budgets (ref.9)

Lake Unden in South Central Sweden may illustrate the increase of nitrate from atmospheric deposition during the last 15 years.

The lake surface area is 30 % of the total catchment area. Here much of the nitrate is not consumed by plankton due to the extremely low phosphorus level of the lake water (~ 5 μg P/l).

EFFECTS OF SPATES ON WATER QUALITY

During high runoff periods with low biological acitvity, for instance the spring melt, the retention of NO^-_3 is even smaller than the figure of 75-90 % for the whole year.

In small catchment areas studied in Norway the input and output become almost equal, and as the buffering capacity of the soil is as smallest during this period, a great portion (about 70 %) of the nitric acid in snow appears unneutralised in the brook water (ref.10)

In brook water in a mountain in Central Sweden the pH fell from 4.9 to 4.4 in the spring of 1972 and the nitrate content was trebled from 70 to 240 μg of NO^-_3 N/l when the snow melted. That year, the snow had a pH of 4.2 and a nitrate content of 600 μg NO^-_3- N/l (ref.11)

Since several mountain brooks have natural low alkalinity values especially during spring flows they will become acidified to critical values if acid from either sulfur or nitrogen has been deposited in the snow pack.

MECHANISMS BEHIND THE SULFATE AND NITRATE RETENTION

As was mentioned in the previous chapter any retention of sulfate or nitrate in the catchment area reduces the acidity of the runoff water. In the case of sulfate the mechanisms involved are chemical sulfate adsorbtion or biochemical sulfide reduction. As for nitrate corresponding mechanisms are biological denitrification or biological nutrient uptake.

The chemical sulfate adsorbtion is favoured by acid conditions i.e. high concentrations of soluble iron and aluminium. Therefore much sulfate can be retained in the acid mineral soil.

Nitrate, on the other hand, reacts in the opposite way as nitrate reducing bacteria are sensitive to low pH and high aluminium concentrations. Also vegetation is suffering when the soil gets acid and results in a reduced uptake of nitrate.

When nitric acid is supplied to the soil but not consumed by biota, it increases the acidity of the soil and runoff water. However, at the same time it reduces the leaching of sulfate. Figur 5 shows a lysimeter experiment which perhaps reflects what might happen in nature: The higher the NO_x load the less the sulfate leaching. (But the higher the sulfur load the *higher* the nitrate leaching, because biota does not like acid).

	SO_4-S in	out	Retention %	NO_3-N in	out	Rentention %
Southern Sweden	12	25	0*)	5	0.5	90%
Southern Norway	16	26	0*)	7	1	85%
South Centr Sweden	10	9	10%	3	0.3	90%
North Centr Sweden	8	4	50%	2	0.2	90%
Northern Sweden	6	3	50%	1	0.1	90%

*) In Southern Sweden the dry deposition of sulfur is at least equal to the amount in wet deposition. (And five times higher than in Northern Scandinavia). Therefore some of the total deposited sulfur even in Southern Scandinavia is to be stored in the catchment area.

Table 3. Precipitation input (wetdeposition) and runoff output of sulfate and nitrate during the 1970's. Kg per hectare and year (ref. 4,7,8)

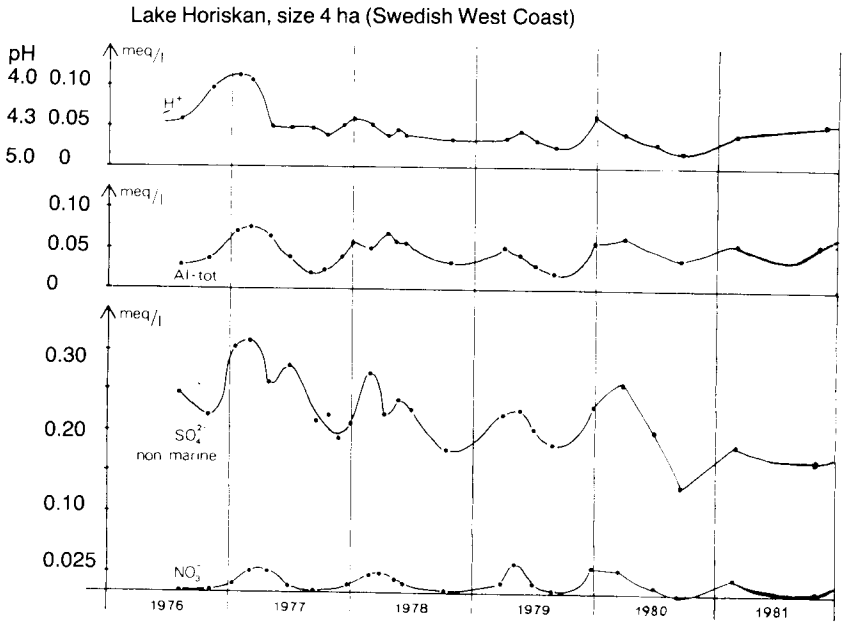


Fig.3. Concentrations of sulfate, nitrate, aluminium and hydrogen ions in a small lake on the Swedish west coast 1976–1981. (ref.12)

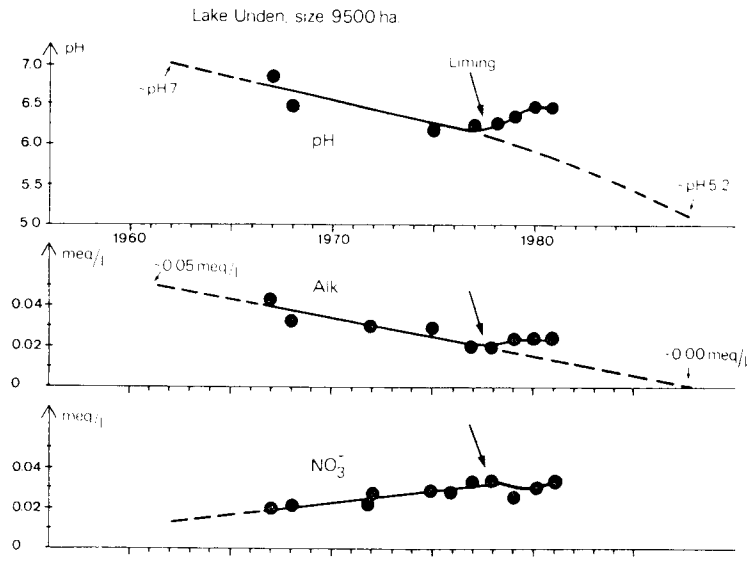
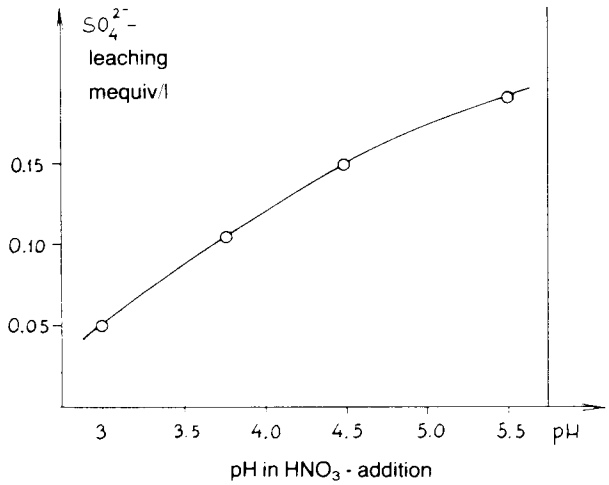


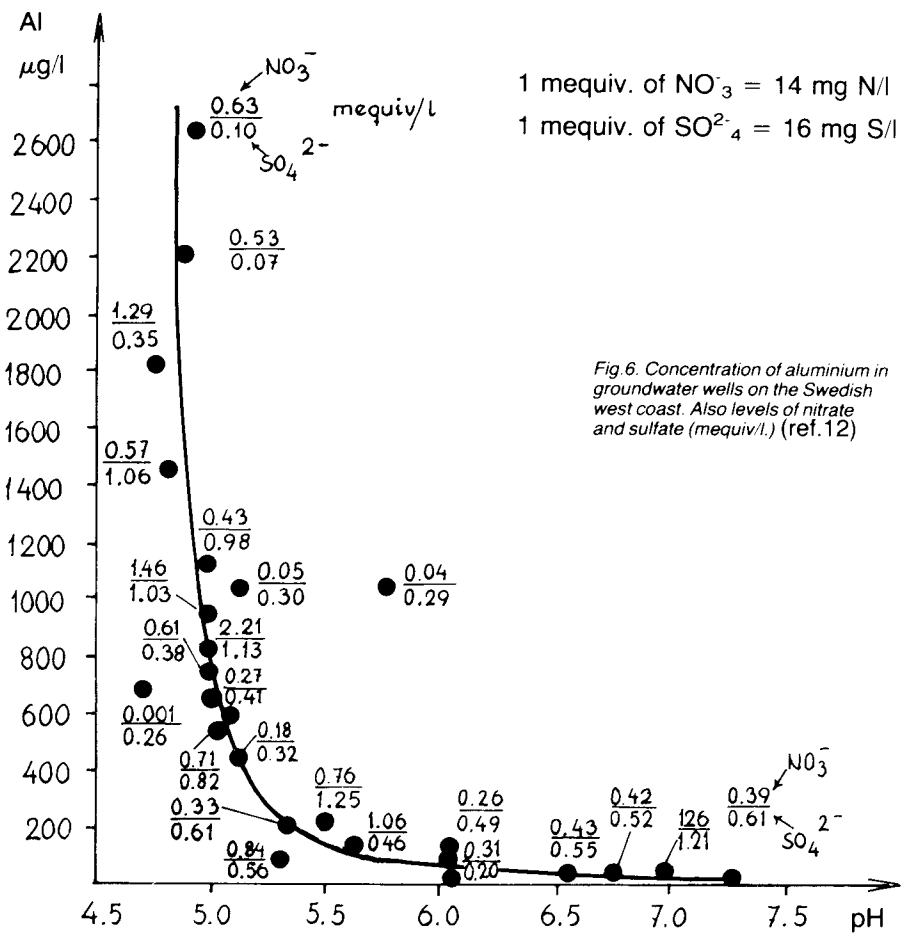
Fig.4. Alkalinity decrease and nitrate increase in lake Unden 9500 hectares. The lake was limed in 1978, which gave a slight increase in alkalinity. (ref. 12)

Fig.5. Leaching of sulfate from forest soil lysimeters after additions of acid from HNO_3. (ref.12)



ACID GROUND WATERS

During the last decade much attention has been directed towards the increasing number of acid ground water wells on the west coast of Sweden for reason of health and corroded copper pipes.
Here acid ground water often has noticeable high amounts of nitrate: about as much as of sulfate. Extremely acid waters sometimes have much more nitrate than sulfate. (Fig 6) Perhaps this is due to the mechanisms mentioned above: Denitrification becomes disturbed in acid soils; the leaching of nitrate increases, while sulfate is retained.
As mobile anion nitrate is even more effective than sulfate in mobilising aluminium which is stored in the soil. Values above 2000 µg/l of aluminium have been found in acid ground water.



1 mequiv. of NO^-_3 = 14 mg N/l

1 mequiv. of SO^{2-}_4 = 16 mg S/l

Fig.6. Concentration of aluminium in groundwater wells on the Swedish west coast. Also levels of nitrate and sulfate (mequiv/l.) (ref.12)

CONCLUSION

Further attention has to be paid to the increasing amount of NO_x deposited from the atmosphere. Today many freshwaters show increasing levels of nitrate. This might indicate that the nitrogen need of the biota is gradually becoming "saturated". Then acidification follows.

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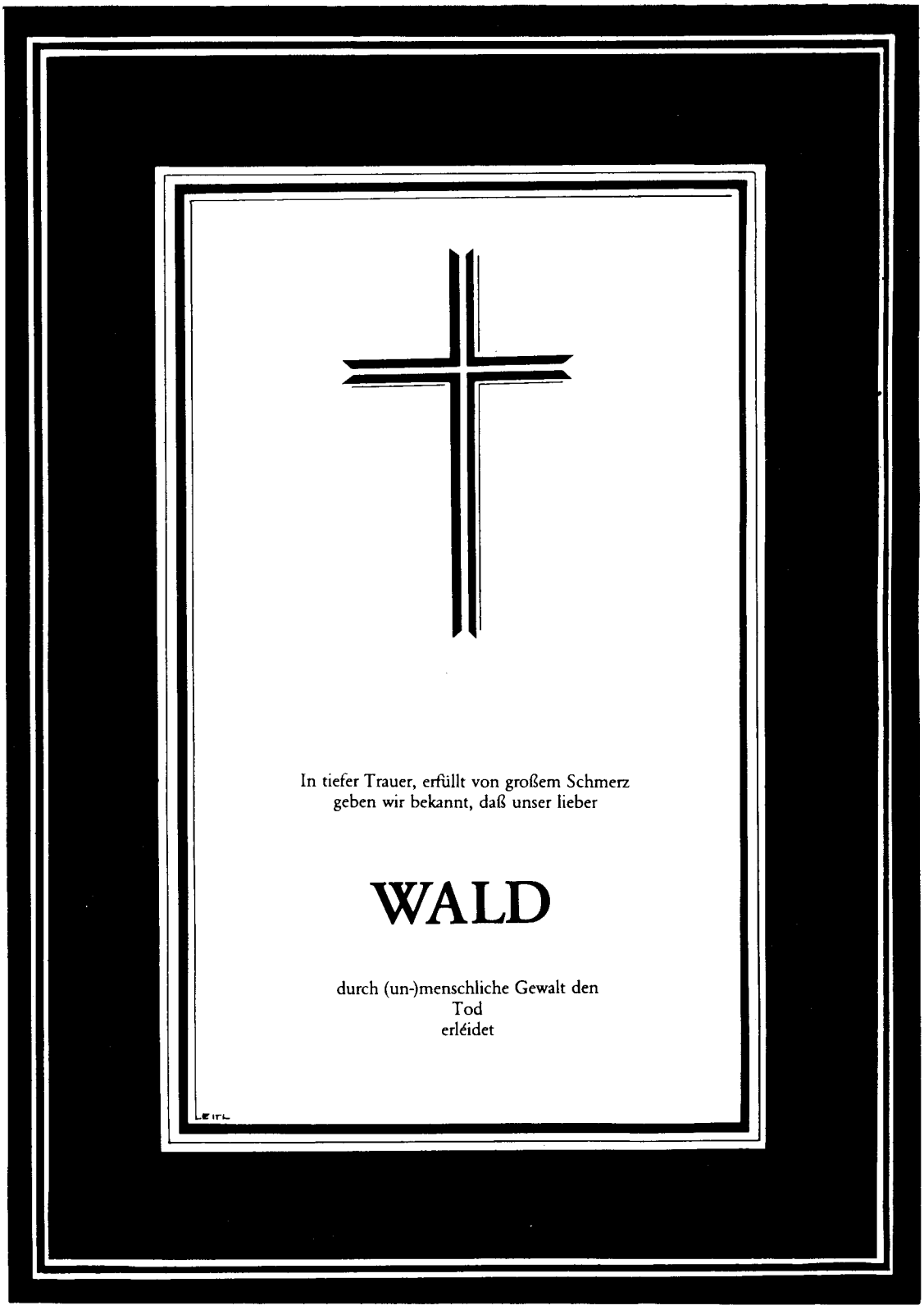

A leaflet made by Österreichischer Naturschutzbund,
Arenbergsstrasse 10
A-5020 Salzburg
Austria

ACID RAIN FILMS

CANADIAN ACID RAIN FILMS ARE SUDDENLY POPULAR IN THE USA

In the wake of the U.S. Justice Department's finding that two Canadian films about acid rain are "political propaganda" ("Acid News" 2/83) and that the films' producers, the National Film Board of Canada, must register as a "foreign agent," the two films have been in wide demand.

The films, available from many Canadian consulates, are entitled *Acid Rain: Requiem or Recovery* and *Acid from Heaven.*

Amidst outcries from many quarters that the Justice Department's action is a blatant attempt to restrain free debate and discussion, and, as such, violates American traditions and constitutional practice, the Canadian government has adopted an attitude of bemused detachment. Evidently the Reagan administration fears the arguments made in the films. Evidently, too, the flap raised by the Justice Department has given the films lots of free publicity. The Canadian Consul in San Fransico assured this reporter that he was delighted with the U.S. Justice Department's action: Requests from private groups wanting to exhibit the films have increased several-fold, and public interest in the acid rain problem has heightened considerably in the U.S.A.

When the films are shown to American audiences, they are preceded by a caption identifying them as "political propaganda." Audiences typically greet this designation with a jeer.

Armin Rosencranz

INTERNATIONAL CONFERENCE: ACID PRECIPITATION – ORIGIN AND EFFECTS

The conference is arranged by Verein Deutscher Ingenieure; Kommission Reinhaltung der Luft. It is held in Inselhalle Lindau, Lake Constance **in southern West Germany at June 7 – 9, 1983.**
For further information, please contact:
VDI-Kommission Reinhaltung der Luft, P.O.B. 1139, D-5000 Düsseldorf 1, BRD

International Prize

International prize goes to Norwegian Acid Rain researcher

Lars N. Overrein, director of the Norwegian Institute for Water Research, has been awarded the **European Nature and Environment Protection Prize** for 1983. Lars Overrein was in charge of the Norwegian research project "Acid precipitation – effects on forests and fish" 1972 -80, and it is for this work that he has received this distinction.

Lars Overrein tells Acid News that he sees the prize as a recognition of the collaboration that it proved possible to establish on the subject of Acid Rain research in Norway from the early 1970s onwards.

The Johann Wolfgang von Goethe Foundation states in its motivation for the award of this year's prize to Lars Overrein that his involvement in this issue has done a great deal to make the problems of Acid Rain known internationally. We asked Lars Overrein what he thought about the present international climate, as compared with that prevailing a few years ago. He told us:

"We are at least in process of finally breaking through the barrier that existed, in that people were simply refusing to accept Acid Rain as a problem. We have achieved an important basis on which to continue building, both scientifically and politically. What has led people in Central Europe to change their views is above all that they now actually ***see*** *the problems, to which they were previously blind."*

In what fields is it now most important to deploy the greatest resources for research?

"Intensive research is necessary into changes in the soil, and in the quality of the water as a result of the accumulation of heavy metals. Also, naturally, we have to continue our research into the damage caused to forests in Central Europe, to establish more precisely what proportions of that damage can be ascribed to Acid Rain."

The fertilizing of forests has been proposed as a way of reducing the damage ...

"Yes, and it may be effective, but it does not constitute a solution to the problem. We can perhaps equate it with the liming of water. It will take a long time before it is possible to establish the results of measures like this."

Lars Overrein adds that the scientific lead that Norway has acquired in connection with the above-mentioned research programme means that it has important obligations in the international context. Norway must press on with its efforts, and continue the investigations it has started to monitor current development.

How do you evaluate extra-Parliamentary opinion in the context of Acid Rain?

"I have the impression that the politicians are in fact paying more and more attention to the interests of our natural environment. In many cases, public opinion can be decisive in bringing an issue to the fore. That opinion, however, must be based on objective findings; and in the case of opinion on the subject of Acid Rain, I believe the politicians responsible have now realised that it has on the whole very sound evidence behind it."

Trygve Aas Olsen

EDUCATIONAL SEMINAR

An educational seminar on acid rain was held on March 11 – 13 in Tilburg, just at the border between the Netherlands and Belgium. The seminar was arranged by **the Dutch Speaking Region of IYF.** About 50 persons from more than four different youth organisations participated. The main organisations were **ACJN** and **NJN** (the Netherlands) and **JNM** and **Natur 2000** (Belgium).

There were held lectures by researchers and experts, films and slide series studied, exqursions made etc. At the end of the seminar was a big discussion about possible acitivites to stop acid rain. Among others one decided to carry out a lot of locally based activities, such as public lectures, exhibitions and different kinds of actions. There was also decided to together carry out several actions and a presscon-ference at the same time as the EC Hearing on Acid Deposition in Brussels (19-20 April).

Together the organisations have formed a coopeation group called **"ZURE NEERSLAG THEMA GROEP".** If you want more information about this, please contact:
ZURE NEERSLAG THEMA GROEP
c/o Pieter Mogrée
Kaninefatanlaan 4
NL-7312 HN Apeldoorn, the Netherlands

Photo: Christer Ågren

ACID RAIN BOOKS

- **"LETZTE CHANCE FUR DEN WALD?** - Die abwendbaren Folgen des Sauren Regens" (141 pages)
  from Verlag des Bund für Umwelt und Naturschutz Deutschland
  Landesverband
  Baden-Würtemberg e.V.
  Erbprinzenstrasse 18, D-7800
  FREIBURG, BRD
- **"STIRBT DER WALD?** - Energiepolitische Voraussetzungen und Konsequensen" (225 pages)
  by Hermann Graf Hatzfeldt (Hrsg.)
  from Verlag C.F. Müller
  Rheinstrasse 122, D-7500
  KARLSRUHE, BRD
- **"SAURER REGEN** - Ursachen, Folgen und Gegenstrategien" (104 pages)
  by ÖKO-INSTITUT
  from Verlag Adolf Bonz GmbH
  D-7012 FELLBACH-OEFF
  INGEN, BRD
- **"WIE KRANK IST UNSER WALD?"** (28 pages)
  by Günther Reichelt
  from B.U.N.D. Verlagsgesellschaft m.b.H.
  Erbprinzenstrasse 18, D-7800
  FREIBURG, BRD
- **"Immisionsbelastungen von Waldökosystemen"** 58 pages A4)
  by Landesanstalt für Ökologie, Landeschaftsentwicklung und Forstplahnung
  Nordrhein-Westfalen
  Leibnizstrasse 10, D-4350
  Recklinghausen, BRD
- **"Ecological Effects of Acid Deposition"** (340 pages)
  Report and background papers from Expert Meeting 1 at the 1982 Stockholm Conference.
- **"Strategies and Methods to control Emissions of Sulphur and Nitrogen Oxides"** (192 pages)
  Report and background papers from Expert Meeting 2 at the 1982 Stockholm Conference.

Both these reports can be ordered from:
The National Swedish Environment Protection Board
Box 1302
S-171 25 SOLNA, SWEDEN

ACID NEWS FROM THE U.K.

environmental groups met in London at the end of March to discuss ways in which acid rain pollution could be countered within the British isles.

Two priorities were decided upon; **the need for more information and publicity,** for interested groups and for the general public, and the necessity of **building up information** about Britain's contributions to acid rain, both inside its own borders and through pollutants exported to mainland Europe. While quite a lot of use has been made of information and pamphlets from the Scandinavian countries, we felt it was important to include material produced in Britain itself, and have decided to first publish a **short report** for British groups, followed by **educational material** and if possible a film strip. A loose-knit **"acid rain information group"** was formed and material will either be published by this body or through the individual organisations involved.

A CAMPAIGN IS COMING

Research work is likely to take place through Earth Resources Research, an independent research group concentrating on environmental issues. Initial investigation will be little more than a thorough survey of already published papers and reports from abroad, and within the UK, to accumulate a consensus on the scope of the problem and the viability of the various control methods suggested, and the likely net costs to the consumer. Later, more specialised areas may be studied in greater detail. With the evidence in hand, we should be ready to launch a far stronger **campaign** towards the end of the year, either by forming a single-issue group (like "Clear" which campaigns against lead in petrol) or by a coalition of existing groups.

ENVIRONMETAL GROUPS COOPERATING

The last few years have seen a steady accumulation of evidence about Britain's role as an exporter of acid rain, despite the shrill denials of the Central Electricity Board and the government. Our failure to agree any controls of sulphur emissions has led to ill-feeling in the Scandinavian countries and frustration among our own environmental bodies. Now, **evidence of acidification within Britain itself is growing,** adding to the pressure for action to reduce the pollution. Accordingly, a number of people from several UK

Britain has certainly got off to a shamefully slow start as regards acid rain pollution. Perhaps we can put some of this to rights over the coming months; judging by the enthusiasm that has greeted the initiative among British groups acid rain could become a major issue here in the near future.

Nigel Dudley, April 1983

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ACID NEWS FROM THE U.K.