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Nordic Council of Ministers

The Nordic Sea and Air Quality Group

Cleaner air for our lungs



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Nordic cooperation

Nordic cooperation is one of the world's most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and three autonomous areas: the Faroe Islands, Greenland, and Åland.

Nordic cooperation has firm traditions in politics, the economy, and culture. It plays an important role in European and international collaboration, and aims at creating a strong Nordic community in a strong Europe.

Nordic cooperation seeks to safeguard Nordic and regional interests and principles in the global community. Common Nordic values help the region solidify its position as one of the world's most innovative and competitive.

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Preface

The solution to air pollution, acidification and eutrophication problems affecting the Nordic countries must be found in Europe. Emissions from other countries and long-range transboundary air pollution are responsible for a large proportion of the pollution load in the Nordic region, and as such, this must form the basis for Nordic cooperation in this area.

Nordic cooperation within the sphere of air protection has existed since the 1960s (Nordforsk and the Nordic Council of Ministers), and it has led to many successes over the years, in particular the creation of the Convention on Long-range Transboundary Air Pollution (CLRTAP) and the protocols on financing and further measures that have followed on from this convention. The organisation created under CLRTAP, which involves working groups from different specialist fields, has also played a significant role. The importance of the EU has grown over the past few years through the emergence of the Clean Air for Europe programme, commonly known as the EU's CAFE programme. The resulting European Thematic Strategy on Air Pollution, which was presented recently, will play an important role in the ongoing development of air protection measures within the Nordic region.

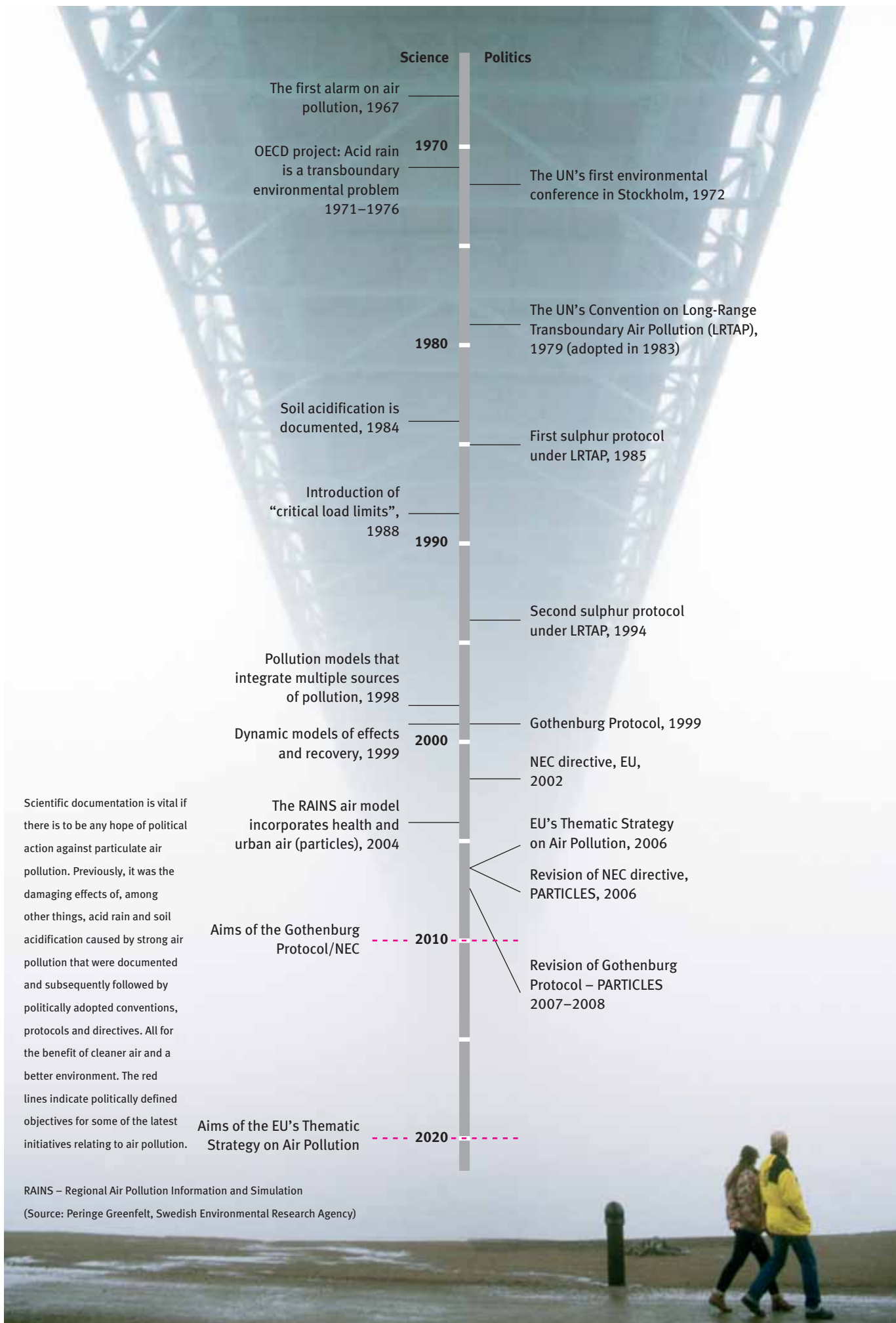
The Nordic Air Quality Group came about as a result of the Nordic Council of Ministers' activities in 1983, and the Nordic Sea and Air Quality Group was created in 1993. Nordic cooperation in the 1980s and 1990s and at the beginning of the twenty-first century has played a central role, particularly as regards CLRTAP, the Gothenburg Protocol, the heavy metal and POP protocols and the EU's CAFE programme with its emission ceilings and air quality directives.

We have so far been unable to meet our environmental goals as regards acidification and air quality in the Nordic region – emissions from Europe are simply too high. Continued close Nordic cooperation will give us valuable opportunities to limit emissions not only in the Nordic region but also in Europe as a whole, to improve air quality and to reduce deposition. It is important, at the European level, that we try to harmonize measures designed to solve air protection and climate issues.

One clear and obvious aim is to bring about a decision on a new EU emissions directive for sulphur oxides, nitric oxides, volatile organic hydrocarbons, ammonia and particles for 2020, with significantly lower emission ceilings compared to those which have been set for 2010.

Despite the existence of the successful long-term Nordic cooperation efforts in the air pollution area, awareness and knowledge of these activities is limited in the Nordic region. The present brochure is designed to fill this knowledge gap. It is aimed at organisations and private individuals with an interest in environmental protection issues, in particular air protection problems and ways in which these may be resolved.

Lars Lindau
Spokesman for the Nordic Sea and Air Quality Group



We must combat particulate air pollution

Generally speaking, the air we breathe in the Nordic region has become cleaner. The air quality, however, is still questionable due to the invisible but dangerous particulate air pollution, which is particularly serious in towns and cities. And that is something the Nordic countries would like to change.

We may not be able to see it or feel it – but we can provide evidence to show that the air in the Nordic region is now less polluted in a number of ways. Just consider, for instance, the previously unregulated lead emissions from petrol. Or the emissions of sulphur and nitrogen that were so high they caused acid rain and led to deforestation and the death of numerous lakes and elves in several Nordic countries. Thankfully, things have improved – not least as a result of the Nordic countries' joint efforts and their strong commitment to the environment over the past 20–30 years. Efforts which through the international organisations within the EU and the UN, have been aimed at shaping conventions and protocols in the area of air quality.

Unresolved problems

Despite these successful results, unresolved problems remain as far as the quality of the air is concerned. One of the greatest problems is the invisible pollution of the air in our towns and cities caused by fine and ultrafine particles which evade the filters on chimneys and cars, or are emitted from heavy diesel vehicles and privately-owned wood-burning stoves. Through atmospheric measurements, we know that between 20 and 40 percent of total particle emissions in the Nordic region stem solely from small local or privately-owned wood-burning stoves. Pollutant particles which originate from other countries and sometimes half-way around the world, however, also contribute to this problem. Particulate air pollution is something which we have only recently realised poses an extreme risk to human health, and as a result this is an issue which has been very much in the limelight in recent

years in the Nordic region. This is also the reason particles are the main focus of this brochure.

Nordic cooperation

The small Nordic countries play a not insignificant role internationally by cooperating in the area of air quality. Today, this work is carried out by the Nordic Sea and Air Quality Group, which brings together specialists and experts from the environmental authorities in the various countries involved. In the area of air quality, the Group contributes scientific knowledge and joint recommendations for new agreements and rules within the EU, as it did for the ground-breaking United Nations LRTAP Convention from 1979. The aim of the Group's efforts in the area of air quality is to reduce the air's content of pollutants so that it does not exceed levels that may damage the environment or human health. This is one of the stated goals in the Nordic Environmental Action Plan 2005–2008, under which the Nordic Sea and Air Quality Group works.

Huge reduction in air pollution

Emissions of sulphur dioxides, nitric oxides and ammonia from power plants and district heating plants, traffic and agriculture have fallen by 65, 30 and 20 percent respectively since the beginning of the 1980s. Lead emissions have been reduced to effectively zero.



Six steps towards cleaner air

The following six case studies have been chosen for two reasons. Firstly, they illustrate the efforts being made in the Nordic countries to increase our knowledge of harmful particulate air pollution. Secondly, they are significant examples of Nordic initiatives and successes in this area. The six case studies describe only initiatives which, in one way or another, are backed by the Nordic Sea and Air Quality Group. This backing may come in the shape of direct financial support for research projects, or indirect support in the form of participation by individual group members in working groups within the Nordic setting which contribute specialist input to the EU or the UN.

About the Nordic Sea and Air Quality Group

The Nordic Sea and Air Quality Group's most important undertaking is to prepare background material – including strategic proposals – for joint Nordic participation in international bodies in connection with negotiations pertaining to sea and air quality. This takes place within the framework of the Nordic Environmental Action Plan 2005–2008. The Group's activities all fall within these two principal themes, i.e. the environment and health in relation to the quality of the air and the sea.

For further information about the Nordic Sea and Air Quality Group and the Nordic Environmental Action Plan, go to: www.norden.org/hlg

Particles are not just particles

Below is a list of the different sizes of particles that pollute the air:

Description	Size (diameter) in μm (one micrometre = one thousandth of a millimetre)
Nanoparticles	less than 0.02
Ultrafine particles	less than 0.1
Fine particles	less than $2.5 = \text{PM}_{2.5}$
Coarse particles	less than $10^1 = \text{PM}_{10}$

PM_{10} = the mass of all particle sizes up to $10 \mu\text{m}$, $\text{PM}_{2.5}$ = the mass of all particle sizes up to $2.5 \mu\text{m}$, etc. Coarse and fine particles are primarily calculated by weight, while ultrafine particles in particular are calculated by numbers as they constitute an infinitesimal part in weight terms in relation to the coarser particles.

Substances that pollute the air

In addition to *particles*, a number of other substances also contribute to air pollution. Some of these are mentioned in this brochure. The main sources of such substances are power plants and other energy plants, traffic, agriculture and industry.

- **Gases:** SO_2 : sulphur dioxides; NO_x : nitric oxides; NH_3 : ammonia; CO: carbon monoxide; CO_2 : carbon dioxide; O_3 : ground-level ozone.
- **Heavy metals:** mercury (Hg); lead (Pb); cadmium (Cd).
- **Organic compounds:** VOCs: volatile organic compounds; PAHs: polyaromatic hydrocarbons; POPs: persistent organic pollutants.

Particle-related deaths to be reduced

The level of particulate air pollution in the Nordic region is relatively low. Even so, we are seeing the same, serious health consequences as in the more polluted central and southern parts of Europe. The big question is why – and the NORDAIR project is designed to find an answer. The aim is to lower the incidence of serious health problems.

Within the past 10 years, a number of international studies have shown that breathing in toxic particles in the air damages people's health. Not enough is known, however, about just how damaging the different types of particles are, or precisely how they affect the body. In the Nordic countries, research is therefore increasingly being conducted into these small particles and their effect.

Several Nordic projects focus on the health effects of breathing in particles from e.g. wood-burning stoves because this type of particulate air pollution is wide-spread but very poorly researched in the Nordic countries. Other projects have looked at the effect of breathing in particles from urban traffic.

"This is an issue that we cannot afford to ignore in the Nordic region if the authorities want to reduce the level of particulate air pollution to which the population is exposed," explains Raimo O. Salonen from the National Public Health Institute in Finland. He is the coordinator for two projects, NORDAIR and NORDAIR-BIOS, which deal with both local and long-range transboundary particulate air pollution. He continues:

"Model calculations conducted under the EU's Clean Air for Europe (CAFE) programme have estimated that out of a total European population of approx. 450 million inhabitants, some 350,000 people with chronic coronary heart disease or respiratory disorders die prematurely every year as a result of particulate air pollution. If we look at the population as a whole, this figure corresponds to a reduction in the average life expectancy of a few months, but for the vulnerable individuals in question, it can mean losing up to ten years

of their lives. In the Nordic region, which has a total population of approx. 24 million inhabitants, we estimate that there are around 9,000 premature deaths a year."

Raimo Salonen explains further:

"It's surprising that the figure is so high here in the Nordic countries since the levels of particulate air pollution are generally lower here than in central and southern parts of Europe. Even so, we're seeing some of the same health effects here as in Central and Southern Europe."

The most important thing for Raimo Salonen is to identify the most harmful types of particles from local sources, and to examine their chemical composition. He would also like to quantify the risks posed by long-range transboundary particulate air pollution from Central Europe.

This kind of knowledge would provide the necessary basis for identifying the most suitable and cost-effective measures to be taken across the EU. It would, for instance, allow us to identify the sources of pollution that can and must be tackled most effectively.

Researchers in the Nordic region have thus far only conducted short-term studies lasting, at the most, a few months. These studies have examined the health consequences of daily variations in the particle content of the air. Raimo Salonen points out that long-term studies, like those conducted in the US, are needed in order to establish the long-term health consequences.



Examples of Nordic studies:

- **Finland:** Epidemiological studies have shown that even the relatively low particle concentration in the air in Helsinki is associated with an increased risk of e.g. respiratory problems and coronary heart disease.
- **Denmark:** In one study, researchers found changes in the DNA of the white blood cells of test subjects who breathed in ultrafine particles from traffic whilst cycling along a cycle route in Copenhagen. These changes indicate that the ultrafine particles trigger a biological response, but the exact health consequences are not known.
- **Sweden:** Under the Swedish SNAP programme, researchers have studied the effect of particles on allergies and other respiratory diseases as well as coronary heart disease. A number of high-risk groups have been studied in order to identify the extent of exposure so as to link this to the determination of exposure limits.
- **Norway:** Epidemiological studies have shown a correlation between the relatively low levels of air pollution and serious health effects. The research seems to indicate that it is not just the fine particles, but also the coarse particles from tyre wear, that have a negative effect on health. Particles from wood-burning stoves and long-range transboundary air pollution seem to trigger inflammatory reactions in the body's cells. The particles found in urban air, particularly those which stem from vehicle exhaust fumes, seem to increase the development of allergies in animal experiments, and to increase the allergic reaction to an allergen.

Health risks associated with breathing in particles:

- Premature death
- Coronary heart disease
- Lung disease and asthma
- Possible increase in allergic effect

Vehicle exhaust fumes, tyres and brakes

It is important to measure the particulate air pollution caused by traffic, not least so that we can learn more about the pollution from roads, tyres and brakes, which is one of the least studied aspects of particulate air pollution. Among other things, the results will be used to improve European air models, which form the basis for more stringent EU regulations on traffic.

Take a deep breath while you're on a busy urban street, and you will be inhaling hundreds of thousands of minute polluted particles with every cubic centimetre of air. A significant amount of these particles, in particular the fine, ultrafine and carbon particles, stem from exhaust fumes. Others stem from roads, tyres and brakes – these are termed coarse particles, although they are not particularly large (more than 2.5 µm in diameter). Finally, some stem from long-range transboundary particulate air pollution, i.e. pollution which originates from other countries and regions.

We have to know more about particulate air pollution from traffic in order to do something about it. Ten groups of researchers in Denmark, Norway, Sweden and Finland have therefore joined forces to launch the NORPAC project. The aim is to contribute new knowledge both nationally and internationally, particularly as regards local pollution from roads, tyres and brakes, which is the least researched area in this field.

Matthias Ketzel from the National Environmental Research Institute of Denmark (DMU), project leader for NORPAC, explains:

“The Nordic countries are affected by a number of common problems in this area. We want to know, for instance, how much studded tyres contribute to particulate air pollution since the use of such tyres is widespread in Norway, Finland and Sweden. Long-range transboundary particulate air pollution from Central Europe is another shared problem that affects all the Nordic countries.”

Matthias Ketzel and his colleagues analyse data from monitoring stations in the four capitals – Copenhagen, Stockholm, Oslo and Helsinki. In order to differentiate between the different particles, they are measured at street level, on the roofs of buildings in urban centres and outside urban areas.

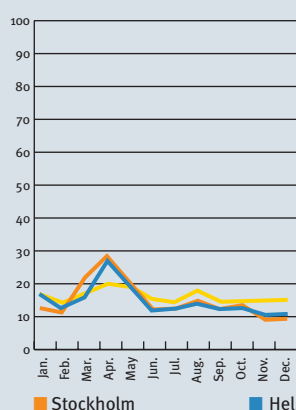
The particles are measured, weighed and analysed at the various stations. Matthias Ketzel explains:

“We measure the total mass of particles, for instance, by passing the air through a filter which is weighed before and after the particles have been captured. In addition, we measure the number of particles sorted according to size using a particle counter. In order to establish whether the particles stem from exhaust fumes or from roads, tyres or brakes, we look at the chemical composition and size of the particles. Time variations and the correlation to e.g. temperature and weather can also tell us something about the origins of the particles.”

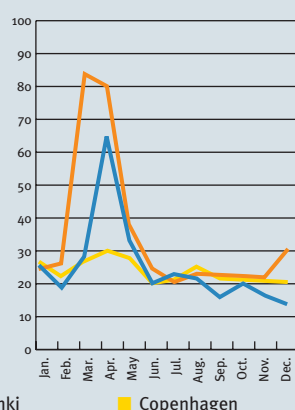
The aim is for the Nordic researchers to use this data to further develop local transport and distribution models for particles in towns and cities, and to improve and refine the European EMEP air model (Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe) to render it more precise. This is important since these models are used, amongst other things, to establish pollution limits in the EU and elsewhere.



Urban background



Street level



The figure shows the annual variation of coarse PM_{10} particle concentration in Stockholm, Helsinki and Copenhagen respectively. Shown are the mean monthly values for 2004 measured for urban background pollution (on the left) and street level pollution (on the right). The high concentrations of particles recorded in spring (February–April) in Stockholm and Helsinki in particular are the result of, among other things, road dust from cars with studded tyres which is stirred up from the street, along with minute particles of the sand which is spread on roads in winter for traffic safety reasons.

Pollution worst at street level

Example of concentration of coarse particles (PM_{10}) in Copenhagen:

Street level	30–40 $\mu\text{g}/\text{m}^3$	– measured in busy streets
Urban background	23 $\mu\text{g}/\text{m}^3$	– measured on roofs of buildings in urban centre
Long-range transboundary	20 $\mu\text{g}/\text{m}^3$	– measured outside urban area

The particulate air pollution is almost twice as high at street level as it is outside the urban area. A great deal can therefore be done locally to reduce pollution. If we look at the distribution of particles at street level, some 50 percent stem from long-range transboundary pollution, around 40 percent from the individual street, and some 10 percent from other urban streets.

Source: Matthias Ketzel, National Environmental Research Institute of Denmark (DMU).

For further information about NORPAC, go to <http://norpac.dmu.dk>

For further information about the EMEP air model, go to <http://www.emep.int>

Wood-burning stove regulations

By now, most people are aware that wood-burning stoves pollute the air in the local environment. Unlike traffic pollution, however, there are no common rules or regulations as regards emissions from wood-burning stoves. The Nordic countries intend to lobby for the introduction of EU legislation in this area.

A good fire in a wood-burning stove on a cold day – there's nothing quite like it. Studies in the Nordic countries have shown, however, that when large numbers of wood-burning stoves are lit, the quiet suburban streets may become just as polluted with fine particles as the most heavily trafficked streets in the city. This is particularly likely to happen on cold, calm nights when the polluted particles accumulate in the small towns at the bottom of the valleys in e.g. Norway and Northern Sweden. It can also be a problem in ordinary residential areas in both Denmark and Finland.

The particles, which stem from the burning of wood and other bio-fuels in small wood-burning stoves and furnaces, have been shown to constitute a significant share of total particle emissions in the Nordic region – up to 20–40 percent, which is very high in relation to the rest of Europe. Despite such findings, this type of pollution is still not covered by emission ceilings in the same way as emissions from power plants and cars.

As a result of the intense focus on the harmful effects of small particles on human health, the Nordic countries are assessing the necessity to limit pollution from wood-burning stoves. They agree, however, that the conclusive factor will be the introduction at EU level of shared rules and requirements pertaining to emissions. This has involved the acquisition of additional knowledge.

Several Nordic projects have therefore focused on obtaining an overview of stove types and sizes, their use and the levels of particles emitted in the various Nordic countries. In overall terms, the situation may look the same everywhere, but the results of the projects have shown that many different types of wood-burning stoves, sauna stoves and masonry stoves are used, and that emissions from one type of stove to the next may differ by up to a factor of 1,000. We also know that the extent of the pollution depends to a large degree on whether or not people use their stoves correctly, i.e. whether they use dry, clean wood for instance.

Another aim of the Nordic projects is to enable researchers to standardise measurements and rankings so that emission data will be directly comparable, and so that emissions may be brought under control. Finally, researchers aim to examine the technical possibilities of reducing pollution and the costs involved therein.

The next step will be to submit a joint Nordic proposal pertaining to particles from wood-burning stoves for negotiation at the international discussions within the EU, with a view to introducing EU legislation in this area.



Norway leads the field

“Since 1 July 1998, Norway has had legislation governing the type of wood-burning stove that may be installed in homes,” says Eli Marie Åsen from the Nordic Sea and Air Quality Group, who works at the Norwegian Ministry of the Environment.

Eli Marie Åsen elaborates:

“When you buy a new wood-burning stove in Norway, it has to comply with a Norwegian standard that ensures efficient combustion and lower emissions, achieved with the addition of an afterburner or a catalyst. Laboratory tests indicate that the levels of suspended dust particles emitted by old stoves are, on average, 5–6 times higher than the levels of particles emitted by the newer stoves. To speed up the replacement of stoves, authorities in individual cities, such as Oslo, have

given financial support to families that have chosen to replace their old stove with a new stove that complies with current requirements.”

According to Statistics Norway, some 335,000 households in Norway have gone over to the new technology, and new Norwegian measurements have shown that the emission of particles (PM₁₀) from wood-burning stoves during the period July 2004 to June 2005 was around 25 percent lower than they would have been with the old stoves. The potential for further reductions is huge, therefore, if we consider the fact that there are more than 800,000 wood-burning stoves in use in Norway alone.

Read more about wood-burning stoves in the Nordic countries in the report entitled “Particulate matter emissions and abatement options in residential wood burning in the Nordic countries” ANP 2004:735. The report is available at: <http://www.norden.org/pub/miljo/miljo/sk/ANP2004735.pdf>

Reduction in long-range transboundary air pollution

The ground-breaking Gothenburg Protocol is scheduled for review. This is an occasion for the Nordic countries to request the inclusion of limits pertaining to long-range transboundary particulate air pollution in the agreement.

The Gothenburg Protocol, which was adopted in 1999, is the crowning glory of our efforts to combat long-range transboundary air pollution caused by sulphur, nitrogen and ammonia in Europe. It played a crucial role in reducing damaging emissions of these substances, in particular sulphur, to such a degree as to avoid deforestation and acid rain across Europe – a true environmental success story. A story we would like to repeat by securing the inclusion of long-range transboundary particulate air pollution in the agreement.

Lars Lindau from the Swedish Environmental Protection Agency is the spokesman for the Nordic Sea and Air Quality Group. He says:

“Unlike the acidification problem, which first and foremost affected the Scandinavian countries, it will be easier to convince the rest of Europe of the need for action as regards particulate air pollution. The majority of other European countries are experiencing as many, if not more, health problems as a consequence of these particles as the population in the Nordic region. We are therefore confident that the issue will be included in the new, revised Gothenburg Protocol.”

Long-range transboundary particulate air pollution is a problem which the Nordic countries have been working on for a number of years.

Lars Lindau explains:

“Scientific documentation is incredibly important if you harbour any hope of securing political intervention. Now that the Gothenburg Protocol is up for revision, we generally have far more data available than we did at the start of the nineties when people were only just beginning to recognise that the particles posed a problem. The Sea and Air Quality Group, for instance, has contributed a lot of data over the years to both

the EMEP air model and the Regional Air Pollution Information and Simulation model, RAINS.”

The EU’s so-called NEC Directive (directive on National Emission Ceilings), which is an offshoot of the Gothenburg Protocol, is also due for review since new and more stringent limits need to be established for 2020. Lars Lindau expects the particle issue to be included here too, partly as a consequence of the EU’s Thematic Strategy on Air Pollution. Alongside the review of the NEC Directive, the EU Commission is also revising a new emissions directive for, among other things, vehicle exhaust fumes, energy production and shipping.

Lars Lindau continues:

“Our Nordic contribution to the NEC Directive illustrates the most cost-effective way to tackle the air problems in the EU, while taking into consideration the very low critical exposure limits in the Nordic countries. In practical terms, it is impossible to live up to the critical exposure limits completely, because these limits imply that only very minor damage to the environment in the sensitive parts of the ecosystems is acceptable.”

Asked about future efforts to improve air quality, Lars Lindau explains:

“In the Nordic region, we must press ahead to link different initiatives in the areas of air and climate change. It is also important to launch initiatives designed to reduce air pollution from shipping, and to link air pollution initiatives in the agricultural sphere with water pollution initiatives. We must also continue the work being done in the Nordic countries to improve emission data, to refine our distribution models for particles, and to look at health effects and the consequences of nitrogen fallout.”



Air pollution control – a historical perspective

The cleaner air in the Nordic region is, first and foremost, the result of the UN's breakthrough Convention on Long-range Transboundary Air Pollution, known as the LRTAP Convention, which came into force in 1983. The convention, which was proposed as early as 1976 by the Nordic environment ministers, set in motion the work to control

long-range transboundary air pollution, which affected the Nordic countries in particular. A total of eight international protocols have been adopted since, including the very important Gothenburg Protocol, alongside a number of directives such as the EU's NEC Directive and legislation to limit air pollution in many countries.

For more information on the Convention on Long-range Transboundary Air Pollution, or LRTAP, go to: www.unece.org/env/lrtap

For more information on the eight protocols under LRTAP, go to: http://www.unece.org/env/lrtap/status/lrtap_s.htm

For more information on the RAINS model, go to: <http://www.iiasa.ac.at/rains/Rains-online.html?sb=8>



Clean air in the EU

The EU's CAFE programme has led to the development of the EU's first joint air protection strategy for Western Europe, including a new directive proposal for improved air quality. This is a victory not least for the Nordic countries, who are the recipients of high levels of pollution from the rest of Europe.

The Nordic countries have contributed in various ways to the EU's CAFE (Clean Air for Europe) programme, which was launched in 2001. This work has led to the formulation of the EU Commission's Thematic Strategy on Air Pollution, published in autumn 2005. This is the first joint strategy for the reduction of air pollution across the whole of Western Europe, and it is crucial because the implementation of all the existing directives and regulations alone is not enough to resolve the air pollution problems – or the ensuing health problems – in Europe. The strategy was finally adopted by the Council in spring 2006, despite resistance from some countries. The next phase of the EU's CAFE programme is to implement the Thematic Strategy for 2020.

Lars Lindau from the Swedish Environmental Protection Agency, who is the spokesman for the Nordic Sea and Air Quality Group, says:

“By joining forces, the Nordic countries have successfully helped shape the EU Commission's work on the air strategy, just as we helped shape the historic LRTAP Convention in 1983 and the Gothenburg Protocol in 1999. One example is the development of EMEP's particulate matter model, which has been backed by a number of the projects carried out by the Nordic Sea and Air Quality Group.”

As far as the Nordic countries are concerned, the most important thing is for the proposed new emissions directive for 2020, yet another result of the EU's CAFE programme, to be adopted and implemented in accordance with the Thematic Strategy on Air Pollution. The new emissions directive is a good starting point for solving a number of the air problems affecting the Nordic countries, many of which are the result of

long-range transboundary air pollution from central European countries.

The new directive is designed to further limit the health effects of small particle air pollution (PM_{2.5}) and to reduce ozone, acidification and eutrophication through a range of stringent emission limits in all 25 EU member states. The proposed new emissions directive is expected to be presented in 2007.

But there are a few other things in the pipeline as well, explains Lars Lindau:

“The proposed directive and the Council's final document on the air strategy also explore the possibility of formulating emissions directives for vehicle exhaust fumes, shipping, agriculture and energy production. Action must be taken in these areas, not least because there is an important link between CO₂ emission and climate policy by way of energy savings, traffic engineering solutions and a reduction in the use of fossil fuels. Any solutions to the air and climate issues must therefore go hand in hand.

“The Nordic countries will continue to work towards the successful completion of a far-reaching emissions directive for 2020, which must be ready to be adopted by the Council and the Parliament in 2008/2009,” explains Lars Lindau before continuing:

“One pressing question for the EU's CAFE programme and the Nordic countries over the next few years, however, is whether the member states will be able to comply with the emissions directive already in place until 2010.



The EU's Thematic Strategy on Air Pollution

The Thematic Strategy establishes a number of provisional targets for a reduction in air pollution within the EU, and proposes a range of measures designed to achieve these targets. The overall aim is to protect the citizens of the EU against dangerous particles and ozone in the air, and to safeguard the European ecosystems against acid rain, excessive nitrogen and ozone.

Compared with 2000, the following targets must be achieved by 2020:

- SO₂ emissions must be reduced by 82 percent
- NO_x emissions must be reduced by 60 percent
- VOC emissions must be reduced by 51 percent
- NH₃ emissions must be reduced by 27 percent
- PM_{2.5} emissions must be reduced by 59 percent
- Ground-level ozone emissions must be reduced

The EU's CAFE programme and the EU's Thematic Strategy on Air Pollution come under the Sixth Community Environment Action Programme.

For further information, go to:

<http://europa.eu.int/comm/environment/air/cafe/index.htm>

Hemispheric pollution

In the Northern Hemisphere, pollution is transported by powerful air currents to the farthest parts of the globe, including Greenland and other sensitive arctic regions. This is a problem which can only be resolved through Nordic cooperation.

Under certain meteorological conditions, the air in Europe and the Nordic region may be polluted with substances that have been transported here via the powerful atmospheric air currents from places far away, including the United States. In addition to particles, the air may contain a number of other dangerous substances such as ozone, mercury and other heavy metals, as well as persistent organic compounds – the so-called POPs. In the same way, the citizens of the US may end up breathing in pollutants which originate from China or elsewhere in Asia.

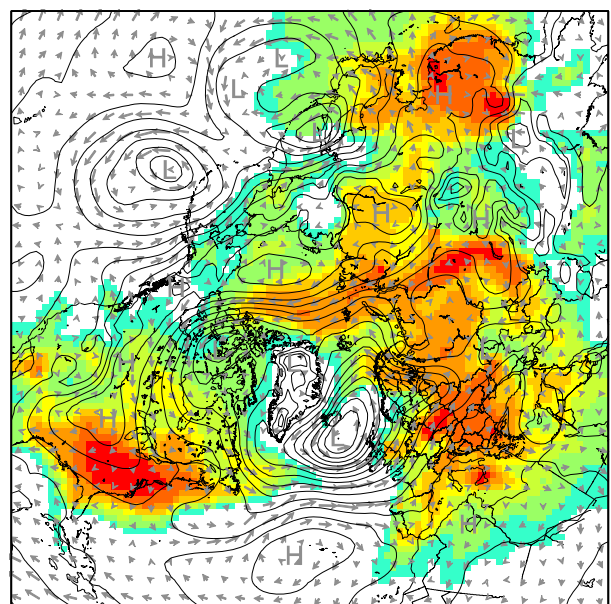
This phenomenon is known as hemispheric air pollution because we are dealing with pollution which is transported via the atmosphere around the earth in both the Northern and Southern Hemispheres. It is precisely this type of air pollution that the Nordic countries have begun to pay particular attention to. The reason is partly that air pollution is increasingly to be found in the environment in both Greenland and the arctic regions, and partly that the dangerous substances are increasingly found in the blood of the inhabitants of these areas.

Lars Moseholm, research manager at the National Environmental Research Institute of Denmark (DMU), and member of the Nordic Sea and Air Quality Group, lists a number of reasons why hemispheric pollution is in the limelight at the moment:

“Firstly, the Nordic countries have a particular responsibility for the state of the environment in the Arctic, and here researchers have recorded the effects of hemispheric air pollution in the form of very high levels of pollutants transported to the region by air currents from distant corners of the globe. The majority of the mercury, for instance, comes from coal burning in China and India.

Secondly, satellite measurements have given researchers far more information on just how these pollutants are transported between the different continents.

Thirdly, researchers are worried that the current climate changes around the globe will bring even more pollution to the far North since the air currents, cloud formations and high and low pressures over the continents will change as the climate changes. Gulf stream changes, for instance, bring about the possibility that the atmospheric air currents will move northwards. The result would be an even greater increase in airborne pollution in Greenland and the Arctic. And it is precisely this problem that the Nordic countries want to see tackled before it is too late.”





Gemensam nordisk dokumentation är viktig

För att kunna ingripa effektivt mot den hemisfäriska luftföroreningen, t.ex. genom globala avtal, måste man känna till föroreningen och dess transportvägar så detaljerat som möjligt. Det innebär kunskap om källorna, klimatet, ämnenas kemi, biologin samt siffror från en lång rad mätstationer på jorden.

< Ett exempel på hemisfärisk förorening

Figuren är ett exempel på hur koncentrationer av svaveldioxid (SO_x) i luften vid jordytan sprids på det norra halvklotet. Grönland ses tydligt ca. mitt i bilden, medan konturerna av USA, Europa, Ryssland, Asien och Nordpolen kan anas under färgangivelserna. Rött och orange anger höga koncentrationer av svavelförorening vid föroreningskällorna i USA, Europa, Ryssland och Asien. En atmosfärisk transport av svavel ses också över Nordpolen. Gult, grönt och blått anger lägre svavelkoncentrationer efterhand som de sprids i atmosfären. Exemplet har beräknats med den Danska Eulerska Hemisfäriska Modellen (DEHM) på bakgrund av data från den 3 januari 1991 kl. 13:00, dansk tid.

Källa Jesper H. Christensen och Jørgen Brandt,

Mot den bakgrunden bygger forskarna upp datormodeller, som blir allt mera komplicerade i takt med den ökade kunskapen. Och det är här som betydelsen av de nordiska ländernas samarbete blir viktig, både forskningsmässigt och politiskt. Om de vetenskapliga nordiska miljöerna samstämmt kan dokumentera både källor och skadeverkningar i bl.a. Arktis, då får man också större möjlighet att ställa krav på en begränsning av luftföroreningen och kan förhoppningsvis påverka även de största aktörerna på globalt plan.



norden

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Cleaner air for our lungs

This brochure contains six articles which illustrate the way in which researchers in Denmark, Finland, Norway and Sweden are collaborating under the auspices of the Nordic Sea and Air Quality Group to gather information on the harmful particulate air pollution that causes an estimated 9,000 premature deaths in the Nordic countries every year. Their overall aim is to reduce particulate air pollution.

Particulate air pollution is a serious and as-yet unresolved problem, which only came to light some years ago. Particulate air pollution is the term for the invisible ultrafine particles from, amongst other things, traffic and wood-burning stoves that pollute our urban spaces.

For this reason, particulate air pollution is a high-priority issue in the Nordic Environmental Action Plan 2005–2008 – and a problem which the joint Nordic Sea and Air Quality Group is working actively to resolve in both scientific and political terms.

For further information about Nordic environmental initiatives, go to:
www.norden.org/hlg

