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NORDMILJØ
NORDICENVIRONMENT

Actions against climate change needed

The Nordic countries are showing the way

Nordic people are in general very fond of nature and in the Nordic countries there is a long tradition of preserving and protecting the environment.

Now the Nordic countries have central positions during the 15th Conference of the Parties (COP15) to the United Nations Framework Convention of Climate Change. Denmark is the official host and Sweden is holding the presidency of the European Union. Hence, the eyes of the world are looking north.

The ongoing financial crisis cannot be used as an excuse not to try to find solutions to our major future challenges, where climate change is the most important one. International work to find solutions to the climate issue is a great ambition for the Nordic countries. At the time being, there is a growing global demand for new technological solutions and products that can mitigate CO_2 emissions and lay the foundation for sustainable development. The Nordic countries are at the forefront internationally in these areas, but now it is important to do even more in terms of innovation, research and technological development. The Nordic countries want to be in the lead when it comes to renewable energy sources and energy efficiency. The purpose of this newsletter is to show examples of our climate and energy research.

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Pathways towards two degrees – what can be done and what will it cost?

The environmental challenges have to be met by creating competitiveness with new innovative ideas and methods. Nordic countries' working together has an important role to fill in this, especially when it comes to showing that it is possible to combine economic growth and environmentally friendly production. By doing this, a green society can be created and climate change combated.

PHOTO JOHANNES JANSSON/NORDEN.ORG

Many countries support the idea that the increase in the global mean temperature should not exceed two degrees Celsius compared to pre-industrial times. According to the IPCC (Intergovernmental Panel on Climate Change), this is the maximum increase that will allow for adaptation to climate change. However, many ecosystems are fragile, and may not be able to adapt to a rapid change in the climate. Even below two degrees, the impact on many ecosystems might exceed their adaptive capacity and the effects may be irreversible. The report *Pathways towards 2 degrees* analyses ways to keep the temperature increase within the two-degree limit and discusses also how global emissions will have to develop for this to happen.

It is a challenge to prevent climate change

There are various pathways that can be taken in order to reach the emission reduction goals, but in the long run they all imply a significant reduction in emissions. All the pathways lead to a temperature increase of two degrees by the end of the century, and all have at least a 50 per cent chance of succeeding.

In order to have a 50 per cent chance of meeting the two-degree goal, total emissions should not exceed 2000 billion tons of CO2 equivalents (GtCO2eq) over the period 2000–2050. An accumulation of 1500 GtCO2eq would increase the chance of meeting the limit to 75 per cent. Between 2000 and 2010 total emission is estimated to be 500 GtCO2eq, i.e. 25 per cent of the maximum allowed emissions up to 2050 to have a 50 per cent chance of succeeding.
Four generic options for global emission pathways are presented. They have in common that they all require urgent action to achieve their target.

Greenhouse gas emissions from forests and agriculture are included in the analysis.

There are various political actions and agreements that may be taken in order to meet the two-degree limit. However, since greenhouse gases (GHGs) remain in the atmosphere for a long time, a reduction anywhere on earth helps stopping the increase in the concentration of GHGs. Both developed and developing countries therefore need to reduce their emissions. The report proposes different ways of financing the reduction in emissions. For instance, developed countries, beyond mitigating their own emissions, could also finance emission reductions in developing countries by buying emission offsets.

Everybody has to contribute

How much will it cost to reduce emissions? The report *Climate Policy: Costs and Design* presents some recent numerical studies on the matter. First of all: the larger the participation, the lower the cost. This is why both developing and developed countries have to contribute to mitigation. The countries covered by the Kyoto Agreement only account for about one third of the emissions in 2010.

	Probability of meeting 2°C	Year of peak	Maximum decline (% per year)	Global emission level (relative to 1990 level) 2020	2030	2050	Cumulate emissions 2000 to 2050 (GtC02eq)
Immediate action	75%	2011	6%	-7%	-46%	-75%	1500
Accelerated action	75%	2013	10%	12%	-44%	-90%	1500
Steady decline	50%	2015	3%	29%	-2%	-47%	2000
Guardrail	50%	2017	8%	34%	8%	-68%	2000

PHOTO NIKOLAJ BOCK/NORDEN.ORG

Achieving the Kyoto target will cost 7.4 times more than if participation was global. This shows how important it is to reach a global climate agreement with full participation.

Both mitigating emissions now and not preventing climate change now will cost money. It is important to find the right balance between the two. Ideally, one should aim at minimising the discounted sum of mitigation costs and climate change costs. Optimisation of this type will give a time path for the marginal mitigation cost, called the carbon price. The price tells us how we should reduce emissions: any emission reduction that costs less than the carbon price should be implemented. The carbon price depends on three factors: mitigation costs, climate change costs and the discount rate. The assumed discount rate is important for the result of an optimisation, since the majority of climate change costs will occur in a more distant future.

It is not just about the money

Some climate change effects will appear in the form of a reduction in the amount of non-market goods. These include a loss of biodiversity, effects on human well-being, extreme weather events and conflicts. If the amount of manufactured goods increases rapidly, the relative price of non-market goods is expected to increase, which means that future climate change costs will be much higher than most analyses predict.

The costs of reducing emissions increase the stricter the climate target is, the higher 'business as usual' emissions are and the higher the mitigation costs are. Most of the studies considered in the report calculated the costs of stabilising CO2 concentrations at 450 ppm, which would correspond to a temperature increase of 2.5–3 degrees. Cost estimates vary a lot, even though the climate targets are the same. Some studies predict that stabilising emissions at 450 ppm CO2 would cost less than two per cent of GDP, while others expect the cost to be considerably higher. The results of the analyses depend a lot on the assumptions made. Some of the analyses include carbon capture and storage technology (CCS), and some push the costs into the future, which makes them appear smaller due to discounting. Future technological developments will be important for the costs of achieving any emission target. Some analyses show that by not allowing CCS and restricting the proportions of solar and wind energy of total energy consumption, mitigation costs in 2050 will increase from 3.9 per cent to more than 7 per cent of GDP. ■

The melting of the Arctic region will affect the whole world

The Arctic climate is changing drastically and rapidly and the effects will be considerable on a global scale. For instance, if the present warming trend continues, melt-water from the Greenland ice sheet together with melt-water from other ice sheets and ocean thermal expansion will contribute to a rise in sea level of around one metre this century.

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This is not the only result of the climate warming. The climate issue is an international challenge that demands international answers and international efforts. The Nordic countries want to show that it is possible to combine a national climate policy with concern for the world around, both when it comes to us and to the generations of the future.

It is quite likely that the Arctic Ocean could be ice-free in the summer as early as 2015-16, if the present melting trend continues. Also, the permafrost both in Greenland and more generally throughout the world is warming, and in some areas thawing. Currently, for example the construction regulations do not take this into account. Because of these combined effects road damage has been noticed and further damage to infrastructure is likely in the near future.

These facts were presented at a scientific conference on climate changes in the Arctic held in Nuuk, Greenland earlier this autumn. The conference was part of the FreshNor-project (Freshwater Budget of the Nordic Seas, http://freshnor.dmi.dk). ▶

Nordic nature is changing

However, not only the Arctic region is fragile; Nordic nature is too. The report *Signs of Climate Change in Nordic Nature* developed a list of indicators that demonstrate how nature in the Nordic countries is being affected by climate change.

By applying a total of 14 indicators it is possible to monitor ecosystems in the Nordic area. These indicators describe, for instance, how a warmer climate will affect fish and plankton stocks as well as the pollen and growing seasons of plants. Climate change could, for example, make life harder for people allergic to pollen, since the pollen season will be prolonged. In some Nordic countries the pollen season is already up to a month earlier than in the 1980s.

Polar bears on involuntary diet

One phenomenon in the project is changes on the polar bear. It has been observed that polar bears are getting slimmer due to the changing climate. This development is linked to the fact that the ice in the Arctic region is breaking up earlier and earlier every year. Due to the earlier break-up of the ice, polar bears' access to seals has dwindled. In just two decades, the average weight of a female polar bear has decreased by 25 per cent to 225 kilograms in some Arctic regions. If current trends continue, polar bears will not just become thinner but over time they might disappear from some Arctic regions, according to the report. ■

Major Nordic investment in climate projects in developing countries

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The Nordic Development Fund (NDF) will invest EUR 14 million in climate projects in developing countries. Some of the beneficiaries include solar energy projects in Uganda and Rwanda. The effects of the climate warming are greatest on the most vulnerable countries. In these countries resources and knowledge to meet the challenges is scarce. By helping these countries, the Nordic countries can help reduce the effects of the climate change.

The Nordic countries and Europe have a dynamic inner market. This market is based on the four freedoms of people, goods, services and capital. It is, however, also important to focus on the fifth freedom – the free movement of knowledge. The support channeled through the NDF will, besides investments in renewable energy, also be spent on transferring of knowledge and technology to some of the poorest countries of the world.

The EUR 14 million forms the start of a bigger amount of no less than EUR 1 billion, which will be donated over 35 years.

"We are very happy to be able to begin our work on climate efforts in the poorest countries of the world. Climate change brings great challenges to these countries. Thanks to its experience and established co-operation with other financiers, the NDF is able to support developing countries in their climate work", says Helge Samb, MD of the NDF.

NDF, the Nordic countries' joint instrument for funding aid, has been issuing credits to developing countries for two decades. This is the first year of its push to help fund climate programs in poor countries. The decision to revamp the NDF was taken in May by the Ministers for Nordic Co-operation.

"Through the NDF, the Nordic countries, with their environmental knowledge, will be able to give adequate help where it is needed. At the same time we are showing the world that the Nordic region is a forerunner with a great commitment to global challenges", says Halldór Ásgrímsson, the secretary-general of the Nordic Council of Ministers.

The projects will be financed in co-operation with the World Bank, the Asian Development Bank, the Ministry for Foreign Affairs of Finland and the Nordic Environment Finance Corporation (NEFCO). ■

www.ndf.fi

The Nordic building sector has great potential to become more energy-efficient

The Nordic countries have great opportunities to develop and commercialise sustainable energy solutions such as biomass-, water-, wind-, and geotechnology, and not the least techniques for energy efficiency. Here the Nordic countries have to expand their co-operation, create better conditions for entrepreneurs and become better at spreading their knowledge around the world.

Together, across all borders, it is possible to create sustainable development in the Nordic countries with a good life quality and belief in the future as common goals. To make this happen there is, however, a great deal of work to be done. One area that has to be more energy efficient in order to achieve sustainable development is the building sector.

To reduce emissions from the building sector it is of great importance to increase the energy efficiency of buildings all over the world. This is a challenge, however, because the people, particularly in developed countries, do not appear to want energy-efficient homes. If incentives are created, people could be educated and thereby demand could be stimulated for energy-efficient buildings and for the construction of sustainable buildings that are carbon-neutral.

Increased energy efficiency in this sector can have a substantial effect on overall energy use, promoting sustainability and achievement of national targets for reduced emissions of greenhouse gases. In the Nordic countries, energy use in buildings is presumed to make up approximately 40 percent of stationary energy use. This includes everything from the construction phase to the cooling, heating and ventilation of people's homes.

The report *Energy efficiency in the Nordic building sector – potentials and instruments* discusses the barriers that stand in the way of the use of more energy-efficient technologies in the building sector, and also what can be done to overcome these barriers. The report identifies a lack of information about energy-saving possibilities and a cyclical industry where energy issues have a low priority as important barriers. The report also states that promoting energy efficiency in order to reduce emissions related to climate change should be handled with care, since such policies might induce large rebound effects that could cause emissions to be reduced very little or not at all. Rebound effects mean that some or all of the expected reductions in energy usage as a consequence of energy efficient improvements could be offset by increased demand for energy. However, most empirical studies show that there is no real evidence of the magnitude of the rebound effect. ■

PHOTO JOHANNES JANSSON/NORDEN.ORG

EU Emission Trading – economic effects of auctions

The European Union Emission Trading Scheme (EU ETS) is the largest multi-national, emissions trading scheme in the world. The first trading period was from 2005 to 2007, and now we are in the second period, that will expire in 2012. In December 2008, the European Parliament approved the Commission's proposal for a directive on the improvement and extension of the EU ETS.

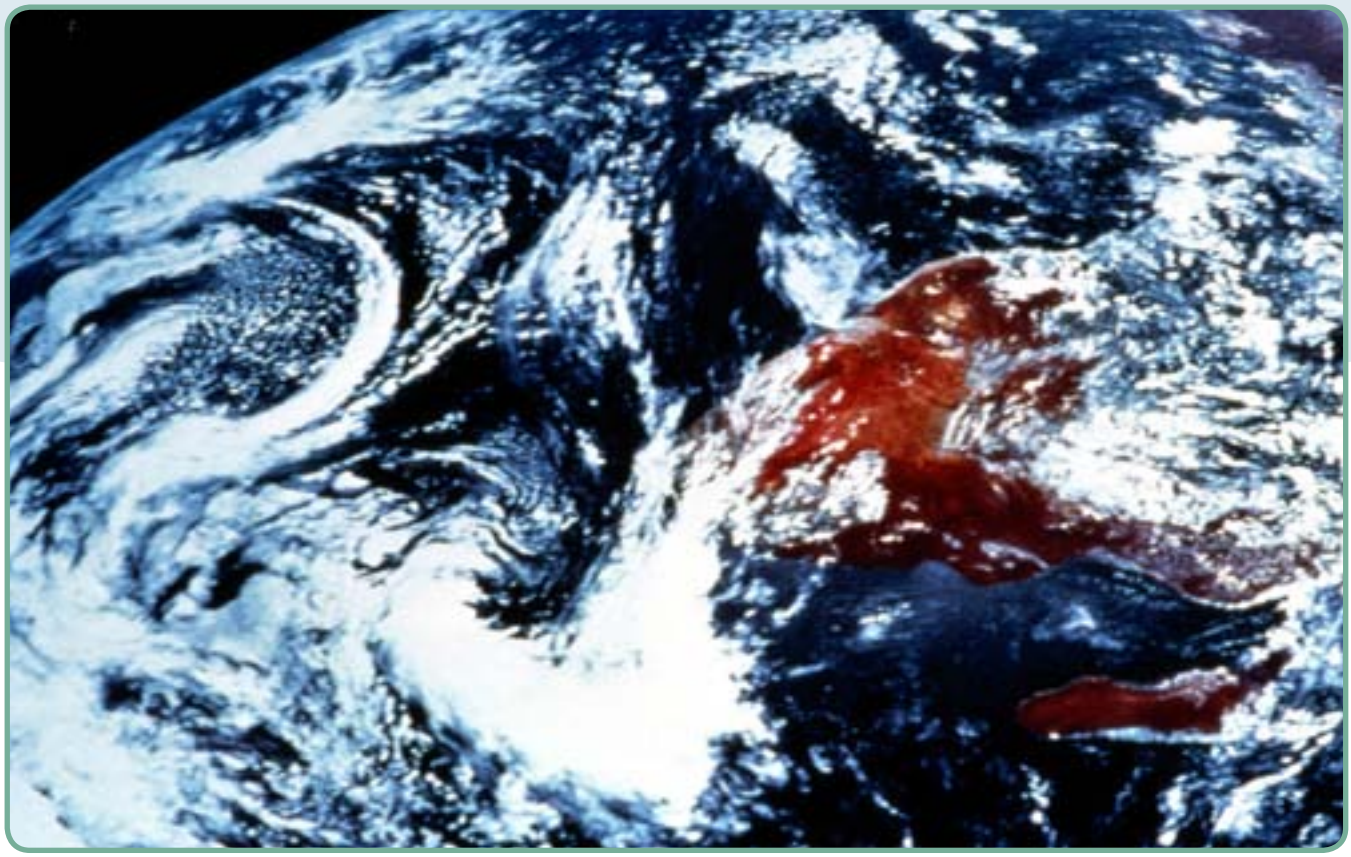
An important part of the agreement is to increase the level of allowance auctioning in the EU ETS. Norway is included in the system, even though the country is not a member of the EU, while Iceland is not a part of the EU ETS. The aim of this article is to present the economic impact that the EU ETS trading system will have on the Nordic countries, excluding Iceland.

About two thirds of the European allocations of emission permits will be auctioned in the third trading period of the EU emission trading scheme, EU ETS. The new report *EU Emission Trading – Economic Effects of Emission Auctions* shows that the Nordic countries will have an annual average auctioning volume of around 63 million allowances, which means that the auctioning of allowances could be a significant source of revenue for governments.

The third EU ETS trading period will cover the period 2013–2020. The report analyses the revenue effects of auctioning allowances in the Nordic countries, excluding Iceland. Allowances for auctioning will be allocated among the Member States according to a predefined formula. With a carbon price of EUR 30 per ton, the Nordic countries could collect around EUR 1900 million annually over the whole period.

There are, however, some uncertainties. Some aspects of the allocation of both free allowances and auctioned allowances remain to be clarified. Additionally, sectors identified as being at risk of carbon leakage will for the time being receive a higher proportion of their allowances for free on the basis of benchmarks. Free allocation reduces the amount of allowances for auction. If all ETS industry sectors get free allowances, the auctioning volume of the Nordic countries would decrease by 35 per cent, which would reduce the annual revenue by approximately EUR 700 million. The list of industry sectors entitled to receive free allowances as a consequence of the risk of carbon leakage will be decided finally by the end of 2009.

The EU ETS directive also recommends that 50 per cent of the auctioning revenues should be spent on measures related to climate change mitigation. The report states that this should not be a problem for the Nordic countries, since they already spend more on combating climate change than what is expected to be half of the revenues. ■



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Economic instruments in environmental policy

The need for innovations in the environment and energy technology sectors is huge all over the world. New methods have to be introduced in order to meet the climate challenge and there is a growing demand for new technological solutions that can contribute to the mitigation of carbon emissions and promote sustainable development all over the world.

Economic instruments in the form of fees and taxes are a very cost effective way of reducing emissions. This is shown in the report *Trafikafgifter og klimapåvirkning* (Traffic charges and climate impacts). One example is the differentiated vehicle registration tax in Sweden, which resulted in the rapid introduction of catalytic converters. Also, introducing a congestion toll in Sweden proved to be effective in reducing CO_2 emissions, especially when combined with improved public transport. By using economic instruments countries can truly make a difference. This should encourage not only the Nordic countries, but also other countries, to introduce further economic instruments.

A long tradition of economic instruments

The Nordic countries have used economic instruments in their environmental policies for many decades. It is difficult to judge which of the Nordic countries makes most use of economic instruments in its environmental policies. Denmark, Norway and Sweden have the largest number of instruments in use, Denmark being the country with the broadest coverage of instruments. The use of economic instruments in the environmental policies of the Nordic countries is examined in the report *The Use of Economic Instruments in Nordic Environmental Policy*. A similar report is published every three or four years, and the latest one covers the years 2006 to 2009.

Energy and transportation instruments

Generally, there has been little change in the use of economic instruments since 2006. However, the most noticeable change regarding energy and transport has been the introduction of the EU Emission Trading System (EU ETS). It was a pilot system from 2005, and has been permanent since 2008. To avoid double taxation, Sweden, Denmark and Norway have adjusted their CO_2 tax systems. Iceland is not part of the EU ETS.

One of the first economic instruments introduced in environmental policy in the Nordic countries was the sulphur dioxide (SO_2) tax on fossil fuels. Denmark, Norway and Sweden have had such a tax for many years. Nitrogen oxide (NOx) tax will be introduced in Denmark from 2010 and Norway introduced the tax in 2007. All the Nordic countries will have environmentally differentiated annual vehicle taxes from 2010. Since 2006, Finland, Denmark and, most of all, Norway have adjusted their vehicle registration taxes so that they are now based on specific fuel use or CO_2 emissions. Sweden is the only country without a vehicle registration or sales tax on new cars and also the only country with a green certificate system to promote the production of renewable energy. Sweden also has emissions-related landing charges at airports, while Finland and Norway have noise charges on one airport each.

The economic instruments are a truly effective way of changing the behaviour of both people and companies. For instance, if there are congestion tolls people are much more likely to leave the car at home and take the bus instead. Sweden is however the only Nordic country with such a toll, so on this area, among others, there is room for improvement in the Nordic countries. ■

Economic transport and energy instruments in the Nordic countries	DK	FIN	IS	N	S
Energy and air pollution					
Excise tax on electricity consumption	X	X		X	X
Excise tax on fuel oil products etc.	X	X		X	X
Excise tax on transportation fuels	X	X	X	X	X
CO_2 tax on fuel oil	X	X		X	X
CO_2 tax on transportation fuels	X	X		X	X
CO_2 emission trading energy intensive industries	X	X		X	X
SO_2 tax	X			X	X
NOx tax				X	X
Subsidy schemes for renewable energy, energy efficiency etc.	X	X		X	X
Transport					
Vehicle registration or sales tax	X	X	X	X	
Annual circulation tax	X	X	X	X	X
Environmental related or noise charges on aviation		X		X	X
Road congestion tax					X

Reports

Signs of Climate change in Nordic nature
www.norden.org/en/publications/publications/2009-551

Trafikafgifter og klimapåvirkning (Traffic Charges and Climate Impact)
www.norden.org/en/publications/publications/2008-587 (in Danish only)

The Use of Economic Instruments in Nordic Environmental Policy
www.norden.org/en/publications/publications/2009-578

EU Emission Trading – Economic Effects of Emission Auctions
www.norden.org/en/publications/publications/2009-582

Climate Policy: Costs and Design
www.norden.org/en/publications/publications/2009-550

Energy efficiency in the Nordic building sector – potentials and instruments
www.norden.org/en/publications/publications/2009-562

COP15 Group

The Nordic Council of Ministers has set up the Nordic COP15 Group to help achieve a successful outcome in the climate change negotiations at COP15 in Copenhagen in December 2009. The Nordic countries have a common interest to achieve a broad binding international agreement on climate change. The Nordic COP15 Group have identified key elements in the negotiations where efforts are needed to ensure a good outcome, i.e. adaptation to climate change, technical transfer and legal issues, measurable, reportable and verifiable activities, sinks and deforestation.

Contact person: *Caroline Dickson*
caroline.dickson@sei.se

Environment and Economics Group

The Working Group on Environment and Economics is a cross-sectoral group whose remit is approved by both the environment sector and the finance sector of the Nordic Council of Ministers. The working group's main task is to deal with relevant environmental economic matters of common Nordic interest.

Contact person: *Maria Vuorelma*
maria.vuorelma@ymparisto.fi

Climate and Air Quality Group

The Climate and Air Quality Group contributes to Nordic goals of limiting serious climate change and of preventing air pollution from damaging the environment or human health.

Contact person: *Hans Skotte Møller*
hsm@blst.dk

norden

Nordic Council of Ministers

Store Strandstræde 18
DK-1255 Copenhagen K

Tel +4533 96 0200
Fax +4533 96 0202

www. norden org

Information about Nordic environmental co-operation
Advisor Mats Ekenger, mek@norden.org
Advisor Anna Gran, ang@norden.org
Advisor Mia Rahunen, mira@norden.org
Communications Advisor Patrik Edman
ped@norden.org

Editor and contact: Mia Rahunen
Text: Liselott Lindström
Design: Jette Koefoed

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Nordic environmental co-operation
The Nordic Environmental Action Plan 2009-2012 forms the framework for environmental co-operation both within the Region and in relation to the adjacent areas, the Arctic, the EU and other international forums. Priorities include the climate and the air, marine and coastal zones, biological diversity and sustainable consumption and production. The objective is to consolidate the position of the Nordic Region as a world leader on the environment. Particular attention is paid to international issues where partnership allows the Nordic countries to exert greater influence and generate the greatest possible Nordic synergy.

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