

YOUR AIR – OUR BUSINESS

NILU, Norwegian Institute for Air Research, conducts environmental research with emphasis on the sources of airborne pollution, atmospheric transport, transformation and deposition. NILU also assesses the effects of pollution on ecosystems, human health and materials. A main priority for NILU is to provide scientific facts and results available in a user friendly manner for decision-makers.

NILU – Norwegian Institute for Air Research

NILU headquarter
P.O. Box 100, Instituttveien 18
NO-2027 Kjeller
Norway
telephone + 47 63 89 80 00
telefax + 47 63 89 80 50
e-mail nilu@nilu.no
www.nilu.no

NILU in the Polar Environmental Centre – Tromsø

Hjalmar Johansens gate 14
NO-9296 Troms
Norway
telephone +47 77 75 03 75
telefax +47 77 75 03 76
e-mail nilu@nilu.no
www.nilu.no

NILU Products AS

P.O. Box 100, Instituttveien 18
NO-2027 Kjeller
Norway
telephone + 47 63 89 80 00
telefax + 47 63 89 80 50
e-mail nilu.products@nilu.no
www.nilu.no

NILU UAE

NILU Region Branch office
1301 Al Masood Tower, Hamdan street
P.O. Box 6924
Abu Dhabi
United Arab Emirates
telephone +9712-6325066
telefax +9712-6348826
e-mail tb@nilu.no
www.nilu.no

NILU Polska Sp. z o.o.

24 Reymonta St.
40-029 Katowice
Poland
telephone + 48 32 7572520
telefax + 48 32 2570858
VoIP 6829668
e-mail nilu@nilu.pl
www.nilu.pl

www.nilu.no



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Norwegian Institute for Air Research, NILU, is an independent research foundation established in 1969.

Our key areas of work include:
Environmental research with emphasis on the sources of airborne pollution, atmospheric transport, transformation and deposition.

Assessment of the effects of pollution on ecosystems, human health and materials.

Performing national tasks on behalf of the Norwegian Ministry of Environment and the Norwegian Research Council.

International environmental assessment projects. For instance participation in The Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe (EMEP), The European Topic Centre on Air and Climate Change, Topic Centre of European Environment Agency (EEA).

Delivering systems for air quality surveillance, monitoring and air quality management.

Performing environmental impact assessments and abatement strategy planning for industries, authorities and urban areas world wide.

Hosting of international databases containing measurement data from atmospheric research and monitoring programmes.

www.nilu.no

DIRECTOR'S INTRODUCTION

During the last 15 months, a new focus on polar activities and especially on the Norwegian Northern areas has emerged in the fields of politics, economics and scientific research.



Polar research and northern areas development is attracting attention, both nationally and internationally.

This annual report focuses on NILU's work in these areas. The new focus is a result of many factors. The oil industry's plans for exploiting resources along the North-Norwegian coast and in the Barents Sea, the forthcoming International Polar Year (IPY), the decision to establish a Norwegian year-around research base in Antarctica, and the Norwegian Government's Northern Areas Strategy Declaration (Nordområdemeldingen), are all important elements. In addition, the Government has recently presented a comprehensive plan for integrated management of the marine environment of the Barents Sea. This plan sets a framework for future activities within the context of environmental sustainability. And last, but not least, The Research Council of Norway has started a process towards a co-ordinated Northern Areas Development Strategy. Environmental and climate research is a vital tool in all of the mentioned activities.

In 2005, NILU was actively involved in several of the plans. We engaged ourselves in the development of the new research strategy for Ny-Ålesund and Svalbard. Likewise we contributed to the development of a new atmospheric/environmental research programme for the Troll Station, Antarctica. Main foci of this programme are aerosols, long-range transported pollutants and the establishment of an atmospheric composition archive.

NILU was also engaged in forming the Barents Sea Management Plan, in contributing to public hearings on knowledge requirements for the region and by contributing to the Environmental Impact Assessment of External Contributions. NILU is very pleased to see that environmental pollution, both long-range transport and pollution arising from future activities, is recognised as a key area.

INTERNATIONAL POLAR YEAR (IPY)

NILU is strongly engaged in the preparation for International Polar Year 2007-2009. NILU researchers have submitted numerous Expressions of Interest after the IPY International Secretary's call in 2004. This has been followed up by contributions to IPY-core projects and full proposals. The internationally accepted core project, POLARCAT, is co-ordinated by NILU. By the end of 2005, NILU will participate in about 10 initiatives. IPY is one of the most important fields of research at the institute in the years to come.

CLIMATE RESEARCH

Climate research has received worldwide attention in recent years. Our knowledge is growing, but there is still a need for better understanding of the many interacting and feedback mechanisms in the climate system.

Several topics are poorly understood, especially in the extremely vulnerable Polar Regions. Important questions are:

- Will the expected rapid warming in the Arctic open new reservoirs of greenhouse gases stored in permafrost or methane hydrate layers in the shallow arctic waters?
- What effect will albedo change in the Arctic (due to sea ice and glacier melting as well as shorter snow-cover season) have on the radiation regime, e.g., via changes in cloud cover and aerosol content?
- Due to vegetation changes, how will terrestrial surface albedo change?
- How will the carbon storing capacity of the oceans change?

These, and other questions need to be addressed in an interdisciplinary context. Atmospheric physicists, meteorologists, glaciologists, hydrologists, biologists and soil scientists will all have valuable contributions.

NILU has an advantage in having been interdisciplinary itself for years. We have experience in practical multi-disciplinary co-operation with other institutes, e.g., in the Polar Environmental Centre in Tromsø and in many EU projects. Joining the newly established CIENS centre in Oslo will further extend this expertise.

A handwritten signature in blue ink that reads "Gunnar Jordfald". The signature is written in a cursive, flowing style.

Gunnar Jordfald
Director NILU

AIR QUALITY MANAGEMENT WORLDWIDE

NILU provides expertise in air pollution research and air quality management world wide.



Many of NILU's tasks are related to urban and residential air pollution. Emission from industrial sources, energy production and traffic cause serious health hazards for millions of people.






The World Health Organization estimates that ambient and indoor air quality is among the five leading factors associated with impaired health worldwide.

NILU has in 2005 been working with either air quality management, air quality monitoring or impact assessment in the following countries outside Europe:

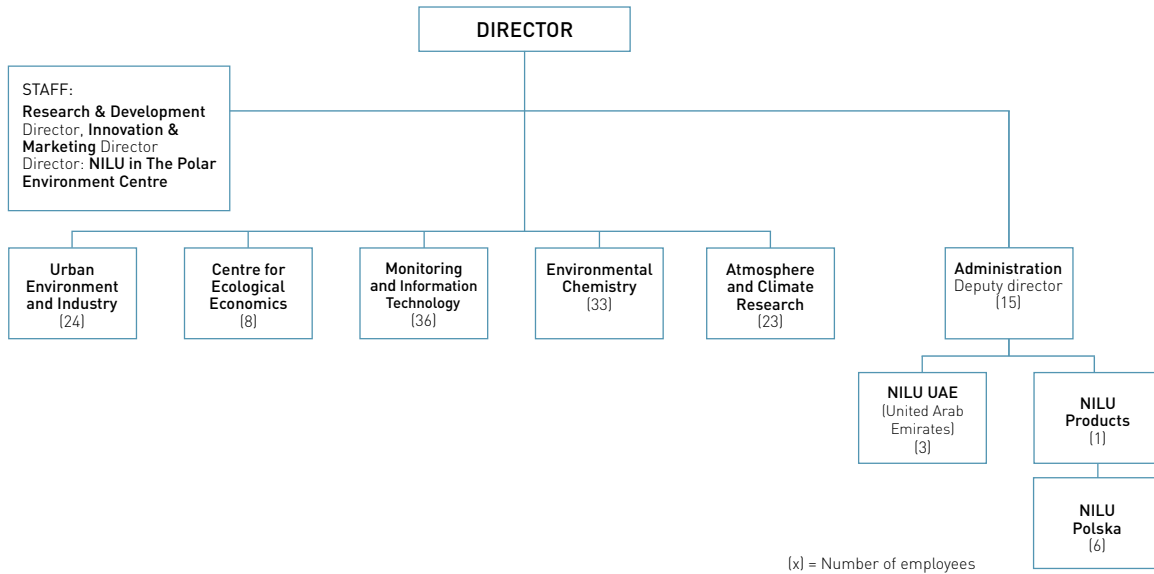
- Bangladesh
- Botswana
- China
- Egypt
- India
- Senegal
- United Arab Emirates
- Vietnam
- Saudi Arabia
- South Africa

The map gives an indication of NILU's international activities.

NILU DEPARTMENTS

Urban Environment and Industry	Centre for Ecological Economics (CEE)	Monitoring- and Information Technology	Environmental Chemistry	Atmospheric and Climate Research
<p>The Department deals with emissions from industry, energy production and traffic in urban and residential areas. Activities include measurements, modelling, consequence analyses, environmental impact assessment and abatement strategy planning. The Department also estimates human exposure based upon dispersion modelling, measurements and micro environmental analyses.</p>	<p>The CEE deals with cost-benefit analyses and socio-economic studies of the impact of pollution on the environment. Supports authorities in developing environmental policies.</p>	<p>The Department develops, operates and maintains instruments for measuring air quality, meteorology and radioactivity. NILU's measurements are accredited in accordance with NS-EN ISO/IEC 17025. The department delivers IT-products and services to NILU and NILU's external projects.</p>	<p>The Department determines a large number of organic and inorganic compounds in samples of air, water, sediments and biological material. The department has some of the most sophisticated and advanced instrumentation on the market and is accredited in accordance with NS-EN ISO/IEC 17025.</p>	<p>The Department deals with air pollution on the regional (European) and global scale, with particular emphasis on aerosols, acid deposition, photo-oxidants, toxic compounds, stratospheric- and ground level ozone and climate change.</p>
 <p>Director Elin Marie Dahlin</p>	 <p>Director Jozef Pacyna</p>	 <p>Director Magne Birger Osmundsen</p>	 <p>Director Ole-Anders Braathen</p>	 <p>Director Kjetil Tørseth</p>

ORGANISATION



NILU TOOLS





Air quality management

NILU has developed an Air Quality Management System (AQMS) that identifies the most cost-effective measures to reduce the impact of air pollution.

Air quality monitoring

The NILU-developed system for air pollution surveillance is named "AirQUIS". AirQUIS is a planning tool for optimal abatement and air quality improvement. It is one of the most advanced and flexible surveillance

and planning tools available on the market. Measurements, modelling, environmental impact assessment and abatement strategy planning are all parts of the system.

Branch office NILU UAE (United Arab Emirates)	NILU Polska Sp. z o.o	NILU Products AS	Administration
<p>The branch office NILU UAE serves the Middle East-market. It delivers systems for air quality surveillance and monitoring, advanced management tools and support services. Constructs ambient monitoring stations and networks combined with technical operation and maintenance. It operates a local reference laboratory.</p>	<p>NILU Polska deals with air quality and air quality management, as well as projects in renewable energy technologies. NILU Polska participates in several EU research projects, national projects in Poland, and proposals for financial support from the EEA and Norwegian Financial Mechanisms.</p>	<p>NILU Products AS is a subsidiary of NILU. The company holds the rights to NILU-developed products, equipment and systems. The department manages commercial aspects of manufacturing, marketing and sales. Products include instruments and equipment for measurements and analyses of air pollutants.</p>	<p>The Department:</p> <ul style="list-style-type: none"> • Accounts group (included purchase) • Archive • Communications group • Library • Printing • Human resources • Contracts
 <p>Director Trond Böhler</p>	 <p>Chairman Jozef Pacyna</p>	 <p>Director Paal Berg</p>	 <p>Director Paal Berg</p>



NILU Scientist, Anders Rørud Borgen, works in the Department for Environmental Chemistry, specializing in high-resolution mass spectrometry and gas chromatography. The NILU laboratories provide scientists with state-of-the-art equipment.

ABOUT NILU

NILU's head office is located at Kjeller outside Oslo. A specialised office for Arctic related matters is an integral part of the Polar Environmental Centre in Tromsø. NILU also has a subsidiary company in Poland and a branch office in the United Arab Emirates.

The staff, consisting of 145 scientists, engineers and technicians, carry out approximately 200 projects annually for research councils, industries, local-, national- and international authorities and organizations.

Our annual turnover is 17 mill US\$. Domestic projects provide 64% of the earnings, while the remaining 36% come from international organizations and customers. 12% of the budget is a basic grant from the Norwegian Ministry of Environment through the Research Council of Norway. The grant is aimed at supporting NILU as a national environmental research institution.

LABORATORIES

NILU's chemical laboratories are among the most advanced in Europe. They have state-of-the-art analytical equipment, including several high-resolution mass spectrometers. Today, the laboratories determine a broad range of organic and inorganic pollutants and are highly competent both in chemical analysis and in evaluating environmental impacts.

NILU's instrument laboratories carry out sampling and analysis, instrument calibration, maintenance and international intercalibration. The laboratory also develop new instruments and analytical techniques.

NILU's instrument laboratories and chemical laboratories are accredited to internationally accepted quality standards. NILU was among the first European laboratories to be accredited according to EN-ISO/IEC 17025.

NILU holds Norway's National Reference Laboratory for air pollution. The laboratory has developed a comprehensive Quality Assurance and Quality Control (QA/QC) system for the operational level of air quality programmes.

INTERNATIONAL ACTIVITIES

NILU works world wide on projects related to air pollution, air quality monitoring and air quality management. We have over the years carried out many assignments involving the co-ordination of international environmental research.

One example is the Co-operative Programme for Monitoring and Evaluation of the Long Range Transmission of Air Pollution in Europe (EMEP). Here NILU functions as the Chemical Co-ordinating Centre (CCC).

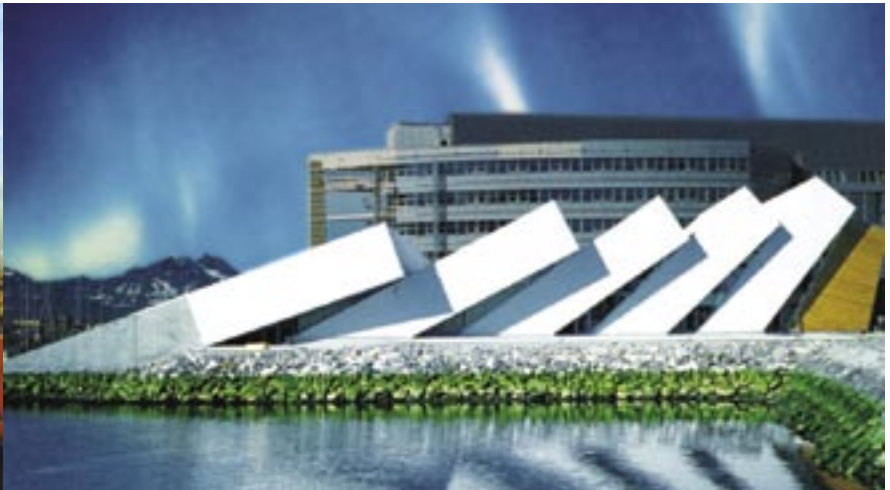
Another specific task over the last few years has been the establishment of the EEA Topic Centre on Air quality. NILU is one of four core research institutes participating in the programmes.



NILU's Head Office is located just north of Oslo.



The city of **Katowice** holds NILU's offices in Poland.



NILU's office in **Tromsø** is situated in the Polar Environmental Centre.

NILU TOPICS

- Changes in the ozone layer and ultra violet radiation
- Pollution and climate changes (global change processes)
- Satellite validation and databases
- Changes in atmospheric chemistry
- Particulate matter in air
- Regional and global dispersion of environmental toxins
- Standardization of monitoring methods
- Electronic distribution of environmental data
- Coastal zone management
- Environmental influence on cultural heritage and building materials
- Air Quality Management Systems (for cities, companies, authorities, countries)
- Assessment of industrial-, urban- and traffic pollution
- Indoor environment
- Eutrophication and acid rain
- Surface ozone
- Toxic compounds
- Radioactivity

NILU is also collecting and storing data, and producing reports for international bodies like the World Meteorological Organisation, Paris and Oslo Commission, the Helsinki Commission and the Arctic Monitoring and Assessment Program.

NILU plays an important part in several EU-initiatives concerning environmental research. For the last 15 years NILU has participated in the EU framework programmes for research and technological development (FP's). During 2005 NILU has participated in almost 30 projects under FP5 and FP6.

In the FP6 NILU is a central partner within air pollution in a Network of Excellence, which started on 1 March 2004. This network is called ACCENT – Atmospheric Composition Change: a European Network. In 2002, NILU was appointed as partner in a Nordic Centre of Excellence (NCoE) for excellent research within the fields of biosphere, aerosols, cloud and

climate interactions.

International co-operation and exchange of scientists is considered by NILU as one of the major features of multi-disciplinary modern research on environmental issues. Thus, the institute supports all activities connected to researcher exchange and mobility of NILU scientists.

DEVELOPMENT PROJECTS

Transfer of competence through development aid is of great importance, through ongoing projects in Bangladesh, Botswana, South Africa, Senegal, China, India and Vietnam. The major topics are to establish infrastructure, to map air quality and to prepare action plans, including transfer of knowledge and competence. Institutional building is an integral part of these projects.



A delegation from Shanghai Meteorological Bureau visited the Norwegian Institute for Air Research (NILU).



NILU has established a branch office in the city of **Abu Dhabi** in the United Arab Emirates.

DATABASES

NILU has internationally a key role in collecting and storing data from the atmospheric research and monitoring programmes. We have been hosting a data centre since the middle of the 1970s, when the institute was co-ordinating the data collection in an OECD funded project of long-range transboundary pollution in Europe.

Today, we operate one of the worlds most comprehensive databases within ground-based atmospheric measurements. The data collected and organized in several databases provide essential information for the scientific underpinning of policy discussion and measures for the abatement of atmospheric pollution.

NILU DATABASES

NILU has an internationally central role in collecting and storing measured data from atmospheric research and monitoring programs. NILU is responsible for databases such as:

- ASSET (Assimilation of ENVISAT Data)
- EARLINET-ASOS (European Aerosol Research Lidar Network - Advanced Sustainable Observation System)
- SCOUT (Stratospheric-Climate Links with Emphasis to the Upper Troposphere and Lower Stratosphere)
- ESA-CDB (The European Space Agency Campaign Database)
- ACCENT (EU FP6 Network of Excellence focusing on tropospheric research in Europe.
- EUSAAR (EU FP6 project European Supersites for Atmospheric Aerosol Research)
- CalVal (calibration and validation of measurements from the environmental satellite ENVISAT)
- MAPSCORE (Mapping of Polar Stratospheric Clouds and Ozone Levels Relevant to the Region of Europe)
- SOGE (Integrated system for observation of halogenated greenhouse gases in Europe)
- Stratospheric NADIR (NILU has been operating the data centre for ozone studies since the beginning of the 1990. This centre has a database focused on measurements of stratospheric ozone, and a series of tools for analysing ozone depletion)
- HELCOM (air quality database – Baltic Sea coastal monitoring.
- AMAP (NILU functions as the Thematic Data Centre (TDC) for AMAP's Atmospheric subprogramme)
- OSPAR air quality database - North Sea/north-east Atlantic coastal monitoring
- EMEP (The EMEP Chemical Coordinating Centre (EMEP-CCC) has been hosted by NILU since the beginning of the programme in 1979)



NILU offers **tailor-made** programmes for any air pollution problem, including necessary scientific and technical personnel. In the laboratory: Senior Scientist Hilde Uggerud.

CLIMATE RESEARCH AT NILU

The rapid changes in atmospheric composition and resulting changes of climate on a global scale is maybe the most important environmental challenge mankind is facing today. Although significant progress has been made in understanding the dominating processes, many questions are unanswered both with respect to the processes causing climate change, the impact of climate change on ecosystems and human society, and the feedback mechanisms and interaction between them.

Knowledge about the consequences of climate change is essential, regardless of whether the climate changes are natural or man-made. Presently NILU is participating in and coordinating projects related to climate research on the following issues:

- Long-term monitoring of atmospheric composition changes : greenhouse gases, aerosols, clouds, ozone and other trace gases in the stratosphere.
- Studying the role of aerosols and tropospheric ozone by means of global models.
- Understanding and quantifying mechanisms that influence the atmospheric content of climate active species, with focus on emission sources and transport.
- Climate dynamics and variability with focus on high-latitude processes, tele-connection patterns and troposphere-stratosphere coupling.
- Radiation measurements and modelling with focus on UV-radiation, effects of radiation on atmospheric composition, the biosphere and human health.
- Effects of climate change on the transport and fate of atmospheric pollutants.
- Effects of climate change on air-land-freshwater-sea coupling processes (e.g., nitrogen and carbone fluxes), ecosystems, materials, infra-structure, and human health.

- The impact of global climate change on cultural heritage buildings over the next hundred years.

The observational/monitoring activities performed at the main Norwegian atmospheric observatories are of fundamental importance in this work:

- The Zeppelin Observatory at Spitsbergen (greenhouse gases, aerosols, pollutants).
- The ALOMAR facility at Andenes, Northern-Norway (stratospheric trace gases including ozone, UV-radiation, aerosols).
- The Birkenes Observatory in southern Norway (surface water acidification, forest damage, material deterioration, aerosols, trace gases.)

NILU is performing most of the Norwegian activities in these observatories and is the only Norwegian institute monitoring greenhouse gases and aerosols in a comprehensive manner.

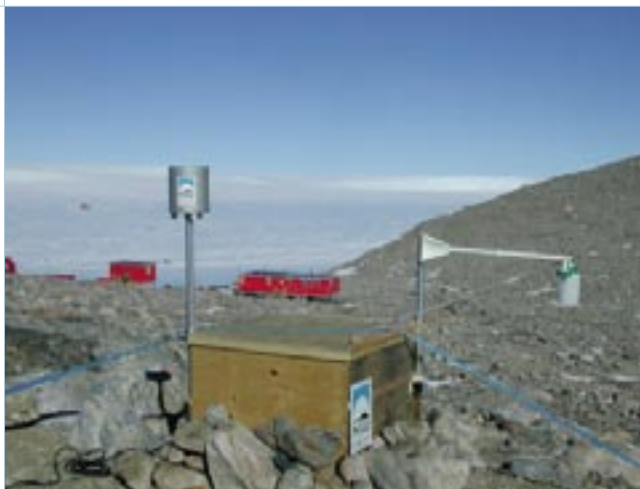
Modelling tools are implemented and increasingly used at NILU. They include state of the art radiation transfer models, and long-range transport models, e.g., EMEP, and the lagrangian dispersion models like Flexpart/Flextra which help to interpret measurements at the observatories.

Through NILU's Centre for Ecological Economics, we work on societal and economic aspects of the climate issue, e.g., emission scenarios and feedback processes related to climate change.



The extreme warming anomaly in the Arctic in recent years has caused record low sea ice extent and rapidly increasing melting rates of the Greenland inland ice. It is still unclear whether this is due to natural variability or an accelerating anthropogenic impact.

NILU OBSERVATORIES



The Troll Observatory is located 72°01'S, 02°23'E, at an elevation of 1260 m above sea level, 235 km from the coastline. Area marked red: location of atmospheric monitoring site.

NILU's first measurements in winter 2004/05 at Troll: UV radiation and aerosol sampling

THE TROLL OBSERVATORY QUEEN MAUD LAND, ANTARCTICA

The Norwegian Troll station in Queen Maud Land in Antarctica was officially opened as a year-round observatory on February 12th, 2005 by HM Queen Sonja. The most important research activity at the station will be a comprehensive atmospheric research and monitoring programme performed by NILU.

An important scientific goal is to establish a bipolar atmospheric programme with similar activities at the Troll Station and at the Zeppelin Observatory in Ny-Ålesund. This will be particularly valuable in the investigation of pollution pathways in both hemispheres.

In February 2005, NILU started pilot measurements of UV, inorganic

compounds and soot (in collaboration with Stockholm University) at Troll. The purpose of this pre-project was to characterise the site and the influence of local pollution from the facility.

There will be no scientific activities at the observatory during the winter 2006 due to reconstruction. During the next Antarctic summer season

(2006/2007), NILU will build up the atmospheric scientific program at Troll. NILU's ambition during The International Polar Year (IPY) 2007-2008, is to establish a long-term atmospheric research and monitoring programme observing climate gases, environmental pollutants, inorganic and organic compounds, UV, stratospheric ozone and aerosols.

THE BIRKENES OBSERVATORY

The Birkenes Observatory is located in southern Norway, to the south-east of the Scandinavian mountain chain.

Due to the location of the site away from local pollution sources, long-range transport exerts the major influence on the pollution climatology of the site.

The site is well suited for trend analysis, providing data on deposi-

tion in support of effect-oriented studies (surface water acidification, forest damage, material deterioration etc.).

Data for the site are applied for the following monitoring programmes; EMEP, ICP Waters, ICP Forest, ICP

Integrated Monitoring, ICP Materials, The Norwegian Air and Precipitation Monitoring Programme, the Norwegian Monitoring Programme on Forest Damage, and others.



Scientists from all over the world visit and work at the **Zeppelin Observatory** (78°54' N, 11°53' E, 474 m a.s.l.), where NILU is responsible for the scientific activities.

THE ZEPPELIN OBSERVATORY: GIVING THE WORLD AN EARLY WARNING

The Zeppelin Observatory is situated in an undisturbed arctic environment far away from local pollution sources. The remote location on "top of the world" combined with the well developed infrastructure in Ny-Ålesund and the year-around accessibility by public transport, makes the observatory unique among monitoring stations world wide.

The observatory receives air masses from all over the northern hemisphere, which is ideal for obtaining information on the relative importance of transport ways and the accumulation of global pollution in pristine areas, including climate relevant parameters. Ground measurements are particularly important in arctic areas, as satellite coverage is often poor.

As a result, the Zeppelin Observatory has become a major contributor of data on a global as well as a regional scale. Its long time-series of monitoring data are unique and of utmost importance for the study of climate change. Scientists from all over the world frequently come to work at the Observatory, funded by the EU Research Infrastructure Programme.

NILU's activities at the observatory mainly consist of monitoring long-range transported air pollution. This includes greenhouse gases, persistent organic pollutants (POPs), aerosols, heavy

metals, ozone, sulphur and nitrogen compounds.

The Zeppelin Observatory is part of several international monitoring networks and an important contributor to several EU-projects:

- Global Atmospheric Watch (GAW)
- Advanced Global Atmospheric Gases Experiment (AGAGE)
- Network for the Detection of Stratospheric (now: Atmospheric Composition) Change (NDSC, now NDACC)
- European Monitoring and Evaluation Programme (EMEP)
- Arctic Monitoring and Assessment Programme (AMAP)
- System for Observation of halogenated Greenhouse gases in Europe (SOGE)

MONITORING ACTIVITIES AT THE ZEPPELIN OBSERVATORY (78°54' N, 11°53' E, 474 M ASL)

Greenhouse gases (continuous measurements):

- Methane
- Carbon monoxide
- Chlorofluorocarbons
- Hydrofluorocarbons
- Hydrochlorofluorocarbons
- Halons
- Other halogenated compounds
- Ozone (tropospheric and stratospheric)
- Carbon dioxide (performed by Stockholm University SU)

Inorganic pollutants in air:

- Mercury (continuous measurements)
- Trace elements
- Sulphur compounds
- Nitrogen compounds
- Water soluble ions
- Carbon (elemental and organic)

Persistent organic pollutants in air:

- HCB, HCH, PCB, DDT, PAH etc.

Aerosols:

- Aerosol optical depth
 - Chemical properties
 - Light absorption*
 - Size distribution*
 - Total aerosol number density*
 - Light scatter*
- * performed by Stockholm University

Precipitation samples

- Main inorganic compounds

For more information, please contact NILU's co-ordinator for climate- and polar research, senior scientist Gerog Hansen. E-mail: georg.hansen@nilu.no



Used to snow: Senior Scientist Ove Hermansen is the co-ordinator for NILU's research activities at the Zeppelin Observatory.

ARCTIC RESEARCH AT NILU: MACESIZ

Through the Norwegian project MACESIZ (Marine Climate and Ecosystems in the Seasonal Ice Zone) NILU explores, quantifies and simulates past, present and future natural and anthropogenic climate variability and changes, and the response of the marine ecosystem, in the Arctic in general, but with a focus on the seasonal ice zone of the Greenland Sea, the Fram Strait, and the Barents Sea.

The climate in the Northern hemisphere has undergone major fluctuations in the 20th century. An ongoing warming in the Arctic region is coupled with a decrease of the sea ice-extent, approximately in accordance with climate model simulations. For all emission scenarios from the Intergovernmental Panel on Climate Change (IPCC), the climate models predict a gradual warming world wide, with a maximum warming at northern latitudes in winter. Models tend to predict an ice-free Arctic Ocean (a Blue Arctic) in summer by the end of the century.

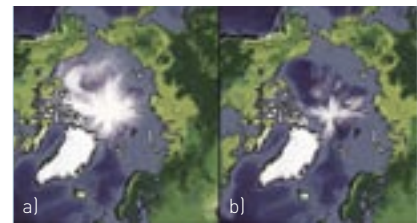
There is hence a great need to understand processes in the seasonal ice zone (SIZ), the area between the summer minimum and winter maximum extent of the polar ice pack. This is a crucial region where the polar atmosphere, sea ice cover and atmosphere interact with the bordering atmospheres and oceans. A joint effort of eight Norwegian institutions within the marine geophysical, geological and biological disciplines, MACESIZ aims at understanding to what degree can the changes in the SIZ and the Arctic climate system be ascribed to natural and anthropogenic forcing. MACESIZ also aims at estimating the changes in the atmospheric circulation linked to the changing cryosphere and the shrinking sea ice in particular.

NILU contribution in MACESIZ is twofold. In collaboration with climate modeling experts at the Bjerknes Centre for Climate Research, we are investigating the climate dynamics of the Arctic, and

especially the coupling of large-scale teleconnection patterns with the cryosphere (the continental snow cover and the sea-ice). Innovative, multi-decadal climate simulations with an atmospheric general circulation model have been made. In these models the snow cover is forced, or nudged, from global satellite observations which have been available since the early seventies. The aim is to understand how the high-latitude snow cover influences the wintertime climate patterns, like the North Atlantic Oscillation and other circumpolar teleconnections like the Aleutian-Icelandic seesaw. We are also investigating how summertime climate variability will be influenced by the decreasing Arctic sea ice extent.

Accurately modelling of the SIZ depends on our understanding of several processes, in particular the radiative properties of Arctic clouds.

The second of NILU's objectives in MACESIZ is to study the sensitivity of radiative fluxes and radiative forcing to cloud microphysical properties under different conditions typical of the Arctic SIZ. The physical parameters are applied in new, detailed radiative transfer calculations to study net downward fluxes at the top of the atmosphere. The fluxes proved to be very sensitive to the ground conditions and the composition of cirrus clouds.



September sea-ice extent predicted from five climate models:
a) Period 2010-2030
b) Period 2070-2090
(Ref.: ACIA 2004 report)

MACESIZ

MACESIZ: Marine Climate and Ecosystems in the Seasonal Ice Zone

Project period: 2003 - 2006

Project co-ordinator:
Professor Ola M. Johannessen,
Nansen Environmental and Remote Sensing Center (NERSC)

Project leader NILU: Senior Scientist Yvan Joseph Orsolini

Project partners:
For full list see: www.nersc.no/MACESIZ/consortium.php

Funding:
The Research Council of Norway (RCN)

Project website:
www.nersc.no/MACESIZ

ARCTIC RESEARCH AT NILU: AMAP

The Arctic Monitoring and Assessment Programme (AMAP) was established in 1991 and provides reports and assessments on a wide range of pollution aspects in the Arctic. NILU serves as one of four Thematic Data Centres (TDC's) for AMAP's Atmospheric subprogramme.



Ny-Ålesund, Svalbard, on a clean day.



Polluted air, transported all the way from central Europe, disturbs the picture.

AMAP

AMAP: The Arctic Monitoring and Assessment Programme

Project partners

and project funding:

Canada, Denmark/Greenland, Finland, Iceland, Norway, Russia, Sweden, United States

Project period: 1994 -

Project website:

www.amap.no

AMAP is funded by the eight Arctic nations and most assessment reports have contributions from several of these countries. The assessments are based to a large extent on information and results from recent (largely unpublished) monitoring and research work. Data from such activities are compiled together with routine monitoring data within the TDCs. Data are made available from the TDCs to scientists engaged in AMAP assessments under strict conditions that protect the rights of data originators.

ASSESSMENT OF ARCTIC HAZE

AMAP has recently conducted an assessment of Arctic Haze in which NILU co-ordinates the work on atmospheric transport and trends. In addition to looking at "traditional" acidifying compounds (e.g. sulphur) the focus was on nitrogen compounds since these can be expected to have a relatively larger effect on arctic acidification and eutrophication as sulphur emissions are reduced.

Our trend analysis shows that whereas sulphur concentrations in air and precipitation are decreasing in most arctic regions, this is not always followed by reduced acidity (increasing pH value) in the precipitation. For nitrogen compounds there is no clear regional or temporal trend pattern. The model projections indicate a strong connection between atmospheric concentrations and climate variations (the so called arctic oscillation) and also that increasing atmospheric emissions in SE Asia in the future will probably not result in significantly higher concentrations in the lower arctic atmosphere.

CLIMATE CHANGE AND LAND USE EFFECTS

Humans have altered the Nitrogen cycle for millennia through agricultural activities. CLUE was established to better understand climate change effects on the N cycle in Norway using a combination of field experiments and model studies including coupling to regional climate models.

The project shows that we can expect increasing reactive nitrogen compounds deposition particularly along the west coast of Norway with impact on vegetation.

The results are relevant to several important sectors in the Norwegian society, including forestry, nature protection, fisheries, drinking water quality and water resources, and will supply important new information for development of adaptation strategies for effects of climate change.

Our atmosphere contains about 78% non-reactive nitrogen gas (N_2). To become available for biological activity this gas must be fixed in reactive compounds such as nitrate and ammonium. Man-made influence on the Nitrogen cycle has escalated after the industrial revolution due to the use of fertilizers and the fact that combustion of fossil fuels fixates N_2 as oxidised nitrogen (NO_x). CLUE aims to quantify the effects of climate change on flux and deposition of nitrogen (N) and carbon (C) from terrestrial semi-natural ecosystems to aquatic ecosystems in Norway.

The invention of artificial fertilizers in the early 1900s is an example of human intervention in the N cycle. Around 1970 humans mobilized about the same amount of N as natural processes. Later anthropogenic reactive compounds production doubled, while natural sources decreased as a result of land use change. Due to increasing population and economic growth this tendency is expected to accelerate in the next 50 to 100 years.

Future climate change with potentially more precipitation and higher air temperatures predicted for Norway will affect the biogeochemical N cycle. Increasing precipitation will result in increasing wet deposition if atmospheric concentrations are constant. Altered precipitation patterns and temperatures are likely to affect mobilisation of reactive compounds pools in the soil and in runoff to rivers, lakes and fjords. Since most aquatic eco-systems in Norway are nitrogen limited, increasing nitrogen fertilization will disturb the natural biological activity.



NILU technician Tore Hansen installs an instrument for measuring dry deposition of reactive nitrogen compounds in Telemark, Norway.

CLUE: CLIMATE CHANGE EFFECTS ON THE N CYCLE IN SOUTHERN NORWAY

NILU Project leader:
Senior scientist Lars R. Hole

Project leader:
Prof. Arne Stuanes, UMB

Partners:
Norwegian University of Life Sciences (UMB), Norwegian Institute for Water Research (NIVA) and Norwegian Institute of Public Health.

Project funding:
The Research Council of Norway (RCN)

Project period: 2003 - 2007

Project website:
www.umb.no/ipm/forskning/clue

PROTECTING CULTURAL HERITAGE: MASTER

NILU is the co-ordinator for an EU collaborative research that is developing an early warning system for use in museums, historic buildings and archives: MASTER (Preventive Conservation Strategies for Protection of Organic Objects in Museums, Historic Buildings and Archives).



For the good of future generations:
The MASTER project aims to protect cultural objects. Example of organic materials from the Schwarzwälder Trachtenmuseum, Haslach, Germany.

MASTER

MASTER: Preventive Conservation Strategies for Protection of Organic Objects in Museums, Historic Buildings and Archives.

Project period: 2003-2006.

Project partners:

Norwegian Institute for Air Research, Kjeller, Norway; University College London, UK; Albert-Ludwigs Universität Freiburg, Germany; Technical University of Crete, Greece; National Museum in Krakow, Poland; Historic Royal Palaces, UK; Trøndelag Folkemuseum, Norway.

Funding:

The European Commission as part of the 5th FP, Key Action: Cultural Heritage and City of Tomorrow; and The Norwegian Archive, Library and Museum Authority.

Project co-ordinator:

Senior Scientist Elin Dahlin, NILU.

Project website:

www.nilu.no/master

For more information:

elin.dahlin@nilu.no

All over Europe objects in museums and historic buildings are being affected either by display or storage because of unsuitable environmental conditions. A broad range of these cultural objects are made of organic materials. The key to the survival of these objects is achieving an acceptable indoor environment and vital to this is a sustainable management including preventive conservation strategies.

The MASTER project aims to provide conservation staff in museums, historic buildings and archives with a new preventive conservation strategy for the protection of cultural property, based on an early environmental warning system.

Novel dosimeters (EWO-Generic dosimeter and EWO-Specific dosimeter) have been developed to assess the effects on organic objects. The EWO-Generic dosimeter, developed by NILU, will clarify the risk for the decay of museum objects during a short exposure and help the conservators to take action before damage to the object is observed.

The dosimeters have been exposed in 10 European museums and historic buildings with different environmental conditions. In addition to the exposure of the EWO-dosimeters, relative humidity (RH), temperature (T) and light/UV have been monitored. The pollution sources were monitored both outdoor and indoor.

The dosimeters are based on polymer and dye technology and the result of the exposure is measured as change in absorption of the dosimeter film. A major advantage of the new dosimeters is that the effects can be read directly at the location after exposure, and can be interpreted by comparison with acceptable exposure levels for different kinds of institutions, from archives to open structures. Threshold levels are set based on best available effect measures for the environmental parameters on organic objects, dyes and existing standards. The EWO dosimeters provide a relatively cheap and easy way for museums as a first step to evaluate the quality of the environment they provide for organic objects.

Based on information provided from the early warning system and the results from end-users review of the system, a new and innovative preventive conservation strategy has been developed and proven useful, for various kinds of institutions, from archives to historic houses. Each institution will have different needs, but the early warning system can be applied to all of them.

HEALTH AND ENVIRONMENT – EUROPEAN FOCUS AREA

The state of our environment has a huge impact on the well-being and health of people. NILU plays a key role in two European projects that deal with this growing area of attention: INTARESE and DROPS.

INTARESE – “Integrated assessment of health risks of environmental stressors in Europe” – is an European collaborative integrated research project. It has 32 partners and runs from 2005 until 2010. It will provide methods and tools to enable integrated assessment of environmental health risks.

In recent years, scientific advances have been made in specific areas of toxicology, air pollution, molecular epidemiology and environmental modelling. Thus enabling environmental health to be taken into account when assessing the need for new legislation and its implementation costs. Until now no unified methodology has been developed. Assessments have, until now, often had to deal with incomplete methodologies and information, e.g. insufficient assessment or monitoring data.

INTARESE aims at providing a unifying methodology. It will look into a number of policy areas and use them as case studies and a “reality check” to all elements of the project. INTARESE will also, as an integral part of the methodologies, develop approaches for integrated environment and health monitoring and surveillance.

NILU is the lead organisation of this part of the project. NILU’s role further includes the development of toolbox for integrated assessment using our expertise in environmental data gathering, information technologies related to environmental databases design and e-learning.

In addition to these two core activities, NILU’s scientists participate in development of exposure assessment methods, in case studies

for transport, housing, and climate change, and NILU also has a role in outreach and dissemination.

DROPS, “Development of Macro and Sectoral Economic Models Aiming to Evaluate the Role of Public Health Externalities on Society”, is a collaborative two-year research project with seven partners, co-ordinated by NILU. DROPS will provide integrated assessment for selected heavy metals, persistent organic pollutants (POP) and indoor air.

Such integrated assessment has never been done for those compounds, and poses several challenges: emission inventories, knowledge of fate and transport in the environment, identification of health and non-health benefits, monetary valuation, and integration of macro-economic modelling into the assessment. DROPS, with partners that are leading experts in relevant areas, will utilize NILU’s expertise on emission inventories for heavy metals and POPs, on indoor environment assessments, and on environmental modelling.

Both projects will have a significant impact on the design of European environmental policies, in particular in the framework of the development of integrated air quality strategies. The Environmental and Health Action Plan recently adopted by the European Commission, aims to provide the information needed to develop cost-effective policy measures on pollution related disease. This has resulted in the request of a full-chain analysis related to impact of health measures of priority. The benefits to society can be divided into pure economic benefits, on the one hand and social benefits on the other.

INTARESE

INTARESE: Integrated assessment of health risks of environmental stressors in Europe

Project co-ordinator:

Professor D. Briggs,
Imperial College, London.

NILU project leader:

Senior Scientist, Alena Bartonova, NILU

Project partners:

33 European partners.

Funding:

European funding:
Through 6th Framework Program (FRP) for Research and Development of European Communities
Norwegian funding:
Research Council of Norway (RCN)

Project period: 2005-2010

For more information about INTARESE contact Alena Bartonova, NILU.
E-mail: alena.bartonova@nilu.no

Project website: www.intarese.org

DROPS

DROPS: Development of Macro and Sectoral Economic Models Aiming to Evaluate the Role of Public Health Externalities on Society”

Project partners:

Eight European partners.

Project co-ordinator:

Professor Jozef M. Pacyna, NILU.

Funding:

European Commission DG Research and the Research Council of Norway

Project period: 2005-2007

For more information about DROPS contact Professor Pacyna,
E-mail: jp@nilu.no

Project website:

www.nilu.no/DROPS



Trainee becomes laboratory technician. Elisabeth Hedevang (left) takes her degree at NILU. Here at work with Senior Scientist Ellen Katrin Enge.

INDIVIDUAL EXPOSURE TO POLLUTION IN CITIES

One of the most important environmental concerns of today is the negative impact of pollution on human health. Environmental changes affect human health through multiple pathways such as air, water and food. Exposure to particulate matter in air is one pathway of major concern.

Standards and guidelines are set for the outdoor concentrations of a number of organic and inorganic species as well as particulate matter. These standards are incorporated into the legal and regulatory frameworks in many countries. It has, however been acknowledged that human exposure estimates must also take into account indoor exposure, due to the fact that people on average spend approximately 85% of their time indoors. In the course of a day, individuals spend a varying amount of time at home, in a working or schooling environment, partaking in leisure activities and in transit between these microenvironments.

The aim of the Urban Exposure project (Integrated exposure management tool characterizing air pollution-relevant human exposure in urban environment) was to study human exposure from air-pollution compounds that accounted for two important pathways of exposure, namely inhalation and dermal absorption, and further to quantify exposure specifically for particulate matter and chloroform in European urban areas.

Estimates of personal exposure to particulate matter in an urban environment are based on defined daily routes for individuals, where the hourly concentration of particulate matter is calculated for various outdoor and indoor microenvironments. The indoor concentrations are calculated on the basis of both outdoor concentrations and contributions from selected indoor

sources, such as smoking, indoor heating, pets etc. Based on the micro-environmental concentrations, activity level, gender and age, the respiratory deposition for various particle sizes is calculated. The tool is implemented in NILU's air quality management system: AIRQUIS.

The tool has been applied for case studies in two urban areas in Europe: Katowice, Poland and Oslo, Norway. The results reflect the differences in concentrations in the various micro-environments, the time spent there, the indoor sources, the activity level and the variations in respiratory capacity due to age and gender.

The Urban Exposure tool is targeted to support the urban authorities' decision-making process in the field of air pollution. For air quality managers, the tool will provide a better understanding of the total exposure and dose related to various activities, as opposed to basing the evaluation on ambient concentrations only. The Urban Exposure tool and the results from the case studies have been presented for end users at demonstration workshops in six cities across Europe and the Middle East.



Air pollution poses a considerable threat to human health. The Urban Exposure tool provides information to support further policy development towards minimising pollution impacts on people's health

URBAN EXPOSURE

21

(member of CLEAR - Cluster of European Air Quality Research)

Project co-ordinator:
Trond Bøhler, NILU.

Project leader NILU:
Inga Fløisand

Funding: The European Commission

Project period: 2002-2005

Project partners:
Norwegian Institute for Air Research, Institute for Ecology of Industrial Areas, Fraunhofer-Gesellschaft, Toxicology and Experimental Medicine University of Essex, Academy of Science of the Czech Republic, Israel Institute of Technology, Technion, Technical University of Crete, National Centre for Scientific Research "Demokritos", City of Oslo, Health and Welfare Agency

Project website:
www.nilu.no/urban_exposure



Waterproof outdoor jackets contain high amounts of fluorinated compounds which are easily released directly to air or to waste-water during washing.



NILU uncovered fluorinated compounds in burbot and trout from lake Mjøsa.

SCREENING ANALYSES – REVEALING ENVIRONMENTAL POLLUTANTS

NILU has extensive experience in investigating the presence of novel pollutants in the environment. The Department for Environmental Chemistry at NILU performs screening analyses on a regular basis. The department determine whether chemical substances can be characterized as a relevant environmental pollutant.

This kind of chemical analyses are challenging. It is necessary to develop numerous new analytical methods, with very low detection limits, in order to determine relevant concentrations.

As new chemicals come to the market, they undergo more or less extensive tests for toxicity, degradability and bioaccumulation. These tests are done under standardized artificial conditions (necessarily neglecting variations under real conditions).

Screening analyses give relevant information on the environmental fate, especially degradability and bioaccumulation, of a chemical substance. Local hotspots or point sources can be found and traced under screening surveys.

EXAMPLES

Triclosan, a biocide, used in toothpaste, soaps, and textiles was detected (by NILU) in sewage emission, surface water, and fish. As a consequence, the State Pollution Control Authority strengthened its classification.

Decabrominated diphenylether was found in moss from Norwegian background areas. This indicates that particle-bound substances undergo long-range atmospheric transport.

FLUORINATED COMPOUNDS

In recent years, perfluorooctane sulfonate (PFOS) and perfluorinated carboxylates (PFCAs) have been detected in high-trophic biota from the Arctic. To help understand the migration from densely populated

areas to remote places, NILU investigated their presence and distribution pattern in consumer products and in the environment.

These environmental pollutants were detected in Norwegian indoor and outdoor air and in the lake Mjøsa. Related compounds were found in lake Mjøsa fish. Analyses also uncovered several of the pollutants in consumer products like all-weather jackets.

For more information contact
Department Director, Ole Anders Braathen.
E-mail: oab@nilu.no



People in the poorer areas in Kanpur, India, are more exposed to air pollution.

STUDYING AIR POLLUTION IN INDIA

In Kanpur, the capital of Uttar Pradesh, India, NILU participated in a project studying exposures to air pollution and respiratory health. Kanpur has nearly 3 million inhabitants and considerable social and environmental challenges.

The project: "Indoor and Ambient Air Exposure of PAHs and Fine Particulate to Women and Children: Health Impacts in terms of Morbidity" studied exposure to particles in four different areas: Urban residential areas, urban slum areas, areas within village proximity and at a University campus.

Particle and spirometry measurements were done in each of the four locations, for up to 14 days each season. 24-hour particle ($PM_{2.5}$) averages ranged between $42 \mu\text{g}/\text{m}^3$ at the campus and in the village in summer, to over $340 \mu\text{g}/\text{m}^3$ in urban residential areas and urban slum areas in winter.

The study subjects (in all, over 210 people, including 30 men and 50 children) showed marked differences in spirometry performance, with the urban slum population performing worst and the urban residential area performing second worst. There is also a strong

indication that women perform worse than men.

Thus, both social disparities and pollution load were shown to play a role in respiratory effects, strongly suggesting priorities for remedial actions.

National press coverage was extensive, and contributed to put air pollution and public health on the national agenda in India.

The project was executed in the period 2002-2005, in collaboration with the Indian Institute of Technology, Kanpur, and the GSVM Medical College in Kanpur. The Indo-Norwegian Programme provided funding for the project through the Institutional Co-operation (INPIC).

NILU's tasks included detailed project planning, monitoring support, support to chemical analyses, data analysis and quality control. Scientific workshops were

an important part of the project. They allowed for the environment and health issues to be thoroughly discussed between the Indian authorities and experts.

Indoor and Ambient Air Exposure of PAHs and Fine Particulate to Women and Children: Health Impacts in terms of Morbidity

Project period: 2002-2005

Project partners:

The Indian Institute of Technology, Kanpur, the GSVM Medical College in Kanpur, NILU.

Funding:

The Indo-Norwegian Programme provided funding for the project through the Institutional Co-operation (INPIC).

Project leader and co-ordinator:

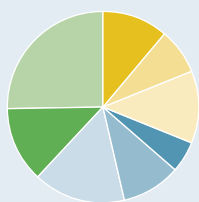
Senior scientist Alena Bartonova, NILU.

For more information:

alena.bartonova@nilu.no

REPORT FROM THE BOARD OF DIRECTORS 2005

OPERATING REVENUE 2005



- 11,2% ● Basic grant
- 7,8% ● Development projects
- 12,4% ● The European Commission
- 5,3% ● United Nations
- 9,8% ● The Research Council of Norway
- 15,6% ● The Norwegian Pollution Control Authority
- 12,7% ● Industry
- 25,3% ● Public Administration

Total sum: 108 NOK million

The foundation Norwegian Institute for Air Research (NILU) conducts research and assessment of technical, economic, health related and other environmental issues related to air pollution and environmental pollutants. Domestic projects provide 64% of the earnings, while the remaining 36% come from international organizations and customers.

The main purpose of the subsidiary company NILU Products Ltd., established in 1996, is to manage the strategic owner interests of the parent company as well as market products and systems developed by NILU. NILU Polska sp. zo.o. was established in 2001 with a 90% share owned by NILU Products.

NILU's main activities are run from the head office at Kjeller in the municipality of Skedsmo, Norway. NILU is also represented with offices in the Polar Environmental Centre in Tromsø in Northern Norway, in the city of Abu Dhabi in The United Arab Emirates.

MAJOR TASKS IN 2005

NILU experienced a shortfall in income within several areas in 2005. Even though a few areas showed improvement, the result ended in a deficit. The loss of income was divided evenly between public and private sector. NILU's international operations showed the weakest results. An important cause to the shortfall was the fact that many contracts were fulfilled in 2005, while new assignments did not start as soon as expected.

The basic grant from the Research Council of Norway represents 12% of the annual turnover of the institute. About one quarter of the grant is assigned to Strategic Institute Programmes (SIP). They are adapted to anticipated future research fields. NILU's five most recent SIPs have had the following focus:

- Earth observation (completed 2005)
- Particles In Air (PIL) (completed 2005)
- Air Quality Management System (AQMS)(completed 2005)

- Development of a risk assessment toolbox for "new" organic pollutants of emerging environmental concern (NEW POLL) (runs until 2007)
- Environmental impact assessments (in collaboration with other Norwegian environmental research institutes). (completed 2005).

The basic grant from the Research Council of Norway has increased with approximately two million NOK in 2006.

The NILU Tromsø department has its main activities within biodiversity, earth observation, climate, ozone and UV research. The department co-operates with other institutions in the Polar Environment Centre through common centre programmes as well as with the scientific staff at Kjeller.

The air quality management system AirQUIS, which integrates monitoring, data handling, geographic information system (GIS), models and presentation of air quality, was further developed and applied. The AirQUIS system is a main component in several new projects during this year, in Norway as well as abroad. NILU and the Norwegian Meteorological Institute (Met.no) are co-operating in forecasting the air quality in Oslo and several other cities in Norway by means of AirQUIS. NILU continues its long-term work in further developing the system.

The observatory on Zeppelin Mountain in Ny-Ålesund, on Svalbard's west coast at 79° north latitude, can be seen as an early warning system for global pollution and changes in the global climate. It's a "natural laboratory" due to its location in an undisturbed Arctic environment. Zeppelin Mountain is an excellent site for atmospheric monitoring, with minimal contamination from the local settlement due to its location above the inversion layer. Zeppelin Mountain is Norway's most important observatory linked to the monitoring of greenhouse gases and long-range transboundary air pollution.

The Board of Directors has asked the management to look into financing options aimed at increasing NILU's activity at the Observatory. Expanding these operations is a challenge. Despite good infrastructure and communications, scientific activity at the Observatory is expensive compared to operations on the mainland.

Surveillance of long-range trans-boundary air pollution and measurements of greenhouse gases on behalf of the Norwegian Pollution Control Authority (SFT) are still important tasks for NILU. SFT has assigned NILU the task of being a reference laboratory for air quality in Norway. In addition NILU has for several years been accredited to conduct monitoring of air quality and meteorological parameters, as well as to undertake chemical analyses of all kinds.

NILU's chemical laboratories are amongst the most advanced in Europe. They have state of the art analytical equipment, including several high-resolution mass spectrometers. Today, the laboratories cover a broad range of organic and inorganic pollutants and are highly competent both in chemical analysis and in evaluating environmental impacts.

INTERNATIONAL ACTIVITIES

NILU plays an important part in several EU initiatives concerning air pollution. One example is the Institute's participation in the Environmental Topic Centre on Air Quality and Climate Change (ETC-ACC) under the European Environment Agency (EEA), together with the Norwegian Meteorological Institute (Met.no).

For more than 15 years, NILU has participated in the EU framework programme for research and technological development (FP). During 2005 NILU has participated in almost 30 EU projects under FP5 and FP6. Main topics for NILU are related to changes in ozone layer and ultraviolet radiation, pollution

and climate changes, satellite validation and databases, changes in atmospheric chemistry, particulate matters in air, regional and global dispersion of environmental toxins, standardization of monitoring methods, electronic distribution of environmental data and environmental influence on building materials.

In the FP6 NILU is a central partner within air pollution in a Network of Excellence, which started 1 March 2004. This network is called ACCENT – "Atmospheric Composition Change: a European Network". In 2002, NILU was appointed as partner in a Nordic Centre of Excellence (NCoE) for excellent research within the fields of biosphere, aerosols, cloud and climate interactions. The main objective is to study the importance of aerosol particles on climate change and on human health, which is well in accordance with the above SIP on particles in air.

NILU develops and manages several international databases, for the most part databases with a scientific purpose. They can be divided into three main groups: Databases linked up to international emission conventions, satellite data and measurements from EU projects.

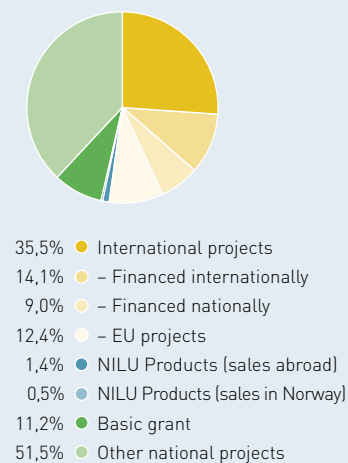
Transfer of competence through development aid is of great importance, through projects in Botswana, Egypt, South Africa, Senegal, China, India and Vietnam. The major topics are to establish infrastructure, to map air quality and to prepare action plans, including transfer of knowledge and competence.

NILU Polska had seven employees year-end 2005 and focuses primarily on renewable energy and air quality management systems (AQMS). NILU Polska participates in several EU research projects, and in proposals for EU projects.

In 2005 NILU launched a branch office in Abu Dhabi in The United Arab Emirates (UAE). The office mainly serves the UAE authorities and the oil industry. NILU assists in setting

REVENUE

NATIONAL/INTERNATIONAL ACTIVITIES



Total sum: 108 NOK millions

up environmental institutions, employing air quality management systems (AQMS), analyzing air quality in the region and air quality monitoring.

FUTURE OPERATIONS

The economic status of NILU as reflected in the economic balance for 2005 makes a good basis for continued operations. The prospects for the future seem sound and are based on an increase of contracts at the end of the year. NILU maintains the basic grant from the Government of about 10% of gross income. There are also reasonable expectations for new contracts from the Research Council as well as from other sources in 2006.

BOARD OF DIRECTORS 2005

GENDER ISSUE

NILU has focused on a balanced personal composition of employees of both sexes. This also applies to the Board of Directors. The directives, salary system and NILU regulations are gender neutral. There are 62 women and 81 men of a total staff of 143 employees. The Board of Directors consists of 4 women and 3 men.

WORK ENVIRONMENT

The institute procedures for the work environment linked to Health, Environment and Safety is according to "Rules on internal control – health and safety". An annual report is prepared to the Health and Safety Authority regarding measures and status. Accidents resulting in absence from work have not occurred during 2005. The total time of absence due to illness sank from 5,2% to 4,7% in 2005.

EXTERNAL ENVIRONMENT

NILU emits insignificant amounts of pollution to the ambient environment. Ordinary waste is source sorted, while special waste is delivered to approved receivers.

DISTRIBUTION OF LOSS

The Board of Directors proposes that the loss of the year of NOK 5,655,463 for the parent company, as well as the group, is covered by other equity capital.



NILU Board of Directors 2005 (from left): Signe Nåmdal, Ingegerd K. Rafn, Ole Christian Torpp, Inga Fløisand, Trond Iversen, Terje Johansen, Thor Ofstad (substitute).

Ole Christian Torpp
Chairperson

Terje Johansen

Signe Nåmdal

Trond Iversen

Mona Johnsrud

Ingegerd K. Rafn

Gunnar Jordfald
Director

Kjeller, 3 April 2006. In the Board of Directors for the Norwegian Institute for Air Research

AUDITOR'S REPORT

I have audited the financial statements of the Norwegian Institute for Air Research for the financial year 2004, showing a loss of NOK 5 655 463 both for the parent company and the group. I have also audited the information in the Board of Director's report concerning the financial statements, the concern assumption of continued operations, and the proposal for the cover of loss. The financial statements comprise the balance sheet, the statements of income and cash flows, the accompanying notes and the group accounts. These financial statements are the responsibility of the company's Board of Directors and Director. My responsibility is to express an opinion on these financial statements and on the other information according to the requirements of the Norwegian Act on Auditing and Auditors.

I have conducted my audit in accordance with the Norwegian Act on Auditing and Auditors and good auditing practice. Good auditing practice requires that I plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. The audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by the management, as well as evaluating the overall financial statement presentation. To the extent required by law and good auditing practice an audit also comprises a review of the management of the company's financial affairs and its accounting and internal control system.

I believe that my audit provides a reasonable basis for my opinion.

In my opinion:

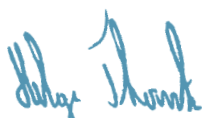
The financial statements are prepared in accordance with the law and regulations and present the financial position of the company and of the Group as of 31 December 2005, and the results of its operations and its cash flows for the year then ended, in accordance with good accounting practice.

The company's management has fulfilled its duty to produce a proper and clearly set out registration and documentation of accounting information in accordance with the law and good accounting practice.

The information in the Board of Director's report concerning the financial statements, the going concern assumption, and the proposal for the cover of loss are consistent with the financial statements and comply with the law and regulations.

To my knowledge, there are no circumstances regarding the management of the institute and its distributions, that are not in compliance with the law, the institute's purpose or its statutes.

Oslo, 3 April 2006



Helge Thorvik
State Authorised Public
Accountant (Norway)

Note: The translation into English has been prepared for information purposes only.

PROFIT AND LOSS ACCOUNT FOR NILU

[all amounts in NOK]		The Group		Parent Company	
OPERATING REVENUE	Note	2005	2004	2005	2004
Project income	1	93 754 536	97 172 876	93 754 536	97 172 876
Basic grant	2	12 123 000	11 864 000	12 123 000	11 864 000
Production income		2 039 089	2 015 624	0	0
Sundry income		172 311	187 769	172 311	187 769
Operating revenue		108 088 936	111 240 270	106 049 847	109 224 646
OPERATING EXPENSES					
Payroll and sosial costs	3	-70 920 357	-69 347 029	-70 269 739	-68 666 294
Direct project expenses	1	-19 270 804	-20 626 247	-19 270 804	-20 626 247
Changes to project in progress		-1 701 891	3 506 130	-1 701 891	3 506 130
Direct production costs/cost of materials		-1 112 298	-1 204 496	0	0
Rent, lighting, heating etc.		-3 993 691	-3 307 887	-3 993 691	-3 307 887
Consumables, operation and maintenance		-8 600 056	-8 902 706	-8 473 658	-8 766 803
Travels and meetings		-849 287	-1 072 644	-849 287	-1 072 644
General office expenses		-2 409 990	-2 529 991	-2 409 990	-2 529 991
Other expenses	4	-850	-486	-400 850	-400 486
Bad debts		0	-1 414	0	-1 414
Depreciation	5	-5 028 259	-5 729 969	-4 631 459	-5 329 269
Operating expenses		-113 887 484	-109 216 740	-112 001 370	-107 194 906
OPERATING LOSS/PROFIT		-5 798 549	2 023 530	-5 951 524	2 029 740
FINANCIAL INCOME AND FINANCIAL EXPENSES					
Income from investments in subsidiary company				178 468	183 705
Income from investments in affi. companies	8	37 782	189 352		
Dividends received		451 242	513 306	449 744	507 784
Other financial income		309 786	343 449	309 786	343 449
Interest expenses	6	-575 545	-192 892	-575 545	-192 892
Other financial expenses		-67 425	-864 554	-66 391	-859 595
Net profit/loss financial items		155 839	-11 339	296 061	-17 549
ORDINARY PROFIT BEFORE TAX CHANGES		-5 642 710	2 012 191	-5 655 463	2 012 191
Tax expenses on ordinary profit	7	-12 753	0	0	0
LOSS/PROFIT OF THE YEAR		-5 655 463	2 012 191	-5 655 463	2 012 191
DISTRIBUTION OF LOSS/PROFIT					
Cover of loss	12	-5 655 463	2 012 191	-5 655 463	2 012 191

BALANCE

[all amounts in NOK]		THE GROUP		PARENT COMPANY	
	Note	31.12.05	01.01.05	31.12.05	01.01.05
ASSETS					
FIXED ASSETS					
Immaterial assets					
Activated research and development costs		921 000	1 290 000		
Tangible fixed assets					
Building Kjeller	5	19 171 250	20 634 700	19 171 250	20 634 700
Instruments/field equipment	5	5 206 440	6 243 800	5 206 440	6 243 800
Computer equipment	5	620 100	827 700	620 100	827 700
Fixtures and fittings	5	358 100	434 100	358 100	434 100
Tangible fixed assets, NILU Products	5	58 500	21 300	0	0
Total tangible fixed assets		25 414 390	28 161 600	25 355 890	28 140 300
Financial fixed assets					
Net pension commitments		91 140	42 600		
Investments in subsidiary company	8	106 511	145 174	1 922 450	1 743 982
Loan to subsidiary company	9	0	0	1 690 000	1 690 000
Investments in affiliated companies	8	1 176 174	1 099 729	0	0
Investments in shares	8	1 694 251	1 647 022	1 694 251	1 647 022
Deposit/other holdings		75 844	83 344	75 844	83 344
Total financial fixed assets		3 143 920	3 017 869	5 382 545	5 164 348
Total fixed assets		29 479 310	32 469 469	30 738 435	33 304 648
CURRENT ASSETS					
Stocks, NILU Products	10	1 324 700	1 542 800	0	0
Work in progress	10	9 915 702	11 617 593	9 915 702	11 617 593
Debtors		12 406 303	9 086 638	12 016 647	8 859 838
Claims on the group		0	0	1 174 378	1 328 325
Other short-term claims		1 981 523	1 531 984	1 781 270	1 523 047
Cash and bank	11	40 718 841	41 988 189	39 832 712	41 655 464
Total current assets		66 347 068	65 767 204	64 720 707	64 984 267
TOTAL ASSETS		95 826 378	98 236 673	95 459 142	98 288 915
EQUITY AND LIABILITIES					
Lock-up capital					
Capital stock		10 000 000	10 000 000	10 000 000	10 000 000
Equity capital income					
Other long-term debt	12	39 546 684	47 116 947	39 546 684	47 116 947
Total equity capital		49 546 684	57 116 947	49 546 684	57 116 947
LIABILITIES					
Provisions made for liabilities					
Pension commitments	13	4 044 158	2 428 800	4 044 158	2 428 800
Deferred tax		0	0	0	0
Other long-term debt					
Mortgage	14	7 267 500	8 122 500	7 267 500	8 122 500
Total long-term liabilities		11 311 658	10 551 300	11 311 658	10 551 300
Current liabilities					
Creditors		4 572 314	4 929 917	4 449 302	4 905 913
Debt to subsidiary company		0	0	85 956	225 060
Advances from clients		12 654 917	9 887 574	12 560 537	9 839 374
Advances relating to management projects	1	3 993 120	2 292 528	3 993 120	2 292 528
Tax payable		12 753	0		
Unpaid government charges and special taxes		5 517 529	5 405 461	5 352 530	5 360 540
Unpaid accumulated holiday payroll/wages		8 068 887	7 835 752	8 010 839	7 780 059
Other short-term liabilities		148 516	217 194	148 516	217 194
Total short-term liabilities		34 968 036	30 568 427	34 600 800	30 620 668
Total liability		46 279 694	41 119 727	45 912 458	41 171 968
TOTAL EQUITY AND LIABILITIES		95 826 378	98 236 674	95 459 142	98 288 915

CASH FLOW ANALYSIS

[all amounts in NOK]

		THE GROUP		PARENT COMPANY	
		2005	2004	2005	2004
OPERATING ACTIVITIES					
Profit before taxes		-5 642 710	2 012 191	-5 833 931	2 012 191
Tax paid for the period		0	-37 464	0	0
Loss on discarded equipment		0	0	0	0
Corrections made for dead stocks		-24 165	-24 087	0	0
Ordinary depreciation		5 028 259	5 729 969	4 631 459	5 329 269
Corr. of interest charges					
by the way of contribution from MD		0	0	0	0
Income in conn. with using the .					
equity method for shares		-37 782	-189 352	0	-183 705
Changes in stocks		242 265	196 887	0	0
Changes in debtors		-2 765 717	-756 194	-2 602 861	-736 816
Changes in creditors		-496 707	-1 658 726	-595 715	-1 666 595
Changes in pension commitments		-347 982	144 500	-299 442	152 700
Changes in other accruals		5 786 818	484 192	5 627 015	706 360
Net cash flow from operating activities	A	1 742 280	5 901 916	926 526	5 613 404
INVESTMENTS ACTIVITIES					
Payments from subsidiary company		-65 000	0		
Purchase of shares		-47 229	-806	-47 229	-806
Income sale of tangible fixed assets		0	55 475	0	55 475
Investment on tangible fixed assets		-1 847 050	-5 465 544	-1 847 050	-5 465 544
Net cash flow from investment activities	B	-1 959 279	-5 410 875	-1 894 279	-5 410 875
FINANCING					
Long-term liabilities repaid		-855 000	-855 000	-855 000	-855 000
Paid loan to Miljøforskningssenteret		0	-15 394	0	-15 394
Cash inflow of loan from subsidiary company		0	0	0	100 000
Cash inflow of sale of shares		-197 350	0		
Cash flow from financing activities	C	-1 052 350	-870 394	-855 000	-770 394
Net changes in cash					
and bank throughout the year	A+B+C	-1 269 349	-379 353	-1 822 753	-567 865
Cash and bank deposits as at 1 January		41 988 189	42 367 542	41 655 464	42 223 329
Cash and bank deposits as at 31 December		40 718 840	41 988 189	39 832 711	41 655 464

NOTES TO THE ACCOUNTS 2005

NOTES

The consolidation accounts comprise the parent company NILU and the wholly owned subsidiary NILU Products AS. The shareholdings in the subsidiary and all internal transactions have been eliminated.

Trade debtors and other receivables are recorded at face value after deducting provisions for bad debts. Provisions for bad debts are made on the basis of an individual valuation of the various receivables. In addition, an unspecified provision for debtors is made in order to cover the assumed loss.

NOTE 1 PROJECT INCOME

In order to show the actual turnover, as in previous years, management projects have not been included in the profit and loss account. In 2005, management costs amounted to NOK 9.5 million and for 2004 NOK 8.9 million. Equivalent amounts are deducted from direct project costs. Advance payment for the management projects has been entered as a separate item in the balance for 2005 amounting to NOK 3 993 120 and for 2004 to NOK 2 292 528.

NOTE 2 BASIC GRANT/INSTITUTE PROGRAMME

		2005	2004	2003	2002
Basic grant	Chapter 1410	8 576 000	8 564 000	8 788 000	8 340 000
Institute programme	Chapter 1410	3 547 000	3 300 000	2 600 000	3 400 000
TOTAL		12 123 000	11 864 000	11 388 000	11 740 000

NOTE 3 EMPLOYEES, REMUNERATION ETC.

	2005	2004	2005	2004	2005	2004
	The Group	The Group	Parent Company	Parent Company	NILU Products	NILU Products
Salaries	54 975 475	53 790 164	54 446 529	53 241 653	528 946	548 511
Salaries clearing NILU Products	-26 925	-34 080	-26 925	-34 080		
Expense for social taxes	8 350 537	8 084 778	8 265 468	8 002 836	85 069	81 942
Norwegian Public Service Pension Fund (SPK)	6 464 974	5 681 455	6 396 720	5 646 619	68 254	34 836
Assistance from The Group	13 815	20 527			13 815	20 527
Change in pension commitments	-347 982	144 500	-299 442	152 700	-48 540	-8 200
Other labour costs	1 490 463	1 659 685	1 487 389	1 656 566	3 074	3 119
Total labour costs	70 920 357	69 347 029	70 269 739	68 666 294	650 618	680 735

The Institute Director received remuneration amounting to: 783 684

Remuneration paid to members of the Board of Directors 16 750

Average number of employees: 143

Auditor's fee (auditing only) (NILU & NP) 66 850

NOTE 4 OPERATING GRANT

NILU Products have received NOK 400 000 in operating grant from parent company.

NOTE 5 TANGIBLE FIXED ASSETS

	New building	Instruments	Data equip.	Off. equip.	TOTAL	R&D costs	Instruments	TOTAL
	NILU	NILU	NILU	NILU	Par. Comp.	NILU Prod.	NILU Prod.	The Group
Original cost 01.01.2005	73 167 064	57 071 256	12 893 859	5 157 007	148 289 186	1 843 388	260 661	150 393 235
Additions during the year	0	1 493 353	291 453	62 243	1 847 049		65 000	1 912 049
Disposal during the year						0		0
Original cost 31.12.2005	73 167 064	58 564 609	13 185 312	5 219 250	150 136 235	1 843 388	325 661	152 305 284
Accumulated depreciation 01.01.2005	52 532 364	50 827 456	12 066 159	4 722 907	120 148 886	553 388	239 361	120 941 635
Ordinary depreciation for the year	1 463 450	2 530 713	499 053	138 243	4 631 459	369 000	27 800	5 028 259
Depreciation written back				0	0			0
Accumulated depreciation 31.12.2005	53 995 814	53 358 169	12 565 212	4 861 150	124 780 345	922 388	267 161	125 969 894
Book value 31.12.2005	19 171 250	5 206 440	620 100	358 100	25 355 890	921 000	58 500	26 335 390
Depreciation rate, linear	2,0%	20,0%	25,0%	12,5%		20,0%	20,0%	

NOTE 6 INTEREST EXPENSES

The interest expenses are mainly connected with interest on the mortgage.

NOTE 7 TAXES

NILU is exempt from tax liability for its main activities. The subsidiary is liable to pay taxes, and the various tax items can be seen in the table below.

Calculation of tax for the year:

Profit on ordinary activities before tax	191 221
Interest income from the tax settlement for the year 2004	-322
Profit written back affiliated companies	-37 782
Changes in the difference between the values for accounting purposes and those for tax purposes	-75 239
The years tax basis = deficit to put forward	77 878
From the point of view taxation the deficit to put forward from 2004	-32 333
For taxation in 2004	45 545
Payable tax = 28% of 45.545	12 753

To be cautious, deferred tax profit is not calculated.

NOTE 8 SHARES

NILU Products AS is wholly owned with a share capital of NOK 750.000.

As of 31.12.2005 NILU is shareholder in the following companies:

Company	Share capital	Number of shares owned	Nominal value per share	Book value
Campus Kjeller AS	8 830 399	32 856	100	1 602 216
Miljøalliansen AS	150 000	30	1 000	30 000
Forskningsparken II KS				47 229
Sundry stocks				14 806
TOTAL				1 694 251

NILU Products AS, as of 31.12.2005, owns shares in the following companies:

Affiliated companies are:	Acquisition time	Business location	Stake in	Voting share
NILU Polska Ltd.	2001	Polen	90 %	90 %
Unilab Analyse AS	1998	Tromsø	49 %	49 %

From 1999, the companies are booked according to the equity method, see table below:

	NILU Polska Ltd	Unilab Analyse AS	TOTAL
Original cost	96 011	1 500 000	1 596 011
Equity at time of purchase as entered on balance sheet	96 011	1 048 078	1 144 089
Goodwill		451 922	451 922
Opening statement on balance sheet as at 1.1.2005 of which goodwill not amortised	145 174	1 099 729	1 244 903
		-90 250	-90 250
Proportion of profit/loss for the year	-43 672	179 165	135 493
Adjusted income balance	5 009	-102 720	-97 711
Total loss/profit for 2005	-38 663	76 445	37 782
Closing statement on balance sheet as at 31.12.2005	106 511	1 176 174	1 282 685

NOTE 9 LOAN TO SUBSIDIARY

NILU Products AS has borrowed NOK 1 690 000 from the parent company in connection with purchase of shares.

NOTE 10 WORK IN PROGRESS AND STOCK

The value of work in progress is the project work carried out which has not yet been invoiced. As in previous years, the invoice value has been written down by 20% en bloc. In addition, write-downs have been assessed for each project relative to the risk of overrun involved. As a result, such provisions may vary somewhat from one year to the next, also in terms of percentage.

As of 31.12.2005 this provision of 40% is slightly lower than previous year. This provision is deemed sufficient following an assessment of the invoice value of each individual assignment.

NOTE 10 WORK IN PROGRESS AND STOCK, CONT.

Work in progress parent company	31.12.2005	31.12.2004	31.12.2003	31.12.2002
Invoice value	16 594 627	19 621 991	15 983 328	12 537 186
Provision	-6 678 925	-8 004 398	-7 871 866	-5 164 237
Total work in progress	9 915 702	11 617 593	8 111 462	7 372 949
Provision in % of invoice value	40%	41%	49%	41%

The stock in the subsidiary are estimated at original cost.

NOTE 11 LOCKED-UP CAPITAL

NOK 3 250 608 of the bank deposit is locked-up as withholding tax funds, NOK 3 208 309 of which is in the parent company.

NOTE 12 OTHER EQUITY CAPITAL

	The Group	Parent Company
Other equity capital as at 1.1.2005	47 116 947	47 116 947
Pension commitments	1 914 800	1 914 800
Profit of the year	5 655 463	5 655 463
Other equity capital as at 31.12.2005	39 546 684	39 546 684

NOTE 13 PENSION COMMITMENTS

The company's pension commitments are covered via the Norwegian Public Service Pension Fund (SPK), of which all employees are members.

In connection with the new accounting law being introduced, the company has calculated its net pension commitment according to the new Norwegian accounting standards. The actual calculation has been carried out by SPK and is based on an expected return of 5.5%, a discount interest of 5.5%, an annual salary growth of 3.5% and an annual "G" adjustment of 3.5%.

	The Group	Parent Company
The 2005 pension commitment taken to expenses is made up of:		
Net changes in the pension commitment	-347 982	-299 442
Pension premium paid	5 518 927	5 462 651
Premium paid to AFP	946 047	934 069
Total	6 116 992	6 097 278

NOTE 14 ASSETS HELD AS SECURITY – LOAN PAYMENT

Of the company's total liabilities, NOK 7 267 500 is a mortgage with the building as security. As per 31.12.2005 this building had a book value of NOK 19 171 250. For the remaining loan half-yearly payments will be made up to 30.06.2014.

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