



**CICERO**

Senter for klimaforskning

Center for International  
Climate and Environmental  
Research – Oslo

# Annual Report

**1999**

University of Oslo  
Universitetet i Oslo



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# CICERO

**CICERO (Center for International Climate and Environmental Research – Oslo) is a private, nonprofit organization founded by the University of Oslo. It was established by Royal decree on 27 April 1990 as a follow-up to the recommendations in the World Commission on Environment and Development report on sustainable development and is thus celebrating its 10-year anniversary this year.**

CICERO's mandate is twofold. First and foremost it states that CICERO will conduct climate research of internationally recognized quality based on a solid foundation in individual academic disciplines. CICERO's work is characterized by its broad interdisciplinary approach with input from a wide range of disciplines, particularly the natural sciences, economics, and political science. A main challenge for our researchers is to acquire new knowledge through a synthesis of discipline-based research.

CICERO's mandate also states that it will play a comprehensive information-providing role in connection with climate issues and climate research in general. CICERO looks upon this challenge as a positive one, one that helps lay the groundwork for the interdisciplinary approach of its research. Nevertheless, most of the emphasis is put on CICERO's role as a research center because we believe that the information we provide must be based on a solid foundation of high-quality research.

A natural extension of our interdisciplinary approach and comprehensive mandate is broad contact with the public. CICERO seeks to ensure that the knowledge gleaned through research—both that conducted here and that conducted externally—can reach the public both through our information activities and through participation in venues such as government reports and hearings, and various boards and steering committees.

All in all, the research and information activities in combination with public contact spans a wide range of tasks and arenas in which CICERO operates.

The evolution of CICERO from its inception to its current level of activity has taken place under the direction of several visionary leaders. In its establishment period, CICERO was led by Ted Hanisch (1990–1993). After an interim period with Ivar Isaksen as acting director, Helga Hernes took over as director until 1996. After another interim period with Kjell Arne Hagen as acting director, Knut H. Alfsen took the helm from 1997. In their different ways, the



**Director Knut H. Alfsen**

three “permanent” directors mark the phases of CICERO's development.

In its earliest stages, CICERO's approach was naturally more exploratory, and the new staff members were given a wide rein to complete their own projects and pursue their own disciplines, which were occasionally somewhat peripheral to CICERO's focus. The research profile was therefore still nascent in the start phase. Under Helga Hernes's direction, economics became the main focus, and much was invested in developing good administrative routines at the Center. Finally, with the economic “boom” period CICERO has experienced over the last few years, the desire for a more scientific focus and increased information activities has come into the foreground. Today, CICERO is one of the key actors within Norwegian climate research and is also playing a more important role on the international scene.

The remainder of this report provides more detailed information about the Center. Additional information can also be found on our Web pages at [www.cicero.uio.no](http://www.cicero.uio.no).

# Key Financial Figures

CICERO's 1999 accounts showed a profit of NOK 768.673.

The basic government grant from the Research Council of Norway made up 30.7% of CICERO's total income. Comparable figures for previous years are: 1993 (73%), 1994 (49%), 1995 (49%), 1996 (45%), 1997 (35%), and 1998 (33.8%). In 1999, the operating profit was NOK 299.646 (equivalent to 1,86% of total sales), while in 1998 it was NOK 634,190.

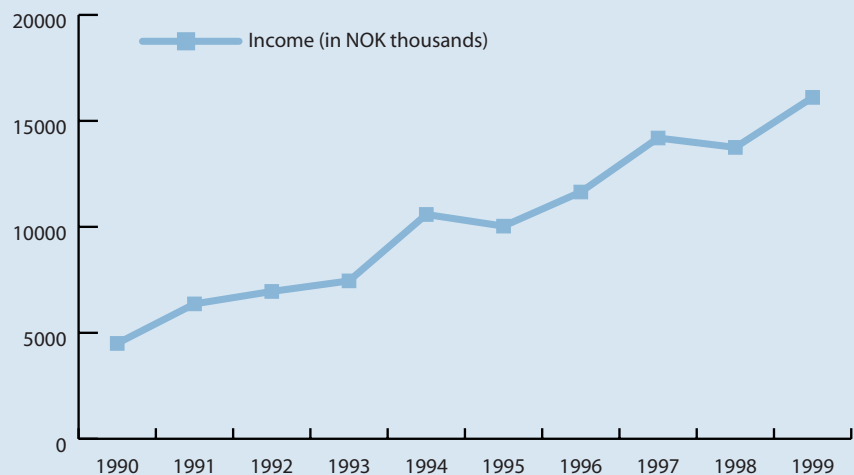
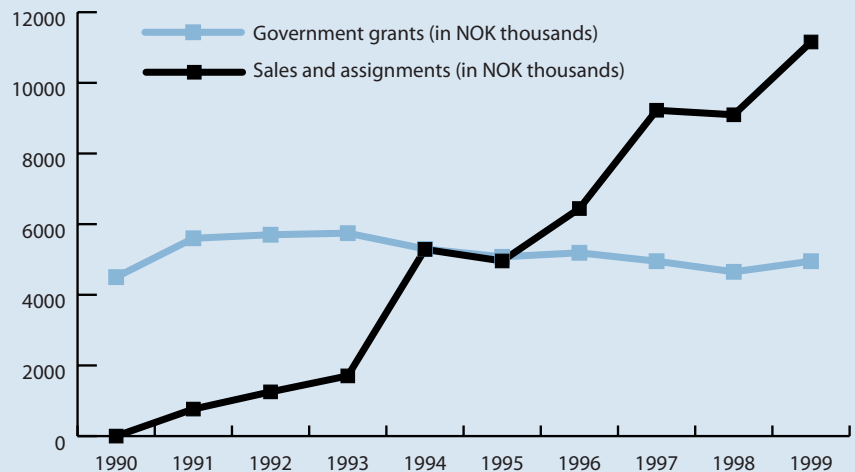
The annual result and operating profit in 1999 were among the best since CICERO commenced normal operations. There has been a steady influx of assignments, many of which can be attributed to the "boom" in climate-related research in the wake of the Kyoto conference in December 1997 and the discussion of domestic climate policy instruments the following year. CICERO was able to tackle the increase in assignments in 1999 without increasing its staff. In addition, CICERO's administrative staff is relatively small and was able to contribute significantly to the total income in 1999. However, administrative costs will increase in the years to come because the new guidelines issued by the Ministry of Justice state that those seeking alternative national service positions will no longer be given research-related assignments.

The key financial figures show that CICERO has had a satisfactory financial development in 1999 with good liquidity and equity. The current liquidity ratio is 2,12 (as compared to 3,02 in 1998), and its net worth at the beginning of 2000 accounted for 70,66% of the liability and shareholder's equity (as compared to 77,17% in 1999).

The Board looks favorably upon CICERO's ability to attract assignments. Nevertheless, the Board has expressed concern that the basic government grant has been steadily reduced in real terms, and that this is occurring without the Research Council of Norway providing any scholarly justification. This negative trend has stopped for the time being, however, and the basic government grant for 1999 and 2000 are equivalent in nominal terms to that given in 1997.

Income from international clients in 1999 made up 16% of total income (as compared to 15% in 1998). With respect to domestic sources of income, the various ministries accounted for 11% of the total (as compared to 7% in 1998), and the Research Council of Norway accounted for 31% (the same as in 1998). Although it must be considered a positive development that CICERO has received a greater share of funding through the Research Council of Norway, in the future CICERO hopes to diversify its sources of income to avoid becoming overly dependent on a few research programs sponsored

by the Council. Many of the Council's research programs that have funded CICERO's activities are either reaching the end of their program periods of have already been completed. For this reason, the Board expects the demand for CICERO's services to be less than that in 1998 and 1999 for the next couple of years. There is some degree of uncertainty as to how financing of the various research areas that these programs have covered will be met in the years to come. One clear objective for CICERO is to play a central role in the follow-up programs.



# Climate Impacts and vulnerability

**Identifying the regional impacts of climate change and climate variability has become more important as evidence of the human impact on climate system accumulates. Climate-related disasters such as Hurricane Mitch, which hit Central America the fall of 1998, show that climate vulnerability is closely related to social and economic factors, as well as to physical exposure. Senior Research Fellow Karen O'Brien at CICERO has been developing research projects on climate impacts and vulnerability in several regions of the world, including Norway.**

CICERO's involvement in the UNEP Country Studies on Climate Impacts and Adaptation Assessment highlights the importance of national and regional impact assessments as tools for understanding the potential consequences of climate change. The Cuba country study, which was completed in November 1999, showed that natural resources of great economic and social importance could become increasingly vulnerable as a result of sea level rise. Human settlements on the eastern side of the island were identified as most vulnerable to climate change because of lower living conditions and potential increases in aridity. Changes in the frequency and magnitude of extreme events, such as hurricanes or droughts, pose potential challenges to Cuba's coastal and agricultural resources.

Climate variability is an important factor that influences climate impacts, and a characteristic that is likely to change as a result of changes to the global climate system. Studies of present-day climate variability can provide important information regarding vulnerability to future climate change. CICERO has been working on a series of projects related to climate variability and change in southern Africa. The latest project was a study of how farmers respond to seasonal climate forecasts. In collaboration with researchers at the University of Namibia and Sokoine Agricultural University in Tanzania, CICERO carried out two farm-

level surveys in the aftermath of the 1997-98 El Niño. The purpose of these surveys was to find out whether climate forecasts actually reach small-scale farmers, and if so, whether the information can be used to adapt to climate variations. Adaptations to climate variability can be seen as a strong indicator of the potential for adapting to climate change.

CICERO organized an international workshop on User Responses to Seasonal Climate Forecasts in Southern Africa in September 1999. The workshop, funded by the World Bank and held in Dar es Salaam, Tanzania, focused on communication issues related to climate forecasts, as well as on constraints to forecast use in southern Africa. Access to alternative seeds and draught power were considered important factors affecting responses to the climate forecasts among small-scale farmers. Economic constraints emerged as an important factor limiting adaptation in southern Africa.

Global economic changes are affecting vulnerability to climate change, both positively and negatively. CICERO has been developing a series of case studies on economic globalization and climate change. The studies are based on the concept of "double exposure," which relates to the dual impacts that certain regions, sectors or social groups will experience as a result of climate change and changes brought about by economic globalization. Working in collaboration



Senior Research Fellow Karen O'Brien

with Rutgers University in the U.S., the University of East Anglia in the U.K., and TERI in India, CICERO has developed proposals to investigate the consequences of globalization and climate change on agriculture in southern Africa and India.

Climate change will have important consequences for both developing and industrialized countries. Because Norway is an affluent country situated in high latitudes, it is sometimes assumed that warmer global temperatures will be a benefit. In fact, the possibility of milder winters and warmer summers appears to support the conception that climate change will be unproblematic for Norway, unless the warm ocean currents of the North Atlantic Current change course. However, it is important to stress that within Norway, some regions and sectors may be more vulnerable to climate change than others. CICERO has been developing a collaborative project on regional climate impacts in Norway, which will eventually address some important questions about climate vulnerability.

# Research and Publication

In 1999, CICERO revised its strategic plan for research and publication in connection with the establishment of a new Board of Directors in fall 1999. The strategic plan contains CICERO's mission statement and is formulated as follows:

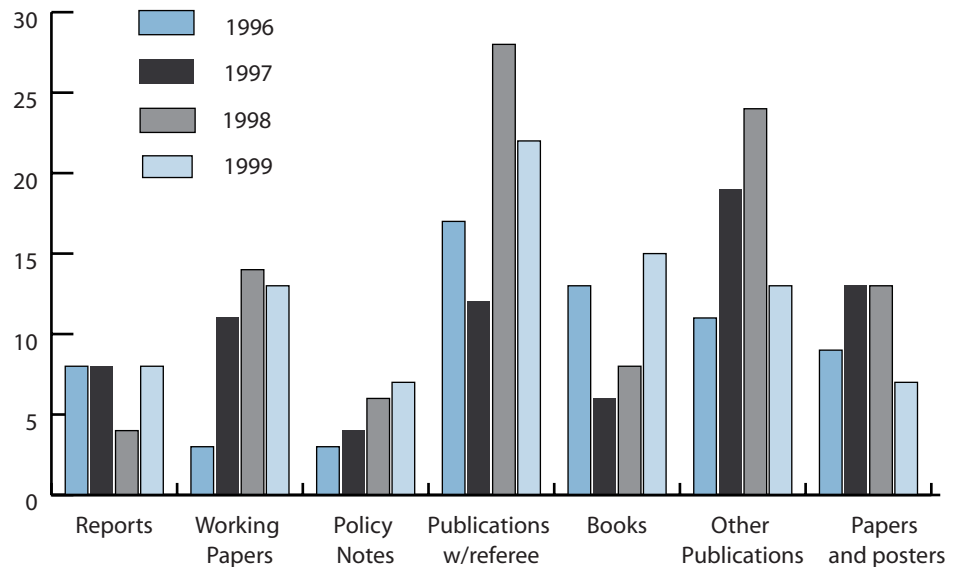
- *CICERO aims to be an institution that produces internationally recognized, genuinely interdisciplinary research on climate issues and related environmental concerns.*

- *CICERO aims to develop its information-providing aspect so that its interdisciplinary insight quickly reaches politicians, the government, businesses, and the general public in such a way that it is as timely, understandable, and useful as possible.*

The strategy also emphasizes synergy between the information and research activities at the Center.

The strategy and the strategic institution program (SIP), part of the basic government grant, are designed to give CICERO a more well-defined academic profile by developing formalized models that focus particularly on greenhouse gases other than CO<sub>2</sub>. The model framework functions as a common reference for activities at the Center to ensure that CICERO's scholarly activities are focused, and that the Center's limited resources are used as efficiently as possible in the research and information activities. This will help shape the long-term development of the center. At CICERO, SIP is used to actively realize the Center's strategic objectives.

In 1998 a relatively simple climate model was developed within the SIP framework. In 1999, the model has been applied in several analyses and has appeared in several international journal articles in addition to a large number of CICERO publications. The model will be used in a major EU-financed project (METRIC) in the years to come. The SIP work with the climate model must therefore be seen as successful so far. With respect to the social scientific aspect of the SIP, work progress has been slower. There are many reasons for this, but one important aspect has been that one of our key staff members has been occupied with a high priority, external activity in



connection with a joint venture with the Oxford Institute for Energy Studies. This has resulted in reorganization for next year where, apart from continued efforts on the natural science aspect, we will work on integrating a climate-negotiations model into the natural science model. This long-term goal for SIP activities is definite, and changes in planned progress are thus only a change in the order of tasks.

A model for analyzing the international permit market, which is expected to be established if/when the Kyoto Protocol enters into force, was also established in 1998. In 1999, this model was applied in a number of analyses, including assignments for the *Kvoteutvalget* (the Norwegian commission on domestic permit trading). The development of permit trading systems was also analyzed to illuminate the various effects of different permit-distribution schemes given market imperfections. Finally, the relationship between different domestic and international market mechanisms in climate policy was explored.

In 1999 CICERO has also been an active participant in activities connected with the Intergovernmental Panel on Climate Change (IPCC). Now that CICERO's study of how air traffic affects climate is completed, efforts will be concentrated on the Third Assessment Report (TAR).

The work to quantify various social costs associated with climate policy in developing countries will also be carried out through analyses of damages to vegetation, health, and material goods as a result of fossil fuel consumption. The study is part of a joint project with other Norwegian research institutes and looks at various climate-policy instruments in a Chinese province. The work in 1999 was extended to also include the Center for International Studies at MIT.

In 1999 CICERO participated in a series of key domestic and international processes connected to the climate issue, and the Board notes with satisfaction that the use of CICERO as a key center of expertise within climate research is increasing. In addition to the IPCC, the Research Council, and the ministries, we also have the pleasure to report a demand for CICERO's services from the private sector.

There was an increase in internal publications in 1999 in comparison to previous years. External publishing was also satisfactory, and the Center has reached its goal of having at least one publication in an international journal with referee per scientific staff member. There has also been an increase in popular scientific presentations through lectures, editorials, and not least, *Cicerone* (*Cicerone* is CICERO's Newsletter).

# Certification of Greenhouse Gas Reductions

**The methods applied to industrial certification world wide can also be applied to certification of greenhouse gas emission reductions. This was the main finding in a project on approval of greenhouse gas reductions.**

In late 1998 the World Bank awarded its first greenhouse gas emissions (GHG) project on verification and certification to Det Norske Veritas (DNV), ICF Inc. and CICERO. The partners won the contract in competition with leading international auditor and consulting companies. The contract stated that the aim was to develop a framework for certifying tradable GHG emission entitlements. This would mean pushing the frontiers of environmental auditing. The case study chosen was a World Bank and Norwegian pilot project to introduce energy-efficient light bulbs in two cities in Mexico, known as the ILUMEX project. CICERO's task was to explore criteria for approval of project based GHG emission reductions in the UN Convention on Climate Change (UNCCC) and later agreements.

In 1997 the Kyoto Protocol established mechanisms for the transfer of GHG reductions between parties (i.e. countries) to increase the cost-effectiveness of achieving reduction targets. These Kyoto mechanisms are Joint Implementation, the Clean Development Mechanism, and International Emissions Trading. Verification and certification of such transfers is a prerequisite for gaining international acceptance that these entitlements and transfers are measurable and real. An in-

**In the ILUMEX project, energy-efficient light bulbs were introduced in two cities in Mexico.**

**Picture: Research Director Asbjørn Torvanger**



dependent third-party auditor could play an important role in this context.

The objective of the pilot certification framework was to develop a method of verifying and certifying GHG reductions. The final report was handed over to the World Bank in April 1999. It was found that the methods applied to industrial certification world wide can also be applied to certification of GHG emissions. Furthermore, the Activities Implemented Jointly and the Kyoto Protocol criteria can be made operational and be verified within this framework. The pilot verification and certification activity has given the project team valuable insights and learning experiences about these complex mechanisms. However, a considerable amount of work remains to be

done before it will be possible to launch a final international certification standard.

In the ILUMEX project the World Bank and Norway assisted the national Mexican utility to introduce energy-efficient light bulbs in the cities of Monterrey and Guadalajara. The aim of the project was to reduce household energy consumption, which in turn would reduce GHG emissions from power stations.

## References

Telnes, E., J. Uzzell, D. Antonioli, B. Feldman, M. Gowen, P. Vrabel, A. Torvanger and T. Skodvin (1999), World Bank ILUMEX Verification Report, DNV Technical Report No. 99-3258, Det Norske Veritas, Oslo.

# GWPs, CO<sub>2</sub> Equivalents, and Lack of Equivalence

In the Kyoto Protocol negotiations, the parties agreed that emissions of various greenhouse gases (GHGs) should be converted to a common unit by using Global Warming Potentials (GWPs). It is generally believed that this index can be used to convert emissions of various greenhouse gases to «CO<sub>2</sub> equivalents», which should represent equivalent climate impacts.

A study performed by CICERO shows that emissions scenarios with identical CO<sub>2</sub>-equivalent measurements, but with different compositions of gases, could have very different effects on the climate. Because the GWP concept is incorporated in the design of various policy instruments, the use of this index could have an impact on future climate developments.

To study in more detail what kind of impact using the GWP index might have on climate change, we applied CICERO's simple climate model, which is well suited to this type of study. We have used the IPCC's emissions scenario IS92a, which goes up to the year 2100, as a point of departure for this study. Because several GHGs have such long lifetimes that their emissions will affect the climate far beyond year 2100, however, we have made some modifications in the scenario, and by making a few simple assumptions we have extended it to the year 2500. We have further assumed that there will be some emissions reductions made on the basis of this reference scenario (S0).

We have looked at two different ways of meeting abatement requirements. In the first scenario, S1, we have introduced reduction measures only for CO<sub>2</sub>. In S2, however, we assumed abatement of gases with lifetimes shorter than 50 years—methane (CH<sub>4</sub>) in particular. Calculations of changes in global mean temperatures in the different scenarios are given in the figure.

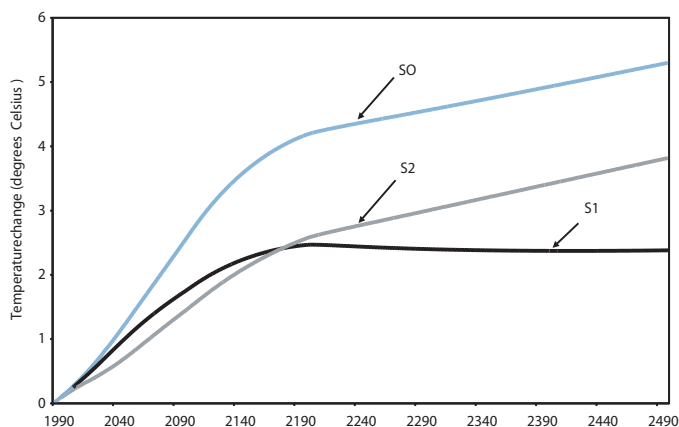
Human-induced damage to the climate can come about as much as from the *rate* of change as from the *magnitude* of the temperature increase. The calculations

show that reductions in methane emissions considerably slow the rate of temperature increase over the next few decades. A climate agreement that is fulfilled primarily through significant reductions in methane emissions will have a relatively strong, but short-term effect, while the long-term effect will be weak. The opposite is the case if abatement is targeted at reducing CO<sub>2</sub> emissions.

Because the GWP index is not based on temperature changes but rather the accumulated radiative forcing for the various gases, we have compared the magnitude of the radiative forcing in the two scenarios. The calculations show that the accumulated radiative forcing will be equivalent in about 300 years, not 100 years, even though GWP values with 100-year horizons are used.

It is a common perception among many of those who apply the GWPs that emissions of various GHGs can be converted in this way to CO<sub>2</sub> equivalents, and that this will represent an equivalent climate impact. This study has shown that the GWP index does not fulfill this function.

Our conclusions are consistent with other studies that have used different methods to test the application of GWPs. The main problem with conversion to



Change in global mean temperature relative to 1990 levels.

CO<sub>2</sub> equivalents does not lie in the fact that the gases have different effects on the climate at a given time, but rather that this effect varies differently over time for the various gases. This dynamic is not taken into account in the way that GWPs are used to convert various gases to a common unit (CO<sub>2</sub> equivalents).

## The results have been published in:

Fuglestad, J.S., Berntsen, T.K., Godal, O., Skodvin, T. (2000): "Climate implication of GWP-based reductions in greenhouse gas emissions," *Geophysical Research Letters*, vol. 27, no. 3, 409–412. See also *Cicerone* 2000/1.

CICERO is now participating in a new interdisciplinary EU project called "METRIC", which will attempt to find a better way of measuring GHG emissions. The project is expected to be completed in the beginning of 2003.



# Personnel

In 1999 there were 33 people working in connection with CICERO, as compared to 31 in 1998. Of these people, 31 were employed (compared to 28 in 1998), with positions totaling 22.4 full-time equivalents (FTEs) (compared to 22.3 in 1998). The number of research FTEs was 17.1 (17.6 in 1998). At the close of 1999, CICERO had 27 employees (compared to 26 in 1998). There were two alternative national service positions in 1999; however, this service will no longer be available to CICERO in 2000.

Five employees took maternity or paternity leave in 1999, representing 1.2 FTEs.

In 1999 a total of NOK 161,250 was paid out in remuneration to members and alternate members of CICERO's board of directors, and a total of NOK 530,697 in wages and remuneration was paid out to the director.

## During 1999 CICERO employed the following persons:

- Alfsen, Knut H., Director
- Alver, May R., Administration Officer
- Aunan, Kristin, Research Fellow
- Barosen, Marit, Senior Accountant
- Berntsen, Terje, Senior Research Fellow (80%)
- Brattland, Jane, Office Assistant
- Bretteville, Camilla, Ph.D. Student
- Dahle, Øystein, Adviser (20%)
- Evensen, Reidar, Information Officer
- Fuglestvedt, Jan S., Research Director
- Gan, Lin, Senior Research Fellow
- Godal, Odd, Project Assistant
- Hagem, Cathrine, Research Fellow
- Hagen, Kjell Arne, Assistant Director/ Research Coordinator
- Holtsmark, Bjart J., Senior Research Fellow
- Hovi, Jon, Professor (20%)
- Isaksen, Ivar S. A., Professor (50%)
- Kasa, Sjur, Research Fellow
- Kolshus, Hans H., Research Assistant
- Malvik, Henrik, Research Assistant
- O'Brien, Karen, Senior Research Fellow
- Ringius, Lasse, Senior Research Fellow
- Romstad, Bård E.W., Project Assistant
- Rørvik, Frode, IT Officer (60%)
- Rykkelid, Hans Arne, Alternative, National Service Employee (from 18 January 1999)
- Seip, Hans Martin, Professor (20%)
- Skodvin, Tora, Research Fellow
- Sygna, Linda, Research Assistant
- Søfting, Guri Bang, Ph.D. Student
- Torvanger, Asbjørn, Research Director
- Underdal, Arild, Professor (20%)
- Aaheim, Asbjørn, Senior Research Fellow

# CICERO Abroad

In addition to cooperating with colleagues in Scandinavia, the EU, and USA, CICERO also worked jointly on projects with the following developing countries in 1999:

- China
- India
- Mexico
- Indonesia
- South Africa
- Tanzania

CICERO also participates in the Climate Change Knowledge Network,

which includes the following institutions:

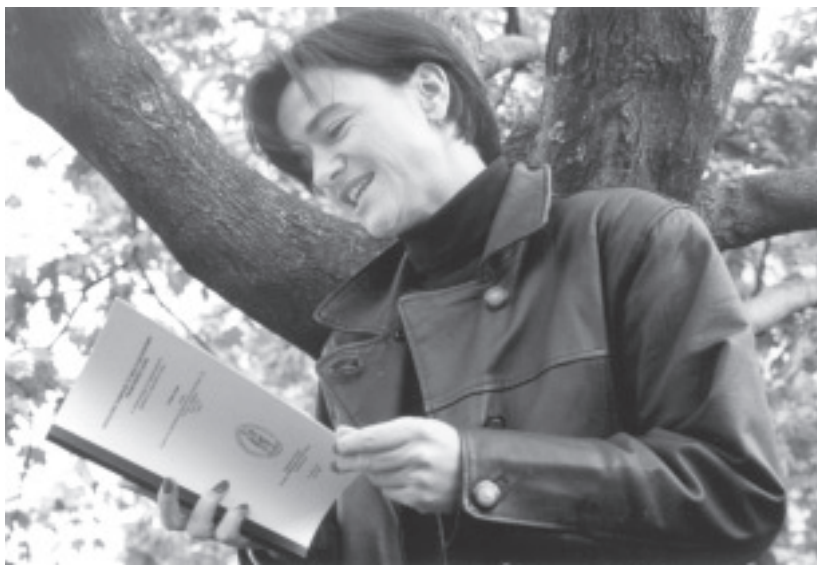
- SCEE - Zimbabwe (the Southern Centre for Energy and Environment)
- ENDA- Senegal (Environnement et developpement du tiers-monde)
- TERI - India (Tata Energy Research Institute)
- ERI - China (the Energy Research Institute)
- COPPE - Brazil (Federal University of Rio de Janeiro)
- CSDA - Center for Sustainable Development in the Americas
- National University "Kiev - Mohyla Academy" - Ukraine
- IVM - Netherlands (Institute for Environmental Studies)
- SEI - Sweden/US (Stockholm Environment Institute)
- GISPRI - Japan (Global Industrial and Social Progress Research Institute)
- WRI - US (World Resources Institute)
- IISD - Canada (Institute for Sustainable Development)

# Short-Term Benefits of Climate Policy: Integrated Pollution Control

**It is not necessarily true that our generation must pay for climate measures while the next generation reaps the benefits. Better health, cleaner air, and less acid rain can be achieved in a short time frame, writes researcher Kristin Aunan at CICERO.**

Because the various benefits of reduced future damages are often calculated in monetary terms, and because the traditional methods for such calculations give significantly reduced future benefits with respect to the costs they incur today (discounting), it is easy to conclude that it is not worth it to implement climate measures yet. This is not helped by the fact that, in a decision-making context, there is a considerable degree of uncertainty associated with how climate changes will be manifested on a regional scale.

Until quite recently, much of the debate about climate policy and costs associated with abatement has overlooked an important point: that the consumption of fossil fuels, which is the main cause of anthropogenic climate changes, causes great damage to our health and environment today. Important sources of greenhouse emissions, e.g., energy production and the transport sector, are also the main sources of, e.g., particles, SO<sub>2</sub>, NO<sub>x</sub>, and various hydrocarbons. Many of the greatest environmental problems facing the world today, apart from climate changes, are directly associated to energy consumption in general and consumption of fossil fuels in particular. In addition to the direct effects on health and environment of the various emission components, there are impacts caused by components that are created secondarily in the atmosphere, such as ozone and fine particles. Several different types of



Research Fellow Kristin Aunan

emissions sources can contribute to the same environmental problem, and one single emissions component can contribute to several environmental problems. One example that shows the connection between various environmental problems is that road traffic—which is an important source of, e.g., NO<sub>x</sub>, VOC (volatile organic compounds) and particles, not to mention CO<sub>2</sub>—contributes to over-fertilization and acidification of the terrestrial and aquatic ecosystems and increases the occurrence of respiratory illnesses in the population. Moreover, these emissions cause increased levels of tropospheric and ground-level ozone, in addition to increased levels of secondary particles (fine particles) on a regional scale, through which they contribute to health, material, and vegetation damage as well as climate changes (because the tropospheric ozone also contributes to global warming).

## Holistic perspective

A more holistic perspective in climate policy, which also covers environment

problems in connections with air pollution, would be able to change the conclusions in economic calculations of the benefits of implementing climate measures. Benefits connected to local and regional environmental problems, often called *secondary effects of climate measures*, will appear after a relatively short period. Thus the methodological problems associated with discounting are reduced, and the choice of method becomes less important for the conclusions. One requirement for this to be correct is that local and regional environmental problems connected with important sources of greenhouse gases must be perceived as pressing. In most Western countries, much attention has been focused on the health effects of air pollution in cities, acid rain, and ground-level ozone, which suggests that a broadened perspective on climate measures will be able to affect the prioritization of measures. In addition, many countries have committed to reducing their emissions into the air through international agreements under the convention on long-range transboundary air pollution.

### Significant health benefits in Hungary

At CICERO, several studies have attempted to quantify the potential for such secondary effects. One completed study in Hungary demonstrated that an energy-savings program, which was created by the Hungarian government primarily to reduce CO<sub>2</sub> emissions, had a great potential for secondary effects. The study showed that the health effect in particular—in the form of fewer damages to the public health as a result of air pollution—was great, and that the economic costs associated with implementing the measures were reduced significantly if the secondary effects were taken into account.

### Large crop losses in China

Calculations have been made regarding the potential for reducing losses of agricultural crop yields if NO<sub>x</sub> and other components that contribute to the formation of ground-level ozone are reduced in China. It has been well documented that ozone, which also has an impact on health, considerably damages plant tissue and can reduce yields in several kinds of crops. With the help of a global model for transport and chemical conversion of pollution in the atmosphere, the level of ground-level ozone was calculated for

various areas in China, which was the focus of a study carried out in 1999. The emissions figures for 1990 and the alternative emissions adjustments for a scenario year (2020) were used to show to what extent ground-level ozone reduces, or can reduce, agricultural yields in the various provinces. In the reference scenario, NO<sub>x</sub> emissions are expected to quadruple within 2020 compared with 1990 levels. The results demonstrate the possibilities for relatively dramatic reductions in yield for certain types of crops. To be able to say anything about the effect of long-range air pollution, calculations were also made where it was assumed that the emissions remain at 1990 levels outside of China, but within the country they increase with respect to the reference scenario. These calculations showed that the pollution outside China had a great impact on the ozone levels within China's borders.

With a point of departure in the dose-response functions described in the literature, three sets of functions were chosen to estimate yield losses in China. The three sets of functions are based on studies in the USA and Europe, and have different exposure indexes. Estimated yield losses vary with the use of the different functions because the methods are based on different assumptions and different threshold values for ozone

concentration. Nevertheless, the calculations indicate which crops are most vulnerable to losses in yield. Among other things, we found that the simultaneous occurrence of maximum levels of ozone and the growth season for spring wheat, soy beans, and corn makes these types of crops particularly vulnerable, and that reductions in yield of up to 30% for spring wheat can be the result of an emissions increase like that assumed in the reference scenario.

Even though there is a great deal of uncertainty associated with these types of estimates, and it must be assumed that agriculture will adjust to the changes in yield (e.g., by changing species and cultivars), this study nevertheless indicates the magnitude of the benefit of reducing emissions to the air in this region. Since NO<sub>x</sub> emissions are closely connected to the consumption of fossil fuels, it is difficult to imagine significant reductions in these emissions with the help of pure technological and cleaning measures. Reducing emissions growth to such a level that it will be of any real benefit will most likely be achieved by reducing the increase in fossil fuel consumption as such, which is also desirable from a climate perspective.

# Research Cooperation

CICERO's location at the University of Oslo and its close cooperation with relevant institutions is essential in a field where there is such a close tie between basic and applied research. CICERO's association with the University is strategically important and mutually beneficial. Cooperation with the University of Oslo is formalized through framework, operations, and leasing agreements. CICERO takes on as many teaching and graduate-student advising assignments as possible at the University in cooperation with the relevant departments. In 1999 CICERO hired its fourth senior researcher from the University in a part-time position. The Center's

research fellows participate in the formal post-graduate instruction at the University. Two of CICERO's research fellows defended their doctoral theses in 1999, and its two remaining fellows are currently studying in the USA.

In Norway, CICERO cooperates not only with the University of Oslo and its institutions, but also with other research communities. In this way, CICERO and the other research communities can draw upon each other's international contacts. Because CICERO was originally established by the Norwegian government to help coordinate climate-policy research in Norway, CICERO has

the main responsibility for coordinating the research program "Norwegian Energy and Environmental Policy: Constraints, Opportunities and Instruments" (SAMRAM) in the Research Council of Norway, as well as acting as a secretariat for the Research Council's *Samarbeidsutvalg for klimaforskning* (The joint committee on climate research).

CICERO has also continued to cooperate with the Fritjof Nansen Institute in 1999 through the support of earmarked funds set aside by the Research Council for joint ventures between foreign policy institutions in the Oslo area.

# Information Activities

There has been a significant increase in information activities at CICERO every year since 1997. In addition to continuing to publish the newsletter *Cicerone* and host the Climate Forum, CICERO staff members participate frequently in the public debate on climate issues and often act as speakers in various forums.

## Increased traffic on the Web site

CICERO's Web pages ([www.cicero.uio.no](http://www.cicero.uio.no)) are updated frequently with news, both in English and Norwegian, on developments on the climate negotiations. CICERO makes all of its publications immediately available on the Web site, which also displays an overview of all of CICERO's research projects and associates. The site also contains number of useful links to articles on climate issues and many other Web pages on climate and energy. The number of visitors to CICERO's Web pages has increased from 36,609 in 1996, 57,121 in 1997, 154,690 in 1998, up to 256,682 in 1999.

## Significant expansion of *Cicerone*

*Cicerone* provides news updates from climate and environmental research, from the political arena, and from CICERO. It also contains reports from important international meetings and conferences, as well as articles on the latest developments in international forums.

The eighth volume of CICERO's newsletter, *Cicerone*, was issued six times in 1999. The number of pages per issue increased from previous years, and the 1999 issues also included pages devoted exclusively to the RegClim research project. Three thousand copies of *Cicerone* are printed for each issue, and the copies are distributed free of charge to about 2300 subscribers. The bulk of the subscribers



are from ministries, directorates, private firms, research institutions, and upper secondary schools.

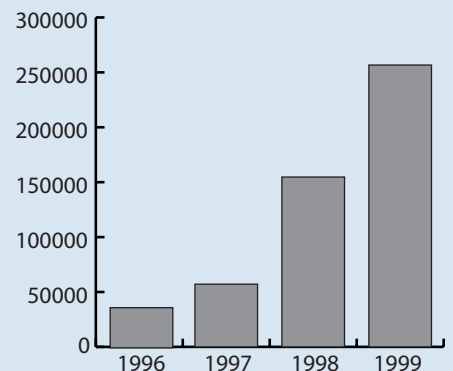
Subscription to *Cicerone* is free. *Cicerone* is published in Norwegian only, and *Cicerone's* director acts as editor-in-chief.

## Resource for the media

CICERO's mandate to disseminate as much information as possible means that virtually all of the research that takes place here is made available to the general public. This also demands a certain emphasis on popular-scientific presentation to increase accessibility.

This accessibility has made CICERO a growing source of information for the media when it comes to both natural science issues and questions connected to climate policy and negotiations.

CICERO's staff members are frequently asked to supply expert commentary, and the Center's publications and newsletter are often used by journalists for background information.



Visits to the CICERO web 1996-1999

# Researching

## Sources of Power

**“Who are the most powerful actors in Norwegian climate policy?” asked five researchers at CICERO. Here’s what they found.**

The project on power and the environment had two main focuses in 1999. First, the researchers analysed Norwegian experiences with tax reform in a comparative context. This effort has been focused both on disseminating information and on analysing the economic and political dynamics of the tax reform process in Denmark, Germany, the Netherlands, and Britain. Second, they analyzed the distributional and economic efficiency effects of various designs of quota systems. The group of researchers was made up of Sjur Kasa, Bjart Holtmark, Guri Bang Søfting, Cathrine Hagem and Odd Godal.

The results may be summarised in the following points:

- Green tax reforms are well under way in most environmentally progressive European countries. While heavy industries are exempted in some important countries (Netherlands, Germany), other countries like Denmark and Britain have chosen to impose modest taxes on their heaviest industries.

**Publications:** Sjur Kasa: “Europa velger miljøavgifter”, *Aftenposten*, 12 July 1999, Sjur Kasa & Bjart Holtmark: “Miljøavgifter. Pigou og den usynlige hånd slår tilbake,” in *Sosialøkonomen*, no. 8 1999. Sjur Kasa: “Avgifter i klimapolitikken i noen europeiske land”, CICERO Working Paper (in press).

- It seems like countries characterised by strong corporatist traditions in export-

oriented heavy industries (Norway, Netherlands) have a stronger tendency to exempt heavy industries than countries with a less institutionalised corporatist system (Denmark). Various corporatist traditions may produce exemptions for heavy industries. While the Nordic trade-union dominated corporatist tradition has contributed to heavy industry exemptions in Norway, the employer-dominated corporatist tradition of the Netherlands has also produced heavy industry exemptions contrary to the wishes of Dutch trade unions and the environmental movement.

**Publications:** Sjur Kasa: “Corporatism and green taxes: The cases of Norway, Netherlands and Denmark”. CICERO Working Paper/Journal manuscript – in preparation.

- A free permit system as proposed by some political parties and industrial interests in Norway may have negative impacts in terms of economic efficiency and redistribution.

**Publications:** Bjart Holtmark: “A comparison of taxes and tradable permits in national climate policy,” CICERO Working Paper 1999:8, “Kostnadseffektiv klimapolitikk med doble gevinster.” *Norsk Økonomisk Tidsskrift*, Vol. 113, pp. 49-70.

Camilla Bretteville is connected to the project as a PhD student. She is staying at the Department of Agricultural and Resource Economics, University of Berke-



Project leader Sjur Kasa

ley. In 1999, she published “Decision criteria under uncertainty and the climate problem,” CICERO Working Paper 1999:10. Together with Guri Bang Søfting, Brettville has submitted the article “From taxes to quotas? – The Norwegian climate policy debate” to *Energy Policy*.

- So far, one article from the project’s first year has been accepted for international publication. This is Sjur Kasa’s “Policy networks as barriers to green tax reform: The case of CO<sub>2</sub>-taxes in Norway,” which has been fully accepted for publication in *Environmental Politics*. Two other papers from the project’s first year are in the review process.

# A Network of participation

In addition to its projects and efforts to disseminate information – through lecturing, media appearances, and other types of participation in the general debate – CICERO had good contact with the public throughout 1999, both in terms of quality and increasing quantity.

The Center was represented on a number of boards and other institutions in the Research Council of Norway: KLIMATEK, NORMIL-2000, SAMRAM, the Energy Forum, Samarbeidsutvalget for klimaforskning (the joint committee on climate research), and Strategiutvalget for energiforskning (the committee on energy research strategy).

Other key public committees where CICERO has been represented include the Kvoteutvalget (Commission for greenhouse gas emission trading systems for Norway), a similar committee of experts established in Sweden, MILJÖSOK and the working group that looks at new and flexible instruments in environmental policy, and Statoil's Environmental Forum.

Internationally, CICERO has actively participated in the IPCC process and been represented in, among others, the European Science Foundation's TERM II program and the European Agency's Scientific Committee.

CICERO has also participated in the application approval process within the EU system for other countries' research councils.

Also in 1999 CICERO participated in a number of conference committees (e.g., ENS 1999 and the national conference on climate change research organized by the Research Council). It submitted several contributions to conferences and working group meetings, and participated actively in researcher evaluations and student grading at institutions of higher learning in Norway. Two international conferences were arranged by CICERO in co-operation with ECON on the theme of national and international quota trading.

## Climate Forum

The Climate Forum assembles participants from the public and private sectors and central research institutions in Norway. On the agenda is the greatest global challenge of our time: The dangers posed by harmful climate changes. Information and discussion about this topic is the objective of the Climate Forum, which is organized by CICERO.

The Forum aims to disseminate knowledge about the latest developments within the area of climate and create a dialog about key climate policy issues between the actors. Fifteen commercial enterprises and governmental institutions are members. In 1999, the Climate Forum met three times with the following themes:

- The natural science basis for climate policy – do we know more? March 23, 1999. Director Knut H. Alfsen gave a broad presentation on the problem of climate change, professor Trond Iversen described ongoing work and preliminary results from a project on regional climate change (RegClim), while Researcher Tora Skodvin gave an introduction to the IPCC process.
- Commissions for greenhouse gas emission trading systems and quota trading. October 6, 1999. Leaders of the Norwegian and Swedish commission for emission trading systems, Eva Birkeland and Kjell Jansson respectively, talked about work in their respective commissions. Geir Høiby from the Confederation of Norwegian Business and Industry offered viewpoints from the business community.
- Quota trading, new impulses. December 13, 1999. Chief negotiator Harald Dovland from the Ministry of the Environment updated the participants on the results from the climate negotiations (COP5) in Bonn. Business development manager Olav Fjellså presented the internal system for emission trading introduced in BP-Amoco. Finally, Nicolai Zarganis from Energistyrelsen in Denmark gave some views on quota trading.

# Board of Directors

In February 1997, the Norwegian Ministry of the Environment appointed a board of directors for CICERO for the term ending 20 February 1999, with Knut N. Kjær from the Central Bank of Norway as the chair. Upon recommendation from CICERO, the period was extended until 30 June 1999, when a new board was appointed. Knut N. Kjær was re-appointed as chair, while University

Director Tor Saglie and Professor Asbjørn Rødseth both stepped down after having served since the early 1990s. Tor Saglie had acted as vice-chair since 1991. Board members Hege Skjeie, Anne Therese Hestenes, and employee representative H. Asbjørn Aaheim also stepped down. The newly appointed board members are professors Jon Vislie from the Department of Economics and Trond Iversen from the

Department of Geophysics, as well as Faculty Director Tove Kristin Karlsen from the Faculty of Social Science, all from the University of Oslo, and Managing Director Øyvind Lund from ABB. Tora Skodvin is the newly appointed employee representative.

In 1999 the Board had four meetings, one of which was combined with a scholarly seminar that included some of CICERO's staff members.

# Crossing the Great Divide: Towards More Interdisciplinary Research

**“If society can really see the benefit of developing good interdisciplinary communities, it should accept the costs and time it takes to build them up,” write Kristin Aunan and Jan S. Fuglestad. They see a great discrepancy between stated goals and actual prioritization of interdisciplinary efforts.**

“Interdisciplinary” is a concept often encountered in political manifestos on education and research, as exemplified by the latest *Forskningsmeldingen* (Report to the Storting/Parliament on Scholarly Research). Interdisciplinary research is often touted as the solution for meeting the great environmental policy challenges facing the world today. Most experts seem to agree that single disciplines working in isolation cannot provide sufficient answers to how problems are created and how they can best be resolved. But to what extent has this acknowledgement actually affected how funding decisions are made in the field of climate and environment research? We believe there is a great discrepancy between expressed goals and actual prioritization, and this article discusses the possible reasons for this as well as some instruments that can promote interdisciplinary research where it is desirable.

## Not a goal in itself

Interdisciplinary research is not an end in itself, but rather a means to achieve better and more complete answers to complex research questions. Often, but not necessarily always, the research focuses on concrete issues defined by society and therefore falls under the category of “applied” research. In the absence of interdisciplinary research, decision-

makers, who have to interact with the real world and all the competing interests this implies, have to draw upon one set of single-discipline analyses. Even though interdisciplinary research can never replace a politician’s need to consider an issue from a variety of angles, it contributes to a stronger basis on which to make decisions.

If we travel far enough back in time, research was commonly conducted in a far more interdisciplinary manner than it is today. Modern research and education communities, however, have increasingly split off into sub-disciplines, a natural consequence of the rapidly growing volume of knowledge people have acquired. What determines the scope and content of a particular academic discipline is not set in stone, and the majority of today’s disciplines have only emerged in this century.

An established discipline is characterized by a given set of explanatory models, methods, and terminology. It is also characterized by having common norms for what makes *good research* within the discipline. Even though there are obviously norms that hold true across disciplines, we cannot escape the fact that the definition of “good research” may vary between disciplines. (See, e.g., Gulbrandsen and Langfeldt in *Forskningspolitikk* 3/97, in Norwegian.) A researcher’s merits depend first of all on how he or she

performs *within* this system, where peer review is a central element. This discipline-based merit system means that devoting time to interdisciplinary research represents a professional risk for the individual researcher because such research may take place at the expense of advancement within a particular discipline. This may turn into a vicious circle: the scholar who does not advance in his or her own field does not bring the necessary prestige to interdisciplinary studies. It is also a fact that interdisciplinary work often takes more time and is therefore demands more resources from the communities involved.

## Single-discipline thinking

Traditional single-discipline thinking can also cause interdisciplinary project proposals to fall between the cracks of the Research Council of Norway. The particular institutional design of the Research Council can limit the opportunities for these proposals. The indirect effect of this could be that the existing structure becomes solidified and continues to restrict the dynamic development of the disciplines. An interdisciplinary project proposal can easily be viewed less favorably than a single-discipline proposal if the evaluation committees do not include representatives with a background in each of the disciplines represented in the proposal and instead consider the proposals on the basis of their own single-discipline criteria. In such a case it is of little help that “interdisciplinary scholarship” is one of the many positive criteria in the evaluation of a project proposal. It is also the case that the research questions in interdisciplinary projects have a tendency to cross the boundaries of the program areas. For example, there is a broad spectrum of important research topics in the area between the program on changes in the climate and ozone layer and the program on the social-scientific issues relating to energy and environment policy

(SAMRAM) that are difficult to capture within each of the programs alone. The ministries and private sector often show an interest in and a need for interdisciplinary projects, but the downside is that these are often short-term assignments that do not necessarily promote long-term competence building.

### Measures that can strengthen cooperation

We see a need for instruments and concrete measures that will help strengthen cooperation between the natural and social sciences in the area of climate and environment research. This is a type of

cooperation that is also explicitly mentioned as desirable by the Research Council of Norway, most recently in its action plan for environment and development in 1999–2000. We believe the Research Council should consider establishing separate guidelines for handling and evaluating interdisciplinary project proposals. The evaluation committees that receive interdisciplinary project proposals should represent expertise within all of the disciplines represented in the proposal. If this is not the case, then external expertise from people who are familiar with the disciplines and know what interdisciplinary research requires should

be brought in to a much greater extent than is the case today. Better contact between the programs will most likely also improve the possibilities of initiating broad-scale interdisciplinary projects that include both natural and social sciences.

It must be acknowledged that good interdisciplinary communities, whether located at the same site or not, need time to develop and that this is a separate investment cost associated with establishing such communities. If society places a value on this kind of development, more measures that are specifically targeted to this end should be implemented to facilitate interdisciplinary research.

# Projects Active in 1999

## Structure and agent in the scientific diplomacy of climate change (402)

Science constitutes a central component of international environmental policy-making, and scientific advisory bodies have increasingly become integral parts of negotiation efforts. This study looks at the science-policy dialogue in the regime formation process. It looks at both the role of *institutional arrangements* and the role of performances of *leadership functions* in the process. The project is a case study of the Intergovernmental Panel on Climate Change (IPCC) during the period 1988–1995. The thesis was publicly defended for the Dr. Polit. degree on May 28, 1999.

**CICERO researcher:** Tora Skodvin (doctoral thesis).

**Status:** Accepted for publication by Kluwer Academic Publishers.

**Funding:** The Research Council of Norway and CICERO.

### Publications:

• Skodvin, T.: *Structure and Agent in the Scientific Diplomacy of Climate Change: An Empirical Case Study of the*

*Intergovernmental Panel on Climate Change (IPCC)*. Doctoral thesis, Department of Political Science, University of Oslo. A revised version of the manuscript will be published by Kluwer Academic Publishers in 2000.

## EU leadership and climate negotiations (6308)

The objective of this project was to evaluate the opportunities for the EU to play a leadership role in climate negotiations. CICERO's contribution consisted of mapping the different economic interests in a selected number of EU countries. Calculations of change in energy demand resulting from implementation of carbon taxes and alternative climate-policy instruments are used as a point of departure. Calculations were made for Germany, Italy, the UK, France, Spain, and the Netherlands, and then an analysis of the measures that might be implemented in these countries was carried out.

**CICERO researchers:** Camilla Bretteville and Asbjørn Aaheim in cooperation with other institutions including the Fritjof

Nansen Institute and RIIA (UK)

**Status:** Completed.

**Funding:** EU and the Research Council of Norway.

### Publications:

• Aaheim, A. and C. Bretteville, "Emission reduction in EU countries: Sources of conflict," in Gupta, J. and Grubb, M. *Climate Change and the Leadership Paradigm: Options for the European Union*. Forthcoming.

• CICERO Working Paper 1999: 3.

## Modeling international negotiations: Exploring the settlement range in the global climate change negotiations (6407)

The aim of this project was to develop a model which could be used to systematically explore (a) the political feasibility of alternative policy options, and (b) the settlement range of the global climate-change negotiations. As a point of departure, the outcome of an international negotiation process was conceived of as a function of three major determinants: the configuration of participant country



preferences (interests, positions), the distribution of relevant political resources ("power"), and the institutional setting (with particular attention paid to the decision rule(s)). The team pursued an incremental approach, starting out with a simple static model including only a small number of countries and a limited range of policy options.

**CICERO researchers:** Arild Underdal, Bjart Holtmark, Jon Hovi, Lasse Ringius, Asbjørn Torvanger and Asbjørn Aaheim.

**In collaboration with:** Steinar Andresen, Olav Schram Stokke and Jørgen Wettestad from the Fritjof Nansen Institute.

**Status:** Completed, awaiting publication in book form.

**Funding:** SAMRAM, The Research Council of Norway.

#### **Documentation:**

- Agrawala, S. and S. Andresen (1999): "Indispensability and Indefensibility? The US in the Climate Treaty Negotiations." *Global Governance*, vol. 5, no. 4, pp 457-482.
- CICERO Report, 1999:8.
- CICERO Working Paper 1997:11
- CICERO Working Paper 1997:6
- CICERO Working Paper 1997:8
- CICERO Working Paper 1998:14
- Hovi, J. and B. J. Holtmark: "Betingete posisjoner i klimaforhandlingene." *Norsk Statsvitenskapelig Tidsskrift*, vol. 14 (1998), no 4, s.353-374. An earlier version of the article is published as CICERO Working Paper 1997:9.
- Presentation at the climate negotiations (COP5) in Bonn 04.11.99
- Stokke, O.S.: "Pure Reasoning from Rio to Kyoto: Norms and Arguments in Climate Change Negotiations." FNI Report R-006-1998.
- Underdal, A.: "Modelling International Negotiations: The Case of Global Climate Change." Paper presented at the 3<sup>rd</sup> Pan-European Conference on International Relations, Wien, Sept. 16-19, 1998.
- Aaheim, H.A.: "The Appropriateness of Economic Approaches to the Analysis of Burden-Sharing." In F. C. Toth (ed.), *Fairness and Climate Change*. Earthscan (forthcoming).

### **AEROCHEM II (6503)**

The overall objective of the AEROCHEM project is to study how past, present and future aircraft emissions affect ozone in the upper troposphere and lower stratosphere. These studies can act as a

basis for decisions on emission standards for future aircraft operations. The main project tool will be global three-dimensional chemical transport models (3-D CTMs) where large-scale ozone distribution and changes due to aircraft are calculated. CICERO will use the 3-D CTM developed at the Department of Geophysics, University of Oslo, to study the impact of future aircraft emissions and, in particular, how this is influenced by deep convection. The results will serve as input to radiative forcing and climate models to estimate climatic effects.

**CICERO researchers:** Ivar Isaksen, Terje Berntsen.

**In collaboration with:** University of Oslo.

**Status:** Completion expected in 2000.

**Funding:** EU.

#### **Publications:**

- Berntsen T., and I.S.A. Isaksen. Effects of lightning and convection on changes in tropospheric ozone due to NOx emissions from aircraft, *Tellus*, **51B**, 766-788, 1999.
- M.Y. Danilin, D.W. Fahey, U. Schumann, M.J. Prather, J.E. Penner, M.K.W. Ko, D.K. Weisenstein, C.H. Jackman, G. Pitari, I. Koehler, R. Sausen, C.J. Weaver, A.R. Douglass, P.S. Connell, D.E. Kinnison, F.J. Dentener, T. Berntsen, I.S.A. Isaksen, and E.L. Fleming, Aviation fuel tracer experiment: model intercomparison and implications, *Geophysical Res. Lett.*, **25**, 3947-3950, 1998.
- Kraabøl, A.G., T. K. Berntsen, J. K. Sundet and F. Stordal, Impact of NOx emissions from subsonic aircraft: Inclusion of plume processes in a global 3-D CTM. Manuscript in preparation.

#### **Contributions to assessment reports**

- Chapter 4 'Modeling of the chemical composition of the future atmosphere', in Aviation and the global atmosphere, IPCC, 1999.

### **Air quality management and planning system for Guangzhou, China (6511)**

This is a NORCE project led by the Norwegian Institute for Air Research (NILU) to help Chinese authorities take measures against air pollution in Guangzhou, to transfer knowledge useful for estimation of pollution-related effects, and to facilitate decisions on policy measures. CICERO's contribution included studies of effects on health and vegetation from local air pollution. Estimates of the frequency of health damages from air pollutants in different parts of the city were carried out using dose-response functions from the

literature. The transferability of the functions were studied by analyzing results based on available health statistics and on epidemiological studies (comparisons of incidence of respiratory illnesses and hospitalization with exposure to air pollution) carried out within the framework of the project. Estimates of damage to crops (particularly by ozone) were also based on established dose-response functions. In addition, soil acidification and contents of toxic metals in crops were studied.

**CICERO Researchers:** Kristin Aunan and Hans M. Seip.

**In collaboration with:** Norwegian Institute for Air Research (NILU), Guangzhou Research Institute of Environmental Protection (GRIEP), Thorjorn Larsen, the Department of Chemistry, University of Oslo.

**Status:** Research completed, report series in preparation.

**Funding:** Norwegian Agency for Development Cooperation (NORAD).

**Publications:** in preparation.

### **Institutional requirements for voluntary agreements (7301)**

The aim of this project was to determine how voluntary agreements (VA) compare to other policy tools in terms of effectively meeting environmental targets, specifically in terms of cost-effectiveness and administrative effectiveness. The project was divided into three parts. In the first part, advantages and disadvantages of VAs were compared to other policy tools. In the second part, the potential of VAs as an international policy tool, either in a bilateral or regional setting, was explored. In the final step, the attractiveness of VAs in implementation of the Kyoto Protocol was discussed.

**CICERO researchers:** Asbjørn Torvanger (project leader), Tora Skodvin.

**In collaboration with:** Rolf Golombek, The Frisch Centre of Economic Research, Norway, Kjell Sunnevåg, Foundation for Research in Economics and Business Administration (SNF), Bergen, Norway.

**Status:** Completed.

**Funding:** The Research Council of Norway/ SAMRAM.

#### **Publications:**

- A revised version of CICERO Report 1999:4 has been accepted for publication in the book *Environmental Agreements: Process, Practice, and Future Trends*. Forthcoming from Greenleaf Publishing: UK.

- CICERO Report 1997:7
- CICERO Report 1999:4
- CICERO Working Paper 1998:10
- Proceedings from workshop on voluntary agreements, Oslo, December 15, 1997
- Seminar on voluntary agreements, Oslo, September 16, 1999, organized by CICERO, Frischsenteret and SNF.

### **Uncertainty and the greenhouse effect (7302)**

The objective of this project was to evaluate the impact of uncertainty on different variables in climate-policy decision-making. The significance of irreversible abatement capital, the relationship between methane and carbon dioxide reductions, conflicts of interest and agreements between developed countries and developing countries, and the significance of start-up costs for climate measures were analyzed.

**CICERO researchers:** Camilla Bretteville, Hans H. Kolshus, Asbjørn Torvanger (project leader), Asbjørn Aaheim.

**In collaboration with:** Statistics Norway, Kjell Arne Brekke, Terje Lystad, Morten Søberg.

**Status:** Completed.

**Funding:** The Research Council of Norway.

#### **Publications:**

- Aaheim, H.A., K.A. Brekke, T. Lystad, and A. Torvanger (2000): "The tradeoff between short- and long-lived greenhouse gasses under uncertainty and learning." Forthcoming Discussion Paper from Statistics Norway.
- Aaheim, H.A. (2000): "Investments in climate measures under uncertainty." Forthcoming CICERO Working Paper.
- Aaheim, H.A. and C. Bretteville (2000): "Decision-making frameworks for analysis of climate policy under uncertainty." Forthcoming CICERO Working Paper.
- Brekke, K.A. and T. Lystad (2000): "Optimal CO<sub>2</sub> emissions with irreversible but depreciating abatement capital." Forthcoming Discussion Paper from Statistics Norway.
- Søberg, M.G. (1998): "Uncertainty and negotiation on international tradable quota treaties." Statistics Norway Discussion Paper 233. Presented at the World Conference of the Association of Resource and Environmental Economists, Venice.
- Søberg, M.G. (1999a): "Asymmetric information and international tradable

quota treaties: An experimental evaluation." Statistics Norway Discussion Paper 248. Forthcoming in *Environmental and Resource Economics*.

- Søberg, M.G. (1999b): "Instruksjonar til og data frå eksperiment om internasjonal kvotehandel," Statistics Norway Notat No. 7.

### **Science, technology and international cooperation (7406)**

The objective of this project was to look at why some international environmental problems are resolved more "effectively" than others. The answer was provided in terms of characteristics of the particular problem and the "problem-solving capacity" the problem is met with.

**CICERO researchers:** Arild Underdal  
**In collaboration with:** Fridtjof Nansen Institute (FNI), Norway, School of Marine Affairs at the University of Washington, Seattle, USA

**Status:** Completed.

**Funding:** The Research Council of Norway, and a couple of American sources.

#### **Publications:**

- Book manuscript submitted to MIT Press.

### **Effectiveness of international environmental agreements (7409)**

By creating a European network of researchers addressing issues of effectiveness of international environmental agreements, this project aims to create a forum for the development of a broader based consensus on the most important factors that influence effectiveness. The research activities of this network will be based on a classification of international environmental agreements, an inclusive definition of effectiveness, and a preliminary list of factors to be considered. Multilateral environmental agreements will be classified in three categories: (1) global environmental agreements, (2) regional environmental agreements (i.e. involving significantly fewer than all countries), (3) and the environmental legislation of the European Community (i.e. involving a specific institutional structure to generate and implement the agreements). The project will present a series of workshops, culminating in a general conference to present the results of the research.

**CICERO researchers:** Lasse Ringius, Arild Underdal.

**In collaboration with:** IEEP Institute for European Environmental Policy, London; IVM-VU Institute for Environmental Studies, Amsterdam; Fridtjof Nansen Institute (FNI), Norway; IPAE-MADRID, Spain; Ecologic, Germany; VERTIC, London; Free University of Berlin; Roskilde University, Denmark; FIELD, London; Cardiff Law School, Wales, UK

**Status:** Ongoing; completion expected in February 2001.

**Funding:** EU.

#### **Publications:**

- First year report.
- Underdal, A, S. Andresen, L. Ringius, and J. Wettstad: "Evaluating regime effectiveness: Developing valid and usable tools." Agenda-setting paper for the second-year workshop, September 10-12, 1999.
- Underdal, A. (with inputs from M. Hisschemoeller and K. von Moltke): *The Study of Regime Effectiveness*. Agenda-setting paper for meeting of an EU Concerted Action Program, 16-18 October 1998.

### **Power and the environment (7408)**

The main purpose of the project is 1) to reach an understanding of how national power structures influence the transition to more climate-friendly production and consumption systems in Norway, and 2) to analyze how national power structures can influence the climate political process internationally. The project has two main phases: the first (1997-98) dealt with economic and political-science analyses of the climate-related coalitions in the Green Tax Commission; the second (1999-2000) will examine which influences the finds relating to power-sharing can have for international climate negotiations.

**CICERO researchers:** Knut H. Alfsen, Camilla Bretteville, Odd Godal, Cathrine Hagem, Bjart Holtmark, Sjur Kasa (project leader), Henrik Malvik, Guri Bang Søfting

**Status:** Completion expected in 2000.

**Funding:** SAMRAM, The Research Council of Norway

#### **Publications:**

- Bretteville, C. and G.B. Søfting: "Beretningen om et varslet avgiftskutt: En historie om norske grønne skatter." *Cicerone* no. 7/98, p. 1.
- CICERO Policy Note 1998:1
- CICERO Policy Note 1998:2
- CICERO Policy Note 1999:5
- CICERO Working Paper 1998:10

- CICERO Working Paper 1998:8
- Hagem, C.: "Gratisvoter mot bedrifts-nedleggelse: Har klimapolitikken et bedre virkemiddel?" *Cicerone* no. 6/98, p. 14.
- Kasa, S.: "Hvor stort er spillerommet for effektive klimatiltak? CICERO-prosjektet Makt og miljø i 1998," *Cicerone* no. 7/98, p. 11.

### UNEP country study on climate change impacts and adaptations assessment in Cuba (7603)

The project comprised the final case study under the UNEP Country Studies program, where CICERO played a coordinating role for technical assistance to Antigua and Barbuda, Cameroon, Estonia, Pakistan and Cuba. One purpose of these country studies was to test the IPCC's guidelines for impact assessments and adaptation. CICERO made use of expertise from an international Technical Assistance Team consisting of technical experts from UNEP, IPCC and CICERO among others. The Cuba project aimed to build local capacity on climate impacts and adaptation, contribute to the preparation of a national assessment on climate impacts, and suggest improvements to the IPCC's guidelines for climate impact assessments.

**CICERO researchers:** Karen O'Brien (project leader), Linda Synga  
**Status:** Completed, awaiting publication of book.

**Funding:** The United Nations Environment Program (UNEP), Global Environment Facility (GEF), Danida, Denmark

#### Publications:

- *Developing Strategies for Change: The UNEP Case Studies on Climate Change Impact and Adaptation Assessment.* Forthcoming CICERO report.
- Impactos del Cambio Climático y Medidas de Adaptación en Cuba. Instituto de Meteorología, Havana, Cuba.

### Climate variability and the use of seasonal climate forecasts in Southern Africa (8310)

Seasonal climate forecasts can potentially increase the capacity of farmers to adapt to climate change by reducing vulnerability to climate risks and to facilitate planning and management. Working in collaboration with researchers in southern Africa, the project involved an analysis of user responses to the 1997-1998 seasonal forecasts issued by SARCOF (Southern Africa Regional Climate Outlook Forum). Case studies were carried out at the farm-level in Namibia and Tanzania, and supplemented by

interviews with institutions tied to the agricultural sector, including agricultural ministries, food cooperatives, seed companies, banks, and famine relief organizations. Institutional interviews were also conducted in Zimbabwe, where local researchers have been examining the responses to forecasts among communal farmers. The project aimed to identify whether and how farmers are receiving forecasts, and what types of constraints there are to making optimal use of the forecasts. This project represents the second phase of a project on climate change in Africa.

**Project leader:** Karen O'Brien and Linda Synga.

**In collaboration with:** University of Namibia, Sokoine University of Agriculture in Tanzania.

**Status:** Research completed, manuscript is in editing stage

**Funding:** The World Bank.

#### Publications:

- "Is information enough? User responses to seasonal climate forecasts in Southern Africa." CICERO Report.
- Næss, L.O., and K. O'Brien: "Stor usikkerhet om effekter av globale klimaendringer: Øket fokus på kortsiktige klimavariasjoner," *Cicerone* nr. 3/98, p. 9.
- SARCOF: Nytte av klimavarsler for landbrukssektoren. *Cicerone* nr. 6/98, p. 5.

### Macro-economic model for Indonesia with environmental effects (8311)

The goals of this project were to (1) enhance capacity of Indonesian experts on macro-economic modeling for environmental analysis through learning by doing; (2) visualize the impact on the environment of the economic development process; and (3) incorporate environment into economic planning. The project concentrated on the development of a macro-economic model for Indonesia that includes environmental inputs and outputs in the input-output module.

**CICERO researchers:** Bjart Holtmark, Hans H. Kolshus.

**Status:** Completed.

**Funding:** Direktoratet for naturforvaltning (DN).

**Publication:** Final report submitted to DN on March 1, 2000.

### Air pollution from the oil industry: Policy, measures and costs (8313)

The aim of this project was to investigate air pollution from the Norwegian oil industry and to provide estimates of costs

related to emissions reductions in the industry. The project also provided an assessment of different types of policy measures against air pollution suitable in Norway in general, although with a special focus on the role of the Norwegian oil industry.

**CICERO researchers:** Kristin Aunan, Odd Godal, and Bjart Holtmark.

**In collaboration with:** Det Norske Veritas (DNV).

**Status:** Completed

**Funding:** The Norwegian Oil Industry Association (OLF).

#### Publications:

- CICERO Report 1999:2.

### Rules for differentiation of greenhouse gas reduction (8315)

The objective of this study is to identify the most promising burden-sharing rules applicable to national emission abatement targets after the first Kyoto Protocol period 2008-12 and for the later involvement of developing countries. The first phase of the project explores relevant fairness principles and surveys concrete differentiation proposals from the negotiations that resulted in the Kyoto Protocol. Country-specific driving forces for greenhouse gas emissions and other indicators relevant for burden sharing rules are also explored. In the second phase, criteria for evaluation and development of burden-sharing rules are discussed, and a preliminary assessment of promising burden-sharing rules carried out. In the third phase the national cost consequences of the burden sharing rules are analyzed, and the most promising burden-sharing rules are summarized. Finally, in phase four, the results of the project are disseminated through workshops with scientists and policy makers and through a computer model.

**CICERO researchers:** Asbjørn Torvanger (project leader), Arild Underdal.

**In collaboration with:** Lasse Ringius, UNEP/Risø, and Jaap Jansen, Remko Ybema, Jos Sijm, Netherlands Energy Research Foundation (ECN).

**Status:** Completion expected in 2000

**Funding:** The Dutch national research program.

#### Publications:

- Ringius L., A. Torvanger, and A. Underdal (1999): "Burden differentiation: Fairness principles and proposals," *ECN Report* No. 11, Petten: Netherlands, and as CICERO Working Paper 1999:13.
- Torvanger, A. and L. Ringius (1999):

“Burden differentiation: Criteria for evaluation and development of burden-sharing rules,” *ECN Report* No. 13, Petten: Netherlands, and as CICERO Working Paper 2000:1.

- Ybema, J.R., J.C. Jansen, and F.T. Ormel (1999): “Project definition and introduction to some key concepts and issues,” *ECN Report* No. 1, Petten: Netherlands.

- Ybema, J.R., J.J. Battjes, J.C. Jensen, and F.T. Ormel (1999): “Burden differentiation: GHG emissions, undercurrents and mitigation costs,” *ECN Report*, Petten: Netherlands.

### **A survey of differentiation methods for national greenhouse gas reduction targets (8316)**

The aim of the project was to provide a systematic overview of proposed regulations and methods for differentiating national targets for greenhouse gas reductions. The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) from 1997 established differentiation of targets among countries, but not in any systematic manner. Our opinion is that a more systematic approach to differentiation will facilitate future negotiations. The sources for this study included proposals from the Ad Hoc Group on the Berlin Mandate (AGBM) process 1995–1997, the European Community’s Triptique approach for differentiation of targets among its member states, and recent academic literature. Based on the selected criteria of political acceptability, feasibility related to negotiations, regional or global relevance of the method, and potential for developing the method further, it was concluded that the most promising contributions are the proposals by Japan, France, Norway, Brazil, and finally, EU’s Triptique approach.

**CICERO researchers:** Asbjørn Torvanger (project leader), Odd Godal.

**Status:** Completed.

**Funding:** Nordic Council of Ministers.

#### **Publications:**

- CICERO Report 1999:5

- Report in the Tema-Nord series for the Nordic Council of Ministers.

### **International certification of greenhouse gas reductions (8317)**

The World Bank broke new ground by awarding its first greenhouse gas emissions project verification and certification contract to Det Norske Veritas (DNV), ICF and CICERO. The contract to develop a pilot framework for certifying tradable greenhouse gas emissions represented a new Bank initiative to push the frontiers of environmental auditing. DNV, ICF and CICERO worked closely with Bank staff on designing a draft framework for the verification and certification of World Bank projects. As required under the contract, the partners have applied this framework to the Bank’s and Norway’s efficient residential lighting project in Mexico (ILUMEX) to conduct a field audit and independent certification of the project’s emissions reduction.

**CICERO researchers:** Asbjørn Torvanger (project leader), Knut Alfsen, Tora Skodvin.

**In collaboration with:** Det Norske Veritas (DNV), ICF Inc.

**Status:** Completed.

**Funding:** The World Bank.

**Publication:**

- Telnes, E., J. Uzzell, D. Antonioli, B. Feldman, M. Gowen, P. Vrabel, A. Torvanger and T. Skodvin (1999): “World Bank ILUMEX Verification Report,” *DNV Technical Report* No. 99-3258, Det Norske Veritas, Oslo.

### **The Kyoto Protocol as a new framework for the fossil fuel market (8318)**

There is considerable uncertainty associated with how the fossil fuel markets will change as a result of the Kyoto Protocol. Although it is common to assume that oil prices might be somewhat lower than they otherwise would have been, just how much they might drop is uncertain. How the Protocol will affect natural gas prices in Europe is even more uncertain. Models developed at CICERO were used to carry out analyses that improve our understanding of these changes in the fossil fuel markets. The analysis looked particularly at the role of the establishment of an international emissions permit market. Various sensitivity analyses were carried out to discover how robust the results of previous analyses are.

**CICERO researchers:** Bjart Holtmark.

**Status:** Completed.

**Funding:** PETROPOL, The Research Council of Norway.

**Keywords:** Kyoto Protocol, fossil fuel market, framework.

#### **Publications:**

- “PETROPOL-midler til CICERO: Skal se på oljeindustrien og Kyotoprotokollen.” *Cicerone* no. 1/99, p. 11

- CICERO Working Paper 1998: 9.

- Holtmark, B. “Fra kvotebørsen til petroleumsmarkedene,” *Sosialøkonomen* 1999, no. 1.

### **Institutional roles in disseminating renewable energy technologies: A comparison of China and India (8401)**

The project focused on mapping institutional barriers for expanding renewable energy production in China and India with a particular emphasis on wind energy. The project has taken place in cooperation with Chinese and Indian research groups, and the results have been reported in a series of internationally published articles.

**CICERO researchers:** Lin Gan, Sjur Kasa

**In collaboration with:** Energy Research Institute and Qsinghua University in China and Tata Energy Research Institute (TERI) in India

**Status:** Completed.

**Funding:** The Research Council of Norway, NORAD, WWF-China

#### **Publications:**

- CICERO Working Paper 1998:7 Also published in *Pacific Asian Journal of Energy*, Vol.9, No.1, June, 1999 and presented at the International Energy Workshop, Stanford University, USA, June 17–19, 1998.

- CICERO Working Paper 1999:5, also in Nagel, S., ed., 2000. *Global Technology Policy: Among and Within Nations*, New York: Marcel Dekker Publishers (forthcoming in April 2000); in *Natural Resources Forum* (forthcoming in 2000); and in China *Environmental Perspectives*, Vol.1, No.2, 1999 [in Chinese].

- CICERO Working Paper 1999:7. The paper is to be revised for publication in *Pacific Asian Journal of Energy*.

- Gan, L. (with Liu, W.Q, Zhang, X.L., Gu, S.H.). 1999. “From Non-market Support to Cost-Competitive Incentives: Wind Energy Commercialization in China.” Submitted to *World Development* (under review), published as a CICERO Working Paper 2000:3. It has also been published as an article in the proceedings from the international workshop: Wind Energy Development in China for the 21<sup>st</sup> Century, held in Beijing, March 9–11, 2000.

- Gan, L.: Wind Energy in China: Institutional Barriers. *Ecological Economics Bulletin*, Vol.3, No.3, 1998.

- Gan, L.: Wind Energy in China: Institutional Barriers. *Sustainable Energy News*, No.22, September 1998.

• Jagadeesh. 1999. "Wind Energy Development in Tamil Nadu and Andhra Pradesh, India." CICERO Working Paper 1999:4, and accepted for publication by *Energy Policy* (forthcoming in 2000). The paper was also presented at the international workshop: Wind Energy Development in China for the 21<sup>st</sup> Century, held in Beijing, March 9–11, 2000.

### **International regimes: Institutional changes and effectiveness (8403)**

The underlying purpose of this project has been to increase knowledge about the factors determining the "effectiveness" of international regimes. The project focused on analyzing the effect of institutional structures. One important methodic objective has been to lay the foundations for wider and more systematic comparative analyses. The project has therefore played a role in the development of "The International Regimes' Database," a project led by Professor Oran R. Young, Dartmouth College. The database has laid the groundwork for an international project group at the Center for Advanced Studies during the academic year 1999–2000 and has provided the background for project 9404.

**CICERO researchers:** Arild Underdal.

**In collaboration with:** Fridtjof Nansens Institutt (FNI), Norway.

**Status:** Completed.

**Funding:** The Research Council of Norway.

### **Measures to reduce emissions in China (8501)**

The main goal for this project is to demonstrate the importance of looking at local (e.g. health effects), regional (e.g. vegetation damage) and global environmental problems in an integrated way. When considering measures with the primary objective to reduce emissions of greenhouse gasses, benefits of reductions of other compounds are often referred to as secondary, although they may turn out to be very important. This project aims to (1) demonstrate the usefulness of an integrated approach on a case study in the Shanxi province, an approach similar to that used for a previous study in Hungary; (2) make a limited number of measurements of emissions and air quality if necessary, and (3) show how this approach is important in connection with Joint Implementation and Clean Development Mechanism projects. We may also cooperate with Professor Kirk S. Smith and his group at University of California, Berkeley, and we are considering

arranging a workshop on "secondary benefits." The work on JI and CDM will possibly be carried out in collaboration with Industrikraft Midt-Norge.

**CICERO researchers:** Kristin Aunan, Hans M. Seip, and Asbjørn Aaheim

**In collaboration with:** ECON, Center for International Studies (CIS), MIT.

**Status:** Ongoing.

**Funding:** Ministry of Foreign Affairs, Norwegian Research Council, possibly FYI, Pachard Foundation

#### **Publications:**

• Article prepared for *Asia Pacific Tech Monitor*. (Authors: H.M. Seip, A. H. Aaheim, K. Aunan, J. Fang and K. A. Oye).

• Aunan, K., J. Fang, G. Li, H.M. Seip, and H. Vennemo. "Health and environmental benefits of CO<sub>2</sub> emission reduction measures in Shanxi, China – a first assessment," forthcoming CICERO report.

### **Modeling of global tropospheric ozone trends 1950–1990; Implications for climate (8502)**

Emissions figures for gases that contribute to ozone formation in the troposphere are prepared for the period 1850–1990 on the basis of trends in the use of fossil fuels, fertilizer, population growth, air traffic, etc. Calculations based on a three-dimensional CTM (Chemical Transport Model) are performed for each decade in the period 1950–1990, as well as for 1850 and 1900. Calculations of radiative forcing as a result of ozone changes were carried out by Gunnar Myhre (Department of Geophysics, University of Oslo).

**CICERO researchers:** Terje Berntsen and Ivar Isaksen.

**In collaboration with:** Gunnar Myhre, Department of Geophysics, University of Oslo, and Frode Stordal, NILU.

**Status:** Completed.

**Funding:** The Research Council of Norway.

#### **Publications:**

• Berntsen T., and I.S.A. Isaksen. "A global 3-D chemical transport model for the troposphere; 1. Model description and CO and ozone results." *J. Geophys. Res.*, 102, 21,239–21,280, 1997.

• Jaffe, D., T.K. Berntsen, and I.S.A. Isaksen, "A global three-dimensional chemical transport model for the troposphere, 2, Nitrogen oxides and nonmethane hydrocarbon results," *J. Geophys. Res.*, 102, 21, 281–21, 296, 1997.

• Myhre G. and F. Stordal, "The role of spatial and temporal variations in the

computation of radiative forcing and GWP," *J. Geophys. Res.*, 102, 11, 181–11, 200, 1997.

• Berntsen T., I.S.A. Isaksen, G. Myhre, and F. Stordal. "Time evolution of tropospheric ozone and its radiative forcing." *J. Geophys. Res.*, (in press).

### **IPCC: Third Assessment Report (TAR) (9203)**

CICERO's researchers have also in 1999 been involved in the IPCC's work as "lead authors," "contributors," and reviewers. This year the input went specifically to the writing of the Third Assessment Report (TAR).

**CICERO researcher:** Terje K. Berntsen, Ivar S.A. Isaksen, Jan S. Fuglestad.

**Status:** Completed.

**Funding:** Norwegian Ministry of the Environment (MD).

### **A national emissions trading system for greenhouse gases (9204)**

The aim of the project was to write a paper on the international operating conditions for a domestic emissions-trading system

**CICERO researcher:** Knut H. Alfsen

**Status:** Completed.

**Funding:** Miljøsoek.

#### **Publication:**

• CICERO Policy Note 1999:3.

### **Conference on international emissions trading 17.06.99 (9206)**

The conference was a follow-up to the February 11 conference on the conceptual elements of an international system of emissions trading. Emissions trading of greenhouse gases raises a large number of issues that only to a limited degree are understood and resolved.

The main focus at the conference on June 17 was the modeling carried out by Massachusetts Institute of Technology (MIT) in the United States on opportunities for Norway in international emission trading. Nordic experts will comment on the applicability on the model on a future Scandinavian emission markets and present experience and available data.

**CICERO researcher:** Øystein Dahle.

**In collaboration with:** ECON.

**Status:** Completed.

**Funding:** The participants at the conference.

**Publications:**

- Presentations from the conference.

**Political instruments before Kyoto (9207)**

The objective of the project was to write a paper on the options for political measures before the Kyoto Protocol is ratified

**CICERO researcher:** Knut H. Alfsen.

**Status:** Completed.

**Funding:** Miljøforsk.

**Publication:**

- K. H. Alfsen: "Noen momenter til en debatt om mulige tilpasninger dersom Kyoto-protokollen ikke trer i kraft." Unpublished paper.

**Conference on domestic emissions trading 11.02.99 (9302)**

Governments of industrialized countries have committed to reducing emissions of greenhouse gases. The costs may become high, but costs also depend on how the climate policy is implemented. Emissions trading may represent an effective tool for cost control. Although promising, emissions trading raises a large number of questions, including issues of allocation criteria, participation criteria, total costs, and transferability of other experiences to climate policy. The conference had two target groups: (1) high-level decision-makers in public administration and private enterprises engaged with emissions control, and (2) professionals engaged in developing trading systems and/or trading services.

**CICERO researcher:** Asbjørn Aaheim.

**In collaboration with:** ECON.

**Status:** Completed.

**Funding:** The participants at the conference.

**Publications:**

- Presentations from the conference.

**Climate change and the oil industry (9303)**

The study investigates the climate strategy of the oil industry and the policy instruments national governments use to control emissions from this sector as a function of this industry's position in the interface between national and international politics. The objectives of the analysis are, first, to explore interaction effects between the climate strategy of major oil companies on the one hand, and the policy instruments governments use to regulate their activities on the other, and, second, to investigate the extent to which

this interaction induces behavioral change (in terms of a reduction in emissions of greenhouse gases). The study explores the climate strategy of three major oil companies—Exxon, the Royal Dutch Shell Group, and Statoil—and investigates national policy instruments directed at this sector in the USA, the Netherlands, and Norway.

**CICERO researchers:** Tora Skodvin, Henrik Malvik.

**In collaboration with:** Jon Birger Skjærseth, Fridtjof Nansens Institute.

**Status:** Ongoing.

**Funding:** PETROPOL, The Research Council of Norway.

**Publication:**

- "PETROPOL-midler til CICERO: Skal se på oljeindustrien og Kyotoprotokollen." *Cicerone* no. 1/99, p. 11.

**Long-term environmental concerns and sustainable development (9304)**

This project studies alternative ways to compare costs and benefits over time (discounting), and assesses how different methods affect optimal decision-making in long-term environmental problems, particularly climate policy. The project focuses on three issues: first, that welfare loss of postponing consumption is usually evaluated in terms of an inadequate description of how social welfare depends on aggregate consumption over time; second, that one cannot choose a discount rate on the basis of observation and then find the best policy since the policy will affect the rate of discount; and finally, that optimal policy, and thereby the rate of discount, critically depends on the requirements for sustainability and how these requirements are interpreted.

**CICERO researchers:** Asbjørn Aaheim.

**Status:** Completion expected in 2000.

**Funding:** SAMRAM, The Research Council of Norway (NFR).

**Development and application of a simple model for scenario studies of changes in global climate: Strategic Institution Program (SIP) (9305)**

The objective of the project was to develop a simple climate model for studying the effects of future climate gas emissions on global mean temperature and sea level, similar to that used by the IPCC. The model uses emissions of 29 different gases as input. Atmospheric concentration of CO<sub>2</sub> is calculated on the basis of work published by Joos et al. Future concentrations of other gases are calculated by standard equations based on

emissions and chemical decay of the different gases in the atmosphere. Radiative forcing from the modeled concentrations in source gases is calculated by applying standard parameterizations published in the literature. In addition, radiative forcing is calculated for soot and sulfate aerosols (direct and indirect effects) as well as the secondary components tropospheric and stratospheric ozone and stratospheric water vapor. The estimated radiative forcing serves as input to an energy-balance-climate/upwelling-diffusion-ocean model developed by Professor Michael E. Schlesinger. The global and hemispheric change in annual mean temperature is calculated based on the exchange of energy between the atmosphere and the oceans, and the transport of energy in the ocean. The model uses prescribed values for climate sensitivity based on GCM results. Sea-level rise is determined by the melting of glaciers and the thermal expansion of the ocean. The model was recently extended for calculation of regional changes in temperature and other climate variables based on a method developed by Schlesinger et al.

A CICERO sub-project was a study of damage from ozone in China. Surface ozone levels are modeled for the base year 1990 and a scenario year (2020). Crop yield losses for wheat, rice corn and soybean are estimated for each province by use of dose-responses functions for the base year and the scenario year.

**CICERO researchers:** Knut H. Alfsen (project leader), Kristin Aunan, Terje Berntsen, Jan S. Fuglestad, Odd Godal, Ivar S.A. Isaksen and Hans Martin Seip.

**Status:** Completed.

**Funding:** CICERO.

**Publications:**

- *CICERO Working Paper 1999:1.*
- *CICERO Working Paper 1999:2.*
- Aunan, K., Berntsen, T.K., and Seip, H.M. "Surface ozone in China and its possible impact on agricultural crop yield." *Ambio* (in press).
- Godal, Sygna, Fuglestad and Berntsen: "Estimates of future climate based on SRES emissions scenarios." *CICERO Working Paper 2000:4.*
- Odd Godal, Jan S. Fuglestad and Terje Berntsen: "Ny klimamodell fra CICERO - Enkelt og nyttig verktøy for scenario-studier: Hovedtrekk ved CICERO-modellen," *Cicerone* no. 2/99.
- Odd Godal, Jan S. Fuglestad and Terje Berntsen: "Nye IPCC-scenarier gir lavere utslipp og høyere temperatur - Årsaken er reduserte utslipp av svoveldioksid." *Cicerone* no. 3/99.

### Climate implications of GWP-based reductions in greenhouse gas emissions: Strategic Institution Program (SIP) (9306)

Possible implications of a GWP based implementation of GHG reductions on future man-made climate change are explored. Abatement scenarios are established in terms of "CO<sub>2</sub> equivalents" using GWP<sub>100</sub> with one scenario reducing only CO<sub>2</sub> and one reducing short-lived gases, mainly CH<sub>4</sub>. Future temperature changes are calculated by using a simple climate model (SCM, see project 9305). It was found that equal emission scenarios in terms of CO<sub>2</sub> equivalents do not imply equivalent responses and large differences in the magnitude and rates of temperature change are calculated.

**CICERO researchers:** Jan S. Fuglestedt, Terje Berntsen, Odd Godal and Tora Skodvin.

**Status:** Completed.

**Funding:** CICERO.

#### Publications:

• Fuglestedt, J. S., T. Berntsen, O. Godal and T. Skodvin (1999): "Climate implications of GWP-based reductions in greenhouse gas emissions." *Geophys. Res. Lett.*, 27(3), 409-412.

• L. Sygna and J.S. Fuglestedt: "Ingen alternativer til GWP - Til no eneste metode for å sammanlikne utslepp." *Cicerone* no. 3/99.

Sygna, Linda, Jan S. Fuglestedt og Asbjørn Aaheim: Metodar for å samanlikne utslepp av klimagassar: GWP-konseptet og alternative metodar, CICERO Working Paper 1999-11.

### IPCC: Revision of rules of procedure (9307)

At their plenary meeting in April 1999, the IPCC revised their rules of procedure. In preparation to the meeting, the Norwegian Ministry of the Environment asked CICERO to comment on the draft to new rules of procedure and proposals for change. The comment is focused on the introduction of review editors, the new procedure for the adoption of the Synthesis Report, and the admission to rely upon non-published and non-peer-reviewed literature in IPCC Assessment Reports.

**CICERO researcher:** Tora Skodvin.

**Funding:** Norwegian Ministry of the Environment (MD).

**Status:** Completed, awaiting publication.

**Documentation:**

• Memorandum to the Norwegian Ministry of the Environment

• Skodvin, T.: "Nye prosedyreregler i IPCC," *Cicerone*, no.2/99, p. 10.

• Skodvin, T.: "Revised Rules of Procedure for the IPCC - A Commentary," *Climatic Change* (forthcoming).

### Interactive chemistry/climate modeling (9308)

Several studies using chemical transport models (CTM) and radiative transfer models have shown that chemically active gases (ozone and methane) might have significant impacts on global radiative forcing, and that there are large spatial variations in the forcing. Due to computer limitations and lack of appropriate chemical schemes, interactive climate/chemistry modeling in GCMs have not yet been carried out. In this project a simplified chemical scheme for use in GCM is developed and tested in our 3-D global CTM. The development is based on the existing comprehensive scheme used in a global 3-D CTM developed at the Department of Geophysics, Univ. of Oslo. The 3-D CTM is also used as a "test-bench" for the new scheme, to evaluate the errors or uncertainties introduced by the simplifications. Benefits of the project will be a better understanding of how the chemistry/climate systems works, thereby improving our skills in interpretation of observed climate trends and in prediction of future climate change.

**CICERO researchers:** Terje Berntsen, Ivar S.A. Isaksen.

**In collaboration with:** W.C. Wang, Atmospheric Sciences Research Center, State University of New York (SUNY), USA.

**Status:** Completion expected in 2000.

**Funding:** The Research Council of Norway.

#### Publications:

• Berntsen T., and I.S.A. Isaksen. "A global 3-D chemical transport model for the troposphere; 1. Model description and CO and ozone results." *J. Geophys. Res.*, 102, 21, 239-21, 280, 1997.

### Abatement analyses: A documentation (9309)

In connection with international and national agreements and targets concerning air pollution the Norwegian Pollution Control Authority (SFT) has the responsibility for analyzing the possibilities for reducing the emission of pollutants in Norway and the costs of abatement measures. The object of the

project is to document the methodology that SFT uses in this type of abatement analyses, and to discuss it in a broader context by relating it to alternative methods of assessing the socio-economic impacts of abatement measures.

**CICERO researchers:** Kristin Aunan, Linda Sygna.

**Status:** Research completed, reports in preparation.

**Funding:** Norwegian Pollution Control Authority (SFT).

#### Publications:

• Sygna, Linda and Kristin Aunan: "Metoder anvendt i SFTs tiltaksanalyser." Dokumentasjonsnotat.

• CICERO report, in preparation.

### Towards a cost-effective climate policy: The International framework and Norwegian policy instruments (9402)

This project analyzes Norway's choice of climate strategy on the background of relevant international treaties, the structure of international energy markets, technological development, and choice of climate policies in other countries. Two scenarios are formulated based on degree of international implementation of climate policies and the Kyoto Protocol: "Kyoto success and Stagnation". The first phase of the project explores various scenarios for the climate policy regime; the second phase explores scenarios for energy markets and technology; and the third phase analyzes the possibility of effective Norwegian implementation of the Kyoto Protocol in the tension between the above-mentioned international and national factors.

**CICERO researchers:** Bjart Holtsmark, Hans H. Kolshus, Henrik Malvik, Lasse Ringius, Tora Skodvin, Asbjørn Torvanger (project leader).

**In collaboration with:** Steinar Andresen, Jørgen Wettestad, Atle C. Christiansen, Jon Birger Skjærseth, Fridtjof Nansen Institute (FNI), Norway.

**Status:** Completion expected in 2000.

**Funding:** The Research Council of Norway.

### Norwegian measures and strategies in a dynamic climate agreement (9403)

In the selection of domestic options for climate policy, the focus has been primarily on how the use of different instruments can affect whether firms in competitively disadvantaged industries will re-locate abroad or close down. The

emphasis on regional policy can lead to giving certain types of industry special treatment because they are located in areas with few alternative places of employment—even though this implies a social cost. This project looks at how the impact of special treatment on certain types of industry depends on the climate policy in other countries, implementation strategies for the Kyoto Protocol, and Norway's general economic development. An important assumption for the analysis is that there are large and irreversible investment costs associated with investment in certain types of competitively disadvantaged industries, thus investment decisions should not depend on the predictability of climate policy. On the other hand, the government depends on being able to adjust its policy in line with the general economic development and development in regulations for implementing the international agreement on emissions restrictions. The project aims to describe how different policy instruments can be combined when both flexibility and predictability must be taken into account.

**CICERO researchers:** Cathrine Hagem.

**Status:** Completion expected in 2000.

**Funding:** SAMRAM, The Research Council of Norway.

### Effectiveness of international environmental regimes (9404)

The aim of this joint project between FNI and CICERO, which is a continuation of project 8403, is to use the International Regime Database (IRD), which contains information about the formation, adaptability and effectiveness of international regimes, to code 3-4 international environmental regimes within the IRD structure. From this basis, a series of journal articles will be written based on case studies of institutional change in the regimes studied, as well as their relationship to the members states and relevant regime processes.

**CICERO researcher:** Lasse Ringius.

**In collaboration with:** Fridtjof Nansen Institute (FNI).

**Status:** Completion expected early in 2000.

**Funding:** The Research Council of Norway (NFR).

### Implementation of sustainable reforestation of reforested grasslands in Kerinci District of Jambi province, Indonesia (9405)

The purpose of this project was to assist and evaluate the efforts of the Indonesian government in planting experimental plots of cash crops to encourage local economic development and carbon sequestration in the Jambi region, Sumatra.

**CICERO researchers:** Sjur Kasa.

**In collaboration with:** Indonesian Ministry of State for Environment (LH).

**Status:** Completed.

**Funding:** Norwegian Agency for Development Cooperation (NORAD).

#### Publications:

- "Demonstration Plot of Casiavera at Imperata Grassland in Bukit Suban, Pauh Sub-district, Sarolangun Bangko District, and Multi Species in Blui Tinggi, Air Hantag Sub-district, Kerinci - District Province of Jambi" Final project report.

### Free permits as a tool for preventing shutdowns (9406)

If the Norwegian authorities establish a market for greenhouse gas emissions permits in Norway, the question rises whether the first allocation of the permits should take place through auctioning or be allocated free of charge. Free-of-charge allocation has been proposed as a tool for preventing shut downs in the Norwegian manufacturing industry.

The project analyses, among other things, the relationship between different allocation methods and industry shutdowns.

**CICERO researchers:** Bjart Holtmark (project leader), Asbjørn Torvanger.

**In collaboration with:** ECON.

**Status:** Completed.

**Funding:** The Norwegian commission on a domestic emissions trading system, Norwegian Ministry of the Environment.

#### Publication:

- CICERO Report 1999:6.

### The Kyoto Protocol and its impact on global oil markets (9407)

The Oxford Institute for Energy Studies (OIES, project leader) in co-operation with CICERO has undertaken a study of the possible impact of the Kyoto Protocol on world oil markets during the period up to the year 2020. The purpose of the study was to assess the effects of climate change

policies on oil demand, supply and prices. The research was based on a global economic and environmental simulation model developed at OIES (the CLIMOX model), which produces projections for emissions, and for quantities and prices of fossil fuels and other commodities. The analysis of climate policy impacts on fossil fuel markets covered three scenarios: a "Business as Usual" scenario, a "Kyoto Base" scenario, and an "Ambitious" scenario.

**CICERO researchers:** Asbjørn Aaheim (project leader) and Hans Kolshus.

**In collaboration with:** Benito Müller and Ulrich Bartsch, Oxford Institute for Energy Studies (OIES).

**Status:** Completed.

**Funding:** Norwegian Ministry of Petroleum and Energy (OED).

**Keywords:** Kyoto Protocol, oil market, carbon taxes, macroeconomic models, abatement measures.

#### Publication:

- The study will be published by the OIES in early 2000 as a book, entitled *Fossil Fuels in a Changing Climate: Impacts of the Kyoto Protocol and Developing Country Participation*.

### Development and dissemination of wind energy technology in India: Institutional support (9408)

The purpose of this project was to invite researchers from TERI in India to come to CICERO to write reports on institutional barriers for renewable energy dissemination in India.

**CICERO researchers:** Lin Gan, Sjur Kasa.

**In collaboration with:** Tata Energy Research Institute (TERI), India.

**Status:** Research completed, awaiting publication.

**Funding:** Norwegian Agency for Development Cooperation (NORAD).

#### Publications:

- Mathur, A. and C. Shah: "Policy and institutional issues in grid connected wind energy development: Lessons from India," presented at the International Workshop: Wind Energy Development in China for the 21<sup>st</sup> Century, March 9-11, 2000, Beijing, China. To be published as CICERO Working Paper and submitted to an international journal.





**Director**  
Knut H. Alfsen



**Research Director**  
Jan S. Fuglestad



**Research Director**  
Asbjørn Torvanger

### **Policy-making behavior in climate change policy: A comparative analysis of Norway, USA and Germany (9409)**

The objective of this project is to achieve a comprehensive knowledge about the decision-making processes that determine each country's national climate change policy, as well as their position in the international negotiation process on climate change. A significant task for the project will thus be to establish which actors and societal processes are important in influencing both policy choices and the perceived range of policy options available for decision-makers in the policy area, both at the national and international levels. The study will gather information on both systemic and domestic variables that govern policy-making behavior. Investigations at the systemic level will be based on the assumption that the countries' perceptions of abatement costs and damage costs play a deciding role. At the domestic level, the basic assumption is that policy-making processes are influenced both by societal demand and support, as well as governmental supply of abatement policies. Furthermore, an assumption is made about social learning and policy diffusion as important influential mechanisms.

**CICERO researcher:** Guri Bang Søvting (doctoral thesis).

**Status:** Completion expected in 2001

**Funding:** SAMRAM, The Research Council of Norway.

**Publication:**

- CICERO Working Paper 1997: 3

- Ringius, L. and G.B. Søvting (1997): "Norsk gjennomføring av klimakonvensjonen," in Lafferty, W.M., O. S. Langhelle, P. Mugaas, and M. H. Ruge (eds): *Rio + 5: Norges oppfølging av FN-konferansen om miljø og utvikling*. Tano Aschehøus: Oslo.

- "Grønn skattereform i Tyskland," *Cicerone*, no. 3/99.

- "Tysklands ledende klimarolle på hell?" *Cicerone*, no. 1/00.

### **Global environmental problems and economic globalization - challenges to Norwegian environmental policies (9410)**

In this project, CICERO aims to analyze the relationship between international conditions for Norwegian environmental policy and national and social economic development trends as input factors. The development of various global environmental problems mark a completely new phase in international and Norwegian environmental policy, where the focus is turned away from traditional conservation and abatement of point emissions and towards the environmental impact of consumption and production patterns. After describing and defining the international challenges posed by efforts to abate greenhouse gases in particular, CICERO will analyze Norway's political response through two case studies. Much of the research conducted in this project is closely connected to the ongoing "Power and Environment" (7408) project.

**CICERO researchers:** Sjur Kasa.

**In collaboration with:** Arild Underdal.

**Status:** Completion expected Feb. 2000.

**Funding:** Makutredningen.

**Publication:**

### **Environmental policy is more than cost effectiveness (9411)**

The study will seek to analyze the role of interest groups in environmental policy. It will try to reveal if and how interest

groups influence policy makers. Further it will look at various ways to regulate the industry under different asymmetric information structures. Regulation based on contracts will be compared to classic regulation based on, for example, taxes. A survey of incentive mechanisms on which policy-makers can base their regulation will form the basis.

**CICERO researcher:** Camilla Bretteville (doctoral thesis).

**Status:** Completion expected 2002.

**Funding:** The Research Council of Norway (NFR).

**Publication:**

### **Reports from United Nations Convention on Climate Change (UNFCCC) (9413)**

CICERO has followed the climate negotiations that lead to the Climate Convention and the Kyoto Protocol throughout the 1990s. This effort is essential for CICERO to function as a competence center for the government, business, the media, and to be able to respond to various inquiries. Continuing this activity, CICERO is attending and preparing reports from all conferences of the parties to the Climate Convention and meetings of its special bodies.

**CICERO researchers:** Knut H. Alfsen, Asbjørn Torvanger (project leader).

**Status:** Completed.

**Funding:** CICERO.

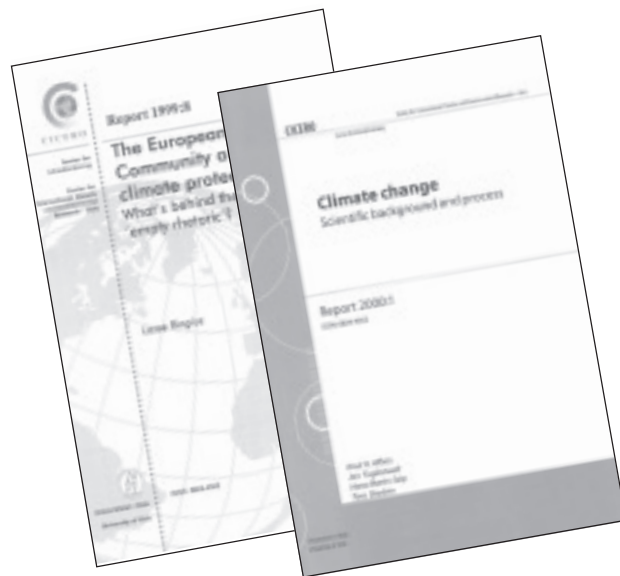
**Publications:**

- Torvanger, A.: "Små skritt i Bonn: Lavt tempo i forhandlingene om Kyotoprotokollen," *Cicerone* 3/99, p. 35

- Torvanger, A.: "COP5: Girskifte i Bonn: Klimaforhandlingene kom eit godt stykke vidare," *Cicerone* 6/99, p. 3-4.

# CICERO Publications

# 1999



## Policy Notes

- CICERO Policy Note 1999:1 Alfsen, Knut H.: *Flexible instruments in climate policy*
- CICERO Policy Note 1999:2 Alfsen, Knut H.: *Virkemidler som virker i klimapolitikken? Om fleksible virkemidler og et nasjonalt kvotesystem*
- CICERO Policy Note 1999:3 Alfsen, Knut H.: *Et nasjonalt kvotesystem for klimagasser: Koplingen til internasjonale mekanismer*
- CICERO Policy Note 1999:4 Holtmark, Bjart: *Fra kvotebørsen til petroleumsmarkedene*
- CICERO Policy Note 1999:5 Kasa, Sjur: *Social and political barriers to green tax reform: The case of CO<sub>2</sub>-taxes in Norway*
- CICERO Policy Note 1999:6 Holtmark, Bjart: *Gratis kvoter til industrien - ikke så enkelt*

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- CICERO Report 1999:1 Næss, Lars Otto: *Skogtiltak mot klimaendringer. Oversikt og status etter fjerde partskonferanse til Klimakonvensjonen*
- CICERO Report 1999:2 Dragsund, Egil, Gerd Petra Haugom, Kristin Aunan, Odd Godal og Bjart Holtmark: *Utslipp til luft fra oljeindustrien: Tiltak, kostnader og virkemidler*
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- CICERO Report 1999:4 Torvanger, Asbjørn and Tora Skodvin: *Implementing the Kyoto Protocol: The role of environmental agreements*
- CICERO Report 1999:5 Torvanger, Asbjørn and Odd Godal: *A survey of differentiation methods for national greenhouse gas reduction targets*
- CICERO Report 1999:6 Holtmark, Bjart og Asbjørn Torvanger: *Kyotoprotokollen som*

*rammeverk for et norsk system for omsettelige kvoter*

- CICERO Report 1999:7 Ringius, Lasse: *Soil carbon sequestration and the CDM: Opportunities and challenges for Africa*
- CICERO Report 1999:8 Ringius, Lasse: *The European Community and climate protection: What's behind the 'empty rhetoric'?*

- CICERO Report 2000:1 Alfsen, Knut H., Jan Fuglestad, Hans M. Seip and Tora Skodvin: *Climate change: Scientific background and process*

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- CICERO Working Paper 1999:1 Knut H. Alfsen and Terje Berntsen: *Modelling atmospheric carbon concentration*
- CICERO Working Paper 1999:2 Fuglestad, Jan S. and Terje Berntsen: *A simple model for scenario studies of changes in global climate: Version 1.0*
- CICERO Working Paper 1999:3 Tora Skodvin: *Science-policy interaction in the global greenhouse: Institutional design and institutional performance in the Intergovernmental Panel on Climate Change (IPCC)*
- CICERO Working Paper 1999:4 Jagadeesh, Anumakonda: *Institutional dynamics and barriers in wind energy development: A case study in Tamil Nadu and Andhra Pradesh, India*
- CICERO Working Paper 1999:5 Zhang Xiliang, Lin Gan, Gu Shuhua and Liu Wenqiang: *Wind energy development technology development and diffusion: A case study of Inner Mongolia, China*
- CICERO Working Paper 1999:6 Holtmark, Bjart: *Kostnadseffektiv klimapolitikk med doble gevinster*
- CICERO Working Paper 1999:7 Amin, Amal-Lee: *Institutional barriers to commercialisation of wind power in India: The case of Gujarat*
- CICERO Working Paper 1999:8 Holtmark, Bjart J.: *A comparison of taxes and tradable permits in national climate policy*
- CICERO Working Paper 1999:9 Skodvin, Tora: *Making climate change negotiable: The development of the Global Warming Potential index*
- CICERO Working Paper 1999:10 Bretteville, Camilla: *Decision criteria under uncertainty and the climate problem*
- CICERO Working Paper 1999:11 Sygna, Linda, Jan S. Fuglestad og Asbjørn Aaheim: *Metodar for å samanlikne utslepp av klimagassar: GWP-konseptet og alternative metodar*
- CICERO Working Paper 1999:12 Ybema, J.R., J.C. Jansen and F. T. Ormel: *Project definition and introduction to some key concepts and issues*
- CICERO Working Paper 1999:13 Ringius, Lasse, Asbjørn Torvanger and Arild Underdal: *Burden differentiation: fairness principles and proposals*
- CICERO Working Paper 1999:14 J. Ybema, R., J. J. Battjes, J. C. Jansen and F. T. Ormel: *Burden differentiation: GHG emissions, undercurrents and mitigation costs.*

# External publications

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- Larssen, T., R.D. Vogt, H.M. Seip, G. Furuberg, G., B. Liao, J. Xiao and J. Xiong: "Mechanisms for aluminum release in Chinese forest soils". *Geoderma*, 91, 65-86, 1999.
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- Aunan, K.: "Malaria - syk luft på frammarsj". *Naturen*, 4, 200-205, 1999.
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- Hovi, J. and L. Helland: "Bayesiansk oppdatering og bayesiansk perfekt likevekt: En innføring"; *Forskningsnotat* 8/99, Institutt for statsvitenskap.
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## Papers and posters

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- Fuglestedt, J.S., Berntsen, T.K., Isaksen, I.S.A.; Mao, H. Liang, X.-Z., Wang, W.-C.: Quantification of the impacts of NO<sub>x</sub> emissions on climate through changes in tropospheric O<sub>3</sub> and CH<sub>4</sub>. Poster at NFR seminar: Klima og Ozon, Klækken 13.-14.04.99.
- Isaksen, I.S.A.: Advance Study courses, Bergen
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## Presentations

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- Alfsen, K.H.: *Om klimadebatten*, Intercity, 25.01.99, Oslo
- Alfsen, K.H.: Presentasjon for NFR om TERM II 18.7.99
- Alfsen, K.H.: Presentasjon i Finansdepartementet om det naturvitenskapelige grunnlaget for klimaproblemet, 12.6.99

- Alfsen, K.H.: Presentasjon i Miljøsoaks råd 12.5 om fleksible virkemidler
- Alfsen, K.H.: Presentasjon på Bioenergidagen "Kvoter eller avgifter?" 7. oktober 99
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- Aaheim, A.: *Nasjonale utslippskvoter*, CICERO-ECON, konferanse, 2.99
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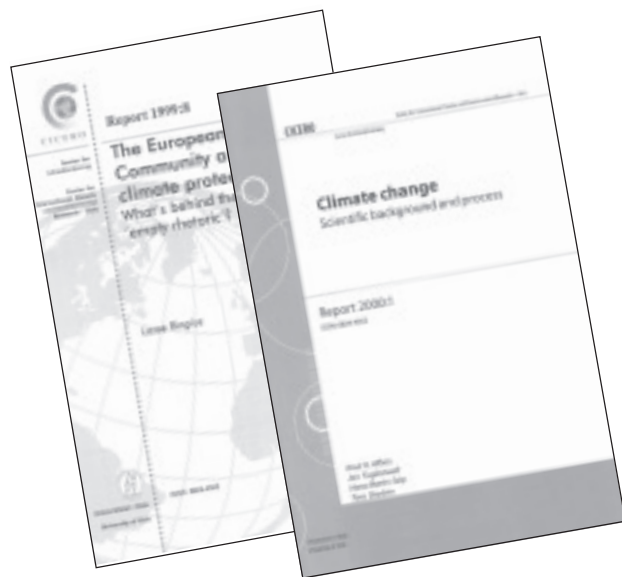
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- CICERO Policy Note 1991:2 Hanisch, Ted: *Joint Implementation of Commitments to Curb Climate Change*
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• **Aunan, K.:** "Jakten på den reelle risiko: Som man roper i skogen får man svar?" in *Lesebok i miljøadministrative metoder*, Telemark College

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- **Camy-Peyret, C.; I.S.A. Isaksen et al.**: "The Partitioning of ClO<sub>y</sub> in the Stratosphere", Final Report to the European Commission on Contract EV5V-CT93-0346
- **Christensen B.; I.S.A. Isaksen et al.**: "Ozone: Climate Chemistry Interactions", Final Report to the European Commission
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- **Aaheim, A.**: "Comparing the Costs of Climate Policies Among Countries", Proceedings from NATO workshop in Moskva, April

## Papers and Posters

- **Berntsen, T.; J. Fuglestedt, I.S.A. Isaksen, G. Myhre**: "Changes in Tropospheric Photochemistry: Implications for Climate", Poster presented on Quadrennial Ozone Symposium

L'Aquila, Italia, September

- **Fuglestedt, J.; T. Berntsen, I.S.A. Isaksen, W.-C. Wang, X.-Z. Liang, H. Mao**: "Impacts of Reduced NO<sub>x</sub> Emissions on Radiative Forcing through Changes in Tropospheric O<sub>3</sub> and CH<sub>4</sub>: A Global 3-D Model Study", Poster presented on Quadrennial Ozone Symposium L'Aquila, Italia, September
- **Hanf, K.; A. Underdal**: "The Domestic Basis of International Environmental Agreements: Modeling National/International Linkages", International work-shop, Ede, Netherlands, February
- **Hanf, K.; A. Underdal**: "The Domestic Basis of International Environmental Agreements: Modeling National/International Linkages", Brussels, October
- **Holtmark, B.**: "Winners and Losers in a Climate Agreement", Annual Meeting in European Economic Associations, Istanbul, August
- **Isaksen, I.S.A.**: "Effects of Climate-chemistry Interactions on the Radiative Forcing of Increasing Atmospheric Methane", XVIII Quadrennial Ozone Symposium L'Aquila, September
- **Seip, H.M.; K. Aunan, A. Aaheim**: "Energy, Climate and Air Pollution: What do We Know and How Should We Act?", 46th Pugwash Conference, September
- **Underdal, A.; O.R. Young**: "Scooping Report on Institutions", Annual Conference, International Association for the Study of Common Property, University of California, Berkeley, June
- **Aaheim, A.**: "Resource and Environmental Policy in Norway", Nordic-Baltic Conference, Bornholm, April

## Presentations

- **Aunan, K.**: "Globale klimaendringer", Agricultural University of Norway; Ås
- **Berntsen, T.**: "Klimaendringer: Nye funn fra IPCC-95", Faglig pedagogisk dag 96; Oslo
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- **Berntsen, T.**: "Klimaendringer: Nye funn fra IPCC-95", Agricultural University of Norway; Ås
- **Berntsen, T.**: "Endringer i atmosfæren, ozonlaget og drivhuseffekt", Norsk Kjemisk Selskap; Kristiansand
- **Berntsen, T.**: "Ozon og klima", Center for Development and the Environment; Oslo
- **Berntsen, T.**: "Drivhuseffekt og klimaproblemer: Om prosess, status og utfordringer", Department of Physics, University of Oslo
- **Berntsen, T.**: "Ozonlaget, kjemiske endringer, Montreal-avtale utfordringer", Department of Physics, University of Oslo
- **Dalfelt, A.**: "Forestry and Climatic Change", Telemark College; Bø
- **Fuglestedt, J.**: "Hva sier FN's klima-panel om menneskeskapte klimaendringer?", The Norwegian Parliament; Oslo
- **Fuglestedt, J.**: "Klimaendringer", Debate, T Trøndelag European Youth; Trondheim
- **Fuglestedt, J.**: "Hva sier FN's klima-panel om menneskeskapte klimaendringer?", Forskningsdagene 96; Oslo
- **Fuglestedt, J.**: "Hva sier FN's klima-panel om menneskeskapte klimaendringer?", Norsk kjemisk selskap og teknisk forening; Sarpsborg
- **Fuglestedt, J.**: "Klimagasser, klima-endringer, trusselbilder", LUFOR -Luftforurensningsrådet i Rogaland; Stavanger
- **Hagem, C.**: "Market Power in a System of Tradable CO<sub>2</sub> Emission Quotas in a Dynamic Model", Centre for Development and the Environment; Oslo
- **Hagem, C.**: "The Value of Information and the Design of a Climate Contract under Asymmetric Information and Uncertainty", Department of Economics, University of Oslo
- **Holtmark, B.**: "Økonomiske virkninger av en klimaavtale", Open days at the University of Oslo
- **Holtmark, B.**: "The Burden-sharing Project", COP-2; Berlin
- **Holtmark, B.**: "Finnes det en rettferdig byrdefordeling i internasjonal klimapolitikk?", Forskningsdagene 96; Oslo
- **Isaksen, I.S.A.**: SASS Steering group, January, Irvine University; California
- **Isaksen, I.S.A.**: "Ozon og klima", February, Center for Development and the Environment, Oslo
- **Isaksen, I.S.A.**: "Klimarapporten og klimaendringer", February, Polyteknisk Forening; Oslo
- **Isaksen, I.S.A.**: "Klimaprosessen", February, Faculty of Journalism, Oslo College
- **Isaksen, I.S.A.**: "Konklusjoner fra IPCC", March, Climate and Ozone-Meeting, March; Bergen
- **Isaksen, I.S.A.**: IGBP Keynote speech, April; Høvik, Oslo
- **Isaksen, I.S.A.**: IGAC, April; Høvik, Oslo
- **Isaksen, I.S.A.**: "Hva sier FN's klimapanel IPCC (og hva sier det ikke)?", Kjeleforeningens Annual Meeting, May; Oslo
- **Isaksen, I.S.A.**: PAUR, June; Athen
- **Isaksen, I.S.A.**: "Global Warming", June, Center for Development and the Environment; Oslo
- **Isaksen, I.S.A.**: ESA, June; Granada
- **Isaksen, I.S.A.**: "Multi-Gas Control Proposals: Analysis and Implementation", Burden Sharing Under the Climate Convention, MIT/CICERO Seminar, June; Oslo
- **Isaksen, I.S.A.**: Norsk Hydro, June; Oslo
- **Isaksen, I.S.A.**: XVIII Quadrennial Ozone Symposium L'Aquila, September; Italy
- **Isaksen, I.S.A.**: SVs millennium conference, September; Oslo
- **Isaksen, I.S.A.**: MIPAS, Karlsruhe, October; Germany
- **Isaksen, I.S.A.**: NISK, October; Oslo
- **Isaksen, I.S.A.**: Department of Philosophy, October; Oslo
- **Isaksen, I.S.A.**: NERSC, November; Bergen
- **Isaksen, I.S.A.**: Meeting on aircraft emissions, December; Taipei, Taiwan
- **Isaksen, I.S.A.**: Vitenskapsakademiet, December; Oslo
- **Kasa, S.**: "Brazil and Indonesia: The Politics of Environmental Reform 1988-1993", Oslo
- **Ringius, L.**: "Adapting to Climate Change in Africa: A CICERO/World Bank project", CICERO Seminar Climate Change and Vulnerability in Africa; Oslo
- **Ringius, L.**: "Climate Change Adaptation in

Africa: Options and Constraints”, World Bank Seminar; Washington D.C.

- **Ringius, L.:** “Climate Change Adaptation in Africa”, The Nordic Climate Seminar and Workshop, Stockholm Environment Institute; Stockholm, Sweden
- **Seip, H.M.:** “Miljøproblemer i Kina: Noen aktuelle kinesisk-norske samarbeidsprosjekter”, Agder College
- **Seip, H.M.:** “Energy, Climate and Air Pollution: What do We Know and How Should We Act?”, 46th Pugwash Conference on Science and World Affairs; Lahti, Finland
- **Torvanger, A.:** “Insights From the CICERO Project on Burdensharing”, *Conference on Burdensharing Under the Climate Convention*; MIT/CICERO, June 12-14, Oslo
- **Torvanger, A. and B. Holtmark:** “The Burdensharing Project”, COP-2; Berlin
- **Torvanger, A.:** “Perspektiv og utfordringer for Norge etter dei siste klima-forhandlingene”, Klimaforum; Oslo
- **Torvanger, A.:** “Economic Issues Related to Climate Change”, Climate Change and Vulnerability in Africa; Vetre, Asker
- **Underdal, A.:** “The Scandinavian Countries in World Politics”, Dartmouth College; UK
- **Underdal, A.:** “Keynote Speech on the Concept of ‘Globality’ in the Study of Environmental Change”, International symposium, Linköping University; Sweden
- **Underdal, A.:** “Statsvitenskap som partner i tverrfaglig forskning”, Student Seminar; Sundvolden
- **Aaheim, A.:** “Miljøtiltak” for stats-sekretærutvalg for miljøspørsmål; Oslo
- **Aaheim, A.:** “Miljø og økonomi”, Department of Chemistry, University of Oslo
- **Aaheim, A.:** “Presentasjon av CICERO og tverrfaglig klimaforskning”, Faculty of Journalism, Oslo College
- **Aaheim, A.:** “Byrdefordeling og Norges situasjon”, Statssekretærutvalget for Langtidsprogrammet; Oslo
- **Aaheim, A.:** “Er Norge pådrivere eller sinker i klimaforhandlingene?”, Forskningsdagene 96; Oslo
- **Aaheim, A.:** “Hvorfor er byrdefordeling viktig for Norge?”, Climate Forum; Oslo

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- **Berntsen, T.:** “Hva betyr havet for klimaendringer?”, Norsk Oljerevy no 10
- **Fuglestedt, J., H.M. Seip:** “Bakke og føre var-prinsippet”, Aftenposten (27.3.)
- **Fuglestedt, J., H.M. Seip:** “Sannsynlige svar finnes”, Aftenposten (12.5.)
- **Fuglestedt, J., H.M. Seip:** “Tro og kunnskap i klimadebatten”, Aftenposten (12.11.)
- **Hernes, H.:** “Klimaavtale kan koste dyrt”, Arbeiderbladet (8.7.)
- **Isaksen, I.S.A.:** “FNs klimapanel og klimaendringer”, Hvor Hender Det? NUPi - Norsk utenrikspolitisk institutt (13.5.)
- **Isaksen, I.S.A.:** “Målinger i riktig høyder”, Aftenposten (August)
- **Ringius, L.:** “Bendiksens fordreining”, Aftenposten (23.11.)

- **Seip, H.M., J. Fuglestedt:** “Justerings-tid for ekstra CO<sub>2</sub> avgjør, ikke midlere oppholdstid for enkeltmolekyler”, Norsk Oljerevy no 9
- **Seip H.M., J. Fuglestedt:** “Segalstad misforstår FN’s klimapanel”, Norsk Oljerevy no 11
- **Aaheim, A.H.:** “Klimameldingen og symbolpolitikk”, N&M Bulletin no 5
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- CICERO Report 1997:1 Aunan, K., G. Pätzay, H. A. Aaheim and H. M. Seip: *Health and Environmental Benefits from the Implementation of an Energy Saving Program in Hungary*
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- CICERO Report 1997:8 Ringius, L.: *Differentiation, Leaders and Fairness: Negotiating Climate Commitments in the European Community*

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- CICERO Policy Note 1997:2 Fuglestedt, J.S. (red.): *IPCCs synteserapport: Norsk oversettelse med kortfattet oppsummering*
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## External Publications

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- **Alfsen, K.H., Bye, T., Glomsrød, S. and Wiig, H.:** Soil degradation and economic development in Ghana, Environment and Development Economics 2(2), 119-144, 1997
- **Berntsen T., and I.S.A. Isaksen:** A global 3-D chemical transport model for the troposphere; 1. Model description and CO and ozone results. *J. Geophys. Res.*, 102, 21,259-21,280, 1997.
- **Berntsen, T., Isaksen, I.S.A., Myhre, G., Fuglestedt, J.S., Alsvik Larsen, T., Stordal, F., Freckleton, R.S., and Shine, K.P., 1997:** Effects of anthropogenic emissions on tropospheric ozone and its radiative forcing. *Journal of Geophysical Research*, 102, 21239-21280
- **Hagem, C.:** Climate Agreements under Limited Participation, Asymmetric Information and Market Imperfections, *Økonomiske Doktoravhandling*, nr.34 -1997, Sosialøkonomisk Institutt
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- **Olson J., M. Prather, T. Berntsen, G. Carmichael, R. Chatfield, P. Connell, R. Derwent, L. Horowitz, S. Jin, M. Kanakidou, P. Kasibhatla, R. Kotamarthi, M. Kuhn, K. Law, J. Penner, L. Perliski, S. Sillman, F. Stordal, A. Thompson, and O. Wild:** Results from the Intergovernmental

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- **Seip, H.M., Liao, B. and Larssen, T.:** Response of two Chinese forest soils to acidic deposition: leaching experiment, *Geoderma*, 74 (1997) 53-73
- **Skodvin, T. and Fuglestedt, J.S.:** A comprehensive approach to climate change: Political and Scientific considerations, *Ambio*, 351-358, vol. 26, no.6, 1997, 351-358
- **Torvanger, A.:** Uncertain Climate Change in an Intergenerational Planning Model, *Environmental and Resource Economics*, Vol. 9, No. 1, pp. 103-124

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- **Kasa, S.:** Brazil and climate change, i G. Fermann: *International Politics of Climate Change*, Scandinavian UP
- **Kasa, S.:** U-landene i det globale drivhuset, akseptert artikkel til Svarstad/Benjaminsen: *Lærebok i miljø og utvikling*
- **Ringius, L. og Søfting, G.B.:** Norsk gjennomføring av Klima-konvensjonen, Lafferty, W.M., Langhelle, O.S., Mugaas, P. og Holmboe Ruge, M. (red.): *Monitor 21 - Fra Rio til New York* (Norway's Implementation of the Climate Change Convention), Tano Aschehoug, June
- **Torvanger, A.:** Choosing an Efficient Climate Policy, in Gunnar Fermann (ed.), *The Politics of Climate Change*, Scandinavian University Press, Oslo
- **Underdal, A.:** Mellom akademi og bedrift. I Tom Christensen og Knut Midgaard (red.), *Universitetet som beslutningsarena*. Oslo: Fagbokforlaget, 1997
- **Aaheim, A.:** Norway: North Sea Oil, Resource Rents, and Long-Term Policies, in H. Aage: *Environmental Transition in Nordic and Baltic Countries*, Edward Elgar, Cheltenham, 1997

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- **Alfsen, K. H. og B. Holtmark:** Klimaforhandlingene og norske posisjoner, *ProSus* 3/97
- **Alfsen, K.H., Ringius, L. and Torvanger, A.:** Climate Change Negotiations: Burden Sharing and Cost-Effective Implementation Mechanisms and Protocols, Conference Summary, TemaNord 1997: 562, Copenhagen: Nordic Council of Ministers, 1997
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- **Bretteville, C.:** Emission Regulation with Private Information about Abatement costs - a Principal-Agent Problem in Three Levels. Hovedoppgave, Sosialøkonomisk institutt, UiO
- **Callaway, J.M., Næss, L.O. and Ringius, L.:** Adaptation Costs: A Framework and Methods. Ch. 5 in: *Mitigation and Adaptation Cost Assessment: Concepts, Methods and Appropriate Use*. IPCC

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- **Hagem, C.:** Klimaforhandling og kostnads-effektivitet, *Sosialøkonomen* 8/97, s. 26-32
- **Isaksen, I.S.A.:** Drivhusgassene og klimaendringer, s.121-133. *Natur, samfunn og miljø* 3. Ressurs-problemer. Miljøproblemer. Universitetsforlaget, 1997.
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- **Isaksen, I.S.A., Jonson, J.E. and Berntsen, T.K.:** Tropospheric Ozone in the Regional and Sub-regional Context. Editor: Øystein Hov, NILU. Vol. 6, Chapter 12. *Modelling studies* p. 455-461
- **Kasa, S.:** Political and social barriers to environmental reform of forest concession management in Indonesia, innsendt bidrag til prosjektrapport: *World Forests and Society* - UNU Press

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- **Kley, D., Beck, J., Greenfelt, P., Hov, Ø., Isaksen, I.S.A. and Penkett, S.A.:** Tropospheric ozone research. Tropospheric Ozone in the Regional and Sub-regional Context. Editor: Øystein Hov, NILU. Vol. 6, Transport and Chemical Transformation of Pollutants in the Troposphere
- **Næss, L.O.:** Reforestation of Imperata grasslands in Indonesia as an option for mitigation of climate change. Forthcoming in: *Proceedings from A Course on Climate Change Impact on Agriculture and Forestry*, Italy, 16.-23. mars 1996. European Commission.
- **Næss, L.O og Jan S. Fuglestedt:** Strid om klimaendringer, *Teknisk Ukeblad* nr. 43
- **Seip, H.M. and Larssen, T.:** Vegetation damage assessment. Background information for "kick-off" seminar for Air Quality Management and Planning System for Guangzhou, Report, Kjemisk institutt, University of Oslo
- **Seip, H.M.:** Environmental impact of Chemicals: Assessment and control. By M.D. Quint, D. Taylor and R. Purchase (red.), *The Royal Soc. of Chemistry*, Cambridge, UK. Kjemisk nr. 3 1997 (book review)
- **Søfting, G.B.:** Medredaktør for konferanserapporten som Norges Forskningsråd utga i etterkant av den internasjonale forskerkonferansen The Brundtland Commission's Report - 10 years
- **Underdal, A.:** Studiet av internasjonal politikk. *Norsk statsvitenskapelig tidsskrift*, 13 (1997):3, s. 299-324

• **Aaheim, A.:** Uncertainty and Decision Making in Climate Policy", in *Proceedings of the Joint CICERO/IEA-ETSAP seminar: Models for Analyzing Energy Development and GHG Emission Reduction Strategies*

## Papers and Posters

- **Alfsen, K. H.:** Possible criteria for differentiated commitments, Conference on Climate Change Negotiations, Oslo (22.-23.05)
- **Flatlandsmo, T. and Isaksen, I.S.A.:** Methane and the  $d^{13}C$ -relationship. Poster presentation at Summer School Clermont Ferrand, Riom, France (21.-31.07)
- **Holtmark, B.:** Climate agreements, fossil fuel taxation, and the distribution of costs across countries, IAEEs 20. årlige forskerkonferanse, Delhi (January)
- **Holtmark, B.:** Climate Agreements, Fossil Fuel

Markets and the Distribution of Costs. In *Proceedings from Joint Seminar CICERO Climate Forum and IEA-ETSAP* (30.05)

- **Karlsdottir, S. and Isaksen, I.S.A.:** Effects of increased moisture and temperature on the tropospheric chemistry; a 3-D model study. Poster presentation at Summer School Clermont Ferrand, Riom, France (21.-31.07)
- **Kasa, S. and Mjøset, L.:** Environmental problems and the international division of labour. 19.th Nordic Congress of Sociology, Copenhagen (13.-15.06)
- **O'Brien, K.:** Globalization and Climate Change. SEPMA Ph.D. Course, The Norwegian School of Management, Sandvika (17.-19.10)
- **O'Brien, K.:** The Tropical-Forest - Climate Connection: Comparing Model Projections to Local Realities in Chiapas, Mexico. Aspen Global Change Institute's 1997 Summer Science Session: Session I: Scaling from Site-Specific Observations to Global Model Grids (17.07)

• **O'Brien, K.:** The State of the North American Environment: Integrating the Human Dimensions. 1997 Open Meeting of the Human Dimensions of Global Environmental Change Research Community, IIASA; Laxenberg, Austria (12.-14.06)

• **O'Brien, K.:** Understanding Deforestation in the Selva Lacandona of Chiapas: A Geographical Approach. 1997 Meeting of the Latin American Studies Association, Guadalajara, Mexico (April)

• **O'Brien, K.:** Deforestation and Climate Change: What Does the Record Reveal? 1997 Association of American Geographers Annual Meeting, Fort Worth, TX (April)

• **Underdal, A.:** Institutional dimensions of global environmental change (med Oran R. Young), IPISA verdenskongress, Seoul, (17.-21.08)

• **Underdal, A.:** Patterns of Effectiveness: Examining Evidence from 13 International Regimes, at the 38<sup>th</sup> Annual Convention of the International Studies Association, Toronto (March)

## Presentations

- **Alfsen, K.H.:** The UK Government and other EU member States' experience with developing satellite accounts: What are the strengths and weaknesses of this approach?, *New Indicators of Economic Success*, Regent's College, London (09.07)
- **Alfsen, K.H.:** Annex-I costs of mitigating Annex-I CO<sub>2</sub> emissions, Discussant on session on Economic Impacts of Mitigation Actions on Annex I Countries, IPCC Workshop on the Economic Impacts of Annex I Actions on All Countries, held in Oslo (18.-20.8)
- **Alfsen, K.H.:** Scenarier for bærekraftig energi i Norge, Nasjonal konferanse om Energi for et bærekraftig samfunn, arrangert av Norges Forskningsråd på Voksenåsen hotell (18.-19.06)
- **Alfsen, K.H.:** Hva kan vi vente av Kyoto-forhandlingene?, Aktuelle økonomiske problemstillinger, Sosialøkonomisk institutt, Universitetet i Oslo (05.11)
- **Alfsen, K.H.:** Hva kan vi vente av Kyoto? Energiutvalget, Voksenåsen (04.12)
- **Gan, L.:** Research conference Society, Environment, and Sustainability - The Nordic Perspective, Oslo. Presentation: International Environmental Aid and National Capacity Building: Implementing Agenda 21 in China (25.-27.08)
- **Gan, L.:** The 1997 Symposium for Young Scientists on Strategies for Sustainable

Development, held in Beijing, China. Presentation: Energy Development and the Environment in China (22.-24.07)

- **Holtmark, B.:** Innledning til diskusjon i Norsk Hydros utvalg for miljø og sikkerhet omkring status i klimaforhandlingene (06.03)
- **Isaksen, I.S.A.:** Aircraft impact on upper tropospheric/outer stratospheric ozone: 3-D CTM model studies and intercomparisons, Irvine, USA (15.01)
- **Isaksen, I.S.A.:** Aircraft impact on upper tropospheric/outer stratospheric ozone: 3-D CTM model studies and intercomparisons, NY, USA (22.01)
- **Isaksen, I.S.A.:** Måling av kjemiske komponenter for satelitt i atmosfæren, Romsenteret, Smestad (28.01)
- **Isaksen, I.S.A.:** Oversiktsforedrag over IGAC, IGAC-møte, Høvik (13.02)
- **Isaksen, I.S.A.:** Flyutslipp, resultater for AERO-CHEM, San Diego, USA (26.02)
- **Isaksen, I.S.A.:** Påskebrun med bismak. Hva skjer med ozonlaget i nord? Norsk Kjemisk Selskap, NTNU, Trondheim (18.03)
- **Isaksen, I.S.A.:** Modelling Arctic Stratospheric Ozone, NILU-seminar, Lillestrøm (10.04)
- **Isaksen, I.S.A.:** The role of N<sub>2</sub>O in the atmosphere, International Workshop on N from Human N-Cycle, and its Role in Present and Future N<sub>2</sub>O Emissions to the Atmosphere, NLH, Ås
- **Isaksen, I.S.A.:** Påskebrun med bismak. Hva skjer med ozonlaget i nord? 3M, Skjetten (19.06)
- **Isaksen, I.S.A.:** Quantification at global scale (CTM), Summer School Clermont Ferraud, Riom, France
- **Isaksen, I.S.A.:** Interaction between chemistry and climate, Summer School Clermont Ferraud, Riom, France
- **Isaksen, I.S.A.:** Impact of aircraft-emissions on the troposphere, Summer School Clermont Ferraud, Riom, France
- **Isaksen, I.S.A.:** Drivhuseffekten – sannhet og myter, Røa Rotary, Røa
- **Isaksen, I.S.A.:** Impact of aircraft-emissions, University of Cambridge, England
- **Isaksen, I.S.A.:** Klimaendringer, idédugnad med næringslivet og politikere, Fridtjof Nansen Institutt, Oslo
- **Kaasa, S.:** Innledning om Globale miljøproblemer og miljøhistorie til nystartet nettverk for miljøsosologi (05.04.)
- **Ringius, L.:** SEPMA annual meeting on Climate Change, Industrial Development and Transformation. The Norwegian School of Management, Sandvika, Norway. Seminar title: Climate Change and Societal Response – Are the Target Reductions Going to be Met? (17.-19.10)
- **Ringius, L.:** Conference: Society, Environment and Sustainability – The Nordic Perspective. Clarion Royal Christiania Hotel, Oslo. Workshop Leader. International Agreements and National Environmental Politics (25.-27.08)
- **Ringius, L.:** NORFA PhD Course International Environmental Cooperation in Theory and Practice - Concepts, Research Methodologies and Case Studies. Linköping, Sweden. Seminar title: National policies and regime functions (19.06)
- **Ringius, L.:** RISØ/UNEP: IPCC Workshop on Mitigation and Adaptation Cost Assessment: Concepts, Methods and Appropriate Use, Risø National Laboratory, Roskilde, Denmark.

Presentation title: Experiences with guidelines for adaptation assessment (18.06)

- **Seip, H.M.:** Miljøkjemisk vintermøte, Geilo: Invitert foredrag: Globale-, regionale- og lokale forensninger: Hvordan kan tiltak mot utslipp baseres på en helhetsvurdering? (Februar)
- **Torvanger, A.:** AGBM-forhandlingene og Kyoto-protokollen ved presseseminar arrangert av CICERO (20.11)
- **Torvanger, A.:** Innlegg om Will the Norwegian negotiating strategy succeed? på Klimaforum (14.11)
- **Torvanger, A.:** The climate protocol negotiations – Status and outlook ved Seminar i miljøøkonomi, Holbæk, Danmark (23.-24.10)
- **Torvanger, A.:** Energy and economics og Economic approaches to CO<sub>2</sub> abatement ved sommarskulekurset Energy planning and sustainable development, Universitetet i Oslo (09.07)
- **Torvanger, A.:** Forskningsprosjekt om frivillige avtaler som miljøpolitisk verkemiddel ved NFR/SAMRAM forskarseminar, Oslo (24.04)
- **Torvanger, A.:** Klimaforhandlingene - Store utfordringer for Norge framover, CICERO Klimaforum, Oslo (13.03)
- **Torvanger, A.:** Sjette forhandlingsmøte i Ad Hoc group on the Berlin Mandate i Bonn (03.-07.03)
- **Torvanger, A.:** Føreling om Finst det ei rettferdig byrdefordeling i internasjonal klimapolitikk?, fagleg-pedagogisk dag, Universitetet i Oslo (03.01)
- **Aaheim, A.:** Forelesning om miljø-økonomi, Kjemisk institutt, Universitetet i Oslo (06.05)

## Newspaper and Magazine Articles

- **Alfsen, K.H. og Næss, L.O.:** Drivhusteorien har ikke fått nådestøtet. Adresseavisen (04.06)
- **Hagem, C. og B. Holtmark:** Å handle med utslippskvoter, Dagens Næringsliv (01.12)
- **Holtmark, B.:** Nøytrale konsekvensanalyser, Natur & Miljø Bulletin nr. 9
- **Kasa, S. og Næss, L.O.:** Hvem har skylden for brannene?, Dagbladet (09.10)
- **Næss, L.O. og Fuglestedt, J.S.:** CO<sub>2</sub>: «Livets gass», men ikke uproblematisk. Stavanger Aftenblad (14.04)
- **Næss, L.O. og Fuglestedt, J.S.:** CO<sub>2</sub> og viktige nyanser i klimadebatten. Stavanger Aftenblad (23.05)
- **Næss, L.O. og Fuglestedt, J.S.:** CO<sub>2</sub> og klima - hva vet vi? Aftenposten (10.11.)
- **Næss, L.O. og Fuglestedt, J.S.:** Menneskeskapt klimaendringer eller ei? Teknisk Ukeblad (20.11.)
- **Næss, L.O. og Fuglestedt, J.S.:** Enten eller i drivhuset. Bergens Tidende (November)
- **Næss, L.O.:** Afrika kan bli taperen. Verdens Natur, 3/97, s. 28-29
- **Ringius, L.:** Norges klimadilemma, Dagens Næringsliv (20.10)
- **Ringius, L.:** Bøter og straff – eller råd og hjelp?, Natur & Miljø Bulletin Tema 3-97
- **Seip, H.M. og Fuglestedt, J.S.:** Dårlig klima for saklig debatt. Norsk Oljerevy, nr. 2/97, s. 34-36
- **Aaheim, A.:** Full gass i klimaforhandlingene?, Dagsavisen Arbeiderbladet (October)

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## CICERO Publications

### Books

- **CICERO Book 1998:1 Dahle, Øystein:** *Energi for fremtiden - Rapport fra konferansen 7.-8.05.98 [Energy for the future: Report from the conference 7-8 May 1998]*

### Policy Notes

- **CICERO Policy Note 1998:6 Aaheim, Asbjørn H., Kristin Aunan and Hans Martin Seip:** *Kostnader ved miljø- og helseskader ved luftforurensninger: Vurdering av skadefunksjonsmetoden opp mot metoder basert på uttrykte preferanser*
- **CICERO Policy Note 1998:5 Torvanger, Asbjørn:** *The state of the Kyoto Protocol negotiations: After the fourth UNFCCC Conference of the Parties (COP4) in Buenos Aires 2-13 November 1998*
- **CICERO Policy Note 1998:4 Gerhardsen, Marte:** *Who governs the environmental policy in the EU? A study of the process towards a common climate target*
- **CICERO Policy Note 1998:3 Alfsen, Knut H. and Tora Skodvin:** *The Intergovernmental Panel on Climate Change and scientific consensus: How scientists come to say what they say about climate change*
- **CICERO Policy Note 1998:2 Godal, Odd:** *Metallindustrien i Norge: Økonomi, sysselsetting og utslipp av klimagasser*
- **CICERO Policy Note 1998:1 Alfsen, Knut H.:** *Framtidige krav til klimagassutslipp: Mulige langsiktige utslippsforpliktelser for Norge*

### Reports

- **CICERO Report 1998:4 Holtmark, Bjart and Knut H. Alfsen:** *Coordination of flexible instruments in climate policy*
- **CICERO Report 1998:3 Gan, Lin, Lars Otto Næss, Sjur Kasa and Karen L. O'Brien:** *Reforestation and climate change mitigation: A background study for joint implementation in China and Indonesia*
- **CICERO Report 1998:2 Ringius, Lasse, Lars Otto Næss and Asbjørn Torvanger:** *Muligheter og betingelser for felles gjennomføring etter Kyoto*
- **CICERO Report 1998:1 Holtmark, Bjart and Cathrine Hagem:** *Emission Trading under the Kyoto Protocol*

### Working Papers

- **CICERO Working Paper 1998:14 Aaheim, H. Asbjørn:** *An economic approach to the analysis of country interests and positions in climate negotiations*
- **CICERO Working Paper 1998:13 Aunan, Kristin:** *Reduced damage to health and environment from energy saving: A methodology for integrated assessment applied to a case study in Hungary*
- **CICERO Working Paper 1998:12 Holtmark, Bjart J.:** *Nasjonal klimapolitikk i lys av Kyoto-protokollen*

- CICERO Working Paper 1998:11 Alfsen, Knut H., Jan S. Fuglestedt and Tora Skodvin: *Climate change: Some elements from the scientific background and the scientific process*
- CICERO Working Paper 1998:10 Hagem, Cathrine: *Climate policy, asymmetric information and firm survival*
- CICERO Working Paper 1998:9 Holtmark, Bjart: *From the Kyoto Protocol to the fossil fuel market: A model analysis*
- CICERO Working Paper 1998:8 Godal, Odd and Bjart Holtmark: *Distribution of emission costs under different regulation schemes in Norway*
- CICERO Working Paper 1998:7 Gan, Lin: *Wind energy development and dissemination in China: Prospects and constraints in an institutional context*
- CICERO Working Paper 1998:6 Ringius, Lasse, Asbjørn Torvanger and Bjart Holtmark: *Can multi-criteria rules fairly distribute climate burdens? OECD results from three burden sharing rules*
- CICERO Working Paper 1998:5 Berntsen, Terje and Ivar S.A. Isaksen: *NOx Emissions from Aircraft: Effects of lightning and convection on changes in tropospheric ozone*
- CICERO Working Paper 1998:4 Gan, Lin: *Implementing China's Agenda 21: From national strategy to local actions*
- CICERO Working Paper 1998:3 Gan, Lin: *Energy development and environmental NGOs: The Asian perspective*
- CICERO Working Paper 1998:2 Alfsen, Knut H., Bjart Holtmark and Asbjørn Torvanger: *Kjøp og salg av klimagasskvoter: Noen mulige konsekvenser av Kyoto-protokollen*
- CICERO Working Paper 1998:1 Alfsen, Knut H.: *Kyoto-avtalen: Hva kan Norge gjøre?*

## External publications

### Publications w/referee

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- Brassieur, P.G., R.A. Cox, D. Hauglustaine, **I.S.A. Isaksen**, J. Lelieveld, D.H. Lister, R. Sausen, U. Schumann, A. Wahner and P. Wiesen: "European scientific assessment of the atmospheric effects of aircraft emissions". *Atmospheric Environment*, 1998, 32, No. 13, 2329-2418.
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- **Hagem, C.** and H. Westskog: "The design of a dynamic tradeable quota system under market imperfections." *Journal of Environmental Economics and Management*, 1998, Vol. 36, No.1.
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- Larssen, T., X. Xiong, R. Vogt, **H.M. Seip**, B. Liao and D. Zhao: "Studies of soils, soil water and stream water at a small catchment near Guiyang, China." In *Water Air Soil Pollution*, 1998, 101, 137-162.
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- **Fuglestedt, J.S.**: contributing author of "Climate effects of ozone and halocarbons" in Chapter 10 of the 1998 WMO/UNEP scientific assessment of the ozone layer.
- **Gan, L.**: "Energy Conservation and GHG Emissions Reduction in China: The World Bank and UNDP Operation," in Terry Cannon (ed.) 1999. China: *Economic growth, population and the environment*, Macmillan Press Ltd (forthcoming).
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## Papers and posters

- **Alfsen, K.H.:** «IPCC: How scientists come to say what they say about climate change». ExPo' 98, Lisboa, Portugal, 22 July 1998.
- **Gan, L.:** "Implementing China's Agenda 21: From national strategy to local actions." Research conference *Society, environment and sustainability: The Nordic perspective*, 25-27 August 1997, Oslo, Norway.
- **Gan, L.:** "Wind energy development in China: Prospects and constraints in an institutional context." International Energy Workshop, Stanford University, USA, 17-19 June 1998.
- **Hagem, C.:** "The value of information and the design of a climate contract under asymmetric information both before and after the contract is signed". World Congress of Environmental and Resource Economists, June 1998.
- **Holtmark, B.J.:** "From the Kyoto Protocol to the fossil fuel markets." OECD-workshop on economic modeling in connection with the climate issue, September 1998.
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# CICERO Senter for klimaforskning

## Styrets beretning 1999

### Innledning

CICERO Senter for klimaforskning ble opprettet ved Kongelig resolusjon av 27. april 1990. Stiftelsens oppgave er å drive forskning, utredning, rådgivning og informasjon om klimarelaterte globale miljøspørsmål og internasjonal klimapolitikk med sikte på å framskaffe kunnskap som kan bidra til å løse det menneskeskapte klimaproblemet og å styrke det internasjonale klimasamarbeidet.

### Kort om 1999

1999 var et år preget av meget høy aktivitet ved CICERO og god tilgang på oppdrag. Det ble arbeidet intenst med problemstillinger knyttet til kvoteutvalg både i Norge og Sverige. Et samarbeidsprosjekt med Oxford Institute for Energy Studies om mulig utvikling i oljemarkedene under ulike klimaregimer fram mot 2020 fikk bred internasjonal presentasjon, blant annet under klimakonferansen i Bonn høsten 1999. CICERO deltok også aktivt i arbeidet med tredje hovedrapport og spesialrapport om utslipp fra fly fra FN's klimapanel (IPCC) gjennom året. For øvrig var det bred innsats på en lang rekke forskningsprosjekter finansiert av Norges forskningsråd (NFR) og utenlandske institusjoner. CICERO var også i 1999 representert i en lang rekke komiteer og utvalg, blant dem komiteer som drøfter strategier for videre energi- og klimaforskning i Norge.

Fjoråret var også det første hele året med en ny, todelte programorganisering internt i CICERO. Erfaringene så langt har vært gode, men det gjenstår fremdeles utfordringer i å bedre kommunikasjonen på tvers av programmene. Det ble avlagt to doktorgrader i 1999.

Omfanget av CICEROs informasjonsvirksomhet økte også i 1999, særlig gjennom etableringen av en samarbeidsavtale med forskningsprosjektet RegClim. Avtalen sikrer RegClim adgang til å publisere egne sider i *Cicerone* med populærvitenskapelig stoff. Både RegClim og CICERO er godt fornøyd med hvordan ordningen har virket i 1999 og forlenger samarbeidet inn i 2000. Styret er ellers av den oppfatning at senteret ivaretar sitt informasjonsmandat på en god måte.

Det ble i 1999 arbeidet med å kartlegge mulige problemer i forbindelse med overgangen til år 2000. Overgangen gikk greit.

### Bemanning

I løpet av 1999 var 33 personer knyttet til senteret (i 1998 31 personer). Av disse var 31 ansatt (i 1998 28), tilsvarende 22,4 årsverk (i 1998 22,3). Antall forskerårsverk var 17,1 (i 1998 17,6). Ved utgangen av 1999 hadde senteret 27 ansatte (i 1998 26). CICERO hadde en til to sivilarbeiderstillinger i 1999. Denne ordningen opphører i 2000.

5 personer hadde fødsels- eller pappa- permisjon i 1999, til sammen 1,2 årsverk.

I 1999 ble det utbetalt kr. 161.250 i samlet godtgjørelse til medlemmer og varermedlemmer av CICEROs styre og totalt kr. 530.697 i lønn og godtgjørelse til direktør.

### Økonomiske nøkkeltall

Regnskapet for 1999 er gjort opp med et overskudd på kr. 768.671. Egenkapitalen er ved utgangen av 1999 på kr. 8.586.316. Overskuddet i 1999 vil bli tilført driftsfondet, som etter tilførsel av årsresultat vil være på kr. 8.536.316.

Basisbevilgningens andel av samlede inntekter utgjorde i 1999 30,7%. Tilsvarende tall for tidligere år var: 1993 (73%), 1994 (49%), 1995 (49%), 1996 (45%), 1997 (35%) og 1998 (33,8%). Driftsresultatet var i 1999 på kr. 299.646 (tilsvarende 1,86% av omsetningen), mens det i 1998 var på kr. 634.191.

Årsresultat og driftsresultat i 1999 er blant de beste siden senteret kom i normal drift. Det har vært en jevn tilgang på oppdrag. Noe av dette må kunne tilskrives den «høykonjunktur» for klimarelatert forskning og utredning man hadde i etterkant av Kyoto-konferansen i desember 1997 og diskusjonen om nasjonale virkemidler i klimapolitikken de etterfølgende år. Den økte oppdragsmengden i 1999 ble håndtert uten at man økte staben. Videre må det påpekes at CICERO har en relativt liten administrativ stab som i tillegg bidro med betydelige inntekter i 1999. De administrative kostnader vil øke framover pga. nye retningslinjer fra Justisdepartementet som slår fast at sivile vernepliktige ikke vil

kunne avgis til forskningspregede oppdrag.

1999 var det første året som ga mulighet for utbetaling av bonus til de ansatte. I beslutningen om størrelsen på bonus legger Styret stor vekt på at utbetalingen for 1999 inkluderer påskjønnelse for de foregående årene da det også var stort omfang av ubetalt overtidsarbeid og gode resultater. Styret takker de ansatte for meget god innsats i de siste årene. Styret anser at forutsetningen om fortsatt drift er til stede, og har lagt dette til grunn ved utarbeidelsen av regnskapet.

Nøkkeltallene viser at CICERO har en god økonomi med god likviditet og soliditet. Likviditetsgraden er på 2,12 (i 1998 3,02) mens egenkapitalen ved inngangen til 2000 utgjorde 70,66% av gjeld og egenkapital (i 1999 77,17%).

Styret ser med tilfredshet på CICEROs evne til å tiltrekke seg oppdrag. Styret har derimot sett med bekymring på at basisbevilgningen stadig er blitt redusert i reelle termer og at dette skjer uten at det gis en faglig begrunnelse fra Norges forskningsråd. Den negative trenden har i det minste foreløpig stoppet opp og basisbevilgningen for 1999 og 2000 er i nominelle termer lik som for 1997.

Inntekter fra internasjonale oppdragsgivere utgjorde i 1999 16% av samlede inntekter (i 1998 15%). Fra nasjonale kilder utgjorde oppdragsinntekter fra ulike departementer 11% (i 1998 7%) og fra Norges forskningsråd 31% (i 1998 31%). Selv om det må anses som positivt at CICERO over årene har fått en økende andel finansiering fra Norges forskningsråd, bør man framover forsøke å konsolidere innsatsen om noe færre, men større prosjekter. Mange av de forskningsprogrammene i Norges forskningsråd hvor CICERO har fått finansiering, nærmer seg slutten av programperioden eller er avsluttet. Styret forventer blant annet av denne grunn at etterspørselen etter CICEROs tjenester i de kommende par år vil ligge noe under nivået i 1998 og 1999. Det knytter seg en del usikkerhet til hvordan finansieringen av de forskningsfeltene som programmene har dekket, vil bli framover. Styret mener at CICERO er godt og strategisk plassert med sikte på å få en sentral plass i oppfølgingsprogrammene.

## Forskning og publisering

CICERO reviderte i 1999 sin strategisk plan for i forbindelse med opprettelse av et nytt styre høsten 1999. I strategiplanen blir nå CICEROs visjon formulert slik:

- *CICERO skal være en institusjon der det utføres genuint tverrfaglig forskning av høy internasjonal faglig kvalitet på klimaproblemet og miljøaspekter relatert til dette.*

- *CICERO skal utvikle informasjonssiden slik at den tverrfaglige innsikten i problemområdene kommer raskt fram til politikere, forvaltning, næringsliv og øvrig publikum i en form og på tidspunkter som sikrer stor nytteverdi av denne informasjonen.*

Det blir i strategien også lagt vekt på synergieffekter mellom informasjons- og forskningsaktiviteten ved senteret.

Strategien og instituttprogrammet bygger opp under arbeidet med å etablere en skarpere faglig profil ved CICERO ved utvikling av formaliserte modellelementer. Modellrammen fungerer som et felles referansesystem for aktiviteten ved senteret og sikrer en tilstrekkelig fokusering av den faglige aktiviteten slik at senterets begrensede ressurser utnyttes best mulig i forsknings- og informasjonsvirksomheten. Dette er med på å sikre den langsiktig utvikling av senteret. Det strategiske instituttprogrammet (SIP) ved CICERO brukes aktivt til å realisere de strategiske mål ved senteret.

I 1998 ble en relativt enkel klimamodell etablert innenfor rammen av SIP. Modellen har i 1999 blitt anvendt til flere praktiske analyser og har avstedkommet flere internasjonale artikler i tillegg til et stort antall CICERO-publikasjoner. Modellen vil bli benyttet i et større EU-finansiert prosjekt (METRIC) i årene framover. SIP-arbeidet med klimamodellen må derfor sies å ha vært vellykket så langt. På den samfunnsvitenskapelige siden av SIP-arbeidet har framdriften vært mindre. Årsakene til dette er flere, men et viktig forhold har vært at nøkkelpersonell har blitt opptatt med en høyt prioritert, men uprogrammert, aktivitet i forbindelse med samarbeidsprosjektet med Oxford Institute for Energy Studies. Dette har resultert i en omlegging for neste år der vi foruten fortsatt innsats på den naturvitenskapelige siden, legger innsats i å integrere en modell for klimaforhandlingene med den naturvitenskapelige modulen. Den langsikte målsettingen med SIP-arbeidet ligger fast og endringene i planlagt framdrift er således kun en endring i rekkefølgen av utviklingsoppgaver.

Det ble i 1998 også etablert en modell for analyser av det internasjonale kvotemarkedet som forventes å bli etablert dersom/når Kyoto-protokollen trer i kraft.

Modellen er i 1999 benyttet i en rekke analyser blant annet på oppdrag for Kvoteutvalget. Utvikling av kvotehandels-systemer ble også studert analytisk for å belyse betydningen av ulike måter å tildele kvoter på når en tar hensyn til imperfeksjoner i markedet. Endelig ble samvirke mellom ulike nasjonale og internasjonale markedsmekanismer i klimapolitikken belyst.

Også i 1999 har CICERO vært aktivt med i aktiviteter tilknyttet FNs Klimapanel (IPCC). Etter at studien av flytrafikkens betydning for klima er ferdig, konsentreres nå innsatsen om den tredje hovedrapporteringen (Third assessment report – TAR).

Arbeidet med å kvantifisere ulike sosiale kostnader knyttet til klimapolitikk i u-land har også blitt videreført gjennom analyser av vegetasjons-, helse- og materialskader som følge av bruk av fossile brenslere. Studien inngår i et samarbeidsprosjekt med andre norske forskningsinstitusjoner som ser på mulige klimatiltak i en provins i Kina. Samarbeidet er i 1999 utvidet til også å gjelde Center for International Studies ved MIT.

CICERO har i løpet av 1999 deltatt i en rekke sentrale nasjonale og internasjonale prosesser knyttet an til klimaproblemet, og styret registrerer med tilfredshet at bruken av CICERO som et sentralt kompetansesenter innen klimaforskning er økende. Foruten IPCC, forskningsråd og departementer er det gledelig å konstatere etter spørsmål etter senterets tjenester også fra næringslivet.

Det var en oppgang i interne publikasjoner i 1999 i forhold til foregående år. Også ekstern publisering har økt, og senteret har nådd målet om å ha minst en publikasjon i et internasjonalt tidsskrift med referee-ordning per vitenskapelig ansatt. Styret merker seg at publiseringshyppigheten er noe ujevnt fordelt blant de ansatte. Det har videre vært en økning av populærvitenskapelig formidling gjennom foredrag, kronikker og ikke minst nyhetsbladet *Cicerone*.

## Informasjon og samfunnskontakt

Det har vært en markert økning i informasjonsvirksomheten ved CICERO i alle år siden 1997. Foruten at aktiviteter som nyhetsbrevet *Cicerone* og *Klimaforum* er blitt videreført, er senterets medarbeiderne hyppige deltakere i den offentlige debatten om klimaspørsmål og foredragsholdere i ulike fora. Antall oppslag på CICEROs nettsider har økt fra 36.609 i 1996, 57.121 i 1997, 154.690 i 1998 og til 256.682 i 1999. Styret merker seg med glede at CICERO benyttes som kompetansesenter av norske medier.

Senterets nyhetsbrev *Cicerone* utkom med seks numre i 1999, som var nyhetsbrevets åttende årgang. Sideantallet er økt fra foregående år, og inkluderte i

1999 også egne sider for forskningsprosjektet RegClim. *Cicerone* har et opplag på 3.000 og distribueres gratis til ca. 2.274 abonnenter. Hovedtyngden av abonnentene er å finne i departementer, direktorater, næringslivet, forskningsinstitusjoner og den videregående skole.

*Klimaforum* hadde tre møter i 1999 og var også medarrangør (med ECON) for to internasjonale kvoteseminarer. Forumet samler deltakelse fra næringsliv, myndigheter og forskning og har som formål å viderefremme kunnskap om utviklingen på klimaområdet og å skape en dialog om sentrale klimapolitiske emner mellom alle aktørene. Femten bedrifter og statlige institusjoner var medlemmer av forumet i 1999.

Samarbeidsutvalget for klimaforskning, der CICERO deltar, har gjennom arbeidet med sin andre årsrapport kommet fram til en anbefaling om at det bør satses midler på systematisk formidling fra norsk klimaforskning i en prøveperiode. CICERO vil stå sterkt som koordinator og utøvende institusjon av en slik oppgave om den blir realisert. Dette vil i så fall utgjøre en vesentlig utfordring for CICERO i kommende periode.

Foruten prosjekt- og informasjonsarbeid (inklusive foredragsvirksomhet, mediaopptredener og deltakelse i den allmenne debatt på andre vis) må samfunnskontakten til CICERO sies å ha vært god også i 1999. Således var senteret representert i en rekke styrever og andre organer i Norges forskningsråd (KLIMATEK, NORMIL-2000, SAMRAM, Energiforum, Samordningsutvalget for klimaforskning, Strategiutvalget for energiforskning). Av andre sentrale offentlige utvalg hvor CICERO har vært (og er) representert vil vi nevne de norske og svenske kvoteutvalgene, MILJØSOKs samarbeidsforum, arbeidsgruppen som ser på nye og fleksible virkemidler i miljøpolitikken, også under MILJØSOK, samt Statoils Miljøforum. CICERO har også deltatt i kåringen av vinner av prisen for fremragende bruk av forskning.

Internasjonalt har CICERO deltatt aktivt i IPCC-prosessen og vært representert i blant annet styringsgruppen til European Science Foundations TERM II program og European Environment Agency's Scientific Committee. CICERO har også deltatt i internasjonale evalueringsgrupper, blant annet for andre lands forskningsråd.

Utover dette har CICERO i 1999 deltatt i en rekke konferansekomiteer (f.eks. ENS '99, Den nasjonale klimaforskningskonferansen, m.v.). CICERO leverte også i 1999 en rekke bidrag til konferanser og arbeidsgruppemøter og deltok aktivt i forskerbedømmelser og sensurvirksomhet ved våre høyere undervisningsinstitusjoner.

## Forsknings samarbeid

CICEROs plassering ved Universitetet i Oslo og senterets nære samarbeid med relevante institutter er viktig på et felt hvor grunnforskning og anvendt forskning er meget tett knyttet til hverandre. Senterets tilknytning til Universitetet er strategisk viktig og av gjensidig nytte og verdi. Samarbeidet med Universitetet i Oslo er formalisert gjennom ramme-, drifts- og leieavtaler. Ved Universitetet i Oslo påtar CICERO seg så langt kapasiteten rekker oppgaver i forbindelse med undervisning og veiledning av hovedfagsstudenter i samarbeid med de aktuelle instituttene. CICERO ansatte i 1999 sin fjerde seniorforsker fra Universitetet i bistilling ved senteret. Senterets doktorgradsstipendiater deltar i den organiserte doktorgradsutdannelsen ved UiO. To av stipendiatene disputerte i 1999. CICERO har for tiden to doktorgradsstipendiater, begge på studieopphold i USA.

I Norge samarbeider CICERO med Universitetet i Oslo og dets institutter såvel som med andre forskningsmiljøer. Slik kan en trekke vekslers på hverandres internasjonale kontaktnett. Med utgangspunkt i Regjeringens og Stortingets intensjon for opprettelsen av CICERO, er det en spesi-

ell oppgave å bistå i den nasjonale koordinering på området klimapolitisk forskning i Norge. CICERO har således ansvaret for å koordinere forskningsprogrammet "Samfunnsmessige rammebetingelser og virkemidler for norsk miljø- og energipolitikk" (SAMRAM) i Norges forskningsråd, samt å bistå Forskningsrådets Samarbeidsutvalget for klimaforskning med sekretariatstjenester.

Gjennom særskilte midler som Norges forskningsråd har stilt til rådighet for samarbeidstiltak mellom de utenrikspolitiske institutter i Oslo-regionen, har CICERO i løpet av 1999 fortsatt samarbeidet med Fridtjof Nansens Institutt.

## Arbeidsmiljø

Generelt var arbeidsmiljøet ved CICERO bra. Sykefraværet i 1999 var på 2,9% (i 1998 3,1%). Det ble også i 1999 gjennomført en HMS-undersøkelse blant de ansatte. Undersøkelsen viste igjen relativt stor tilfredshet med det psykososiale arbeidsmiljø og med tekniske hjelpemidler. Derimot ble det fortsatt påpekt noen svakheter ved det fysiske arbeidsmiljø, særlig knyttet til inneløst og renhold.

Virksomheten forurenser ikke det ytre miljø. Det er ikke rapportert om skader el-

ler ulykker ved arbeidsplassen.

## Styret

Miljøverndepartementet oppnevnte medio februar 1997 styre for CICERO med funksjonstid fram til 20.02.99 med direktør Knut N. Kjær, Norges Bank, som styreleder. Etter anmodning fra CICERO ble perioden forlenget til 30.06.99, da nytt styre ble oppnevnt. Knut N. Kjær ble gjenoppnevnt som styreleder. Ut av styret gikk universitetsdirektør Tor Saglie og professor Asbjørn Rødseth som begge har vært med i styret siden tidlig på 1990-tallet. Tor Saglie har vært styrets nestleder siden 1991. Videre trådte styremedlemmene Hege Skjeie, Anne Therese Hestenes, og de ansattes representant H. Asbjørn Aaheim ut av styret. Nye medlemmer er professorene Jon Vislie fra Sosialøkonomisk institutt og Trond Iversen fra Institutt for geofysikk, samt fakultetsdirektør Tove Kristin Karlsen ved det Samfunnsvitenskapelige fakultetet, alle ved Universitetet i Oslo, og konsernsjef Øvind Lund fra ABB. Ny representant for de ansatte er forsker Tora Skodvin.

Styret hadde i 1999 fire møter, hvorav ett var kombinert med et faglig seminar med deler av CICEROs stab.

Oslo, 16. mars 2000



Knut N. Kjær  
Styrets leder



Tove Kristin Karlsen  
Nestleder



Inger Hanssen-Bauer



Trond Iversen



Jon Vislie



Bente Lise Dagenborg  
Varamedlem



Knut H. Alfsen  
Direktør



Øvind Lund



Tora Skodvin  
Ansattes representant



Eli Marie Åsen



Raino Malnes  
Varamedlem


# Resultatregnskap for CICERO 1999

<b>Driftsinntekter</b>	<b>Noter</b>	<b>1999</b>	<b>1998</b>
Prosjektinntekter	1	10 645 294	9 096 768
Basisbevilgning	2	5 451 000	4 650 000
Andre driftsinntekter		12 200	1 850
		<b>16 108 494</b>	<b>13 748 618</b>
<b>Driftskostnader</b>			
Innkjøp av FoU og andre underleveranser		2 615 284	1 805 436
Lønn og andre sosiale kostnader	3	9 322 841	7 699 658
Husleie		878 580	878 580
Reiser		677 849	1 026 130
Konferanser og møter		252 535	105 381
Andre driftskostnader		1 611 344	1 067 239
Avskrivninger, nedskrivninger	4	442 016	489 517
Tap på fordringer	5	8 400	42 486
		<b>15 808 848</b>	<b>13 114 427</b>
<b>Driftsresultat</b>		<b>299 646</b>	<b>634 191</b>
<b>Finansinntekter</b>			
Renteinntekter		461 019	465 326
Agio		21 399	35 403
		<b>482 417</b>	<b>500 729</b>
<b>Finanskostnader</b>			
Rentekostnader		1 079	3 718
Agio		12 313	21 388
		<b>13 392</b>	<b>25 106</b>
<b>Finansresultat</b>		<b>469 025</b>	<b>475 623</b>
<b>Årsresultat</b>		<b>768 671</b>	<b>1 109 813</b>
<b>Disponering av årets resultat</b>			
Overført til driftsfond		768 671	1 109 813

# Balanse for CICERO 1999 per 31.12.99

EIENDELER	Noter	1999	1998
Anleggsmidler			
Inventar og datautstyr	4	535 593	415 911
Statsobligasjoner	6	4 054 400	2 699 730
		<b>4 589 993</b>	<b>3 115 641</b>
<b>Omløpsmidler</b>			
Kundefordringer		466 816	1 361 730
Andre fordringer		4 775	12 487
Opptjent/ikke fakturert arbeid	7	3 189 831	1 651 226
Kontanter og bankinnskudd	8	3 898 477	3 944 410
		<b>7 559 899</b>	<b>6 969 854</b>
<b>Sum eiendeler</b>		<b>12 149 892</b>	<b>10 085 495</b>
<b>GJELD OG EGENKAPITAL</b>			
<b>Egenkapital</b>			
Innskutt egenkapital		50 000	50 000
Opptjent egenkapital		8 536 316	7 767 646
		<b>8 586 316</b>	<b>7 817 646</b>
<b>Gjeld</b>			
<b>Avsetninger for forpliktelser</b>			
Skyldig forskuddstrekk, arbeidsgiveravgift, pensjonsinnskudd, fagforeningskontingent, og feriepenger og annet pliktig trekk		1 515 917	1 243 888
<b>Kortsiktig gjeld</b>			
Forskuddsbetalte prosjektmidler		538 308	645 435
Leverandørgjeld		166 971	103 926
Annen gjeld	9	1 342 380	274 599
		<b>3 563 576</b>	<b>2 267 849</b>
<b>Sum gjeld og egenkapital</b>		<b>12 149 892</b>	<b>10 085 495</b>

Oslo, 16. mars 2000


Knut N. Kjær  
Styrets leder

  
Inger Hanssen-Bauer


  
Trond Iversen

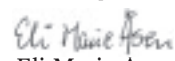

  
Jon Vislie


  
Bente Lise Dagenborg  
Varamedlem



  
Tove Kristin Karlsen  
Nestleder


  
Øivind Lund


  
Tora Skodvin  
Ansattes representant


  
Eli Marie Asen


  
Raino Malnes  
Varamedlem


  
Knut H. Alfsen  
Direktør

# Noter

## Note 1: Prosjektinntekter

CICEROs prosjekter mottok, foruten basisbevilgningen, finansiering fra følgende instanser:

	1999	1998
Forskningsrådet	31 %	31 %
Departementer	11 %	7 %
EU	6 %	6 %
Andre offentlige institusjoner	7 %	5 %
Næringsliv m.m	2 %	5 %
Nordisk Ministerråd	0 %	2 %
Organisasjoner/stiftelser	2 %	4 %
UNEP	1 %	4 %
Verdensbanken	5 %	2 %
Andre utenlandske oppdragsmidler	4 %	1 %
	69 %	67 %

## Note 2: Offentlige tilskudd

CICERO mottok i 1999 kr. 4 951 000,- i basisbevilgning fra Norges Forskningsråd, og kr. 500 000,- i bevilgning fra Miljøvern-departementet.

## Note 3: Lønn og andre sosiale kostnader

Posten består av lønnskostnader, feriepenger, styrehonorar, arbeidsgiveravgift, premie pensjonsordning, telefon og avis for ansatte, kantinekostnader, kompetansehevingstiltak, trygdekasserefusjoner og velferd. Lønn og andre honorarer til direktør har i 1999 vært kr. 530.697, og styregodtgjørelse utgjorde kr. 161.250.

## Note 4: Avskrivning, nedskrivning

	Datautstyr	Kontorutstyr	Inventar	Sum
Anskaffelseskostnad per 01.01.99	1 627 164	15 928	542 593	2 185 685
Årets investeringer	397 975	0	0	397 975
Avgang til anskaffelseskostnad	0	0	0	0
Akkumulerte avskrivninger per 31.12.99	1 511 996	10 618	525 454	2 048 068
Bokført verdi per 31.12.99	513 143	5 310	17 139	535 592
Årets avskrivninger	250 198	5 309	22 786	278 293
Avskrivningsmetode	Lineær avskrivning over 3 år			

Varige driftsmidler ble for 1998 avskrevet for hele år, uavhengig når på året driftsmiddelet ble anskaffet. For 1999 har driftsmidlene blitt avskrevet i samsvar med måneden kjøpet ble foretatt.

## Investering i varige driftsmidler de siste fem år (tidligere års anskaffelser ble kostnadsført i sin helhet).

År	Datautstyr	Kontorutstyr	Inventar	Sum
1994	407 655		311 463	719 118
1995	366 708	156 993	523 701	
1996	238 633	238 633		
1997	231 075		55 779	286 854
1998	382 637	15 928	18 359	416 924
1999	397 975			397 975
Sum	2 024 683	15 928	542 594	2 583 205

## Omløpsmidler

Omløpsmidlene ble vurdert til virkelig verdi og ikke høyere enn anskaffelseskost.

## Nedskrivning

Nedskrivning på obligasjoner på grunn av kursfall utgjør kr. 163 723.



**Note 5: Tap på fordringer**

Det er i regnskapet kostnadsført to tap som knytter fordringer hos leverandører fra tidligere år, pålydende kr. 8 400.

**Note 6: Statsobligasjoner**

Verdien på statsobligasjoner som ble kjøpt i 1999 er korrigert i henhold til kursen per 31.12.99.

**Note 7: Opptjent/ikke fakturert arbeid**

Posten består av direkte lønnskostnader ved den nedlagte arbeidsinnsats med tillegg av andel felleskostnader og direkte prosjektutlegg.

**Note 8: Kontanter og bankinnskudd**

Posten inkluderer en bankkonto i USD som står oppført i balansen med kurs per 31.12.99. Regnskapsposter i utenlandsk valuta i løpet av året er inntekts- og kostnadsført til periodens kurs.

**Note 9: Annen gjeld**

Denne posten består av avsetning for påløpte, ikke fakturerte kostnader per 31.12.99.

**Note 10: Antall ansatte**

Gjennomsnittlig antall ansatte har for 1999 vært 27.

**Note 11: Revisjon**

Regnskapet er i henhold til Regnskapsloven og blir revidert av Riksrevisjonen.

# Kontantstrømanalyse 1999

## Kontantstrøm fra operasjonelle aktiviteter

	1999	1998
Årets resultat	768 671	1 109 813
Gevinst v/salg av varige driftsmidler	-12 200	-1 850
Avskrivninger	278 293	312 666
Nedskrivninger	163 723	176 850
Økning i varelager	0	303 187
Reduksjon i kundefordringer	894 914	-1 127 575
Økning i leverandørgjeld	63 045	-298 468
Endring i andre tidsavgrensingsposter	-298 214	-440 015
<i>Netto kontantstrøm fra operasjonelle aktiviteter</i>	<b>1 858 234</b>	<b>34 608</b>

## Kontantstrøm fra investeringsaktiviteter

Utbetaling ved kjøp av varige driftsmidler	-397 975	-416 924
Innbetalinger ved salg av varige driftsmidler	12 200	1 850
Kjøp av statsobligasjoner	-1 518 393	
<i>Netto kontantstrøm fra investeringsaktiviteter</i>	<b>-1 904 168</b>	<b>-415 074</b>

## Netto endring i kontanter og kontantekvivalenter

Kontanter og kontantekvivalenter per 01.01.99	3 944 410	4 324 875
<i>Kontanter og kontantekvivalenter per 31.12.99</i>	<b>3 898 477</b>	<b>3 944 410</b>

# Revisjonsberetning for 1999

# R

Riksrevisjonen

Til styret i stiftelsen CICERO Senter for Klimaforskning

## REVISJONSBERETNING FOR 1999

Vi har revidert årsregnskapet for CICERO Senter for Klimaforskning for regnskapsåret 1999, som viser et overskudd på kr 768 671. Vi har også revidert opplysningene i årsberetningen om årsregnskapet, forutsetningen om fortsatt drift og forslaget til anvendelse av overskuddet. Årsregnskapet består av resultatregnskap, balanse, og noteopplysninger. Årsregnskapet og årsberetningen er avgitt av stiftelsens styre og direktør. Vår oppgave er å uttale oss om årsregnskapet og øvrige forhold i henhold til revisorlovens krav.

Vi har utført revisjonen i samsvar med revisorloven og god revisjonsskikk. God revisjonsskikk krever at vi planlegger og utfører revisjonen for å oppnå betryggende sikkerhet for at årsregnskapet ikke inneholder vesentlig feilinformasjon. Revisjon omfatter kontroll av utvalgte deler av materialet som underbygger informasjonen i årsregnskapet, vurdering av de benyttede regnskapsprinsipper og vesentlige regnskapsestimater, samt vurdering av innholdet i og presentasjonen av årsregnskapet. I den grad det følger av god revisjonsskikk, omfatter revisjon også en gjennomgåelse av stiftelsens formuesforvaltning og regnskaps- og intern kontroll-systemer. Vi mener at vår revisjon gir et forsvarlig grunnlag for vår uttalelse.

Vi mener at

- årsregnskapet er avgitt i samsvar med lov, forskrifter og stiftelsens formål og gir et uttrykk for stiftelsens økonomiske stilling 31. desember 1999 og for resultatet i regnskapsåret i overensstemmelse med god regnskapsskikk
- ledelsen har oppfylt sin plikt til å sørge for ordentlig og oversiktlig registrering og dokumentasjon av regnskapsopplysninger i samsvar med lov og god regnskapsskikk
- opplysningene i årsberetningen om årsregnskapet, forutsetningen om fortsatt drift og forslaget til anvendelse av overskuddet er konsistente med årsregnskapet og er i samsvar med lov og forskrifter.

Oslo, 13 april 2000  
Etter fullmakt

*Siv Janne Natvik*  
Siv Janne Natvik  
fung. avdelingsdirektør

*Veronica Brandt*  
Veronica Brandt  
hovedrevisor



## **CICERO**

Center for International Climate and Environmental Research - Oslo was established by the Norwegian government in April 1990 as a non-profit organization associated with the University of Oslo.

### **The Research Concentrates on:**

- International negotiations on climate agreements. The themes of the negotiations are distribution of costs and benefits, information and institutions.
- Global climate and regional environment effects in developing and industrialized countries. Integrated assessments include sustainable energy use and production, and optimal environmental and resource management.
- Indirect effects of emissions and feedback mechanisms in the climate system as a result of chemical processes in the atmosphere.

### **Contact details:**

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