INVESTING IN RESEARCH TO SOLVE TOMORROW’S ENVIRONMENTAL PROBLEMS
2008 has been an exciting year for Mistra: two major research programmes – Mistra-SWECIA and MistraPharma – have started, and a decision has been taken to fund one of the biggest ever – Future Forests. New blood has been brought to the Mistra Board, and with it fresh approaches and ideas. Within the Board, we have given much thought to Mistra’s role. A new strategy has been developed, underlining more clearly than before the need for partnerships between industry and research to translate new knowledge into practice.

From the outset, I have followed Mistra’s work with great interest, and I feel honoured to be entrusted now with the important responsibility of chairing its Board. The links between research, business, politics and society have always held a fascination for me, and the interaction between all these areas is crucial to the Foundation, forming the very basis for its activities. This emphasis on cooperation between different stakeholders, with widely differing areas of expertise, is unique to a research foundation like Mistra. The task demands a large measure of patience and energy, both of Mistra itself and the researchers we support, and of our user communities, who have called for more knowledge and whose job it will be to apply it in practice. In return, working in this way offers new angles and usable results. We will therefore continue to invest in large-scale interdisciplinary programmes which, working with decision makers, business people, public authorities and other partners, will help to generate new knowledge to prevent and solve major environmental problems.

Mistra currently has a whole series of interesting programmes under way. A key challenge this year will be to identify the new ideas that can blaze fresh paths for the barrier-breaking research the Foundation supports. In 2009, therefore, we will continue to look to the future.

Lena Treschow Torell
Chair of the Mistra Board
From a strategic environmental point of view, 2008 has been an eventful year: melting polar ice, prolonged drought followed by torrential rains in the northern and southern hemispheres, an abrupt economic downturn and much more besides. Many of these developments are linked to our planet’s resources and how we choose to use them, in the short or long term. They are dramatic, affecting many people. Many have been caught off guard. We humans have proved to be ill prepared for sudden economic and ecological changes.

We need to plan for the unknown. That requires not only good monitoring of current trends but, to an even greater degree, open-minded horizon scanning. In general, there is no shortage of ideas for research in our society. But quality-assured ideas – ideas that add something new, that break through existing barriers – are not as thick on the ground. And not all researchers can be given the time and resources it takes to achieve the highest quality. This is where Mistra can make a difference. As a foundation, we want to offer something extra: to invest in research ideas that will prevent environmental and societal problems and at the same time create new potential for development.

When does a research result assume its true value? Presumably, when discussion of the research begins, when the findings are scrutinized and reappraised, and above all when they are put to use and generate benefits for society. That is one of the cornerstones of the research Mistra supports. The other is that the research must be of the highest scientific quality, that is, it must be able to compare with work at the international cutting edge. These two basic concerns have guided us as we have sought this year to learn from earlier experience in order to map out the way ahead. We have arrived at a six-year strategy with three strategic goals in the areas of research, communication and asset management.

During 2008 Mistra has decided to invest in two new research initiatives: Future Forests and Politics, Policy and Regulation of Carbon Capture and Storage. We have also awarded continued funding for the programmes Sustainable Investments, PlantComMistra and Towards a Closed Steel Ecocycle. Very different fields of research, but all equally crucial to long-term sustainable development. In addition, we have agreed to fund six Idea Support projects, with a particular emphasis on bold, innovative thinking. Through the ProEnviro programme, the Foundation has supported small businesses’ efforts to develop environmental products and services. We have also awarded planning grants for Urban Futures. Here, three consortia are competing for funding, and a decision will be reached in 2009.

New calls for proposals are planned. New competitors are entering the starting blocks. But competition is not everything. Mistra needs those of you who are prepared to step out of the well-trodden paths of research and do the unexpected. To go beyond disciplinary and sectoral boundaries. Researchers, business people and administrators with knowledge, ideas and courage, who are ready to shoulder a long-term responsibility for society. Mistra will play its part by working with you and continuing to invest in sustainable development.

Ola Engelmark
Chief Executive
THIS IS MISTRA

The Swedish Foundation for Strategic Environmental Research – Mistra – supports research of strategic importance for a good living environment and sustainable development. It seeks to promote the development of strong research environments of the highest international class and of importance for Sweden’s future competitiveness. The research funded is intended to be of significance in finding solutions to major environmental problems and promoting the sustainable development of society. Opportunities to achieve industrial applications are to be pursued to the full.

• Mistra’s vision is to be a leading initiator of barrier-breaking research that prevents and solves significant environmental problems.

• Mistra invests in interdisciplinary research of the highest quality which, in collaboration with end-users, will contribute to preventing and solving such problems.

• Research initiated by Mistra should, among other things, promote more efficient energy use and transport, non-toxic, resource-saving environmental life cycles, sustainable production and consumption, and wise management of land, water and the built environment.

• To ensure that the results benefit society, all research, from the idea stage onwards, is developed in close collaboration with academia, the private sector, public agencies and NGOs.

• Mistra provides funding of some SEK 200 million a year, and currently supports around twenty major interdisciplinary research programmes, each extending over six to eight years, and in one or two cases even longer.

• Mistra’s assets are to be managed in a way that serves as a model of how investments can promote progress towards long-term sustainability in society and the private sector. This is achieved by Mistra managing its assets both profitably and increasingly sustainably, through research and a continuous exchange of ideas in the area of sustainable asset management.
Mistra aims to be a leading initiator of research that prevents and solves significant environmental problems. To achieve its goals, the Foundation applies an approach that includes continuous evaluations of both scientific quality and benefits for the environment.

**Mistra Has A Unique Mission**

Mistra has a unique mission, driven by a model that is constantly evolving. Every research programme it funds is expected to be interdisciplinary in design, to involve research of an internationally high scientific standard, and to produce results that find practical applications. Programmes must help to prevent or solve significant environmental problems, and the results are to be of importance for Sweden’s competitiveness.

To realize these aims, Mistra reviews its priorities annually and revises its strategy every six years. “The world around us is constantly changing, which means that we have to regularly reassess our priorities, to ensure that the research we initiate and support is always at the cutting edge,” says Ola Engelmark, the Foundation’s Chief Executive.

**Keeping A Step Ahead**

Mistra wishes to give a lead in the renewal of Sweden’s research and innovation system. It does so by independently developing and evaluating new ideas and, with them as a base, investing in work of the highest quality.

The first step towards a new research programme is to identify future challenges to sustainable development. The aim is to find solutions beyond today’s environmental problems. To be a step ahead. This is done partly by monitoring which environmental fields are being researched around the world – and which are not. When an idea has taken shape, a feasibility study is carried out, mapping out the nature and extent of the area of research, identifying potential partners and considering what role Mistra could play. If this study proves favourable and the Board gives the go-ahead, the Foundation then issues a call for proposals, inviting Swedish universities and research institutes to compete for funding.

**Highest Quality Science**

Mistra demands a great deal of the research programmes it supports. The environmental problems of the present and the future are complex, and one of the Foundation’s criteria is therefore that programmes must be interdisciplinary in design. Another is that the research must be of the highest scientific quality internationally. All Mistra-funded programmes are therefore evaluated several times over by international peer review panels, not least before they begin, prior to a new programme phase, and on completion.

The research Mistra finances is intended to produce results that will benefit various end-users, including companies, politicians and public autho-
It may for instance generate new, greener products or processes for commercial use, such as plant protection products or fuels. Or it may provide important knowledge for use in international climate negotiations, in developing climate models linked to economic development, or in identifying drug substances in the environment that pose significant risks to ecosystems. Some programmes therefore collaborate closely with industry, others with environmental coordinators working for local authorities or county administrative boards, and yet others with politicians at the local, regional, national or EU levels.

**COMMUNICATION AND DIALOGUE**

To ensure that programmes have a clear user perspective, every proposal also undergoes an evaluation of its value to users before a funding decision is taken.

From the planning stage on, and not least at the start-up of a Mistra programme, dialogue is encouraged in various ways between the researchers involved and the people who are intended to use the results. This helps both to make sure the work is relevant and to give the researchers a good basis for their studies. And that in turn leads to results that can be put to use.

Mistra aims to serve as a bridge between research and the rest of society, and since it was created it has recognized the need for a process that effectively links research and practice. Part of that link is provided by the boards of its programmes, which are made up of representatives of the user community, whether they be decision makers in the public or the private sector. As a research foundation, Mistra is active in communicating ideas, feasibility study findings and research results, as well as its strategy and its work in the area of sustainable asset management.

**RESEARCH THAT LIVES ON**

One of the reasons Mistra chooses to support the development of large-scale, broad-based programmes is that it wants to build research centres that become established and are able to live on after funding from the Foundation ends.

‘In this way, Mistra helps to ensure that the results of its research are put to use in the long term, both in practical applications and in further research,’ says Dr Engelmark. ‘Few funding bodies in Sweden today are ready to take on the challenge of creating really robust, dynamic research environments, and there we meet a need.’
ENVIRONMENTALLY DRIVEN BUSINESS DEVELOPMENT

MISTRA FUEL CELL PROGRAMME
PERSEA
PLANTCOM-MISTRA
PROENVIRO
CLOSED STEEL ECOCYCLE
HAGMARKSMISTRA
HEUREKA
MISTRA-SWECIA
CLIPORE
ENTWINED

KNOWLEDGE SUPPORT FOR RESOURCE MANAGEMENT AND POLICYMAKING

SOUNDCAPE SUPPORT TO HEALTH
STOCKHOLM RESILIENCE CENTRE
SUSTAINABLE INVESTMENTS
TRANSPORT-MISTRA
USEFUL RESULTS

The results of the research Mistra initiates are intended to be used. Either as a knowledge base for politicians and other decision makers, or in the form of environmentally sound products, processes or services.

Mistra initiates research which it believes will, among other things, help to promote more efficient energy use and transport, non-toxic, resource-saving environmental life cycles, sustainable production and consumption, and wise management of land, water and the built environment. In 2008 the Foundation funded twenty major research programmes. These can be divided into two groups, on the basis of how the results are intended to be used: for environmentally driven business development or as knowledge support for resource management and policymaking.

Below, the programmes are presented under these two headings.

Environmentally Driven Business Development

Many of the research programmes funded by Mistra have been concerned with developing new, environmentally sound products, processes or services – an area that spans everything from ideas to products and how those products can be sold on commercial markets. The Foundation supports a large number of programmes under the heading of Environmentally Driven Business Development. Apart from broad-based research programmes, they include ProEnviro, an initiative co-funded by Mistra and the Swedish Foundation for Strategic Research (SSF). ProEnviro’s aim is to promote innovative research ideas that will enable small and medium-sized enterprises to develop environmentally sounder products and become more competitive.

Programmes:

- Black Liquor Gasification
- DOM – Domestication of Microorganisms for Non-Conventional Applications
- E4 Mistra – Energy-Efficient Reduction of Exhaust Emissions from Vehicles
- Greenchem – Speciality Chemicals from Renewable Resources
- Marine Paint
- MASE – Microbial Activity for a Sound Environment
- The Mistra Fuel Cell Programme
- PERSEA – Plasma-Enhanced Reaction Systems for Environmental Applications
- PlantComMistra
- ProEnviro
- Towards a Closed Steel Ecocycle

Knowledge Support for Resource Management and Policymaking

International environmental negotiations and the management and use of natural resources are two highly complex areas. In the case of the former, many countries and interests are involved, and both political and economic factors have a part to play. Mistra research in this field is for example seeking to provide knowledge support for the global dialogue on climate, based on work in both the natural and the social sciences.

Several of Mistra’s research programmes focus on our use and management of natural resources – an area in which different interests often collide. Here, therefore, programmes have sought to bridge the gaps between interest groups and to start a dialogue – both to promote mutual understanding and to find common ground on how best to manage our natural resources.

Programmes:

- Clipore – Mistra’s Climate Policy Research Programme
- ENTWINED – Environment and Trade in a World of Interdependence
- Heureka – Environmental Decision Support Models for Forest Land
- MistraPharma
- Mistra-SWECIA – Mistra SWEdish research programme on Climate, Impacts and Adaptation
- Soundscape Support to Health
- Stockholm Resilience Centre
- Sustainable Investments
- TransportMistra
BLACK LIQUOR GASIFICATION

Challenge: Roughly half of all bioenergy in Sweden is to be found in black liquor, a valuable by-product of paper pulp manufacturing that is currently burnt in recovery boilers to generate steam for use at pulp mills. Gasification of this by-product would improve efficiency compared with existing boilers, as well as making possible cost-effective production of vehicle fuels or electricity.

Benefits: A commercialized process would add significantly to the supply of renewable energy. The programme aims to speed progress towards that goal by addressing key scientific issues and problems currently standing in the way of large-scale gasification of black liquor.

Users: Beneficiaries range from the forest industry, which could become a supplier of transport fuels or electricity, to energy consumers, who will gain access to green electricity and fuels. For society as a whole, there will be the benefit of reduced dependence on energy from abroad.

Duration: 2004–2009

Mistra Funding: SEK 43 million

Website: www.etcpitea.se/blg

DOM

Challenge: Microorganisms now offer answers to a range of environmental problems: they can be used, for example, as substitutes for chemical pesticides, or to develop more efficient processes for biofuel production. Progress in this area is hindered, though, by inadequate understanding of the safety assessment, cultivation and stabilization of new organisms.

Benefits: DOM’s programme of research, symposia and courses is filling gaps in current knowledge and building bridges between research, government agencies and industry. This will make possible new applications for microorganisms with biological effects and benefits for the environment.

Users: DOM is a centre of excellence, to which companies can turn for support in the stabilization (formulation) and safety assessment of microorganisms. It also provides support and information to collaborating authorities, as well as helping researchers with assessments of new microorganisms.

Duration: 2003–2010

Mistra Funding: SEK 61.3 million

Website: www.mistra.org/dom

GREENCHEM

Challenge: The chemical industry’s dependence on fossil raw materials, supplies of which are dwindling, and which adversely affect health and the environment.

Benefits: Greenchem aims to bring about a paradigm shift in the industry, from fossil oil to renewable raw materials for the production of ‘green’ chemicals. Using modern biotechnology and green chemistry, both cleaner products and cleaner processes can be developed.

Users: The key beneficiaries will be industries that produce and use chemicals, as well as suppliers of renewable raw materials. The knowledge gained will also be of use to other scientists, to decision makers and to society at large.

Duration: 2003–2010

Mistra Funding: SEK 70 million

Website: www.greenchem.lu.se

E4 MISTRA

Challenge: To reduce vehicle emissions of nitrogen oxides and particulates, without increasing releases of carbon dioxide.

Benefits: The programme’s aims are to develop new, energy-efficient exhaust treatment systems for combustion engines, and to achieve emission levels below existing statutory requirements.

Users: The results will be of use to several sectors of Swedish industry, to decision makers and to environmental NGOs. They will also benefit the individual and society as a whole by improving ambient air, i.e. reducing local air pollutant levels, and curbing greenhouse gas emissions. Finally, vehicle owners will benefit from lower fuel consumption.

Duration: 2006–2010

Mistra Funding: SEK 19.4 million

Website: www.kck.chalmers.se/e4mistra

ENVIRONMENTALLY DRIVEN BUSINESS DEVELOPMENT
MARINE PAINT

CHALLENGE: Fouling of ships’ and boats’ hulls by marine organisms greatly increases fuel consumption and hence greenhouse gas and other emissions to the atmosphere. Existing anti-fouling paints need to be replaced with more effective products causing less harm to the environment.

BENEFITS: The aim is to generate knowledge for use in developing new hull paints that are superior to existing ones. New combinations of the most environmentally benign anti-fouling agents and systems for their controlled release are being developed. These will prevent fouling and thus keep down fuel use, while reducing leakage of biocides into the marine environment. They could also help to limit the introduction of alien marine species.

USERS: The results will benefit shipping companies and owners of recreational craft, as well as the paint industry and its suppliers. In addition, authorities will be able to use the knowledge base created by the programme in their assessments and decisions.

DURATION: 2003–2010
MISTRA FUNDING: SEK 82.4 million
WEBSITE: www.marinepaint.se

MASE

CHALLENGE: Chemicals are widely used in agriculture, with the result that pesticide residues can be found higher up in food chains and large proportions of the nutrients supplied to soils are lost to ground and surface waters.

BENEFITS: MASE is exploiting the interaction between naturally occurring microorganisms to develop new commercial products that will, on the one hand, boost crop growth and make nutrient uptake from the soil more efficient; and on the other, control harmful fungi, reducing use of chemical pesticides and making for more sustainable agriculture. Faster growth could also cut energy consumption in greenhouses.

USERS: The results will be of use to researchers, farmers and other growers, consumers and the food industry, biotech companies, and authorities the world over. Two products are expected to be ready for market launch during the second phase of MASE.

DURATION: 2004–2010
MISTRA FUNDING: SEK 58 million
WEBSITE: www.maselab.se

MISTRA FUEL CELL PROGRAMME

CHALLENGE: Fuel cells could play an important role as a substitute for fossil fuels. The technology exists and is now commercial in certain niche markets, such as power units for forklift trucks and backup power for telephone exchanges. The challenge now is to make it cheaper and safer—and to create infrastructures to enable it to be used in practice.

BENEFITS: The programme will promote greater sustainability by helping to reduce fossil fuel use. The focus is on developing materials and components and studying how fuel cells can be introduced and used in a sustainable society. In the process, the programme is also generating expertise that an emerging Swedish fuel cell industry requires.

USERS: Vehicle manufacturers, battery users and companies in the energy conversion sector. The results will also be of importance to government agencies responsible for energy and infrastructure.

DURATION: 1997–2009
MISTRA FUNDING: SEK 121.6 million
WEBSITE: www.mistrafc.se

PERSEA

CHALLENGE: More efficient methods are needed to clean up flue and exhaust gases from combustion plants and vehicles, preferably methods that will deal with several pollutants at once without giving rise to other harmful substances.

BENEFITS: The aim is to develop plasma technology that will cost-effectively reduce emissions, chiefly of nitrogen oxides and volatile hydrocarbons. The technology is intended to be capable of eliminating a number of pollutants at the same time.

USERS: Several industries with significant air pollutant emissions. The main focus is on the power and automotive sectors, but the research has applications in other contexts as well: printing, painting and varnishing, pressure treatment, and certain processes used in the manufacture of paper, electronics and plastics.

DURATION: 2003–2009
MISTRA FUNDING: SEK 34.7 million
WEBSITE: www.engineering.uu.se/plasma
TOWARDS A CLOSED STEEL ECOCYCLE

Challenge: Steelmaking processes need to be changed so as to use metals more efficiently and less resource-intensively. More recycling-friendly designs must be developed to optimize the use of new varieties of steel.

Benefits: This programme is helping to develop, first, improved production processes and better use of steel in designs; and second, environmental evaluation methods for process and product development that describe benefits for the environment from a broad, societal point of view. Interdisciplinarity and cross-learning are key elements.

Users: The results will help to improve manufacturing processes in industry – steelworks, the scrap trade and engineering – and will benefit society by providing new methods of environmental evaluation for use in research, industry and education.

Duration: 2004–2012

Mistra Funding: SEK 97 million

Website: www.stalkretsloppet.se

ENVIRONMENTALLY DRIVEN BUSINESS DEVELOPMENT

PLANTCOMMISTRA

Challenge: Aphids cause problems for crop producers, and heavy use of pesticides over large areas puts significant environmental pressure on the farmed landscape.

Benefits: The aim of this programme is to exploit the crop plants’ own ability, through signalling based on volatile chemicals, to develop greater resistance to aphids and attract aphids’ natural enemies, such as ladybirds.

Users: Farmers, companies, authorities and the general public.

Duration: 2006–2012

Mistra Funding: SEK 65 million

Website: www.plantcommistra.com

COMPLETED PROGRAMMES/ENVIRONMENTALLY DRIVEN BUSINESS DEVELOPMENT

ASC – Ångström Solar Centre
Biosignal – Pheromones and Kairomones to Control Pest Insects
ByggMISTRA – Sustainable Building
COLDREM – Soil Remediation in a Cold Climate
KAM – The Ecocyclic Pulp Mill
MAaF – Microbial Antagonism against Fungi
MiMi – Mitigating the Environmental Impact of Mining Waste
KNOWLEDGE SUPPORT FOR RESOURCE MANAGEMENT AND POLICYMAKING

CLIPORE
CHALLENGE: The threat of climate change is one of the most serious and complex challenges the world faces. If international agreements are to succeed, they need to be based on a thorough understanding of the circumstances and interests of different stakeholders and on assessments of the consequences both for climate and for different negotiating partners.

BENEFITS: Clipore is supporting research and encouraging dialogue that can help to secure progress in the international negotiations on climate.

USERS: The majority of the results are intended to be of direct use to political decision makers, in Sweden and in other countries. Industry also has an important part to play in the programme, both by providing an input to the research and as a user of the results.

DURATION: 2004–2010
MISTRA FUNDING: SEK 106.3 million
WEBSITE: www.clipore.org

ENTWINED
CHALLENGE: International exchange of products, services, capital, technology, information and, to a certain extent, labour has created a growing interdependence between countries. The focus of this programme is therefore on how economic globalization and its governing institutions are affecting human welfare and the environment, locally, nationally and globally.

BENEFITS: The programme is expected to enhance our understanding of how integration of markets – which extend across national frontiers – can be achieved without upsetting the balance of the environment.

USERS: The aim is to help develop tools that will support Swedish and other European researchers and stakeholders seeking to integrate environmental concerns into international trade agreements.

DURATION: 2007–2009
MISTRA FUNDING: SEK 18.4 million
WEBSITE: www.entwined.se

FUTURE FORESTS
CHALLENGE: Climate change, globalization and growing consumption of materials and energy are increasing pressure on forest resources. The challenge is to intensify forestry, so as to produce more timber, paper and energy, while also safeguarding biodiversity, recreation and other ecosystem services.

BENEFITS: Future Forests is expected to generate knowledge and develop tools that will make possible scientifically based decisions on the future management of forests, one of our most valuable natural resources.

USERS: Key target groups are the people and organizations that manage forests, including private owners, forest owner associations and forest companies. Other intended beneficiaries are national and regional authorities, other industries dependent on forests, politicians and interest groups.

DURATION: 2009–2012
MISTRA FUNDING: SEK 55 million
WEBSITE: www.futureforests.se

HAGMARKSMISTRA
CHALLENGE: With more and more agricultural land being taken out of production, the area of meadows and pastures is dwindling. As a result, many species associated with the farmed landscape are now threatened to varying degrees.

BENEFITS: This programme aims to provide a scientific basis for successful and profitable management of meadow- and pastureland. There are no other programmes with a similar focus, so HagmarkMistra could also be an important source of inspiration at the international level.

USERS: Wide-ranging, from individual farmers, via local authority and county administrative board advisers, to central government agencies and, not least, the people involved in reforming EU agricultural policy.

MISTRA FUNDING: SEK 49.5 million
WEBSITE: www-hagmarksmistra.slu.se
HEUREKA
CHALLENGE: Forests are used not only for commercial timber production, but also, for example, as a source of biofuels, for recreation, and as a carbon sink. Because different stakeholders have differing visions, tensions can arise.

BENEFITS: Heureka is developing computer-based tools that will provide broad support for decision making, taking account of as many factors as possible. These tools describe how the values and functions of forests are affected, depending on how they are used.

USERS: The Heureka system will be of use both to forest enterprises, large and small, and in regional and national analyses. Users thus range from individual landowners, via forest companies and local authorities, to authorities such as the Swedish Forest Agency and the Swedish Environmental Protection Agency.

DURATION: 2002–2009
MISTRA FUNDING: SEK 18.8 million
WEBSITE: www.mistra.org/heureka

MISTRAPHARMA
CHALLENGE: Almost 200 active pharmaceutical ingredients have been detected in the aquatic environment. Their very presence there is undesirable, but are the levels at which they occur hazardous to the animals and plants of such environments? We know that synthetic oestrogen from oral contraceptives affects fish, but for the great majority of drugs the possible environmental impacts are very poorly understood.

BENEFITS: This programme aims to identify drug substances that pose a significant risk to aquatic organisms; recommend technologies to improve wastewater treatment; develop better strategies and indicators for early identification of substances that could have undesirable environmental effects; and strengthen contacts and communication within the network of Swedish and international researchers and stakeholders.

USERS: Government agencies, companies/organizations that treat and supply water, health authorities and the pharmaceutical industry.

DURATION: 2008–2011
MISTRA FUNDING: SEK 42 million
WEBSITE: www.mistrapharma.se

SOUNDSCAPE SUPPORT TO HEALTH
CHALLENGE: Noise is a significant and growing environmental problem, with impacts on human health. There is a wide gap between existing noise environments and official long-term targets.

BENEFITS: The programme has introduced a new way of thinking in this area. Noise is not just a matter of decibels, but also of how we perceive sounds and are affected by them. The knowledge gained is intended to be used in planning housing and traffic environments, to achieve the best possible ‘soundscapes’.

USERS: The programme’s aim has been to get everyone concerned – the construction industry, housing providers, planning authorities and residents – to think in terms of soundscapes, an approach that will benefit human health and well-being.

MISTRA FUNDING: SEK 40 million
WEBSITE: www.soundscape.nu

KNOWLEDGE SUPPORT FOR RESOURCE MANA
STOCKHOLM RESILIENCE CENTRE

CHALLENGE: Humans are exerting a growing influence on the dynamics of ecosystems. Many such systems have shifted to less productive states, in terms of their capacity to generate ecosystem services such as food, purification of water and regulation of climate. There is a considerable risk of threshold effects. New principles that will build resilience are needed for the management of natural resources and the environment.

BENEFITS: The Centre’s aims are to promote a better understanding of complex social-ecological systems, and to provide new insights and tools to improve their management and governance.

USERS: The Centre will generate knowledge for and offer advice to decision makers at the national, European and international levels. A joint undertaking between Stockholm University, the Royal Swedish Academy of Sciences and the Stockholm Environment Institute, it will be seeking to develop broad partnerships.

DURATION: 2007–2013
MISTRA FUNDING: SEK 98.5 million
WEBSITE: www.stockholmresilience.su.se

SUSTAINABLE INVESTMENTS

CHALLENGE: Through their investment decisions, institutional investors can influence company behaviour in the direction of greater sustainability. Many obstacles may have to be overcome, however, before longer-term investment strategies, integrating environmental, social and corporate governance issues, are widely adopted.

BENEFITS: This programme involves applied research into the value chain of financial markets, focusing on company reporting, analysts’ valuations, the behaviour of investment managers and investors, and portfolio selection based on sustainability criteria.

USERS: The results are intended to be of use to institutional investors, managers, analysts and other players on financial markets.

DURATION: 2006–2012
MISTRA FUNDING: SEK 103 million
WEBSITE: www.sirp.se

TRANSPORTMISTRA

CHALLENGE: Of the various goals of today’s society, sustainable transport is one of the hardest to achieve. Apart from when it comes to adapting transport systems to the natural and cultural values of the landscape, there is no lack of proposals for policies, instruments and measures to improve the situation. The problem is that, even now, very few of the good ideas advanced are being put into practice.

BENEFITS: TransportMistra has developed advice and decision support tools to promote sustainable transport systems.

USERS: The work has been built around three identified user groups: policymakers, practitioners in the public sector, and the international research community.

DURATION: 2006–2008
MISTRA FUNDING: SEK 31 million
WEBSITE: www.mistra.org/mobility

COMPLETED PROGRAMMES/KNOWLEDGE SUPPORT FOR RESOURCE MANAGEMENT AND POLICYMAKING

ASTA – International and National Abatement Strategies for Transboundary Air Pollution
FjällMISTRA – Sustainable Management in the Mountain Region
FOOD 21 – Sustainable Food Production
LUSTRA – Land Use Strategies to Reduce Greenhouse Gas Emissions
MARE – Marine Research on Eutrophication – A Scientific Base for Cost-Effective Measures for the Baltic Sea
NewS – New Strategy for Risk Management of Chemicals
RESE – Remote Sensing for the Environment
SUICOZOMA – Sustainable Coastal Zone Management
SUFOR – Sustainable Forestry in Southern Sweden
SWECLEM – Swedish Regional Climate Modelling Programme
Urban Water – Sustainable Urban Water Management
VASTRA – Water Management Research Programme Ways Ahead – Paths to Sustainable Development
Through its unique research, PlantComMistra is seeking to enhance the capacity of crop plants both to resist insect pests and to attract the pest insects’ natural enemies, says Lisbeth Jonsson, the programme’s director.
GREENER FUTURE FOR PESTICIDES

With funding from Mistra, Swedish scientists are trying to reduce the use of pesticides that damage the environment. In 2008, results from the Marine Paint programme, for example, came a good deal closer to commercialization. With a new major shareholder, the development company I-Tech will be able to take the last remaining steps towards a marketable anti-fouling paint.

Mistra supports several research programmes which, in various ways, are developing or studying the environmentally sounder pesticides of the future. Most progress has been made by Marine Paint, funded by the Foundation since 2003. Its researchers have shown that the compound medetomidine, at present an active ingredient of certain pharmaceuticals, could also be used to prevent fouling of boats’ and ships’ hulls by acorn barnacles. It takes only very small amounts of it to affect barnacle larvae in such a way that they avoid treated surfaces, without suffering any harm. The substance could reduce the need for the toxic anti-fouling paints currently used on recreational craft and merchant vessels.

For a few years now, commercial development of hull paints based on the programme’s findings has been in the hands of I-Tech, a company that holds the patents for this use of medetomidine. In December 2008 came the very encouraging news that Volvo Technology Transfer had decided to become a major new shareholder, investing SEK 12 million in the company.

‘This investment puts us in a position to commercialize the results. First and foremost, it gives us the resources to secure EU approval for medetomidine,’ says I-Tech’s managing director Per Jansson.

Towards a finished product
A market launch of an anti-fouling paint is at least a couple of years away. The active substance medetomidine first has to be approved under the EU’s Biocides Directive. Dr Jansson expects the paperwork based on the programme’s findings to be submitted this spring, and to get the go-ahead for the compound within 12–18 months.

In addition to official approval, some hard work in terms of industrial development remains – among other things, to devise suitable formulations for paints containing the substance. But Per Jansson is confident about the future. It is only a few months since Volvo’s investment was announced, but he has already noticed a greater interest in I-Tech. Not least, there has been a change of attitude on the part of the Finnish drugs company Orion Pharma, which makes medetomidine.

‘Orion Pharma used to see us as a slightly off-beat development company,’ he says. ‘Now we are equal partners in industrial terms.’

RESEARCH CONTINUING
In parallel with the business development under way at I-Tech, research under the Marine Paint programme is continuing until 2010, to find methods of preventing fouling by other organisms besides barnacles. Programme director Björn Dahlbäck naturally welcomes Volvo Technology Transfer’s investment, which means that his team will soon be able to see the practical fruits of their efforts. He also underlines I-Tech’s importance as a bridge between academia and industry. Several of the programme’s original researchers are now working for the firm, among them Lena Lindblad. She has been a project manager since the programme began, and was last year appointed director of research at I-Tech.

‘Everyone talks about the innovation system, about how people can move from academia to industry,’ says Dr Dahlbäck. ‘We’ve shown that we’re helping to achieve that in practice, and that’s something to be proud of.’

BIGGER HARVESTS
Mistra’s research programme MASE – Microbial Activity for a Sound Environment is also searching for substitutes for the toxic pesticides currently used. The idea is that, by treating seed or plant roots with microorganisms, growers will be able to obtain higher yields, with lower inputs of commercial fertilizers and pesticides. In the summer of 2008, large-scale field trials on peas were conducted, in collaboration with Findus, producer cooperative Lantmännen and other partners. As in tests carried out the previous year, the method resulted in larger harvests. A third round of trials is planned for this summer. The aim is to assemble...
the data needed to register a new plant protection product based on naturally occurring bacteria.

**FOCUS ON MICROORGANISMS**

Interest in biotechnological use of microorganisms is increasing, not just in agriculture, where such organisms can reduce the quantities of harmful pesticides used in crop growing, but also in areas such as bioenergy and the food industry. One concern of Mistra’s programme DOM – **Domestication of Microorganisms for Non-Conventional Applications** is to study the safety aspects of large-scale production and use of microorganisms. The research group are for example looking at how organisms of this type spread in nature, and what risks increased exposure could pose for people and the environment.

In 2008, DOM arranged an international symposium at the Swedish University of Agricultural Sciences in Uppsala, on the subject of national and international regulations that restrict microorganism use in various applications. Representatives of industry, public agencies and the academic community – some sixty delegates in all, from thirteen countries – discussed current regulations and the balance to be struck between those rules and real hazards.

**PLANT COMMUNICATION**

Microorganisms are not the only way of curbing pesticide use, however. As an alternative to chemicals, researchers on the PlantComMistra programme want to prevent pest damage to crops by exploiting the plants’ ability to communicate with one another by means of airborne signal substances. Using this mechanism, they hope to enhance the capacity of crop plants both to resist insect pests and to attract the pest insects’ natural enemies.

This unique research has been funded by Mistra since 2006. Last year the programme was awarded another SEK 49 million for a second phase that will run for four years.

‘The reports from Mistra’s evaluators were very favourable. We were delighted, and feel really encouraged to continue,’ says Lisbeth Jonsson, the programme’s director.

PlantComMistra is focusing on cereals, particularly barley, and on attacks of the bird cherry-oat aphid (*Rhopalosiphum padi*). In a bad year, this aphid can reduce yields of barley and oats, two of Sweden’s most important crops, by 25 per cent. To avoid this, large areas are currently sprayed with pesticides, and the hope is that the programme will offer better alternatives.

The researchers have shown that a barley plant that receives signals undergoes various changes which make it more resistant to aphid attacks. This effect has been demonstrated both under glass and in open fields. One aim of the second phase is to confirm the results of the field trials in practical cropping systems. Another is to gain a better understanding of airborne signal substances and how they affect plants.

If PlantComMistra achieves these goals, it could significantly reduce the use of chemical pesticides in Swedish agriculture.

“Everyone talks about the innovation system, about how people can move from academia to industry. We’ve shown that we’re helping to achieve that in practice, and that’s something to be proud of.”
PRODUCTION OF paper pulp gives rise to large quantities of ‘black liquor’, an energy-rich by-product from which pulp mills are already recovering pulping chemicals and generating steam and electricity. But if black liquor is gasified in a separate process, its energy potential can be harnessed far more efficiently, to produce either green electricity or renewable vehicle fuels. That is the thinking behind the programme Black Liquor Gasification.

One key element of the work is a development plant in Piteå. The technology is now well tested, but according to Rikard Gebart, the programme’s director, some research is still needed to fully understand the process:

‘A number of question marks remain. The most important one has to do with being able to predict in detail what will happen under certain process conditions.’

INCREASED EARNINGS
The pulp and paper industry is following the development plant with much interest, seeing great potential to boost its earnings in this area. By modifying existing pulp mills, it hopes to be able to supply not only paper pulp, but also a range of chemicals and raw materials for energy production.

‘Black liquor gasification is an extremely interesting technology, and one that has progressed further than any other as a source of revenue from pulp mill by-products,’ says Tore Persson, biorefinery development manager at Smurfit Kappa, which supplies the Piteå plant with black liquor.
Chemrec, the company that owns both the development plant and the patents, plans to build full-scale facilities in the United States and Sweden. But, according to Mr Persson, it is still difficult to say when Smurfit Kappa will be able to make money from the process. ‘As a pulp and paper mill, we have to feel there’s a profitable market for the products we recover,’ he points out. ‘Otherwise, we’ll find other uses for our black liquor.’

To ensure profitability, the capital cost of a commercial plant must not be too high. Consequently, there may be a silver lining to the current economic uncertainty in the world, Töre Persson believes, as it has brought down construction costs.

NEW VEHICLE FUEL
Originally the idea was to use the synthesis gas produced to generate electricity, but now growing hope is instead being placed in production of motor fuels. The group involved in the development plant, the Energy Technology Centre at Luleå University of Technology and Chemrec, plan to use the gas to make dimethyl ether (DME), a renewable fuel for diesel vehicles. In 2008 the group, together with Volvo, the oil companies Total and Preem and others, received total funding of SEK 260 million from the Swedish Energy Agency and the EU to build a DME demonstration plant. In addition, a number of Volvo trucks are to be involved in trials of the fuel.

According to Rikard Gebart, the investments which Mistra and other funders have made in black liquor gasification to date have laid a crucial foundation for this fuel project, as it uses both synthesis gas from the development plant optimized as part of the research programme, and knowledge emerging from the programme.

CLOSED CYCLE TO CUT ENERGY USE
Reducing energy consumption in all sectors of the steel industry is one of the goals of Mistra’s programme Towards a Closed Steel Ecocycle, launched in 2004. Another is more efficient use of raw materials.

‘The first phase of our work has shown, for one thing, that choice of materials has a greater impact on the environmental performance of steel than we believed,’ says programme director Birgitta Lindblad.

The programme has been extended for a second four-year period from 2009, with another SEK 55 million from Mistra and matching funding from the industry. A key task of the second phase will be education, conveying to decision makers and the public the importance of high-strength steels – which, incidentally, are a major Swedish export. Being much more robust than standard types, high-strength steels make for thinner, lighter structures. A reduced input of materials means less impact on the environment and a saving in weight, which could for example lower fuel consumption in vehicles.

‘Most people don’t see the link between reduced use of materials and a diminished impact on climate,’ Ms Lindblad explains. ‘In the second phase, therefore, there needs to be a greater focus on communication.’

FUEL CELLS FOR A WORLD MARKET
The Mistra Fuel Cell Programme has been under way since 1997 and is now entering its final stage. Its researchers have developed new materials and new production test methods for PEM (polymer electrolyte membrane) fuel cells.

Sweden has an emerging fuel cell industry, with many companies manufacturing materials, components and entire fuel cells. The third and final phase of the programme chiefly involves research relevant to those companies. ‘We’re supporting and encouraging Swedish businesses by providing skills and knowledge that will enable them to establish themselves on a world market,’ says Bengt Steen, the programme’s deputy director.

Fuel cells can be used in vehicles, for example to generate electricity on board heavy trucks. But first the technology needs to become cheaper and more reliable, according to Andreas Bodén, head of fuel cell development at Volvo Technology, one of the companies involved in the programme. For Volvo, the Mistra Fuel Cell Programme is a good way of getting closely involved in research and development.

‘It gives us an idea what technical solutions could become available in the foreseeable future,’ Mr Bodén explains. ‘A partnership like this also provides a good base for recruiting people with the necessary expertise.’
THE PRINCIPLE TASK of Clipore – Mistra’s Climate Policy Research Programme is to study ways of developing an internationally legitimate and effective climate regime. One means to this end is to provide the negotiating system – in a wide sense – with a social science input into its work. That includes both proposals for economic instruments and more politically oriented tools, such as suggestions for new frameworks and agreements.

One area of interest to researchers involved in Clipore, and also in the ENTWINED programme (see page 23), is various financial instruments to reduce carbon dioxide emissions.

‘The majority of our work on this subject relates to emissions trading. We’re looking at the factors shaping this market and its development, and at the effects different allocation systems can have on competition between countries and sectors,’ says Peringe Grennfelt, programme director of Clipore. ‘An important point which decision makers need to keep in mind is that emission allocations will influence the system for a long time to come. And that will affect not only the EU or the US, but global trade as a whole, and technological development as well.’

Another question being explored is how climate adaptation in developing countries can be made as effective as possible – while also giving the countries concerned scope for economic development.

‘For one thing, we need to find a method that will allow the poorest countries to increase their emissions for the sake of their development,’ Professor Grennfelt explains. ‘At the same time, the rich world must contribute by transferring both knowledge and technology.’

INFLUENCE AND PARTNERSHIP
A key aim of Clipore is to exert an influence through a continuous process of communication between the research community, politicians and other decision makers. To maintain that process and make its findings more widely known,
Clipore uses certain formal channels, such as its programme board, which includes Swedish climate negotiators. But it also has direct contacts with government ministries.

‘Those contacts are based on two-way communication,’ Peringe Grennfelt points out. ‘On the one hand, we need to keep up to speed on progress in the negotiations, so we can think two steps ahead about what will be needed in the months and years to come. On the other, we want to explain and discuss the results of our research.’

In addition, the programme’s researchers hold seminars to which they invite various stakeholders. Clipore was represented at the international Climate Change Conference in Bali in autumn 2007, and is now preparing for the forthcoming meeting in Copenhagen in December 2009. One reason for attending such gatherings is to exert an influence by informing politicians and negotiators. This is done partly by organizing ‘side events’: during the Bali Conference, Clipore arranged three such meetings, and in Copenhagen a number of different seminars will be held.

Eight research groups are participating in the programme, in four countries: India, Norway the US and Sweden. A partnership has also been established with the Centre for European Policy Studies (CEPS), a European think tank. Within that context, Clipore arranges two seminars a year for negotiators and other stakeholders. Each seminar has a theme: most recently, it was funding issues.

‘Under any climate agreement, the action to be taken, both to reduce emissions and to adapt to climate change, has to be paid for,’ says Professor Grennfelt. ‘One current concern is whether climate measures could make industry less competitive, for example in relation to developing countries.’

INTEGRATED CLIMATE MODELS

Another programme that is expected to contribute significantly to the international climate
talks in the years ahead is *Mistra-SWECIA*, which was launched in 2008. Its purpose is to develop models that integrate climate and climate change, impacts on societies, adaptation measures, and the economic basis for and consequences of such measures.

A fundamental assumption in this programme is that climate change will affect the economy, just as economic development in turn will determine what kinds of measures are introduced and how well societies are able to adapt.

“We want to develop a completely new modelling system that is more explicit, many-sided and detailed than existing ones. Our aim is to highlight more clearly the importance of links and feedbacks within and between climate and society,” says Markku Rummukainen, programme director of *Mistra-SWECIA*.

Up to now, he suggests, climate models have been developed in one place, impact models in another, and economic models in yet another. That creates a risk of key information being lost when data are transferred between the different models, and of certain feedbacks between them being missed.

“We’re trying to combine these separate models into an interactive system, so as to be better placed to study uncertainties and develop a coherent knowledge base that will enable society to move forward in adapting to climate change,” Professor Rummukainen continues. “We’re also studying how knowledge about climate, economics and impacts is turned over in society and how it can benefit stakeholders that have implemented adaptation measures.”

**LONGER START-UP**

Within the programme, therefore, natural scientists such as climate modellers and ecosystem researchers are collaborating with social scientists working in the field of economics.

“These are different research worlds, with partly different methods and terminology, so during the first year one task has been to establish a common platform and a common language. An interdisciplinary programme takes a little longer to get under way, but on the other hand it allows you to do more,” Markku Rummukainen points out.

Since it began, the programme has engaged with intended users, such as decision makers at various levels, trade associations, companies and others. The models, scenarios and analyses developed are intended to generate findings and tools that will be of use in both national and international climate negotiations.

“Our models are complex, and eventually, over the next few years, they will provide a complement to the operational elements underpinning the climate talks,” Professor Rummukainen believes.

**TRADE AND THE ENVIRONMENT**

The research programme *ENTWINED*, meanwhile, is exploring how environmental concerns can be integrated into international agreements on trade. One of its goals is to develop tools to enable that to happen. The background to the work is the growing trade in both goods and services between countries, which means that environmental problems, too, are moving across borders. It is becoming increasingly important, therefore, to take a range of environmental issues into account in international trade agreements.

A much-debated issue in the run-up to the negotiations in Copenhagen is how cuts in carbon dioxide emissions will affect industry.

“One way of protecting domestic industry is to impose what are called carbon tariffs, an option that is now the subject of intense discussion,” says Mark Sanctuary, the programme’s director. “But we have to ask ourselves whether such tariffs really are an effective means of curbing emissions of carbon dioxide. Isn’t there a danger that they will simply result in carbon-intensive industry relocating to developing countries, for example? And how are they to be designed? Our job as researchers is to provide basic facts that will put decision makers in a position to choose between different alternatives.”

Dialogue with a wide range of partners is therefore a cornerstone of the programme. On the one hand, its researchers attend research conferences, seminars and so on; on the other, the programme brings them together with intended end-users, such as the National Board of Trade and others involved in international trade negotiations.

Another key information channel, Dr Sanctuary explains, is an ongoing series of reports aimed directly at decision makers.
MISTRA PHARMA IS ONE OF two new research programmes launched in 2008. The researchers involved hope both to identify drug substances that pose a significant risk to aquatic organisms and to develop and recommend technologies that will improve wastewater treatment. They will also be seeking to develop better risk assessment methods and rule systems.

It is a well-known fact that active ingredients of pharmaceuticals used by humans find their way into lakes and rivers via sewage, but their effects on living organisms in the environment are still poorly understood.

‘At present, sewage treatment removes only a few of these substances. Their very presence in watercourses and lakes is undesirable, but the important question is whether the levels at which they occur are hazardous to the animals and plants living there. That’s something we need to study more closely,’ says Christina Rudén, an associate professor at Stockholm’s Royal Institute of Technology and programme director of MistraPharma.

Oestrogen from contraceptive pills, for example, is known to feminize male fish. And researchers on the programme have recently shown that frogs are just as sensitive to such effects.

‘For the great majority of drug residues, though, we know very little about how they affect organ-
isms in lakes and rivers,’ Dr Rudén continues. ‘But we have good reason to believe that there are more pharmaceutical compounds that are sufficiently stable and biologically active to have effects on such organisms. One of the main objectives of the programme is therefore to increase our understanding in this area.’

**DRUGS WITH POTENTIAL EFFECTS**

So far, the research team have, among other things, selected just over 120 of the total of some 1,200 drug substances in Sweden that could pose a risk to aquatic organisms. As a rule, drug ingredients are not toxic, but they are designed to interact with biological processes and could thus have impacts on other organisms besides humans. Antidepressants, for example, may affect the behaviour of fish, with possible implications for their ability to avoid danger and hence for their survival.

Based on the volumes of different substances used and their chemical properties, researchers have estimated expected concentrations in the blood of fish.

‘Modelled values always have their limitations, and we plan to confirm them experimentally by exposing fish to the selected substances, but they have enabled us to make an initial selection of compounds which we will now take a closer look at,’ Dr Rudén explains.

The 120 or so substances chosen include oestrogens and other sex hormones, drugs to lower blood pressure and antidepressants. It is hoped that, once it is clear which compounds affect aquatic organisms, the programme will be able to develop wastewater treatment methods that will eliminate the most dangerous ones.

To disseminate its findings, MistraPharma is working with government authorities and other stakeholders, such as the Swedish Chemicals Agency, the Medical Products Agency, the Environmental Protection Agency, the Association of the Swedish Pharmaceutical Industry and water suppliers. In March 2009, researchers are publishing a book titled ‘A healthy future – pharmaceuticals in a sustainable society’ (in Swedish), in association with the pharmacy chain Apoteket AB and Stockholm County Council.

‘We consider it important to communicate the knowledge emerging from our research and to collaborate with relevant stakeholders,’ Christina Rudén points out. ‘We therefore have a reference group with whom we maintain a continuous dialogue on our work.’

**SUSTAINABLE TRANSPORT**

When it comes to achieving sustainable transport systems, the problem is not a lack of knowledge.

‘We have a good enough understanding of what needs to be done. The problem is that the necessary measures are not being implemented to a sufficient degree,’ says Lena Smidfelt Rosqvist, programme director of *TransportMistra*.

The aim of this programme, which ran from 2006 to 2008, has therefore been to develop a knowledge base for decision making in support of sustainable transport. One of the questions the researchers have explored is what factors in the transport sector help or hinder measures to achieve greater sustainability. Decisions taken today may, for example, lock us into certain options, or restrict the range of measures open to us in the future.

**DIFFERENT DECISION-MAKING LEVELS**

One issue the programme has studied is the importance of various organizational factors, such as relations between different stakeholders and decision-making levels. It has also explored how communication can affect the introduction of sustainable transport solutions.

‘Creating networks can be very useful, to enable stakeholders to understand each other and the problem they are trying to solve,’ Ms Smidfelt Rosqvist explains. ‘That in itself affects success in implementing the measures agreed.’

The programme has now been completed, but parts of it will continue in other forms. Some of the researchers have, for instance, initiated a partnership with stakeholders in the southern provinces of Skåne and Blekinge, to broaden the range of sustainable transport options in the region – a necessity if the transport system as a whole is to become more sustainable.

According to the programme’s director, public transport must be given priority and a better environment planned for walking and cycling, to make those alternatives more attractive than taking the car.”
Sustainable Natural Resources

How our natural resources can be managed on a long-term, sustainable basis is a question a number of Mistra’s programmes are trying in various ways to answer. One important challenge has to do with future forestry and how forests are to meet more and more of society’s needs.

Sweden’s forests have long been a profitable source of raw materials for the timber and paper industries. They are also popular places for recreation and important in conserving biodiversity. In recent years, moreover, there has been growing interest in using them to produce biofuels. At the same time, there are hopes that their trees will help to slow down climate change by soaking up atmospheric carbon dioxide. Mistra has funded several research programmes with a focus on
forests, including LUSTRA (completed in 2007) and Heureka – Environmental Decision Support Models for Forest Land.

Forest ecosystems form a complex web, and different stakeholders have differing visions for their future. To meet this challenge, researchers involved in Heureka have developed computer-based systems for a comprehensive analysis of forests.

‘Our software offers much greater analytical power than earlier systems. It could help to achieve better resource use and a better balance between the various products and ecosystem services forests supply,’ says the programme’s director, Tomas Lämås.

INTEGRATED STUDIES

The Heureka system is intended to be of use to both small- and large-scale forest owners, enabling them to analyse and visualize the overall dynamics of forests. It handles factors such as timber and biofuel production, biodiversity, suitability for recreation, and carbon uptake. It also takes account of future climate change and its possible effects on forestry.

‘Heureka allows us to study these issues in an integrated fashion, which is a major advantage,’ Dr Lämås explains.

Since the programme began in 2002, the software has been progressively developed, and three distinct applications are now available for different target groups. One is aimed at smaller-scale forest managers, who can use it to study options for individual stands of pine or spruce, for example, while another enables users to predict how the forest ecosystem will develop over a larger geographical area, such as a county. In the current phase of the programme, Tomas Lämås points out, new versions are being released every month, with an increasingly wide array of functions.

Heureka, which as well as Mistra funding receives support from the Swedish University of Agricultural Sciences, the Kempe Foundations and the Swedish Forest Industries Association, is now entering its final year. This autumn, the programme’s researchers will be touring Sweden to talk about and demonstrate the various applications. The aim is to make the Heureka software known to as many potential users as possible, with a particular focus on consultants and advisers to small-scale forest owners.

‘We’re planning a kind of roadshow through Sweden, with open seminars,’ says Dr Lämås.

FIFTEEN EXTERNAL FACTORS

Although the research programme Heureka will be concluded during 2009, new versions of the software are to be developed. It is to be used, for example, in a newly launched programme, Future Forests – Sustainable Strategies under Uncertainty and Risk.

‘We’re starting an integration project this autumn, in which different research groups will have the chance to use Heureka,’ says Stig Larsson, research director of Future Forests.

The aim of the new programme, launched in January 2009, is to systematically identify external factors that could conceivably influence forests over the next fifty years. Two major factors are climate
change and global economic development. Initially, some fifteen factors in all will be identified. The programme is to be interdisciplinary, involving research groups working in the natural sciences, social sciences and humanities. The integration project planned for the autumn will therefore be an important part of its first year, giving the different groups a chance to get to know each other and discuss relevant research issues. They will study a real forest and simulate various future scenarios using Heureka, which will thus make a tangible contribution to achieving the necessary integration, Professor Larsson explains.

**MEADOWS AND PASTURES**

2008 saw the completion of another research programme relating to resource management: HagmarksMistra – Management of Semi-Natural Grasslands – Economics and Ecology. Its overarching aim was to provide a scientific basis for grassland management. As the number of farms declines, many meadows and pastures are falling into disuse. A great many plant and animal species, as well as the open character of the farmed landscape, are threatened. For a long time, Swedish farmers have been able to claim agri-environment payments for continued management of these grasslands.

HagmarksMistra, in collaboration with the Swedish Board of Agriculture, environmental NGOs and the Federation of Swedish Farmers, has helped to improve the design of this support scheme. In purely scientific terms, the programme has been a success, according to its director Urban Emanuelsson:

‘We have provided important findings that will benefit the landscape, both by influencing regulations and acting as a stimulus to farmers. And we have drawn attention to key issues, nationally and internationally.’

**RESEARCH CHANGED EU’S MIND**

In 2008, however, a conflict flared up between Sweden and the EU. Checks revealed that some Swedish farmers had received agri-environment payments for preserving semi-natural pastures, but failed to fulfil their commitments. As a result, says Dr Emanuelsson, the scheme was threatened. Thanks to HagmarksMistra’s research, Sweden was able to put forward scientifically based arguments for retaining it. During the year, EU Agriculture Commissioner Mariann Fischer Boel was invited to an international conference on pasture management and biodiversity. Together with the Swedish Minister for Agriculture, she was shown a farm in Uppland, where she was able to see the results of the Swedish scheme at first hand.

‘With the agriculture minister following behind, the landowner and I explained to her how it worked,’ Urban Emanuelsson recalls.

The visit brought a partial change of mind on the part of the Commission. The payments scheme is now to be retained, though not on the same scale as before. The most valuable pastures will survive, Dr Emanuelsson believes, but there is a risk of some grasslands being lost to scrub encroachment.

‘Looking a few years ahead, our research findings will provide a basis for usable decision support systems. But sadly, by then, some semi-natural pastures will have disappeared. I say sadly, because the EU is not taking full account of the evidence.’

Although the programme was formally concluded during the year, the researchers are continuing their efforts to conserve valuable grasslands. Among other things, they are seeking EU support for a new joint European project.

**CENTRE GOES FULL-SCALE**

The aim of the Stockholm Resilience Centre is to promote sustainable management of natural resources and ecosystem services. As the name implies, a key concept in its work is *resilience*, which refers to a system’s capacity to adapt to change and continue to develop. One thing that distinguishes this concept from earlier research approaches is that it encompasses the interaction between ecological and social systems. Working on an international and interdisciplinary basis, the Centre is seeking to enhance our understanding of complex social-ecological systems. Man and nature are being studied as an integral whole. The programme was launched in 2007, with the first two years forming an essential start-up phase.

‘During 2008 we basically reached full operational scale – a faster start-up than we’d anticipated. We now have some sixty researchers, which is a good critical mass,’ says Johan Rockström, the Centre’s executive director.

As well as building up a physical centre at Stockholm University, the programme has developed a number of partnerships, both with researchers at Stockholm and other Swedish universities and with leading international research groups. An impor-
tant next step is to establish a Resilience Graduate School at the university.

INTERNATIONAL LEADERSHIP

A major event during the year was an international scientific conference on resilience. Attracting almost 600 delegates from around the world, it also served to put the Stockholm Resilience Centre on the map internationally.

‘The conference exceeded our expectations,’ says Dr Rockström. ‘The research groups who came here were impressed both by the way we organized it and by our research. Sweden is once again showing international leadership in the environmental field.’

He emphasizes that the primary role of the Centre is to create a world-class research environment. But for that to be possible, there needs to be a dialogue with decision makers, at both the local and the international level.

‘Strategic communication with decision makers is an integral aspect of our work. An interactive dialogue with stakeholders is part of the interdisciplinary research process.’

In the past year, the Centre has lent its weight to international efforts to create a counterpart to the Intergovernmental Panel on Climate Change in the area of ecosystem services and biodiversity. A new organization of this kind would be able to present scientifically based assessments of the state of the earth’s ecosystems – documents that would form a basis for political decisions. However, according to Johan Rockström, full agreement on establishing such a body has yet to be reached.

The Centre’s staff are also providing support to the Swedish Government in the run-up to Sweden’s EU Presidency in autumn 2009.

‘We’re supporting planning in areas close to our research agenda, for example on issues relating to biodiversity, the marine environment and resilience,’ Dr Rockström explains.
Mistra’s Board took a number of key decisions in 2008, among other things to set up a new research programme and to extend support for three existing ones. In addition, funding is to be provided for a research review relating to carbon capture and storage.

**FUTURE CITIES AND CARBON CAPTURE**

During 2008 the Mistra Board decided to award up to SEK 60 million for an initial four-year phase of a research programme entitled *Future Forests – Sustainable Strategies under Uncertainty and Risk*. The focus is on forests and how we use them, and the aim is to develop usable, sustainable strategies for forest management in a future characterized by change (see pages 27–28).

In the framework of Mistra’s current call in the area of Urban Futures, the Board decided to award grants to three out of a total of seven applicants to enable them to prepare full proposals. The intention is to establish a world-leading research centre on sustainable urban development, beginning in January 2010. The centre will be developed in collaboration with Swedish cities and other investors, including international partners. Before the final proposals are submitted, an international panel will hold several meetings with the three applicant groups, giving them the opportunity to clarify and improve their proposals in an open dialogue. The Board will then reach a decision in 2009.

**EXISTING PROGRAMMES EXTENDED**

The Board also decided this year to extend three existing Mistra research programmes. *Towards a Closed Steel Ecocycle* was awarded up to SEK 55 million for a second phase of four years, conditional on industry contributing at least as much. The overall goal of this programme is to ensure that steel and the alloying agents that accompany it are constantly recycled.

*PlantComMistra* received SEK 49 million for a second phase, also over four years. Its aim is to optimize the ability of crop plants to produce chemical signals that will counteract aphid attacks and also alert the aphids’ natural enemies to such attacks.

*Sustainable Investments* (SI) was likewise granted funding for a second phase, totalling SEK 58 million over four years. One question this programme is studying is what obstacles there are to more institutional owners pursuing sustainable asset management policies. It is also seeking to develop better analytical tools and exploring to what extent sustainable investments pay, from the point of view of investors, companies and the environment. In addition, following evaluations, the Board decided not to extend *TransportMistra*.

**CAPTURING CARBON DIOXIDE**

Carbon capture and storage (CCS) is the subject of much discussion around the world. The process involves removing the carbon dioxide arising from combustion before it reaches the atmosphere and pumping it into geological reservoirs thousands of metres below the earth’s surface. In 2007 Mistra studied the feasibility of establishing a neutral arena for CCS research. On the basis of this study, the Board decided to award SEK 7 million for the production of a ‘white paper’, or research review, in the area of *Politics, Policy and Regulation of Carbon Capture and Storage*. This in turn could form the basis for a possible future call for proposals for a programme on CCS.
RESEARCH BREATHE
NEW LIFE INTO BUSINESS

The research programme ProEnviro has so far funded thirteen projects with a focus on product development to improve environmental performance. All of them are based on partnerships between research and industry, and the results to date have been encouraging.

The ProEnviro programme is aimed at small and medium-sized businesses that are keen to invest in environmentally sound product development, but are not themselves in a position to do the research needed to generate new products or processes. A basic requirement for project funding, therefore, is collaboration between industry and a university or research institute.

Lars Frenning, programme director of ProEnviro, points out that this contact with the research community breathes new life into businesses:

‘Working with researchers often acts as a shot in the arm, giving companies a chance to develop and then apply new knowledge. We see this in all thirteen of the projects we have funded so far.’

ProEnviro was launched in 2006 as a joint initiative of Mistra and the Swedish Foundation for Strategic Research (SSF), and will run until the end of 2010. It is proving a great success. In all, 46 project applications have been received, in response to three calls, and they have been assessed by a scientific and an industrial council. The first looks in particular at scientific quality and innovative thinking, while the strategic and commercial assessment undertaken by the second focuses on improved environmental performance and industrial relevance.

SOON AT THE FINISHING LINE

To date, ProEnviro has provided funding for thirteen projects, one of which has now been completed and, moreover, given rise to a further project. In 2006, Järfälla-based Midsummer AB was awarded SEK 8.8 million to work with scientists from Chalmers University of Technology on a new commercial manufacturing process for cadmium-free thin-film solar cells. Initially, Midsummer developed a method to attach the various layers of the cells to glass. Some way into the project, they began to test the method on stainless steel, with good results. They abandoned glass, as steel is more robust and easier to handle.

‘During the first two years, Midsummer developed a prototype production line, exactly as envisaged in the project plan. Now they will be devoting another two years to a new project to further improve the process,’ says Dr Frenning.

The other projects are also going according to plan, and in September 2009 all the groups will be reporting on progress at a review day in Lund. Final reports will be presented in autumn 2010, when all the projects are to be more or less completed.

‘Small and medium-sized businesses often have considerable potential for development, which we want to bring to life by enabling them to work with researchers from universities or research institutes,’ says Lars Frenning, programme director of ProEnviro.

QUICK FACTS

PROJECTS AWARDED FUNDING 2008–2009

Hellospectra AB in Borås was awarded just under SEK 4m to work with scientists from Chalmers University of Technology on the development of a new lighting system for greenhouse crops.

Applied Nano Surfaces Sweden AB in Stockholm was granted almost SEK 3m to develop, with researchers at Uppsala University and others, a new technology to minimize friction losses and wear and thus reduce energy consumption in diesel engines and other applications.

Midsummer AB in Järfälla was awarded just short of SEK 4m to optimize sputtered CIGS solar cells in collaboration with researchers from Chalmers University of Technology.

Callo AB in Nässjö was awarded SEK 2m to work with scientists at Chalmers University of Technology and Dalarna University to develop a resource-efficient, cost-effective method of mass-producing powder-pressed components with complex shapes.

Magu Automation AB in Staffanstorp was awarded almost SEK 3m. In partnership with Lund University, the company will be developing a new, environmentally improved production process for coating highly processed metal and plastic products.
WATER-SAVING WASHING MACHINES AND MUSSEL GLUE

In the final round of the Idea Support scheme as currently designed, Mistra awarded grants to six out of a total of 69 applicants. Boldness and innovative thinking have been key elements of projects funded under the scheme – and are qualities Mistra wants to continue to encourage, though in a different form.

OVER THE PERIOD 2001–8, Mistra has awarded Idea Support funding of some SEK 160 million, for a total of 30 projects. Each application has been considered by an international scientific assessment panel, which has judged proposals on the basis of their potential environmental benefits and their boldness, originality and creativity. The 2008 funding round marks the end of the Idea Support scheme in its present form. The arrangement is now being reviewed, with regard both to the research results achieved and what funding has meant for individual researchers. One thing that is clear, though, is that Mistra wants to maintain its support for unusual and sometimes challenging research ideas.

‘The Idea Support scheme was unique in design, and we wish to continue to harness the creativity that such a funding arrangement encourages in researchers,’ says Mistra’s Chief Executive Ola Engelmark.

SIX SHARE SEK 30 MILLION

In 2008, six projects were awarded Idea Support Grants totalling SEK 30 million:

Fuel from the air – a study of a new concept was given SEK 3.9m, with the twin aims of reducing net emissions of carbon dioxide from vehicles and solving the problem of storage of hydrogen gas. The idea is to collect carbon dioxide from vehicles and cause it to react with locally produced hydrogen. The reaction produces a hydrocarbon that can then be used as a motor fuel. Vehicle owners could thus become self-sufficient in carbon-neutral fuel.

Clean development and demonstration – sustainable domestic washing – iwash, granted SEK 6m, has the aim of designing a prototype washing machine for home use that will cut water consumption by 70 per cent, reduce environmental impacts by using less detergent for each wash, and bring down electricity use by 60 per cent – without compromising the quality of the washing process.

The urban mind – cultural and environmental dynamics received funding of SEK 5.1m. The idea of this project is to draw lessons from history about the ‘urban transitions’ we now face, as cities seek to adapt to ongoing climate change. The necessary knowledge will be obtained from studies of the rise and fall of the Byzantine Empire and comparisons with studies in progress in Africa, Eurasia and North and South America.

Universal primer with anti-corrosive properties for all types of metals and plastic materials was awarded SEK 5.3m to develop an environment-friendly universal primer that will improve the adhesion of surface coatings to metals and plastics. The primer consists of a protein – MAP – derived from the glue mussels use to attach themselves to rocks. This glue adheres to all solid materials and is highly water-repellent. In addition, the protein counteracts corrosion of steel and probably has the same effect on several other metals.

A mobile pyrolysis unit for carbon sequestration and fertilizer production was given SEK 5.8m to develop a mobile unit which, by pyrolysis, turns organic waste from farming, forestry, gardening etc. into ‘biochar’, a form of charcoal. The process binds the carbon from the waste in the charcoal, which is then used as a soil conditioner, improving soil fertility and water retention and reducing nutrient losses.

Lignin-based, formaldehyde-free wood adhesives was awarded SEK 4.5m to develop a wood glue based on lignin, a natural substance obtained from trees and other plants that offers a cheap, environment-friendly and renewable resource.

Read more about all our Idea Support projects at www.mistra.org

“Grants of this kind are unusual, and the ideas that Mistra supports would have difficulty gaining approval from any other funding body.”

“Grants of this kind are unusual, and the ideas that Mistra supports would have difficulty gaining approval from any other funding body.”

ELIZABETH NESS IDEA SUPPORT SCHEME ASSESSMENT PANEL

"Grants of this kind are unusual, and the ideas that Mistra supports would have difficulty gaining approval from any other funding body.”
RESULTS AND IMPACTS

A wide range of results from Mistra research programmes caught the public eye in 2008. Here are a selection of those reported in the Foundation’s newsletter. Stories that made headlines in other media included advances in black liquor gasification, alternative anti-fouling paints and new climate models.

GREENCHEM IN CHICAGO

The research programme Greenchem helped to organize a Swedish panel at the World Congress on Industrial Biotechnology & Bioprocessing in Chicago.

The panel was very well received by a large and interested audience. The approach of Greenchem – Speciality Chemicals from Renewable Resources was new to most delegates. In the US, biofuels and biopolymers are the main focus of interest. This was also reflected in the fact that most of the chemical companies represented – DSM, BASF, Evonik, Lonza etc. – were from Europe.

‘Greenchem already has contacts with several of these companies, but this was a useful opportunity for us to “sell” our work to them,’ says Harald Skogman, who chairs Greenchem’s programme board.

He also reports that, in the ensuing discussion, there was much praise for Mistra’s far-sighted investment in the programme.

‘Following our return from Chicago, a number of invitations have been followed up, including from a group in Germany and a major Dutch company.’

FROGS FEEL EFFECTS OF DRUGS IN ENVIRONMENT

Frogs are more sensitive to hormone-disrupting environmental contaminants than previously believed. New results from MistraPharma show that such substances can make male tadpoles less fertile, or turn them into females.

A host of different medicines are discharged with sewage effluent into rivers and streams around the world, and it is suspected that they have effects on aquatic organisms. Irina Gyllenhammar, with the MistraPharma programme, has therefore been studying how drugs and fungicides used in shampoos and ointments affect the reproductive system of frogs. Her doctoral thesis shows that, even at low concentrations, they reduce fertility and cause sex reversal.

‘According to my findings, frogs are more sensitive to oestrogenic contaminants than was previously believed,’ she says. ‘When tadpoles were exposed to low concentrations of such substances, the males developed ovaries instead of testicles.

‘They fertilized fewer eggs when they mated than unexposed males, and also had less sperm in their testicular tubules. Many female frogs that had been exposed lacked oviducts, rendering them sterile.’

FOCUS ON BLACK LIQUOR AND ALTERNATIVE FUELS

The Energy Technology Centre in Piteå and Chemrec AB have been awarded the Swedish Road Administration’s latest environment prize for their work on alternative fuels based on ‘black liquor’ from pulp mills. In addition, Chemrec has recently issued new shares to allow production of new vehicle fuels to be stepped up.

The Road Administration established its prize to boost interest in improving environmental performance in road transport. The theme for 2008 was transport and spatial planning to reduce climate impacts. The research programme Black Liquor Gasification, funded by Mistra and the Swedish Energy Agency, is behind the technology that won this year’s award.

‘As participants in the programme, we’ve been privileged to be involved in important technological development in its most intense and creative phase,’ says Rikard Gebart, the programme’s director.

Ingvar Landälv, vice-president for technology at Chemrec, agrees:

‘If everything goes according to plan, we will also soon be seeing a major commercial breakthrough for biorefineries, with black liquor gasification as one of the key technologies.’
ALTERNATIVE ANTI-FOULING PAINT WORKS

In summer 2008, the research programme Marine Paint and its commercial partner I Tech conducted field trials on the west coast of Sweden. With good results.

Along Sweden’s west coast, from Trelleborg to the Norwegian border, copper-based anti-fouling paints are permitted, even on recreational craft. That is not the case in the Baltic, for example, where use of such products is illegal.

The Marine Paint programme has developed an ecologically sustainable alternative to traditional hull paints for ships and boats. The product, containing an active substance called medetomidine, prevents barnacle larvae from attaching to the surface of the hull.

PREVENTS FOULING

In the summer of 2008, a low concentration of medetomidine was compared with a copper-based paint to see whether the compound could be substituted for copper as an anti-fouling agent.

‘Our trials have shown that medetomidine in low concentrations could completely replace copper in hull paints, with no loss of effectiveness,’ says Lena Lindblad, I Tech’s director of research.

Before a new product can go on sale, the substance has to be approved under the EU Biocides Directive. In December, I-Tech submitted an application to the European authorities, based in part on data from its research collaboration with Marine Paint.

LARGE-SCALE TRIALS ON PEAS

Increased yields and less need for commercial fertilizers and pesticides. That is what the MASE programme is hoping to achieve in large-scale field trials.

By treating seed with microorganisms, Mistra’s research programme MASE – Microbial Activity for a Sound Environment has reduced the need not only for chemical pesticides, but also for fertilizers.

‘The bacteria we use act as a growth factor,’ says Christopher Folkeson Welch, the programme’s director.

Greenhouse and smaller-scale field experiments have proved highly successful.

‘Now we’ve been given the go-ahead for large-scale trials. In one of these, we’ve grown peas on 400 hectares of land – a large enough area to decide whether the product we’re developing has a commercial future.’

SPINACH

Similarly, tests have been run in the past year on spinach, dill and parsley, to study how seeds and harvests are affected by different soils and infections. The first crops were sown in April 2008, with the results emerging over the six to eight weeks from late June.

‘We measure harvests and perform a range of other investigations,’ Dr Folkeson Welch explains. ‘If the trials prove a success, the next step will be to register and commercialize the product.’

The decision whether or not to proceed with the product will be taken by the programme’s end-users, Findus and Lantmännen BioAgri.

RESEARCH IN BALI

The Climate Change Conference in Bali can be described as both a success and a disappointment: a success, because the countries reached agreement; a disappointment, because no binding treaties were signed.

For the first time, though, the politicians showed a willingness to take the researchers’ message on board.

‘Clipore’s principal task is to study ways of developing an internationally legitimate and effective climate regime. So keeping an eye on the negotiations is crucial to our work,’ says Markus Åhman, one of the programme’s researchers.

Another reason for attending such conferences is to exert an influence by informing politicians and negotiators. This can be done, for example, by holding seminars in parallel with the negotiations proper. At the Bali Conference, Clipore arranged three such side events.

‘But the real work of influencing and informing people is done much earlier, in an ongoing process of communication between the research community, politicians and decision makers.’

Major conferences also provide an opportunity to meet other researchers. In Bali, Clipore was represented by 10 researchers from Sweden and another 10 from the United States, India and Norway.
FUEL CELLS IN CARS
A FUTURE MARKET

Cars and trucks powered by fuel cells represent a major market for the future. But government and industry must act now if Sweden is not to miss out, claims Lars Öjefors, former president of venture capital provider Industrifonden, in the technology newspaper Ny Teknik.

Ten years of fuel cell research will be at stake when the Mistra Fuel Cell Programme is left without funding next year, according to the programme’s chairman Lars Öjefors. Partners in the programme include the Royal Institute of Technology, Stockholm, Chalmers University of Technology, Lund University’s Faculty of Engineering, Volvo, Morphic and Nolato.

‘There’s a danger that the knowledge base and the links between industry and research built up over ten years with Mistra’s support could be left in ruins, and that Swedish industry could miss out on a major future market,’ Dr Öjefors tells the paper.

To date, the programme has produced twenty engineering PhDs, with another five in the pipeline, as well as ten patents and several spin-off companies – Powercell, My FC and Cellkraft.

SECTORAL RESEARCH INSTITUTE

Dr Öjefors, along with the Fuel Cell Programme’s director, Professor Göran Johansson, is now launching the idea of a new sectoral research institute to take over responsibility for carrying forward research in this area and making sure the knowledge developed in Sweden is put to use.

Government and business, he says, must join forces to save Swedish fuel cell research, with the state and industry each meeting half the cost of the new competence centre he and Professor Johansson wish to create.

MISTRA AT THE HUB

For a decade now, Ny Teknik writes, Mistra’s Fuel Cell Programme has been at the hub of Swedish research in this field.

‘In Sweden, more than SEK 100 million of public money has been put into fuel cell development over the last ten years,’ Lars Öjefors says in the newspaper. ‘During the same period, industry has invested around SEK 400 million, bringing the total to half a billion kronor.’

NEW LIGHT ON CLIMATE MODELS

The European Research Council has awarded a prestigious Advanced Investigator Grant in the social sciences and humanities to Per Krusell, for his work on climate models and economics.

Krusell, a professor at Stockholm University’s Institute for International Economic Studies (IIES) – a partner in the Mistra-SWECIA programme – is the only Swede to receive a grant of this kind in the social sciences and humanities.

‘The award means a great deal – in a number of ways,’ he says. ‘Obviously, at the personal level, it’s a feather in my cap, but it also provides an enormous injection of funding for research in this area.’

The prestigious grant enriches the field of climate models and economics in two other ways as well, Professor Krusell believes. One is that it creates scope for new appointments.

‘It means that we can afford to have another four or five people working on our project. The expertise needed is unique, so we’re planning to attend a recruitment fair in San Francisco to look for suitable new graduates in the field.’

Finally, the grant represents a major vote of confidence in this whole area of research.

SUSTAINABILITY PAYS

An active focus on ethics and the environment is also good for profitability, according to a new book summarizing some of the work done as part of Mistra’s research programme Sustainable Investments.

We now have it in black and white: listed companies that invest in areas such as sustainability, health and safety, ethics and human rights are more profitable and have higher market value than those without active corporate social responsibility (CSR) policies.

‘Returns in the area of CSR have long been a matter of dispute. But in a recently published book, researchers provide clear evidence that companies that have made CSR an integral part of their operations are profitable and involve less risk for investors.

‘It turns out that investments in ethics and the environment enhance the profitability and stock market value of all companies, regardless of sector. How marked that effect is, though, depends on the type of sector you’re looking at. The greater the risk, the more such investments pay,’ says Lars Hassel, a professor at the Umeå School of Business and director of the programme.

According to Professor Hassel, this in fact goes without saying, as investors in certain sectors demand a ‘risk premium’.

‘Fundamentally, CSR is a way of reducing business risks – as more and more investors have come to realize.’
ACCORDING TO Mistra’s investment policy, the assets of the Foundation are to be managed in a way that reflects its mission of helping to prevent and solve environmental problems and promoting sustainable development. In pursuing that goal, a reasonable balance is to be struck with the requirements of limited risk and a good rate of return, laid down in Mistra’s Statutes. To ensure compliance with the criteria set, Mistra engages in an ongoing dialogue with its investment managers. This involves an annual questionnaire survey and ensuing discussions, as well as other meetings, including the Sustainable Investment Platform seminars, which are attended not only by researchers, but also by asset managers and other actors on financial markets.

‘A living dialogue with our managers is hugely important to us, to monitor how our sustainability requirements have influenced the make-up of our portfolio and to what extent they have contributed to the return achieved, but also because we learn from each other,’ says Eva Thörnelöf, Mistra’s Chief Investment Officer.

Key questions addressed are how sustainable investment principles affect the performance and investment mix of each manager’s portfolio, and comparisons with how investments would have performed if managers had not applied sustainability criteria.

Most asset managers make every effort to follow Mistra’s criteria, and several of them speak of having a constructive and trusting relationship with the Foundation, which puts them in a real position to act as long-term owners.

Where a manager fails to live up to Mistra’s requirements, however, the relationship is terminated.

‘We want to manage our capital on a long-term basis, which among other things involves detailed discussions with managers,’ Ms Thörnelöf explains. ‘If we discover shortcomings, we raise our concerns in a dialogue with them, giving them the opportunity to put things right.’

PROGRESS OVER TIME
Mistra has now conducted its fourth questionnaire-based evaluation. Basically, it asks the same questions every year, so as to be able to track progress over time. The questionnaire includes questions on how asset managers are applying various sustainability criteria and to what extent they are exercising active ownership. Some managers have reported difficulties in the latter regard, as it has been unclear how they are to use the voting rights attached to Mistra’s shares. When it comes to active ownership, though, Mistra has in fact been able to exert an influence going beyond its own managers.

‘One of our managers, IDEAM, has now succeeded in persuading its owners, Crédit Agricole Asset Management, to draw up a voting policy for the entire group. So in this case we’ve been able to achieve something that is good not only for Mistra – which is part of how we view our role,’ says Ms Thörnelöf.

A new question in the 2008 questionnaire was linked to the United Nations Principles for Responsible Investment (UNPRI). By signing up to these principles, a company or institutional owner undertakes to follow them. And the majority of Mistra’s managers have already done so.

‘Having signed the principles ourselves, we’re under an obligation to try to persuade others to follow suit,’ Eva Thörnelöf continues. ‘We there-
When Mistra took its first steps towards sustainable asset management, it soon discovered that there was little literature or research on the subject. This was a major factor behind the launch in 2006 of the research programme Sustainable Investments (SI), which will run up to the end of 2012.

The programme is, among other things, looking at what obstacles there are to more institutional owners pursuing sustainable asset management policies. One of the research groups is concentrating on financial and capital markets and exploring issues such as to what extent sustainable investments pay, from the point of view of investors, companies and others.

The hope is that the results will lead to the development of better analytical tools for investors and asset managers. During its first three years, SI has been able to present findings which show, among other things, that investors do not lose out by investing sustainably. In its next phase, the programme will be focusing on questions such as the factors governing investor behaviour.

QUICK FACTS
When Mistra took its first steps towards sustainable asset management, it soon discovered that there was little literature or research on the subject. This was a major factor behind the launch in 2006 of the research programme Sustainable Investments (SI), which will run up to the end of 2012.

<table>
<thead>
<tr>
<th>QUICK FACTS</th>
<th>SUSTAINABLE INVESTMENTS</th>
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<tr>
<td>When Mistra took its first steps towards sustainable asset management, it soon discovered that there was little literature or research on the subject. This was a major factor behind the launch in 2006 of the research programme Sustainable Investments (SI), which will run up to the end of 2012.</td>
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MANAGEMENT REPORT

The Board of the Foundation for Strategic Environmental Research (Mistra) hereby presents its annual report and financial statements for the period 1 January–31 December 2008, the fifteenth year of the Foundation’s existence. The figures in brackets are for 2007.

ACHIEVEMENT OF OBJECTS

The objects of Mistra, as set out in Article 1 of its Statutes, are as follows:

‘The purpose of the Foundation, whose name shall be the Foundation for Strategic Environmental Research, is to fund research of strategic importance for a good living environment.

‘The Foundation shall promote the development of strong research environments of the highest international class with importance for Sweden’s future competitiveness. The research shall be of importance for finding solutions to important environmental problems and for a sustainable development of society. Opportunities for achieving industrial applications shall be taken advantage of.’

BOARD

During the financial year, the Board of Mistra comprised the following members:

Lena Treschow Torell, Chair
Björn Hägglund, Deputy Chair
Swante Axellson
Charlotte Brogren
Christina Lindbäck
Lars Magnusson
Stefan Nyström
Maria Strömme
Mathilda Tham
Johan Trouvé
Cynthia de Wit

The Board held four meetings during 2008.

MISTRA’S ACTIVITIES IN 2008

During the year, Mistra – disbursed research funding of SEK 169 (170) million and – awarded funding for one new major programme.

Mistra funding can be divided into three categories: Mistra programmes, Idea Support Grants and other forms of support.

MISTRAS PROGRAMMES

From its inception to the end of 2008, Mistra has awarded funding for a total of 41 (40) major research programmes, including one new one approved in 2008. The new programme, Future Forests, is the result of a call for proposals issued in 2007. It was awarded a total of SEK 60 million over four years.

During the year Mistra also made available financial support for a further phase of research in the framework of PlantComMistra, Sustainable Investments and Towards a Closed Steel Ecocycle. In all, a sum of SEK 165 million over a period of up to four years was awarded for these three programmes.

Four programmes, LUSTRA, Hagmarks-Mistra, Soundscape Support to Health and TransportMistra, received their final tranche of research funding in 2008. Certain parts of TransportMistra, Soundscape Support to Health and HagmarksMistra have yet to be fully completed, but the programmes are now being brought to a close.

A call in the area of Urban Futures was announced during the year, resulting in three out of a total of seven applicants being awarded planning grants to prepare full proposals.

Mistra also decided during 2008 to fund a major review of research into Carbon Capture and Storage (CCS). A total of SEK 8 million has been awarded for this work, which will take up to 2 years.

IDEA SUPPORT GRANTS

Since the scheme was introduced in 2001, Mistra has awarded 30 (24) Idea Support Grants in all. In 2008 six such grants were approved on the basis of the 2007 announcement, worth a total of SEK 30 (23) million over four years. These grants represent the last round of funding under this scheme.

OTHER FORMS OF SUPPORT

During the year, in addition to actual research funding, Mistra mainly provided support in the form of planning grants to enable applicants to develop full programme proposals.

ASSET MANAGEMENT

Mistra’s Statutes contain a number of provisions relating to the management of the Foundation’s assets:

– ‘The board of trustees is responsible for ensuring that the Foundation’s assets are managed satisfactorily with limited risk and a good rate of return.’
– ‘The Foundation’s endowment consists of the funds which have been transferred to the Foundation as of 2 December 1993 by Government decision plus whatever funds may be transferred to the Foundation thereafter as additional foundation capital.’
– ‘The activities of the Foundation may eventually entail that the Foundation’s endowment is used up.’
Since 1 July 2004 Mistra’s Committee for Asset Management has included the following external members: Märtha Josefsson (Chair), Peter Norman and Erik Sjöberg, who were reappointed on 1 July 2008. Under the rules of procedure adopted by the Board on 4 April 2005, the Committee also includes Mistra’s Chief Executive, Ola Engelmark.

When it was established in 1994, Mistra had a capital of SEK 2,500 million. At the end of 2008, the market value of its assets was SEK 2,731 (3,529) million. In all, research funding of SEK 2,559 (2,390) million has been paid out, SEK 169 (170) million of it in 2008.

Mistra’s assets are managed under eleven mandates, entrusted to eight investment managers. In June 2008 the Foundation invested for the first time in a Clean Tech fund – Generation Climate Solution Fund.

The return on Mistra’s capital, for the portfolio as a whole, was –19.1 per cent, which was 4.7 percentage points below the benchmark index. This was primarily a result of fixed-income investments significantly underperforming their benchmark.

The return on the equity portfolio was –33.3 per cent, 1.2 points below Mistra’s benchmark index for shares. The fixed-income portfolio delivered a return of 0.5 per cent, 6.1 points below the benchmark. Rates of return are calculated by measuring the change in the market value of each portfolio after management fees and transaction costs and adjusted for capital invested and withdrawn (i.e. a time-weighted return is used).

Since 1 April 2007, the whole of Mistra’s portfolio has been managed on the basis of sustainability criteria of one kind or another. The sustainability profile of the Foundation’s investments was monitored for the fourth year running by means of a questionnaire survey, followed up by telephone calls. The aim was to ensure that Mistra’s assets were being managed as agreed, and to learn lessons for the future. It is too early yet to analyse the return generated under these mandates, compared with a conventional portfolio.

At year end, Swedish fixed-income investments, including liquid assets, made up 55.2 (40.7) per cent of the overall portfolio.

ORGANIZATION AND STAFF
At the end of the year, Mistra had a permanent staff of seven (six) and one (two) part-time employee appointed on a project basis. Early in 2009, another three members of staff are to be recruited.

To assess proposals for research programmes, to review existing programmes prior to continued funding, and to evaluate completed programmes with a view to learning from them, Mistra engages the services of scientific experts, chiefly from outside Sweden. The Foundation also uses outside experts to assess the relevance and utility of its research programmes.

Mistra makes use of consultants and external experts in specialized areas such as IT, law, securities administration etc.

RISKS AND RISK MANAGEMENT
In the management of the Foundation’s capital, market risks arise in the form of share price, interest rate, credit and currency risks. The Board has laid down guidelines to ensure that the level of risk is compatible with the defined investment horizon. The Committee for Asset Management regularly reviews the level of risk involved in the Foundation’s investments and evaluates the established frameworks.

Operational risks also arise in the Foundation’s activities, i.e. risks of losses attributable to inappropriate or failed processes, the human factor, defective systems or external events. Such risks are limited by systematic quality management.

LOOKING AHEAD
Mistra intends to disburse research funding of up to SEK 1.2 billion over the next six years. With total assets of SEK 2.7 billion, this level of disbursement is so high that, in the long term, there is a considerable likelihood of the Foundation’s capital being exhausted.

The surplus/deficit for the year and the overall financial position of the Foundation are set out in the following income and expenditure account, balance sheet, cash flow statement and supplementary disclosures.

BREAKDOWN OF MISTRA’S OVERALL PORTFOLIO, 31 DECEMBER 2008:

<table>
<thead>
<tr>
<th>Portfolio Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed-income investments, including liquid assets</td>
<td>55.3%</td>
</tr>
<tr>
<td>Swedish equities</td>
<td>7.9%</td>
</tr>
<tr>
<td>Other European equities</td>
<td>9.0%</td>
</tr>
<tr>
<td>US equities</td>
<td>6.3%</td>
</tr>
<tr>
<td>Global equities</td>
<td>16.5%</td>
</tr>
<tr>
<td>Other equities</td>
<td>3.3%</td>
</tr>
<tr>
<td>Alternative investments</td>
<td>1.7%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
## INCOME AND EXPENDITURE ACCOUNT

<table>
<thead>
<tr>
<th>Note</th>
<th>2008 (SEK)</th>
<th>2007 (SEK)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foundation income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dividends</td>
<td>21,763,460</td>
<td>25,023,177</td>
</tr>
<tr>
<td>Interest, securities</td>
<td>55,248,536</td>
<td>51,779,263</td>
</tr>
<tr>
<td>Interest, bank</td>
<td>2,412,838</td>
<td>6,041,609</td>
</tr>
<tr>
<td>Other income</td>
<td>291,344</td>
<td>2,126,936</td>
</tr>
<tr>
<td><strong>TOTAL INCOME</strong></td>
<td>79,716,178</td>
<td>84,970,985</td>
</tr>
</tbody>
</table>

| **Foundation expenditure** | | |
| Management costs | –438,206 | –4,915,651 |
| Other external costs | 1,2,3 | –15,208,253 | –11,694,983 |
| Staff costs | 4 | –10,796,221 | –9,199,771 |
| Depreciation of tangible and intangible fixed assets | | –162,539 | –252,878 |
| **TOTAL EXPENDITURE** | –26,605,219 | –26,063,283 |

| **Surplus/deficit before financial items** | 53,110,959 | 58,907,702 |

| **Net income/loss from financial items** | | |
| Net income/loss from securities and receivables constituting fixed assets | 5 | –432,175,109 | 105,059,725 |
| Interest expense and similar income/expenditure items | 0 | –3,206 | 0 |
| Interest income | 3,248 | 0 |
| **Surplus/deficit after financial items** | –379,060,902 | 163,964,221 |

| **Surplus/deficit for the year** | –379,060,902 | 163,964,221 |
## BALANCE SHEET

### ASSETS

<table>
<thead>
<tr>
<th></th>
<th>Note</th>
<th>31 Dec 2008 (SEK)</th>
<th>31 Dec 2007 (SEK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed assets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intangible assets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of improvements to leased property</td>
<td>6</td>
<td>130,055</td>
<td>173,406</td>
</tr>
<tr>
<td>Tangible assets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>7</td>
<td>390,026</td>
<td>161,395</td>
</tr>
<tr>
<td>Financial assets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Securities held as fixed assets</td>
<td>8</td>
<td>2,528,100,372</td>
<td>3,129,457,520</td>
</tr>
<tr>
<td><strong>Total fixed assets</strong></td>
<td></td>
<td><strong>2,528,620,453</strong></td>
<td><strong>3,129,792,321</strong></td>
</tr>
<tr>
<td>Current assets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current receivables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current prepaid taxes</td>
<td></td>
<td>0</td>
<td>141,728</td>
</tr>
<tr>
<td>Other receivables</td>
<td>9</td>
<td>460,437</td>
<td>1,242,392</td>
</tr>
<tr>
<td>Prepayments and accrued income</td>
<td></td>
<td>17,606,079</td>
<td>14,106,495</td>
</tr>
<tr>
<td><strong>Total current receivables</strong></td>
<td></td>
<td><strong>18,066,516</strong></td>
<td><strong>15,490,615</strong></td>
</tr>
<tr>
<td><strong>Short-term investments</strong></td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other short-term investments</td>
<td></td>
<td>14,608,520</td>
<td>74,124,166</td>
</tr>
<tr>
<td>Cash and bank balances</td>
<td></td>
<td>168,861,391</td>
<td>56,057,470</td>
</tr>
<tr>
<td><strong>Total short-term investments</strong></td>
<td></td>
<td><strong>183,469,911</strong></td>
<td><strong>130,181,636</strong></td>
</tr>
<tr>
<td><strong>Total current assets</strong></td>
<td></td>
<td><strong>201,536,427</strong></td>
<td><strong>145,672,251</strong></td>
</tr>
<tr>
<td><strong>TOTAL ASSETS</strong></td>
<td></td>
<td><strong>2,730,156,880</strong></td>
<td><strong>3,275,464,572</strong></td>
</tr>
</tbody>
</table>

### LIABILITIES AND NET ASSETS

|                  |      |                   |                   |
| Net assets       | 11   |                   |                   |
| Restricted       |      |                   |                   |
| Foundation capital |     | 2,500,000,000    | 2,500,000,000     |
| Unrestricted     |      |                   |                   |
| Net surplus/deficit brought forward | | –31,947,803      | 65,994,852        |
| Surplus/deficit for the year | | –379,060,902     | 163,964,221       |
| **Total unrestricted net assets** | | **–411,008,705** | **229,959,073**   |
| **TOTAL NET ASSETS** | | **2,088,991,295** | **2,729,959,073** |

|                  |      |                   |                   |
| Current liabilities |   |                   |                   |
| Accounts payable  |      | 1,344,400         | 886,630           |
| Other liabilities |      | 2,894,106         | 4,510,429         |
| Grants awarded but not yet paid |   | 634,986,878      | 539,155,716       |
| Accrued expenses and deferred income | | 1,940,201         | 952,724           |
| **Total current liabilities** | | **641,165,585**  | **545,505,499**   |
| **TOTAL LIABILITIES AND NET ASSETS** | | **2,730,156,880** | **3,275,464,572** |

|                  |      |                   |                   |
| Assets pledged |      | None              | None              |
| Contingent liabilities |   | None              | None              |
## CASH FLOW STATEMENT

### Operating activities

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surplus/deficit after financial items</td>
<td>-379,060,902</td>
<td>163,964,221</td>
</tr>
<tr>
<td>Depreciation</td>
<td>162,539</td>
<td>252,879</td>
</tr>
<tr>
<td>Write-downs</td>
<td>303,524,477</td>
<td>0</td>
</tr>
</tbody>
</table>

### Cash flow from operating activities before changes in working capital

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-75,373,886</td>
<td>164,217,100</td>
</tr>
</tbody>
</table>

### Cash flow from changes in working capital

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in current receivables</td>
<td>56,939,745</td>
<td>-18,080,014</td>
</tr>
<tr>
<td>Changes in other current liabilities</td>
<td>-171,076</td>
<td>-5,950,276</td>
</tr>
</tbody>
</table>

### Cash flow from operating activities

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-18,605,217</td>
<td>140,186,810</td>
</tr>
</tbody>
</table>

### Investing activities

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investments in tangible fixed assets</td>
<td>-347,819</td>
<td>-62,614</td>
</tr>
<tr>
<td>Investments in financial fixed assets</td>
<td>297,832,671</td>
<td>40,802,450</td>
</tr>
</tbody>
</table>

### Cash flow from investing activities

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>297,484,852</td>
<td>40,739,836</td>
</tr>
</tbody>
</table>

### Cash flow from grant-making activities

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-166,075,714</td>
<td>-169,879,441</td>
</tr>
</tbody>
</table>

### Cash flow for the year

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>112,803,921</td>
<td>11,047,205</td>
</tr>
</tbody>
</table>

### Liquid assets at the beginning of the year

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>56,057,470</td>
<td>56,057,470</td>
</tr>
</tbody>
</table>

### Liquid assets at the end of the year

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>168,861,391</td>
<td>56,057,470</td>
</tr>
</tbody>
</table>

## SUPPLEMENTARY DISCLOSURES

### ACCOUNTING AND VALUATION PRINCIPLES

The annual report and financial statements have been prepared in accordance with the Swedish Annual Accounts Act and the general recommendations of the Swedish Accounting Standards Board. Where no general recommendation exists, or a deviation from such a recommendation has occurred, the accounting and valuation principles applied are as described below.

### VALUATION PRINCIPLES

Unless otherwise stated, assets and liabilities have been valued at cost. Short-term investments are valued at the lower of cost and fair value. Accrued interest on these investments is recorded as accrued income on the balance sheet. Securities held as fixed assets are valued collectively at the lower of cost and fair value, since the purpose of these investments is to spread risk. The fair value of a security is determined by its most recent trade price. The value of receivables and liabilities in foreign currencies has been calculated using the quoted buying rate for each currency at the balance sheet date.

### DEPRECIATION PRINCIPLES FOR FIXED ASSETS

Depreciation according to plan is based on original cost and estimated useful life. Where there is a permanent decline in value, assets are written down. As from 2006, the depreciation period applied has been changed: for equipment purchased in or after 2006, the period is 5 years, while for equipment purchased prior to 2006 it is 3 years.

### RECEIVABLES

Receivables are recorded at the amounts expected to be received, based on an individual appraisal.

### GRANTS AWARDED

Grants awarded are charged directly against unrestricted net assets (unappropriated funds). Grants are recorded as liabilities at the time they are awarded.

### RECOGNITION OF INCOME

For purchases and sales of securities, trade date accounting is applied. Premiums and discounts on bonds in relation to their par values have been accounted for according to the accruals concept over the remaining term. Accrued interest on investments is recorded as accrued income on the balance sheet.
1 Leasing agreements
Leasing expenses during the year totalled SEK 68,153 (79,621).

2 Fees and expenses
‘Audit work’ comprises auditing of the annual report and financial statements and the accounting records and of the management undertaken by the Board and the Chief Executive, other duties incumbent on an auditor of the Foundation, and any advice or other assistance occasioned by observations made in the course of such auditing or such other duties. Any other undertakings are referred to as ‘other work’.

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>KPMG AB</td>
<td>204,049</td>
<td>175,000</td>
</tr>
<tr>
<td>Swedish National Audit Office</td>
<td>54,250</td>
<td>76,125</td>
</tr>
<tr>
<td>Total</td>
<td>258,299</td>
<td>251,125</td>
</tr>
</tbody>
</table>

3 Other external costs

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultancy costs</td>
<td>9,253,353</td>
<td>5,160,274</td>
</tr>
<tr>
<td>Travel expenses and subsistence allowances</td>
<td>1,667,745</td>
<td>1,120,541</td>
</tr>
<tr>
<td>Accounting fees</td>
<td>16,467</td>
<td>370,063</td>
</tr>
<tr>
<td>Accommodation costs</td>
<td>1,592,572</td>
<td>1,509,171</td>
</tr>
<tr>
<td>Office costs</td>
<td>1,290,597</td>
<td>2,459,459</td>
</tr>
<tr>
<td>Other external costs</td>
<td>1,387,519</td>
<td>1,075,475</td>
</tr>
<tr>
<td>Total other external costs</td>
<td>15,208,253</td>
<td>11,694,983</td>
</tr>
</tbody>
</table>

4 Staff and staff costs

<table>
<thead>
<tr>
<th>Average number of employees</th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Male</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

Salaries, other emoluments and social security costs

| Salaries and other emoluments, Board members and Chief Executive | 1,644,250 | 1,523,308 |
| Salaries and other emoluments, other employees                | 4,579,962 | 4,252,049 |
| Pension costs                                                | 1,800,832 | 1,354,593 |
| Other social security costs                                  | 2,276,203 | 1,753,264 |
| Other staff costs                                            | 494,973  | 316,557  |
| Total salaries, other emoluments and social security costs   | 10,796,220| 9,199,771 |

The remuneration paid to members of the Board totalled SEK 520,000 (459,420), while the members of Mistra’s Committee for Asset Management received remuneration totalling SEK 203,250 (204,288).

The Chief Executive received a salary of SEK 921,000 (859,600). His contract of employment may be terminated on six months’ notice by either party. Following termination of the contract, the Chief Executive will be entitled to a further six months’ salary if notice is given by Mistra. From these monthly payments, deductions are to be made corresponding to any monthly salary the Chief Executive receives from another employer. Mistra pays a monthly sum equivalent to 30 per cent of the Chief Executive’s agreed monthly salary towards his individual pension and permanent health insurance schemes. In 2008 the total paid for this purpose was SEK 256,200 (234,850).
### 5 Net income/loss from securities and receivables constituting fixed assets

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange rate differences</td>
<td>-88,553,743</td>
<td>-46,099,628</td>
</tr>
<tr>
<td>Realized gains/losses on assets sold</td>
<td>-40,096,889</td>
<td>151,159,354</td>
</tr>
<tr>
<td>Write-downs</td>
<td>-303,524,477</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-432,175,109</td>
<td>105,059,726</td>
</tr>
</tbody>
</table>

### 6 Cost of improvements to leased property

<table>
<thead>
<tr>
<th></th>
<th>2008-12-31</th>
<th>2007-12-31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulated cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening cost</td>
<td>303,459</td>
<td>303,459</td>
</tr>
<tr>
<td>Acquisitions</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Closing accumulated cost</td>
<td>303,459</td>
<td>303,459</td>
</tr>
</tbody>
</table>

### Accumulated depreciation

<table>
<thead>
<tr>
<th></th>
<th>2008-12-31</th>
<th>2007-12-31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening depreciation</td>
<td>-130,053</td>
<td>-86,702</td>
</tr>
<tr>
<td>Depreciation for the year</td>
<td>-43,351</td>
<td>-43,351</td>
</tr>
<tr>
<td>Closing accumulated depreciation</td>
<td>-173,404</td>
<td>-130,053</td>
</tr>
</tbody>
</table>

|                      |                   |                   |
| Closing book value   | 130,055           | 173,406           |

### 7 Equipment

<table>
<thead>
<tr>
<th></th>
<th>2008-12-31</th>
<th>2007-12-31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulated cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening cost</td>
<td>727,827</td>
<td>4,450,810</td>
</tr>
<tr>
<td>Acquisitions</td>
<td>347,819</td>
<td>62,614</td>
</tr>
<tr>
<td>Sales/retirements</td>
<td>0</td>
<td>-3,785,597</td>
</tr>
<tr>
<td>Closing accumulated cost</td>
<td>1,075,646</td>
<td>727,827</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2008-12-31</th>
<th>2007-12-31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening depreciation</td>
<td>-566,432</td>
<td>-4,142,502</td>
</tr>
<tr>
<td>Retirements</td>
<td>0</td>
<td>3,785,597</td>
</tr>
<tr>
<td>Depreciation for the year</td>
<td>-119,188</td>
<td>-209,527</td>
</tr>
<tr>
<td>Closing accumulated depreciation</td>
<td>-685,620</td>
<td>-566,432</td>
</tr>
</tbody>
</table>

|                      | 390,026           | 161,395           |

### 8 Securities held as fixed assets

<table>
<thead>
<tr>
<th></th>
<th>Cost</th>
<th>Market value</th>
<th>Book value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equities, Swedish</td>
<td>298,632,211</td>
<td>214,426,379</td>
<td>214,426,379</td>
</tr>
<tr>
<td>Equities, foreign</td>
<td>5,336,080</td>
<td>1,463,668</td>
<td>1,463,668</td>
</tr>
<tr>
<td>Mutual fund units, foreign</td>
<td>1,139,794,769</td>
<td>995,782,824</td>
<td>995,782,824</td>
</tr>
<tr>
<td>Bonds, Swedish</td>
<td>1,312,011,648</td>
<td>1,253,444,130</td>
<td>1,253,444,130</td>
</tr>
<tr>
<td>Other foreign securities</td>
<td>78,850,141</td>
<td>62,983,371</td>
<td>62,983,371</td>
</tr>
<tr>
<td>Total securities</td>
<td>2,831,624,849</td>
<td>2,528,100,372</td>
<td>2,528,100,372</td>
</tr>
</tbody>
</table>

Securities have been written down by a total of SEK 303,524,477 to their market value, as it is below their book value.
### 9 Other receivables

<table>
<thead>
<tr>
<th>Item</th>
<th>2008-12-31</th>
<th>2007-12-31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refunds, withholding tax</td>
<td>0</td>
<td>687,595</td>
</tr>
<tr>
<td>Premium refund, Skandia</td>
<td>249,203</td>
<td>459,802</td>
</tr>
<tr>
<td>Other receivables</td>
<td>137,092</td>
<td>94,995</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>74,142</td>
<td>–</td>
</tr>
<tr>
<td><strong>Total other receivables</strong></td>
<td><strong>460,437</strong></td>
<td><strong>1,242,392</strong></td>
</tr>
</tbody>
</table>

### 10 Short-term investments

<table>
<thead>
<tr>
<th></th>
<th>Book value</th>
<th>Market value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Money market instruments</td>
<td>14,608,520</td>
<td>14,928,405</td>
</tr>
</tbody>
</table>

### 11 Net assets

<table>
<thead>
<tr>
<th>Item</th>
<th>31 Dec 2008</th>
<th>31 Dec 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original capital of the Foundation</td>
<td>2,500,000,000</td>
<td>2,500,000,000</td>
</tr>
<tr>
<td>Change previous years</td>
<td>232,610,491</td>
<td>172,280,796</td>
</tr>
<tr>
<td>Grants awarded during the year</td>
<td>–266,539,340</td>
<td>–119,881,250</td>
</tr>
<tr>
<td>Grants cancelled</td>
<td>1,981,046</td>
<td>13,595,306</td>
</tr>
<tr>
<td>Surplus/deficit for the year</td>
<td>–379,060,902</td>
<td>163,964,221</td>
</tr>
<tr>
<td><strong>Total net assets</strong></td>
<td><strong>2,088,991,295</strong></td>
<td><strong>2,729,959,073</strong></td>
</tr>
</tbody>
</table>

### 12 Accrued expenses

<table>
<thead>
<tr>
<th>Item</th>
<th>31 Dec 2008</th>
<th>31 Dec 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accrued management costs</td>
<td>–817,392</td>
<td>–320,011</td>
</tr>
<tr>
<td>Statutory social security contributions, special payroll tax/health insurance</td>
<td>–390,711</td>
<td>–378,475</td>
</tr>
<tr>
<td>Other accrued expenses</td>
<td>–732,098</td>
<td>–254,238</td>
</tr>
<tr>
<td><strong>Total accrued expenses</strong></td>
<td><strong>–1,940,201</strong></td>
<td><strong>–952,724</strong></td>
</tr>
</tbody>
</table>

Stockholm, 2 April 2009

Lena Treschow Torell, Chair
Mathilda Tham
Björn Hägglund, Deputy Chair
Lars Magnusson
Maria Strömme
Charlotte Brogren

Our audit report was presented on 2 April 2009

Henrik Söderhielm
Authorized Public Accountant
Appointed by the Swedish National Audit Office

Stefan Nyström
Christina Lindbäck
Svante Axelsson
Cynthia de Wit
Johan Trouvé

Anders Bäckström
Authorized Public Accountant
Håkan Östebo
Authorized Public Accountant

Authorized Public Accountant
Authorized Public Accountant
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Professor,
Royal Swedish Academy of Engineering Sciences

Björn Hägglund, Deputy Chair
PhD (Forestry)

Svante Axelson
Secretary General,
Swedish Society for Nature Conservation

Charlotte Brogren
Vice President R&D, ABB Robotics AB

Christina Lindbäck
Environmental Affairs Manager, RagnSells

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Professor, Uppsala University
Ångström Laboratory

Stefan Nyström
Secretary General, Swedish Anglers’ Association

Maria Strömme
Professor, Uppsala University
Ångström Laboratory

Mathilda Tham
Visiting Professor, Beckmans College of Design

Johan Trouvé
President,
West Sweden Chamber of Commerce and Industry

Cynthia de Wit
Associate Professor, Stockholm University
Analytical Environmental Chemistry Unit

Ola Engelmark
Chief Executive
ola.engelmark@mistra.org
Tel: +46 8 791 10 24

Berith Nordström
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