IHWS

SUMMARY ANNUAL REPORT

2008

DIRECTOR-GENERAL'S REVIEW

2008 has been an eventful year for SMHI. The driving forces behind the changes being carried out have included EU Directives which affect a number of different organisations.

In particular there has been extensive activity on the hydrological side. The water directive places new demands on Sweden's water management and SMHI has been assigned a pivotal role in the process. In consultation with the water authorities, the Swedish Environmental Protection Agency and the Geological Survey of Sweden, SMHI has developed tools and databases during the year for detailed monitoring of flows and water quality in Sweden's lakes and watercourses.

EXTERNAL REQUIREMENTS ON DATA

Other EU Directives which influence both SMHI and other players is the PSI Directive (Public Sector Information) and the INSPIRE Directive (Infrastructure for Spatial Information in Europe). They both aim to secure the availability and quality of various kinds of data. At SMHI we have adapted our data policy to meet new requirements and enable better access to free information for non-commercial operations.

An increased focus on data has also entailed greater demand for data management and data hosting, services SMHI currently provides for various parties and organisations. Handling larger quantities of information and different formats requires a good infrastructure. We are now investing resources in strengthening the infrastructure while adapting it to the EU Directives.

INTERNATIONAL POSITIONING

International co-operation is continuing to develop and is likely to grow even more. At SMHI we have primarily focused on Nordic co-operation, and this has progressed furthest with the Norwegian Meteorological Institute. Together we are developing shared technical systems for visualisation, quality control of data and storage of weather and water information, for example.

SMHI has also continued its positioning internationally. One example during the year is the extensive financing granted by the EU to develop the next generation weather radar network. The current Nordic network will now be expanded to cover the entire Baltic region. SMHI will manage the project and develop part of the functionality.

A programme is under way in the EU called GMES (Global Monitoring for Environment and Security). The programme aims to develop environment-related services and tools based on existing knowledge and resources in Europe. SMHI is contributing in various ways. One example is the MyOcean project in which

SMHI will participate. The project is led by a French research institute, and is part of Europe's programme for global monitoring of the oceans with a special focus on the environment and security in European waters. This project is also an example of SMHI's focus on developing operational oceanography and co-ordinating this increasingly on an international scale.

RESULTS FOR THE YEAR

The goals stated in SMHI's Letter of Appropriation have essentially been fulfilled. The accuracy of forecasts has improved in recent years. One important explanation is the investment in European co-operation regarding model development, greater computer capacity and better use of satellite data, for example.

From an economic perspective, 2008 has been a good year. The results are completely in line with the economic forecasts for the year. The operation funded through government subsidy is in balance and SMHI's Business Services report a profit of 1.8 MSEK.

Maria Ågren, Director-General

Revenues (MSEK)	2008	2007	2006
Governmental Services	236.2	236.1	254.8
Other revenues in Governmental Services	89.0	79.6	61.0
Commission Services	20.5	20.7	17.8
Business Services	207.9	204.7	194.7
Total	553.6	541.1	528.3

CLIMATE

Understanding of the complexity of climate issues is growing, which facilitates co-operation in the area, both nationally and internationally. Within SMHI, research and production work together to supply more and more knowledge adapted to society's various needs.

SMHI's expertise in the area is broad thanks to the collaboration of meteorologists, hydrologists and oceanographers in producing facts that support climate work. This knowledge is increasingly being put to use in society in preparation for imminent climate change.

CLIMATE RESEARCH AS A KNOWLEDGE BASE

SMHI conducts research into climate systems and climate processes with particular emphasis on the Nordic region and the Arctic. The main work tools are regional climate models. The modelling work includes meteorological, oceanographic and hydrological processes.

Co-operation in international networks is important to the research. One example from 2008 is that SMHI organised a scientific meeting with many leading climate scientists. The meeting focused on the development of Earth System Models, a new generation of models that can be used to calculate the future climate, among other things. The models used to date have generally encompassed calculations of physical processes in the climate system. The new models also include biological and chemical processes. The results will lead to increased understanding of mankind's impact on the climate and effects in society. The meeting focused on issues regarding future scenarios for the Nordic region and the Arctic.

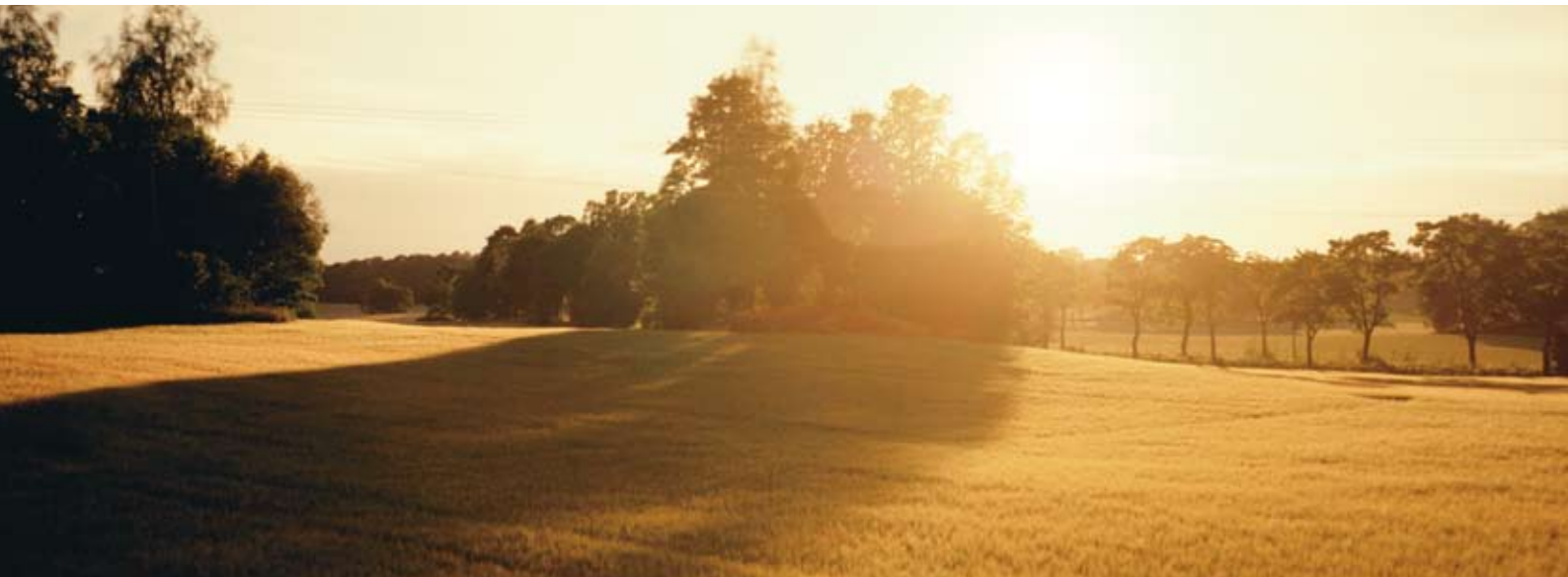
SMHI's researchers have devised a new method for calculating the influx of freshwater into the oceans on a large geographical scale. By linking a calculation model for fresh water to the modelling system for atmosphere and oceans, it has become possible to model the transport of water into the ocean.

For the Arctic region, where a fifth of the land surface is a drainage area, this has special importance for ice formation and circulation in the ocean, for example. The method can be applied to any area in the world.

SMHI is hosting a new research programme, Mistra-SWECIA, which is funded by the Foundation for Strategic Environmental Research (Mistra). SWECIA stands for Swedish Research Programme on Climate, Impacts and Adaptation. The programme brings together scientists in the fields of climate modelling, climate effects, adaptation processes and climate economy. As part of the programme a shared framework for advanced modelling of the climate system, climate effects and economy will be developed. The models will be used in studies of connections and uncertainties, but also to produce scenarios and obtain other results that can be used as a basis for making decisions relating to society's adaptation to climate change.

INCREASED USE OF CLIMATE INFORMATION

Demand for information about the climate is increasing more and more. SMHI's scientists continuously supply data on the conceivable future climate to other scientists and users at authorities, institutes and companies. Work has been carried out during the year to improve access to climate scenario data via the website. The so-called 'Sweden analysis' is an illustrative presentation of clausible climate developments in the future. In addition to a presentation of future temperatures and precipitation for the entire 21st century according to two emission scenarios, there are also observed temperatures and precipitation on a county by county basis.



FORECASTS

SMHI carries out forecasting and warning services in meteorology, hydrology and oceanography. Development efforts in these areas focus on ensuring that the information becomes more accurate, detailed, easy to access and customised.

SMHI monitors the quality of forecasts and warnings using several different parameters. The results show that model development is producing increasingly reliable forecasts which are also more detailed both geographically and in time. To make the information more easily accessible and customised, web services and new forms of co-operation are being developed.

FORECAST QUALITY IS IMPROVING

In 2008, the accuracy of forecasts for the first 24 hours was 83.2 per cent and the accuracy of meteorological warnings was 77.5 per cent. These figures show that quality has improved in recent years. The most important reason for this improvement is the continuous development of SMHI's HIRLAM forecast model (High Resolution Limited Area Model).

A new four-dimensional analysis system has been brought into use after several years in development. The system optimises the use of observations in forecast calculations. Sweden is the third country in the world to apply the method in a regional forecast model.

Accuracy for the five-day forecasts is currently 71.1 per cent. These forecasts are exclusively based on the global forecast model from the ECMWF (European Centre for Medium-Range Weather Forecasts). SMHI actively participates in the development work at the ECMWF. The figure therefore reflects the improvements that SMHI benefits from thanks to this international co-operation. Increased use of and improved access to satellite data has contributed greatly to the four percentage point improvement over the past three years.

International co-operation is very important to the development of the forecasting and warning service. The ECMWF and the EUMETSAT (European Organisation for the Exploitation of Meteorological Satellites) are two major European organisations. They are growing in importance, not only for meteorological institutes in Member States, but also for work on security, environment and climate issues in Europe and globally.

In a great many comparative quality assessments, the ECMWF is clearly a world leader when it comes to the accuracy of medium-range forecasts. In recent years the development of satellite systems within the EUMETSAT has brought about the clearest improvement in observations used in the ECMWF's forecast models.

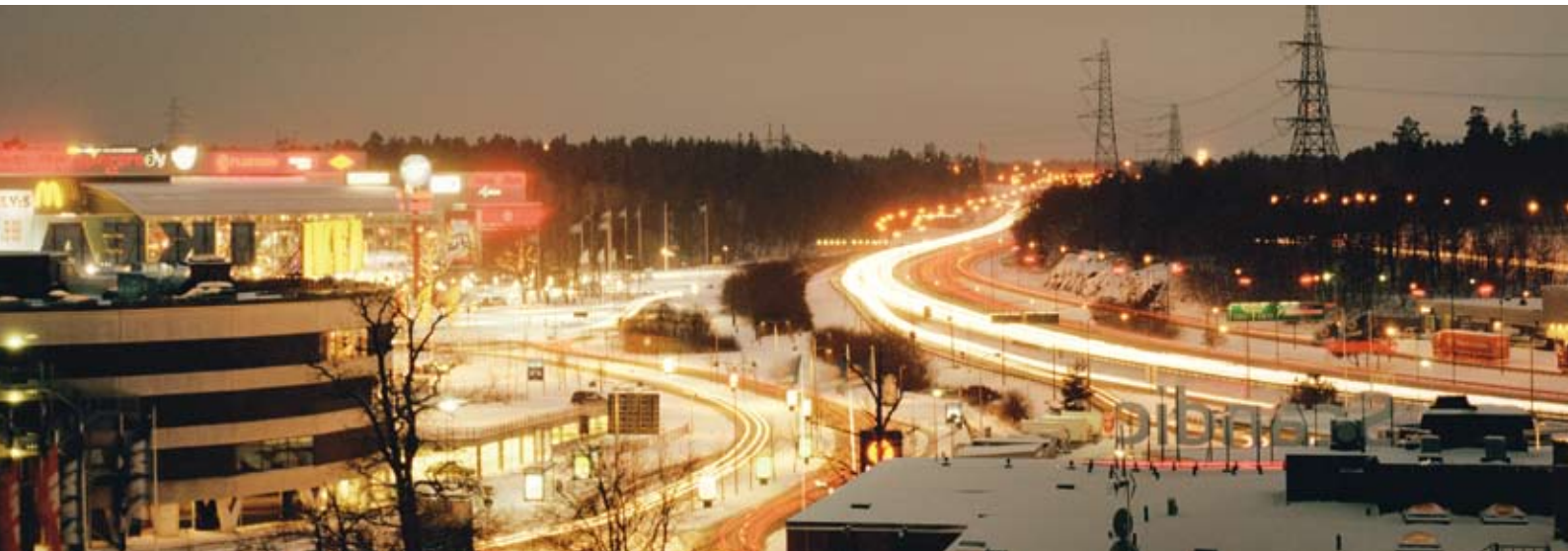
PROBABILITY OF HIGH FLOWS

During 2008 SMHI has developed a new web-based product that can help rescue services and county administrative boards be better prepared for high flows. Daily 9-day forecasts show the probability of high water flows in around a thousand drainage areas across Sweden.

SMHI was the first in Europe to use probability forecasts in hydrological production. This year the working method has been systematised and put into operation. Probabilities of warning levels being exceeded are presented on a map that can be used directly by rescue services and county administrative boards via the website.

WARNINGS REACH SOCIETY

The SMHI website has become increasingly important for the communication of SMHI's information, particularly in connection with weather events that affect society. Ahead of severe weather or water events, SMHI initiates collaboration conferences. These are an important information channel between SMHI and the relevant authorities in Sweden. This form of collaboration began in 2006 and is now well established.



ENVIRONMENT

SMHI contributes to achieving Sweden's environmental quality targets by producing meteorological, hydrological, oceanographic and climatologic information for decision-makers.

The information is used to improve the Baltic Sea and North Sea environment and the air environment in population centres as well as in the administration of Sweden's lakes and watercourses.

STATUS OF THE BALTIC SEA

The Baltic Sea's environmental problems are partly due to shortage of oxygen in the deep basins, eutrophication, acidification and in the future climate change. SMHI studies these processes through measurements, analysis and model calculations.

The Baltic Sea is particularly sensitive to shortage of oxygen due to its topography as a semi-enclosed sea, and the phenomenon can occur without human influence. It is therefore important to distinguish between a natural shortage of oxygen, and a shortage that arises due to eutrophication.

In 2008 SMHI took part in the Helsinki Commission's assessment project on eutrophication. The effects of eutrophication in the Baltic Sea area were estimated by evaluating all aspects of the ecosystem, from the load of nutrients to changes in bottom flora and fauna.

In autumn 2008 SMHI, in collaboration with the Swedish Board of Fisheries, carried out a particularly comprehensive monitoring operation in the Baltic Sea and the eastern North Sea. Data showed that 33 per cent of the entire Baltic Proper suffers from an acute shortage of oxygen, the largest area observed to date.

Low oxygen concentration has an adverse impact on the nutrient balance in the Baltic Sea. At very low oxygen levels, phosphate is released from the sea bed, disperses upwards and becomes available to plankton in the surface layer. Excess phosphate during summer favours blue-green algae, which are often toxic. This is one reason for the strong algal blooms in the Baltic Sea in recent years.

SMHI has developed reference values for nutrient levels in Swedish coastal and deep-sea waters. Today's phosphate levels are too high in the Baltic Proper. This is probably due to the dramatic increase in shortage of oxygen since the year 2000. Today's levels of bioavailable nitrogen in the Baltic are normal, at least in offshore areas.

Future climate change will have serious consequences for the marine environment, with higher water temperatures and probably lower salinity levels, for example. Scientists at SMHI are working with other marine scientists to connect results from model calculations for the future climate with effects on the ocean's biochemistry and fish stocks.

BETTER WATER QUALITY

SMHI is carrying out a major initiative to support Sweden's water management. The goal is an operationally reliable, quality assured information and production system which is accessible via the Internet.

SMHI's initiative aims to adapt different parts of the hydrological and oceanographic production systems to the requirements of Sweden's water management. Planning is taking place in consultation with the water authorities, the Swedish Environmental Protection Agency and the Geological Survey of Sweden.

Water management needs increasingly detailed information on water quality and water flows for individual lakes and watercourses, known as water occurrences. To meet these needs the model calculations are being further developed to increase the resolution, the databases are being modernised, the statistics refined and the number of measurement stations increased. The information is also being made more readily accessible via web services.

During 2008 it became possible for the water authorities to access SMHI's model system and carry out their own calculations of water quality in their area. The system is mainly used for characterising the water, environmental impact analyses and planning measures in work on the EU's Water Framework Directive.

By collaborating in individual drainage areas, the various parties involved in water management and SMHI can jointly evaluate the tools that are developed.

AIR ENVIRONMENT STATUS

SMHI is developing dispersion models for calculating various air quality parameters. This is largely taking place in European collaborations and means that SMHI is well placed to provide information about air quality in Sweden.

The models use input data from meteorological forecast models and measurements, as well as emission data from emission databases. The dispersion process is described physically and chemically on different geographic scales. The results describe both local and long-term contributions to different pollution levels.

Inhalable particles are the form of air pollution that create the biggest health problems in population centres in Sweden. The most important contributors are long-distance transport, traffic and small-scale wood burning.

SMHI has developed web-based user interfaces for its models which simulate inhalable particle levels. The models can be used by any municipality in Sweden.

BUSINESS SERVICES

Sales for Business Services remain stable and amounted to 207.9 MSEK in 2008. A number of new products have been launched during the year. Product development aims to increase customer benefit, which in turn can lead to lower environmental impact, adaptation to climate change and energy efficiency.

Turnover for Business Services has increased by just under 2 per cent since last year. A number of new products focusing on increased customer benefit have been launched during the year. Operating profit totalled 9.2 MSEK, slightly lower than last year. Profit including costs for joint projects and interest income was 1.8 MSEK, compared to 3.4 MSEK in 2007. The decrease in profit can largely be attributed to initiatives that entailed increased costs to strengthen the sales organisation.

The turnover for service exports amounted to 45.6 MSEK, an increase of 13 per cent on 2007. Profit is positive at 0.8 MSEK. Service export encompasses Sida-funded training and education as well as forecasts and consultancy services, for instance in the areas of shipping, energy, environment and media.

MARKET DEVELOPMENT

Society's focus on climate and environmental issues has increased demand for SMHI's services and products, while at the same time more players are establishing themselves in these markets.

The market for consultancy services developed positively in 2008 and SMHI has performed well in niches of the climate and environment market. A large number of climate seminars, 220 in total, have been held for municipalities and Swedish companies.

The debate on climate and energy has meant that new customer groups are requesting weather parameters to support their daily investment decisions. SMHI has expanded its customer group in the energy sector outside of Sweden through a closer collaboration with the Norwegian news agency Montel Powernews. The agency delivers news to players in electricity and energy trading in Scandinavia and Europe.

Demand for SMHI's products for controlling the heating of premises based on weather forecasts has increased, which is a sign of greater awareness in energy efficiency.

More and more customers are realising that they can benefit from synchronising their activities with the effects of weather and water. Lower impact on the environment, energy efficiency and business optimisation are positive effects. SMHI is continuing to work in line with the WeatherSync® concept, which incorporates SMHI's working method, as well as the services' impact on customer operations. The aim is to contribute to the development of customers' weather and water-dependent activities.

Handling data from other players is an area that is growing in importance. SMHI offers data hosting in various areas, such as environmental work. This means that SMHI archives and quality assures data and information, and makes it available. The service provides effective support for other operators.

ADAPTATION TO CLIMATE CHANGE

One example of how SMHI contributes to society's adaptation to the future climate is an assignment from the energy company Vattenfall. SMHI has developed a new forecast model for assessing the influx of water into Sweden's largest lake, Lake Vänern. By forecasting high water levels several weeks in advance, Vattenfall can start draining Lake Vänern as a precautionary measure. This will not eliminate the risk of serious flooding, but it should at least restrict the flooding.

To be able to regulate the water level in the way currently being proposed, detailed hydrological forecasts are required for Lake Vänern's catchment areas. The forecast model developed by SMHI is based on collating a large number of meteorological forecasts and converting them into hydrological forecasts. SMHI therefore delivers eight-week forecasts in an easily accessible web-based presentation. County administrative boards and rescue services can also access these forecasts.

COST-EFFECTIVE DECISIONS FOR THE ENVIRONMENT

There is growing demand for SMHI's expertise and support in environmental hydrology. SMHI data is used to make decisions which both improve the environment in lakes or watercourses and are cost effective. SMHI's

support is in demand in balancing between energy and environmental benefit.

SMHI products and consultants contribute to sustainable development also for players in the agricultural sector. Customised forecast services are used as decision-making material for agricultural organisations of various sizes, and with different types of main focus area. The information makes it easier for farmers to plan and streamline their operations, and also to protect the environment.

GREEN APPROACH

The term 'green approach' means that upon landing, an aircraft glides from its cruising altitude down to the runway. This entails a significant reduction in fuel consumption, with benefits for the environment and airlines alike. Since 2006 the Swedish Civil Aviation Authority and Scandinavian Airlines have been testing the technology with successful results. Today the concept is approved and approximately 10 per cent of the landings at Stockholm Arlanda take place this way.

A successful green approach requires accurate information about winds at a number of levels from cruising altitude down to the ground. SMHI was an advisor during the development of a calculation method.

A CHANGING AVIATION WEATHER SERVICE

Weather forecasts have always been important for the aviation and SMHI has longed played a pivotal role. Aviation forecasts are issued every three hours and made available to landing aircraft from around the world. In 2008 there was a major change in the aviation forecasts in line with new international requirements from airlines. Changes in production times and new meteorological codes enable longer forecasts. Optimal use of air space and minimisation of fuel consumption are becoming increasingly important. Weather conditions and forecasts are therefore also growing in importance.

Europe is seeing a strong focus on new technology and more efficient organisation of air traffic control. Far-reaching changes in aviation weather services in Europe can also be expected.

In preparation for these changes, the Nordic aviation weather service providers have drawn closer with the aim of finding possibilities for collaborating on and streamlining the weather services for air traffic.

A CHANGING MEDIA MARKET

Consolidation on the media market has intensified during the year, and more and more of SMHI's customers are now part of large media groups. This is an advantage for SMHI as the products have been developed so that the weather is supplied as a news item adapted for the entire media sector.

Increased competition has been observed during the year, in particular from Norway. Nevertheless, SMHI has maintained a leading position in Sweden and has been able to expand, both nationally and internationally. SMHI's application for online weather, SMHI Flash, is now available in 14 languages and is not only used in Sweden but also in Finland, Estonia and Spain.

VESSEL GUIDANCE

During the year SMHI has focused further on assisting operators on land and vessel captains choose shipping routes that are both safe and optimal. This work has included improving the tools and products regarding visualisation. The onboard systems have been further refined to also include land-based web services.

The EU project MarNIS, which involves 50 partners including SMHI, was completed during the year with good results. A brand new concept for calculating vessels' arrival times has been developed.

INTERNATIONAL COMPETENCE BUILDING

SMHI supports building up competence in the rest of the world within its areas of operation. This work is being funded primarily by Sida.

SMHI's collaboration with the weather service in Botswana is well-established. The collaboration has been running since 2006 and there are now plans in place for up to 2011.

SMHI's Sida-funded course entitled 'Climate Change Mitigation and Adaptation' has been carried out twice during the year. Sida's prioritisation of climate issues influences demand. There were a high number of applicants for the course and subsequent evaluations were positive.

Anfang Reklambyrå, Norrköping Tryck: Norrköpings Tryckeri AB

SMHI, the Swedish Meteorological and Hydrological Institute, is a government agency under the Ministry of the Environment. SMHI manages and develops information on weather, water and climate that provides knowledge and advanced decision-making information for public services, the private sector and the general public. SMHI's national and international co-operation is extensive.

Government agency and business partner
SMHI offers products and services that provide various kinds of enterprises and organisations with an important foundation for decision-making. General forecasts and weather warnings, industry-specific services, simulations and analyses, statistics, climate studies and contracted research are some examples.

SMHI's operation is funded in three main ways: by government subsidy, by assignment from other government agencies, and on commercial terms through its Business Services. Although apparently different on the surface, these operations are all based on the same fundamental aim – to contribute to increased social benefit, safety and a sustainable society.

From observation to decision-making information
Air and water are crucial to life on earth and an important part of our environment. Observations and measurements are made from various observation stations and with balloon-carried instruments, as well as from aircraft, ships and buoys. Satellites, weather radar and lightning sensors provide information. The collected data is structured, processed and analysed in highly powerful computers. SMHI makes forecasts and develops various decision-making material for society and monitors climate and environmental developments. SMHI's real time operations are up and running 24 hours a day, all year round. Warning of strains and extreme weather conditions is an important task.

A host of products and consultancy services are being developed and adapted to the needs of various users. In addition to weather forecasts specially adapted to particular business sectors, many of SMHI's assignments relate to the climate and the environment, issues that are highly connected with conditions in air and water. SMHI's customers can be found in the public sector as well as in media, shipping, energy, transport, commerce, construction and real estate management.

Research and development
SMHI conducts extensive research. The aim is to improve forecasts for weather and water conditions, and to develop methods for analysing climate change and environmental problems linked to the atmosphere, oceans, lakes and watercourses.

Research is funded through three operational sections: infrastructure and decision data, commission services and business services. Important research funding is also provided through national and international research subsidies.

SMHI has a turnover in the region of 550 MSEK and just over 600 employees.

SMHI

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