SMHI

SUMMARY ANNUAL REPORT

2013

DIRECTOR GENERAL'S OUTLOOK

» Sweden's Most Modern Agency

On 19 November 2013, SMHI was presented with the award "Sweden's Most Modern Agency". This award was created to promote an innovative and synergistic public administration. We see this award as confirmation that we have established an approach that allows us to be both innovative and efficient. We are honoured by the jury's comments: "SMHI is, in a broad sense, a good exponent of the modern state". Collaboration and transparency are important watchwords in our organisation. We must, and will, continue to refine the modern agency.

Transparent data within all disciplines

SMHI has an extensive amount of data within all of our disciplines. From January 2014, all of our data is transparent and open to use, and it is possible to download the most frequently requested data from our website at no cost. We are pioneers in doing this, and our hope is that the open data policy of SMHI will contribute to innovation and development.

Research to promote development and innovation

During the year, the EU's Seventh Framework Programme for Research and Technological Development, FP7, has launched its last call. In connection with this, we can sum up a successful period during which we have been one of the major Swedish participants in the areas Environment and Space. SMHI has contributed in 38 FP7 projects, and has coordinated five of these. For the new framework programme Horizon 2020, we will bring in our experiences and networks, along with new thoughts on how to formulate research questions and on how to put together projects. In this way we will continue to develop knowledge to meet the needs of SMHI and the Swedish society, while strengthening innovative European research in a global context.

Baltic cooperation on aviation weather services

We continue to expand our international cooperation. Our joint production of aviation weather forecasts together with the Danish Meteorological Institute is fully underway and is working well. We continue to develop and rationalise the production. The Director Generals in the Nordic countries, along with Estonia and Latvia, have signed an agreement this year regarding future collaboration. This means that all seven institutes will work together on aviation weather forecasts in the new geographical air traffic control area in northern Europe – if and when the EU has made a decision regarding the next step of a joint European airspace.

Collaboration on more detailed forecast bases

The joint Numerical Weather Prediction (NWP) production with the Norwegian Meteorological Institute is deployed in March 2014. The aim is to increase the quality of weather forecasts by using a higher resolution NWP model. The ability to assess local effects and extreme situations increases as the forecast becomes more detailed and better in taking into account topographical effects such as a coastlines and mountains.

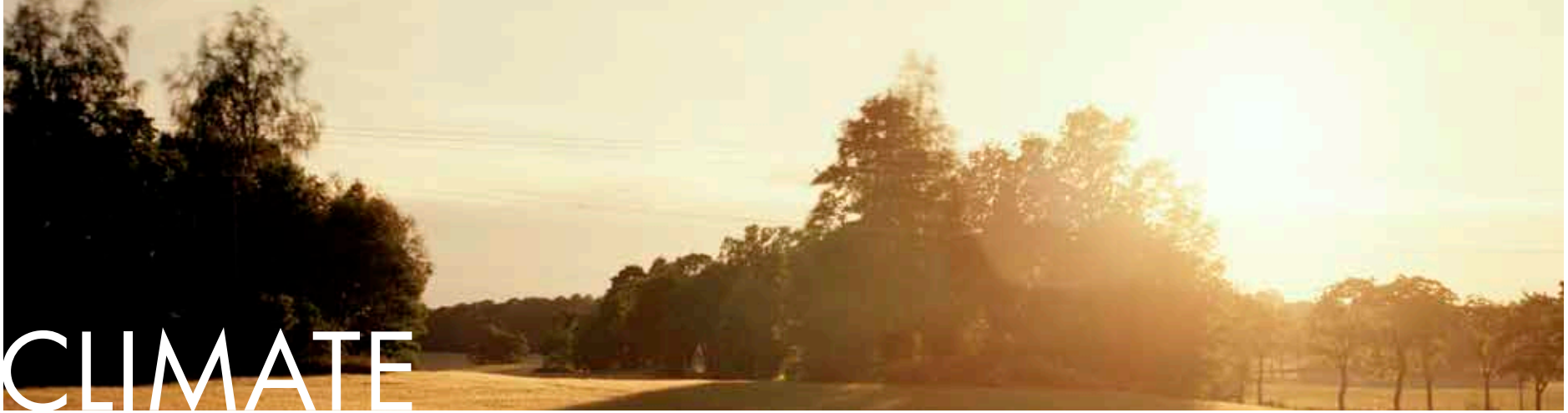
IPCC meeting in Stockholm

In September, the first interim report of the Fifth Assessment Report from the UN Intergovernmental Panel on Climate Change (IPCC) was presented in Stockholm. This interim report highlights the scientific documentation on the climate issue, and SMHI researchers have contributed research results and data, and have participated in the review process. I hope this report will help to put the climate issue high on the global agenda again. Over the year, we have continued to focus on mediating knowledge about a changing climate and about climate change adaptation.

Lastly...

Here at SMHI, we are of course very proud and happy to have received the award Sweden's Most Modern Agency, which I spoke of earlier. But this does not mean that we can now rest easy, knowing that we are "modern". The award obligates us to continue developing along with our clients' needs and in line with global developments. «

Lena Häll Eriksson
Director General



CLIMATE

Over the year, the National Knowledge Centre for Climate Change Adaptation has developed basis for decision-making and worked to increase awareness and understanding of climate change adaptation. The research conducted at the Rossby Centre has contributed essential information on how the climate is changing.

NATIONAL KNOWLEDGE CENTRE FOR CLIMATE CHANGE ADAPTATION

Klimatanpassning.se is the main communication channel of the National Knowledge Centre for Climate Change Adaptation. The portal collects information and knowledge intended to facilitate the climate change adaptation of the society. Lectures at around 100 seminars and conferences have been given by the Knowledge Centre and the film ”Klimatanpassning i Sverige” (Climate Change Adaption in Sweden) was produced this year. The County Administrative Boards have continuously been given support to interpret information in matters relating to climate change, adaptation and vulnerability.

INTERNATIONAL COOPERATION ON CLIMATE CHANGE ADAPTATION AND CLIMATE SERVICES

SMHI is participating in the implementation of the EU Strategy for the Baltic Sea Region when it comes to sustainable development, and is also the Swedish point of contact for the priority area “Measures to counteract - and adapt the Baltic Sea Region to - climate change”. A proposal for the Strategy for adaptation to climate change in the Baltic Sea Region has been coordinated by SMHI within the scope of the EU project Baltadapt.

The European network for research funding agencies, CIRCLE-2, in which SMHI plays an active role, is in its final phase. Over the year, workshops have been organised and a new database of adaptation examples called the InfoBase has been established.

CONTRIBUTIONS TO IPCC

SMHI has contributed in several ways to the work on the first part of the Fifth Assessment Report from the UN Intergovernmental Panel on Climate Change (IPCC). Research articles and climate simulations using the global climate model EC-Earth are part of the documentation on which the report is based. Climate experts and researchers from SMHI have contributed as authors, expert reviewers and, as part of the Swedish delegation, in the final hearing of the report. In connection with the launch of the first interim report in September, SMHI also carried out public communication activities.

REGIONAL CLIMATE SIMULATIONS

Within the framework of the Coordinated Regional Climate Downscaling Experiment (CORDEX), researchers from SMHI have completed 115 regional climate simulations for future climate in Africa, the Arctic, Europe, the Middle East, South Asia and South America. For three areas in Africa, the researchers have calculated Standardised Precipitation Indices. National agencies can use these for effect and adaptation planning, for example, for access to fresh water and to support measures to reduce emissions. SMHI has also published high-resolution, regional climate simulations for Europe. These are more detailed and give more consideration to local and regional variations in the landscape.

GLOBAL CLIMATE SIMULATIONS WITH EC-EARTH

Researchers have finalised deliveries of climate simulations for the period 1850-2100 to the archives of the Climate Model Intercomparison Project (CMIP5), and experimental decadal hindcasts and predictions from 1960 until today. These simulations were carried out using the Earth System Model EC-Earth. These deliveries form an important milestone in the work on global climate simulation, and can be used to compare different climate models and study climate effects.

CLIMATE CHANGES IN THE ARCTIC

Understanding various processes that impact on the climate of the Arctic, and how these affect bordering regions is important to increase our knowledge of future climate changes.

Researchers now have better explanations for how various feedback processes interact, and how circulation in the atmosphere and oceans convey heat to the Arctic. They have also been able to show how satellite data can be used to increase knowledge of the Arctic climate system.

ENVIRONMENT

In national and international collaboration, SMHI plays an active part in promoting better water environments, on land and in the sea. SMHI develops models to increase the understanding of atmospheric processes, and to provide a knowledge basis for measures that contribute to the fulfilment of the environmental objective of 'Clean Air'.

SMHI continues to support the government's work on reducing Short-lived Climate Pollutants (SLCP). During the course of 2013, SMHI has contributed to the investigation of new milestone targets within the environmental objective of 'Clean Air', and to work with the Clean Air Coalition (CCAC). SMHI has also continued running the national SLCP website.

SUPPORT IN WORK WITH THE WATER ENVIRONMENT

Physical impacts and eutrophication are the most extensive environmental problems in Sweden today. SMHI has used the hydrological model S-HYPE to calculate the condition of the fresh water environment. These calculations include parameters that describe the effect of water regulations on hydrology, as well as transport and distribution of eutrophicating substances. Two new online tools have been launched based on model calculations and visualization, showing distribution of nitrogen and phosphorus in terms of sectors and geography. Also, SMHI has calculated the amount of nitrogen and phosphorus transported on a daily basis to the seas around Europe and the sources contributing to this. The results show that agriculture releases the most nitrogen into the seas around the European coasts, while the emissions of phosphorus to a relatively large extent come from treatment plants. The calculations for Europe have been done using the SMHI hydrology model; E-HYPE.

INCREASED SAFETY AT SEA

MIMIC is an EU project to minimise the risks connected to oil transports at sea. Its purpose is to make simpler and safer decisions on cost-effective measures to reduce the risk of oil spills. SMHI has primarily been working on further development of Seatrack Web, an online system used by all organisations tasked with combating oil spills in the Baltic Sea. Seatrack Web helps the prognosis of how a spill will spread, and to which coastlines it can be expected to drift.

THE OTHER CARBON DIOXIDE PROBLEM

CO_2 emissions from the combustion of fossil fuels are leading to acidification of the oceans. This phenomenon is commonly referred to as "the other carbon dioxide problem". Declining pH values will most likely have a great impact on the ocean life.

Animals and plants that have calcium in their shells or skeleton will be affected, but animals in their larvae stage are also particularly vulnerable. Certain research results indicate that cyanobacteria (blue-green algae) benefit from the acidification. SMHI is monitoring animals and phytoplankton in the seas around Sweden, and measures pH and CO_2, as part of its national environmental surveillance, and within the EU project JERICO.

SATELLITE DATA AND SIMULATION MODELS; TOOLS IN THE RESEARCH ON AIR QUALITY

After analysing satellite data, researchers have been able to establish that around 70 per cent of the total amount of aerosols in the atmosphere above Sweden is located at an altitude of less than one kilometre. Pollution from continental Europe greatly influences air quality in Sweden when there are winds from the south.

The simulation models show that future depositions of sulphur and nitrogen compounds is controlled more by the amount of emission than by climate change. The deposition of sulphur and oxidised nitrogen is declining in all of Europe between 2000 and 2050. The deposition of reduced nitrogen is only declining in northern and eastern Europe.

NEW RESEARCH PROGRAM – BALTIC EARTH

The seventh and final Baltex conference launched the project Baltic Earth, a new interdisciplinary research programme led by researchers from SMHI. Baltic Earth takes an earth system perspective, focusing on the interaction between the physical and biochemical processes in the Baltic Sea, and interactions with the atmosphere, in the sea, with sea ice and on land. Human impact on the environment is also included.

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FORECASTING

By 2020, all the Nordic countries will most likely have a joint forecast production, in order to increase the accuracy of forecasts and warnings.

The accuracy of SMHI's forecasts has been stable over the last few years, with a small improvement in 2013. The weather services in Sweden and Norway have jointly developed a high resolution weather model that intends to better describe the local weather variations. This model is central for the joint forecast production which started in 2014 by SMHI and the Norwegian Meteorological Institute.

The meteorological collaboration is becoming tighter between the Nordic weather services. By 2020, all the Nordic countries will most likely have a joint forecast production, in order to increase the accuracy of forecasts and warnings. By collaborating, the countries can share the costs of the huge computer resources required for the model calculations.

JOINT FORECAST PRODUCTION

SMHI and the Norwegian weather service initiated a project in 2011 to prepare for a joint forecast production starting in 2014. Forecasters, researchers and system developers from the Swedish and Norwegian weather services have been working side by side to refine the model and the technical solutions in preparation of the launch of the joint production. Meteorological tools and working methods have also been adapted to this new model. Forecast calculations will be carried out on supercomputers in Norway and Sweden, where the respective institutes alternate in covering the new investment. New and improved products for the users are also possible to develop based on high resolution ensemble calculations/forecasts, such as information concerning probabilities and distribution measurements.

HEAT ALERTS WERE INTRODUCED IN TIME FOR THE SUMMER

After a few years of testing, SMHI started issuing notices and warnings of heat waves this summer, as part of the regular weather warning services. An alert of a heat wave is issued when the daytime temperature is expected to be above 26 degrees for three days in a row. If the temperature is expected to exceed 30 degrees during three days, a class 1 warning will be issued. A class 2 warning will be issued when the temperature is expected to exceed 30 degrees for a period of five days, or 33 degrees for three days in a row.

In 2013, a number of alerts were issued, but no warnings. The notices were mainly linked to two periods; one at the end of May and one slightly longer period in late July.

HYDROLOGICAL WARNINGS IN EUROPEAN COLLABORATION

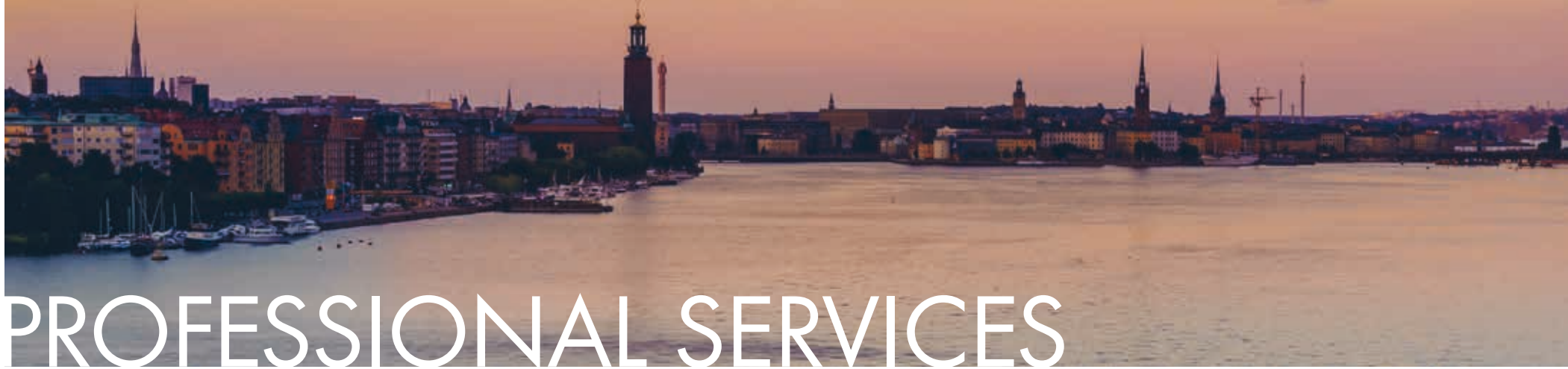
SMHI is involved as a coordinator in the European Flood Awareness System (EFAS), to monitor the rivers with outlets into the Baltic Sea as well as the Elbe. Our colleagues in the Netherlands and Slovakia monitor the other rivers in Europe. SMHI has the task of monitoring the hydrological situation, and providing early warnings of high runoff. These warnings are sent to the national hydrological institutes, which will then handle the information to the public, assist rescue services etc. ERCC (former MIC), the authority that coordinates emergency response in the EU, receives daily summaries of the hydrological situation.

SMHI IS ACTIVE WITHIN NORDIC COLLABORATION

Within a collaboration between SMHI and the Finnish Meteorological Institute a new ice mapping system will be developed. This system will be used by each country's ice services, and will utilise better and more modern support information.

Within the project BALTRAD+, coordinated by SMHI, new software for exchange of radar data in real time has been developed. Thirteen partners in ten countries around the Baltic Sea have participated.

The project was completed in the beginning of 2014, and will continue as an Open Source collaboration. In 2013, Russia and Ukraine also joined this collaboration. The software has had a great impact, and is now used at meteorological institutes in Europe, both in forecast work and model development.



PROFESSIONAL SERVICES

The Professional Services of SMHI markets and produces customised and industry-specific forecasting services aimed at customers in spheres such as media, industry and commerce, agriculture, shipping, infrastructure, energy, the building trade and property management. Professional Services department has collective environmental expertise including marketing responsibility for consulting services.

SMHI has decided to make its data openly available in order to make it easier for other actors to further develop products and services. Through guidance and consultation, the client can be assisted in finding and compiling quality-assured data.

IMPROVED FORECAST QUALITY

In order to increase the perceived forecast quality, new models, methods and presentations are developed to the latest technology. Statistical processing of forecast services for winter road maintenance has yielded positive results. The benefits of improved forecasts lead to safer roads and less accidents caused by icy conditions and slush.

NEW DIGITAL SERVICES

SMHI adapts consumer products to the changes seen within the media industry, where digital services, primarily mobile, are becoming increasingly important.

The collaboration with Sweden's largest daily newspaper Dagens Nyheter on the weather site weatherpal.se has increased the overall understanding of visitor behaviour and needs. SMHI supplies forecasts, weather expertise, products and weather-related news.

As major clients are to an increasing extent working in a global arena, a new web service has been developed that can handle weather data with good global coverage and which supports several languages.

DECISION DATA FOR THE MARITIME INDUSTRY

The current global market conditions have severely impacted the maritime industry. The high oil prices mean that the shipping companies' fuel costs constitute approximately 40–70 per cent of their total operating costs. There is a pressing need to optimise speed and minimise fuel costs. SMHI has developed a visualisation tool that visualises how meteorological and oceanographic parameters affect speed, fuel consumption, estimated arrival times and other determining factors for safe and cost-efficient transports. The potential to visualise reality, both in terms of analysing the past and forecasting the future, has been further refined during the course of the year. By visualising the impact of different on-board procedures and behaviour which affect the total energy consumption for the transport, the shipping companies can identify vessels that are not sufficiently profitable.

SUPPORT FOR MAJOR INFRASTRUCTURE INVESTMENTS

The expertise of SMHI is in high demand when it comes to the major infrastructure investments on Sweden's agenda.

The planned West Link in Göteborg requires in-depth analyses of how the on-going climate changes may affect the dimensions of various structures. SMHI contributes expert advice linked to climate research results, as well as support in the adaptation of a long-term sustainable investment.

SMHI has compiled information on the sources contributing to air pollution, such as road traffic, maritime traffic and energy production. Computational tools have then been used to determine how these various emission sources affect the concentrations over Göteborg. The results of these calculations have been used by the City of Göteborg as part of the environmental report for the infrastructure investment entitled the West Swedish Agreement.

Commissioned by the City of Stockholm, the SMHI Professional Services have been working for several years with the goal of developing a new strategy for the regulation of water levels in Lake Mälaren. This strategy is now in place and, in order to support the city in the work to establish the New Slussen area, a hydrological forecast system is being developed based on expected inflow to Mälaren and forecasts regarding the water level of the Baltic. This system serves as an important support function in the expansion phase of the Slussen project, and contributes

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AUTHORITY COMMISSIONS

to securing Stockholm against flooding, while reducing the risk of salt water inflow from the Baltic that could pollute the water supply of around two million people.

EXPORTING KNOWLEDGE ON CLIMATE CHANGE

2013 saw the conclusion of Climate Change – Mitigation and Adaptation, an advanced training programme for developing countries that SMHI has been organising in collaboration with Sweco and Stockholm Environmental Institute (SEI) since 2007. The programme has been financed by Sida, and the overall goal has been to increase and transfer knowledge on climate changes and their consequences.

At regional follow-up meetings, the participants have presented the results of their own projects. The majority of the studies have dealt with water resources, agriculture, education and communication.

Most of the participants are convinced that the knowledge they have acquired has been of great use in their own organisation, and that it has led to an increased awareness among the general public and politicians in their countries. Most of them employ several of the tools provided through the programme. The majority of the participants have joined networks that open up the possibilities for future collaboration and the exchange of information and experience. These programmes have also led to new networks being created, such as the Africa Partnership on Climate Change Coalition (APCCC), which began in Tanzania in 2007.

SMHI carries out assignments from various public authorities, such as the Swedish Environmental Protection Agency, the Swedish Agency for Marine and Water Management, the Swedish Civil Contingencies Agency and the Swedish Transport Administration.

FORECASTS FOR SAFER AVIATION

As of 1 May 2013, SMHI is the designated and exclusive supplier of forecast and warning services in Swedish airspace.

The requirements on these services are formulated in a performance plan established by Eurocontrol, the European organisation that controls the airspace in parts of Europe. The performance plans state how deliveries are to be successively streamlined.

In order to live up to the European coordination and streamlining requirements, SMHI is collaborating with the Danish Meteorological Institute (DMI), to deliver aviation weather services in the combined Swedish-Danish airspace. This collaboration, which became operational in 2013, is unique in Europe, and has allowed both institutes to reduce the number of hours spent on aviation weather forecast production by approximately 15 per cent, without reducing quality.

IMPROVED URBAN AIR QUALITY

Reference Laboratory – models is an advisory service helping municipalities in their air quality management. SMHI is operating these activities by commission from the Swedish Environmental Protection Agency in order to facilitate the use of air quality models. Models are important tools in surveying air pollution models and planning measures to improve air quality. Over the years, the Reference Laboratory has developed its activities to include consultation via the website, telephone and e-mail to municipalities and other model users.

On the website, there is a checklist that gives a step-by-step description of appropriate measures to take when carrying out model calculations. There is also a tool that can be used to estimate how a model result will cope when faced with statutory quality requirements.

SERIOUS HYPOXIA IN THE BALTIC SEA

In collaboration with the Swedish Agency for Marine and Water Management, SMHI is involved in maritime surveillance to examine the marine environment of the Baltic Sea, Kattegat and Skagerrak. One measurement of the environmental condition of the sea is the amount of oxygen found in the water.

Data for 2012 collected in the Baltic International Acoustic Survey (BIAS), with contributions from Sweden, Poland, Estonia and Finland, has been analysed. The results indicate that the extreme oxygen conditions observed in the Baltic Proper after 1999 continues. The proportion of areas affected by hypoxia (oxygen deficiency) and anoxia (total depletion of oxygen levels) continue to be at levels that have never before been seen in the deep waters of the Baltic Sea.

About SMHI

The Swedish Meteorological and Hydrological Institute (SMHI) is a government agency operating under the auspices of the Ministry of the Environment. As expert organisation in the fields of meteorology, hydrology, oceanography, and climatology, SMHI aims to provide social benefits by increasing safety, and fostering a more sustainable society.

Air and water are crucial to life on earth and to the environment. Knowledge and advanced information let us meet the challenges presented by our climate, weather, and air and water conditions.

SMHI manages and develops information that provides knowledge and advanced decision-making information for public services, the private sector, and the public. General forecasts and weather warnings, industry-specific services, simulations and analyses, statistics, climate studies, and contracted research are just a few of its many services. SMHI's national and international cooperation is extensive as well.

SMHI operations are funded in various ways, by government subsidy, on contract for other government agencies, by research funding, and on commercial terms through its professional services. SMHI has about 640 employees and a turnover of approximately SEK 640 million, of which approximately SEK 200 million is in the assignment and professional services area.

SMHI

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