

The North German Climate Office – an interface between science and practice

Insa Meinke¹ and Hans von Storch^{1,2}

¹*Institute for Coastal Research, GKSS-Research Centre, Max-Planck-Str. 1, 21502 Geesthacht, E-Mail: insa.meinke@gkss.de, phone: +494152871868*

²*Meteorological Institute, University of Hamburg, Bundesstraße 55, 20146 Hamburg*

1 The North German Climate Office

The North German Climate Office has been set up at GKSS as an interface between science and practice. After several years of experience in the field of regional climate change research we have sensed a broad need in the public to communicate and discuss climate change impacts and risks for certain regions. In Northern Germany risks are especially related to storms, storm surges and ocean waves, but also to flooding, droughts and heat waves as consequence of a changed energy and water cycle. A public opinion poll by Bray et al. 2007 showed that communication of scientific results is assessed as insufficient, in particular in the field of coastal research. 64% of the respondent would like to see science stronger involved with their particular home region. The communication of scientific results should be in plain language and with media easily accessible (Bray et al., 2007).

The communication between science, on the one side, and the public and stakeholders, on the other side, needs to base on what the scientific insights are. Besides communicating results of climate change scenarios we need to also explain what their limitations are and which type of uncertainty is associated with this scientific knowledge. At the same time, science has insufficient insight in the type of questions and concerns raised in the public and relevant for stakeholders. Thus, there are two main tasks of the North German Climate Office. One is to explore the range of perceptions, views, questions, needs, concerns and knowledge in the public and among stakeholders about climate, climate change and climate risks. The other task is to convey the content of scientific knowledge into the public, to media and to stakeholders. This includes communicating also the limitations of such knowledge, the known uncertainties and the unknowable, as well as the limited role of science in complex social decision processes.

1.1 Research activities at the GKSS Institute for Coastal Research

The North German Climate Office provides climate change information mainly based on research done at the GKSS Institute for Coastal Research (IfK) and by its partners in the Centre for Atmospheric and Marine Research (ZMAW) in Hamburg. The IfK focuses in particular on the impact of global climate change on regional scales, in particular coastal systems. Regional climate of coastal systems is analyzed for different time scales, namely recent past (50-100 years ago) and historical past (200 and more years ago). Our research of future climate change is based on numerical scenarios for different time spans. In this context we mainly focus on storms, storm surges and wave heights. Further analyzes are also due to the energy- and water cycle components within coastal systems. Coastal systems are complex systems forced not only by atmospheric components, but also by properties of river catchments and human activities. Climate variability and climate change in Northern Germany are strongly correlated to the coastal response.

1.2 Data availability

Most of the data created in the frame of the above activities are stored in a data base at the Institute for Coastal Research, named CoastDat. This data base contains information on coastal climate variables, such as storms, wave heights and water levels for future, present and past time periods. The data base receives an ongoing actualization and is open to the public. The Institute for Coastal Research at GKSS is also partner of EU-Projects focussing on future regional climate change in Europe. As project partner we have access to all scenarios of these projects, covering the time spans from 1960 to 1990 and from 2070 to 2100. The data has a horizontal resolution of about 50 kilometres. This allows us to

derive climate projections based on area means over Northern Germany. In 2007 the DKRZ started with another set of climate scenarios, the so-called Konsortialrechnungen, calculated by the German community model CLM. These scenarios cover the time span 1960 to 2100 and have a horizontal resolution of 16 km. On the basis of these scenarios we can derive climate changes scenarios for certain natural landscape units. Also, the time span analyzed is more flexible compared to the data base provided by the above mentioned EU projects. Soon, the data will be open also to the public. Access and use are helped with by the DKRZ “service group adaptation” (SGA).

2 Providing regional climate change information for decision making processes

Regional climate change information needs to be integrated into the general public since climate change demands adaptation on every level, up to private households. Increased communication is needed to reach acceptance for the need of climate change adaptation strategies. The need to operate with scenarios, i.e., visions of possible, plausible, internally consistent alternative futures, as opposed to the availability of predictions has to be explained. Stakeholders need regional climate change information as basis for planning purposes.

Based on our interaction with the public we found some barriers of integrating climate change information into decision making processes. In the following, some examples are shown. They are based on experiences during our communication activities in the last year.

2.1 *General public*

The “Climate change is natural”-view

The IPCC reports in 2001 and 2007 showed conclusively that global warming during the last decades of the 20th century is not explainable without anthropogenic greenhouse gas forcing. Nevertheless, large parts of the public still assume that recent climate changes are due to natural variability. We, however, expect that future climate changes will differ from historical climate changes. During the last century we adapted to 0.8K warming. Adapting to 2K, i.e., to another 1.2K, or more warming within this century will be a great challenge. Thus, strategies of adaptation to a changing climate combined with efforts to limit CO₂ emission are needed. To achieve acceptance in the general public for this strategy, increasing the communication of the latest IPCC results has still high priority.

Weather, climate and media

Public attention to climate change issues is still highly correlated with the actual weather regime. In case of weather anomalies or extreme events public attention for climate change issues is increased. Whereas, a wet and cold summer may decrease attention for climate change issues, since it is assumed, that climate change will not affect the particular home region and / or is still far away.

We assume that this is mainly related to the media coverage of climate change issues. A public opinion poll by Bray et al. (2007) showed that a majority would like to see an increased coverage of scientific results in the media, independent from actual weather regimes. Another study of Heinrichs and Peters (2004) shows that recipients actively engage with media content.

Even if the media offer interpretations of the characteristics and mechanisms behind climate change and of the state and needs of coastal protection, the perception of individual depends significantly on the social and cultural milieu of the individuals; they build their own views, which are only to a limited extent influenced by media. Thus, in order to increase direct interaction, we decided to also increase our activities on other platforms like talks, classes, exhibitions and round table discussions.

Global and regional

There is still much uncertainty in the general public on how climate change will impact certain regions. Many people still think that climate change is a global issue and either will not have any or might have unknown consequences for their home regions. Thus, it is important to downscale climate change information as much as it makes sense. Also, characteristics of the particular natural landscape units need to be addressed in the climate change context.

Recent past and future

Recent and future climate change projections are often mixed. For some climate variables, this leads to confusions in the public. For example, in case of a heavy storm event, we are often asked by the media if this is already a consequence of a changed climate. The answer is “no”, since the recent storm climate has not changed significantly, yet. If this is the end of the interview, the core message for the public is that storms do not change. However, this is not true for the future: For future climate change projections (2070-2100) we expect that storm intensity may increase by about 10% for the German Bight.

The different results for future and recent climate change are often mixed up in the public and lead to confusion. Thus, it is important to clearly distinguish between recent and future climate change projections. Also, the timing of expected or possible changes in the future needs to be emphasized.

2.2 Stakeholders of climate change impacted sectors

Scenarios versus forecasts

As described above, we have also to communicate the limitations of our knowledge on global future climate changes, namely, the known uncertainties and the unknowable. Numerical future climate change projections are based on future greenhouse gas emission scenarios. These are derived on the basis of certain assumptions concerning future human behaviour with regard to the use energy sources, consumption of raw material, population growth, economic growth and globalization. Since these factors are highly uncertain we have to deal with several possible futures. These futures scenarios distinguish significantly from each other. Under the present perspective, however, no probability of any of these future scenarios can be given.

Unlike as for weather forecasts which provide certain magnitudes for changes of particular variables within the next 5 days, for climate changes projections we only can provide certain possible and plausible tendencies and ranges in which climate variables may change.

Plan with uncertainties

Although the magnitude of climate change is uncertain, mostly the tendency is clear. For example, at the end of this century (2070 to 2100) in Northern Germany storm intensity may increase by about 10%. This will cause higher storm surge water levels. In winter precipitation may increase by about 30%, in summer it may decrease by about 30%. Hot summers may become hotter by about 3-5°C. Although there are uncertainties in these scenarios, it is clear that an increased need for adaptation will emerge in the future.

Most of the impacted sectors are very sensitive to the magnitude of changes. The knowledge about uncertainty ranges of climate change scenarios may help us to build adaptation strategies and to avoid misdirected investments at the same time.

Time scales

Time scales of spatial planning activities or political decisions are much shorter compared to climatologically time scales. So far, most of the regional climate change results focus on the last 30 years of the 21st century. New scenarios, prepared as “Konsortialrechnungen” at the DKRZ, cover the full 140 years from 1960 to 2100.

At the same time stakeholders should learn taking into account scenarios beyond the conventional short term planning horizon, to set the course for future adaptation to climate change.

3 Integrating public and stakeholders concerns into scientific agendas

As described above, one of the tasks of the North German Climate Office is to explore the information need in the public and among stakeholders about climate, climate change and climate risks. We try to integrate these information needs into scientific agendas in order to derive practice related information from the regional climate change scenarios. By now we expect these requests leading us to a more practice-related climate research.

Coastal defence and off shore activities

Adapting coastal defence strategies to a changing climate needs information on changing storm surge activities. Here, not only the change of maximum water levels is relevant, but also the frequency of high water levels as well as the duration of single water levels. This information is needed for dikes and other coastal defence constructions. Since water levels and their durations vary e.g. with the exposition of the coast line and with the particular morphology, the information on a changing storm surge climate needs to be down scaled as much as possible and as it makes sense. Also the impact of a changing morphology on water levels needs to be investigated. Another focus might be on river deepening activities. Stakeholders need to know if there is a critical river depth in regard to a changing climate. If so, this might also impact coastal defence strategies.

All kind of off-shore activities need information on the wind climate. The ship building sector needs information on storm intensity and significant wave heights; whereas the transport sector also needs information on storm frequency and future location of storm tracks. For off-shore wind parks also the duration of storm events and information on the significant wave height is evident, since actual wind generators still need frequent technical check ups. For planning locations of new off shore wind parks, wind climatologies are needed.

Water management and -supply

Hydraulic engineers need information on precipitation intensity and on the duration of heavy precipitation events. In Northern Germany, we expect a decrease in precipitation amount during summer within this century. This is connected with a decreased number of days with precipitation. At the same time we expect an increased intensity of precipitation events. The risk of flooding is additionally related to the land surface use and the soil characteristics. These features, in turn, will change and interact with a changed climate in a particular natural landscape unit.

In winter we expect an increase of precipitation amount in Northern Germany within this century. Planning the need of pumping low-lying areas needs additional information on duration and location of the precipitation events. Again, land surface use and soil characteristics play an important roll. The interaction of land surface use, soil characteristics and changing climates in particular regions need to be understood and analyzed.

Water supply is not only vulnerable to the mean precipitation amount. For example the less days with precipitation occurs in certain summer months occurs, the more water is needed for irrigation purposes. Also heat waves will increase the public and industrial water need. Besides droughts and heat waves, the sea level rise may impact water supply since brackish water zones may move upstream. Thus, the conjunction of heat, drought and rising water levels needs to be analyzed.

Energy providers

The vulnerability of energy supply is strongly related to the energy source. Nuclear energy generation, for example, is vulnerable to heat and low water levels. There is a critical value of 28°C for river water temperature which must not exceeded by inflow of cooling waters from power plants. Coal fired power plants are as well vulnerable by low water levels since coal is transported mainly by ships. Supply by wind power plants however is vulnerable to heavy storm events or to longer time periods without sufficient wind. Solar power plants are vulnerable to high clouds and clouds with high optical thicknesses and hail. All these climate variables need to be analyzed under the particular view of certain energy providers.

City planning

The particular mechanisms of town climates need to be accounted in climate research as well as interactions of land use properties with micro climates and of storm characteristics and infrastructure. Cities need to reduce the impact of heat waves, heavy precipitation, and storms on infrastructure. Thus, the interaction of adaptation activities and micro climate needs to be analyzed.

Agriculture

Selecting species growing under changed climatic conditions need information on certain growing criteria of particular species, witch is mainly characterized by the annual cycle of temperature and precipitation but also on the duration of cold spells, frost and droughts.

Certain pests reproduce if a certain temperature threshold at a certain day time is reached. Thus, to adapt to a changed climate, we need to analyze these particular growing conditions in the scenarios.

Tourism

Tourism strongly depends on certain weather conditions. Thus we need to analyze characteristics like sunshine hours, precipitation characteristic during summer, water quality and snow fall height for certain regions. Besides climate change in tourist regions of Northern Germany, the climatologically conditions in other regions may also impact the tourist behaviour in Northern Germany. Thus, besides analyzing the change of the above variables, changes of tourist behaviour of various regions should be increased at the same time.

Literature

- Bray, D., Stelljes, N., Grossmann, I., Rau, S. (2007): Perspektiven für deutsche Küstenregionen aus Sicht von Verwaltung und regionalen Interessenvertretern. GKSS 2007, 7-49.
- Heinrichs, H. and Peters, H. P. (2004): Media communication on climate changes and coastal protection: Reception and interpretations by the audience. PCST International Conference Proceedings – www.pcst2004.org
- Solomon, S., D. Qin, M. Manning, R.B. Alley, T. Berntsen, N.L. Bindoff, Z. Chen, A. Chidthaisong, J.M. Gregory, G.C. Hegerl, M. Heimann, B. Hewitson, B.J. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, T. Matsuno, M. Molina, N. Nicholls, J., Overpeck, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, R. Somerville, T.F. Stocker, P. Whetton, R.A. Wood and D. Wratt (2007): Technical Summary. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Houghton, J. T., Ding, Y. Griggs, D. J., Noguer, M., van der Linden, P. J., Dai, X., Maskell, K., Johnson, C.A.(2001): *Climate Change 2001: The Scientific Basis*