

Climate Services in Germany

**P. Becker^{1*},
G. Brasseur², T. Deutschländer¹, F.-W. Gerstengarbe³, B. Hain⁴, W. Kusch¹**

* Corresponding author: Paul.Becker@dwd.de

¹ Deutscher Wetterdienst (DWD), Frankfurter Straße 135, 63067 Offenbach, Germany

² Climate Service Center (CSC), GKSS-Forschungszentrum Geesthacht, Beim Schlump 58, 20144 Hamburg, Germany

³ Potsdam-Institut für Klimafolgenforschung (PIK), Telegrafenberg A62, 14473 Potsdam, Germany

⁴ Umweltbundesamt (UBA), Wörlitzer Platz 1, 06844 Dessau-Roßlau, Germany

With the release of the IPCC Fourth Assessment Report (AR4), climate change has finally been recognized as one of the greatest challenges for the current century by politicians, economists, and societies around the globe. Besides strategies to avoid carbon dioxide emissions, adaptation measures will become inevitable according to the report. In response, the “German Adaptation Strategy (GAS)” was therefore enacted by the German government in late 2008. This strategy sets the framework for activities on national adaptation to climate change impacts and establishes a medium-term process intended to identify the need for actions collectively with stakeholders from affected sectors in a transparent and structured stepwise manner. This communication process shall furthermore help to define objectives and recognize possible target conflicts early on. Finally, adequate adaptation measures are to be developed and implemented in an adaptation action plan, to be adopted by the Federal Government in April 2011.

Adequate adaptation measures are designed by first of all quantifying the impact of climate change for specific sectors such as transport, construction, energy, agriculture, health, and waterways management. For this purpose, the present regional climate projections need to be linked to special impact models which are able to break down the information to local scales. Beforehand, global climate projections are typically downscaled by means of regional climate models. Since extensive climate monitoring is the cornerstone of all climate research activities, it needs to be maintained and enhanced in the future.

This presentation will introduce examples of German climate impact assessment projects such as “KLIWAS (Impacts of climate change on waterways and navigation - options to adapt)”. This project is an initiative of the Federal Ministry of Transport, Building and Urban Affairs designed to prepare water transport for expected changes such as altered runoff conditions of inland waterways, changes in extreme weather events, or sea level rise. KLIWAS should therefore help to sustain future effectiveness of this environmentally friendly transport carrier.

To properly account for the uncertainties inherent in climate model projections, an ensemble approach, similar to the one used in Numerical Weather Prediction (NWP), is employed, i.e., results from a variety of different climate models and emission scenarios are synthesized and applied to specific questions. Collectively, the results of the individual runs currently define a range of probability for possible impacts due to changes in climate. The width of the probability range allows conclusions about the uncertainty of the results. For the future, the tendency is to abandon the idea of all projections from the individual climate models for the same emission scenario being equally probable. Instead, it is aimed to provide probabilistic forecasts. Such an approach requires a very large ensemble though. The described ensemble approach has to be further developed in Germany and applied to multiple GCM applications.

Adaptation measures need to be developed and implemented on different time scales and spatial resolutions. Besides immediately effective measures such as national heat wave and

forest fire warning systems, long-term projects such as urban and landscape planning are supported as well. In this context, the improvement of the newly developed decadal prediction systems – linking the classical NWP and the climate projection time scales – is of special importance since planning measures and financial plans are designed for a time horizon of 10-15 years. Natural climate variability and anthropogenic climate change are of the same magnitude on decadal time scales. In addition to changes in greenhouse gas concentrations, the initial state of all climate subsystems is, therefore, of great importance for decadal climate predictions. After all, a successful forecast tool requires multidimensional observations from the coupled atmosphere-hydrosphere-cryosphere-land-surface system.

The development of suitable adaptation measures requires an intensive advisory activity, to which national weather services can contribute substantially. Momentarily, this communication process between the climate research community, the providers of climate services, and the decision makers from the different sectors is in the state of identifying customer demands. Furthermore, the decision makers are currently informed about the scientific options and limitations to use the outcomes of climate change research.

In Germany, relevant information and advice about climate is provided by a number of federal ministries and agencies under their jurisdiction, as well as scientific institutions. Examples include the Federal Environment Agency (UBA) hosting the Centre of Competence on climate impacts and adaptation (KomPass), the Potsdam Institute for Climate Impact Research (PIK), the recently founded Climate Service Center (CSC), and the German Meteorological Service (DWD).

KomPass was set up in 2006 on behalf of the Federal Government to support the preparation of an adaptation strategy for Germany. It has been developing and running networks of experts from different sectors and regions, making assessments on impacts and the research situation as well as building up expertise on climate impacts and adaptation and communicating this expertise to decision makers and the public, and will do so in the future.

PIK is a member of the Leibniz Community and addresses crucial scientific questions in the fields of global change, climate impacts, and sustainable development. Its objective is to generate interdisciplinary insights and to provide society with sound information for decision making. Furthermore, PIK is also an important member of the Climate Limited-area Modelling Community (CLM-Community) which is an open international network of scientists maintaining and developing the regional climate model CCLM.

The CSC will be embedded in the already established network of facilities, borne by all German climate change and impact research institutions. It complements the existing information offer by supplying stakeholders with research-based and service-oriented products.

On climate change issues, decisions are commonly made on a sub-national level. Therefore, a network of regional climate offices hosted by some of the Research Centers of the Helmholtz Association (HGF) and of regional climate consultancies (so-called RKB) of the DWD has also been established. These facilities support climate related decision making on a more regional scale. They are complemented by another network of institutions from the individual federal states of Germany.

The regional climate consultancies of the DWD strengthen its ability to propagate scientific information and to establish close relationships to many governmental and societal institutions. The on-site contact often helps to better communicate user needs and the limitations of scientific findings related to climate change. Each regional climate consultancy has its own expertise. Extensive research during the past has helped compiling fundamental know-how within these specific fields of expertise. These so-called know-how centers can therefore satisfy particular climatological requests from all over Germany as well as, occasionally, other European countries. The most important sectors are snow and ice load projections, the determination of expected spatial and temporal distributions of solar radiation measures, the generation of statistics of dispersion categories, medical meteorology, and climatic spa consulting.

For data supply DWD operates the Climate Data Center (CDC) offering easy access to a wide variety of German, European, and even global data particularly for researchers and users from educational and public institutions.

The four recently established climate offices hosted by some of the Helmholtz Research Centers in Germany seek to facilitate both integrated research activities and the necessary linkages among scientists, policy-makers, and the public at a regional, national and international level. Each of these offices individually concentrates on specific climate related issues.