

Climate projection

Guidance

Climate projections and scenarios information

[Guidelines on Communicating Forecast Uncertainty \(WMO/TD No. 1422\)](#)

These Guidelines address the issue of communicating forecast uncertainty. The emphasis is on how National Meteorological and Hydrological Services (NMHSs) can incorporate uncertainty information in their hydrometeorological forecast services, including the best ways to communicate this information to the benefit of users.

[Guidelines on Ensemble Prediction Systems and Forecasting \(WMO-No. 1091\)](#)

The present Guidelines are intended to provide some general advice to forecasters and forecast providers on the effective use of the Ensemble Prediction Systems (EPS), and on what EPS can and cannot be expected to provide.

Building National Capacity in developing countries

[Guide to the Management and Operation of WMO Regional Training Centres and Other Training Institutions \(WMO-No. 1169\)](#)

The guide is designed for those who review, or monitor, the requirements for recognition or reconfirmation of a WMO Regional Training Centre.

[Guidelines for Trainers in Meteorological, Hydrological and Climate Services \(WMO-No. 1114\)](#)

This publication is intended for those involved in providing training for staff in a National Meteorological and Hydrological Service (NMHS) or related agencies. In particular, it aims to strengthen training departments and enhance the expertise of trainers by providing a reference Manual and introductory guide. It includes guidance on the options available to ensure positive learning experiences for individuals and organizations.

[Initial formation and specialisation of meteorological personnel: Detailed Syllabus Examples \(WMO/TD No. 1101\)](#)

This publication is supplementing Chapters 3 and 4 of the Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology, WMO-No. 258, Volume I Meteorology.

[IWRM as a Tool for Adaptation to Climate Change, with Caribbean Case Studies](#)

These training materials are intended to increase the understanding about climate change and to explore opportunities of action. There are actions that can be taken to prepare for a more variable climate and we can make a case to our policy makers to prepare for change. The most important immediate action concerns the way water resources are managed. Improving water management today will prepare to adapt tomorrow. Improved understanding of water resources will allow more efficient and flexible allocation systems and better investment in infrastructure, both to improve access to water and reduce risks from climate change.

[Notes for the Training of Instructors in Meteorology and Operational Hydrology Part I \(WMO/TD No. 1058\)](#)

This publication aims at helping the meteorological and hydrological instructors to update their know-how on teaching methods, strategies and technologies. It will also serve as a guide and reference to both new and experienced instructors.

[PROVIA Guidance on Assessing Vulnerability, Impacts and Adaptation to Climate Change Consultation Document](#)

The PROVIA Guidance provides a framework for considering the full range of approaches to Vulnerability, Impacts and Adaptation assessment. It aims to help professionals such as researchers, policymakers, sectoral planners and consultants to select the appropriate methods and tools for their particular context and adaptation situation.

Training

Create and/or Interpret Climate Forecasts and Projections

These training modules aim to help the user understand how long-range forecasts and outlooks for specific regions are created using past climatological data and records, as well as analyzing patterns (see training competency 2). The layout of these modules initially allows the user to learn the background behind the set up and structure of the forecasting, then applies more specific examples using both climate records and patterns. The last two modules allow the user to experience a more interactive example as they create and interpret their own climate outlooks.

1. Introduction to Climate Models:
https://www.meted.ucar.edu/education_training/lesson/913
2. An Introduction to Downscaled Climate and Hydrology Projections Website:
https://www.meted.ucar.edu/education_training/lesson/1104
3. Tokyo Climate Center Annual Training Seminar:
<https://ds.data.jma.go.jp/tcc/tcc/library/index.html>

Ensure Quality of Climate Information and Services

These training modules focus on ensuring the quality of climatological products. This competency focuses on explaining the importance and real world purposes of the first three competencies. The above modules are all specific examples on how analysis of climate data and forecasting applies to very specific circumstances. The user will complete these modules and have a deeper understanding of why climate products are important.

1. ASMET: 2009 Drought in East Africa
https://www.meted.ucar.edu/education_training/lesson/923
2. Ocean Acidification: https://www.meted.ucar.edu/education_training/lesson/1195
3. Using Climatological Products in Common Operations:
https://www.meted.ucar.edu/education_training/lesson/512

Communicate Climatological Information with Users

These training modules focus on how to properly communicate climate products and forecasts with the general public. This is a key issue, considering how audiences that need

this information may have little background in regards to climate. The video modules provide a background into how scientific information, specifically climate, is structured to be easily accessible and readable. The second and third modules dive deeper into communicating specific issues such as drought and climate change.

1. Climate Science Communication:
https://www.meted.ucar.edu/climate/cvc_lectures/media/flash/arndt_communication.mp4
2. Climate Communication Skills for Use with Decision Support Audiences:
https://www.meted.ucar.edu/climate/cvc_lectures/media/flash/buhr_clim_communication.mp4
3. Communicating Climate Change Scenarios with Decision Makers:
https://www.meted.ucar.edu/education_training/lesson/1283

Tools

ClimateHD

ClimateHD is an online tool for integrated visualization of past and future climate evolution on a national and regional scale - available for France.

CORDEX

The Coordinated Regional Climate Downscaling Experiment (CORDEX) serves to advance and coordinate the science and application of regional climate downscaling through global partnerships. The CORDEX goals include: 1.To better understand relevant regional/local climate phenomena, their variability and changes, through downscaling. 2.To evaluate and improve regional climate downscaling models and techniques 3.To produce coordinated sets of regional downscaled projections worldwide 4.To foster communication and knowledge exchange with users of regional climate information.

ESGF

The Earth System Grid Federation (ESGF) is an international collaboration for the software that powers most global climate change research, notably assessments by the Intergovernmental Panel on Climate Change (IPCC). ESGF manages the first-ever decentralized database for handling climate science data, with multiple petabytes of data at dozens of federated sites worldwide. It is recognized as the leading infrastructure for the management and access of large distributed data volumes for climate change research. It supports the Coupled Model Intercomparison Project (CMIP), whose protocols enable the periodic assessments carried out by the IPCC.

IPCC DDC

The Data Distribution Centre (DDC) of the Intergovernmental Panel on Climate Change (IPCC) provides climate, socio-economic and environmental data, both from the past and also in scenarios projected into the future. Technical guidelines on the selection and use of different types of data and scenarios in research and assessment are also provided. The DDC is designed primarily for climate change researchers, but materials contained on the site may also be of interest to educators, governmental and non-governmental organizations, and the general public.

PRECIS

PRECIS is a regional climate modeling system developed at the Met Office Hadley Centre with the intention of allowing users in developing countries to easily produce detailed climate projections for any chosen region of the world. PRECIS is designed to run on a Linux PC so does not require extensive IT infrastructure.

RegCM4

The Regional Climate Model (RegCM) system, originally developed at the National Center for Atmospheric Research (NCAR), is maintained in the Earth System Physics (ESP) section of the ICTP. The first version of the model, RegCM1, was developed in 1989 and since then it has undergone major updates in 1993 (RegCM2), 1999 (RegCM2.5), 2006 (RegCM3) and most recently 2010 (RegCM4). The latest version of the model, RegCM4, is now fully supported by the ESP, while previous versions are no longer available. This version includes major upgrades in the structure of the code and its pre- and post- processors, along with the inclusion of some new physics parameterizations. The model is flexible, portable and easy to use. It can be applied to any region of the World, with grid spacing of up to about 10 km (hydrostatic limit), and for a wide range of studies, from process studies to paleoclimate and future climate simulation.

WRF

The Weather Research and Forecasting (WRF) Model is a next-generation mesoscale numerical weather prediction system designed for both atmospheric research and operational forecasting needs. It features two dynamical cores, a data assimilation system, and a software architecture facilitating parallel computation and system extensibility. The model serves a wide range of meteorological applications across scales from tens of meters to thousands of kilometers.