How to estimate climate change impact?

The climate impact indicators provided are the end result of a long chain of model simulations and statistical calculations. Here, we provide an overview of the method for producing the data in the portal.

Scenarios for the evolution of greenhouse gas emissions are provided by Representative Concentration Pathways (RCPs) and are often presented for a high emission path representing "business-as-usual" (RCP8.5), and a more moderate path with a stabilization of the resulting radiative forcing (RCP4.5).
Global Climate Models (GCMs) are then applied to calculate climate projections forced by the different future scenarios. The various GCMs differ in their sensitivity to the greenhouse gas forcing, and also in how they simulate different processes in the Earth's climate; each having their own strengths and weaknesses. Ensemble statistics, e.g. the average of all models, are therefore generally considered more reliable than using a single model projection.
GCMs have a typical horizontal resolution of several hundred kilometers, and since most hydrological processes occur at much smaller scales, a further downscaling of the GCM information is necessary. This is performed by Regional Climate Models (RCMs), which nest into the GCM and provide finer scale information of 50 km or less.
It is common practice to apply 'bias correction', a statistical method that removes various errors from the climate model so that they become more similar to observations, and thus more useful for hydrological applications.
At the end of this chain of models and methods, a range of hydrological models can be applied to provide an ensemble of estimations of the hydrological response to the climate projections.
Since climate, in contrast to weather, is more evident from long term statistics, e.g. the average over thirty years, indicators are produced to show how the climate changes between different time periods and for a given emission scenario, which is shown for a range of possible combinations of emission pathways, GCMs, RCMs, and hydrological models. Each model step in the production chain includes uncertainties and therefore an ensemble of projections is used to account for the spread of possible climate impacts in the future. The exact future still remains unknown but the indicators show tendencies and future risks generated by climate change.

Emission Scenario

Global climate model

Regional climate model

Bias correction

Hydrological model

For information about the production chain (lineage) of each impact indicator, see the metadata