Why the spread of values in the Ensembles?

The estimates of climate-change impact include large uncertainties, therefore an ensemble of projections is presented. The ensembles contain a spread of values that reflect the lack of knowledge, for instance about initial conditions, sensitivity of processes, future emissions and natural variability.

Most uncertainty in near-time projections refers to natural variability, which still remains difficult to describe due to low spatial resolution in observation networks and thus unknown initial conditions. On a longer time scale, most uncertainty refers to future concentrations of greenhouse gases in the atmosphere (RCP's), which depend on societal evolution and implementation of mitigation measures. Additionally, uncertainties refer to future circulation patterns involving atmosphere and ocean dynamics; as the atmospheric system is quite chaotic, it is possible to only make predictions for the nearest days based on known initial conditions - the climate time-scale is not yet possible to predict. Instead, climate modellers explore sensitivities and make assessments about future climate change by using different scenarios for the future, producing projections of climate change in a range of different climate models starting from different initial conditions. The result is an ensemble of climate projections.

Bias adjustments are normally performed before impact analysis, to make the climate-model results correspond to observations during a reference period. However, the observations at specific points may not be representative, and methods are very sensitive to gauge density. Moreover, various methods may lead to different implications for the final analysis, e.g. inconsistency between corrected variables if this is done separately. The final part of the model chain, the hydrological impact models, may respond differently to climate change due to different interpretation of drivers for flow generation in the model set-up or assumptions in the model structure.

Water management is always local, and the local scale is already exposed to large variation in weather patterns. This means that climate impact may not be evident on a year to year basis, but some events may become more frequent, or prolonged, if analysed over a longer time period. Therefore, climate impact assessments often use 30 year averages to explore changes. In practice this may be too short a period for local conditions as they are so variable. If the trend is small and the variability large (often in precipitation and river flow) it may be very difficult to detect changes beyond natural variability.

The ensembles try to give examples on how climate change may be manifested in the future, given some major sources of uncertainty. However, for specific applications, some models and some impact indicators may be more trustworthy than others. We will try to elaborate on this and give more guidance on using indicators in climate adaptation throughout the project.

Read More: http://www.int-res.com/articles/cr_oa/c056p103.pdf