“The Future Okavango” was a BMBF funded research project coordinated by the University of Hamburg. This research project focused on the Okavango basin with its variety of savannah woodland and wetland ecosystems linked by the central lifeline of the Okavango River. The region is considered to be as a global hot-spot of accelerating change and land use conflicts and the findings of the project linked high-level inter- and trans-disciplinary research with trans-boundary stakeholder and land user requirements. The basin comprises different aspects of the Okavango River. It flows through the highly disturbed war ridden areas of Angola, through the semi-arid areas of Namibia and Botswana, and terminates in the Okavango Delta, the world’s largest inland delta and the largest freshwater swamp south of the equator. The Okavango basin was proposed here as a trans-boundary study region of high international visibility and high potential transferability of results to other tropical and sub-tropical regions.

The Climate Service Center Germany led subproject 1 “Climate Change in the Okavango Region” in the project, in which present and future climate conditions were analysed in the Okavango region under different climate change scenarios, and climate change data including uncertainty information was provided to the other sub-projects. In addition, sensitivity studies were carried out to strengthen the understanding of the processes determining the climate of the Okavango region. These studies concentrated on remote influences on the moisture transport into the Okavango region.

The regional climate model REMO was extensively validated using hindcast simulations forced with ERA-INTERIM and ERA-40 re-analysis data for the Okavango region. Subsequently, two different global climate projections (RCP4.5 and RCP8.5) from two different general circulation models (ECHAM6/MPI-OM and EC-EARTH) were downscaled with the regional climate model REMO. All climate simulations were initially downscaled over the CORDEX-Africa domain with a spatial resolution of 50 x 50 km² and afterwards downscaled to the Okavango domain with a spatial resolution of 25 x 25 km² (double-nesting). The climate change projections showed an increase in annual mean temperature for all three sub-domains (SD) (Fig. 1) throughout the century. Thereby the low emission scenario simulation (RCP4.5) showed a moderate increase and the high emission scenario simulation (RCP8.5) a strong increase in temperature. The model simulated for all sub-domains a decline in mean daily precipitation with a high inter-annual variation throughout the century. While the RCP4.5 scenario simulation showed a small reduction in mean daily precipitation in all sub-domains, the RCP8.5 shows a medium (north) to strong (south) reduction. However, it has to be mentioned that the annual precipitation in the southernmost SD3 was much lower compared to the one in the northernmost SD1.

In addition, five sensitivity studies to analyse the sensitivity of the atmospheric water cycle to sea surface temperature (SST) corrections were carried out using the regional climate model REMO. In these experiments the historical simulation of the general circulation model ECHAM6/MPI-OM was downscaled with REMO to a spatial resolution of 25 x 25 km² by means of double-nesting for southern Africa using different SST data. The results showed a distinct impact of the SST biases on the atmospheric water cycle in southern Africa. In particular, the contribution of the SST bias of the Atlantic Ocean was stronger, which has to be taken into account in future climate change projections.
Publications

Peer-reviewed


Book Chapters


Non peer-reviewed


Contributions


Figures

Fig. 1: Okavango River Basin divided into three sub-domains.