Climate Change Impact on Lake Ziway Watershed Water Availability, Ethiopia

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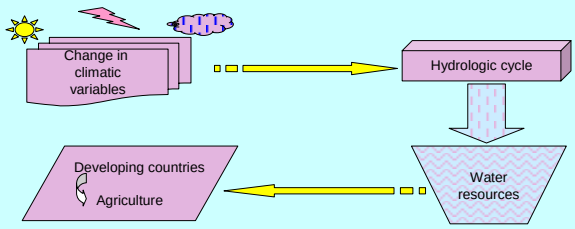
INTRODUCTION

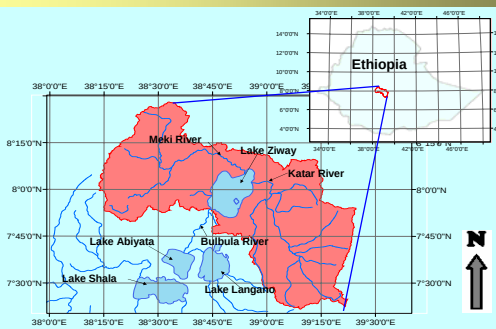
According to the International Panel on Climate Change (IPCC) report, by 2100 global average temperature would rise between 1.4 and 5.8°C and precipitation would vary up to ±20% from the 1990 level. Being one of the very sensitive sectors, climate change can cause significant impacts on water resources. Developing countries, such as Ethiopia, will be more vulnerable to climate change mainly because of the larger dependency of their economy on agriculture. Hence, assessing vulnerability of water resources to climate change at a watershed level is very crucial. This gives an opportunity to plan appropriate adaptation measures that must be taken ahead of time. Moreover, this will give enough room to consider possible future risks in all phases of water resource development projects.



OBJECTIVES

- To develop temporal climate change scenarios of precipitation & temperature for Ziway Watershed for the years from 2001 to 2099,
- To quantify possible impacts of this change on water resource availability of the lake watershed for the years from 2001 to 2099,
- To suggest possible adaptation measures

STUDY AREA

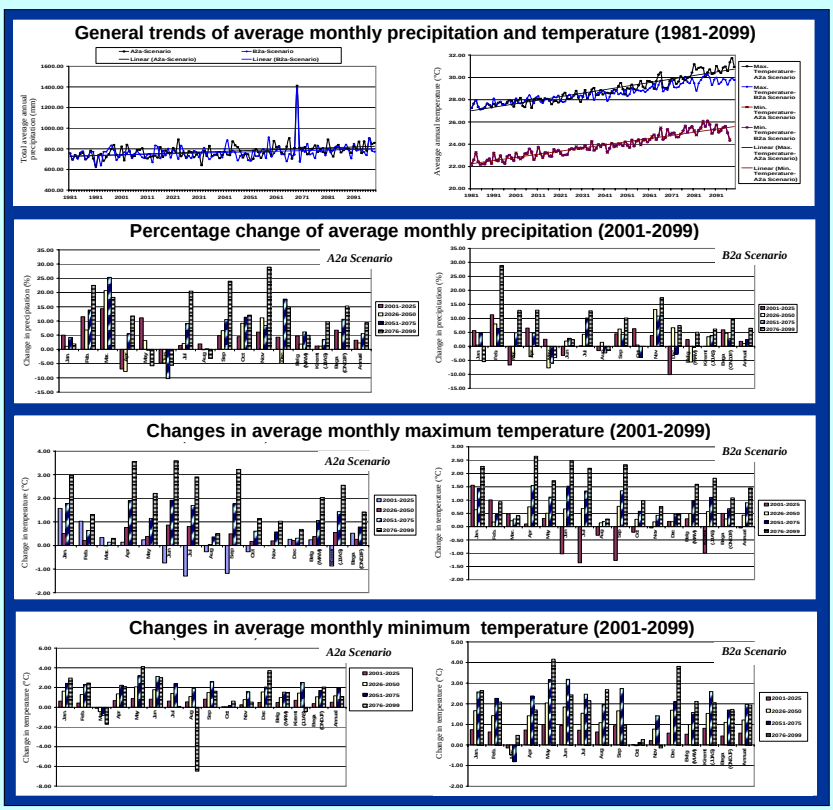


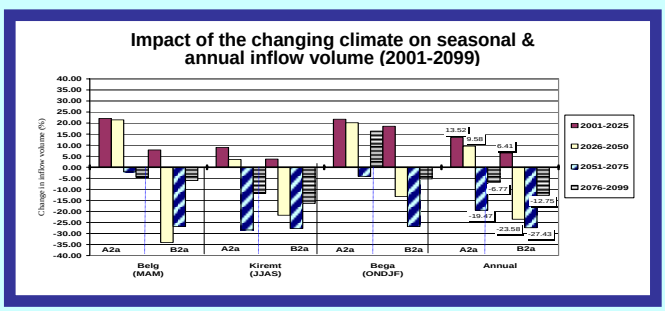
METHODOLOGY

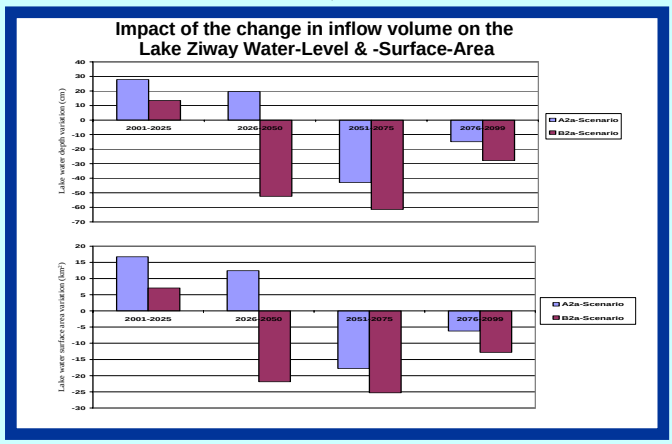
Climate change scenarios were developed for maximum temperature, minimum temperature and precipitation, based on the HadCM3 GCM model outputs that are established on the A2 and B2 SRES emission scenarios. The outputs of HadCM3 were downscaled into a watershed scale using the Statistical DownScaling Model (SDSM). The scenario-years from 2001 to 2099 were divided into four periods of 25 years and their respective changes were determined as monthly temperature changes (in °C) and monthly precipitation changes (in %) from the base period (1981-2000). Flow was simulated using the SWAT hydrologic model. First, the total inflow volume into the lake was simulated for the base period under normal conditions. Then, the total inflow volumes of the future periods were simulated by applying the respective future changes of temperature and precipitation. Finally, the changes in total inflow volume from the base period volume were calculated to see the impact on the lake-water-level and –water-surface-area.

RESULTS AND CONCLUSION

Both precipitation and temperature are likely to show an increasing trend from the base period level. The average monthly and annual precipitation in the watershed might increase up to 29% and 9.4%, respectively. Besides, the average maximum and minimum temperature might rise up to 3.6°C and 4.2°C, respectively. The total average annual inflow volume into Lake Ziway might decline significantly up to 27.43%. This inflow volume reduction is likely to drop the lake level up to two third of a meter. Consequently, the surface area might also shrink by 25.3 km^2, which is about 6% of the base period lake surface area. Hence, in Lake Ziway Watershed, runoff is likely to decrease in the future and be insufficient to meet future demands for water of the ever increasing population in the region.







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