Potential Hydrologic Impact of Climatic Change to Major River Basins of Western Canada

The potential climate change impact to the water resources of Athabasca River Basin (ARB) and South Saskatchewan River Basins (SSRB) of Alberta are investigated. The Modified Interaction Biosphere Atmosphere (MISBA) of Kerkhoven and Gan (2006) is used to simulate the future flows of ARB and SSRB under four IPCC SRES climate scenarios (A1FI, A2, B1, and B2) over three 30-year time periods (2010-2039, 2040-2069, 2070-2100). In the ARB, mean annual flows are expected to decline as the shortened snowfall season and increased sublimation together lead to a decline in the spring snowpack. Although the wettest scenarios predict mild increases in annual runoff in the first half of the century, all GCM and emission combinations predict large declines by the end of the 21st century with an average change in annual runoff, mean maximum annual flow and mean minimum annual flow of –21%, –4.4%, and –41%, respectively. For SSRB, albeit precipitation is projected to increase over the 21st century, most of the scenario runs show a decrease in the mean annual maximum streamflow for three of its sub-basins, the Oldman, Bow and Red Deer River basins over the next century, except for a few cases. The runoff coefficients simulated by MISBA for almost all the climate scenarios for Oldman, Bow and Red Deer River basins show that for every °C rise in temperature means an approximate 4% decrease in the runoff coefficient for the Oldman River basin, 7 % for the Bow and 8 % for the Red Deer River basins.