



Contribution of human and climate change impacts to changes in streamflow of Canada

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Climate change exerts great influence on streamflow by changing precipitation, temperature, snowpack and potential evapotranspiration (PET), while human activities in a watershed can directly alter the runoff production and indirectly through affecting climatic variables. However, to separate contribution of anthropogenic and natural drivers to observed changes in streamflow is non-trivial. Here we estimated the direct influence of human activities and climate change effect to changes of the mean annual streamflow (MAS) of 96 Canadian watersheds based on the elasticity of streamflow in relation to precipitation, PET and human impacts such as land use and cover change. Elasticities of streamflow for each watershed are analytically derived using the Budyko Framework. We found that climate change generally caused an increase in MAS, while human impacts generally a decrease in MAS and such impact tends to become more severe with time, even though there are exceptions. Higher proportions of human contribution, compared to that of climate change contribution, resulted in generally decreased streamflow of Canada observed in recent decades. Furthermore, if without contributions from retreating glaciers to streamflow, human impact would have resulted in a more severe decrease in Canadian streamflow.

Ref: Tan, X., and Gan, T. Y., 2015, Contribution of human and climate change impacts to changes in streamflow of Canada, *Scientific Reports*, Nature Publishing Group, 17767; doi: 10.1038/srep17767