

Pan-Canadian Hydro-Economic Model to Study the Economy-Wide Impacts of Climate Change and Water Markets as a Coping Mechanism



Jorge A. Garcia*, Roy Brouwer
University of Waterloo, Waterloo, Canada
* ja4garci@uwaterloo.ca



INTRODUCTION

The model presented here studies the effects of introducing a **water market** as a mechanism to cope with the impacts of climate change on water availability on the Canadian economy as a whole.

Water market simulations have been useful for exploring **market-efficient water allocations** or gauging the adaptation of economies to water shocks.

This work provides new insights into the economic impacts of water markets in Canada.

MODEL

A **Computable General Equilibrium** model is a comprehensive modeling tool that describes the economy as a system of nonlinear equations. Raw water extraction is included as a separate input factor in different water extraction industries.

SCENARIOS

Scenario A simulates the direct and indirect impacts of water shocks in selected water-intensive industries on the Canadian economy as a whole.

- A1. Irrigated crop production.
- A2. Paper manufacturing.
- A3. Mining & quarrying.
- A4. Water sectors.
- A5. Power generation.

Scenario B assumes a water market is introduced as a climate adaptation and mitigation mechanism to improve the economic efficiency of water allocations and alleviate the total economic costs on different industries. Under this scenario, water is assumed to be transferable across industries.

RESULTS SCENARIO A

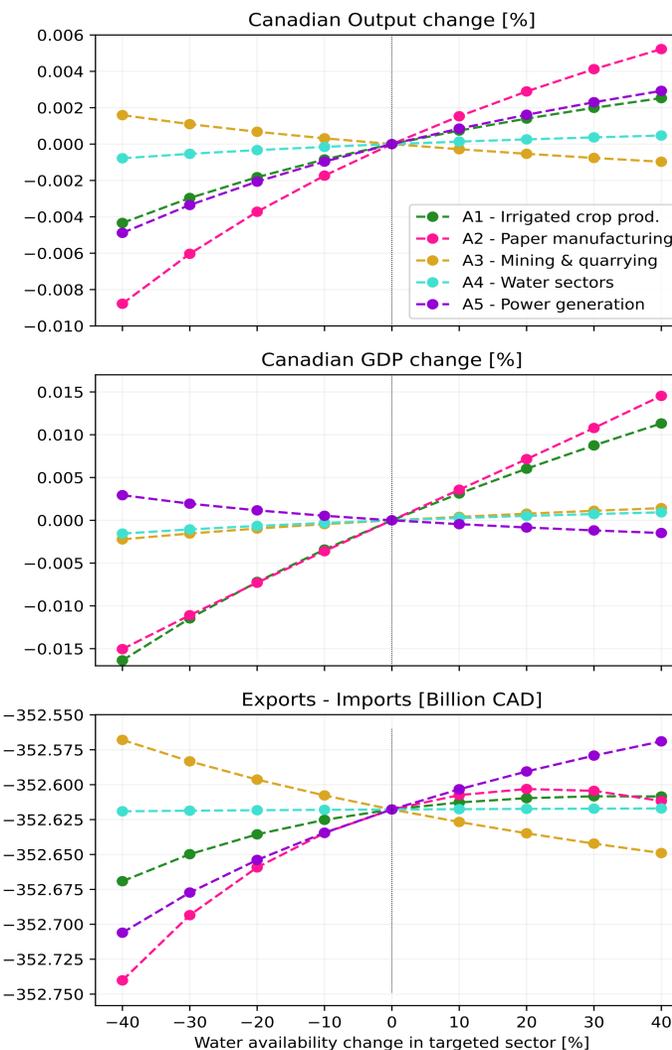


Fig. 1 Changes with respect to baseline scenario

RESULTS SCENARIO B

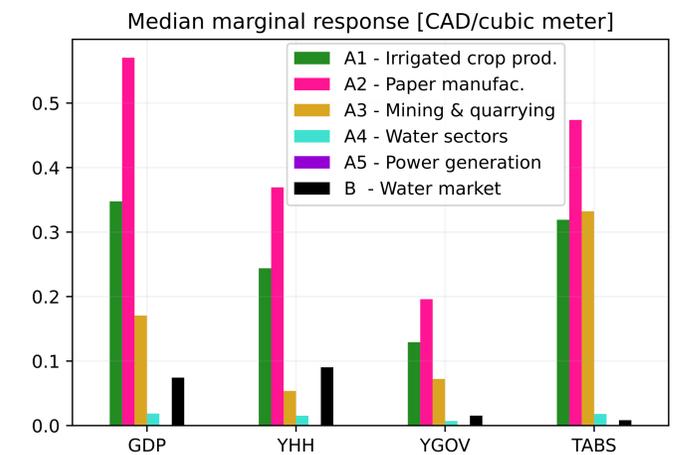


Fig. 2 Scenario A and B comparison

SENSITIVITY ANALYSIS

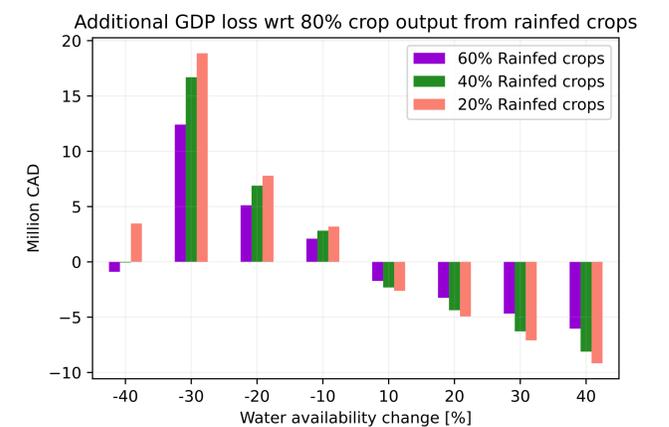


Fig. 3 Cost in GDP w.r.t. baseline scenario B

CONCLUSIONS & NEXT STEPS

- ❖ Canadian economy responds more pronouncedly to water shortages than water exceedances, regardless of whether a water market is in place or not.
- ❖ Implementing a water market across Canada has the effect of balancing out the economic costs that otherwise industry-specific water disruptions would produce.
- ❖ Introducing a water market affects mostly primary metal manufacturing and paper manufacturing, followed by irrigated crop production and the water sector.
- ❖ **Next step:** spatially disaggregate the model for selected Canadian drainage basins for regional analyses.