Biophysical and economic analysis of climate change altering the composition of New Brunswick's forests: CGE Analysis

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Climate change will alter the composition of New Brunswick's timber supply, which will impact the provincial economy. The problem is there is currently no economic model that is able to be paired with a forest succession model and distinguish between hardwood and softwood timber.

There are two main design elements of this study. The first one is to create a framework that allows a computable general equilibrium (CGE) model to be coupled with a dynamic forest secession model (Figure 1). In this study forest succession is dynamically simulated using the PICUS and LANDIS-II model.

In order to account for the uncertainty around climate change, four climate change scenarios will be run over a period of 80 years (2020-2100). The four climate change scenarios are baseline (no change in radiate forcing), RCP 2.6, RCP 4.5, and RCP 8.5.

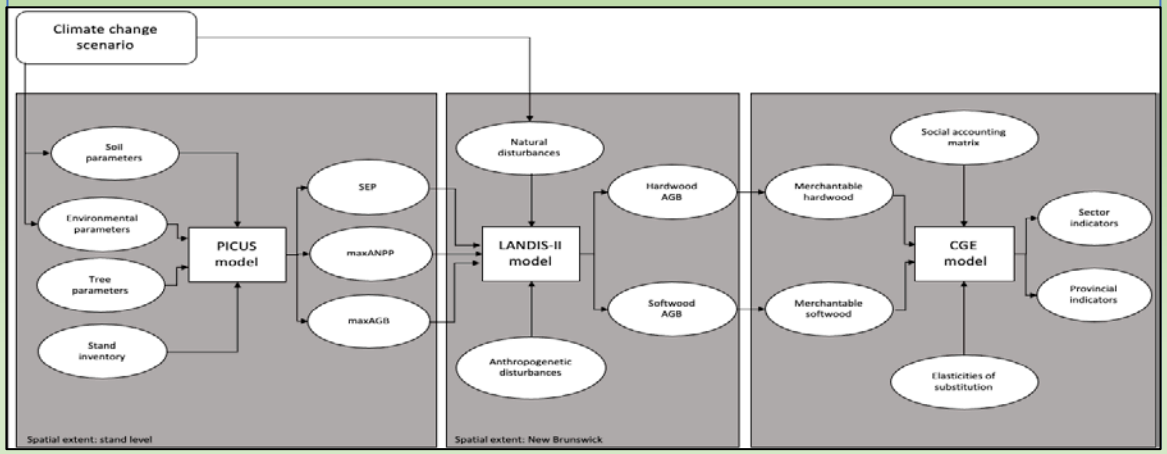

Figure 1 simplified illustration of the coupling of the three models (PICUS, LANDIS-II and CGE) and their inputs/outputs

The second element of this study is to create a novel CGE model that is able to distinguish between hardwood and softwood timber. This is important because hardwood and softwood tree species are expected to react differently to climate change (Taylor et al., 2017). Furthermore, hardwood and softwood timber are not always substitutable for each other. This study will use a four-factor bundling technique in order to separate hardwood and softwood timber, while still allowing labour and capital to be substitutable.

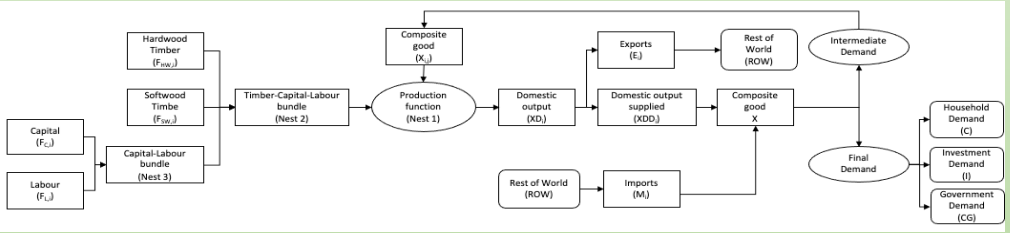

Figure 2 illustration of the four factor (capital, labour, hardwood timber, softwood timber) CGE model that will be used in this study.

Preliminary results have shown that a change in forest composition (10% decrease in softwood timber and a 10% increase in hardwood timber) will have a negative impact on the provincial economy.

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Taylor, A. R., Boulanger, Y., Price, D. T., Cyr, D., McGarrigle, E., Rammer, W., & Kershaw, J. A. (2017). Rapid 21st century climate change projected to shift composition and growth of Canada's Acadian Forest Region. *Forest Ecology and Management*, *405*(September), 284–294. https://doi.org/10.1016/j.foreco.2017.07.033