

Regional Energy Management under Climate Change Studies

Climate change is one of the most serious issues that need to be dealt with in the coming decades. The energy system plays an essential role in accounting for GHG emissions, which is widely recognized as the main factor leads to the climate change. My research focuses on energy system planning under uncertainties consistently in a GHG and economic perspective. Recommendations for energy supply and capacity expansion schemes under climate change are provided.

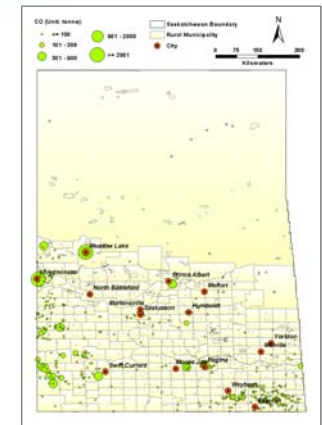
Energy Management under Climate Change in Yukon

With a prosperous economy desired for more energy, limited accessible energy resources, and impacts of climate change, serious energy problems have been encountered in Canada more than ever before, especially in Northern Territories. The objective of this study is to develop a multi-period interval chance-constrained mixed-integer programming (ICMI), then integrated it into regional energy model (REM) in Yukon Territory. The model is able to realize the optimal energy supply which will meet future electricity demands, and greenhouse gas (GHG) emission targets with minimized system cost.



A GIS-based Emission Inventory for Saskatchewan

This research established GIS-based Saskatchewan emission inventories of SO₂, NO_x, PM10, PM2.5, VOC, CO, NH₃, Pb, Cd and etc. from 1994 to 2008. Activity and statistical data from the National Pollutant Release Inventory (NPRI) were used for the quantification of emissions from machinery sectors and mobile sources. The emission data were disaggregated spatially and temporally. The evaluation of the emission inventory can provide a good representation of the amounts of pollutants emitted on province scale.



Regional Energy System Planning under Uncertainties

Energy crises and energy system risks are a remarkable problem in rapid community development. Meanwhile, an energy management system may be associated with processes inherent with many uncertainties. To deal with various uncertainties, an inexact credibility-constrained integer programming (ICIP) approach was developed in a hypothetic community-scale energy system. Tradeoffs between system cost and constraints violation, and also the system risk of energy supplies was incorporated into the model. This model could be implemented elsewhere in Canada and worldwide.

Regional Climate Modeling

The Providing Regional Climates for Impacts Studies (PRECIS) regional climate model (RCM) model is implemented in Ontario. The past regional climate trends (1961-1990) from observations, and the simulation of future climate change (2071-2100) are evaluated for verification and then generate possible future climate trends.

