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Uncertainty in forest management under climate change

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Abstract

This presentation describes a conceptual decision support framework for forest management under climate change. Since all GCMs of future climate are considered equally likely, this creates conditions of 'deep' uncertainty in forest management decisions. Among different approaches to deal with uncertainty, we use robustness as a criterion for evaluation. Rather than looking for optimal strategies assuming that future conditions are known, robust approaches search for "good-enough" strategies under a range of unknown future conditions.

For the Quesnel study area, we addressed only a timber supply goal and formulated it as a sustained yield management model. The model incorporates effects of climate change on forest productivity of dominant tree species and on distribution of BEC zones. We compare the model outcomes generated under the ten scenarios of climate change to those under the "no change" scenario of future climate. The model outcomes (period volumes and deviations from even flow) are analyzed from both the optimistic and conservative perspectives.

Two strategies are identified as robust as they generate "good enough" period harvests and deviations from harvest flow across all climate scenarios. The sustained yield strategy associated with future cool and moist conditions (HadCM3 B1 run 1) is the best in terms of the harvest volume while it also reduces deviations from even flow relative to the "no change" climate scenario. The sustained yield strategy associated with future hot and dry conditions (HadGEM A1B run 1) produces the lowest deviation from even flow of harvests. However, there is no strategy that can guarantee even harvest flows across all climate scenarios. Different decisions may be reached if objectives other than timber supply are included in the model. Research is underway to examine other management scenarios involving assisted migration of some tree species and intensified silviculture. This study illustrates that forest management decisions under climate change should be done in accordance with thorough analyses across different climate change scenarios, various management strategies and risk attitudes. There is a clear need for more large-scale and long-term studies of forest management under climate change as well as for educating the managers and stakeholders about alternative approaches to decisions under uncertainty.

Biography

Emina Krcmar has been a Research Associate at the University of British Columbia in Vancouver since 1995 and an economist with the Climate Change group of the Policy, Economics and Industry Branch, Canadian Forest Service since January 2011. Emina has extensive experience in natural resource management and in quantitative decision-making, including the economics of forest carbon sequestration and managing forests under uncertainty and for multiple tradeoffs. She holds a Ph.D. in Operations Research from the University of Belgrade, where she was also an Assistant Professor.