

# Economic Analysis of Source Water Protection

Principal Investigator – Dr. Vic Adamowicz, University of Alberta, 2013-2016

## Challenge

There is considerable interest, worldwide, in the evaluation of ecosystem services arising from management strategies such as source water protection (ecosystem management) as an alternative to infrastructure investments (capital, operating costs). However, there are relatively few detailed investigations of such systems. This project develops a conceptual framework and begins to construct the empirical analysis of the economic benefits and costs of source water protection.

Project partners are interested in the extent to which landscape management can reduce water treatment costs and/or the risks of water supply interruptions, as well as how ecosystem service management interacts with capital investment requirements for water treatment. This project helps inform this process by assessing the costs and benefits of ecosystem services associated with water quality and quantity.

## Project

The overall objective of this project is to develop a framework for the economic analysis of alternative methods of protection of water quality that include consideration of ecosystem services such as upstream source water protection as an alternative to infrastructure investments. This project focuses on the assessment of the economic benefits of water reliability (e.g. avoiding water advisories, outages, etc.). To assess the value of reliability a survey was designed and administered in the southern regions in Alberta. This survey includes a preference elicitation component and collects information on defensive expenditures associated with water quality and reliability.

Three categories of potential benefits from source water protection have been investigated:

- a) Avoidance of water supply interruptions and “advisories” (reliability).
- b) The benefits of reduced infrastructure (capital investment in water treatment facilities) that may arise from source water protection, and
- c) The benefits associated with the provision of additional water quantity in a water-short region will be assessed.

The costs of ecosystem service provision, including direct forest management costs and potential losses of ecosystem services like aesthetics and short term water quality declines have been examined as well.

## Outputs

Anticipated Outputs include:

- Report to Stakeholders

- Statistical Models of the willingness to pay for improved water reliability.

Additionally, this research has been disseminated through several presentations:

- Lloyd-Smith, P. C. Schram, W. Adamowicz and D. Dupont. Endogeneity of Risk Perceptions in Water Expenditure Models, presented at
  1. World Congress of Resource and Environmental Economics. Istanbul, Turkey, June 2014.
  2. Canadian Resource and Environmental Economics Study Group, Saskatoon, Saskatchewan. October 2014.
  3. Canadian Water Resources Congress, June 2014.
  4. Sustainable Development Doctoral Society, Columbia University NY. Interdisciplinary PhD Workshop on Sustainable Development. April 2014.

This research project has held several key workshops:

- 2-day workshop for project researchers in Edmonton as well as the study region (Southwest Rockies in Alberta).
- Workshops with government officials, including two workshops (one in Edmonton, one in Calgary) with fire management officials, as well as conference calls regarding the development of the reliability survey and methodological innovations in the survey.

## Outcomes

Outcomes include:

- Strengthened relationships with researchers through continuous interaction with other researchers in the broader interdisciplinary team, including hydrologists, engineers, foresters and other academics involved in sourcewater protection.
- Strengthened relationships with partners through workshops with government officials on the on-going research and the linkages to their needs.
- It is anticipated that the information in this project will lead to changes in the way that forested sourcewaters are protected (e.g. the use of prescribed burning or other risk mitigation strategies). It is also possible that this information will be used in water infrastructure planning as the project will provide evidence on the value of reliability which relates directly to treatment and infrastructure sizing decisions.
- The survey from this project has increased knowledge about how prepared the public is for water outages and the impact of such outages, including regional variation (e.g. urban versus rural) and demographic differences (e.g. age, background).
- Increased knowledge through the exploration of several methodological innovations in the survey design and implementation. In the economics literature the issue of consequentiality (whether respondents view the survey as potentially having an impact on policy) is of critical importance for obtaining credible valuation estimates. The project's approach sheds light on the methods used to assess consequentiality and the validity of stated preference economic value estimates.

## **Research Team and Partners:**

### **Research Team:**

Dr. Vic Adamowicz, University of Alberta  
Dr. Peter Boxall,  
Dr. Diane Dupont, Brock University  
Dr. Steven Renzetti, Brock University  
Dr. Monica Emelko, University of Waterloo

### **Partners:**

Alberta Innovates – Energy and Environment Solutions (Water Resources – AWRI)  
Alberta Innovates – Bio-solutions  
Alberta Environment – Sustainable Resource Development

### **Highly Qualified Personnel (HQP):**

Patrick Llyod-Smith, PhD, University of Alberta