

ADAPTATION OF DAM SAFETY TO CLIMATE CHANGE IMPACTS BY USING LOW RECURRENCE-INTERVAL FLOODS AND BY INFORMING MANAGERS ABOUT THE UNCERTAINTIES

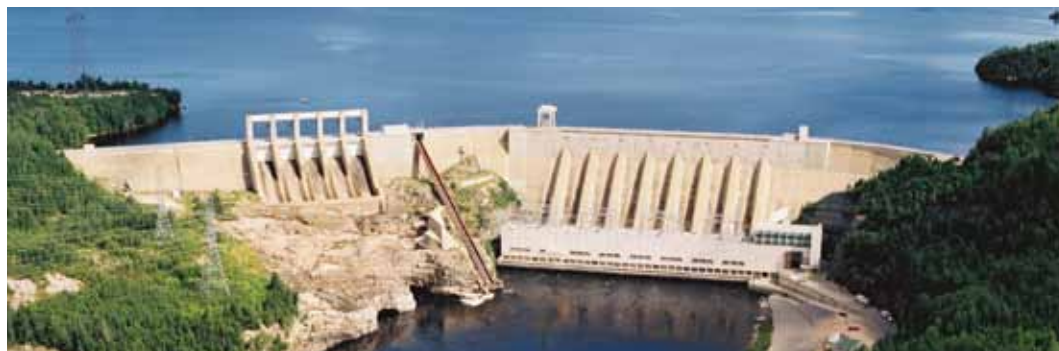


photo : Hydro-Québec

Program
WATER RESOURCES

PROJECT STARTING DATE
AND LENGTH
February 2010 • 2 ½ years

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CONTEXT

Climate change will potentially lead to an increase in both the frequency and intensity of extreme discharges. As a result, it is important to take these changes into account by immediately adapting the approaches used for the assessment of dam safety, since they involve a vision and long-term investments that may not be optimal unless they include adequate consideration for climate change impacts. This project addresses this concern, and targets the adaptation of dam safety assessment by using low recurrence-interval floods.

OBJECTIVES

The general objective of this project is to estimate low recurrence-interval floods in the context of climate change. The main goal concerns the adaptation of dam safety assessments to these changes. A particular effort will be made to inform dam managers about the uncertainties linked to estimation. The floods under study correspond to return periods of T=100, 1,000 and 10,000 years in relationship with the failure consequence categories laid down in the Dam Safety Act of Quebec: respectively Very Low to Low, Moderate to High, Very High.

APPROACH

Precipitation and minimum and maximum daily temperatures simulated by the CRCM constitute the inputs of the HYDROTEL hydrological model. We will use four simulations covering the entire period available, which is 140 years (1961-2100). The watersheds that are of particular interest in this study include the Haut St-François, Lac Kénogami, and the Chaudière and Gatineau rivers. As a first step we will verify whether the coupling between the CRCM and HYDROTEL simulations makes it possible to reproduce the extremes in the current climate (1961-1990 period) that are of interest. The second step will involve an in-depth analysis of the stationarity of the series. Next we will develop a method for carrying out a frequency analysis for the entire period, taking into account the potential non-stationarity induced by climate change. The next steps are to estimate the climatic and statistical uncertainties for low recurrence-interval floods, and to study the management of climate uncertainty from the user's viewpoint. The last step will be the development of adaptation recommendations for users.

EXPECTED RESULTS

The results of this project will be published in various reports including:

- An assessment of the impact of climate change on low recurrence-interval floods;
- The estimation of statistical and climatic uncertainties associated with expected changes;
- The management of climate uncertainties from the optic of the user.

Recommendations will be made to users about proposed adaptations of dam safety assessment to take into account the impacts of climate change.

LEAD SCIENTIST

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OTHER PARTICIPANTS

- Centre d'Expertise Hydrique du Québec
- Hydro-Québec
- Institut national de la recherche scientifique- Centre Eau Terre Environnement (INRS – ETE)

IMPACT

Dam owners and administrators of the Dam Safety Act of Quebec will derive direct benefits from the spin-offs of this project. Consulting engineering firms involved in the design of spillways and the evaluation of dam safety represent potential users of the results. Experts in shoreline and floodplain development should also be warned of potential changes in low recurrence-interval floods.

FUNDING

