

# Delimiting Freedom Space for Rivers Using GIS and Remote Sensing: Updating existing tools to manage functional and resilient river systems

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Globally, in the context of a changing climate, there has been movement towards more sustainable river management, based on the concept of working with natural processes (e.g. Natural Flood Management (UK), Room for the River (Netherlands), Channel Migration Zones (Oregon) and Hazard Lands (Ontario)). These approaches involve giving appropriate space to rivers for natural flooding and erosion to occur, and for associated ecosystem services to function. This long-term restorative approach is in contrast to reactive, reach-based interventions, which have often served to temporarily displace problems rather than providing long-term solutions.

In Ontario, this vision is already reflected within Provincial Policy Statement 2005, which includes consideration of flood and erosion hazards, and in several established protocols outlining how these hazard lands are to be defined. However, the key techniques and protocols were introduced in the early 2000s, and since, several new tools for analysis have become more widely available. This presentation will focus on how such innovative tools, including higher-resolution satellite imagery, LiDAR and drones, may be used to update or complement existing approaches.

Recently in Quebec, an approach to determine “Freedom Space” for rivers has been developed. This approach differs from current Ontario protocols in that LiDAR and hydrogeomorphological interpretation are used to help define flooding mechanisms, riparian wetlands are an integral consideration and different levels of risk are defined within the hazard lands. The presentation will firstly outline how the techniques of the “Freedom Space” approach have been applied to date.

The main body of the presentation will subsequently discuss the findings of an ongoing research project, showing how new GIS and Remote Sensing technologies can be used to further improve the method to make it more robust and objective, including the potential for GIS-based semi-automation. The presentation will conclude by recommending how these innovative tools could be used to update or complement existing Ontario protocols.

## **Biography**

Fabien Hugue has an interdisciplinary profile combining geosciences and geographical approaches to study large scale fluvial processes. He holds a Ph.D. degree in Geography from McGill University (Montréal, Qc, Canada) and a M.Sc. degree in Earth and Environmental Sciences from the Joseph Fourier University (Grenoble, France). His research focuses on using GIS and remote sensing techniques coupled with hydraulic modelling to support sustainable river management.

Joanna Eyquem is professionally qualified in both Canada and the UK, with extensive experience applying fluvial geomorphological principles to practical river management challenges. She has been delivering geomorphologically-led assessments, action plans and channel designs since 2002, working to ensure that natural processes are taken into account in river management. Joanna is Technical Lead for AECOM's Fluvial Geomorphology practice, both across Canada and worldwide.