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Development of interactive diagnostic tools and metrics for the socio-economic consequences of floods

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Spring floods have generated colossal damages to residential areas in the Province of Quebec, Canada, in 2017 and 2019. Government authorities need accurate modelling of the impact of theoretical floods in order to prioritize pre-disaster mitigation projects to reduce vulnerability. They also need accurate modelling of forecasted floods in order to direct emergency responses.

We present a governmental-academic collaboration that aims at modelling flood impact for both theoretical and forecasted flooding events over all populated river reaches of meridional Quebec. The project, funded by the ministère de la Sécurité publique du Québec (Quebec ministry in charge of public security), consists in developing a diagnostic tool and methods to assess the risk and impacts of flooding. Tools under development are intended to be used primarily by policy makers.

The project relies on water level data based on the hydrological regimes of nearly 25,000 km of rivers, on high-precision digital terrain models, and on a detailed database of building footprints and characterizations. It also relies on 24h and 48h forecasts of maximum flow for the subject rivers. The developed tools integrate large data sets and heterogeneous data sources and produce insightful metrics on the physical extent and costs of floods and on their impact on the population. The software also provides precise information about each building affected by rising water, including an estimated cost of the damages and impact on inhabitants.