Evaluating coastal run-up, erosion, and flooding hazards for climate-change adaptation and hazard mitigation in the Halifax Regional Municipality, Nova Scotia

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Climate-change adaptation and natural hazard planning are mandated in the 25-year Regional Municipal Planning Strategy of the Halifax Regional Municipality. This recognizes the importance of climate change and the need for a precautionary approach to minimize negative impacts of rising sea level and storm events. The impacts of several major storms have been documented over the past two decades in terms of water levels, wave run-up and overwash, coastal erosion and flooding, and impacts on infrastructure. Using 30 years of coastal survey data and 70 years of airphotos, we can place these impacts in the context of long-term coastal evolution, providing a basis for better understanding of rapid coastal change and development hazards.

Topographic LiDAR data were acquired in 2007 to produce a high-resolution digital elevation model (DEM) as a basis for mapping flood limits in Halifax Harbour and along the Eastern Shore. The selection of flood levels for adaptation planning required an understanding of present and future sea-level rise (SLR), vertical land motion, extreme water levels (combined tide and surge), harbour seiche and wave run-up.

Relative sea level in Halifax Harbour has risen 3.2 ± 0.13 mm/yr since 1920 through roughly equal contributions from regional subsidence and local SLR. Scenarios of future extreme water levels were developed using the 2007 IPCC projections and others from recent publications. These SLR rates were combined with regional subsidence and extreme water levels for 2-, 10-, and 50-year events and applied to the LiDAR DEM to visualise the extent and depth of flooding for each event. This analysis provides the scientific basis for a set of plausible scenarios for a 100-year planning horizon, recognizing that SLR projections continue to be refined and may need to be adjusted in future.

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