

# Climate Change, Extreme Events, and Insights into the Role of the Arctic Ocean

By

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## Abstract

Issues of urban flood damage are intensifying due to the intensification of urban storms with climate change and the increasing sizes of urban areas. Increased levels of carbon dioxide are being recorded and the increasing of long-term temperatures are being reported. These indicators are being used as part of the evidence that sea level rise in the future will be between 0.3 and 1.0 m by the year 2100, which translates into increasing challenges for coastal cities. As part of this puzzle, the enormous glaciers in Greenland and Antarctica will continue to contribute to sea level rise but, fortunately, at modest levels, as thousands of years are involved in their melting. On the other hand, land-based glaciers will continue to become depleted and the ramifications to agricultural practices are expected to be profound with situations of significant percentages of the world's land-based glaciers being lost by the year 2100. Further, the disappearance rate of the Arctic Ocean ice cover is already profoundly evident, with losses of ice cover of about 13.2 percent per decade now occurring. The rate of warming in the Arctic is increasing at two to three times the global annual average since, with the reduced ice cover, the water in the Arctic Ocean is now absorbing the energy from the sun, and not reflecting the sun's energy, thereby accelerating further ice cover melting. These features may be responsible for introducing more extreme weather conditions.

These many evidential-based information sources are implying that the ability to safely improve control of urban flooding are in jeopardy.



Dr. Ed McBean received his BSc from University of British Columbia (UBC) in 1968, and his PhD (Magna Cum Laude) from Massachusetts Institute of Technology (MIT) in 1973. After a post-doc at Cornell University, he was a professor at the University of Waterloo and from 1995 to 2003, and Ed then worked in industry, as Vice President of CRA (3<sup>rd</sup> largest engineering firm in Canada) and President of CRA Engineering, Inc. In 2003, McBean was awarded a Tier 1 Canada Research Chair in Water Security, which he held at the University of Guelph until 2017. Subsequently, he has been University of Guelph Research Leadership Chair Professor, Water Security. Ed is an academician in Canada, being a Fellow of Canadian Academy of Engineering and an academician in the US, being Diplomate, American Academy of Water resources Engineering and American Society of Civil Engineers. Ed has received many additional awards including the Research and Development Medal from Professional Engineers of Ontario, the K Y Lo Award from the Engineering Institute of Canada, Lifetime Achievement awards from both UBC and from Ton Duc Thang University in Viet Nam, and the Julian C. Smith Award from the Engineering Institute of Canada. Ed has published three books and more than 400 papers in engineering journals.