

Adapting Infrastructure and Civil Engineering Practice to a Changing Climate: Implications for Climate Science

Dan Walker,¹ J. Rolf Olsen,² Ted S. Vinson,³ Richard N. Wright,⁴ and Ana Barros⁵
Bilal M. Ayyub,⁶

ABSTRACT

According to U.S. Census, new construction spending in the U.S. for 2014 was \$993 Billion (roughly 6 percent of U.S. GDP). Informing the development of standards of engineering practice related to design and maintenance thus represents a significant opportunity to promote climate adaptation and mitigation, as well as community resilience. The climate science community informs us that extremes of climate and weather are changing from historical values and that the changes are driven substantially by emissions of greenhouse gases caused by human activities. Civil infrastructure systems traditionally have been designed, constructed, operated and maintained for appropriate probabilities of functionality, durability and safety while exposed to climate and weather extremes during their full service lives. Because of uncertainties in future greenhouse gas emissions and in the models for future climate and weather extremes, neither the climate science community nor the engineering community presently can define the statistics of future climate and weather extremes.

The American Society for Civil Engineering's (ASCE) Committee on Adapting to a Changing Climate is actively involved in a number of efforts internal and external to ASCE to promote understanding of the challenges climate change represents in engineering practice and to promote a re-examination of those practices that may need to change in light of changing climate. In addition to producing an ASCE e-book, a number of webinars, and promoting an examination of how information about future climate may need to influence ASCE standards, the Committee has developed

¹ President and Chief Executive Officer, ClimateMonkeys LLC, 10019 Founders Way, Damascus, MD 20872, USA

² Senior Lead for Climate, Institute for Water Resources, U.S. Army Corps of Engineers (USACE), 7701 Telegraph Road., Alexandria, VA 22315, USA

³ Professor (Emeritus) of Civil and Environmental Engineering, Oregon State University, 11029 Dublin Canyon Road, Pleasanton, CA 94585, USA

⁴ Retired Director, Building and Fire Research Laboratory, National Institute of Standards and Technology, 20081 Doolittle Street, Montgomery Village, MD 20886, USA

⁵ Professor of Civil and Environmental Engineering, Duke University, Durham, NC 27708-0287, USA

⁶ Professor of Civil and Environmental Engineering, 4298 Campus Drive, Martin Hall, University of Maryland, College Park, MD 20742, USA, ba@umd.edu

working relationships with the Societal Dimensions Working Group of CESM, the Program for Climate Model Diagnosis and Intercomparison at LLNL, and, most recently, the Engineering for Climate Extremes Partnership at NCAR. While these opportunities are encouraging, they also underscore a potential need for greater coordination of efforts by various governmental and academic groups wishing to support efforts of practicing engineers.