American Water Resources Association
2015 SUMMER SPECIALTY CONFERENCE
Climate Change Adaptation
June 15 - 17, 2015
New Orleans, LA

Tuesday, June 16
10:30 AM – 12:00 Noon
SESSION 8: Extreme Events

Extreme Climate/Weather Events: Lessons Learned from Water and Wastewater Utilities - Katy Lackey, Water Environment Research Foundation, Alexandria, VA (co-authors: N. Beller-Simms, E. Brown, L. Fillmore, K. Metchis, K. Ozekin, C. Ternieden)

Extreme climate and weather events are occurring more frequently and with more intensity across the nation, often leaving communities - and the water utilities that serve them - reeling from the costly aftermath. Such events have the potential to disrupt water services including drinking water supply, wastewater conveyance and treatment, and stormwater management. There is global recognition that the water sector remains at the forefront of climate impacts, yet water resources and services have reverberating impacts on energy, development, and economic sectors. Utilities' abilities to successfully respond and adapt to increasing trends of extreme events is of the utmost importance for resiliency in all sectors. In 2012/2013, a collaboration of water and climate research organizations conducted six workshops around the nation to identify impacts, highlight effective community response, and explore future adaptation strategies for extreme climate/weather events. This presentation discusses common lessons learned from these six case studies. It examines what happened, how information was used to inform decisions, what institutional dynamics helped or hindered, and how water utilities (and their communities) are planning to deal with extreme events in the future. There is no "silver-bullet" decision support tool, as different events affect communities in different ways. Several lessons emerged, however, and this study identified important gaps in the availability of information. The six workshops concluded that communities are grappling with not just one, but several, types of extreme events (floods and droughts, among others), and must balance both emergency response and long-term preparedness. By looking at how water, wastewater, and stormwater utilities - and other local water resource managers - in these six regions made decisions in response to recent extreme events, others can benefit from these experiences. The presentation gives real-life examples from case studies to highlight how multi-disciplinary collaboration, increased public awareness, and managing multiple risks better enables utility managers to cope with events themselves. With particular attention to the study in the Tidewater region of VA, this presentation discusses the cumulative impacts of sea level rise, small storm surges, and extreme hurricane events on water utilities, and how managers in the Tidewater region are responding. Looking forward to enhance resiliency includes actions for 'rebuilding differently' in the aftermath of extreme events. Another key response is planning for integrated water resource management through flexible adaptation pathways. Sharing

successful strategies from these case studies contributes to nationwide efforts to advance extreme event preparation and adaptation to climate change.

Structures of Coastal Resilience: Probabilistic Coastal Flood Hazard Mapping for Dynamic Performance Based Design – **Julia Chapman,** Princeton University, Princeton, NJ (co-authors: G. Nordenson, N. Lin, C. Little, T. Mayo, M. Oppenheimer, M. Tantala)

As climate change drives sea level rise and increases the frequency and severity of hurricanes, urban coastal areas are increasingly vulnerable to flooding from storm surge. Coastal planning and design must be re-assessed so that inhabited coastal regions can adapt to both the gradual and extreme consequences of these changes. Frameworks such as dynamic performance based design could allow communities to incorporate climate uncertainty into urban planning processes and build for the risk levels they are willing to accept. Intended for insurance purposes rather than for planning, the flood maps of the National Flood Insurance Program do not communicate a range of risk levels or account for climate change. This paper proposes a method of probabilistic coastal flood hazard mapping to accomplish two goals: first, to spatially represent probabilistic coastal flood hazard risk, accounting for climate change, over the next century; and second, to evaluate the flood mitigation effects of design proposals through this system of mapping. This paper is one product of the Structures of Coastal Resilience project through which an interdisciplinary team of architects, landscape architects, climate scientists and mapping technology specialists combine climate research with planning and design (detailed information at www.structuresofcoastalresilience.org). For four particularly vulnerable sites along the North Atlantic Coast, we create probabilistic storm surge flood maps using Geographic Information Systems (GIS) software. The storm surge elevation values are generated through the Sea, Lake and Overland Surges from Hurricanes (SLOSH) model from a suite of statistical-deterministic storm pressure fields and combined with astronomical tide and sea level rise distributions. We produce a series of map matrices to represent probabilistic still water flood elevation values for multiple return periods in current and future climate. In addition, we modify digital elevation models (DEMs) at the four sites in order to test and visualize the flood mitigation capacities of design proposals under surge conditions. While employed here for four select sites (Narragansett Bay, Jamaica Bay, Atlantic City and Norfolk), the mapping method and matrix framework could be expanded as a design and planning tool for coastal communities and serve as a model for a holistic probabilistic coastal flood hazard mapping endeavor. This paper is one of four papers submitted from the Structures of Coastal Resilience project. More information about this interdisciplinary effort can be found at www.structuresofcoastalresilience.org.

Building Resilience in ICT: How Extreme Weather and a Changing Climate Can Impact Telecommunications and Data Centers, and What We Can Do About It – Ben Rabb, Acclimatise Group Ltd., Cardiff Bay, UK (co-authors: P. Adams, B. Ashe, J. Steeves)

Telecommunications and data centers are key utilities that facilitate the functioning and connectivity of the United States economy. Disruptions in the ability to communicate or access information severely inhibit governments, companies, and citizens, and in periods of disaster or

extreme events, this challenges puts national and human security and business value at risk. Climate variability and change may threaten the infrastructural integrity and productivity of these critical sectors, increasing the number and severity of disruptions. Many of these impacts are intimately tied to water, from the role of hydropower to water cooling systems to water-related climate impacts. Extreme or unusual weather can lead to cascading impacts felt across sectors and borders. However, despite the importance of these sectors, the climate risk they face is poorly understood. Even less understood are climate risks to the supply chains both sectors rely upon. This presentation will share highlights of a report prepared for the US General Services Administration, including insight on how climate change may disrupt these sectors, how resilience can be fostered, and recommends next steps. GSA is using guidelines derived from this report to communicate resilience among ICT services providers and integrate climate vulnerability into procurement decisions.