American Water Resources Association
2009 SPRING SPECIALTY CONFERENCE
Managing Water Resources Development in a Changing Climate
May 4-6, 2009
Anchorage, AK

Wednesday, May 6
8:30 AM – 10:00 AM
Session 27: Increased Flooding and Flood Management?

1. Potential Impacts of Changes in Rainfall Intensity on Flood Control Infrastructure in the Lower Rio Grande of New Mexico - Susanna Glaze, New Mexico Water Resources Research Institute, Las Cruces, NM (co-authors: Bobby J. Creel, Chris Brown)

Communities in the American Southwest are experiencing the effects of global climate change. These effects are not limited to simply warmer temperatures and drier climates, but also have effects on rainfall intensity. A study by Denault et al in 2006 explored the impacts of future increases in rainfall intensity on the urban infrastructure and natural ecosystems in a watershed near Vancouver in British Columbia, Canada. Using the framework constructed by the authors, the impacts of potential changes in rainfall intensity in the Lower Rio Grande of New Mexico will be examined. Various statistical analyses will be used to determine if there are trends in rainfall intensity for several different rainfall time durations in the watershed. Any resulting trend lines of statistical significance will be used to extrapolate future rainfall intensities and the resulting runoff. The Storm Water Management Model (SWMM) will be used in conjunction with ArcGIS to model these possible changes in rainfall intensity and the resulting runoff on flood control infrastructure as well as on stream health by examining impervious surface area present. The results of the study will be useful in incorporating issues of climate change into community planning.

2. The 2008 Tanana River Flood: Where Did All the Water Come From? - Edward Plumb, National Weather Service, Fairbanks, AK

Heavy rain fell over interior Alaska in late July 2008 and resulted in some of the worst flooding seen along the Tanana River since the record flood of 1967. An unusual weather pattern which developed east of Fairbanks produced in excess of 5 inches rainfall in 24 hours over a portion of the Tanana River valley. This surge of water into the basin yielded rapid and dramatic water level rises on the Tanana River which are more typical of smaller, fast responding drainages. The Tanana River rose over bank and flooded a wide swath from Salcha downstream to Nenana. Backwater at the mouth of the Chena River also created flooding problems. The duration and extent of the flooding was exacerbated by several successive weather systems which followed the initial deluge. The meteorological situation responsible for the significant rainfall and the resultant flooding impacts will be discussed.

3. Managing Future Floods Today: A Framework for Sustainable Risk Management - Adam Hosking, Halcrow, Inc., Tampa, FL (co-authors: Jerry Sparks, Peter von Lany)

Regardless of the causes or our mitigation efforts, it is certain that there will be future climate change impacting flood and erosion risk management. Changes in rainfall, snowmelt, sea level, and storminess will all contribute to increased future risks. These future changes present a significant challenge to U.S. floodplain and emergency managers where flood risk management is typically based on existing conditions. In the face of climate change and resultant changes to flood and erosion risks, it is unlikely that this short term approach will be capable of delivering sustainable solutions. If we continue to focus only on near term hazards, the only options will be costly structural or retrofit solutions and/or deal with the physical deterioration of the land and infrastructure and accompanying consequences. Sustainability, by definition, requires consideration of future needs and constraints. In this context that means having an awareness of how risks could affect communities in the future. The appropriate management of future risks requires a long-term planning perspective moving away from simple cost-benefit based decision making and developing approaches that enable the consideration of a range of future scenarios and review of the ability of management responses to deliver benefits across those scenarios. Dealing with uncertainties is also a major challenge. In developing these approaches we can draw on lessons from international best practice in those countries where sustainable planning is more established. The UK offers a strong role model for this, where long-term strategic plans are a central feature of the risk management process. The development and adoption of sustainability indicators, and metrics for their appraisal, provide a technique for evaluating the performance of management options across a range of possible future scenarios. Metrics such as adaptability, resilience, and robustness have been applied, and concepts such as 'social justice' and 'good governance' are incorporated into the assessment of option performance. The paper will overview international best practices and recommend approaches that could be taken to improve US risk management in order to deliver sustainability in the face of uncertain climate change.

4. Protecting London from Tidal Flooding: Limits to Adaptation - Luke Lovell, Halcrow, Swindon , UK (co-authors: Tim Reeder, Jonathan Wicks, Owen Tarrant)

Projections indicate significant physical and ecological changes as a result of a changing climate. What barriers and limits exist to adapting to such changes? What thresholds are there in physical and ecological systems beyond which it is not feasible for societies to adapt? In what ways is adapting to +2 degrees Celsius possible? What might adaptation mean in a system nearing a threshold? How is adaptation possible if the change occurring is irreversible? Which habitat ranges, ecosystem functions and threats of extinction of particular species have been identified to constitute thresholds? Given the large uncertainty in the potential impacts of climate change on sea levels and North Sea storm surges, the UK Environment Agency is developing its understanding of the limits to engineering adaptation for the tidal Thames. Thresholds, defined in terms of sea level rise, increase in surge magnitude and target standard of protection, have been quantified for a number of possible engineering adaptation responses. The Environment Agency's Thames Estuary 2100 (TE2100) project team are preparing a flood risk management plan for the tidal Thames, which will cover the next 100 years. Part of the plan is developing decision pathways, which map out different options for future flood risk management with full consideration of the need for adaptability. Future options include portfolios of responses, some of which are structural (engineering), while others are non-structural (e.g. enhanced development control). In order to place the various responses along each of the decision pathways, there is a need to define the 'end game' (or limit to adaptation) for each option. This paper describes how hydrodynamic river modelling was used to test responses against sea level rise scenarios of up to 8 metres, as well as possible increases in surge magnitudes. The study has delivered important quantitative information for seventeen engineering responses, enabling the TE2100 team to develop decision pathways for implementation of various options against possible increases in future sea levels. The way in which the study has applied reasoned assumptions in order to constrain the problem under investigation is likely to be of particular interest to others about to embark on similar studies.