Water Resources Management in the Face of Climate Change

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Water resources infrastructure around the world has largely been designed for the climate and hydrology of the previous century. As climate change continues to alter the fundamental elements of the hydrological cycle, the vast array of human and natural systems that depend on or are influenced by water resources infrastructure will be forced to adjust. The scale of this adjustment will be immense, and complicated by the fact that climate change appears to be resulting in hydrologic conditions characterized by greater extremes and higher uncertainty.

Human and natural systems have already begun to experience the impacts of climate change. In the United States, especially coastal areas, climate change impacts have spurred new thinking about all aspects of water resources systems, from water supply to flood management to aquatic ecosystem protection and enhancement. California is a prime example of the increasing importance of climate change adaptation strategies for water resources systems in the United States. California has one of the world's most highly engineered water resources systems that serves nearly forty million people and a multi-billion dollar irrigated agriculture industry, while at the same time providing habitat for commercially important fish species like salmon and a wide range of other highly valued fish and wildlife species. California's water resources system was built to capture snowfall in the northern half of the state during wet winters and deliver much of it through a network of massive canals and pumps to the southern half of the state during dry summers. Climate change in California is expected to yield less snow and more extreme rain, which will stress the already over-stressed water resources system, requiring changes in water supply infrastructure like dams, agricultural practices, flood management facilities like levees, and ecosystem management aimed at preventing the extinction of sensitive fish and wildlife species.

Similarly, in India, a large country with diverse climate, topography, and land use, the summer (June – October) monsoon provides nearly 80% of the annual precipitation, resulting in very high seasonality of water supply. Ever increasing municipal water demands, food production requirements to feed a growing population and growing industries are putting immense stress on India's water resources systems. Climate change is likely to significantly impact the flow of Himalayan rivers which account for nearly 2/3rd of India's water supply potential. Recent studies also indicate that the instances of extreme weather events in India are expected to increase due to climate change. Facing these fundamental shifts, India must be able to improve its ability to predict likely future climate scenarios and the impacts of climate change on water resources systems and the sectors they serve, including agriculture and energy, so that effective adaptation strategies can be developed and implemented.

This session will explore four areas critical to the future of the world's water resources systems in the face of climate change: 1) causes of climate change and the increased prevalence of extreme hydrologic events; 2) emerging water resources modeling technologies to understand impacts on various sectors and develop adaptation strategies; 3) the developing field of eco-engineering and

how it is being applied to increase the resilience of water resources systems in the face of climate change; and 4) implementation of smart water resources infrastructure that will improve our ability to adapt water resources systems to climate change and respond to extreme events like floods and hurricanes.