Managing Flood Risk Through Risk Reduction Infrastructure

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As Hurricane Joaquin approached the United States, individuals along the East Coast prepared for the wind, heavy rain and dangerous storm surges that would impact their area. Coastal water levels rose significantly above normal tides, which caused flooding in areas already dealing with significant rainfall from previous weeks. [1]

Flooding risks will likely increase across the United States. By the year 2100, the average 100-year flood plain is projected to increase by 45 percent, with annual damages increasing by $750 million. [2] As infrastructure ages, flooding may overwhelm drainage system capacity. Many communities want to reduce storm water runoff by developing technologies and strategies to manage localized and riverine floods.

Flooding in North Dakota caused significant damage and delay. (Image courtesy of the Federal Emergency Management Agency)

In the South Central and Southwestern United States, the U.S. Army Corps of Engineers is creating risk reduction projects to mitigate damages caused to infrastructure and local communities by flooding. From May to June 2015, risk reduction reservoirs and other systems saved this area an estimated $13.3 billion in damages. [3] The ability to estimate preventable flood damages "is a multi-stage process that involves looking at the water level with the flood reduction project (dam or levee) in place, and where the water level would have reached if the dam or levee had not been built." [3]

To reduce the cost and long-term maintenance of storm water management, several solutions will play a fundamental role of urban drainage system designs. One company is developing a concrete capable of diverting water directly below the surface upon impact. This new concrete, known as the Topmix Permeable, allows approximately 880 gallons a minute, significantly more than traditional concrete. [4] During periods of high rainfall, this permeable concrete delays the release of surface water into drainage systems, which reduces the risk of overwhelming the systems and producing flash flooding. Ideally, this material would be implemented in warm urban areas, but would be beneficial in areas prone to flooding.

Historically, implementing risk reduction techniques relied on design methods from past events. Engineers now have scientific tools and technologies to create improved approaches to anticipate sea-level rise, impacts of storm intensity and geomorphic changes. The Army Corps of Engineers also initiated design innovations to complete of risk reduction infrastructure quickly, at a lower cost than federal civil works projects. Flood protection infrastructure offers at least $4 in benefit for every dollar spent, a smart investment for forward-looking resilient cities. [5]

References:

[1] Payne, E. (2015). Hurricane Joaquin now Category 3 storm as it nears Bahamas. *CNN*.

[2] Building Green Infrastructure to Manage Flood Risk. (2015). *United States Environmental Projection Agency*.

[3] Cenkci, M. (2015). Army Corps of Engineers projects prevent $13.3 billion in flood damages. *U.S. Army*.

[4] Weller, C. (2015). This 'thirsty' concrete absorbs 880 gallons of water a minute – here's how it works. *Tech Insider*.

[5] Merdith, W.B. & Goldsmith, W. (2013). Building flood risk reduction infrastructure pays off and can even pay back. *Engineering News-Record*.

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