When the levees fail

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Flood victims are rescued in New Orleans. Credit: Federal Emergency Management Agency

"A hard rain's gonna fall..." So the Dylan song went... but when rain and storm surges fall on lands protected by weak levees, this means trouble…big trouble. Hurricanes Katrina and Rita were devastating reminders of this frightening fact. How then can we limit trouble when a levee breaches or, better yet, prevent such a break from ever happening again?

“Any solution will be difficult and challenging,” says Wil Laska, who manages the Levee Strengthening and Damage Mitigation Project at Homeland Security's Science & Technology (S&T) Directorate. “But

first, we've got to ensure that all the levees in the United States are solid, built correctly and well. We also have to make sure that all repairs are attended to on a rigorously timed basis. No ifs, ands, or buts."

The levee project is a comprehensive one, spanning four years and operating in three phases. In the first phase, researchers will identify potential technologies and procedures that can rapidly and affordably indicate problem locations along a levee, strengthen these existing areas, provide innovative designs for new levees, and repair any breaches. Subsequent phases will test and demonstrate the technologies and procedures. For instance, the U.S. Army Engineer Research and Development Center has developed the Levee Condition Assessment Technology, or LevCAT, which combines geophysical instrumentation with airborne and ground-based research to essentially "see" weak soil under levees.

When considering the country's levee system, however, there's another issue at play here besides horrendous storms. We are witnessing the slow death of our natural buffer zones – which protect us from powerful sea surges. River basins, deltas, and savannahs are being congested with soil and debris. Human development and our residual waste is causing the surrounding land to sink, and as salt water rushes in, thick expanses of wetland, mangroves, trees and grasses are poisoned. Without these buffers, storms can push sea surges quite a distance inland. And, as ocean levels rise, as they are doing, low-lying cites will have to protect themselves by using some sort of barriers and pumps to help keep the rising waters out.

Laska is taking on this problem too. The project also aims to develop approaches and technologies that will duplicate the effect of marshland and reduce the strength of surges. Solutions being considered include: inflatable and drop-in structures that last just long enough to prevent severe damage; fast-growing vegetation to rapidly imitate the effect of

marshlands in lowering tides; and ways to reroute flood waters and flood-proof critical infrastructure.

Laska is part of a small group of experts focused on DHS's Science & Technology Directorate projects called Homeland Innovative Prototypical Solutions, or HIPS. These projects are designed to deliver prototype-level demonstrations of potential game-changing technologies in two to five years. They come with a moderate-to-high risk of failure, but they can also yield a high payoff if successful.

“All of these goals are enormously ambitious, but that’s the nature of the work,” he says. “Right now, the S&T Directorate is looking at just about any decent idea.”

Source: US Department of Homeland Security