

A strand jack on the Olmsted Lock and Dam catamaran barge lowers a 5,100 ton concrete shell into the water. The navigable pass shell is one of 12 to be installed on the inland waterways navigation project on the lower Ohio River.



CAPT. CHELSEY O'NAN/USACE

SOLID GROUND

Advances in funding, construction could help USACE solve America's aging infrastructure problem

By Matt Alderton

THE NATION'S CRITICAL INFRASTRUCTURE includes everything from roads and railroad tracks to airports and power plants. For the U.S. Army Corps of Engineers, however, its most important components are the levees, dams and inland waterways that it has helped build since its inception. Unfortunately, much of that infrastructure — now nearly a century old — is beginning to disintegrate.

"We've pretty much built the nation's water resources, and now they're reaching retirement age," said USACE Director of Civil Works Steven Stockton. "We've got a lot of tough decisions to make."

Indeed, the United States is home to approximately 87,000 dams, more than half of which have exceeded their expected 50-year lifespan, according to the U.S. Government Accountability Office.

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The Olmsted Locks and Dam project on the Ohio River will improve commercial navigation to and from cities.

“Are our dams going to fail tomorrow? Absolutely not. They’re built to last. It’s like the ‘use by’ date on food; if you eat it the day after it expires, you’re not going to die,” explained Billy Deeb, director of public entities at Aon Risk Solutions, which provides risk management and insurance services to infrastructure projects across the country. “But the infrastructure is old and has issues, so there are definitely things we need to be doing to maintain it so it lasts a long time.”

In its most recent *Report Card for America’s Infrastructure*, published in 2013, the American Society of Civil Engineers gave America’s infrastructure a D+; it gave bridges a C+, dams a D and levees a D-. The stakes are high: Left to fester, this deteriorating infrastructure could cause not only loss of life, but also loss of livelihood.

“Infrastructure builds the foundation for a strong economy,” USACE’s Stockton said. “If you look at the inland waterways system, it allows the U.S. to be competitive in getting agricultural products to market. If that system becomes unreliable, or fails, it affects the U.S. economy and the global marketplace.”

THE MAINTENANCE GAP

When it comes to aging infrastructure, USACE has a lot in common with the U.S. Navy, according to Jonathan Waldman, author of *Rust: The Longest War*.

“A lot of Navy admirals are concerned about the size of the U.S. fleet; they’d love

A catamaran barge and super gantry crane were built specifically for the Olmsted Locks and Dam project.



CAROL LABASHOSK/USACE



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The Olmsted Locks and Dam project's precast yard in Olmsted, Ill., is where the massive shells or pieces of the dam are constructed, and then moved to the shoreline by the super gantry crane and into the Ohio River. There, they are floated by catamaran barge to the dam. The project will replace two of the original locks and is scheduled to open in 2018.

to enlarge the fleet to something like 313 ships, but ... we can't even maintain the (272) ships we currently have," said Waldman, who interviewed the nation's highest ranking rust official: Daniel Dunmire, director of the Navy's Office of Corrosion Policy and Oversight. "What Dan advocates is preserving and maintaining. Other people can concern themselves with building new things; Dan would like what we already have to last for a long time."

That sentiment pervades the Corps. "Most of our projects are designed or justified based upon an economic life of about 50 years. That said, with proper maintenance, repair and rehab, we can make these projects last for a long, long

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— Steven Stockton, U.S. Army Corps of Engineers director of civil works

time — many hundreds of years," Stockton said.

Unfortunately, maintenance requires money and money is scarce. "At current funding levels, fixing all of the dams and levees to bring them up to required standards would take \$24 billion and over 50 years," said Deeb, whose estimate encompasses federal, state and privately owned dams — 709 of which are operated by USACE, along with 242 navigation lock

chambers and approximately 14,000 miles of levees. "The money simply isn't flowing in at the required level to repair things."

Absent required resources, USACE in the last several years has embraced a risk-sensitive approach to asset management, taking inventory of all the infrastructure for which it's responsible and assessing its condition and strategic importance to develop a hierarchy of needs. Simply put: If it's really important and in really poor

shape, it's first in line to get fixed.

"We now have a risk profile of all our asset classes in the nation, and every dollar we get in the way of operation and maintenance we now know how to spend in order to buy down the most risk," explained Edward Belk, chief of the Operations and Regulatory Community of Practice within USACE's Directorate of Civil Works. "So even though our infrastructure is getting older, we have a very repeatable, disciplined, consistent way to characterize where we can make the biggest impact with the limited operations and maintenance dollars that we get."

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GETTY IMAGES

A rural church is surrounded by floodwater April 10, 2011, near Gardner, N.D., after the Red River crested. Communities in Fargo, N.D., and Moorhead, Minn., are especially at risk.



GETTY IMAGES

The Fargo-Moorhead Area Flood Diversion Project aims to reduce flood risk from the Red River by constructing a 12-mile-wide dam to divert floodwaters.

PARTNERING FOR SUCCESS

In addition to spending existing capital more strategically, USACE is looking for innovative ways to acquire new capital.

One way of ensuring this is through public-private partnerships (P3s), which share construction, operation and maintenance costs among government and private-sector stakeholders. A common example, for instance, is a toll road; in exchange for a lump-sum payment, a private entity receives the right to collect tolls for a number of years before returning the asset to public ownership.

“P3s won’t take the place of public investment in infrastructure, but they can help amplify the investments the nation is making in those assets,” explained Belk, who said a USACE demonstration project is the Fargo-Moorhead Area Flood Diversion Project in Fargo, N.D., and Moorhead, Minn.

The \$2.1 billion project will reduce flood risk from the Red River by constructing a 12-mile-wide dam and a 36-mile-long diversion channel that will catch and divert floodwater around the Fargo-Moorhead metropolitan area, respectively.

“In the fiscally constrained environment that we currently have, it would take (USACE) 20 years to deliver that project,”

Belk said, noting it is receiving funds, instead, from a consortium of federal, state, local and private-sector partners, of which the Corps is just one. “With a P3 transaction we’re able to secure all the funding up front, which means we can deliver the program in six or seven years instead of 15 to 20.”

While USACE will build the dam, a private contractor will build the diversion, operating and maintaining it for at least 20 years to ensure its ongoing integrity and upkeep as it ages.

BETTER BUILDING

Innovative financing must be matched with innovative building. “While there is a need to look at funding models, we as civil engineers also need to look at how to design things so they can be built and maintained more cost-effectively,” said Mark Woodson, president of the American Society of Civil Engineers. “Funding is always going to be a challenge, so we need to build things better so they last longer.”

USACE agrees. “At our Engineer Research and Development Center in Vicksburg, Miss., we’re looking at a whole host of technologies and approaches to help inform future designs,” said Belk, who noted advances in design, hydraulics, polymers and coatings, all of which could make future infrastructure more resilient.

The Corps is also experimenting with construction techniques as much as materials. In Olmsted, Ill., for instance, its \$3.1 billion Olmsted Locks and Dam project is replacing two aging locks and dams on the Ohio River with a single, dual-chamber structure that will improve commercial navigation to and from cities such as Pittsburgh and Louisville.

“Both of these locks are very old and very much in need of rehabilitation,” Belk said, adding they were built in 1929. “One of them is in active failure; it’s just a matter of time before it loses its ability to function.” This could lead to unprecedented disruption and delays in commercial navigation.

Now scheduled to be operational in 2018, the replacement structure is being built “in the wet.” Unlike traditional “in-the-dry” dams, which are cast in place in drained riverbeds, in-the-wet dams are prefabricated on the riverbanks, then floated out and sunk into pre-installed foundations. The benefits include lower costs, faster construction, reduced environmental impact and safer construction — not to mention improved quality, as prefabricated segments are built to strict

standards within a more controlled environment, which could translate to longer life.

“It will be a more efficient asset than what’s there now,” said Belk, noting the significance of building a single new structure that can handle the workload of two old ones. “Any time you can reduce the number of things you have to maintain, it makes for a less complex and more efficient

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maintenance tail.”

In the face of old infrastructure, new thinking is exactly what’s needed to move forward. ●