Rising flood waters advance on Midland, Michigan, after the breach of the Edenville and Sanford dams.

Edited by **Jennifer Sills**

Preparing for proactive dam removal decisions

On 18 May, the Edenville and Sanford dams, built in the 1920s to serve the people of Michigan, failed after a series of extreme rainfall events. More than 10,000 residents were evacuated, and flood waters inundated a major chemical complex, raising concerns of a widespread environmental catastrophe (*1*). These incidents, the latest in the long line of increasingly frequent (*2*) dam failures, highlight once again the importance of proactively addressing aging and problematic dams. To move forward, we need a scientific and legal framework in place to evaluate if and when dam removal is required and to ensure that adequate funds are devoted to implementing responsible decisions.

The United States has removed about 1700 dams (*3*), many of them since 2000, but our understanding of how these decisions are made and the effects on local ecosystems remains incomplete. Less than 10% of dam removal cases have been scientifically evaluated (*4*). Most post-dam removal studies are less than a decade old and do not adequately represent the diversity of dam types, watershed conditions, dam-removal methods, and the decision-making processes in the United States. To prepare for future decisions, scientists should document, share, and analyze the collected data and lessons from both past and ongoing dam removal missions.

We also lack information about the effects of dam removal on the environment. Records show that the local river and ecosystem do not fully revert to their pre-dam condition (*5*). Environmental impact assessments should inform all dam rehabilitation and removal decisions by considering a wide range of ecosystem evolution trajectories. Restoring the environment will require careful planning, close monitoring of the state of the ecosystem, sediment removal, and land use regulations.

Finally, we must identify and address socio-economic, technological, and regulatory barriers to judicious and timely dam maintenance, rehabilitation, and removal. Both of the Michigan dams were more than 90 years old and previously classified as "high hazard," as are a third of Michigan's 1059 dams and more than 15,600 dams across the United States (*6*). Because rehabilitating the nation's non-federal dams would cost more than $65 billion (*7*), unsafe dams continue to operate. To prevent future catastrophic events like the one in Michigan, we must clarify the importance of making funds available for rehabilitation and removal by raising awareness about the risks of problematic dams to human safety and environmental health.

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Unnecessary hesitancy on human vaccine tests

In their Policy Forum "Ethics of controlled human infection to address COVID-19" (22 May, p. 832), S. K. Shah and colleagues provide an ethical framework to determine whether controlled human infection studies (CHIs) are justifiable for studying potential vaccines and treatments for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (COVID-19). Some of the Policy Forum authors reportedly disagreed that "the social value of such CHIs is sufficient to justify the risks" at this time. Their reluctance is unfounded. The risks of a properly conducted CHI are low enough, and the social value of expedited SARS-CoV-2 vaccine development is high enough, that properly conducted CHIs with a fair chance at accelerating that development remain a legitimate strategy.

Shah *et al.* identify an ineliminable risk to participants: a 0.03% death rate among "healthy adults aged 20 to 29" infected with SARS-Cov-2. The source for this mortality rate (*1*) documents death among all infected 20- to 29-year-olds. In healthy people in this age range, death should be rarer. CHIs will only recruit healthy people. And, perhaps thanks to evolving COVID-19 treatment practices, the mortality rate is already lower in that age group than it was when the Policy Forum was published (*2*). Moreover, as shown in Shah *et al.*'s table S1, live kidney donation, a broadly accepted

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