Report offers framework to guide decisions about Spirit Lake and Toutle River at Mount St. Helens

December 9 2017

A new report from the National Academies of Sciences, Engineering, and Medicine offers a framework to guide federal, tribal, state and local agencies, community groups, and other interested and affected parties in making decisions about the Spirit Lake and Toutle River system, near Mount St. Helens in southwest Washington state. The process should include broader participation by groups and parties whose safety, livelihoods, and quality of life are affected by decisions about the lake and river system, the report says.

In addition, updated data are needed to inform decision-making, said the committee that wrote the report. Currently, much of the information that informs long-term management of the system is from the 1980s and 1990s and is incomplete and sometimes outdated. Agencies engaged in risk management of the system should develop a coordinated monitoring system to track changes in factors that affect risk, and the data and analysis should be made available to all. Recent insights about the likelihood of a Cascadia Seismic Zone earthquake affecting the Mount St. Helens vicinity warrant greater examination, the report notes.

"Our report stresses the importance of thinking of Spirit Lake and the Toutle River as a system," said committee chair Gregory Baecher, Glenn L. Martin Institute Professor of Engineering at the University of Maryland, College Park. "Using an analytic process that is also deliberative will help decision-makers identify the many objectives,

alternatives, and impacts of those alternatives for managing that system."

The 1980 eruption of Mount St. Helens radically changed the landscape surrounding the volcano in southwest Washington State. The eruption sent an avalanche of debris into the North Fork of the Toutle River and blocked the drainage of Spirit Lake, causing a dangerous rise of lake waters. Should the debris blockage- which is functioning as a dam - fail, 50,000 people could be put at risk of catastrophic flooding and mud flows. The region also suffers from chronic flooding, which is exacerbated by heavy sediment loads coming off the mountain.

In the 1980s, engineering measures were implemented to manage catastrophic and chronic flooding risks - including a tunnel to drain and help manage water levels in Spirit Lake, and a sediment retention structure to prevent sediment from flowing downstream. The tunnel now requires major repairs, and the sediment retention structure is nearing its capacity. In 2015, the U.S. Forest Service asked the National Academies to convene a committee to propose a decision framework to support the long-term management of risks related to the Spirit Lake and Toutle River system.

To guide choices about the lake and river system, the Academies' new report recommends a decision framework grounded in scientific and engineering information, and the use of decision analysis techniques to account for multiple objectives and the values of interested and affected parties. The framework guides the decision-making process through five steps, from clarifying the decision problem to identifying trade-offs among management options.

Early in the decision process, the range of interested and affected groups should be engaged at a depth sufficient for management decisions to be informed by their concerns and values, the report says. Although agencies may already include affected groups in community outreach,

the methods of inclusion could be enhanced.

Participants in the decision process may include agencies with authority or interests in the system, those who experience the safety, economic, cultural, or life-quality impacts resulting from management decisions, and those with specialized knowledge related to potential impacts. The number of people participating needs to be small enough that discussions can be of sufficient depth to be meaningful and effective, the report says. In addition to this group, there must be a neutral support team that includes expertise in the technical and scientific fields of concern, decision analysis, stakeholder engagement, and group facilitation.

A framework implementer or lead also needs to be identified to be responsible for applying the collaborative analytic decision-making process. Ideally, the lead would be a new system-level entity or a formal consortium of existing agencies, the report says. The lead would provide a central focus for congressional mandates and appropriations, ensure collaboration across agency and jurisdictional boundaries, and maintain continuous engagement by all interested parties.

It is likely that the first attempt to apply the decision framework will be related to decisions regarding management of water levels in Spirit Lake. As decision participants consider long-term management of the lake, they need to consider a broad set of alternatives, the report says. Options to consider could include, for example, constructing a dry spillway as a backup outlet, or installing a second modern drainage tunnel that would provide redundancy and flexibility. The viability of these and other options is best quantified through an analytic deliberative process as outlined in the report.

Implementing the framework's steps and establishing a common understanding of the lake and river system depends on widely shared, reliable data and analysis, the report says. Monitoring capabilities and

data collection need to be updated, and analytic capabilities need to be re-evaluated. Decisions need to be informed by a current characterization of the debris blockage damming the lake, current meteorological trends, a quantification of risks posed by volcanic activity on Spirit Lake water levels, and site-specific quantitative seismic analysis conducted at the debris blockage and the sediment retention structure.

Operational risks - those related to operating engineered structures in the river and lake system - should be explicitly considered when evaluating alternatives for management, the report adds; such risks do not appear to have been systematically considered so far. Examples of operational risk scenarios include rapid lake level rise when the tunnel is closed for repair, and the failure of engineered structures such as the sediment retention structure and levees.

In early 2018, members of the study committee will hold a public briefing in southwest Washington to discuss their findings and recommendations.

More information: www.nap.edu/catalog/24874/a-de … m-at-mount-st-helens

Provided by National Academies of Sciences, Engineering, and Medicine