

## Community Resiliency Efforts through the U.S. National Tsunami Hazard Mitigation Program

M. Angove<sup>1</sup>, A. Devaris<sup>2</sup>, T. Biasco<sup>3</sup>, K. Gately<sup>4</sup>, L. Kong<sup>5</sup>, R. Lopes<sup>1</sup>, C. McCreery<sup>6</sup>, K. Miller<sup>7</sup>,  
A. Rizzo<sup>8</sup>, J. Schelling<sup>9</sup>, P. Whitmore<sup>4</sup>, and R. Wilson<sup>10</sup>

### ABSTRACT

The U.S. National Tsunami Hazard Mitigation Program (NTHMP) comprises representatives from U.S. coastal states, territories, and commonwealths and federal agencies who, under the guidance of the National Oceanic and Atmospheric Administration (NOAA)'s National Weather Service (NWS), work together to develop protocols and products that help communities prepare for and mitigate tsunami hazards. The NTHMP framework provides a stable, over-arching platform for collaboration among the state and territory programs to implement robust, long-term education programs and tsunami preparedness plans at the most important place: the community level. The NTHMP works to reduce potential casualties, damage, and disruption from future tsunami disasters, and supports creative and collaborative efforts to produce safe, resilient, and adaptive communities when tsunamis strike.

Three subcommittees of the NTHMP organize the activities of this multistate and multiagency partnership. These subcommittees help bridge the gap between physical and social science research and the needs of local government agencies to mitigate impacts from tsunami hazards.

Mapping and Modeling Subcommittee work results in development of tools that forecast tsunami impact on people and property, and assist communities to plan and build for resiliency. Inundation, evacuation, and other hazard reduction map products clearly indicate who and what is at risk to inform decision-making by community and state-level leaders.

Mitigation and Education Subcommittee activities improve tsunami awareness, outreach, preparedness, response, and recovery effectiveness. This is achieved by fostering NTHMP partnerships as a means to share and integrate practical preparedness efforts among state, territory, and federal programs and apply that to tsunami risk reduction activities.

Warning Coordination Subcommittee action improves the effectiveness of the U.S. Tsunami

---

<sup>1</sup>U.S. National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS) Headquarters;  
primary federal contact: [Michael.Angove@noaa.gov](mailto:Michael.Angove@noaa.gov)

<sup>2</sup>U.S. NOAA, NWS, Alaska Region

<sup>3</sup>U.S. Federal Emergency Management Agency, Region 10

<sup>4</sup>U.S. NOAA, NWS, National Tsunami Warning Center

<sup>5</sup>U.S. NOAA, NWS, International Tsunami Information Center

<sup>6</sup>U.S. NOAA, NWS, Pacific Tsunami Warning Center

<sup>7</sup>State of California Governor's Office of Emergency Services

<sup>8</sup>State of Oregon Office of Emergency Management

<sup>9</sup>State of Washington Emergency Management Division

<sup>10</sup>California Geological Survey; presenter and state-level contact: [Rick.Wilson@conservation.ca.gov](mailto:Rick.Wilson@conservation.ca.gov)

Warning System by providing NTHMP partners a means to exchange emergency response experiences and develop improvements related to operational product dissemination. A key function is to review and standardize components of the tsunami warning system such as warning center products, warning procedures, message dissemination, system exercises, and Emergency Alert System activation.

The effectiveness of the NTHMP has been and will continue to be tested by future tsunamis. Additional lessons will be learned by collaborating with similar organizations and activities of other countries, especially those which have faced significant and devastating tsunamis in recent years.

Life safety and community resiliency are the ultimate goals of the NTHMP and its activities. The NTHMP serves as a champion of collaboration, sharing, and integration of activities that focus on disaster risk reduction and serves as a model upon which to build a resilient tomorrow for all nations.

The U.S National Tsunami Hazard Mitigation Program (NTHMP) is the primary facilitator for comprehensive and consistent tsunami preparedness activities at the coastal community level. The Tsunami Warning and Education Act of 2006 provided the initial framework support for federal, state, and territory tsunami programs in the NTHMP to carry out this work [1]. The National Research Council of the National Academy of Science report confirmed that the NTHMP is the ideal platform for state, territory, and federal tsunami programs to coordinate and share information with each other about new and ongoing tsunami preparedness projects [2]. Federal, state, and territory tsunami programs work closely together and with social science experts to ensure that mitigation, awareness, and preparedness activities and messaging are done in a consistent manner nationally. Figure 1 illustrates the relationship between state/territory and federal partners, and how community-level resiliency is the focus of NTHMP efforts.



Figure 1. Illustration of National Tsunami Hazard Mitigation Program partners, functions, and community focus.

The benefit of the many activities coordinated and shared through the NTHMP has been that lives and property were saved in the U.S. during recent significant tsunami events originating from Samoa (2009), Chile (2010), and Japan (2011) [3]. Lessons learned from these events are being evaluated and integrated into tsunami preparedness and planning activities of the NTHMP state, territory, and federal partners [4].

The NTHMP has a Coordinating Committee, comprised of representatives of state/territory and federal agencies, which provides recommendations to tsunami preparedness and mitigation programs throughout the U.S. In order to ensure that there is consistency between federal and state/territory tsunami programs, three important subcommittees were formed to develop guidance and set standards:

- 1) Mapping and Modeling Subcommittee (MMS) – ensures tsunami hazard analyses and products are accurate and consistent.
- 2) Mitigation and Education Subcommittee (MES) – establishes a common platform for tsunami preparedness and outreach activities.
- 3) Warning Coordination Subcommittee (WCS) – maintains the communication network between the National Weather Service’s Tsunami Warning Centers and at-risk local communities for reliable dissemination of alert information.

The Mapping and Modeling Subcommittee (MMS) brings together expertise on a variety of tsunami and coastal mapping, modeling, and hazard issues. The MMS acts in an advisory capacity to the NTHMP Coordinating Committee on tsunami hazard analysis, modeling and mapping issues including: tsunami hazard and source identification, strategic guidance and standards for modeling and mapping priorities, and Digital Elevation Model development priorities. The MMS identifies and applies educational opportunities related to modeling and mapping products as well as hazard mitigation deficiencies that can be addressed by further mapping and modeling research, and utilizes opportunities to integrate modeling and mapping efforts into NTHMP mitigation activities. On-going MMS work includes: developing tsunami hazard guidance and products for maritime and land-use planning; coordinating production of products for new tsunami-related building codes; creating guidance for tsunami evacuation modeling; and developing other products to assist with community recovery and resiliency. The MMS vision is to be the authoritative source of scientific and technical guidance for tsunami modeling and mapping projects done by the NTHMP.

The Mitigation and Education Subcommittee (MES) improves tsunami awareness, preparedness, response and recovery effectiveness by providing NTHMP partners a means to integrate and share their experience with existing state, territory, and federal programs and apply that to tsunami risk reduction activities. The MES develops recommendations relating to products and activities that will provide increased education, outreach, and training to the public and other stakeholders. The primary focus of the MES members is the safety of the public from local-source tsunamis where “natural warning” signs, like earthquake ground shaking, will likely be the only “warning” before the tsunami arrives. Some of the other activities of the MES include, but are not limited to: promoting community education networks and programs; helping provide recognition of prepared communities; integration of tsunami activities into ongoing all-hazard warning, response, and risk management activities; and developing and disseminating “best practices” in mitigation and preparedness; participating in community meetings, conferences,

workshops, and special events. NTHMP partners have contributed to or are considering developing tsunami guidance for vertical evacuation, maritime mitigation and response strategies, and community recovery planning.

The Warning Coordination Subcommittee (WCS) helps improve U.S. Tsunami Warning System effectiveness by providing NTHMP partners a means to exchange experiences and discuss improvements related to operational product dissemination. WCS members formulate and agree to actions and recommendations regarding components of the tsunami warning system such as warning center products, warning procedures, message dissemination, system exercises, and Emergency Alert System activation. The WCS executes strategies and activities as assigned by the NTHMP Coordinating Committee.

The NOAA/NWS Tsunami Program and the NTHMP work with international partners and organizations to improve tsunami hazard analysis, response, and recovery planning. The U.S. Tsunami Warning Centers and the WCS collaborate with other nations to ensure the Global Tsunami Warning System is maintained and effective. The NTHMP and its MES supports requested international tsunami efforts through the United Nations' Intergovernmental Oceanographic Commission and the International Tsunami Information Center. In the wake of the recent devastating tsunamis, NTHMP members have partnered with organizations like the Earthquake Engineering Research Institute and others in the international community to evaluate post-event impacts and lessons learned. Many of these lessons, especially those related to tsunami recovery, help form the foundation of new tsunami resiliency planning by NTHMP members.

## Conclusions

The ultimate goal of the NTHMP and its subcommittees is to improve life-safety and increase community resiliency to future tsunamis. On-going community-level tsunami education and preparedness will improve evacuation while reducing casualties, especially during local-source tsunamis where there may only be minutes to respond. Improvements in tsunami hazard analyses and mitigation strategies will also provide communities with the tools to better plan for and recover from tsunamis. The work of the NTHMP in these areas has, and will continue to greatly reduce the impact of tsunamis on the residents and the economy of the United States.

## References

1. Tsunami Warning and Education Act, Public Law 109-424, 33 U.S.C. 3201 et seq., 2006.
2. National Research Council of the National Academies of Science. Committee on the Review of the Tsunami Warning and Forecast System and Overview of the Nation's Tsunami Preparedness. *Tsunami Warning and Preparedness: An Assessment of the U.S. Tsunami Program and the Nation's Preparedness Efforts*. The National Academies Press, Washington, D.C. 284 p., 2011.
3. Western States Seismic Policy Council (WSSPC). Tsunami hazard mitigation and preparedness - A Perspective from State and Territory tsunami programs in the high tsunami risk Pacific region. *WSSPC Report 2011-01*, 30 p., 2011.
4. Wilson, R., and Eble, M. New activities of the U.S. National Tsunami Hazard Mitigation Program, Mapping and Modeling Subcommittee: *presentation at 2013 American Geophysical Union Fall Meeting*, San Francisco, California, 2013.