

NTHMP Review Committee Consensus Statement

The NTHMP has established a unique partnership among multiple states and federal agencies that has been developed over the past decade, has set challenging goals, and met many of them. This program has institutionalized a partnership between federal and state members that is unmatched by other hazard and risk management programs. The reviewers unanimously agree on the following points:

- NTHMP was established well before the Sumatra tsunami and its goals have been validated by the impacts of that event. Recognition of a broader regional vulnerability to tsunamis, coupled with the success of the NTHMP provided the foundation for the Tsunami Warning and Education Act.
- Despite modest budget allocations, the program has achieved much because the state and federal agency partners have made investments of time and effort that go beyond normal expectations.
- All state and federal NTHMP representatives were highly engaged in the activities of the program and committed to its success.
- The program has expanded beyond a narrow focus on mitigation to include community resiliency. The reviewers endorse this expanded interpretation of the program's goals
- The representatives recognize that the technology developed and used by the program must be tied to education and awareness in order to be effective.
- The program has allowed states to experiment with alternative methods of achieving tsunami safety. This has resulted in a variety of innovative approaches that now provide an opportunity to develop assessment tools for evaluating their relative effectiveness.
- Since products such as inundation maps have been implemented at the local level, NTHMP is in a unique position to establish performance standards and standardized assessment tools for evaluating its effectiveness.
- There is a strong need for the National Academy of Sciences' review of the forecast/warning system and an external review of the *TsunamiReady* community program.
- The expansion of the NTHMP from the five Pacific states to 29 coastal states, commonwealths, and territories and the passage of the Tsunami Warning and Education Act offers a unique opportunity to strengthen the organizational structure of the program and enhance tsunami resilience in the United States.

- The lessons learned from the existing program should now be transferred to the additional 24 members that have joined the expanded program.
- The overarching goal for all partners is to continue to demonstrate the program's value over the next five years and to achieve a sustainable program.

Professor Lori Dengler's Assessment

I concur with the preceding NTHMP Review Committee Consensus Statement and offer the following additional comments on the NTHMP's achievement of its current goals.

The NTHMP is a unique hazard mitigation program that has achieved much since its inception in spite of a relatively small budget and no direct tsunami impacts on US States and territories over most of the review period. Its most notable achievements:

- Institutionalizing tsunami hazard mitigation at the federal level, first through incorporation into NOAA's budget and more recently with the passage of the Tsunami Warning and Education Act.
- Creating a commitment to tsunami hazard mitigation, strengthening state tsunami programs, and promoting communication and coordination across state lines.
- Encouraging consistency in message and products.
- Creating the framework for a coordinated state/federal response to the 2004 Sumatra earthquake that resulted in the passage of the Tsunami Warning and Education Act.

My main recommendations for the program:

- Develop a satisfactory leadership structure that supports state and local efforts and can effectively represent the interests of the program at the federal level.
- Develop strategic and implementation plans that reflects both the Act and the expanded membership.
- Incorporate local/community representation into the NTHMP coordination structure.
- Develop standards and/or endorse best practices for products including hazard and evacuation maps, mitigation and preparedness programs.
- Define measurable outcomes for educational/preparedness programs, maps and other products.
- Develop tools and conduct assessments of the effectiveness of achieving outcomes that can be applied to all states, commonwealths and territories.
- Strengthen ties with the tsunami research community to identify and support research needed to improve mitigation/preparedness and to communicate results of research with potential users.

My responses to the Review questions:

1. What are the implications of the Tsunami Warning and Education Act (P.L. 109-424) on NTHMP's future?

This is an extraordinary act. For the first time tsunami hazard mitigation is specifically incorporated into public law. If full funding is appropriated, measurable improvements in tsunami preparedness and mitigation at the community level should be achieved. The issues in the Act I find particularly of interest:

- The Act identifies tsunami as a significant risk to the United States
- Designates NOAA as the Administrator of the tsunami program
- Requires cooperation among NOAA, USGS and NSF
- Requires maintenance of at least two tsunami warnings centers (in Hawaii and Alaska)
- Mandates an external review of the tsunami program
- Identifies the NTHMP as the organization to promote mitigation and improve tsunami preparedness in the US
- Defines the NTHMP as a community-based mitigation program
- Sets minimum funding levels for the NTHMP
- Establishes a coordinating committee including federal, state, local and tribal officials
- Requires standards for inundation models
- Names several specific mitigation products – comprehensive coastal risk/vulnerability assessment training and decision tools, technical training and public education programs, community certification
- Discourages development in high risk areas.
- Sets minimum funding levels for tsunami research
- Requires that social science research be applied to warning, evacuation and education materials

While a number of these requirements are a part of the existing NTHMP, meeting the Act will require modification to the program.

- 1) The NTHMP has made significant progress in expanding the participation of all US coastal states, commonwealths and territories. State/territory representatives at the review appeared to accept a representational formula based on perceived risk.
- 2) The Act will require modification of the current Steering Committee structure to include local and tribal representation. In the 2001 NTHMP review, Dennis Mileti recommended "...developing partnerships with entities not now part of the program. All mitigation is local, yet the current plan largely involves federal and state players." The Act provides an excellent opportunity to expand the role of local communities in the program.
- 3) While the Act does require cooperation among NOAA, USGS and NSF for reliable seismic input to the warning system, it does not identify specific federal agency representatives to the NTHMP. It is interesting that NTHMP is defined as a mitigation program and FEMA is not mentioned anywhere in the Act. I think the original mix of NOAA, USGS and FEMA representation on the Steering Committee was well-conceived. It is unfortunate that FEMA has not participated as fully in the program as the other federal agencies. The lack of specific mention

- of FEMA in the Act should not be interpreted as justification for nonparticipation. For the NTHMP to succeed, FEMA must be involved.
- 4) The Act calls on inclusion of social science in the research program. While it does not specifically name disciplines in the makeup of the coordinating committee, the sense of the Act suggests to me that a social scientist should be on the committee. The final success of a tsunami hazard mitigation program depends on the complex behavior of people. Current federal representatives include seismologists, oceanographers and modelers. One of the state representatives does have a social science background but this is fortuitous. The program needs the continued input of someone from a human behavior field at the coordinating committee level.
 - 5) The Act fundamentally changes the NTHMP from the three sided Warning – Hazard Assessment – Mitigation approach of the first decade of the Program to a much larger emphasis on resiliency. This change should be reflected in the organizational structure of the program and its goals. One of the biggest challenges facing the NTHMP is its organization. At present there are three subcommittees – Warning Guidance, Mitigation, and Map/Modeling. The membership, structure and responsibilities of the subcommittees are not well defined. With the expanded role of mitigation, education, outreach and planning in the NTHMP, the subcommittee structure should be re-examined. The program needs to define and distinguish what is meant by resiliency, mitigation and preparedness.

Defining and attaining goals in the new framework of the Act may be difficult. Technical goals are easier to quantify. Benchmarks for “tsunami resiliency” are undefined. A top priority for the NTHMP is to develop new strategic and implementation plans that address these issues and to define achievable goals so that the Act will be renewed after the 5 year authorization expires.

2a. What are the strengths of the state/federal partnerships?

The NTHMP state – federal partnership is unique in hazard mitigation and the most important asset of the program. It was, arguably, the partnership that kept a modest level of funding for the program through the appropriations add-on process during the early years of the program. I believe that NOAA has generally provided unbiased leadership that has allowed the states to work together as equal partners. The relative autonomy of the individual state programs and the lack of mandated matching funds has encouraged a great variety of approaches. States have been encouraged to develop programs and products unique to their geographic and socio-economic circumstances. The program framework has fostered friendly competition among states to produce materials and programs. All five original states now have well-established state tsunami programs. The NTHMP has also had some success in encouraging multistate efforts. I find the communication among the three West Coast state emergency managers commendable. I would like to see more multistate projects supported by the program.

2b. What are the weaknesses?

I see two significant weaknesses: leadership of the program and lack of consistency among state products and programs.

The NTHMP has had a number of changes in leadership in the last three years. Dr. Eddie Bernard directed the program from its inception until 2002 and there was a clear set of expectations for and from the states on NOAA's role. Since then, the leadership has shifted between Jeff LaDouce, NWS Pacific Region Director and John Jones, NWS Deputy Director. Jeff LaDouce is the current interim director. All five Pacific state representatives expressed a lack of confidence in the leadership structure of the past several years. The primary concern was lack of interest from NWS headquarters in Washington. The larger changes in NOAA's tsunami program have also affected the NTHMP. This will be further complicated by the Act which sets minimum funding levels for both the NTHMP and research activities. NTHMP needs to develop a leadership structure that can both adequately support the state programs and represent the program's interests in Washington D.C. Without an active, interested leadership that has the confidence of the states, the program will not succeed.

The diversity in state approaches has led to a strong sense of ownership of the individual state programs. Much of this is positive. But the down side is lack of consistency across state lines in product and message and some resistance to uniform standards. One of the goals of the program following the 2001 review (Goal 8) called for assessment of the effectiveness of products and programs. Several assessment surveys have been conducted within states but have no common questions or methodology making it impossible to compare the different state approaches. It is important that the program allow the states a degree of autonomy, but the program can and should do more to develop standards and insure consistency.

2 c. Is there an appropriate distribution of roles and responsibilities between federal and state partners?

The roles and responsibilities of the federal and state partners were reasonably well-defined during the first years of the program. From the comments of the state representatives during the review, I get the sense that the last two years have been a state of limbo. The lack of direction at the leadership level and the expansion of the program have created a void where the roles and the responsibilities are not clear. It is essential that the leadership issues be resolved as soon as possible.

3. Is the program achieving its goals?

As a result of the 2001 Review, the program established 13 goals. This was an overly ambitious, and, in some cases, a poorly defined list. Many of the goals were unrealistic considering the resources of the program or impossible to meet due to lack of criteria to evaluate.

2001 Goals:

1. Complete tsunami inundation maps for 75% of U.S. coastal communities at risk in the Pacific States

There are two problems with this goal. First, we were presented with no compilation of coastal communities so that a percent could be estimated. We were told that nearly 100% of the Washington coast is now completed, and perhaps 30% of the Oregon coastal communities. Most of the California coast now has unpublished maps from 400 m grid size runs that are of relatively little use from emergency planning. All Hawaiian communities had maps before the NTHMP began. The approach has been to divide funding for inundation mapping equally among the five Pacific states. While this may have been essential for the program to survive the first five years, it no longer seems a justifiable division of scarce resources. The NTHMP needs to define what the mapping need is, what constitutes an adequate map for the different needs, and what level of numerical modeling is required to achieve the desired result. It makes no sense for one state to continue to refine adequate maps while others have few useful map products. Changes in mapping support have also affected this goal. Several state representatives expressed concern about the closure of the TIME mapping center and the need for assistance in grid development to support their mapping efforts.

2. Produce evacuation maps that are consistent from state to state for mapped communities

This goal has not been met. Evacuation map products differ significantly from State to State and in some cases, within states. Criteria and uniform standards for maps have not been developed.

3. The USGS, NOAA, and state agencies disseminate automated, reviewed earthquake and tsunami notifications as rapidly as technologically feasible.

This goal has been met. Earthquake and tsunami information is routinely disseminated by both the USGS and NOAA in under 10 minutes and both agencies should be commended for the rapid release of this information. The change to 24-7 operations at both the USGS and the warning centers has been a positive move. There are still difficulties in information reaching end users, but this is a problem at the state level. End-to-end testing of the system should become at least an annual event. I also commend the efforts of the WCATWC to improve communications within its AOR. There are still problems with the format of the messages and the difference between the two warning centers' messages that I hope will be addressed by the National Academy of Sciences' review.

4. For at least one community per state, issue site- and event-specific forecasts of maximum flooding depth and inland penetration with an average rms error less than 50%.

NOAA has made significant progress on this goal through the SIFT simulations. The usefulness of this product was demonstrated by the two recent Kuril Islands tsunamis. At present, the SIFT output is able to estimate water levels at tide gauge locations for at least one community within each Pacific State within the 50% error margin. I encourage NOAA to make these simulations operational as soon as possible. I suggest that the SIFT output include local tide conditions. It is not clear how the SIFT simulation will work for estimating the likely inland penetration of a large tsunami event or how local communities would process such information.

5. Develop a suite of graphical products for dissemination from NOAA's tsunami warning system.

The two Warning Centers have developed a variety of graphical products. WCATWC in particular has done an excellent job of making data available from recent events and improving the consistency and representation of data. There are still some problems with water height measurements (amplitude vs peak to trough), but I commend the efforts that have been made and hope that more pre-digital data will be included. There is far less graphical material available at the PTWC site and the formats are different. It is time for this information to be presented in the same way by both warning centers.

6. Install evacuation notification systems in 50% of coastal communities in each state.

This is a poorly defined goal. Evacuation notification systems are not defined. All states have some form of evacuation notification system – even if it only consists of the EAS broadcast system or knocking door to door. There has been no inventory of coastal communities and their notification systems. It is not possible to assess this goal.

7. Reduce tsunami warning system false alarms by 20%.

This is a poorly defined goal. “False alarm” is undefined. This term has significant negative connotation and should not be used. The terms “unnecessary evacuation”, “non-damaging tsunami” may be better alternatives, if well-defined. The NWS should look at the criteria developed for storm surge and flood water height forecasts and develop consistent, statistically-based definitions. I am concerned that an emphasis on avoiding “false alarms” may lead to setting criteria for alert bulletins too low. The November 15, 2006 tsunami caused nearly \$6 million in damages to the Crescent City Harbor while no tsunami alert message was in place.

8. Use social science tools to measure tsunami resilience of communities and the effectiveness of the NTHMP.

This goal has not been met. While there have been several isolated studies involving social science research (note studies by Wood, Johnston, Lindell and Prater). The NTHMP has not defined performance measures that can be used to quantify “tsunami resilience” and can be used to compare effectiveness of programs and materials either within states or between them.

9. Designate that 25% of communities at risk in each state are TsunamiReady.

This goal has not been met. There are significant problems with the current TsunamiReady Program. Standards vary from region to region, there has been no enforcement of recertification procedures. The TsunamiReady summit in August is a good first step in improving the program. An external review of the program should also be completed. If the TsunamiReady Program is to be designated the main method for NOAA to promote resiliency at the local level, goals need to be defined for the program that go beyond notification systems. To encourage communities to become certified, clear incentives need to exist and be well-publicized. The current incentive, reduction in rates for flood insurance, can apparently be achieved without TsunamiReady designation.

Other incentives should be explored such as preference for being awarded FEMA Hazard Mitigation and Pre-Disaster Mitigation grants.

10. Ensure that public information is available at all beach access points; ensure that evacuation procedures and maps are in all coastal jurisdiction telephone books/utility bills/schools sites/hotels. Display education posters in 75% of coastal water oriented/recreation businesses.

This is an unattainable goal as it is impossible to measure given the program resources.

11. Develop approved engineering guidance in the FEMA Coastal Construction Manual or other appropriate documents that addresses both high seismic and tsunami loading for use in new construction and retrofitting of existing structures.

I commend the progress that has been made in developing guidance for vertical evacuation. There is now some consideration for tsunamis in the coastal Construction Manual, but it is my understanding that this applies primarily to residential housing. The NTHMP should continue to make engineering guidance for coastal construction a high priority.

12. Convince 25% of the potentially threatened businesses to include tsunami components in their business continuity plans.

This is an unattainable goal as it is impossible to measure given the program resources. Among the small business community that dominates many coastal areas, it is unlikely that most have any business continuity plans. A more appropriate goal would be to assemble a suite of “best practice” continuity plans for differing sizes and types of businesses that are endorsed by the NTHMP and made available to coastal communities.

13. Ensure the National Response Plan comprehensively addresses tsunami response and recovery.

This is an inappropriate goal as the NRP is not hazard specific. A more appropriate goal is that all coastal jurisdictions include tsunami response and recovery in their hazard mitigation plans.

4. What are the potential benefits and pitfalls of the program expansion?

I see the program expansion as a potential positive move. A coordinated approach to tsunami hazard mitigation across states, territories and commonwealths will be unique in US hazard mitigation and may facilitate a more uniform approach to other hazards. Expansion areas should be encouraged to adopt/modify existing materials and programs to reduce duplication of effort and insure consistency. If all of the entities can be brought together in support of tsunami hazard mitigation, this group can also provide a powerful base to continue the program. I see several potential problems:

1) Involvement of the new entities. The evidence presented at the review did not show much interest in the program outside of the original 5 Pacific states, the Caribbean and the Pacific territories. A major challenge will be to engage the gulf and eastern states. The NTHMP should make use of existing multi-state venues such as the National Emergency Management Association to encourage fuller participation in the program.

State emergency managers are more likely to respond to their colleagues in other states than NOAA or NWS officials.

2) Organization. The NTHMP is still developing a new organizational structure. The challenge is to provide coordination over a very large geographic region and with many different organizations. The proposed 1 national meeting, 1 regional meeting a year structure seems promising. The program should explore applications of newer electronic communication methods to facilitate communication and participation. The proposed vote distribution (1 vote each Pacific states and Caribbean territories, 1 vote for the eastern states, 1 vote for the Gulf states) seems to have been accepted by the states currently participating, but could become problematic in the future as it impacts spending decisions.

3) Consistency and assessment. There is currently considerable variation in the products and educational messages among the original Pacific states. This has the potential to become even more problematic in the expansion. It is essential for uniform learning outcomes to be defined for the program and standardized representation of evacuation maps and other educational materials be endorsed.

5. Have the NTHMP really developed products that are actually creating a foundation for change and preparedness in the community?

This cannot be answered at present because the goals and outcomes of products have not been well-defined and can't be measured. A priority for the program is to develop the criteria and the methodology to measure the effectiveness of these products.

6. Please list any suggestions which would be beneficial to the management and outcomes of this program

The NTHMP faces considerable challenges in the next year. The Tsunami Warning and Education Act could provide the catalyst to improve the organizational structure and strengthen the program over the next five years. In addition to the priorities that I have outlined above, I have several other suggestions:

- 1) Research. Of the federal agencies at the review, the least engaged in the NTHMP was NSF. This is unfortunate as significant improvements in US tsunami resiliency will require research breakthroughs. The NTHMP and its state partners need to define its research priorities and continue to work with NSF to support targeted projects. One recommendation of the 2006 NSF-sponsored Tsunami Research Symposium was for the NTHMP to develop a research grant mechanism. I suggest that NOAA consider designating some of the increased research funding from the Act to such a grant program.
- 2) The number one source of information in the United States is the media. NTHMP needs to develop innovative approaches to utilizing the media for education and outreach.
- 3) Exercises and training are essential to emergency planning. In March 2007, FEMA's Emmitsburg training facility ran their first ever comprehensive tsunami exercise. NTHMP should promote, support and encourage community, state and multi-state exercises.

- 4) Best practices materials. Most states and local jurisdictions are not interested in re-creating already existing materials. Templates and readily adaptable materials should be made available electronically. This is particularly important for the expansion regions.
- 5) There is a need for reasonable tsunami and tsunami/earthquake scenarios that include physical and economic loss estimations.
- 6) There is concern among the West Coast states that tsunami has overwhelmed earthquake concerns. NOAA needs to continue to partner with the USGS to make sure that earthquake issues are included for near-source events like Cascadia, the Lesser Antilles, and the Alaska-Aleutian regions
- 7) The NTHMP has reached its current success largely through the efforts of committed individuals at either the state or federal agency level. To become a permanent program, it needs to become more firmly institutionalized both within the Weather Service and at the state level. One of the biggest NWS resources is the system of regional Weather Service offices. Some of these offices have been highly engaged in the TsunamiReady program and in working with communities in tsunami education and preparedness. Other offices have had relatively little interest. The NTHMP should identify and recognize offices that have been particularly successful in tsunami efforts and expect that all coastal weather regions be equally involved.