

Implementation Plan for Tsunami Mitigation Projects

submitted to the Mitigation Subcommittee
of the National Tsunami Hazard Mitigation Program

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A1: Technical Assessment of the International Tsunami Information Center Library, Honolulu, Hawaii, by Connie J. Manson, Washington Department of Natural Resources.

A2: Bibliographies

- Mitigation
- Education
- Warning Systems

A3: Summaries

Preuss, J. and others, 1988, Planning for Risk: Comprehensive Planning for Tsunami Hazard Areas, prepared by Urban Regional Research for the Nation Science Foundation.

Ayre, R.S., Trainer, P.B., and Mileti, D.S., 1975, Earthquake and tsunami hazards in the United States: a research assessment: Program on Technology, Environment and man, Monograph # NSF - RA - E - 75 - 005, Institute of behavioral Science, University of Colorado, 150 pp.

Steinbrugge, K.V., 1982, Earthquakes, Volcanoes, and Tsunamis, an anatomy of hazards: Skandia America Group, New York, New York, 392 pp.

A4: State Needs Assessments

- Alaska
- California
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- Oregon
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Executive Summary

The National Tsunami Hazard Mitigation Program is a Federal - State partnership to reduce risks from tsunamis. The National Oceanographic and Atmospheric Administration, United States Geological Survey, the Federal Emergency Management Agency, and the States of Alaska, California, Hawaii, Oregon and Washington are working together to assess tsunami hazard, facilitate communication of hazard information, improve early detection of tsunamigenic earthquakes, reduce false tsunami alarms, and support tsunami mitigation efforts for at-risk communities.

This strategic implementation plan responds to the need to define, prioritize and coordinate the mitigation efforts of the National Program. It emphasizes the efficient use of available resources, implementation of the technical results of the National Program at the state and local level, collaboration and sharing of information among the states and federal agencies, incorporation of tsunami issues into existing all-hazards programs, and the reporting and dissemination of program results.

Goal: A tsunami resistant community which:

1. Understands the nature of the tsunami hazard.
2. Has the tools it needs to mitigate the tsunami risk.
3. Disseminates information about the tsunami hazard.
4. Exchanges information with other at-risk areas.
5. Institutionalizes planning for a tsunami disaster.

The Strategic Plan provides a framework for the development of specific tools and policies for states and local communities to reduce the impact of future tsunamis. The plan address five strategic planning areas:

- A. Education
- B. Tools for Emergency Managers
- C. Construction, Abatement and Land Use Guidance
- D. Information Exchange and Coordination
- E. Long-term Tsunami Mitigation

Activities supported by the Mitigation Task of the National Program are in the following areas of emphasis:

1. Improve tsunami education.
2. Provide tools to supply guidance and support local planners and emergency managers.
3. Create and strengthen links within and among states to support long-term tsunami mitigation.
4. Improve the mitigation science infrastructure.
5. Encourage innovation and local sponsorship of tsunami mitigation programs.

This plan's approach to achieving the goal involves four year intensive development effort followed by continued sustained effort:

Year 1: Assessment of needs and resources

Year 2: Feasibility studies and product development.

Year 3: Product development and implementation.

Year 4: Implementation, and evaluation.

Year 5 and beyond: Implementation and maintenance

I INTRODUCTION

The National Tsunami Hazard Mitigation Program is a Federal - State partnership to reduce risks from

tsunamis. The National Oceanographic and Atmospheric Administration, United States Geological Survey, the Federal Emergency Management Agency, and the States of Alaska, California, Hawaii, Oregon and Washington are working together to assess tsunami hazard, facilitate communication of hazard information, improve early detection of tsunamigenic earthquakes, reduce false tsunami alarms, and support tsunami mitigation efforts for at-risk communities. This strategic plan addresses the Mitigation Task of the national program.

Mitigation is the sustained effort taken by communities at risk before a disaster strikes to lessen its impact. Effective mitigation not only reduces loss of life and property, but facilitates disaster response and recovery. The purpose of the Mitigation Task of the National Tsunami Hazard Mitigation Program is to reduce the tsunami risk to coastal communities by providing essential mitigation tools, implementing and maintaining local and regional tsunami mitigation programs, and raising the awareness of individuals, businesses, emergency responders and decision makers at the local, state and federal levels. This plan is the beginning of an on-going process to provide coordination and a framework for tsunami mitigation activities. The plan recognizes:

- The different tsunami exposure and unique demographic situations of the five Pacific states.
- The importance of utilizing existing materials and products when possible.
- The need to incorporate tsunami efforts into existing earthquake and all-hazard mitigation programs for tsunami mitigation to be viable.
- That mitigation is a complex task involving a variety of products and projects of differing scope and scale.
- The need to couple product development with a well-defined method of distribution and dissemination.
- That mitigation ultimately cannot succeed without the support of local populations.

A. The Strategic Implementation Plan

Historically, tsunami mitigation efforts in the United States have followed disaster. The 1946 tragedy in Hawaii resulted in the establishment of the first tsunami warning center. When disaster struck Hawaii again following the 1960 Chilean earthquake, permanent land use changes were incorporated into the Hilo city plan. The 1964 Alaskan tsunami resulted in recognition of the near-source tsunami hazard and the establishment of the Alaska Tsunami Warning Center. Although post-disaster response has led to significant progress in mitigation, the urgency of the situation often precludes a well-thought out, coordinated effort. Many post-disaster efforts wane with time, becoming less effective as memory fades, leaving the populace more vulnerable to the next event.

This plan is intended to provide direction and coordination for tsunami mitigation activities in the absence of disaster. It articulates the goals, defines strategic planning elements, and outlines an implementation framework. Mitigation resources are limited, particularly for perceived "rare" events like tsunami which have not caused serious damage to coastal property in the United States in over three decades. Strategic planning is essential for the effective expenditure of these scarce resources.

This plan recognizes that the five Pacific states have different tsunami exposure and histories, diverse populations, and different institutional structures and issues. No single solution or list of projects will fit the needs of all five states. The plan requires exchange of information and collaboration among the states to

improve program effectiveness and guide the use of limited resources. However, it respects the unique circumstances of each state and provides the flexibility for projects tailored to each state's needs.

No mitigation effort will succeed without the involvement and support of local communities. A key underpinning of the plan is dialogue between state and local emergency managers/planners/responders and other local decision-makers. It supports information exchange between local communities and the professional tsunami community. It solicits the input of coastal communities in defining mitigation needs and assessing priorities. It recognizes that the ultimate responsibility for sustained mitigation efforts is with the users of the coastal environment.

B. Background

Tsunami mitigation in the United States has received relatively little research effort compared with other natural hazards. While there are a number of groups and institutions engaged in the science of tsunamis (modeling, propagation, inundation, historic effects, etc.), projects focused solely on mitigating tsunami hazards are few. There are numerous pamphlets and brochures which provide general information about tsunami hazards. While many of these materials are excellent, they are generally stand-alone documents, not linked to any comprehensive mitigation program and many are out of print or have limited access.

The International Tsunami Information Center in Honolulu maintains a library, publishes a quarterly magazine, and provides general tsunami information. However, many of the materials in the library are not catalogued and its location makes access to the information for other states difficult (Appendix A1). A bibliography of tsunami mitigation studies catalogued by the Natural Hazards Center in Boulder Colorado is given in Appendix A2. Summaries of three mitigation studies are given in Appendix A3.

C. Mitigating the tsunami hazard: special considerations

Tsunami mitigation is similar in many ways to mitigating other natural hazards. It requires knowledge of the hazard, its likely effects, and what can be done to reduce those effects. However, in several ways the tsunami hazard poses particularly difficult obstacles.

1) Tsunamis are very rare events.

Even in Hawaii, which historically has had the greatest tsunami exposure, a whole generation has never experienced one. For most people, residents of coastal areas and emergency planners/responders alike, the tsunami hazard seems remote and of less importance than more frequently reoccurring problems. This increases the difficulty in allocating scarce resources and contributes to considerable confusion about tsunami risk and safety. Images promoted by the popular media increase public misconceptions and make tsunami mitigation more difficult.

All mitigation efforts are more effective when undertaken before the advent of a natural hazard; for tsunami mitigation it is critical. The next event may well be the Big One with no "wake-up call" to spur mitigation efforts ahead of time.

2) Much of the at-risk area has low population densities.

In all five Pacific States, the majority of the coastline at risk of tsunami flooding is rural and, in many cases, sparsely populated. These regions often have difficulty competing with more populated areas for scarce mitigation resources. Current national mitigation priorities are targeted at urban areas. Even though sparsely populated, the potential loss of life, property and infrastructure to tsunami is large. The Big Island of Hawaii, with a total population of about 150,000 people, has lost over 220 lives since 1946, more than twice the loss of life in the Loma Prieta Earthquake and Northridge Earthquake combined. About 120 lives were lost to tsunami in the Great 1964 Alaskan earthquake, in relatively small towns and cities.

3) Locally-generated tsunamis are accompanied by significant earthquake effects.

Communities in the epicentral region of a major tsunami-generating earthquake must deal with significant earthquake-related impacts in addition to tsunami flooding and damage. This includes significant damage to roads, structures, communication networks, and other vital lifelines, in areas both within and outside of the zone of potential tsunami inundation. Dissemination of warning information and coordinated official evacuation will be virtually impossible. Major population centers away from the coast are likely to suffer other impacts from the earthquake and may be unable to lend immediate assistance to coastal communities.

4) Local tsunami mitigation must rely strongly on education.

Because of the difficulties in disseminating short-term warnings due to damaged infrastructure and the very short time period to take action, it is critical that all people in hazard areas immediately recognize that the earthquake is their warning and take immediate response. This involves a complicated set of behaviors -- protecting oneself during the earthquake, identifying the earthquake as an event capable of producing damaging waves, identifying one's location as hazardous, knowing how to get to a safe area, and how long one must remain away from the coast before the danger period is over. All of these actions must be taken in the absence of any official guidance and during a time of extreme personal duress. The diverse population of coastal regions further complicates this problem. Information about the tsunami risk and appropriate response needs to be communicated to residents, workers (seasonal and year-round), regional visitors, and transient populations, all of whom have different exposure to the tsunami hazard.

5) Tsunamis and their effects are uncertain.

There is uncertainty in all natural hazards, but recognition of the tsunami hazard, particularly the locally-generated or near-source tsunami, is relatively new to many areas of the coastal United States and the science is still young. For example, scientific studies supporting the potential hazard associated with the Cascadia subduction zone along the Pacific northwest coast are barely two decades old. Detailed inundation maps are available for few communities outside of Hawaii. Although the National Tsunami Hazard Mitigation Program will assist states in inundation mapping, tsunami hazard mitigation efforts must recognize that high quality maps for many areas, particularly rural areas, will not be available in the near future. Potential local tsunami sources are also not fully understood, particularly in the seismically active areas off of southern California and Washington. Even less is known about the interaction of tsunami waves and structures and, in contrast to seismic design and engineering, no standards have been developed in the United States for the design of tsunami-resistant structures. This means that fewer tools are available for effective tsunami mitigation.

II. Goals and Objectives

A. Goals

The goal of the plan is to promote the development of tsunami resistant communities along our vulnerable coastlines.

A tsunami resistant community:

- 1) Understands the nature of the tsunami hazard. Knows the risk that tsunami waves, from both near and far sources, pose to its coastal areas.
- 2) Has the tools it needs to mitigate the tsunami risk. Has defined needed mitigation products , has access and knows how to use them.
- 3) Disseminates information about the tsunami hazard. Has identified vulnerable populations, has materials which include areas at risk and safety, evacuation routes, appropriate response, and has developed a dissemination plan to provide information to all users of the coastal area.
- 4) Exchanges information with other at-risk areas. Supports mitigation efforts through the free exchange of information, products and ideas with other at-risk areas and learns from the mitigation efforts for other natural hazards.
- 5) Institutionalizes planning for a tsunami disaster. Has incorporated tsunami hazard mitigation elements into their long-term all-hazard management plans and has developed a structure to develop and maintain the support of local populations and decision makers for mitigation efforts.

B. Objectives

The following objectives indicate how the strategic implementation plan will achieve the above goals:

Goal 1 Understands the nature of the tsunami hazard.

1. Tsunami inundation map guidance. Mapping performed as part of the National Tsunami Hazard Mitigation Program will provide inundation maps to targeted coastal communities in all five states. The Mitigation Task will support interpretation and dissemination of the maps to local communities.
2. Guidance for regions without inundation maps. Inundation maps will only be available for targeted communities. Even in mapped communities, some risks are not covered by currently available mapping techniques. For example, tsunami river bores have produced significant damage in past tsunami events and are not covered by the current inundation modeling task of the National Tsunami Hazard Mitigation Program. The mitigation program will support developing guidance for regions without maps.

Goal 2 Has the tools it needs to mitigate the tsunami risk.

1. Identify needed mitigation tools. Assess the needs of coastal emergency managers and planners for tsunami mitigation materials, products and programs.

2. Tool Development. Define and prioritize needed products and support development.

3. Dissemination. Provide coastal communities with products and training through workshops, meetings, or print/electronic media.

Goal 3 Disseminates information about the tsunami hazard.

1. Identify vulnerable populations. Identify the diverse users of the coastal environment.

2. Materials for identified populations. Prioritize needed materials, and support development of materials as needed.

3. Dissemination mechanism. Define the mechanism to distribute information to the identified populations.

Goal 4 Exchanges information with other at-risk areas.

1. Establish a Resource Center for tsunami mitigation. Establish a center to archive existing tsunami mitigation products, projects and materials both within the United States and in foreign countries and make materials accessible to states and coastal communities and maintain an electronic index to mitigation products. Provide contact and direction for inquiries from local communities. Consideration should be given to housing the Resource Center within an existing institution with tsunami and/or mitigation expertise.

2. Workshops and meetings. Support workshops and other meetings and publish proceedings/summaries for the exchange of information among the states. Encourage the use and sponsorship of existing forums such as the Earthquake Engineering Research Institute, Western States Seismic Policy Council and the Natural Hazards Workshop.

3. Annual Report of Mitigation Projects. Compile a report which will summarize the products developed and the projects undertaken by individual states and multi-state efforts. Case study examples of mitigation efforts from each of the five Pacific states will be included.

Goal 5 Institutionalizes planning for a tsunami disaster.

1. Identify existing all-hazard mitigation programs. Identify existing hazard mitigation programs within states and local jurisdictions and incorporate tsunami elements into them.

2. Establish state and/or local tsunami work groups. Support the formation of state, regional and/or local tsunami working groups. Encourage broad representation including both government and private sectors with coastal interests and jurisdiction.

3. Develop state tsunami mitigation plans. Include long-term strategy for state support of tsunami mitigation. Incorporate a mechanism for continued assessment of coastal community needs and evaluation of the success of existing programs.

4. Reward innovation in tsunami mitigation. Recognize outstanding local and regional mitigation efforts in an award program, Annual Report, and/or financial support.

III. Strategic Planning Elements

The technological advances in tsunami modeling, inundation mapping, and improved warnings cannot protect coastal inhabitants from a near-source tsunami. When a large subduction zone earthquake occurs nearby, the first tsunami waves may reach the coast within minutes of the event. Local populations must be able to recognize the signs of impending tsunami hazard and seek higher ground immediately. Communities need to be informed of what areas are likely to be flooded and how to safely evacuate them. Planners, emergency responders and local residents need to understand the multihazard ramifications of a very large local earthquake that will disrupt much of the infrastructure in their pre-tsunami planning. Local decision makers need to understand the nature of the risk and be provided with the mitigation tools in order to make reasoned planning decisions. A sustained program is needed to gain the long-term grassroots support of coastal populations and to institutionalize tsunami mitigation in an all-hazard approach to risk reduction.

A summary of the needs assessment conducted by the five Pacific states is given in Appendix A4. These needs can be grouped into five strategic planning elements:

- A. Education
- B. Tools for Emergency Managers
- C. Building and Land Use Guidance
- D. Information Exchange and Coordination
- E. Long-term Tsunami Mitigation

A. Education

Education is essential to the success of any mitigation effort, but particularly so in mitigating the near-source tsunami hazard. There is no time for coordinated response after the earthquake occurs and each individual must be able to take appropriate action on their own. Tsunami education is further complicated by the diversity of audiences and, in many cases, the inadequacy of the technical information available. Much of the information about tsunamis is highly technical and not easily accessible to emergency managers, local decision makers and the public.

NEEDS:

- Information for the general public on the coastal tsunami hazard, tsunami hazard signs, evacuation routes and how to recognize and respond to the signs of an impending tsunami.
- Information for businesses and other organizations on cost/risk benefits of tsunami hazard mitigation.
- Information and training for emergency managers on the use and interpretation of tsunami inundation maps, and how to approach areas not covered by mapping.

- Information for tourists, seasonal workers, and transients who occasionally visit coastal areas.
- Curriculum materials for schools and training for teachers on how to present tsunami programs in the classroom.
- Information and training for planners and other government officials on interpreting land-use, construction and other tsunami guidance materials.
- Information for local and state elected officials about the tsunami hazard and the importance of tsunami mitigation efforts.

A tsunami education program needs to:

- Define the audiences.
- Determine what the audience needs to know.
- Define how to convey the message.
- Assess existing materials and resources.
- Select appropriate vehicles to reach targeted audiences.
- Develop needed materials.
- Define a dissemination mechanism.
- Define a strategy for sustained support.

Education efforts include electronic/print/audio/video media, posters and signs, curriculum programs, museums and information centers, public relations efforts, workshops and other public forums.

B. Tools for Emergency Managers

In most coastal communities, disaster planning, response and mitigation responsibilities are centered in the local civil defense or emergency services office. For tsunami mitigation efforts to be successful, these organizations must be the core of tsunami hazard reduction efforts at the local level. Local emergency managers often have few resources for mitigation and in many cases have little technical background on the tsunami hazard. They are faced with a multitude of day-to-day responsibilities and personnel turnover is often high. They are often in the difficult position of balancing State and Federal mandates with local realities. For effective tsunami mitigation, local emergency managers must be supported and actively participate in the assessment of mitigation needs and implementation of mitigation programs.

NEEDS:

- Interpretation of technical information -- inundation maps, scenarios, modeling studies.
- Understanding the tsunami warning systems and disseminating warning information.
- Guidelines for establishing and operating local tsunami warning systems.
- Guidelines for areas not covered by inundation maps.
- Rapid access to technical advice during a tsunami alert situation.
- Guidance for planning evacuation routes and siting of signs.
- Mechanism for training new personnel about tsunami issues.
- Exchange of information with other coastal emergency managers.

C. Building and Land Use Guidance

The impacts of flooding and high velocity water flow caused by tsunami are strongly dependent on construction and land use/planning in the inundation area. Wood-frame structures which perform well in strong ground shaking are likely to collapse when hit by rapidly moving water. Reinforced concrete structures may provide havens for vertical evacuation. Consideration of both the effects of moving water and strong ground shaking need to be included in construction codes. Vegetation may dampen the water velocity in some cases, but in others, add to the debris and projectile force of the flow. No guidelines addressing these issues are available to coastal communities.

NEEDS:

- Construction guidelines.
- Coastal land use guidance such as siting of structures, open space, interactions of uses.
- Infrastructure guidance such as issues facing utilities, bridges, roadway embankments.
- Vegetation guidance.

D. Information Exchange and Coordination

Tsunami mitigation efforts have been carried out by many coastal communities, states and foreign countries. For example, Canon Beach, Oregon, Crescent City, California and Port Alberni, British Columbia have all established local tsunami warning systems. Chile and Oregon have developed tsunami curriculum. Construction guidance for buildings in tsunami hazard zones has been incorporated into the State of Hawaii's building codes. Few of these efforts have been described in journals or other catalogued media. As a result, it is difficult for a community to get information about other efforts, sometimes resulting in duplication of efforts

and lost opportunities to learn from one another. Programs to mitigate other natural disasters such as flash flooding and hurricanes may offer valuable models for tsunami mitigation efforts. However, this information is not readily available to most emergency managers unless their community is also subject to these other hazards.

Coastal communities also need access to technical advice on tsunami issues. When a tsunami alert occurs, they may need consultation on how to interpret information. They may need assistance in interpreting inundation maps and land-use models. Printed guidance information will help but can't replace direct contact with technical experts for particular situations. Electronic information may assist these communities, but access to the internet is still difficult in many small coastal communities.

NEEDS:

- Resource Center to archive and catalogue existing and new mitigation programs and maintain electronic media.
- Forums, workshops and meetings to promote exchange among coastal community representatives.
- Forums, workshops and meetings to promote exchange between different hazard mitigation disciplines.
- Access to technical advice and electronic media.

E. Long-term Tsunami Mitigation

Tsunami mitigation efforts, to be successful, need to become part of local, regional and state hazard mitigation programs. Coastal communities must see tsunami mitigation not as a one time short burst of effort, but as a sustained program. Local and regional tsunami work groups provide a framework for coastal constituencies to participate in developing priorities and strategies and to gain a stake in the results of hazard mitigation. State tsunami work groups provide a forum for coastal communities to exchange information and to keep state organizations abreast of tsunami mitigation efforts. Incentives, zoning, legislation are all vehicles to institutionalizing tsunami mitigation into the fabric of a community. Long-term planning also involves consideration of post-tsunami recovery. After a tsunami strikes, a community may have unique opportunities to take long term mitigation actions which are not currently available. These may include large post-disaster funding sources, political support for major legislative and land use planning changes, and damaged coastal areas which can be more easily set-aside from future development.

NEEDS:

- Regional and State Tsunami Work Groups.
- Identification of existing all-hazard mitigation programs where tsunami programs can be included.
- State tsunami mitigation planning.
- Guidance for post disaster tsunami recovery.

IV. implementation

This section presents the approach to achieving the goals and meeting the objectives of the plan. Considerations which are included in this implementation strategy:

- Educating community decision makers of the present and the future on tsunami hazards.
- Developing activist constituencies.
- Motivating officials and citizens to reduce risk..
- Encouraging action at the local level.
- Developing incentives to encourage risk reduction.
- Using limited resources effectively.

A. Areas of Emphasis

Activities supported by the Mitigation Task meet the following areas of emphasis:

1) Improve tsunami education. The Mitigation Task will support efforts to develop comprehensive educational programs for the diverse users of the coastal environment. It encourages collaborative efforts among states and adaptation of existing education programs and strategies to meet local needs. It encourages all coastal communities to provide tsunami safety information in schools to guarantee awareness of the tsunami hazard in succeeding generations.

Addresses Goal 3, Objectives 1, 2, 3.

2) Provide tools to supply guidance and support local planners and emergency managers. The Mitigation Task will support activities that transfer the technical results of inundation mapping into local application. It emphasizes activities that facilitate structural and land use mitigation at the local level. This includes the development of guidelines for construction, siting of structures and open space, land use conflicts, infrastructure, the use of inundation maps , and local warning systems. The guidelines should recognize the cumulative effects of both high velocity water and earthquake effects. The development of products in itself is inadequate. All products supported in this effort must be part of a comprehensive program and be coupled with a well-defined method of distribution and dissemination. To best utilize resources, existing materials and products should be used or adapted when possible and tsunami considerations incorporated into general planning and established practices.

Addresses Goal 1, Objectives 1, 2; Goal 2, Objectives 1, 2, 3.

3) Create and strengthen links within and among states to support long-term tsunami mitigation. The Mitigation Task will support exchange of information about tsunami mitigation through the establishment of a Resource Center, workshops and meetings, and documentation of activities. It will create institutional frameworks for

tsunami mitigation by the formation of tsunami work groups, incorporation of tsunami elements into existing mitigation plans, and developing a long-term state mitigation strategy.

Addresses Goal 4, Objectives 2, 3; Goal 5, Objective 1, 2, 3.

4) Improve the mitigation science infrastructure. The Mitigation Task will support activities to archive and catalogue existing mitigation studies both domestic and foreign and make information available electronically. Establishing a Resource Center, best housed within an existing institution, will provide a permanent home to oversee these activities and respond to local queries for information. It will support activities which promote interchange among tsunami and other hazard mitigation sciences.

Addresses Goal 4, Objectives 1, 2, 3.

5) Encourage innovation and local sponsorship of tsunami mitigation programs. The Mitigation Task will support activities which recognize and support outstanding local mitigation efforts through awards and/or incentives. It encourages establishing and maintaining local tsunami work groups.

Addresses Goal 5, Objectives 2, 4.

B. Plan Management

The activities supported by the Mitigation Task fall into three areas.

- 1) Multi-state projects with products expected to benefit all, or a majority of the five Pacific states.
- 2) Single state projects.
- 3) Coordination and exchange of information.

Plan management is the responsibility of the Mitigation Subcommittee of the National Tsunami Hazard Mitigation Program Steering Committee. Management is shared by the states through their state representatives on a collegial basis. Each state represents its own interests and remains responsible for its own programs, but recognizes the value of cooperative actions.

The Mitigation Subcommittee is composed of the state representatives to the Steering Committee. The Subcommittee will prioritize needs, develop criteria for assessing proposals and determine the allocation of funds to multistate and single state projects. Each year, part of the federal mitigation funds may be allocated to support general projects targeted to benefit all of the states at risk of tsunami. The remainder of the funds will be distributed among the individual states for targeted projects which meet the goals of the strategic plan. The Subcommittee will oversee the coordination of efforts among the states. State representatives are responsible for supplying timely reports on all tsunami mitigation projects within their states to the Subcommittee.

C. Time Line

The National Tsunami Hazard Mitigation Program is a four year program of intensive development followed by continued maintenance. The following outlines of the focus of mitigation activities during the years of the

program.

Year 1: Assessment of needs and resources

Year 2: Feasibility studies and product development.

Year 3: Product development and implementation.

Year 4: Implementation, and evaluation.

Year 5 and beyond: Implementation and maintenance

The plan is not a simple linear progression of the above. Some implementation projects have already been accomplished in the first year and additional needs and resources may be recognized in later years of the program.

1) Assessment of needs and resources. During the initial year, the states will conduct an inventory and needs assessment of existing educational programs, public information materials, warning and mitigation programs. This initial evaluation of capability will establish a baseline against which products resulting from this plan can be assessed. This analysis is to include both domestic efforts on federal, state and local levels and foreign programs developed in other tsunami-prone regions.

2) Feasibility studies. In some cases, it may be necessary to conduct feasibility studies before embarking on final project contracts. For example, several choices may be available for developing guidance, curriculum, or establishing a Resource Center. In order to make a reasoned decision and best use of available funds, activities may be supported which present the Mitigation Subcommittee with an analysis of the available options.

3) Product development. In the second and third year of the program, product development is emphasized. The program will develop tools to support coastal community risk reduction, including land use guidelines, construction guides and model codes, model awareness and preparedness programs, media materials, and education programs. Projects will utilize existing products where available and crossover information from other hazard mitigation efforts.

4) Implementation and dissemination. This is the application of mitigation programs at the local level. It may involve training and workshops, or media and publicity campaigns depending on the nature of the activity.

5) Evaluation. The states are expected to qualitatively assess the success of tsunami mitigation programs within their states on an annual basis and report to the Steering Committee. In the fourth year of the program, the Subcommittee will conduct amore formal review looking at the output of the program in view of the goals and objectives of the plan.

6) Maintenance. In the out years of the program, maintaining programs initiated in the development phase is emphasized. This may include long term training programs, reprinting of materials, adaptation of programs as new information becomes available.

V. measuring performance

The goal of the tsunami mitigation effort is building tsunami resistant communities. Progress towards meeting this goal can be measured in terms of the program products, community awareness of the tsunami hazard and, eventually, the outcome of the next tsunami disaster.

This program is expected to produce tangible results in terms of the five strategic planning elements: educational materials and programs, tools for emergency managers, building and land use guidance, information exchange and output, such as the number of coastal communities posting tsunami signs, pamphlets and brochures distributed, classrooms presenting tsunami curriculum, evacuation routes established, tsunami elements introduced into planning efforts and so forth. It is important to document these projects, not only in regards to final product, but to also describe the development and implementation process. For example, what issues were considered in the development of a product such as evacuation routing, or a curriculum package? What organizations and agencies worked together in making the final decisions? What were some of the difficulties encountered along the way? How has the targeted community responded? Only through full documentation can the activities of one state or group of states be fully understood by others and by succeeding generations of persons working in tsunami hazard mitigation.

Success in improving community awareness of the local tsunami hazard can be assessed through surveys of targeted populations and/or workshops and meetings with the constituent groups. Tsunami hazard mitigation will only be successful if it is embraced at the local level and feedback from local constituencies must be supplied for all activities supported by the mitigation task of the National Tsunami Hazard Mitigation Program.

Documentation of activities, products and programs supported by this program will be included in an Annual Report compiled by the Mitigation Subcommittee. The Annual Report will include summaries of all supported projects whether by states or through a joint state effort. The reports will include:

- Project description.
- Project/product development.
- Resulting products.
- Dissemination and use of products.

The Annual Report will also include case study examples of at least one high lighted program from each of the states.

VI. plan assessment and revision

Strategic planning is not a one time event. It is rather a process involving a continuum of ideas, assessment, planning, implementation, evaluation, readjustment, and revision. This plan is an initial product to approach a previously poorly recognized problem in the Pacific states, the risk to coastal communities from near-source tsunami waves. The National Tsunami Hazard Mitigation Program is new. The understanding of the tsunami hazard, particularly along the western coast of the United States, is still developing. As new information

becomes available and new programs are initiated, the planning context may change. To respond to this need to reassess the plan, the Mitigation Subcommittee of the National Tsunami Hazard Mitigation Steering Committee will review the plan annually during the first four years of the program. A more formal and comprehensive review will be performed at the end of four years and may result in more substantive changes.