



PACIFIC NORTHWEST STRATEGY FOR EARTHQUAKE EARLY WARNING (EEW) OUTREACH, EDUCATION, AND TRAINING

March 2018



EXECUTIVE SUMMARY

Earthquake Early Warning (EEW) systems combine earthquake science with monitoring systems that detect and monitor earthquakes. When an earthquake attains a specified level, an EEW system issues an alert that may allow automated systems and people to take protective action before potentially damaging shaking arrives. The seconds of advance warning can allow people and systems to take life- and property-saving protective actions. The U.S. Geological Survey (USGS), in collaboration with state agencies, universities, and private companies, has been working to develop an EEW system for the U.S., called ShakeAlert. The system is currently operating as a production prototype in California, Oregon, and Washington.

In the U.S., EEW pairs the development and implementation of the ShakeAlert system with activities that promote end user awareness, education, and training on life-saving actions. The purpose of this Pacific Northwest Strategy for EEW Outreach, Education, and Training is to define a path forward for state, tribal, and local government in Oregon and Washington to contribute to the successful development, implementation, and preparedness activities associated with EEW in the U.S.

Emergency preparedness activities are critical to EEW's success. In the aftermath of a damaging earthquake, stakeholders will ask the following questions to examine the effectiveness of EEW in the U.S.:

- 1. Did the ShakeAlert system adequately detect an earthquake and rapidly disseminate warnings to end users in potentially affected areas?**
- 2. Did the end users receive the warnings and take the recommended protective measures?**
- 3. Did the receipt of the warning and resulting protective actions enhance public safety?**

These questions underscore the need for stakeholders, including ShakeAlert system developers, scientists, state and local public safety professionals, professional and crisis communicators, first responders, and emergency managers, to work closely on EEW implementation. Much of this strategy focuses on the role of stakeholders in the socialization of EEW. These professionals are among the most effective messengers of life-safety information, such as instructions on protective actions to take during an earthquake or tsunami. They have evaluated their communities' capabilities and resources; understand the cultural and political climate around earthquake preparedness; are responsible for consistent, vetted information across all audiences; will coordinate local efforts to raise awareness and train on EEW; and, will lead the integration of ShakeAlert into their processes, systems and educational materials.

This strategy recognizes the value of engaging emergency managers and public safety professionals as ShakeAlert and EEW preparedness champions and harnessing their leadership to coordinate a broader base of stakeholders. More than 100 stakeholders, representing all levels of government and business, collaborated to develop this strategy.

The strategy describes the Pacific Northwest's shared vision and goals for EEW. It also identifies dozens of objectives and activities to accomplish the region's goals. Goals include:

- 1. Facilitate Oregon's and Washington's involvement in ShakeAlert and EEW;**
- 2. Engage and inform federal, state, local, tribal, and private sector decision makers, policy influencers, media, and emergency management/public safety partners on EEW and ShakeAlert;**
- 3. Promote opportunities for end users to integrate EEW into their systems and operations;**
- 4. Support the education and training of end users on EEW protective actions; and**
- 5. Assess EEW's ability to reduce injury and loss to life and property.**



The objectives and activities in this strategy suggest a series of near- and long-term next steps, highlighted in the following list. These critical future investments are designed to produce returns on investment and result in long-term cost savings.

HIGHLIGHTED RECOMMENDED ACTIVITIES

- **Hire state Program Coordinators responsible for EEW outreach, education, and training, including implementation of the activities in this strategy.**
- **Clearly define roles and responsibilities of federal, state, tribal, local, university, private sector, and other partners in the implementation of ShakeAlert and EEW.**
- **Continue to engage partners at all levels, including local, tribal, state, and federal government, businesses, non-profit organizations, media, elected officials and community groups to ensure roll out and participation in EEW is collaborative and successful.**
- **Actively conduct outreach to stakeholders, educating them on the benefits of EEW; technology and policy limitations; and their roles as partners and end users in ShakeAlert implementation.**
- **Gather data from EEW pilot users and synthesize the information so it is useful for EEW outreach, training, and education activities.**
- **Develop and refine EEW and ShakeAlert websites and branding, so that materials are consistent and identified as credible.**
- **Develop EEW preparedness education and training materials to support end user outreach to their audience(s) on recommended protective actions.**
- **Develop evaluation criteria and research methods for evaluating the effectiveness of ShakeAlert warnings, recommended protective actions, and the activities outlined in this strategy.**
- **Continue to maintain and update this strategy to reflect accomplishments, new research, stakeholder feedback, and lessons learned.**

Without additional funding, implementation of this strategy and EEW is in jeopardy. Currently, there is no projected funding for EEW outreach, education and training in Oregon or Washington. Whenever possible, the strategy recommends leveraging existing earthquake preparedness initiatives and collaborating with partners in California and British Columbia, although funding will be necessary to carry out the most essential activities in the strategy. Stakeholders have cited lack of funding as the most significant obstacle to EEW's success.

Through dedicated funding, thoughtful stakeholder engagement, development of a functional management and evaluation structure, and implementation of an outreach and education strategy founded upon social science and evidence-based approaches designed to support local and tribal jurisdictions, stakeholders can confidently look to a future where EEW is an integrated part of preparedness culture in the U.S.

ACKNOWLEDGMENTS

More than 100 stakeholders representing all levels of government and business collaborated to develop the Pacific Northwest Strategy for EEW outreach, education, and training. Contributions across a broad spectrum of perspectives and disciplines led to a strategy that is both pragmatic and achievable. The development of a workable strategy would not have been possible without the direct stakeholder input and feedback provided through a whole-community approach.

The project team, led by Cascadia Region Earthquake Workgroup (CREW), the Oregon Office of Emergency Management, the Washington Emergency Management Division, and supported by the Pacific Northwest Seismic Network (PNSN) and Nusura, Inc., would like to sincerely thank stakeholders for taking the time to share their insight in developing the strategy. Stakeholders included local and tribal emergency managers, school district officials, utility and lifeline providers, private industry partners, public information officers, preparedness coordinators, systems and technology administrators, executives in the public safety community, and hundreds of members from Oregon and Washington Community Emergency Response Teams (CERT). The team would also like to acknowledge the support of the Oregon Emergency Management Association, Washington State Emergency Management Association, Washington Association of Sheriffs and Police Chiefs, Washington Association of Fire Chiefs, and many other membership organizations that spread the word about the opportunity to participate in the strategy.

The project team would like to acknowledge the U.S. Geological Survey (USGS); California Institute of Technology; University of California, Berkeley; the University of Oregon; and the University of Washington; the State of California (especially the Governor's Office of Emergency Services); British Columbia; and multiple Oregon and Washington state agencies for their generous contributions of project input, guidance, and direction throughout the development of the strategy.

CREW would also like to recognize the Federal Emergency Management Agency (FEMA) for their continued financial support of seismic risk reduction efforts through the National Earthquake Hazard Reduction Program (NEHRP), which have included the development of this strategy. Without their dedication and support, this project would not have been possible.

The objectives and activities in this strategy suggest a series of near- and long-term next steps, highlighted in the following list. These critical future investments are designed to produce returns on investment and result in long-term cost savings.

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INTRODUCTION

In the aftermath of a damaging earthquake, stakeholders will ask the following questions to examine the effectiveness of EEW in the U.S.:

1. Did the ShakeAlert system adequately detect an earthquake and rapidly disseminate warnings to end users in potentially affected areas?
2. Did the end users receive the warnings and take the recommended protective measures?
3. Did the receipt of the warning and resulting protective actions enhance public safety?

The purpose of this strategy is to define a path forward for state, tribal, and local government in Oregon and Washington to contribute to the successful development, implementation, and preparedness activities associated with EEW in the United States. The strategy describes the Pacific Northwest’s vision for EEW, and it explains the urgency in funding and supporting state, tribal, and local involvement. The activities in this strategy improve resilience and reduce risks of earthquakes. Partners in California, British Columbia, and in other regions may use all or part of this strategy as a model to support EEW implementation.

Over the past decade, the course of the nation’s EEW System, ShakeAlert, has been steered by a group of federal government, state, and university partners who have pioneered the development, testing, and direction of the system. As more and more organizations and communities learn about and implement ShakeAlert, the list of federal, state, and local stakeholders with essential roles in the success of EEW has grown.

At the same time that more stakeholders are joining conversations about ShakeAlert, the focus of EEW is expanding. In the early days, the core partners dedicated resources to building the infrastructure to deliver “ShakeAlerts.” Next, in addition to ShakeAlert development, they began to prioritize identifying and working with users to test the system. Over the past couple years, partners have started to explore the outreach, education, and training around not only ShakeAlert, but also EEW preparedness. For example, government, social scientists, state, and university partners are researching methods for training the public end users on protective actions to take when people receive a ShakeAlert.

Earthquake Early Warning and ShakeAlert

This strategy uses the following definitions (also refer to the Glossary section for more detail) –

- **Earthquake Early Warning (EEW):** The combination of ShakeAlert system technology; the recommended protective messages communicated to end users; and, the outreach, education, training, and other emergency preparedness and mitigation activities required to fully implement EEW. These activities help ensure that users have access to ShakeAlert and that they take the recommended protective measures when they receive warnings.
- **ShakeAlert:** The EEW technology and system developed by the USGS and West Coast university partners (including California Institute of Technology; University of California, Berkeley; the University of Oregon; and the University of Washington) that detects an earthquake and rapidly disseminates warnings to end users in potentially affected areas. The ShakeAlert system currently operates as a production prototype in California, Oregon, and Washington.

INTRODUCTION (CONTINUED)

The paired focus on 1) emergency preparedness and public outreach, and 2) emergency protective actions necessitates that public safety/emergency management play an important role in the implementation of ShakeAlert and the preparedness activities associated with EEW. Historically, emergency preparedness has been the responsibility of federal, tribal, state, and local public safety/emergency management agencies (including outreach, communications, awareness, education, and training to the public, businesses, and government agencies). Local stakeholders draw from trusted relationships with community members to promote disaster resilience.

Public safety/emergency management's approach has always been to work across disciplines and join diverse interests and priorities to ensure the success of emergency preparedness efforts. Oregon and Washington's stakeholders believe that ShakeAlert and EEW will continue to require partnership with the USGS, universities, FEMA, state public safety/emergency management agencies, tribal and local governments, businesses, and partners in California and British Columbia. Stakeholders in Oregon and Washington are committed to working alongside partners to promote EEW preparedness and support ShakeAlert's successful implementation. This strategy defines how Pacific Northwest stakeholders will fulfill these critical roles.

BACKGROUND ON EARTHQUAKE EARLY WARNING AND SHAKEALERT

Brief History of ShakeAlert and Planned Future Implementation

Earthquake Early Warning (EEW) technologies and systems combine earthquake science with monitoring systems that detect and monitor earthquakes. When an earthquake attains a specified level, an EEW system issues an alert that may allow automated systems and people to take protective action before potentially damaging shaking arrives. The seconds of advance warning can allow people and systems to take life- and property-saving protective actions. The U.S. Geological Survey (USGS), in collaboration with state agencies, universities, and private companies, has been working to develop an EEW system for the U.S., called ShakeAlert. The system is currently operating as a production prototype in California, Oregon, and Washington. The system currently under development consists of seismic monitoring networks to detect earthquakes; the ShakeAlert software to send out the alert; and, hardware and software in buildings, on cell phones, and other locations to receive the alert. The EEW system is designed to cover the West Coast States.¹

Worldwide, EEW systems have been activated for devastating earthquakes in several countries, for example, in Japan (2011) and, most recently, in Mexico (2017). Officials in these countries have credited their EEW systems with providing up to a minute of warning to the areas with EEW sensors in advance of devastating earthquakes.² EEW systems are also operational in regions of Turkey, Romania, Mongolia, China, Italy, Taiwan, Israel, and South Korea.

ShakeAlert development and implementation can be described in three phases. The EEW system is currently in Phase 1. The USGS and its partners hope to begin the transition to Phase 2 in 2018.

Phase 1: System Development & Testing

For more than a decade, federal, state, local, university, business, and non-profit partners have been collaborating on developing the technology and tools to support the use of EEW in the U.S. University partners and the USGS have led efforts to develop the ShakeAlert algorithms, to install West Coast seismic monitoring stations and data telemetry systems, and to recruit and support pilot users. The ShakeAlert system does not yet support public warnings. The current version allows selected early adopters to develop pilot implementations that demonstrate the system's utility and pioneer technologies that pave the way for broader use.³

EEW in the U.S. originated in California in part due to the state's early investment in seismic monitoring instruments. In addition, initial studies by the state's academic research community helped advance the system. As a result, the ShakeAlert system has been further developed in California than in other regions along the West Coast. In 2012, the USGS, with support from the California Office of Emergency Services (Cal OES) and university partners began sending live "ShakeAlerts" to test users in California.⁴ California entered the production prototype phase in February 2016.

With nearly seven years of testing from West Coast users complete, many organizations have had an opportunity to partially or fully integrate ShakeAlert into their systems. Examples of this include the use of EEW signals and actuators in a fire station in Universal City, California. Upon receipt of a ShakeAlert signal, sensors connected to the fire station's bay doors activate and the bay doors open. Similarly, Bay Area Rapid Transit (BART) has initiated an EEW pilot user project in which once a ShakeAlert signal is received, high-speed rail trains automatically begin a slow-down procedure.

¹ For more information on ShakeAlert, please refer to the ShakeAlert Fact Sheet developed by the U.S. Geological Survey (USGS): <https://pubs.er.usgs.gov/publication/fs20143083>

² Mexico City: <http://www.latimes.com/world/la-me-mexico-quake-earth-warning-20170908-htlstory.html>; Japan: <https://www.technologyreview.com/s/423274/80-seconds-of-warning-for-tokyo/>

³ <https://www.usgs.gov/news/shakealert-earthquake-early-warning-system-goes-west-coast-wide>

⁴ <https://www.shakealert.org/implementation/beta-users/>

BACKGROUND ON EARTHQUAKE EARLY WARNING AND SHAKEALERT (CONTINUED)

In April 2017, Version 1.2 of the ShakeAlert system extended the production prototype to beta users and pilot users in Oregon and Washington. Pilot projects provide an opportunity for Pacific Northwest stakeholders to capture best practices, lessons learned, and highlight the practical life-safety measures. For example, Oregon and Washington state transportation departments are developing applications to safeguard vulnerable bridge crossings and other transportation modes. Eugene Water & Electric Board is deploying means to automate controls on water spillways and power generation turbines. A water district in Washington is working with RH2 Engineering to install devices that will automatically shut off water in critical parts of the water distribution and storage system and shut off power to pumping stations when ShakeAlert triggers a warning.

In 2016, the USGS began discussions with the Alliance for Telecommunications Industry (ATIS) to establish a pathway to mass EEW notification via cell phones. EEW partners recognize that it will take multiple years to update current technologies and policies to allow for push notifications suitable for ShakeAlert.

For EEW/ShakeAlert to be successful in Phase 1, the partners are focusing on:

- Building the system (e.g., installing additional seismic monitoring stations, refining the ShakeAlert algorithms, and increasing the robustness of data telemetry)
- Recruiting pilot users (e.g., encouraging pilot users to test ShakeAlert in different environments and industries and working with them to overcome roadblocks when possible)
- Sharing lessons learned (e.g., among pilot users to capitalize on strengths and to avoid common challenges when possible)
- Establishing and communicating core expectations about ShakeAlert (e.g., the system's capabilities and limitations, opportunities for participation, etc.)
- Developing content to support pilot user programs (e.g., awareness, training, and education materials for pilot user communities that can also be tested and adapted for Phase 2 implementation)
- Determining the protective actions users should take when they receive an alert
- Engaging with and reviewing social science related to EEW, including a gap analysis of needed research
- Advocating for proper funding levels, since the system is currently at half the annual funding level (based on costs identified in the 2014 USGS Technical Implementation Plan).

Phase 2: Limited Rollout

Once the partners build out the ShakeAlert infrastructure, refine the software, and gather feedback from the pilot users and technology enablers, the ShakeAlert system will be ready for limited public use and acceptance. The USGS and Joint Committee for Communication, Education, and Outreach (JCCEO) have mapped an initial phased approach to broad distribution of ShakeAlert with Limited Public Rollout occurring in 2018. The USGS Executive Committee is currently determining priorities for 2018.

In this phase, system-wide “mega” pilots will allow organizations within a sector or region to work closely on the technical, social, and political issues around ShakeAlert implementation. Recently, the ShakeAlert Executive Committee affirmed its interest in engaging representative school districts in California, Washington, and Oregon to form the first ShakeAlert mega pilot group (more on this under the Goals section below). Partners may also focus on developing mega pilots in four to five additional sectors, including the emergency management, hospitals, transportation and utilities sectors.

BACKGROUND ON EARTHQUAKE EARLY WARNING AND SHAKEALERT (CONTINUED)

In this phase (and in Phase 3), the USGS, state agencies, and university partners will continue to support system maintenance, respond to technical questions, collaborate with state partners on priorities and direction for continued implementation, and promote information sharing among user groups.

As the number of end users increases, the demands for EEW education and training will also grow. End users will need information on what ShakeAlert is and what to do when they receive a warning. More organizations will want ideas, proven examples, and access to ways they can integrate ShakeAlert into their processes and systems. This phase includes increased involvement from public safety/emergency management on EEW preparedness efforts (including outreach, education, and training) and in identifying and communicating EEW protective actions. National and state committees will continue to operate to provide a forum for coordination, bridging national, state, and local interests and perspectives, and need to have a strategy in place to facilitate this process. Stakeholders are committed to collaboration, as it supports long-term success and maximizes member resources.

Phase 3: Full Public Rollout

Under full public rollout, end user groups will include organizations that use ShakeAlert to trigger automated processes and/or notify staff and other controlled populations (such as students or stadium visitors) of potential shaking. Radio and TV media could broadcast alerts to public audiences. Facilities such as stadiums or malls could amplify warnings via their public address systems. End public users could receive alerts via smartphone apps and smart home devices.

It will take many years to implement a full public rollout of ShakeAlert and success will depend in part on:

- Recurring funding in outreach, education, and training for ShakeAlert and EEW preparedness
- Additional and recurring funding to build out and maintain the ShakeAlert system
- Success of public/private sector collaboration
- Level of effort engaging state, tribal, and local stakeholders
- Ability to recruit end users to install ShakeAlert
- Investments that organizational end users make in technology and equipment to integrate ShakeAlert into their systems
- Effectiveness of end user notification technologies
- Effectiveness of end users' education and training on EEW

ShakeAlert Management and Engagement Structures

Since 2015, the USGS, universities, states, and other partners have started to formalize structures for coordinating ShakeAlert development and implementation. At the national level, the ShakeAlert Executive Committee currently guides the technical development of the ShakeAlert system, approves pilot user applications, and provides direction and priorities on national rollout. Members of the Executive Committee currently include executives from the USGS and the four university partners (California Institute of Technology; University of California, Berkeley; the University of Oregon; and the University of Washington).

Recently, the USGS established the ShakeAlert Internal Oversight Committee (comprised of USGS staff) and the ShakeAlert External Working Group (with global membership). The USGS is in the process of defining the roles, responsibilities, communications structures, and authorities of these new committees, including how they will coordinate with existing committees and stakeholders.

BACKGROUND ON EARTHQUAKE EARLY WARNING AND SHAKEALERT (CONTINUED)

The universities of Oregon and Washington operate the Pacific Northwest Seismic Network (PNSN).⁵ PNSN monitors seismic and volcanic activity across the Pacific Northwest. The organization receives funding from the USGS to support ShakeAlert development and partnerships in the two states. University of Oregon and University of Washington PNSN staffs serve as ShakeAlert Regional Coordinators, recruiting, sharing best practices, responding to technical questions, working with regional media and fostering dialogue across ShakeAlert pilot users. PNSN staff also work closely with the USGS to manage pilot project work plans.

The USGS also chairs and runs the ShakeAlert **Joint Committee for Communication, Education, and Outreach (JCCEO)**.⁶ Members include university partners, social scientists, and representatives from state emergency management agencies and geological surveys in California, Oregon, and Washington. British Columbia is an affiliate member of the JCCEO. As part of system development, the JCCEO was formed in 2016, with the vision of providing guidance and resources for public use of the ShakeAlert system and to help promote consistency in use of the system, while recognizing individual state needs. For example, the JCCEO divided into several focused working groups conducting research to advise on the content of alerts (e.g., sound, visual, and message), as well as developing sector-specific training or educational materials (e.g., for K-12 schools, transportation, healthcare, and utilities, among other sectors). Consistency across alert content is important in areas that have unique hazards and challenges, such as tsunami messaging in coastal communities.

This strategy recommends that all members of JCCEO engage in strategic planning to define committee roles and responsibilities, and identify authorities and priorities, to ensure appropriate representation and decision-making across all partner organizations. These discussions with JCCEO members will ensure that the committee makes recommendations on system-wide approaches and materials that take best practices, social science, and state- and user-specific needs into consideration.

As the ShakeAlert Program transitions from Phase 1 (System Development & Testing) to Phase 2 (Limited Rollout), new partners and stakeholders will increasingly focus on identifying, testing, and integrating EEW preparedness activities, protective actions, and ShakeAlert resources into their emergency management and earthquake preparedness and mitigation programs. The states of Washington and Oregon have recently formed structures similar to the JCCEO to lead EEW outreach, education, and training.

The state-level committees are actively engaging and gathering feedback from tribal, state, and local stakeholders, so that the work of the committees reflects local programs, capabilities, resources, and priorities. The **Washington Committee for Communication, Education and Outreach (WACCEO)** has monthly meetings since February 2017. **Oregon Committee for Communication, Education and Outreach (ORCCEO)** held its first meeting in November 2017. Both committees are currently finalizing their mission statements and initial committee objectives. The State of California statewide committee has committee leadership in place and held its inaugural meeting in late 2017. The intent of these committees is to:

- Gather input from tribal, state, and local EEW stakeholders on EEW implementation;
- Collectively support ShakeAlert implementation activities within each state;
- Lead emergency preparedness activities associated with EEW on the state, local, and tribal levels; and
- Serve as state advocates and policy advisors to the JCCEO, identifying state priorities and providing guidance based on the states' unique needs and capabilities related to EEW (e.g., EEW protective actions for communities at risk from tsunamis).

⁵ pnsn.org

⁶ <https://www.shakealert.org/education-outreach/>

BACKGROUND ON EARTHQUAKE EARLY WARNING AND SHAKEALERT (CONTINUED)

Also at the state level, the **Oregon and Washington emergency management agencies** have roles in:

- Continuing to establish clear expectations about ShakeAlert’s capabilities and limitations (this strategy provides suggestions on communicating those expectations);
- Engaging public safety officials, policy makers, and decision makers to ensure the long-term success of implementation (and navigating cultural and political climates to support implementation);
- Leading outreach and support to local and tribal governments and businesses, customizing materials to respond to local needs (this strategy provides numerous suggestions);
- Developing educational materials for public users and connecting organizational/industrial users with best-practices in their sectors;
- Operating as a clearinghouse for local questions about ShakeAlert, including inquiries from the media (referring technical questions to the appropriate USGS and university partners); and
- Collaborating with national and state-level EEW committees to share research, successes, and challenges, and continuing to identify opportunities for consistent warning content and end user communications.

The state committees and state emergency management agencies will require funding to sustain their mission and roles. Currently, the USGS is funding PNSN regional coordinators to support ShakeAlert system development and testing. For example, the coordinators are partially funded to engage ShakeAlert pilot users. There is no current or projected funding for the state committees’ broader focus on the end user (including the public) EEW outreach, education, and training. This strategy provides guidance on initial funding necessary to support EEW preparedness goals, objectives, and activities in the Pacific Northwest.

ShakeAlert and Earthquake Early Warning Challenges and Limitations

Across the West Coast, state, local government, and business leaders agree on the potential tremendous value of EEW. As one public safety executive noted, “[We] would be at risk for major loss of life without an early warning system for earthquake detection. Thousands of lives could be saved – if not more.”⁷ Stakeholders also recognize that EEW implementation will be complex.

All stakeholders – from federal agency sponsors to local government users – agree that funding is imperative for EEW’s success. Funding is needed to continue to build the system and to support user outreach, education, and training. Neither the states of Oregon and Washington, nor FEMA have committed funding to the activities identified in this strategy that are vital to the implementation and success of EEW. The USGS has only committed funding one staff position for communications, outreach, and education coordination. An investment at all levels – federal, state, local, and private sector – in implementing this strategy is essential to ensuring that members of the public who receive warnings take the recommended protective measures, saving lives and property.

The core stakeholder group will continue expanding to include state, tribal, and local agencies and businesses with an increased interest and political and financial investment in ShakeAlert. Current Phase 1 pilot projects are limited to areas where use of ShakeAlert will have no economic impact for false alarms. Phase 2 and 3 implementation will involve significant outreach, and engaging thousands of stakeholders from every sector and discipline using the EEW system. It will include education on what protective actions to take, education on false alerts and missed alerts, training on a massive scale, and continuing to build out the ShakeAlert system to drive notifications across the entire West Coast. Efforts to bring together such a large group with very diverse priorities, resources, and capabilities will be complicated.

⁷ Quote from responses to surveys conducted as part of the development of this strategy.

BACKGROUND ON EARTHQUAKE EARLY WARNING AND SHAKEALERT (CONTINUED)

Many of the hardware components necessary to integrate ShakeAlert warnings into physical infrastructure or the software necessary for systems integration are not yet well understood and/or require further development. Technological advancement in these areas continues to improve at a rapid pace. Collaboration between the USGS and several private industry partners is yielding new and innovative products, such as actuators that open fire station doors at fire station in Los Angeles, CA, and actuators to close valves at water tanks in Bothell, WA; or receivers that alert students to drop, cover, and hold on.

Each of these systems operates upon receipt of a ShakeAlert signal. Additional investment for end user installations (e.g., actuators or physical address systems), sensors, communications infrastructure, software development, and operations personnel will be required to expand the ShakeAlert system.⁸ The USGS and university partners have only installed about 50 percent of the 1,675 sensors it needs to protect seismically-vulnerable areas of the West Coast.⁹

While the USGS plans to distribute ShakeAlert via commercial and public mass notification systems, some limitations still exist. Depending on their location and proximity to the epicenter, end users may receive little if any notice of shaking. Users may not have enough notice to perform recommended protective measures.

Limitations also include potential latency challenges with the use of FEMA's Integrated Public Alert and Warning System (IPAWS), which is used to broadcast Amber Alerts, severe weather warnings and other hazard alerts. IPAWS also connects to the Emergency Alert System (EAS) that disseminates warnings via TV, radio, cellular, NOAA Weather Radio, and other systems. The USGS is, however, established as an IPAWS "alert authority" and is able to send alerts through the IPAWS system once its capabilities can meet EEW requirements.

Mass notification systems currently available within the emergency alerting market are not capable of meeting the rapid reception and distribution needed for effective EEW; however, both the cellular phone industry and mass notification providers are currently working to bring their hardware and software into alignment with the specifications necessary for EEW.

This strategy includes goals, objectives, and activities that reflect the current limitations and challenges, as well as the partners' shared commitment to the success of ShakeAlert and EEW.

⁸ <https://www.shakealert.org/faq/#limits>

⁹ <http://ow.ly/VcqK30fOyJt>

PROJECT APPROACH & METHODOLOGY

A note on Public Safety, First Responders, and Emergency Management – In this strategy, these terms are used to refer to the individuals and organizations that prioritize the protection of life safety, property, and environment in an emergency. They may belong to law enforcement, fire, emergency medical services, public safety answering points (PSAPs) (e.g., 9-1-1 call centers), and emergency management agencies. They also represent the individuals and organizations responsible for public safety and emergency management at schools, utilities, healthcare facilities, and other government and business agencies and organizations. All of these organizations are essential Earthquake Early Warning (EEW)/ShakeAlert stakeholders, not only because it is critical that they integrate EEW into their community outreach, organizational processes/systems, and response training; but also because they share responsibilities to prepare their communities for earthquakes.

Stakeholder Engagement

The professionals that support public safety/emergency management – including first responders, preparedness coordinators, administrators, public information officers, and executives – are instrumental in emergency preparedness and earthquake response. These individuals play a unique role in ensuring that their constituents has the essential information and training necessary to take protective measures before, during, and after earthquakes. Given their critical roles, the project team prioritized outreach to public safety/emergency management in Oregon and Washington in the development of this strategy.

At the start of the project, the team compiled a list of first responder, public safety, and emergency management organizations. The team contacted the organizations with information about EEW/ShakeAlert, the project, and a request for participation to share with their members. More than 150 local and state-level public and private sector representatives signed up to contribute their insight and feedback for the strategy. The project team developed and sent surveys to stakeholders to collect qualitative and quantitative data that would help inform this strategy. More than half of the stakeholders completed one or more of three surveys focused on EEW and ShakeAlert outreach/preparedness, technology/systems integration, and executive leadership support for implementation. Stakeholders' unique and diverse insights with regards to alert and notification systems, organizational capabilities and limitations, and their needs for broader integration and implementation feedback contributed to the goals, objectives, and activities in this strategy.

As the project team collected the survey responses, the team hosted a series of three conference calls with stakeholders. Each call focused on a different perspective: technology/systems integration, public information and emergency preparedness, and executive leadership. The calls were an opportunity for stakeholders to learn more about EEW and ShakeAlert. The calls also provided an opportunity for the project team to gather ideas for activities that meet stakeholders' unique needs. The project team also held one-on-one calls with selected stakeholders.

Research to Practice: Examining Protective Actions

In addition to reaching out to stakeholders, project researchers also compiled research on end user protective actions, including a literature review of current state-of-the-art knowledge about protective actions. The white paper examined research on protective actions that can be taken by the public before the ground starts to shake, using multiple scenarios. This evidence based approach serves as the fundamental underpinning for both stakeholder engagement and strategy development.

PACIFIC NORTHWEST VISION AND GOALS

This strategy is the culmination of a months-long project to consider EEW outreach, education, and training from the perspectives of Oregon and Washington state and local stakeholders. It acknowledges that state, tribal, and local agencies and businesses are essential partners in the rollout of ShakeAlert, will have an increasing role in its implementation, will require resources – including funding – to support efforts, and must be prepared to perform their growing responsibilities to ensure the success of EEW.

The Pacific Northwest’s Vision for ShakeAlert and EEW Preparedness

Ultimately, the goals, objectives, and activities in this strategy aim to support ShakeAlert implementation and EEW preparedness via a coordinated and thoughtful approach to outreach, education, and training. The Pacific Northwest’s vision for successful implementation and integration includes:

- A fully-developed and tested ShakeAlert system that detects earthquakes and disseminates warnings to end users;
- Broad use of ShakeAlert (including public alerts and integration with organizational systems and processes);
- End users take proven protective actions upon receipt of a warning;
- Broad understanding and acceptance of ShakeAlert capabilities and limitations;
- Funding and political support for EEW preparedness, ShakeAlert, and a commitment to system and program maintenance;
- Disseminated information and training to users on ShakeAlert and EEW preparedness; and,
- Demonstrated improvement in life-safety and property protection capabilities.

The project team understands ShakeAlert’s capabilities and limitations (especially around current available resources and funding). Whenever possible, the following principles guide the goals and more than a dozen objectives outlined in this strategy.

- **Leverage and integrate with existing public education outreach efforts:** This is recommended to maximize unity of effort and resources for earthquake preparedness and EEW outreach and education as well as to capitalize on existing, recognized efforts, such as 2-weeks ready, the annual Great ShakeOut Drill, earthquake-related exercises, various local jurisdiction preparedness initiatives, and programs in partner states like California.
- **Benefit from emergency management/public safety’s relationships in local communities:** Much of this strategy focuses on the role of state, tribal, and local public safety, first responder, and emergency management stakeholders in the socialization of ShakeAlert and EEW. Local public safety professionals have trusted relationships with local residents, agencies, and businesses that will be necessary to implement ShakeAlert among end users. These organizations and individuals prioritize the protection of life safety, property, and environment in an emergency and have responsibilities to promote emergency preparedness and disaster resiliency. Public safety professionals and emergency managers are among the most effective messengers of life-safety information, such as instructions on protective actions to take during an earthquake or tsunami. They also have evaluated their communities’ capabilities and resources; understand the cultural and political climate around earthquake preparedness; will manage local efforts to raise awareness and train on EEW; will lead the integration of ShakeAlert into their processes, systems, and educational materials; and will be direct users of ShakeAlert. This strategy recognizes the value in providing local public safety with the knowledge base to champion ShakeAlert and EEW preparedness.

PACIFIC NORTHWEST VISION AND GOALS (CONTINUED)

- **Include a strong emphasis on a web-based and social media outreach and education:** This is recommended based on feedback from surveyed local stakeholders and public that they turn first to online sources for earthquake preparedness and EEW information. In addition, eventually millions of individual users will interact with EEW systems via their mobile devices.
- **Incorporate social science evidence-based approaches:** This is recommended for messaging related to recommended protective actions upon receipt of an EEW alert, as well as delivery of EEW awareness, training, and education.

The Pacific Northwest Goals for ShakeAlert and EEW Preparedness

Goal 1. Facilitate Oregon's and Washington's involvement in ShakeAlert and EEW

Dedicated program management and clearly defined roles, responsibilities, and authorities are essential to the states' ability to implement ShakeAlert and educate end users on EEW and protective actions. Program management provides direction, accountability, and oversight over the states' investments. Managers work with partners to develop and implement program management plans with activities, timelines, budgets, and responsibilities, as well as project risks and communication structures.

In addition, the states acknowledge that this strategy is a living document: The Pacific Northwest's objectives and activities to support ShakeAlert implementation and EEW awareness, outreach, and education will evolve in the coming years. The states must update this strategy so it remains current and relevant to its audiences.

Goal 2. Engage and educate federal, state, local, tribal, and private sector decision makers, policy influencers, media, and emergency management/public safety partners on EEW and ShakeAlert

Outside of the earthquake risk reduction and seismology communities, many end user groups, especially public policy makers and public safety professionals, are unfamiliar with EEW systems and the current state of EEW technology available within the U.S.

Given the infancy of ShakeAlert within the U.S. as a whole and in the Pacific Northwest specifically, this strategy provides recommendations designed to leverage existing efforts to the greatest degree possible, but also recognizes that additional effort is required to engage the whole community, especially influential stakeholders with the power to advocate for EEW, educate their peers, and affect policy and decision making. It is imperative that they understand the system's capabilities and limitations, and support the funding and activities necessary to implement the system and preparedness efforts.

A 'one-size-fits-all' or 'top-down' approach can lead to a lack of ownership and support among stakeholders and end users. Conversely, a purely local-driven approach on an advanced system like ShakeAlert without connection to expert guidance can lead to inconsistent results, conflicted messaging, and public confusion. With the vast majority of earthquake preparedness and training activities occurring at the local level, the strategy recognizes the necessity of providing expert guidance directly to local stakeholders (e.g., emergency management/public safety professionals) to work with end users.

Goal 3. Engage and educate federal, state, local, tribal, and private sector decision makers, policy influencers, media, and emergency management/public safety partners on EEW and ShakeAlert

Emergency services provided by public safety, emergency management, and first responders prioritize life safety and are essential components of a successful earthquake response. Ensuring that these stakeholders have the opportunity to incorporate EEW into their systems and operations will facilitate faster response times and save lives and property, and protect the environment. ShakeAlert warnings will also provide this essential user community with advance notice to take self-protective actions so that they will be able to support initial disaster response.

PACIFIC NORTHWEST VISION AND GOALS (CONTINUED)

In addition to the public safety community, state, tribal, and local stakeholders include schools, hospitals, transportation systems, utilities, and many others. For EEW to be successful, each of these groups will need to understand and embrace their role, integrate ShakeAlert into their organizations, and provide EEW preparedness training and educational materials to their audiences.

Emergency Preparedness Coordinators who responded to surveys for the development of this strategy observed that the most successful outreach efforts involved a combination of local trainings and presentations (because they establish trusted relationships with community members) and social media/tradition press releases (because they have the capacity to reach large audiences).

Goal 4. Support the education and training of end users on EEW protective actions

ShakeAlert is a groundbreaking technology. System implementation will require collaboration at all levels of government and business. Successful system use will necessitate mass awareness, education, and training activities on EEW protective actions. Outreach, education, and training efforts will also encompass changes to programs and policies across dozens of sectors in the Pacific Northwest.

This strategy provides initial recommendations to build awareness, educate, and train different end users, including the public, on ShakeAlert and protective actions to take when receiving a warning. The recommendations also focus on providing consistent, meaningful support to local communities in the Pacific Northwest. The deployment of new, advanced technologies, such as ShakeAlert, without the necessary investment in education and training for all end users can derail the system's success.

Goal 5. Assess EEW's ability to reduce injury and loss to life and property

Once stakeholders have implemented the activities in this strategy, it will be valuable to examine how effective they (and ShakeAlert) were in prompting actions that led to a reduction in injuries and losses to life and property. Before the next drill or earthquake, stakeholders should discuss and identify the metrics for evaluating EEW and ShakeAlert, including system delivery, and end user understanding and acceptance.

STRATEGIC OBJECTIVES AND ACTIVITIES

The following objectives and recommended activities translate the strategic vision and goals into action. The list includes assigned priorities based on stakeholder and project team feedback, overall value, and criticality to a successful ShakeAlert implementation and EEW preparedness program in the Pacific Northwest. Some short-term actions are prioritized in order to facilitate subsequent mid-to-long-term actions. The list of activities also includes estimated timeframes and cost ranges. Estimated costs are based on assumptions and for initial budgeting purposes.

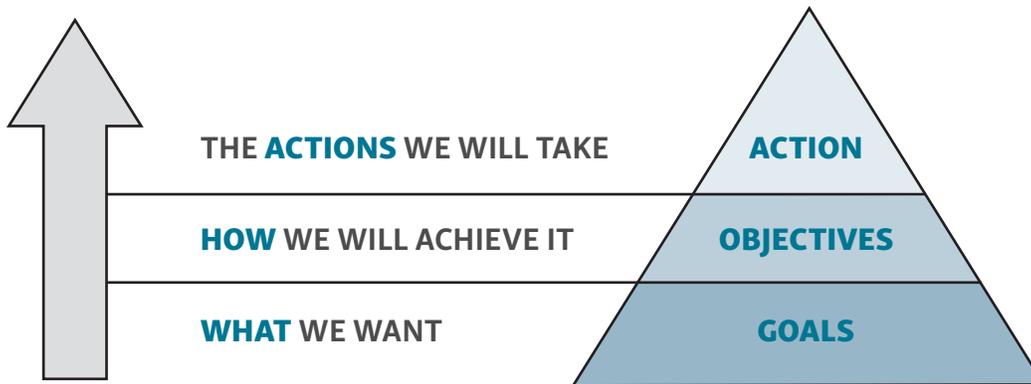


Figure 1. Outreach, Education and Training Strategic Planning Process

Stakeholders should use these objectives and activities as a starting point. Opportunities to promote awareness, education, and training will change based on the partners' progress in developing the ShakeAlert system and their direction and priorities for implementation.

GOAL 1. FACILITATE THE STATES OF OREGON AND WASHINGTON'S INVOLVEMENT IN SHAKEALERT AND EEW

Table 1. Goal 1 Summary of Objectives and Activities

Number	Objectives	Activities
Objective 1	Develop a structure for and dedicate resources to program coordination	<ul style="list-style-type: none"> Hire EEW Program Coordinators Integrate the role of the state's EEW Program Coordinator into existing ShakeAlert coordination structures Identify and pursue funding for EEW and ShakeAlert outreach, education, and training
Objective 2	Define roles and responsibilities	<ul style="list-style-type: none"> Define roles and responsibilities of federal, state, tribal, university, and local partners involved in ShakeAlert and EEW Determine the short- and long-term vision for the state committees
Objective 3	Maintain this strategy	<ul style="list-style-type: none"> Review and update this strategy annually or as appropriate

OBJECTIVE 1: Develop a structure for and dedicate resources to program management

Activity: Hire EEW Program Coordinators

- Purpose:** The two EEW Program Coordinators will represent Washington and Oregon states, tribal, and local priorities, collaborate with the JCCEO, chair the WACCEO or ORCCEO, and serve as the state contact for local stakeholders (including elected officials, government agencies, and businesses). This strategy identifies more than two dozen activities conducted or led by the Program Coordinators. The job description should clearly define roles, responsibilities, and authorities. Bringing on a staff member to coordinate the states' EEW programs will provide a substantial cost-savings (versus hiring contracted support). The alternative to hiring Program Coordinators is to retain contractor support. For additional discussion on the Program Coordinators, please refer to the Critical Future Investments section below.
- Responsibilities:** State emergency management agencies recruit and hire Program Coordinators. States work with ORCCEO and WACCEO to define roles, responsibilities, and authorities.
- Priority:** High
- Cost Range: \$\$\$\$** (Estimate includes two full-time equivalent staff members at an average annual salary each of \$100,000 inclusive of benefits, depending on the position classification level. Program Coordinators should also have a budget for travel expenses and other direct costs.)

Note that cost estimates associated with activities in this strategy assume that the states will each hire EEW Program Coordinators to coordinate and/or complete the majority of the activities. An asterisk (*) next to the cost estimate indicates any activities assuming Program Coordinators' support. Rather than hire Program Coordinators, the states may opt to engage contractors at an estimated billable hourly rate of \$50-\$200/hour to complete the activities identified in this strategy. Roughly, contractor management and delivery of all activities in this strategy would cost approximately \$500,000 to \$1.2 million. Cost estimates also indicate where limited contractor support from subject matter experts and facilitators may be beneficial.

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 1. FACILITATE THE STATES OF OREGON AND WASHINGTON'S INVOLVEMENT IN SHAKEALERT AND EEW (CONTINUED)

Activity: Integrate the role of the state's EEW Program Coordinator into existing ShakeAlert coordination structures

- **Purpose:** The EEW Program Coordinators will have responsibilities representing the state emergency management agencies at the national level and will chair the ORCCEO and WACCEO state committees. The Program Coordinator, state earthquake program leads, the university partners, ORCCEO, WACCEO, the ShakeAlert Executive Committee, and JCCEO should discuss roles, as well as coordination and communication processes.
- **Responsibilities:** State EEW Program Coordinators work with partners to define roles and coordination processes.
- **Priority:** High
- **Cost Range:** \$*

Activity: Identify and pursue funding for EEW and ShakeAlert outreach, education, and training

- **Purpose:** As noted, lack of funding is the primary challenge facing the implementation of EEW. Refer to the Funding Consideration section in this strategy for more information. This activity would include raising awareness with policy and law makers.
- **Responsibilities:** ORCCEO and WACCEO review sources of potential funding and develop a plan for pursuing funding.
- **Priority:** Very High
- **Cost Range:** \$*

OBJECTIVE 2: Define roles and responsibilities

Activity: Define roles and responsibilities of federal, state, tribal, university, and local partners involved in ShakeAlert and EEW

- **Purpose:** Clearly defined roles ensure that individuals are involved in decisions that affect their responsibilities and authorities. Defined roles also remove the guesswork from decision making, supporting buy-in, and trust in group decisions. Washington and Oregon partners have started this conversation. Partners should include FEMA – the federal agency responsible for providing guidance on emergency preparedness. Roles should be defined not only by tasks, but also by criteria for coordination/communication and responsibilities for decision making.
- **Responsibilities:** EEW partners, including WACCEO, ORCCEO, CACCEO, JCCEO, USGS, FEMA, and university partners work together to develop their respective roles and responsibilities in supporting EEW preparedness.
- **Priority:** High
- **Cost Range:** \$* (\$-\$\$\$), if using contracted facilitator support, which may be beneficial if EEW partners gather in person for a planning workshop)

Activity: Determine the short- and long-term vision for the state committees

- **Purpose:** The WACCEO and ORCCEO are new committees and are discussing their respective mission statements. In the short-term, they will be leading outreach and engagement of ShakeAlert users and local stakeholders. They will provide state-specific feedback on ShakeAlert implementation. In the long-term, the states will need a structure to support ongoing engagement and use of ShakeAlert, share technical updates, and connect with local stakeholders. This strategy also provides suggestions for the committees' scope in the Background on EEW and ShakeAlert section.

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 1. FACILITATE THE STATES OF OREGON AND WASHINGTON'S INVOLVEMENT IN SHAKEALERT AND EEW (CONTINUED)

- **Responsibilities:** WACCEO and ORCCEO develop vision statements and identify committee member roles. Committees discuss roles with counterparts in California and British Columbia.
- **Priority:** High
- **Cost Range:** \$*

OBJECTIVE 3: Maintain this strategy

Activity: Review and update this strategy annually or as appropriate

- **Purpose:** The strategy should be updated to reflect lessons learned from pilot users, as well as direction and priorities established by the ShakeAlert Executive Committee and the JCCEO, especially as partners agree on mega-pilot projects and broad public distribution. The vision and goals will remain relevant; although objectives and activities will change as the partners make progress.
- **Responsibilities:** WACCEO and ORCCEO review and update strategy annually or when there are significant updates to the ShakeAlert implementation plan. JCCEO reviews and provides suggestions on updated objectives and activities. The states' EEW Program Coordinators facilitate edits to the strategy and maintain recent versions.
- **Priority:** Medium
- **Cost Range:** \$*

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 2. ENGAGE AND INFORM DECISION MAKERS, POLICY INFLUENCERS, MEDIA, AND EMERGENCY MANAGEMENT/PUBLIC SAFETY PARTNERS

Table 2. Goal 2 Summary of Objectives and Activities

Number	Objectives	Activities
Objective 4	Develop (or support the development of) core assets and materials	<ul style="list-style-type: none"> • Create ShakeAlert branding • Update ShakeAlert website and align partner websites • Develop a plan for media partnership and a media kit on ShakeAlert and EEW in the Pacific Northwest
Objective 5	Identify and engage tribal, state, and local stakeholders and influencers	<ul style="list-style-type: none"> • Continue to identify tribal, state, and local government and business points of contact and influencers, and define their roles • Develop a plan for reaching influencers and educating tribal, state, and local government and business points of contact on EEW preparedness and ShakeAlert • Develop protocols to engage and update elected officials and executives on ShakeAlert implementation and EEW preparedness activities • Identify activities to continue engagement with local emergency managers and public safety professionals • Engage Resilience Programs/Officers and Seismic Safety Committees
Objective 6	Educate tribal, state and local emergency management/public safety stakeholders on ShakeAlert and EEW preparedness	<ul style="list-style-type: none"> • Identify methods of consistently engaging tribal and local stakeholders in ORCCEO and WACCEO activities • Provide a platform for tribal, state, and local stakeholders to share information about EEW • Provide real-time forums on EEW and ShakeAlert for public safety officials and other tribal, state, and local stakeholders

OBJECTIVE 4: Develop (or support the development of) core assets and materials

Activity: Create ShakeAlert branding

- **Purpose:** Branding, including a ShakeAlert logo and style guide, will help establish name recognition, consistency, professionalism, and trust in ShakeAlert and EEW preparedness. When surveyed on EEW and ShakeAlert, the vast majority of Washington and Oregon CERT members responded that they look to the USGS as the most authoritative source for EEW information (78% of more than 300 respondents). Surveyed emergency management executives agreed with more than 80% citing the USGS as the most credible source of information. Ensuring that the USGS is visibly associated with ShakeAlert branding will lend credibility, and is an important consideration for end-user acceptance.
- **Responsibilities:** JCCEO develops branding. The state committees and the USGS will approve branding.
- **Priority:** High
- **Cost Range:** \$ (if developed by federal or state staff), \$\$ - \$\$\$ (if using contractor design support)

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 2. ENGAGE AND INFORM DECISION MAKERS, POLICY INFLUENCERS, MEDIA, & EMERGENCY MANAGEMENT/PUBLIC SAFETY PARTNERS (CONTINUED)

Activity: Update ShakeAlert website and align partner websites

- **Purpose:** ShakeAlert's website (www.shakealert.org) inconsistently references the involvement of state partners. The site needs to be updated to reflect the contributions and commitment to ShakeAlert in the Pacific Northwest. The state emergency management agencies do not have ShakeAlert landing pages for local stakeholders to receive information about their state's activities. Messaging on PNSN's website is not aligned with the ShakeAlert site.
- **Responsibilities:** USGS updates website with input from WACCEO, ORCCEO, and state representatives on the JCCEO ShakeAlert.org Content Focus Group. State emergency management agencies create landing pages. PNSN updates site to align with ShakeAlert site.
- **Priority:** High
- **Cost Range:** \$* (if sites developed by federal or state staff), \$\$ - \$\$\$\$ (for more complex sites developed with contractor support)

When surveyed, more than 300 CERT members reported that they receive the majority of their information on earthquake preparedness via their CERT trainings (96%). Other sources of information include websites (59%), booths at community events (45%), flyers (37%), and speakers at community events (34%). CERT members were least likely to obtain preparedness information from paid advertising (with an average of 4%, depending on the type of media). These responses were consistent with responses from Emergency Preparedness Coordinators from Oregon and Washington agencies and organizations. Few Coordinators invest in paid advertising, ranging from 2% who run ads in magazines to 10% who sponsor ads on TV. Most Coordinators rely on their websites to convey preparedness information (78%). Social media (74%) and speaking at community events (68%) are also popular avenues for disseminating information to local communities.

Activity: Develop an overview presentation on ShakeAlert and EEW in the Pacific Northwest

- **Purpose:** Local and state stakeholders requested a slide deck specific to the Pacific Northwest that defines EEW, provides basic information on ShakeAlert and its benefits, and outlines current status and next steps of ShakeAlert implementation, and provides an overview of state, tribal, and local roles in system implementation and EEW preparedness. Stakeholders want to raise awareness of ShakeAlert with local elected officials and non-public safety agency partners and businesses.
- **Responsibilities:** The JCCEO Education Resources Working Group is currently developing a general presentation on ShakeAlert. WACCEO and ORCCEO adapt presentation and talking points. JCCEO reviews Oregon and Washington presentation, and provides suggestions for message alignment. Oregon and Washington distribute to state, tribal, and local stakeholders.
- **Priority:** High
- **Cost Range:** \$*

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 2. ENGAGE AND INFORM DECISION MAKERS, POLICY INFLUENCERS, MEDIA, & EMERGENCY MANAGEMENT/PUBLIC SAFETY PARTNERS (CONTINUED)

Activity: Develop a plan for media partnership and a media kit on ShakeAlert and EEW in the Pacific Northwest

- **Purpose:** As the states conduct outreach to influencers and local stakeholders, the media will become increasingly interested in EEW preparedness and ShakeAlert. Media will likely have a role in transmitting ShakeAlert warnings to their audiences. A plan will provide processes for coordinating responses to inquiries and messaging about ShakeAlert implementation, EEW preparedness, and EEW benefits across the Pacific Northwest and with the JCCEO. Media will continue to ask questions about the status of ShakeAlert (e.g., what it is, what it does, why it works the way it does, etc.). Pre-scripted messages and general talking points must be developed that puts all spokespersons and partners on the same page. If specific questions come up, each state could customize the general talking points to their own audiences (similar to the Southern California Earthquake Center's approach for the Great ShakeOut). This material should also include frequently asked questions, which could then be utilized on the ShakeAlert website and potentially used in future media advisories and press releases. This activity should also include the graphics aligned with ShakeAlert branding, as well as pre-scripted social media messages.
- **Responsibilities:** State emergency management agency Public Information Officers collaborate on a media management plan and kit, working with the EEW Program Coordinators to develop the strategy and materials, and the WACCEO and ORCCEO to provide input with the JCCEO, local emergency management agencies, and the USGS (including the USGS Office of Communications and Publishing). Program Coordinators share final media plan and kit with partners.
- **Priority:** High
- **Cost Range:** \$*

OBJECTIVE 5: Identify and engage tribal, state, and local stakeholders and influencers

Activity: Continue to identify tribal, state, and local government and business points of contact and influencers, and define their roles

- **Purpose:** As part of the survey, state, tribal, and local public safety executives recommended contacts to provide feedback and support ShakeAlert implementation within their organizations. The states should continue to build the list of stakeholders to ensure they are involving the appropriate contacts. Lists should identify contacts for ShakeAlert system implementation, as well as for EEW preparedness coordination. EEW Program Coordinators and Regional Coordinators should collaborate to review lists so that the university partners can identify organizations that may benefit from ShakeAlert pilot projects. In addition to the lists of local agency and business contacts, the states should create a list of influencers (e.g., policy makers and others) who may (or may not) support the ShakeAlert implementation and/or EEW preparedness.
- **Responsibilities:** WACCEO and ORCCEO continue outreach to their states' local executives and add to the list, maintaining contact with designated individuals. Program Coordinators should develop a list of potential influencers. Program Coordinators and Regional Coordinators continue to identify organizations that may be interested in pilot projects.
- **Priority:** High
- **Cost Range:** \$*

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 2. ENGAGE AND INFORM DECISION MAKERS, POLICY INFLUENCERS, MEDIA, & EMERGENCY MANAGEMENT/PUBLIC SAFETY PARTNERS (CONTINUED)

Activity: Develop a plan for reaching influencers and educating tribal, state, and local government and business points of contact on EEW preparedness and ShakeAlert

- **Purpose:** More than three-quarters of emergency management/public safety executives surveyed stated that they were “only somewhat familiar,” or “very unfamiliar” with ShakeAlert or EEW.¹⁰ While not surprising given the limited availability of ShakeAlert, this demonstrates a significant need for educating these influential users. Tribal, state, and local stakeholders contributed to the development of this strategy and they will be integral stakeholders in the years ahead. Oregon and Washington will need to educate stakeholders on ShakeAlert and EEW preparedness, technical capabilities, limitations, case studies, pilot user lessons learned, and successes, among other areas. The Program Coordinators should lead the development of a strategy or plan to reach state/local influencers and discuss the tremendous benefits that ShakeAlert and EEW preparedness can provide. This step is critical to ensure that an influencer does not detract from ShakeAlert or EEW’s success due to misinformation or misaligned expectations.
- **Responsibilities:** Program Coordinators work with WACCEO and ORCCEO to develop an initial list(s) and suggestions to reach influencers. Program Coordinators to finalize, implement, and oversee outreach plan.
- **Priority:** High
- **Cost Range:** \$*

When surveyed, Oregon and Washington emergency management executives said that their organizations would benefit most from a better understanding of how ShakeAlert and EEW work, as well as suggestions for integrating EEW and ShakeAlert into their plans, policies, and technologies.

Activity: Develop protocols to engage and update elected officials and executives on ShakeAlert implementation and EEW preparedness activities

- **Purpose:** As the implementation progresses, elected officials and state, tribal, and local executives will request updates on EEW and ShakeAlert. The Program Coordinators, with input from the ORCCEO and WACCEO, should develop protocols for updating policy and decision makers, as well as plans for advocating for additional resources for education and outreach. For example, opportunities to inform officials regularly may include quarterly emails distributed to legislative staff, website updates, etc. Officials will likely include Offices of the Governor, state legislatures, tribal leadership, mayors, city councils, CEOs, state resilience officers, and others. In addition, the Oregon Seismic Safety Policy Advisory Council (OSSPAC), Washington State Seismic Safety Committee (WA SSC), Oregon Resilience Officer (and in the future, a potential Washington Resilience Officer), have statutory authority and annual reporting responsibilities related to earthquake and tsunami safety. Through their existing efforts, ORCCEO and WACCEO should work collaboratively OSSPAC and WA SSC chairs to capture current policy, organizational needs, and funding issues related to EEW preparedness, and incorporate that information into their annual reports to the Office of the Governor and/or state legislature.

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

¹⁰ For example, executives assumed that they would be able to use many of their current alert notification platforms to issue ShakeAlerts to the public, when there are latency issues with current technologies that make integration with many platforms challenging.

GOAL 2. ENGAGE AND INFORM DECISION MAKERS, POLICY INFLUENCERS, MEDIA, & EMERGENCY MANAGEMENT/PUBLIC SAFETY PARTNERS (CONTINUED)

- **Responsibilities:** ORCCEO and WACCEO to discuss protocols and opportunities for engaging elected officials. Program Coordinators to lead the development of a plan and/or protocol.
- **Priority:** High
- **Cost Range:** \$*

Activity: Identify activities to continue engagement with local emergency managers and public safety professionals

- **Purpose:** Professional associations such as Associations of Sheriffs, Police Chiefs, Fire Chiefs, and others not only provide access to stakeholders, but they also allocate resources to networking events, educational/training opportunities, legislative affairs and policy advocacy. These associations also maintain email distribution lists, host conferences, distribute newsletters and provide other avenues for reaching stakeholders. Some associations may also be willing to provide financial support to local members for ShakeAlert installations or EEW trainings. The Program Coordinators, ORCCEO, and WACCEO should work with public safety associations and leaders to identify opportunities, such as presenting at public safety conferences (such as Partners in Emergency Preparedness, State Emergency Management Association conferences, healthcare coalition forums, K-12 educators conferences, and others), writing a column for association and community newsletters, posting updates and events to member listservs or email distribution lists, etc. In providing feedback on this strategy, stakeholders noted the importance of also engaging member associations, such as the American Public Works Association, the American Water Works Association, and many others). Based on feedback from the committees and associations, the states' Program Coordinators should develop a plan or approach to foster continual state, tribal, and local public safety/emergency management engagement.
- **Responsibilities:** Program Coordinators, in coordination with the ORCCEO and WACCEO, identify associations, develop a list of and calendar for activities to engage state/local stakeholders.
- **Priority:** High
- **Cost Range:** \$*

Activity: Engage Resilience Programs/Officers and Seismic Safety Committees

- **Purpose:** Oregon has a legislatively-established and Governor-appointed State Resilience Officer who serves as the state's top-level policy advisor on resilience issues, connects core sectors, and works with the OSSPAC to address seismic safety issues. This position also helps build capacity for emergency preparedness and supports the strategic vision of the Oregon Resilience Plan. The role of both Oregon and Washington legislatively-established Seismic Safety Committees (OSSPAC and WA SSC) is to serve as champions for earthquake and tsunami risk-reduction efforts; increase public understanding of earthquake hazard, risk, exposure, and vulnerability; and provide policy recommendations to the Governor. EEW outreach and other preparedness efforts should be coordinated with these individuals and organizations.
- **Responsibilities:** ORCCEO and WACCEO reach out to the states' Resilience Programs/Officers and seismic safety committees to discuss opportunities for collaboration on activities described in this strategy.
- **Priority:** High
- **Cost Range:** \$*

GOAL 2. ENGAGE AND INFORM DECISION MAKERS, POLICY INFLUENCERS, MEDIA, & EMERGENCY MANAGEMENT/PUBLIC SAFETY PARTNERS (CONTINUED)

OBJECTIVE 6: Educate tribal, state and local emergency management/public safety stakeholders on ShakeAlert and EEW preparedness

About two-thirds of respondents from Emergency Preparedness Coordinators from Oregon and Washington agencies and organizations said that they were “somewhat familiar” with EEW and ShakeAlert, although 21% said that they were not at all familiar.

Activity: Identify methods of consistently engaging tribal and local stakeholders in ORCCEO and WACCEO activities

- **Purpose:** The success of EEW preparedness and ShakeAlert depends on implementation at the local level. Tribal and local stakeholders (including sector-specific representatives, such as school district emergency managers) are not consistently represented on the WACCEO and ORCCEO.
- **Responsibilities:** WACCEO and ORCCEO invite selected local and regional representatives to join, present, and/or provide insight to the committees.
- **Priority:** Medium
- **Cost Range:** \$

Activity: Provide a platform for tribal, state, and local stakeholders to share information about EEW

- **Purpose:** A shared online coordination platform, such as Basecamp, can provide stakeholders a forum for providing status updates on activities, lessons learned from pilot programs, status of system implementation, technical updates, information about upcoming events/activities, contact information, etc. The platform should leverage CREW Basecamp site as a repository of EEW information and connect to the public education repository already established.
- **Responsibilities:** States’ Program Coordinators, WACCEO, and ORCCEO work with CREW to explore building and managing a Basecamp site to foster stakeholder (including Pilot User) collaboration. Program Coordinators to update and maintain the site. (Alternative is for CREW to manage the site).
- **Priority:** Medium
- **Cost Range:** \$*

Activity: Provide real-time forums on EEW and ShakeAlert for public safety officials and other tribal, state, and local stakeholders

- **Purpose:** In addition to an online document repository and coordination platform, conference calls and webinars provide an opportunity to educate stakeholders on ShakeAlert/EEW capabilities and for dialogue about user needs and successes. Participants can pose questions and benefit from peer feedback.
- **Responsibilities:** Program Coordinators, WACCEO, and ORCCEO schedule, host, and facilitate webinars and other events that provide an opportunity for dialogue.
- **Priority:** Medium
- **Cost Range:** \$*

COST RANGES: \$ = \$0–\$5,000 | \$\$ = \$5,000–\$10,000 | \$\$\$ = \$10,000–\$50,000 | \$\$\$\$ = \$50,000+

GOAL 3. PROMOTE OPPORTUNITIES FOR END USERS TO INTEGRATE EEW INTO THEIR SYSTEMS AND OPERATIONS

Table 3. Goal 3 Summary of Objectives and Activities

Number	Objectives	Activities
Objective 7	Continue to focus efforts on public safety/emergency management integration	<ul style="list-style-type: none"> Solicit input from state, tribal, and local stakeholders on prospective candidates for pilot integration projects Provide guidance for effective integration of ShakeAlert with emergency operations plans and earthquake response/coordination Continue discussions with state, tribal, and local stakeholders on integrating ShakeAlert into 911 call centers Provide information on technical assistance and funding opportunities to install ShakeAlert
Objective 8	Collect information and successes from pilot users	<ul style="list-style-type: none"> Complete a brief survey of current ShakeAlert pilot users Develop EEW success stories

OBJECTIVE 7: Develop (or support the development of) core assets and materials

Activity: Solicit input from state, tribal, and local stakeholders on prospective candidates for pilot integration projects

- **Purpose:** The greater the number of ShakeAlert pilot user projects, the greater the opportunity to showcase effective integration and demonstrate the value of the ShakeAlert system. Focusing resources on cultivating strategic partnerships with entities that have demonstrated technical and fiscal capabilities to integrate EEW within their systems will help partners showcase tangible results. Existing pilot users will be valuable advocates for ShakeAlert, and can share information on successful approaches to integration.
- **Responsibilities:** Regional Coordinators, with support from the Program Coordinators, ORCCEO, WACCEO, DOGAMI and WA Geological Survey, (and specifically from state emergency management agencies), reach out to and continue to engage potential pilot users.
- **Priority:** High
- **Cost Range:** \$ (with continued funding to universities)

Activity: Provide guidance for effective integration of ShakeAlert with emergency operations plans and earthquake response/coordination

- **Purpose:** As noted in this strategy, public safety and emergency management are foundational parts of ShakeAlert implementation and EEW preparedness. Beyond integrating ShakeAlert into their systems, they must understand and integrate EEW into their processes, operational plans, and communications with the public. ShakeAlert implementation will only be successful if public safety and emergency management have a shared awareness about how alerts will affect community preparedness and response.
- **Responsibilities:** Program Coordinators, ORCCEO and WACCEO to draft guidance/recommendations and share with JCCEO for feedback.
- **Priority:** High
- **Cost Range:** \$*

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 3. PROMOTE OPPORTUNITIES FOR END USERS TO INTEGRATE EEW INTO THEIR SYSTEMS AND OPERATIONS (CONTINUED)

Activity: Continue discussions with state, tribal, and local stakeholders on integrating ShakeAlert into 911 call centers

- **Purpose:** Public Safety Answering Points (PSAPs), or more commonly known as 911 call centers, provide an essential emergency service to communities and are located in designated critical facilities. During the development of this strategy, the State of Washington started discussions around 911 integration. Stakeholders identified that by integrating ShakeAlert within the existing PSAP network in Washington State, PSAPs within an area experiencing an earthquake may be able to take a variety of actions, including immediate life-safety protective actions, initiate failover protocols to PSAPs outside of the shaking area for continuity of service, and/or serve as an alerting distribution point for the first responders they serve. Moreover, the Washington State Enhanced 911 office maintains a high-speed network that may be able to provide low-latency transmission of alerts.
- **Responsibilities:** State emergency management agencies, with support from university partners, continue discussions with Oregon and Washington stakeholders.
- **Priority:** Medium
- **Cost Range:** \$ (future costs will depend on subsequent installation efforts)

Activity: Provide information on technical assistance and funding opportunities to install ShakeAlert

- **Purpose:** Government agencies and businesses will be responsible for installing and integrating ShakeAlert within their organizations. For example, installation may involve funding and installing actuators to transmit warnings over public address systems. ORCCEO and WACCEO must educate end users on their roles and work with them to continue to identify opportunities for grants and/or loans to install ShakeAlert. The state committees should draw from best practices from the ShakeAlert user community. When possible, this support may include providing financial and/or technical assistance for ShakeAlert integration. As noted, funding has not yet been allocated to complete the implementation of the ShakeAlert system. This strategy identifies some avenues for funding, but it is critical that more advocacy and research occur to secure funding at national, state, and local levels.
- **Responsibilities:** Program Coordinators, university partners, ORCCEO, and WACCEO draft sector-specific ideas/guidance and share with the JCCO for feedback. Program Coordinators develop talking points articulating the role and investment of government agencies and business.
- **Priority:** High
- **Cost Range:** \$* (if the states provide guidance) / \$\$\$\$ (if the states provide funding for installations)

OBJECTIVE 8: Collect information and successes from pilot users

Activity: Complete a brief survey of current ShakeAlert pilot users

- **Purpose:** When pilot testing of ShakeAlert began, numerous public and private-sector organizations stepped forward to voluntarily assess ShakeAlert's functionality. The pilot users' roles vary, and have included implementing ShakeAlert, monitoring alerts issued, identifying opportunities to integrate ShakeAlert into their operations, and considering how ShakeAlert and EEW preparedness fit into their operations and emergency response plans. Partners should survey pilot users on integration, what users found most/least useful, what information/training they would have liked to receive, etc.

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 3. PROMOTE OPPORTUNITIES FOR END USERS TO INTEGRATE EEW INTO THEIR SYSTEMS AND OPERATIONS (CONTINUED)

- **Responsibilities:** Regional Coordinators, with support from the Program Coordinators, ORCCEO, WACCEO, DOGAMI and WA Geological Survey, (and specifically from state emergency management agencies), reach out to and continue to engage potential pilot users.
- **Priority:** Medium
- **Cost Range:** \$*

Activity: Develop EEW success stories

- **Purpose:** The development of brief, web- and social media- ready success stories will provide content for promotional, training and educational purposes. Video would be preferred, but photos and short text blurbs may also be workable. ORCCEO and WACCEO can also incorporate vignettes into standard presentations and use them during outreach efforts.
- **Responsibilities:** ORCCEO, WACCEO, and university partners discuss pilot user engagement and outreach. Program Coordinators work with state emergency management agency Public Information Officers to produce content.
- **Priority:** Low
- **Cost Range:** \$ (if developed by state or federal staff) - \$\$\$ (if videos are produced with contractor support)

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 4. SUPPORT THE EDUCATION AND TRAINING OF END USERS ON EEW PROTECTIVE ACTIONS

Table 4. Goal 4 Summary of Objectives and Activities

Number	Objectives	Activities
Objective 9	Support the education and training of end users on protective actions to take when receiving a warning	<ul style="list-style-type: none"> Publish and disseminate a white paper on earthquake protective measures Create (or update existing) preparedness materials on EEW protective actions Develop videos highlighting protective actions
Objective 10	Support public education efforts on EEW and ShakeAlert	<ul style="list-style-type: none"> Develop general and sector-specific EEW and ShakeAlert packages for tribal, state, and local stakeholders Engage CERT graduates to spread awareness about EEW and integrate EEW protective actions and ShakeAlert into local CERT programs Conduct local and tribal outreach and Train-the-Trainer workshops Present at conferences and other events related to ShakeAlert and EEW Develop/execute a social media strategy for ShakeAlert awareness and EEW preparedness
Objective 11	Plan for and implement ShakeAlert and EEW preparedness programs in different sectors	<ul style="list-style-type: none"> Develop and execute a plan for engaging sectors in the Limited Rollout of ShakeAlert Collaborate with State Superintendents of Public Instruction (SPI) Engage State Public Health Officials
Objective 12	Integrate EEW Outreach with the Great ShakeOut	<ul style="list-style-type: none"> Engage ShakeOut Coordinators within Oregon, Washington, and at Southern California Earthquake Center (SCEC) Develop materials on ShakeAlert and EEW protective actions for the Great ShakeOut Include questions focused on EEW-related activities into annual post-ShakeOut survey
Objective 13	Develop Guidance for Tsunami-Threatened Communities	<ul style="list-style-type: none"> Conduct research on EEW protective actions, including recommendations for coastal emergency managers on initiating evacuations Develop consistent guidance to be used by local and tribal officials in California, Oregon, and Washington coastal communities on responding to EEW Integrate EEW awareness and protective action guidance into FEMA, USGS, NOAA, and NTHMP-related earthquake and tsunami outreach products Develop outreach and educational materials that reflect consistent EEW guidance for coastal communities

A survey on EEW and ShakeAlert asked respondents to describe the type of materials that would be helpful to share with their communities when ShakeAlert becomes available to the general public. Earthquake Preparedness Coordinators from Oregon and Washington requested that the lead agencies provide initial materials that focus solely on EEW and ShakeAlert, since the technology and protective actions will be new to the public. As the public awareness increased, then the Coordinators would integrate EEW and ShakeAlert into their existing preparedness materials.

GOAL 4. SUPPORT THE EDUCATION AND TRAINING OF END USERS ON EEW PROTECTIVE ACTIONS (CONTINUED)

OBJECTIVE 9: Support the education and training of end users on protective actions to take when receiving a warning

Activity: Publish and disseminate a white paper on earthquake protective measures

- **Purpose:** Providing information on evidence-based EEW protective actions to end users will be essential to life safety and the success of EEW. ShakeAlert and EEW partners are uniquely positioned to provide practical scientifically-backed research as the foundation for their recommendations. The project team has drafted a White Paper on EEW Protective Actions to share the research with the EEW community and will explore options for publishing.
- **Responsibilities:** Project team discusses options for publishing the White Paper and sharing its findings.
- **Priority:** High
- **Cost Range:** \$ (white paper already developed with existing funding)

Activity: Create (or update existing) preparedness materials on EEW protective actions

- **Purpose:** The White Paper on EEW Protective Actions (developed as part of this project) compiles research on earthquake protective actions. Current materials on earthquake protective actions may need updating based on the paper's findings. States should review their materials to ensure that they are aligned with the latest research. States should provide updated EEW and earthquake preparedness materials to state, tribal, and local governments and businesses.
- **Responsibilities:** State emergency management agencies work with the Program Coordinators, ORCCEO and WACCEO, and FEMA to lead the development EEW preparedness materials.
- **Priority:** High
- **Cost Range:** \$* - \$\$\$\$ (depends on costs for designing/printing materials)

Activity: Develop videos highlighting protective actions

- **Purpose:** Videos on EEW protective actions can be used across government agencies and businesses to support education and awareness efforts. This activity includes the development of multi-lingual, social media/web-based video shorts featuring local officials, first responders, and emergency managers highlighting EEW protective actions based on scenarios and current recommendations. ORCCEO and WACCEO could provide guidance or support the production of videos that local stakeholders can use in trainings and outreach efforts. The Great ShakeOut campaign materials include examples of videos highlighting protective actions.
- **Responsibilities:** ORCCEO and WACCEO discuss next steps with state emergency management agencies.
- **Priority:** Medium
- **Cost Range:** \$* - \$\$\$ (depends number of videos, production costs, and whether the states use contractor support)

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 4. SUPPORT THE EDUCATION AND TRAINING OF END USERS ON EEW PROTECTIVE ACTIONS (CONTINUED)

OBJECTIVE 10: Support public education efforts on EEW and ShakeAlert

Activity: Develop general and sector-specific EEW and ShakeAlert packages for tribal, state, and local stakeholders

- **Purpose:** Educational materials will help elected officials, media, public safety and emergency management professionals, and various publics on how EEW works and proactively address potentially sensitive EEW-related questions, such as false alarms, incorrect shaking intensity, magnitude, etc. The states should work with the JCCEO and FEMA to develop general and sector-specific materials on EEW preparedness and ShakeAlert implementation, including materials that address needs of people with disabilities and access and functional needs. When surveyed, Earthquake Preparedness Coordinators from Oregon and Washington reported that they commonly adapt and use earthquake preparedness materials from FEMA, state emergency management agencies, and the Great ShakeOut. Sectors should include public safety/emergency management, schools (K-12 and higher education), healthcare, transportation, and utilities, among others. Materials should be customized for Washington or Oregon with a state point of contact. Materials may include a ShakeAlert Overview/Fact Sheet, FAQ, information on obtaining access to ShakeAlert, sample press kit, ShakeAlert style guide, sector-specific training guidance and materials, resources for more information, sample training materials (for the system and on EEW protective actions), graphics and other educational materials illustrating EEW protective actions, etc. An excellent example of this type of content delivery is the Great ShakeOut earthquake campaign, which has a branded logo, graphics, etc., and is augmented with state-specific guidance and customized by user groups.
- **Responsibilities:** JCCEO to draft core materials for each sector. WACCEO and ORCCEO to provide input. Program Coordinators to customize materials for Pacific Northwest stakeholders.
- **Priority:** Medium
- **Cost Range:** \$* - \$\$\$\$ (depends on costs for designing/printing materials)

“If an education and outreach tool kit can be put together with the ability for local agencies to tailor it to their community it would shorten the timeline to start messaging at the local level about ShakeAlert. It would give us the ability to quickly integrate it into our existing messaging around emergency preparedness.”

– Response to survey for the development of this strategy

Activity: Engage CERT graduates to spread awareness about EEW and integrate EEW protective actions and ShakeAlert into local CERT programs

- **Purpose:** CERT graduates have demonstrated a commitment to learning about emergency preparedness, supporting local response efforts, and serving as champions for emergency management in their communities. EEW and ShakeAlert partners should educate CERT graduates about EEW protective actions and on the ShakeAlert system when it becomes available to the public. EEW and ShakeAlert should be integrated into CERT training materials.
- **Responsibilities:** Program Coordinators and state emergency management agencies work with CERT coordinators to discuss EEW and ShakeAlert integration.
- **Priority:** Medium
- **Cost Range:** \$*

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 4. SUPPORT THE EDUCATION AND TRAINING OF END USERS ON EEW PROTECTIVE ACTIONS (CONTINUED)

As a part of the development of this strategy, the project team surveyed CERT members from Washington and Oregon. People who have participated in CERT have demonstrated a commitment to earthquake preparedness and will likely be champions for EEW in their communities. Of the more than 300 Community Emergency Response Team (or CERT) members who responded to a survey for this strategy, nearly half were unfamiliar with EEW or ShakeAlert.

Activity: Conduct local and tribal outreach and Train-the-Trainer workshops

- **Purpose:** These workshops would build a network of ShakeAlert and EEW trainers and champions across the Pacific Northwest. They would support the deployment of a consistent and comprehensive training curriculum. The states may consider recruiting one or more participants from regional areas or disciplines (e.g., Homeland Security Regions or in Oregon, the Portland Solutions Group/Counties). Trainings would provide local/tribal officials with a foundation in basic earthquake science, ShakeAlert system functionality and operations, the appropriate protective actions to take when a warning is received, and best practices for user engagement, education, and training.
- **Responsibilities:** Program Coordinators and ORCCEO, WACCEO, and JCCEO members discuss training curriculum. Program Coordinators lead trainings with support from stakeholders.
- **Priority:** Medium
- **Cost Range:** \$* - \$\$\$\$ (depends number of workshops and travel costs)

Activity: Present at conferences and other events related to ShakeAlert and EEW

- **Purpose:** Conference sessions provide a forum to raise awareness about ShakeAlert and EEW, and to educate stakeholders and end users. Participants may play a key role in delivery of EEW outreach information to their communities. Conferences may include:
 - Partners in Emergency Preparedness Conference
 - Oregon Emergency Management Association Annual Conference
 - Washington State Emergency Management Association Annual Conference
 - Washington Association of Sheriffs and Police Chiefs Conference
 - Oregon Association Chiefs of Police
 - Oregon State Sheriffs' Association
 - Washington Association of Fire Chiefs
 - Oregon Fire Chiefs Association
 - Northwest Tribal Emergency Management Association's Emergency Management & Public Health Conference
 - Oregon and Washington Science Teacher Associations

One of CREW's strategic objectives is to increase presence at public and private sector conferences and the organization provides funding to members to cover travel expenses. CREW's Board of Directors includes multiple EEW partners.

- **Responsibilities:** Program Coordinators, CREW, ORCCEO, and WACCEO should list conference opportunities and develop a plan to present on EEW and ShakeAlert at Pacific Northwest conferences.
- **Priority:** High
- **Cost Range:** \$* - \$\$\$\$ (depends on travel costs and method of delivery)

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 4. SUPPORT THE EDUCATION AND TRAINING OF END USERS ON EEW PROTECTIVE ACTIONS (CONTINUED)

OBJECTIVE 11: Plan for and implement ShakeAlert and EEW preparedness programs in different sectors

The activities under this objective highlight schools and healthcare. The processes outlined for each of these sectors will be applicable to other sectors, including utilities, transportation, emergency management, and others, that include stakeholder engagement and partnership.

The Los Angeles Unified School District (LAUSD) has been an active pilot user of ShakeAlert. Interested in building on the successes with the LAUSD, the ShakeAlert Executive Committee is in the process of identifying four to five California, Oregon, and Washington school districts (both K-12 and higher education) to participate in a “mega-pilot user program” as part of ShakeAlert’s Phase 2 Limited Public Rollout in 2018. Engaging schools involves outreach, education, and training for administrators, teachers, students, and their caregivers. In addition to schools, the partners will continue to expand ShakeAlert testing and use in other sectors, such as utilities, healthcare, public safety, and transportation.

Activity: Develop and execute a plan for engaging sectors in the Limited Rollout of ShakeAlert

- **Purpose:** Providing new users with access to ShakeAlert will be a complicated process and will require a thoughtful approach to be successful. States must map out a process for ShakeAlert implementation and review the process with pilot user representatives and decision makers. For example, the steps to engage schools may include the following (other sectors will follow similar steps):
 1. Brainstorming assets and potential risks/challenges for school districts
 2. Presenting to school districts at regional conferences or reaching out to school associations, such as Educational Service Districts or the Washington Association of School Administrators, to raise awareness about ShakeAlert and EEW
 3. Recruiting school districts to participate as pilot users (working with the Regional Coordinators, JCCEO, and the ShakeAlert Executive Committee)
 4. Working with emergency management/public safety agencies in those communities to understand EEW and support ShakeAlert implementation
 5. Assessing the district’s capabilities, needs, and potential challenges [including staff support (e.g., IT support), funding, existing equipment, etc.] and provide guidance to bridge challenges (e.g., around funding or lack of support)
 6. Identifying specific opportunities for installing/integrating ShakeAlert (e.g., via actuator, app, etc.)
 7. Meeting with executives and decision makers to educate them on ShakeAlert and EEW (this may include local elected officials, district administrators, school board members, union representatives, parent-teacher organizations, and other advocacy and community groups)
 8. Working with schools to identify end user groups and developing programs for training and educating audiences
 9. Integrating EEW protective actions into the schools’ existing earthquake preparedness programs including plans (e.g., update existing teacher resource guides and providing recommended actions for people with access and functional needs)
 10. Leveraging existing earthquake drills, such as the Great ShakeOut to include ShakeAlert
 11. Assessing whether users followed EEW protective actions (updating plans and training/education materials as necessary)

GOAL 4. SUPPORT THE EDUCATION AND TRAINING OF END USERS ON EEW PROTECTIVE ACTIONS (CONTINUED)

12. Developing school-specific supplemental materials for ShakeAlert installation and system training, as well as EEW preparedness and training on protective actions (aligning educational materials and resources with state science standards so that teachers may use them in their classrooms)
13. Training school staff to provide ShakeAlert and EEW protective action training to user groups
14. Testing the ShakeAlert system incrementally (e.g., starting with a single school or method of delivery)
15. Gradually rolling out ShakeAlert and EEW preparedness training to multiple schools within the district

- **Responsibilities:** Program Coordinators should collaborate with ORCCEO and WACCEO to lead the development of a rollout plan. They should gather feedback from the JCCEO. The states should execute the plan in coordination with the ShakeAlert Executive Committee and Regional Coordinators.
- **Priority:** High
- **Cost Range:** \$* - \$\$\$\$ (depending on the funding and support needed from the pilot users)

Activity: Collaborate with State Superintendents of Public Instruction (SPI)

- **Purpose:** SPI can provide insight on existing requirements for school emergency planning. They can determine whether any additional legislative or policy considerations are required for EEW preparedness or ShakeAlert integration in schools. Additionally, the SPI may have ideas for funding K-12 ShakeAlert pilot testing or EEW preparedness programs.
- **Responsibilities:** Program Coordinators and members of ORCCEO and WACCEO meet with the SPI.
- **Priority:** Medium
- **Cost Range:** \$*

Activity: Engage State Public Health Officials

- **Purpose:** Following the 1971 Sylmar quake that caused 65 deaths and a hospital collapse, the California State Legislature passed the Alfred E. Alquist Hospital Seismic Safety Act. The act requires that acute-care hospitals be designed and constructed to withstand a major earthquake and remain operational immediately after the quake. The act has been modified and amended over time, but the goal remains the same: to ensure that essential facilities, such as hospitals, remain operational. EEW can help protect not only the systems and infrastructure that critical care facilities rely on, but patients as well. State Public Health Officers will be essential partners in implementing ShakeAlert and EEW preparedness in healthcare facilities. The state health partners may also identify strategic opportunities or partnerships that can be effectively leveraged to deploy outreach, education, and training for healthcare providers and their facilities.
- **Responsibilities:** Program Coordinators and members of ORCCEO and WACCEO meet with State Public Health Officials.
- **Priority:** High
- **Cost Range:** \$*

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 4. SUPPORT THE EDUCATION AND TRAINING OF END USERS ON EEW PROTECTIVE ACTIONS (CONTINUED)

OBJECTIVE 12: Integrate EEW Outreach with the Great ShakeOut

THE GREAT SHAKEOUT AND EARTHQUAKE EARLY WARNING

The Great ShakeOut and EEW preparedness are natural partners in earthquake preparedness. For many Oregon and Washington residents and businesses, ShakeOut is the one time during the year when they learn about and practice earthquake protective measures. ShakeAlert and EEW should leverage extensive outreach campaigns along the West Coast.

Activity: Engage ShakeOut Coordinators within Oregon, Washington, and at Southern California Earthquake Center (SCEC)

- **Purpose:** The Great ShakeOut is an annual earthquake drill that attracted more than 12 million participants in California, Oregon, and Washington. In addition to practicing earthquake protective actions like drop, cover, and hold on, many local/tribal jurisdictions, state governments, and businesses conduct tests of various systems and response protocols. With the widespread success and brand recognition of the Great ShakeOut, it would be a natural progression to continue integrate ShakeAlert testing (as Washington did in 2017) and to practice EEW protective actions. This includes engaging the school ShakeOut partners on becoming beta and pilot users to support the limited and full public rollouts. ShakeAlert and EEW educational materials will dovetail with each of the ShakeOut target areas (K-12 schools, healthcare, businesses, government agencies, higher education, non-profit organizations, and others). The states discuss joint outreach and education strategies with the Great ShakeOut organizers at the Southern California Earthquake Center.
- **Responsibilities:** Program Coordinators and members of ORCCEO and WACCEO meet with Great ShakeOut organizers.
- **Priority:** High
- **Cost Range:** \$*

Activity: Develop materials on ShakeAlert and EEW protective actions for the Great ShakeOut

- **Purpose:** The partners should develop awareness materials on ShakeAlert and EEW protective actions, and work with ShakeOut organizers to upload materials to their website and integrate messaging into their social media sites. In addition, the partners may opt to create vignettes, telling stories of successful pilot user systems, planning, and response actions. These stories (as one-pagers or videos) would promote the effectiveness of ShakeAlert, provide a variety of users with first person accounts of successful implementation, and capture best practices that can be shared with other stakeholders via outreach materials, social media, web-based information delivery, etc.
- **Responsibilities:** Program Coordinators and members of ORCCEO and WACCEO discuss materials with the JCCEO. The states work with the Great ShakeOut organizers to add materials to their website.
- **Priority:** High
- **Cost Range:** \$* - \$\$\$ (depending on design/printing expenses)

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 4. SUPPORT THE EDUCATION AND TRAINING OF END USERS ON EEW PROTECTIVE ACTIONS (CONTINUED)

Activity: Include questions focused on EEW-related activities into annual post-ShakeOut survey

- **Purpose:** The survey questions will provide another method of gathering information from users on the success of the ShakeAlert system and stakeholder perceptions on protective actions.
- **Responsibilities:** Program Coordinators draft survey questions, with feedback from the ORCCEO, WACCEO and JCCEO. Program Coordinators work with the Great ShakeOut organizers to review and include questions in survey.
- **Priority:** Medium
- **Cost Range:** \$*

OBJECTIVE 13: Develop Guidance for Tsunami-Threatened Communities

Activity: Conduct research on EEW protective actions, including recommendations for coastal emergency managers on initiating evacuations

- **Purpose:** Additional research may be needed on protective actions for coastal communities that may receive more than a minute of warning. Partners should examine EEW protective actions for communities – especially coastal communities – that receive more than a minute of warning. These efforts may be considered in parallel with pedestrian evacuation modeling initiatives underway in Oregon and Washington. Tsunami Program Coordinators and EEW Program Coordinators should determine whether this research would be eligible as a collaborative multi-state project for California, Oregon, and Washington via the National Tsunami Hazard Mitigation Program (NTHMP) or the National Earthquake Hazards Reduction Program (NEHRP), as it has direct bearing on existing warning system education and outreach efforts. Such research efforts may also be possible via Washington Emergency Management Division's collaboration with GNS Science, the University of Washington's M9 project, the USGS Science Application for Risk Reduction (SAFRR) project, National Science Foundation (NSF)-funded research by ShakeAlert university partners, or even as an interagency collaborative effort.
- **Responsibilities:** Program Coordinators and members of ORCCEO and WACCEO discuss next steps with the JCCEO.
- **Priority:** Medium
- **Cost Range:** \$\$\$* - \$\$\$\$ (depending on research efforts)

Activity: Develop consistent guidance to be used by local and tribal officials in California, Oregon, and Washington coastal communities on responding to EEW

- **Purpose:** Seismic hazards for Pacific Northwest coastal communities – including Northern California – include both earthquakes and tsunamis. It will be important to update tsunami and earthquake guidance to reflect research to ensure the appropriate response when people in coastal communities receive a ShakeAlert.
- **Responsibilities:** Tsunami Program Coordinators in California, Oregon, and Washington collaborate with EEW Program Coordinators on specific language, messaging, and protective actions for coastal residents. Partners collaborate with the Mitigation and Education Subcommittee to ensure National Oceanic and Atmospheric Administration (NOAA) and National Weather Service (NWS) also distribute state-developed messaging through their outreach efforts, including through the outreach efforts supported by Warning Coordination meteorologists.
- **Priority:** High
- **Cost Range:** \$*

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 4. SUPPORT THE EDUCATION AND TRAINING OF END USERS ON EEW PROTECTIVE ACTIONS (CONTINUED)

Activity: Integrate EEW awareness and protective action guidance into FEMA, USGS, NOAA, and NTHMP-related earthquake and tsunami outreach products

- **Purpose:** Partners should leverage existing tsunami-related education, outreach, and training efforts and their associated funding in order to deliver consistent messaging to coastal communities from federal, state, local, and tribal governments. Examples may include engaging FEMA's Preparedness Division and FEMA Regional offices (e.g., on the [Ready.Gov](#) campaign); coordinating with USGS public outreach/SAFRR efforts; integrating with NOAA and NWS public safety education via the NTHMP Program Coordinator and NOAA Tsunami Program Coordinator. Integrating EEW messaging in these programs (e.g., in pamphlets, training, videos, media toolkits, social media postings, etc.) provides a cost-effective method that reinforces messaging.
- **Responsibilities:** Tsunami Program Coordinators and EEW Program Coordinators collaborate with federal and state agency partners include EEW messaging into preparedness programs and materials.
- **Priority:** High
- **Cost Range:** \$* - \$\$\$\$ (depends on design, production, and printing expenses)

Activity: Develop outreach and educational materials that reflect consistent EEW guidance for coastal communities

- **Purpose:** A significant outreach and education effort will be necessary to train coastal residents and visitors on how to respond to an EEW alert. Residents will require information on protective actions to take when an EEW alert is broadcast, especially for example, if EEW technologies are integrated into All Hazard Alert Broadcast (AHAB) siren warning systems within Washington. The states should update materials to reflect EEW research for coastal residents.
- **Responsibilities:** Program Coordinators work with ORCCEO and WACCEO to review and update materials, in coordination with the JCCEO and state tsunami Program Coordinators.
- **Priority:** Medium
- **Cost Range:** \$* - \$\$\$\$ (depends on design/printing materials)

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

GOAL 5. ASSESS EEW'S ABILITY TO REDUCE INJURY AND LOSS TO LIFE AND PROPERTY

Table 5. Goal 5 Summary of Objectives and Activities

Number	Objectives	Activities
Objective 14	Develop and implement a plan for assessing the effectiveness of EEW preparedness efforts	<ul style="list-style-type: none"> • Develop evaluation criteria and research methods for evaluating the efficacy of EEW efforts • Assess effectiveness of outreach, education and training initiatives

OBJECTIVE 14: Develop and implement a plan for assessing the effectiveness of EEW preparedness efforts

Activity: Develop evaluation criteria and research methods for evaluating the efficacy of EEW efforts

- **Purpose:** Evaluation criteria and methods for evaluating EEW efforts would address, for example, the data required to determine whether end users received the ShakeAlert in time to take recommended actions; whether the end users took the recommended protective actions; and whether the protective actions saved lives and property, among other questions. It is preferable that these discussions occur prior to the next earthquake or drill (like the Great ShakeOut), so researchers can identify and, in some cases, implement methods to collect the required observations and data. These discussions should involve research scientists and stakeholders from federal, state, and local government, university partners, the West Coast state committees, and the JCCEO, as the evaluation criteria and methods should be consistent across the U.S.
- **Responsibilities:** Program Coordinators work with the state committees and JCCEO (including research members) to discuss evaluation criteria and methods. Additional steps will depend on the collective approach to gathering data.
- **Priority:** High
- **Cost Range:** \$* (research costs not included)

Activity: Assess effectiveness of outreach, education and training initiatives

- **Purpose:** As noted, it is prudent for updates to the strategy and new activities to be based on evaluation of past outcomes, stakeholder feedback, and program accomplishments. EEW Program Coordinators, consulting with the ORCCEO and WACCEO, should develop a plan to monitor activities and measurable outcomes to assess their effectiveness at regular intervals. For example, the states could track the number of participants in webinars and workshops, the number of presentation opportunities at conferences, the number of new pilot users recruited, etc.
- **Responsibilities:** Program Coordinators facilitate sessions with WACCEO and ORCCEO to define measurable outcomes. Program Coordinators lead state-level program assessments, sharing successes and challenges with the state committees and JCCEO.
- **Priority:** High

COST RANGES: \$ = \$0-\$5,000 | \$\$ = \$5,000-\$10,000 | \$\$\$ = \$10,000-\$50,000 | \$\$\$\$ = \$50,000+

RECOMMENDED NEXT STEPS

Earthquake Early Warning (EEW) systems in the U.S. have existed for only a decade. Through academic and scientific rigor, federal agencies and university partners have made tremendous strides in advancing the ability to provide EEW to millions of Americans in the spirit of protecting human life, property, economic security, and our shared environment. While not yet fully operational, the realization of a West Coast-wide EEW system is visible on the horizon.

This strategy identifies dozens of near- and long-term actions to support EEW implementation, specifically outreach, education, and training activities associated with EEW preparedness. Many of the activities will require additional resources to enact, although several high-priority, low- to no-cost actions can be initiated immediately. Other high-priority activities may require upfront costs, but are strongly recommended to save costs in the near future and provide the management and coordination that implementation will necessitate. High-priority next steps include:

- **Formalizing Roles and Responsibilities**

While the U.S. Geological Survey (USGS) and the ShakeAlert university partners continue to make tremendous strides in bringing this new technology to fruition, the emphasis has been primarily on the technical developments of ShakeAlert. There have been limited opportunities to collaborate on how broad user awareness and education on EEW protective actions will be addressed. This is evidenced with the USGS EEW Technical Implementation Plan, which does not address education, training, and outreach in any detail.

One of the most critical activities for the future success of EEW implementation is the formalization of an organizational structure with roles and responsibilities for EEW outreach, education, and training. At the state level, these discussions should involve the ORCCEO, WACCEO, and California's state committee (including the state emergency management agencies). At the federal level, these conversations should also include the Federal Emergency Management Agency (FEMA)'s Preparedness and Mitigation Directorates. This next step will shape the future success of EEW and ShakeAlert in the Pacific Northwest, and the U.S.

The National Oceanic and Atmospheric Administration's (NOAA) highly successful federal-state partnership, the National Tsunami Hazard Mitigation Program (NTHMP), brings together NOAA, USGS, and FEMA. All agencies play crucial roles in helping to improve community preparedness and resilience for tsunamis. While NOAA administers the program, each agency brings their unique expertise to the table alongside state partners in order to advance critical life safety and community protection goals. A similar paradigm could be considered for EEW's organizational structure in the U.S.

- **Continuing Public Safety/Emergency Management Engagement**

As the rollout of EEW systems progress and more end users have access to ShakeAlert, public safety and emergency management professionals will be critical partners. Local and tribal public safety officials are often asked to explain how public systems operate, and the appropriate response to take before, during, and after alerts are issued. In the case of cutting-edge technology like ShakeAlert, setting and managing public expectations will be an essential function that requires collaboration between scientists and federal, state, tribal, and local public safety and emergency management professionals. The state committees should continue to engage stakeholders identified as part of the project to develop this strategy. Immediate activities may include a webinar to present a summary of this strategy, along with next steps and an update on EEW. Future activities should include the development and deployment of EEW/ShakeAlert Training for local officials. The development of a consistent and comprehensive training curriculum, and creation of quality training materials can provide local officials with a foundation of basic earthquake science, ShakeAlert functionality and operations, and the appropriate protective actions to take when a warning is received.

RECOMMENDED NEXT STEPS (CONTINUED)

- **Hiring State-Level EEW Program Coordinators**

Program Coordinators will serve as the pivot point between broader federal activities and state- and local-level implementation of EEW outreach, education, and training efforts. EEW Program Coordinators would be responsible for managing the majority of the activities outlined in this strategy, monitoring progress and modifying their direction, as necessary. Hiring for these positions will provide a significant return on investment, as the alternative is to hire contractor support. Finally, as EEW systems and ShakeAlert expand to broader public distribution, existing constrained resources will be inadequate to meet stakeholders' growing demands for information and support.

- **Continuing the Great ShakeOut Partnership**

Socializing EEW outreach and education during the annual Great ShakeOut leverages a successful earthquake preparedness campaign. The state committees should contact the ShakeOut organizers at the Southern California Earthquake Center to discuss opportunities for integrating ShakeAlert and EEW preparedness, how best to share messaging on protective actions with pilot and mega-pilot users in 2018.

- **Identifying and Advocating for Funding Opportunities**

Policy and funding advocacy will also be essential next steps for the continued advancement of EEW and ShakeAlert, especially as it relates to outreach and education on protective actions. The state committees should work with ShakeAlert partners to identify funding sources for the activities outlined in this strategy.

When surveyed, the majority of Oregon and Washington emergency management executives reported that funding represents the most significant challenge to implementing EEW and ShakeAlert in their organization.

The most cost effective approach for implementing the goals, objectives, and activities in this strategy is allocate funding as outlined in Table 6.

Table 6. Costs to Implement Activities in this Strategy

Recommended Expense	Description	Estimated Costs
One Oregon and one Washington EEW Program Coordinators	Responsible for managing or facilitating the majority of activities identified in this strategy	Approx. \$100,000 (for each FTE position, inclusive of benefits)
Travel for EEW Program Coordinators	Travel costs and other associated with conference presentations, stakeholder meetings, and other outreach opportunities identified in this strategy	\$18,000 - \$36,000 (estimated at 12-24 travel days/annually)
Additional contractor support	To support state staff with training/workshop facilitation, graphic design, website development, video production, and research	\$85,000 - \$315,000+ (depending on level of support)

As mentioned, the cost estimates associated with activities in this strategy assume that the states will each hire Program Coordinators to manage and/or complete the majority of the activities. Although less cost effective, the states may opt to engage contractors at an estimated billable hourly rate of \$50-\$200/hour to complete the activities identified in this strategy instead of hiring EEW Program Coordinators. Roughly, contractor management and delivery of all activities in this strategy would cost approximately \$500,000 to \$1.2 million. See *Attachment 1. Funding Opportunities* for a list of potential funding sources.

ATTACHMENT 1: POTENTIAL FUNDING OPPORTUNITIES

Initial funding for ShakeAlert system research and development has been provided by a variety of public entities and private foundation sources, including the U.S. Geological Survey (USGS), Gordon and Betty Moore Foundation, the California Office of Emergency Services (Cal OES), and the National Science Foundation. No long-term funding sources have been identified to fully operationalize and maintain the system or to fund the Earthquake Early Warning (EEW) outreach, education, and training activities detailed in this strategy.

A variety of funding sources may be leveraged to support these expenses. Existing funding sources that may be used to support EEW outreach and education efforts include:

Federal Sources

- **FEMA NEHRP Direct State Assistance**

FEMA NEHRP Direct State Assistance provides an opportunity for qualifying states to propose earthquake risk reduction projects, including public education and outreach that would be relevant to EEW efforts. This past year, Washington received \$59,000 in funding for existing projects like the Great ShakeOut. The states can use this source to apply for additional funding and leverage existing programs like ShakeOut to integrate EEW and ShakeAlert.

- **FEMA NEHRP Cooperative Agreements**

FEMA provides cooperative agreements to a variety of organizations that enhance earthquake safety, including contracted entities that specialize in stakeholder engagement and the development of effective communications campaigns. This includes organizations such as Outreach Process Partners (OPP) and the Great ShakeOut campaign. Specific EEW outreach and education projects may be eligible for implementation under this program. Efforts that are applicable across multiple states, such as coordinated EEW outreach, may also be supported. While states routinely receive an allocated amount of funding for various projects through FEMA's Cooperative Agreement partners, they should continue to seek strategic multi-objective opportunities that are beneficial to FEMA, the Cooperative Agreement entity, and the West Coast states.

- **FEMA Emergency Management Performance Grant (EMPG)**

The EMPG Program plays an important role in the implementation of the National Preparedness System by supporting the building, sustainment, and delivery of core capabilities essential to achieving the National Preparedness Goal. EMPG funding may be programmed at the state level to support public education and outreach efforts. While EMPG funds may be fully committed or oversubscribed within Pacific Northwest States, such funding is an important tool to consider as part of the overall strategy implementation. Additionally, while EMPG funding may already be committed in support of existing activities, unspent year-end funds may provide opportunities for rapid support of one or more education and outreach strategy actions, such as procurement of public education and outreach materials for use by local and tribal jurisdictions.

- **FEMA RiskMap Program**

The FEMA RiskMap Program emphasizes geographic mapping areas at risk from natural hazards and proactively identifying opportunities to reduce risk and increase community resilience. The program offers a limited amount of grant funding for projects that support risk reduction and promote community resilience. The FEMA RiskMap program is also able to engage FEMA Cooperative Agreement holders on identified risk reduction efforts. The RiskMap program has been effectively used in the past to support the development of visualizations and other communications tools that help communities understand their risk and develop mitigation measures. This program could provide an opportunity to integrate EEW into mitigation and resilience efforts. Funding may also be used to support related staffing.

ATTACHMENT 1: POTENTIAL FUNDING OPPORTUNITIES (CONTINUED)

- **USGS Cooperative Agreements and SAFRR Project**

The USGS Earthquake Program maintains the ability to develop high-quality outreach tools, such as videos, publications, and other collateral that can be effectively integrated into public education and outreach campaigns that emphasize public safety. Similarly, the Science Application for Risk Reduction (SAFRR) project within the USGS is often able to support efforts designed to translate USGS science products, like ShakeAlert, into actionable information and outreach.

- **NOAA National Tsunami Hazard Mitigation Program (NTHMP) State Grants**

Both Oregon and Washington participate in the NTHMP, which is administered by NOAA's National Weather Service and receive funding to support hazard assessment, warning guidance, and mitigation. Specific EEW outreach and education initiatives may qualify for NTHMP support when a tsunami component is included. Recommendations for tsunami-threatened communities have been included within this strategy and projects promoting such information may be an optimal fit for NTHMP funding.

- **Hazard Mitigation Grant Program (HMGP)**

Hazard Mitigation Grant Program funds may support a variety of EEW and ShakeAlert-related planning and project-related implementation activities. Examples of such efforts include installing ShakeAlert components in a water and wastewater systems in Washington, as well as efforts by the State of California to fund installations. While the funding opportunities to leverage HMGP funds for EEW-related activities may be limited to post-Presidential Disaster Declarations, having a pre-identified list of actions with completed cost-benefit analysis may ensure that state and locally prioritized projects may be easily incorporated into the application process.

- **USGS ShakeAlert Earthquake Early Warning Program and Science Application for Risk Reduction (SAFRR)**

State/Local/Tribal Sources

- **State-level 911 funds**

Within both Oregon and Washington, an opportunity may exist to use 911 public education and outreach funds to further specific objectives within the strategy document.

- **State general funds**

State general funds, when available, can provide a flexible funding stream to implement one or more of the objectives found within the strategy. These resources, when appropriated by state legislatures, can serve as an integral component of any public outreach and education campaign. They may also be leveraged and serve as match for one or more of the federal funding sources identified above.

- **State capital budget funds**

State capital budget may be available if a construction-related activity is needed. For instance, if a local fire department is seeking funds to have its fire station doors automatically open by installing EEW sensors on those doors or a publicly owned utility district seeks funding to close natural gas valves when the earth shakes.

- **Local general funds**

Similar to state general funds, local general funds can provide a flexible funding stream to local communities implement one or more of the objectives found within the strategy. For instance, in Washington, local jurisdictions can use a specific sales tax on public safety activities. These resources, when appropriated by county/city/tribal councils or commissions, can serve as an integral component of any public outreach and education campaign, especially one that is implemented by local officials. Such funds may also be leveraged and serve as match for one or more of the state or federal funding sources identified above.

ATTACHMENT 2: GLOSSARY

Earthquake Early Warning (EEW): The combination of ShakeAlert system technology; the recommended protective messages communicated to end users; and, the outreach, education, training, and other emergency preparedness and mitigation activities required to fully implement EEW. EEW activities help ensure that users have access to ShakeAlert and that they take the recommended protective measures when they receive warnings.

Education: Educators impart theoretical or conceptual knowledge about a topic, like EEW or ShakeAlert. Trainers work with individuals to facilitate activities to apply or practice theoretical or conceptual knowledge. Training is necessary for the acquisition and retention of a specific knowledge, process, and/or skill. Training and education integrate at all levels, since learning environments most often encompass both the imparting of theoretical knowledge (education) and the practice that goes into the acquisition of the knowledge (training).

In educational environments, both training and education occur. In the case of Drop, Cover, and Hold On, educating individuals may include providing background on earthquake damage and explaining the rationale to perform the protective action. The training component may include demonstrating the protective action and asking trainees to practice it for multiple scenarios. In this example, the combination of education and training provides individuals with a baseline understanding, decision making tools, and memory through repetition of what to do (and how to do it) when shaking occurs.

End User: Organizations and individuals that receive the ShakeAlert data feed and use that information to initiate a process or an action to protect life and property. For example, a light rail operator could use ShakeAlert data to slow down trains and inform riders to take protective action such as Drop, Cover and Hold On. In the future ShakeAlert warnings could be delivered to smartphones.

Outreach: Outreach involves identifying and connecting with stakeholders and other target audiences. It may also involve audience engagement. Outreach may encompass raising awareness or educating audiences. For EEW, outreach will be necessary for multiple groups, including decision- and policymakers, end users, and local, state, and federal partners.

Protective Actions: Measures that individuals should take to safeguard life and property before, during, or in the aftermath of an emergency. It is the responsibility of emergency management and response organizations to recommend, educate, and train individuals on evidence-based protective actions. Actions for EEW can be taken seconds before earthquake shaking begins.

ShakeAlert: The EEW technology that includes algorithms, sensor networks, telemetry networks, and alert generation developed for the U.S. by the USGS and West Coast university partners. ShakeAlert detects an earthquake and rapidly disseminates warnings to end users in potentially affected areas. The seconds of advance warning can allow people and systems to take life- and property-saving protective actions. The ShakeAlert system currently operates as a production prototype in California, Oregon, and Washington.

Training: See EDUCATION.