Informing Tsunami Risk with Average Annualized Losses

Recent events in the United States and around the world show how tsunamis can cause substantial loss of life and property damage. To better understand the potential impacts from future tsunamis striking the nation's coastal states and territories, the Federal Emergency Management Agency partnered with the United States Geological Survey; the National Oceanic and Atmospheric Administration; and the National Tsunami Hazard Mitigation Program (the program). Together, they conducted the Estimated Average Annualized Building and Population Losses from Earthquake-generated Tsunamis in the United States study and created a technical report to go with it. They also worked with state and territorial partners through the program so that the study used the best available data and methods.

Summary

- This is the first national assessment of its kind to quantify and compare tsunami risk across most United States coastal communities. These include the United States West Coast, Alaska, Hawai‘i, and the United States Pacific and Caribbean territories.

- The Federal Emergency Management Agency (the agency) worked with the United States Geological Survey, National Oceanic and Atmospheric Administration and the National Tsunami Hazard Mitigation Program to produce this study and report. This work marks a key milestone in quantifying and comparing tsunami risk across the country. The study data and results are publicly available in multiple formats. They include a technical report, map viewer, Hazus Loss Library analyses, two journal articles, and two data releases.

- The study estimates that buildings and residents across the country could face **over $1 billion in potential average annualized losses.** The study and report provide insights to help compare tsunami risk across locations and with other natural hazards.

Overview

IMPORTANCE OF UNDERSTANDING TSUNAMI RISK

Tsunamis are massive, long-period waves generated by vertical displacements of bodies of water (up-down motion of the seafloor). They can be triggered by earthquakes; landslides (on land or underwater); volcanic eruptions; glacial calving; near-earth objects; weather; and other hazard events. Tsunamis can cause severe destruction due to strong currents and flooding that can arrive with little warning. They can lead to high numbers of fatalities, injuries and building damage costs. Understanding this risk is key to prepare for tsunami events and reduce their impacts.

ABOUT THE STUDY

The Estimated Average Annualized Building and Population Losses from Earthquake-generated Tsunamis in the United States study by the agency and its partners is a first-of-its-kind assessment. To estimate building loss, the agency used point-level building data from the United States Army Corps of Engineers National Structure Inventory, as well as state and territory hazard data. The agency used Hazus 6.1 to estimate building losses based on estimated replacement values for each scenario. To estimate population fatalities among residents, the agency leveraged a United States Geological Survey study that combined residential data from the 2020 Census with a National Structure Inventory dataset, state and territory hazard data, and pedestrian-evacuation modeling. The study used estimated return period data to annualize findings on building and population loss.

Use the results from the study to help inform your tsunami risk.

The agency and its partners have published the data and results from the study in a number of formats. Communities can use this information in a way that works best for them. You can explore the study through any of the following:

- The Tsunami Loss Viewer lets you explore the results in a user-friendly, map-based tool on ArcGIS Online. The tool provides average annualized, probabilistic, and individual scenario-level loss results at the county and Census tract levels. You can also download the results in a number of formats on the accompanying resources page.
- The Hazus Loss Library offers data packages you can download for each of the study's analyses. These data packages include the tsunami hazard data, national exposure data, and building loss results. Pre-average annualized input building loss data are sorted by location and type of analysis; you can download them to customize for your own assessments. To learn more about the library and how to download the data, check out the How To Use the Hazus Loss Library guide.
- The P-2426 Technical Report, P-2426 Estimated Average Annualized Tsunami Losses for the United States, describes the study's methodology and offers further insights into some of the results.
- The Average Annualized Tsunami Loss Data Release is the basis for the study. It includes all of the input and average annualized loss data.
- The Tsunami Evacuation Study Journal Article by the United States Geological Survey is a peer-reviewed article that interprets the residential population loss results.
- The Tsunami Evacuation Study Data Release by the United States Geological Survey is the basis for population loss results of the study. It includes estimates for the residential populations' potential to evacuate.

SCOPE OF STUDY

The study estimates potential average annualized building and residential population economic losses from earthquake-generated tsunamis based on currently available hazard zones. It covers losses for the United States West Coast (California, Oregon and Washington); Alaska; Hawaiʻi; United States Pacific territories (American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands); and Caribbean territories (Puerto Rico and the United States Virgin Islands). It does not include United States East Coast or Gulf of America states. Estimating potential losses from tsunamis depends on factors, such as distance to high ground, types of buildings, and population distribution. This study considers:

- **Tsunami hazard data**: Modeled earthquake-generated tsunami scenarios and Probabilistic Tsunami Hazard Analysis.
- **Population losses**: Impacts on residential populations living in single-family homes, manufactured homes, multi-family buildings, institutional dormitories, and nursing homes. It does not account for employee or visitor populations.
- **Building losses**: Impacts on residential, commercial, and other buildings included in the National Structure Inventory.

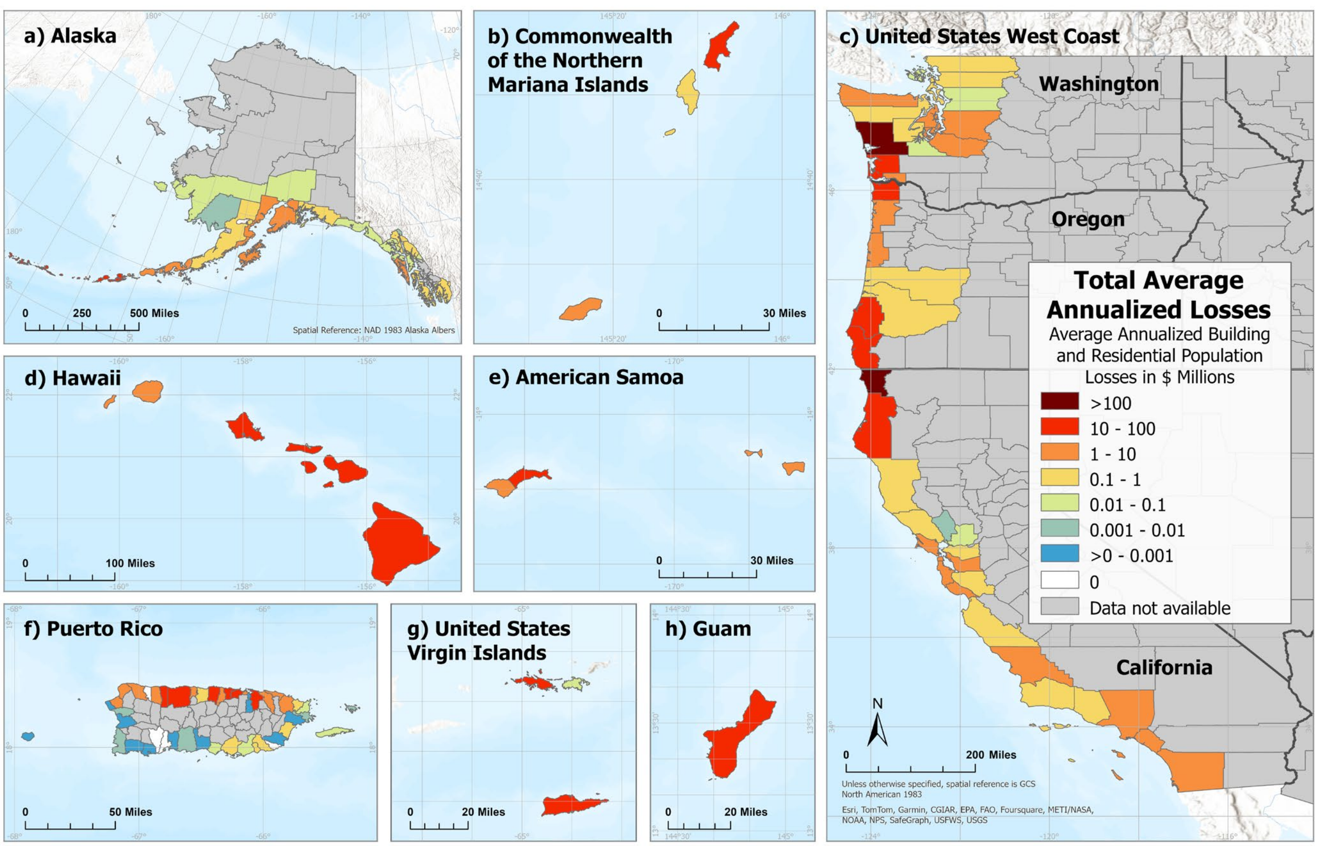

Figure 1. Total Average Annualized Losses by county or county equivalent.

Study Methodology

OVERALL METHODOLOGY

The study provides an in-depth national assessment of earthquake-generated tsunami risk. All analyses use the same national exposure dataset to estimate losses. The agency and its partners collected data on tsunami hazards and estimated return periods for each state and territory. They then used these data to estimate losses of buildings and residential population for each geography. The study team annualized losses for each state and territory in the study. This let the agency start addressing hazard data gaps and inconsistencies in state- and territory-level data. It also let the agency compare risk across regions and with other hazards.

EARTHQUAKE-GENERATED TSUNAMI SCENARIOS

The study mostly uses deterministic scenarios to assess tsunami risk. There are two exceptions: California, which includes several Probabilistic Tsunami Hazard Analysis; and Hawai'i, which has one Probabilistic Tsunami Hazard Analysis. Probabilistic Tsunami Hazard Analysis assess a range of scenarios; they account for uncertainty within the tsunami sources. Deterministic scenarios consider the impact of just one possible event. These can range from rare, high-impact events to more common ones. Using several **return periods** and tsunami sources helps lead to more representative average annualized losses. The agency worked with tsunami subject matter experts to estimate return periods and develop methodologies to standardize data from states and territories.

Return periods are the average time intervals between tsunami events; they are measured in years. In this study, a return period is used as a proxy for annual probability to calculate Average Annualized Loss. For instance, a rare tsunami event may have a 1,000-year return period (0.1% annual chance). A more common event could have a 200-year return period (0.5% annual chance). The agency and its partners can use this measure to assess losses from these events on an annualized basis. They can also compare tsunami events that are likely to occur at different frequencies.

Estimating return periods for tsunami scenarios is challenging because past tsunamis have been inconsistent and infrequent. This is an active area of tsunami research; tsunami experts provided the return periods for this study as defensible estimates.

BUILDING LOSSES

Building loss estimates include all structural, nonstructural, content, and inventory losses. Estimates are calculated using replacement values in 2022 United States dollars. States and territories supplied available hazard data such as flow depth grids, maximum run-up grids, and velocity data. The study team combined these data with national exposure data and Hazus 6.1 tsunami model to help estimate the building losses for each scenario or Probabilistic Tsunami Hazard Analysis. To estimate the damage of a tsunami, the Hazus 6.1 tsunami model can produce a Level 1, 2 or 3 analysis. Of these, the Level 3 analysis is the most accurate in terms of estimating losses. See Appendix B of the report to learn more about Hazus.

POPULATION LOSSES

This study uses the United States Geological Survey Tsunami Evacuation Study (Wood et al. 2025) which leverages a range of pedestrian-evacuation modeling efforts. It estimates the number of people who would not have enough time to evacuate by walking to safety during a local, regional, and distant tsunami scenario. **Details about the scenarios are shown below**:

- Local tsunamis: Less than one hour of travel time, or 200 km., from its source.
- Regional tsunamis: One to three hours of travel time, or within 1,000 km., from its source.
- Distant tsunamis: More than three hours of travel time, or 1,000 km., or more from its source.

The number of potentially exposed individuals was based on the distribution of residents and does not account for temporary populations, such as tourists or employees. The agency chose a cautious approach, considering each person who could not evacuate prior to wave arrival to be a fatality. Note that a percentage of these individuals would likely be injured but not be killed. The study accounts for a number of factors to assess potential losses. These include:

- **Departure delays**: This reflects the amount of time between the start of earthquake ground shaking and a person starting their evacuation on foot. This study considers departure delays of 0, 5 and 10 minutes for local events. It uses departure delays of 65, 75 and 90 minutes for regional and distant events.
- **Wave arrival time**: This refers to when the first wave of a tsunami reaches land. This is a key estimate in assessing how long people have to evacuate to safety.
- **Exposed population**: The study uses National Structure Inventory building points and 2020 Census block-level data on residents to estimate the number of those residents exposed to a tsunami event.
- **Economic losses**: For each assumed fatality, this study uses the 2022 Value of a Statistical Life estimate of $12.5 million.

Study Results

With the total Average Annualized Losses estimated to be more than $1 billion, it is important to understand how potential losses differ by location. The states and territories in the study have different tsunami hazard data, data gaps, population sizes, and building exposure. This means that when assessing and addressing tsunami risk, you need to look closely at your area's specific risk. Average annualized losses may be low due to long estimated return periods. Still, a community could suffer severe impacts to population and buildings in a rare tsunami event. Tsunamis, like all hazards, can happen in any given year. Average Annualized Losses offers the long-term annualized average that accounts for both frequent and infrequent events. Having a sense of losses in terms of Average Annualized Losses helps to compare the scale of tsunami risk to that of other hazards, like flooding and earthquakes.

The table below highlights losses for the states and territories in the study. For more data on your state or territory, please review Section 2 of the report, as well as with the appendices.

Table 1: Total Average Annualized Losses for each geography in the study.

Rank	State or Territory	Residential Population Losses	Building Losses	Total Average Annualized Loss
1	Puerto Rico	$224.31 million	$2.54 million	$226.85 million
2	Washington	$198.26 million	$11.89 million	$210.16 million
3	California	$129.92 million	$44.46 million	$174.39 million
4	Oregon	$116.78 million	$13.50 million	$130.28 million
5	Hawaiʻi	$0*	$91.77 million	$91.77 million
6	Alaska	$17.09 million	$27.97 million	$45.07 million
7	Guam	$35.90 million	$368,600	$36.26 million
8	American Samoa	$16.78 million	$14.99 million	$31.77 million
9	Commonwealth of the Northern Mariana Islands	$29.99 million	$185,500	$30.17 million
10	United States Virgin Islands	$25.09 million	$1.18 million	$26.27 million
	Total	**$794.12 million**	**$208.88 million**	**$1.002 billion**

**Hawaiʻi has the highest potential average annualized building losses. Since warning systems are likely to address population losses to distant tsunamis, Hawaiʻi's combined losses are reduced. There were no local tsunami scenario data for Hawaiʻi at the time of this analysis.*

LOCATION-SPECIFIC KEY TAKEAWAYS

Alaska

- **Tsunami hazard:** Alaska is threatened by many potential tsunami scenarios, including high-frequency and high-impact events. Historical events, like the 1964 magnitude (M) 9.2 earthquake that resulted in 106 fatalities, are proof of this. There can also be earthquakes in the Aleutian Trench that would lead to local tsunamis. Waves generated by local events in this study show a wide range of arrival times (between 15 and 120 minutes). Distant tsunamis generated by earthquakes elsewhere in the Pacific Ocean Basin may also affect coastal communities in the state.

- **Population risk factors:** Evacuating Alaskan coastal communities may be challenging due to large amounts of vegetation and seasonal snow. High ground may be close by, but it may not be easy to access. This would lead to higher fatality rates. The Kenai Peninsula Borough has the largest number of exposed residents at about 3,900. The risk of population loss in Alaska is elevated due to the relatively high frequency and impact of tsunamis.

- **Building risk factors:** Kodiak Island has the highest average annualized building loss figure in Alaska. The Aleutians West Borough has the highest building loss ratio; 80% of its buildings are exposed to tsunami hazards. Alaska has one of the highest projected loss figures relative to exposure; on average, the state has an average annualized building loss ratio of $1,000 per $1 million in exposed structures. Adopting and enforcing up-to-date building codes may be one way to greatly reduce losses in the state.

American Samoa

- **Tsunami hazard**: In 2009, a moment magnitude (M_w) 8.1 earthquake occurred 120 miles south-southwest of American Samoa on the nearby Tonga Trench Subduction Zone. This caused a tsunami that led to 34 fatalities and hundreds of injuries. About 200 homes were destroyed, too. The 2009 tsunami is included in the study as a more frequent event, estimated to have a 100-year return period. The study also included one larger local event, which was estimated to have a 1,000-year return period.

- **Population risk factors**: In American Samoa, about 11,000 residents are estimated to be in tsunami-hazard zones. This figure makes up about 24% of American Samoa's total population. The Eastern District has the highest exposure, with about 8,000 people in tsunami-hazard zones. Based on a 10-minute evacuation departure delay, there could be about 174 fatalities. With a 5-minute delay, the number drops to about 16.

- **Building risk factors:** American Samoa has very high relative projected loss figures; its average annualized building loss ratio is over $3,000 per $1 million in exposure. The Eastern, Manu'a, and Western districts all have high building loss ratios. The Western District's ratio is about $2,038 per $1 million. Assessing current building codes and adopting more recently published building codes may address some of this potential for loss.

California

- **Tsunami hazard:** Distant sources have historically affected California., including the 1964 (M 9.2) Alaska and the 2011 (M_W 9.3) Japan tsunamis. These led to extensive damage to harbor facilities; the 1964 tsunami caused 13 fatalities, and the 2011 tsunami caused one fatality. The major threat to the population stems from short wave arrival times. Earthquakes in the Cascadia Subduction Zone can cause waves with arrival times as little as 10 minutes.

- **Population risk factors:** Two of the northernmost counties in the state, Del Norte and Humboldt, have the greatest potential population loss due to short wave arrival times. The Cascadia Subduction Zone tsunami source has a wave-arrival time of 10 minutes in these counties. Based on a 10-minute evacuation departure delay, there would be about a 99% fatality rate. With a 5-minute delay, the rate drops to about 62%. This highlights the value of raising awareness about tsunami risk and evacuation.

- **Building risk factors:** California has the highest total building value exposure of any state or territory in the study. San Mateo County has the highest building value exposure of any exposed county in the state. The northern counties have the most average annualized building loss. Del Norte County has the lowest amount of average annualized building losses and building exposure. Still, it has the highest building loss ratio at about $459.05 per year per $1 million in exposure.

Guam

- **Tsunami hazard:** Guam is affected by local tsunamis caused by earthquakes in the Mariana Subduction Zone. It is also affected by distant tsunamis from the Pacific Ocean and East Philippine Subduction Zone. A Mariana Subduction Zone-related tsunami is more likely to affect the east coast of Guam, which is not as densely populated as the west coast.

- **Population risk factors:** The study found that population losses were greatly reduced when the departure delay shortens from 10 minutes to 5 minutes. This change may lower potential fatalities from about 1,400 to about 380.

- **Building risk factors:** Guam has about $3.5 billion in total building exposure, with a building loss ratio of $107 per $1 million dollars. More building inventory data and tsunami inundation modeling may help to expand our understanding of potential building loss in Guam.

Hawaiʻi

- **Tsunami hazard:** Since 1813, Hawaiʻi has experienced a tsunami every two years on average, with a damaging tsunami every five years. Hawaiʻi is mainly threatened by distant earthquake-generated tsunamis from around the Pacific Ocean Basin. Still, there is emerging research on the potential threat of locally generated tsunamis as well.

- **Population risk factors:** Investments in modern warning systems have greatly reduced the risk of fatalities. As a result, population losses for a distant tsunami event in Hawaiʻi have a fatality rate of 0. More research and tsunami inundation modeling may help to understand the potential losses for a local tsunami event. Locally generated tsunamis in 1868 and 1975 led to 47 and two fatalities, respectively.

- **Building risk factors:** Hawaiʻi has the highest amount of potential average annualized building losses in the nation; a single tsunami could destroy over one-third of the state's exposed structures. Almost half of the total losses would come from Honolulu County. Maui and Hawaiʻi counties have the highest building loss ratios in the state at about $980 and $795 per $1 million in building exposure, respectively.

Commonwealth of the Northern Mariana Islands

- **Tsunami hazard:** The Commonwealth of the Northern Mariana Islands receives frequent tsunami waves from events in the region. Historically, most of these have not been destructive. Local and distant tsunamis occur along the coasts of Saipan, Tinian, and Rota. The most destructive threat to the territory includes tsunamis generated by earthquakes in the Mariana Subduction Zone and other distant sources including subduction zones near the Western Aleutians, Cascadia Subduction Zone, the Philippine Trench, Japan Trench, Manus Trench, New Guinea Trench, and the Ryukyu-Nankai Trench.

- **Population risk factors:** Saipan, Tinian and Rota are the most-populated islands in the territory. Saipan has the largest number of potential fatalities due to its higher population. These losses found in the study can be greatly reduced by improving the evacuation departure delay from 10 minutes to 5 minutes. With high ground close to the coast, a 5-minute delay may cause the number of fatalities to drop from 3,807 to three. Having no departure delay may lead to a 0% fatality rate.

- **Building risk factors:** The Commonwealth of the Northern Mariana Islands has a high degree of building exposure to tsunami, at over $3.5 million. The building loss ratios, though, are fairly low. This is because the tsunami scenarios used in the study have longer return periods. More research with a range of return periods may help us better understand potential building losses from both frequent and rare events.

Oregon

- **Tsunami hazard:** Oregon's main tsunami threat relates to earthquakes generated within the Cascadia Subduction Zone, which can produce tsunamis with short wave arrival times. Substantial evidence of paleotsunamis over the past 10,000 years has been found across Oregon, including at least 19 earthquakes of M_W 8.5 or greater. Distant tsunamis originating around the Pacific Rim are also a threat to Oregon.

- **Population risk factors:** Short wave arrival times make it hard for residents to evacuate in a timely manner. This results in some of the highest fatality-related losses in the study. The largest number of potential losses is in the city of Seaside in Clatsop County. The next-largest is in the city of Gold Beach in Curry County.

- **Building risk factors:** Clatsop County has the highest average annualized building loss in the state, followed by Lincoln and Tillamook counties. Behind Clatsop, Curry County has the second-highest building loss ratio; its potential losses are high compared to the value of its exposed buildings.

Puerto Rico

- **Tsunami hazard:** The territory is most affected by local tsunami events due to its proximity to the Puerto Rico Trench and other seismic sources in the Caribbean Sea. A local tsunami in 1918 caused an estimated 116 fatalities. Still, regional and distant events can affect Puerto Rico. The study finds that the greatest potential impacts are on the northern coast of Puerto Rico's main island.

- **Population risk factors:** Puerto Rico has the highest fatality rate when accounting for a 10-minute departure delay across all the states and territories in the study. Given a 10-minute delay, almost half of the exposed population would not reach safety before waves arrive. Shorter evacuation delays in Puerto Rico may greatly reduce losses. The largest potential impact is on the northern coast, where the Municipio de San Juan has the highest exposed population.

- **Building risk factors:** The Municipio de San Juan has the highest amount of average annualized building losses, as well as high exposure, at $9.72 billion in total building exposure to tsunamis. Despite the high building losses, the municipio has the smallest total building loss ratio in Puerto Rico, at $64.69 per $1 million in losses due to its high exposure. The Municipio de Dorado has the highest building loss ratio, with $303.38 per $1 million in losses.

United States Virgin Islands

- **Tsunami hazard:** Like Puerto Rico, the United States Virgin Islands are most affected by local tsunami events due to its proximity to the Puerto Rico Trench and other seismic sources in the Caribbean Sea. The islands are close to local tsunami sources, which create short wave arrival times. An 1867 tsunami event resulted in 24 fatalities; arrival times were as low as 5 – 15 minutes.

- **Population risk factors:** The modeling suggests there may be enough time for residents to evacuate tsunami-hazard zones; higher ground is easy to access prior to the arrival of the first tsunami waves for four of the five tsunami sources. Still, there is over $25 million in average annualized losses from potential fatalities caused by the Anegada Passage scenarios. Due to the high number of visitors to the islands each year, further assessments of this temporary population's exposure may help enhance our overall understanding of risk in the islands.

- **Building risk factors:** Each island in the United States Virgin Islands has fairly high building exposure compared to their potential losses. Most of the potential losses are in St. Thomas County, with $811,358 of average annualized losses and $6.9 billion in exposed buildings.

Washington

- **Tsunami hazard:** Washington's tsunami threats are linked to earthquakes generated by distant events (such as from Alaska), the Cascadia Subduction Zone, and local crustal sources in Puget Sound. The study assesses three scenarios for the state—one with a distant tsunami and two with local tsunamis. The three scenarios include tsunamis originating from the Alaska-Aleutian Subduction Zone, the Cascadia Subduction Zone, and the Seattle Fault. The Alaska-Aleutian Subduction Zone has the shortest return period at 800 years.

- **Population risk factors:** The state's estimated population losses are heavily concentrated in Grays Harbor and Pacific counties. Overall, Washington could suffer the highest number of fatalities out of all states in this study. This is due to relatively short wave arrivals and longer distances to reach safety. All departure delay scenarios have high population losses, even 0 minutes (immediate evacuation).

- **Building risk factors:** Losses are concentrated in Grays Harbor and Pacific counties. These high-risk areas have 57% and 79% of their building stock exposed to tsunami impacts, respectively.

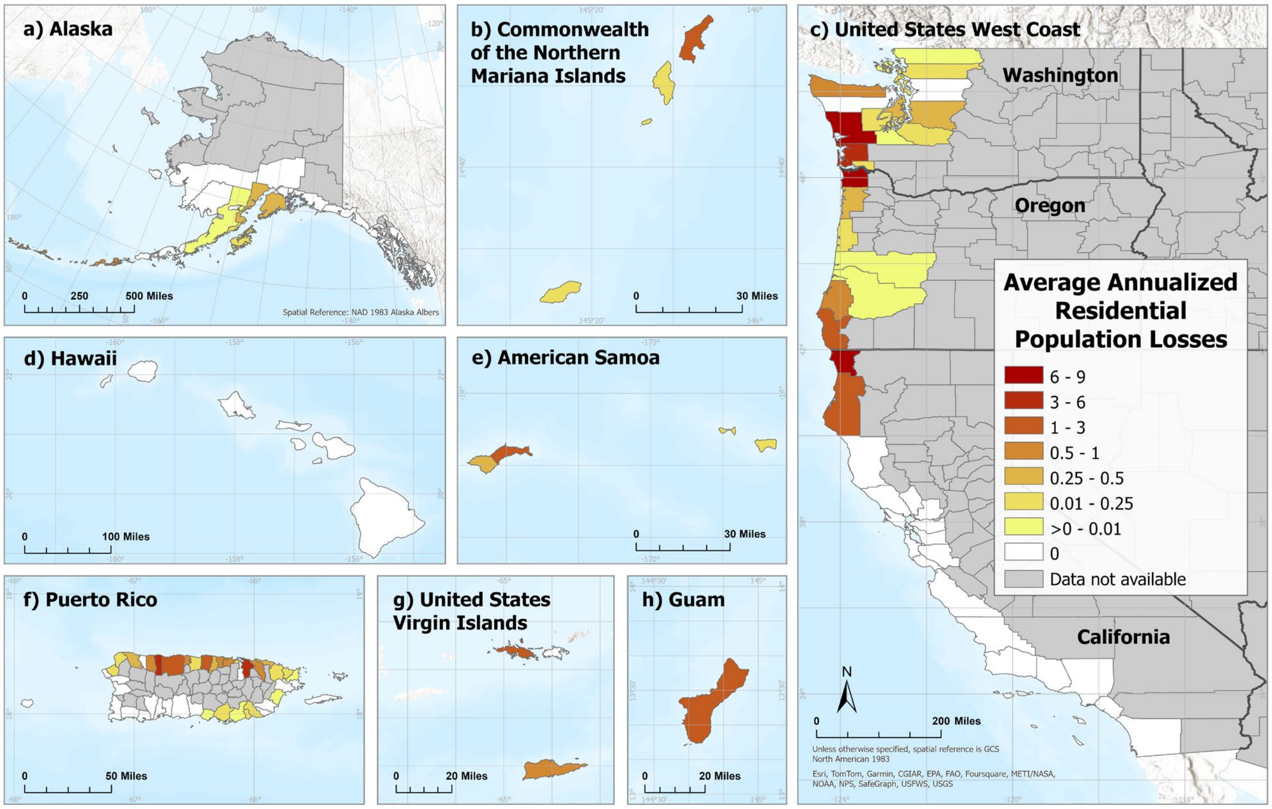

Figure 2. Average annualized residential population losses. ***The figures for counties in California and Hawai'i reflect a lack of data on locally generated tsunamis. They also reflect the expectation that distant tsunamis would not lead to any population loss among residents*.**

Next Steps – Using This Study

The agency's P-2426 Estimated Average Annualized Tsunami Losses for the United States report on this study details key factors of risk, as well as building and population losses for each of the study areas. It may help state, local, tribal and territorial leaders make informed decisions to address tsunami risk, reduce losses, and save lives. All communities are unique; they have their own challenges, capabilities and needs. Your community's approach to tsunami risk reduction may look very different from that of a neighboring community. **Your community's specific risks, resources and preferences inform which strategies it may choose to reduce risk.** Below are examples of how to use the report on this study and other products to reduce risk and build resilience. If you have questions, please reach out to the agency's Natural Hazards Risk Assessment Program by email at FEMA-HAZUS@fema.dhs.gov.

Application	How To Apply Study Findings	Benefits
Engage the public to raise awareness around tsunami risk and evacuation.	Use the Tsunami Loss Viewer or Tsunami Evacuation Study publication to get information on departure delays, wave arrival times, and population losses. This information can help you show the value of being	• You can create generational knowledge of tsunami risk and safety. • Reducing departure delays can save lives. There is a clear link between evacuation timing and fatalities.

Application	How To Apply Study Findings	Benefits
	able to evacuate quickly. Use a wide range of methods to reach out to residents and boost awareness. This could include hosting exhibits at community events, creating informational and wayfinding signage, and sending mailers to those who live in high-risk areas.	
Add new warning systems or improve current ones; make evacuation routes and signage clearly visible.	Consider what counties or county equivalents have the highest potential population losses using the Tsunami Loss Viewer or Tsunami Evacuation Study publication. Assess the warning and evacuation systems that are in place and identify areas of possible improvement.	• Tsunami warning systems are a proven way to save lives. Adding and maintaining these systems can help people evacuate safely. • Clearly marking evacuation routes and paths to safe havens helps people know where to go and evacuate safely.
Update and enforce building codes up to or above code. Look into retrofitting critical structures.	Discuss the findings of the study with local building officials using the Hazus Loss Library, Tsunami Loss Viewer, or Average Annualized Tsunami Loss Data. Assess the benefits of improving building codes in high-risk communities.	• Updating building codes means that new development or redevelopment in the community can be built for resilience. • The International Building Code offers the highest-available standards; it includes recommended tsunami provisions. The International Code Council updates its codes on a regular basis to help improve safety through design.
Look into design-based strategies to reduce the impacts of tsunami waves.	Use the details in the Tsunami Loss Viewer, Hazus Loss Library, or Average Annualized Tsunami Loss Data to identify the counties or county equivalents most at risk to building losses. Determine what key structures and buildings should be prioritized for mitigation. These may include critical assets, such as critical infrastructure, schools or hospitals.	• Design-based tsunami strategies offer a way to reduce risk for critical assets that cannot be moved from the inundation zone. • There are a range of options that communities can use based on what works best for them.
Consider whether targeted buyouts or relocations for residences in inundation zones make sense for your community. Discuss relocating public and critical structures to locations that are safe	Use the findings and visuals in the Tsunami Loss Viewer to teach property owners about their risk. Work with people who are interested in a buyout or relocation. Provide details, support and funding when possible. Assess the risk to critical and public assets that may need to be relocated.	• Buyout and relocation offer homeowners a financially viable way to move out of high-risk locations. • Communities can create greenspace from the bought-out properties. These can also include educational elements that teach the community about tsunami and flood risk.

Application	How To Apply Study Findings	Benefits
from tsunami inundation.		• Relocating public and critical infrastructure means that they can keep functioning before, during and after a tsunami event.
Perform more research in locations that have high risk or are missing key data.	Use the study limitations, data gaps, and missing data from the **Average Annualized Tsunami Loss Data** or **Tsunami Evacuation Study article** as a starting point. Think about what other data and analysis you need to give your community a full picture of risk.	• More in-depth data and analysis lead to greater knowledge of tsunami risk. This is key to save lives and reduce economic losses. Data-informed risk analyses can also help win funds to carry out mitigation projects and reduce risk.

The agency would like to thank its partners at the United States Geological Survey; the National Oceanic and Atmospheric Administration; and the National Tsunami Hazard Mitigation Program for their data, time and expertise while performing this study. For a full list of contributors, please refer to the report: P-2426 Estimated Average Annualized Tsunami Losses for the United States.