National Institute of BUILDING SCIENCES™
*Building American Innovation*

Natural Hazard Mitigation Saves: Case Study

# PORTLAND RESILIENT RUNWAY BENEFIT-COST ANALYSIS: AN OVERVIEW

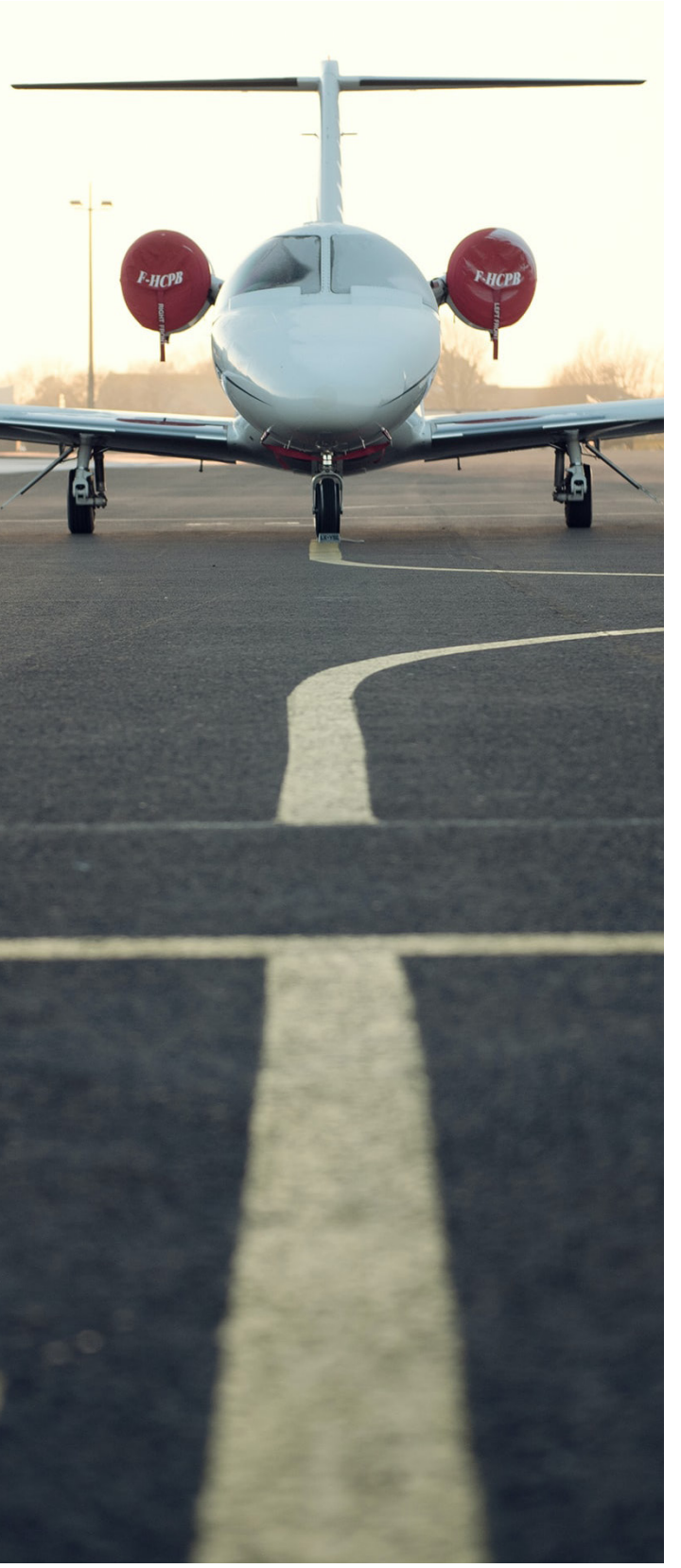
July 2025

Oregon has significant potential of experiencing a greater than magnitude-8.7 earthquake within the next 50 years. An earthquake of this magnitude will cause catastrophic damage and loss of life across much of the Pacific Northwest, but pre-disaster mitigation can prevent much of that loss. When large earthquakes occur in the Pacific Northwest, they can cause liquefaction, landslides, and other hazards. When liquefaction occurs, it greatly damages pavement and can damage Portland International Airport's (PDX) runways so severely that repairs could take almost a year. However, the Port of Portland (Port) can reduce the likelihood of future damage by constructing a resilient runway.

While an earthquake cannot be prevented, it is possible to prepare and build resilience though mitigation. Building resilience lessens the impacts and positions communities to respond, rebuild, and recover quicker and more efficiently. Nationally and locally, mitigation can save billions of dollars.

## BENEFIT-COST RATIO

Strengthening the south runway to mitigate potential earthquake damage will cost an estimated $460 million (all figures in 2030 USD). However, extensive research conducted by the National Institute of Building Sciences (NIBS) Multi-Hazard Mitigation Council (MMC) has determined that making the south runway resilient will save $12 billion in future losses. That equates to $25 saved per $1 spent, a 25:1 benefit-cost ratio. Few mitigation measures provide such a high ratio, and this 25:1 figure does not even take into consideration $280 million in defense value from protecting the mission of the 142nd Fighter Wing of the Oregon Air National Guard.



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# Findings

The Portland Resilient Runway Benefit-Cost Analysis study estimates how a resilient runway saves lives, helps people to return to safe buildings, restores economic activity associated with air travel, reduces future runway damage, and aids in national defense.

### SAVE LIVES

The resilient runway will also add value to the airport by ensuring that emergency medical care can reach the northern Willamette Valley, potentially saving lives. The federal government would value those lives at about **$750 million**, at least for regulatory purposes.

### SPEED RETURN TO HOMES AND WORKPLACES

Of the total benefit-cost analysis of building the seismically resilient runway, **$9.3 billion** comes from ensuring certified building safety evaluators can get to Portland quickly after an earthquake to evaluate the safety of buildings in the affected area. Identifying safe structures will help people return to their homes, reduce displacement, and speed recovery.

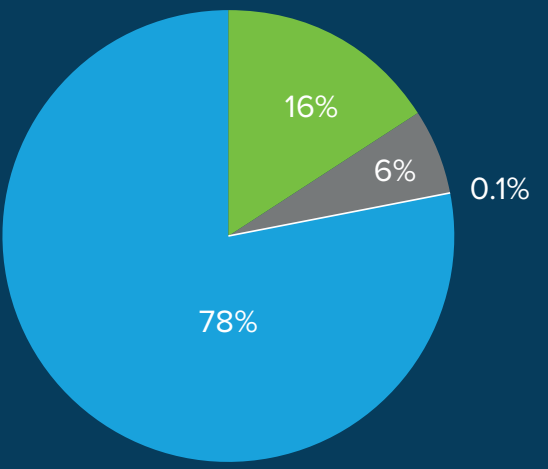
### AVOID BUSINESS INTERRUPTION

Another **$2.0 billion** will be saved by avoiding economic losses from PDX being unable to support large aircraft operations.

### REDUCE REPAIR COST

An additional **$7 million** of value is added by avoiding future runway repairs.

## BENEFIT-COST ANALYSIS BREAKDOWN




- Business Interruption Near PDX ($2,000) — 16%
- Health and Medical ($750) — 6%
- Runway Repair ($76) — 0.1%
- Building Safety Evaluation ($9,300) — 78%

Preventing liquefaction under the south runway at PDX would save $12 billion, counting the four sources shown here (units: 2030 $ million).

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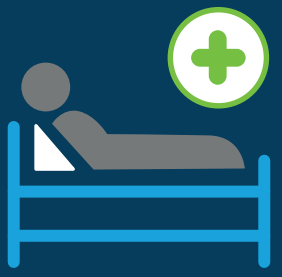
# Benefits of a Resilient Runway

A resilient runway shows the Port of Portland's commitment to the community and to transship essential goods and services to those who need them most under difficult conditions. It communicates the Port's interest in efficiently returning commercial service after a big earthquake, and positions PDX to serve as a federal and state response staging area.

## A RESILIENT RUNWAY SAVES LIVES.

The airport transports care and resources into Willamette Valley, while also removing potential earthquake victims. Under normal, non-pandemic, non-earthquake conditions, 68% of local intensive care units (ICU) and emergency-department (ED) hospital beds are occupied, leaving an excess capacity of about 360 beds. A large earthquake could injure **tens of thousands of people**, including up to 2,400 injuries so severe that the victims will die without ICU or ED care.

A LARGE EARTHQUAKE COULD INJURE **TENS OF THOUSANDS** OF PEOPLE.



A resilient runway could save lives by allowing for emergency medical care to arrive in Portland from outside the Willamette Valley, either to treat injured victims at or near PDX or to facilitate evacuation of severely injured people out of the Willamette Valley. Medical evacuation directly benefits people throughout the study area, especially those who live or work in highly seismically vulnerable buildings. The US government sets acceptable regulatory costs for safety. The value of the avoided deaths could **exceed $5 billion**. Accounting for aftershocks, the probabilities of different outcomes, and the number of people that could die before arriving at a distant hospital, the present value of those avoided future fatalities is about **$1.5 billion**, half of which could reasonably be attributed to PDX's resilient runway.

## A RESILIENT RUNWAY HELPS PEOPLE RETURN TO DAMAGED BUT STRUCTURALLY SAFE HOMES AND WORKPLACES FASTER.

Along with damaging the PDX runways, a large earthquake in the region could damage **around 600,000 buildings**. After a disaster, agencies managing response use the Safety Assessment Program (SAP) to evaluate building safety. SAP uses certified professional volunteers and agency staff to complete building safety evaluations. There are only **approximately 180** certified SAP evaluators in the Willamette Valley and **thousands will be needed** for several weeks to respond to a large earthquake. However, Portland is isolated: volunteers can only arrive via air or by driving over mountainous routes. Those routes could suffer more than 1,000 landslides in wet conditions, and earthquake shaking could damage many of the over 2,000 highway bridges along the route.

A LARGE EARTHQUAKE COULD DAMAGE AROUND **600,000 BUILDINGS.**

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A resilient runway allows the volunteers to arrive by air within days, rather than waiting for road repairs that could take up to three months under the worst conditions. Faster building reoccupancy has health and safety benefits, response and recovery administration benefits, and economic benefits. The cost of delay—of being unable to use **600,000 buildings for up to three months** because safety evaluators cannot arrive—is enormous, **up to $33 billion**, not counting aftershocks. Accounting for probabilities and the time value of money, the value of being able to use those buildings sooner is **$9.3 billion**. Vulnerable populations will benefit greatly from briefer displacement.

THE COST OF DELAYED BUILDINGS SAFETY EVALUATIONS IS ENORMOUS, UP TO **$30 BILLION.**

## A RESILIENT RUNWAY AVOIDS $2.0 BILLION IN BUSINESS INTERRUPTION LOSSES.

THE AIR-TRAVEL ECONOMIC SECTOR COULD SUFFER **$1.8 BILLION** IN LOST ECONOMIC ACTIVITY.

Many businesses in the region either directly or indirectly rely on PDX's air operations. A functioning runway will help reduce interruption to businesses throughout the region. A resilient runway would reduce lost revenue to PDX, its tenants, and users; lost revenue to nearby businesses that rely on PDX; and indirect business interruption to businesses that trade with PDX and its nearby businesses. Some part of the study area's **$330 billion in gross domestic product** depends upon air travel. Runway damage slows that economic activity, and runway repairs could take almost year.

The lack of a functioning major runway in the region would significantly slow economic activity and recovery. Given the estimated runway repair times, the air-travel economic sector could suffer $2.0 billion in lost economic activity after a large earthquake. Increased business stability benefits all economic demographic groups approximately equally.

## A RESILIENT RUNWAY LESSENS THE COST OF RUNWAY REPAIRS.

A resilient runway will suffer less earthquake damage, costing an estimated $7 million less to repair. Lower runway repair costs primarily benefit PDX. Assuming the earthquake results in a presidential disaster declaration (a likely outcome), the repair costs would eventually be transferred to the federal government through FEMA's Public Assistance program. Thus, reduced runway repair costs benefit all U.S. taxpayers.

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## OTHER BENEFITS:

This study focuses on costs that the project team could confidently estimate. Other costs were omitted because they are highly uncertain or too open to debate, such as an estimated $280 million saved by avoiding interrupting the mission of the 142nd Fighter Wing stationed at the Oregon Air National Guard at PDX. Other problematic recovery costs include some public health benefits of a timely recovery and the ability to physically reconnect with family. The project team identifies but does not quantify those costs and benefits. While this study includes an economic impact analysis (mainly focused on business interruption) and quantifies income loss by income level, this study does not estimate racial and social equity impacts. The Port is working with Portland State University (PSU) on an equity-impact analysis that will address racial and social vulnerability and equity and that will complement this study.

THE ECONOMIC IMPACT OF THE OREGON AIR NATIONAL GUARD IS AROUND **$210 MILLION** PER YEAR, OR **$580,000** PER DAY.

## About the Study

This case study builds on where we started. In 2005, the National Institute of Building Sciences Multi-Hazard Mitigation Council released the initial Natural Hazard Mitigation Saves study, which demonstrated that for every public dollar spent on mitigation, society saves $4. The subsequent studies in 2017, 2018, and 2019 expanded the scope and evaluated broader mitigation measures from adopting up-to-date building codes and exceeding codes to addressing the retrofit of existing buildings and utility and transportation infrastructure. We found that mitigation saves up to $13 per $1 invested (national average) across perils, including riverine flood, hurricane surge, wind, earthquake, and wildland-urban interface fire. Download the report and find more about NIBS Natural Hazard Mitigation Saves at **www.nibs.org/PDXreport**.

Multi-Hazard Mitigation Council (2025). PDX Resilient Runway Benefit-Cost Analysis: An Overview. Principal Investigator Porter, K.; Co-Principal Investigators Rose, A., and Santos, J.; Investigator Wei, D.; Yuan, J., Executive Director, MMC. National Institute of Building Sciences. Washington, DC, www.nibs.org.

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