Seismic Preparedness in Western Oregon

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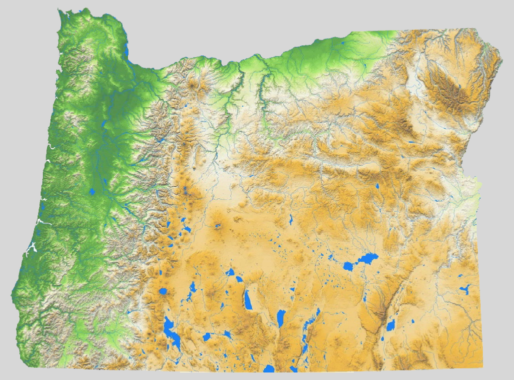

Abstract

Earthquakes are a powerful force of nature capable of causing millions of dollars worth of damage, displacing populations, and carrying the risk of endangerment to human life. They are deceptive in that the damage caused by ancillary co-seismic processes (e.g. liquefaction, tsunami, falls, slides) can sometimes outweigh the damage caused by the ground shaking itself, which is why preparation is a key aspect of mitigation planning. Co-seismic processes are responsible for shaking foundations of poorly- supported buildings, weakening and toppling un-reinforced masonry structures, the destruction of public road systems vital to post-event aid, and are even capable of damage thousands of miles away.

The destruction caused by earthquakes and related processes can never be truly avoided, but it is within our scope of ability to reduce the amount of damage and risk associated with them. By evaluating structures based on their construction, regional geologic analysis, and promoting a partnership between planners and the public to establish safe havens, the costs of earth-quake-related damage can be minimized. This paper focuses on current efforts to increase seismic awareness and preparedness in western Oregon.

Introduction

The Pacific Northwest has garnered some attention in the past few years due to an article written by the New Yorker regarding the anticipated M9.0 earthquake that will occur within the next 100 years. In the event that this should happen-- or any earthquake --seismic preparedness is the key to minimizing the risks, hazards and losses they pose on our lives, homes, and the cities we visit.

Seismic preparedness involves designing and employing a set of rules, guidelines, and plans meant to reduce the damage caused by seismic risks and hazards via building/structure surveys, creating regulatory zones, securing nonstructural components, public outreach, maintenance of vital road systems to provide support and medical attention, and loss estimations.

All parts of Oregon are prone to seismic activity due to its location east of the Cascadia subduction zone, which is why it is imperative to plan for the future and to take the threat of earthquakes very seriously.

**** Additional materials are available and offered by OSHA (Occupational Safety and Health Administration), PEPPER [Pre-Earthquake Planning for Post-Earthquake Rebuilding), DOGAMI (Oregon Department of Geology and Mineral Industries) and CREW (Cascadia Region Earthquake Group) are available to the public.*

Hazards/Risks

Fig 1: Tsunamis are a co-seismic hazard capable of causing damage thousands of miles away from the vicinity of an earthquake.

Communication is the key to avoid loss from a tsunami. Know of high-elevation areas, listen for tsunami sirens, and keep a radio with you at all times (Image Credit: Newsweek).

Fig 2: Subsidence, the process opposite of uplift, is responsible for millions of dollars in damage as a result of poor material foundation.

To prevent damage from subsidence, look into enhancing water drainage infrastructure. Look into using a foundation with less water retention. (i.e., soils) (Image Credit: LiveScience).

Fig 3: Unreinforced masonry is a high risk, high-hazard structure. Square/rectangular structures tend to resist ground shaking motion, but the sealant between the bricks cannot.

Increasing crosswise bracing, bracing establish parapets, structurally 'tying' masonry to the floors and ceilings are ways reduce the hazard/risk associated (Image Credit: OSSPAC).

Seismic Preparedness

Redevelopment (Fig 2) is a common pre- and post-hazard/risk reduction technique that assesses structural properties before an earthquake occurs. Structures in poor condition are integrated into redevelopment projects before and after an earthquake occurs.

Regulatory zones are assigned to expanses of property in order to assess risk and reduce them by implementing construction and habitation standards. Steps taken include but aren't limited to:

- Site investigations
- Population density reducing measures
- Regulations requiring special seismic-design and construction standards

A way to reduce the hazard/risk inside of a structure is to ensure that all non-structural components are tied, secured, and bolted down. A lot of personal damage occurs inside of a building during an earthquake when objects fall from walls or topple over. These measures can be taken to reduce the danger:

- Attach heavy equipment to the walls or floors such as filing cabinets
- Secure artwork to the wall
- Arrangement of free-standing partitions for offices

The free flow of safety materials on the subject boosts an interpersonal understanding and interest in keeping the community safe from seismic hazards.

Unreinforced masonry structures (Fig 3) represent a sizable danger to people in their vicinity. In order to increase the safety of those in and outside of them (as well as neighboring structures):

- Unreinforced masonry can be deemed to dangerous to exist and be torn down .
- Unbraced parapets can be secured and/or further reinforced to strengthen the structure.

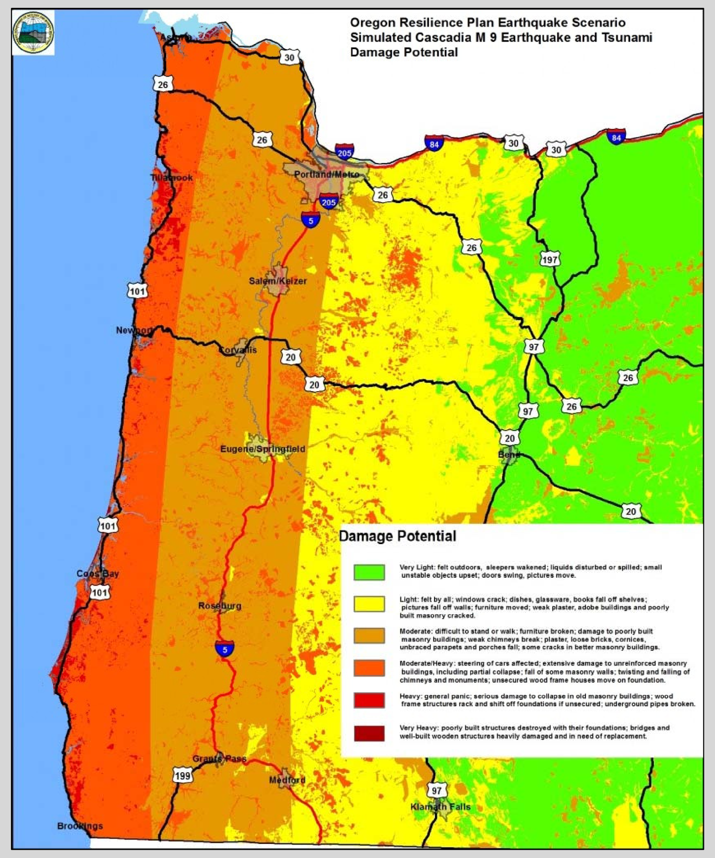

Fig 4: Oregon's earthquake hazard increases from east-to-west due to the west's proximity to the coast, susceptibility to mass wasting processes, and tsunami risk.

It is prudent to exercise all preparedness measures wherever you may be in Oregon, but the further west one goes, the more serious one should be when considering seismic preparedness (CREW, 2005).

Kochelman (1996) encourages other steps that can be taken to increase the response to an earthquake, such as prioritizing the securement of vital roads to hospitals, schools, shelters, and a route to the community for outside support access. The public infrastructure

Discussion

Earthquakes and the co-seismic hazards they are responsible for creating are capable of shutting down entire regions in Oregon, California and Washington due to the states' proximity to the Cascadia subduction zone.

A scientific approach to seismic preparedness is recommended to reduce the damage, death and disorganization in the aftermath of an earthquake (Kochelman, 1996). Where an earthquake occurs, the area's susceptibility to co-seismic hazards, their size, triggering mechanics, and response are relevant to the efforts that go towards mitigating their associated hazard and risk. A suggested means of examining this categorical process is to research the effects of earthquakes that were not prepared for the seismic hazards or risks associated with them, for approaching the problem from a scientific perspective and making the materials publicly available is a fantastic way of raising awareness (Fig 4.).

A holistic approach towards seismic preparedness (e.g., assessment of hazards and risks, redevelopment, multi-stage planning for the condition of the effected region in terms of damage control, availability of food and shelter, and medical care) requires a cross-disciplinary understanding that involves political awareness, layman participation, and critical thinking in earth sciences.

Conclusion

The science of earthquake-hazard research is still being pursued in an effort to glean and compose a powerful tool in the aftermath of a seismic event.

Geologists have known of Oregon's high-seismic activity and risk since the late 19th century, and it is the duty of a cooperative that includes politicians, scientists and the everyday citizen to propagate and raise awareness of the dangers that lay at rest until an earthquake occurs.

Through planning, preparation and execution, the goal of minimizing the hazard and risk associated with seismic activity can be achieved.

References

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