Planning for Resilient Communities in the Pacific Northwest

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Planning for Resilient Communities in the Pacific Northwest

Created by: Christopher Johnson, Environmental Studies

Introduction

When most Americans think of earthquake country what often comes to mind is California, the San Andreas Fault, and destruction and chaos worthy of Hollywood. In fact, many would not even consider Washington and Oregon to be earthquake country at all. The biggest threat to this region posed by the Cascadia Subduction Zone only became widely known in the 1990s, and was completely thought to be “benign” by much of the scientific community due to the lack of recent large earthquakes. Another recent study run by the Seismic Hazards Investigation in Puget Sound (SHIPs) in the late 1990s discovered numerous unimportant faults that could potentially cause the tape to roll directly towards the rapidly expanding Seattle Metropolitan Area. It is because of this lack of knowledge that the Northwest region is in such a vulnerable position. Not only have seismic hazards studies looking into the Cascadia Subduction Zone never really begun to see the full picture of seismic activity, but, due to the infrequent recurrence of large earthquakes, many in the Northwest have never even experienced an earthquake. This has allowed for the development of a massive urban corridor stretching from Eugene, Oregon north to the Canadian border with a population upwards of 10 million. This metropolis has attracted dozens of Fortune 500 companies, multiple military bases, a very dense shipping and transportation infrastructure, millions of tourists annually, and generates the third largest regional GDP in the United States. This area will continue to attract growth, to the tune of an additional 1.3 million residents by the year 2030. For the longevity and resilience of the region, governments and planning authorities must start integrating hazards into the planning process, and this begins with identifying areas of vulnerability.

Discussion

The results of the demographic analysis reveal that an estimated 2,013,724 residents in Washington State and 1,013,606 more residents in Oregon by the year 2030. Average densities varied considerably from a high of approximately 2,200 people per km² in King County, WA to 150 people per km² in Sherman County, OR. After creating a baseline average density for each county, I determined that we can expect to require 1,740.13 km² of additional developed land in Washington, and 932.49 km² in Oregon. These numbers are all determined under the assumption that growth continues at the projected rates, and that new residents continue to settle in existing urban clusters at the same levels of density. If we now factor in additional development within Washington, an additional 4,350 km² of land would allow for millions of new residents to be accommodated, and lead to a greater surplus of available land. Using a dataset detailing Land Use Land Cover (LULC) in Washington State, I was able to do a much more detailed analysis of exactly how much land we have available, and where development should concentrate in order to avoid areas determined to be unsuitable. This analysis revealed that we have 88,644.43 km² of available land in Washington State, which is quite a surplus. While there are many other factors that go into the suitability of land for development, such as ownership, the presence of wetlands or sensitive habitat, site slope, and location, this provides an excellent baseline for planning efforts to explore these other details further, because of the vast surplus of suitable land in Washington State, it can be assumed that there is a surplus to a similar degree in Oregon, however additional data would be required to conduct the same kind of analysis to be certain.

According to population projections, more than 75 percent of new residents are expected to settle west of the Cascades, which, as shown in the above maps, is the area of this region most at risk. While retrofitting existing infrastructure is certainly expensive, it is also expensive. New development has the potential to benefit from detailed risk analysis and thoughtful urban and emergency planning. This research lays the groundwork for further planning and emergency management efforts to build off of in the creation of a robust and resilient society in the Pacific Northwest.

Methods

The process of this analysis took place in essentially two parts. The first part involved demographic analysis, bylookup of census data from 2010, and the average density of the principal city or metropolitan area of each county in Washington and Oregon. I was able to create a rough estimate of the number of persons per km² of additional developed land we could expect to order to accommodate the population increase for the year 2030. These numbers are detailed in the included tables. The other portion sought to determine what kind of a disproportionate risk to damage from earthquakes, and should therefore be avoided for development. The main indicators for disproportionate risk were the presence of liquefiable soils with the potential to experience MMI VII+ severe level shaking and coastal locations below 35 meters in elevation that fall within a tsunami inundation zone. After identifying these areas, I created maps to highlight the high risk zones and further explain the aspects of seismic risk.