



Hazard Resilience Index (HRI)

Earthquakes, Tsunamis, and Volcanoes

Earthquakes
 Tsunamis
 Volcano-Ash Falls, Projectiles and Lateral Blasts, Pyroclastic Flows and Lava Flows

Earthquakes, Tsunamis and Volcanoes

Please refer to the *Hazard Resilience Index Instructions (HRI)* document for more information on using this document.

In order to avoid repetition, resiliency factors which only apply to human-caused hazards are in italics.

Since many of the specific earthquake hazards have similar mitigative strategies, they have also been combined.

Earthquakes – General, ground failure, surface faulting, tectonic deformation – Natural and Human-Caused ^{1 2 3 4 5 6}

Hazard Resilience Rating High Resilience Low Resilience Need More Info Not Applicable

Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based earthquake exercises have taken place in the community-at-large (e.g., table-top or full-scale exercises)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Dam operators carefully monitor water levels in large dams.</i>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Legislation regulates and monitors deep fluid injection (fracking) in oil and gas drilling sites and of disposal of nuclear waste injections into the soil.</i>	<input type="checkbox"/>



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<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Most businesses have secured tall furniture, filing cabinets or book cases that might fall onto individuals to the wall.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Most residences in the community are typical light-frame buildings with vertical shear walls and are anchored to an adequate foundation. Vertical shear walls are “typically wood frame stud walls covered with structural sheathing material like plywood. When the sheathing is properly fastened to the stud wall framing, the shear wall can resist forces directed along the length of the wall” (Tim McCormick, 2005).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Most residents have placed large or heavy objects on lower shelves and store breakable items in low or closed cupboards with latches.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Most residents have secured tall furniture and/or furniture that might fall onto individuals to the wall and established home-based earthquake evacuation and preparedness plans.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Quarry operators carefully monitor large scale excavations.</i>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community actively promotes businesses, residents and school children to take part annually in “Exercise Shake-Out.”	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has a retrofit regulation that requires all buildings that are being significantly retrofitted to be seismically upgraded if they do not meet current earthquake standards.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has access to earthquake hazard and soil zonation maps and shared them with the community.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has an inventory of public structures and buildings that do not meet current seismic codes.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has designated seismically safe buildings with access to resources like potable water and back-up electricity as emergency shelters.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has educated residents and school children regarding earthquake risks in the community through public awareness campaigns.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has regulations in place to prevent building across known fault lines (areas of earthquake vulnerability).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has regulations in place to prevent building on soils subject to loss of soil strength and stiffness (e.g., reclaimed land and old river beds) without having adequate engineering plans in place to address the deficiency.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has seismically upgraded all schools and other public buildings that do not meet current earthquake standards.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a earthquake response plan in place that directs police, fire and ambulance personnel as well as Search and Rescue (SAR) volunteers to those areas most likely to suffer major structural damage post-earthquake.	<input type="checkbox"/>

Tsunamis 7 8 9 10 11 12

Hazard Resilience Rating	High Resilience <input type="checkbox"/>	Low Resilience <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
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Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based tsunami exercises have taken place in the community-at-large (e.g., table-top or full-scale exercises)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Plans are in place to develop and preserve coastal forests which act as protection against tsunamis.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has access to tsunami hazard zonation maps and shared them with the community.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has clearly marked tsunami evacuation routes with visible signage.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has designated tsunami safe buildings as temporary evacuation facilities.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has educated residents and school children regarding tsunamis risks in the community through public awareness campaigns. .	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has regulations in place to prohibit new construction or rebuilding in tsunami hazard areas. .	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has tsunami defenses such as dykes built. .	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify police, fire and ambulance personnel of a potential tsunami.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify residents of a potential tsunami.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify transient, migrant and homeless people of a potential tsunami.	<input type="checkbox"/>

Volcanoes – Ash falls, lava flows, mud flows, projectiles and lateral blasts, and pyroclastic blasts ^{13 14 15 16}

Hazard Resilience Rating	High Resilience <input type="checkbox"/>	Low Resilience <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
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Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based volcano exercises have taken place in the community-at-large (e.g., table-top or full-scale exercises)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has access to volcanic hazard zonation maps and shared them with the community.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has built engineering measure such as dykes, catch basins and dams to control flows and/or divert them away from the community.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has clearly marked volcanic evacuation routes with visible signage.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has designated seismically safe buildings with access to resources like potable water and back-up electricity as emergency shelters.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has educated residents and school children regarding volcanic risks in the community through public awareness campaigns.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has in place or has access to a volcanic monitoring system in place with rain gauges (it's easier to predict debris flow if you have information about rainfall and storm build-up), trip wires (set off by debris flow) and flow sensors (to record the nature of lava flows) to detect volcanic flows.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has performed activities to divert lava flow (i.e. channel deepening, widening, dredging and removal of silt) to help direct volcanic materials to the sea and/or control movement of sediment.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has plans to have people at watchtowers in safe locations during times of high risk.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has regulations in place to prohibit new construction or rebuilding in volcano hazard areas. .	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify police, fire and ambulance personnel of a potential volcano.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify residents of a potential volcano.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify transient, migrant and homeless people of a potential volcano.	<input type="checkbox"/>

References

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- ² Health Canada. (2006, May). Preparing your family for an emergency. Retrieved May 6, 2011, from http://www.hc-sc.gc.ca/hl-vs/alt_formats/pacrb-dgapcr/pdf/iyh-vsv/life-vie/emerg-urg-eng.pdf
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- ⁴ Delica, Zenaida G. (1993). Citizenry-based Disaster Preparedness in the Philippines. *Disasters*, 17:3, 239-247.
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- ⁸ Johnstone, W.M. & Lence, B.J. (2009). Assessing the value of mitigation strategies in reducing rapid-onset, catastrophic floods. *Journal of Flood Risk Management*, 2, 209-221.
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- ¹² Gopalakrishnan, C. & Okada, N. (2007). Designing new institutions for implementing integrated disaster risk management: key elements and future directions. *Disasters*, 31:4, 353-372.
- ¹³ Tayag, Jean C. & Punongbayan, Raymundo S. (1994). Volcanic disaster mitigation in the Philippines: experience from Mt.Pinatubo. *Disasters*, 18:1, 1-15.
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- ¹⁶ Delica, Zenaida G. (1993). Citizenry-based Disaster Preparedness in the Philippines. *Disasters*, 17:3, 239-247.