

# Hazard Resilience Index (HRI)

## *Dam Failure and Structural Collapse*

Dam Failure  
Structural Collapse - Buildings  
Structural Collapse - Transportation

### Dam Failure and Structural Collapse

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

#### Dam Failure

<b>Hazard Resilience Rating</b>	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 dam failure exercises have taken place in schools and 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"/>	Dam operators have an emergency response plan developed in conjunction with downstream communities, outlining what to do in the event of potential or actual dam failure.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dams have spillways (parts of a dam designed to pass water from the upstream side of a dam to the downstream side) in place to catch overflow.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dam reservoir operation restrictions are in place to minimize risks from over-exertion of the system.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dam engineers and safety officials have recently inspected all dams which could affect the community and have retrofitted/or recommended retrofitting any dams that do not meet safety standards (including earthquake resistant upgrades).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Dam operators regularly monitor dams for compliance with safety	<input type="checkbox"/>

## Hazard Resilience Index

				protocols and ensure that the dams are well maintained.	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify community residents of a potential dam failure.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify emergency response personnel of a potential dam failure.	<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, homeless and visiting people of a potential dam failure.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Flood control dams are part of an integrated water management plan for regulating seasonal variations and considerations for rainfall variability have been incorporated to prevent dam failures related to heavy rainfall events or to leverage dam capacity during droughts.	<input type="checkbox"/>

## Structural Collapse – Buildings

<b>Hazard Resilience Rating</b>	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"/>	The appropriate community officials regularly inspect new buildings being constructed and enforce building code requirements throughout.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community officials regularly perform safety checks on existing public buildings.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community officials require unsafe structures to be modified/rebuilt to current standards.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based structural collapse 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"/>	Emergency Response personnel have received light urban search and rescue (LUSAR) and Swift Water Rescue training (where applicable).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has a building retrofit (to equip with safety upgrades) policy in place (e.g., if more than 50% of the building is being retrofitted it has to be brought to code).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has a retrofit policy in place for all unreinforced masonry buildings located in an earthquake hazard area.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has an inventory of buildings not meeting modern building codes and posing a public risk; an action plan for financing and retrofitting/rebuilding these buildings is underway.	<input type="checkbox"/>

## Structural Collapse – Transportation

<b>Hazard Resilience Rating</b>	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 officials regularly inspect new structures being constructed and enforce engineering code requirements.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community officials regularly perform safety checks on existing transportation structures (e.g., bridge, overpasses).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community officials require unsafe structures to be rebuilt to current engineering standards.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based structural collapse 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"/>	Emergency response team personnel have received heavy urban search and rescue (HUSAR) training.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has a long-term mitigation strategy in place to replace aging structures.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has an inventory of structures not meeting modern building codes and posing a public risk; an action plan for financing and retrofitting/rebuilding these structures is underway.	<input type="checkbox"/>

## References

- 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.
- Lave, L. B., & Balvanyos, T. (1998). Risk analysis and management of dam safety. *Risk Analysis, 18(4)*, 455-462.
- Melchers, R. E. (2002). Safety and risk in structural engineering. *Prog. Structural Engineering Mater, 4*, 193-202.