

# Hazard Resilience Index (HRI)

## Contamination

Air Pollution  
Soil Contamination  
Water Contamination

### Contamination

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

### Air Pollution

<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"/>
---------------------------------	--	---	---	---

Yes	No	Need More Info	Not Applicable	FACTORS	This is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Stores and offices are encouraged to reduce non-essential use of air conditioners and equipment during off peak hours to reduce power consumption and reduce radiant heat.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based air pollution awareness/reduction exercises have taken place in the schools and 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"/>	In case of extended poor air quality days, there are plans to allow residents to evacuate to a designated shelter outside of the community.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Most residents check regularly with weather forecasting agencies such as Environment Canada.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Most residents have received education regarding air pollution and know strategies to reduce exposure to polluted air, for example by remaining indoors.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community encourages community members and businesses to	<input type="checkbox"/>

## Hazard Resilience Index

				temporarily stop or reduce their emission of pollutants if there is serious air pollution, such as not driving or reducing vehicle usage.	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community encourages increased green spaces, the planting of shade trees and use of light-coloured building and road surfaces.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has a “no idling” in your vehicle for more than one minute policy.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has identified “at risk” individuals to air pollution (e.g., those with asthma or elderly).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Where present, the community encourages and enforces industries to reduce carbon emissions.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify community residents of potential air pollution and associated poor air quality days, including air pollution from forest fires.	<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 potential air pollution, including from forest fires.	<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 other visiting people of potential air pollution including from forest fires.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Existing shelters have made provisions for increased capacity, hazard specific conditions and evacuation procedures to other emergency shelters located outside of the community.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Regulations exist and are enforced to control air pollution in the community.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has a means through which to consult with Traditional Knowledge holders about air pollution, natural air quality improvement planning and preventative actions.	<input type="checkbox"/>

## Soil Contamination

<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"/>
---------------------------------	--	---	---	---

Yes	No	Need More Info	Not Applicable	FACTORS	This is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has regular inspections of potential polluting facilities and testing of surrounding soils and enforces compliance.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has well-designed landfills and regularly tests for water contamination seeping from the landfill.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If levels of contaminants are discovered in soils above baseline levels or at levels that pose risks to public health and the environment, the community has a means to require repairs or adjustments to the pollution source and/or removal of soil contaminants by the polluter, future developer or government.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has identified and implemented appropriate soil contamination prevention and removal techniques, such as physical barriers that prevent contaminants migrating into groundwater, soil excavation, soil flushing, adding soil amendments, and bioremediation.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community is working with the Department of National Defense to	<input type="checkbox"/>

				ensure that all chemicals, unexploded ordinances and metals are removed from old military training sites.	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community is working with the owners of past and existing firing ranges to ensure that all ammunition and metals are removed from the site by the proper authorities or organizations.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community prevents soil contamination by controlling the placement of potentially polluting facilities and chemical storage areas through zoning and designations.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Regular soil testing takes places to ensure ecosystem health and the preservation of groundwater and plant health, including testing community and private gardens.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community regulates the number and type of pesticides and fungicides that can be used by residents and encourages eco-sustainable methods of controlling pests.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community monitors the number and type of pesticides and fungicides that are used by nearby farmers and encourages eco-sustainable methods of controlling pests.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community zoning and designations effectively identify sensitive and culturally significant areas to preserve and protect species, especially species at risk (e.g., medicinal plants) and the soils in which they grow.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has a means through which to consult with Traditional Knowledge holders about soil pollution, appropriate and effective soil quality improvement efforts and prevention of further contamination.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	For sites contaminated through previous activities (e.g., historic waste sites), the community is working with the owners to monitor and remediate those sites.	<input type="checkbox"/>

## Water Contamination

<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"/>
---------------------------------	--	---	---	---

Yes	No	Need More Info	Not Applicable	FACTORS	This is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has adequate storm sewage and human sewage treatment systems (e.g., septic systems) to minimize water contamination.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has regular inspections and testing of irrigation systems and farmland water sources and enforces compliance.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has regular inspections of potential polluting facilities and testing of groundwater and enforces compliance.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has well designed landfills and regularly tests for water contamination seeping from the landfill.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has regular inspections and testing of residential and business septic systems, water retention ponds and cisterns to identify and prevent possible public health risks.	<input type="checkbox"/>

## Hazard Resilience Index

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If levels of contaminants are discovered in groundwater above baseline levels or at levels that pose risks to public health and the environment, the community has the means to require repairs or adjustments to the pollution source and/or removal of water contaminants by the polluter, future developer or government.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has identified and implemented appropriate techniques to remove groundwater contaminants, such as injecting oxygen into the groundwater to speed degradation of organic pollutants, placing porous treatment walls in front of a contaminated plume, or pumping out and treating the groundwater.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community controls or prevents activities that could cause damage to ecosystems and water quality.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community prevents water contamination by controlling the placement of potentially polluting facilities and chemical storage areas through zoning and designations.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place, using various means of communication including social media, to notify community residents and visitors of potential boil water and “do not drink” advisories, as well as “no swimming” areas (even when temporary) that result from water contamination, stagnation etc.	<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 potential boil water and “do not drink” advisories.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Where boil water advisories have been in place for extended periods, the community provides bottled water according to Public Safety Canada’s recommendations (i.e., 4 litres per person per day) AND the community is working to establish a more permanent and safe water supply.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community zoning and designations effectively identify sensitive and culturally significant areas to preserve and protect species (e.g., fish, caribou) and the water sources on which they depend.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Where surface water is known to be, or suspected to be, contaminated (e.g., high levels of mercury), regular monitoring is undertaken and remediation actions are laid out in regulations.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has a means through which to consult with Traditional Knowledge holders about water pollution, appropriate and effective water quality improvement efforts and prevention of further contamination.	<input type="checkbox"/>

## References

- Akbari, H., Pomerantza, M., & Tahaa, H. (2001). Cool surfaces and shade trees to reduce energy use and improve air quality in urban areas. *Solar Energy*, 70, 295-310.
- Alberta Environment. (2010). *Alberta tier 1 soil and groundwater remediation guidelines*. Retrieved from <http://environment.gov.ab.ca/info/library/7751.pdf>
- Environment Canada. (n.d.). *Technical Assistance Bulletin #24: Remediation technologies for ground water contamination*. Retrieved from [http://publications.gc.ca/collections/collection\\_2014/ec/En163-1-24-eng.pdf](http://publications.gc.ca/collections/collection_2014/ec/En163-1-24-eng.pdf)
- Gordon, J. A. (2001). *Risk assessment and management in local government emergency planning*. Institute for Catastrophic Loss Reduction. Retrieved from [http://www.iclr.org/images/Risk assessment and management in local government emergency planning.pdf](http://www.iclr.org/images/Risk%20assessment%20and%20management%20in%20local%20government%20emergency%20planning.pdf)

Lombi, E., Wenzel, W. W., & Adriano, D. C. (1998). Soil contamination, risk reduction and remediation. *Land Contamination & Reclamation*, 6, 183-19.

Smoyer-Tomic, K. E., Kuhn, R., & Hudson, A. (2003). Heat wave hazards: An overview of heat wave impacts in Canada. *Natural Hazards*, 28, 463–485.