

Public Safety Around Dams in New Zealand

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What is Public Safety?

Dam Safety considers the importance of Public Safety by determining the dam's potential impact classifications and their potential failure modes. Public Safety considers the **everyday** hazards and risks which are exposed to the public through general activities around dam sites.

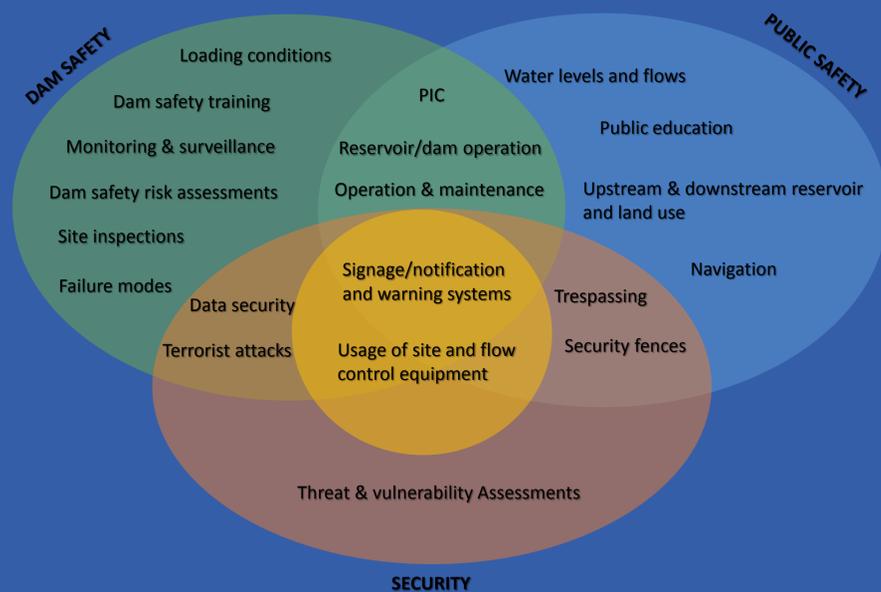


Figure 1: Linkages and differences between Dam Safety and Public Safety¹

Dam Hazard and Risk

There is a difference between the hazards that pose a threat to a dam and the hazards of a dam to society²:

- Hazards posed to a dam include external causes (e.g. natural events) or internal vulnerabilities which can lead to an initiation of failure modes.
- Hazards of a dam posed to society include it being a potential source of harm or having the potential to cause loss.

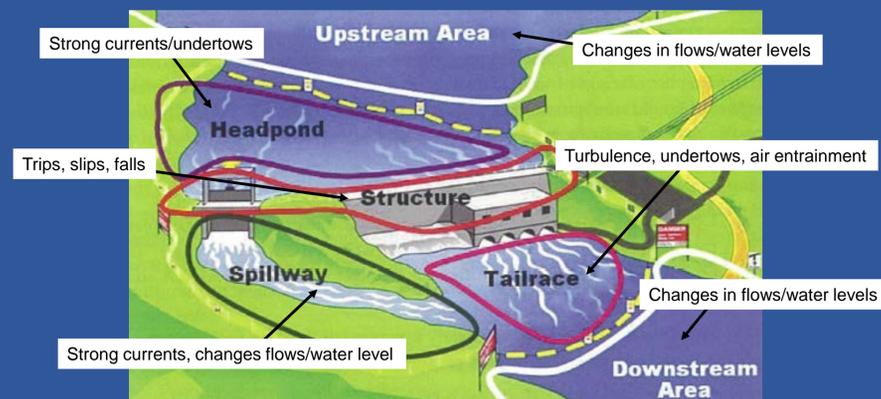


Figure 2: A dam system and its associated potential hazards³

Risk can be determined by understanding²:

- The exposure of hazards
- The likelihood of adverse consequences due to exposure
- Consequences

However, risks can always change due to uncontrollable variables, particularly by¹:

- Public use
- Changes over time

Why is Public Safety Relevant?

Many countries have shown that injuries and fatalities caused by general water activities are often similar to, or exceed, the amount of incidents caused by dam failures⁴. Reported cases worldwide and in New Zealand indicate that majority of the people involved are locals, or those who are familiar with the area.

Area	Incidents in Database	Fatalities in Database
Africa	5	15
Asia	49	180
Australia /NZ	23	17
Canada	343	290
Europe	50	97
Latin America	4	13
United States	530	431
Total	1004	1043

Figure 3: Recorded Public Safety incidents and fatalities (source: Ontario Power, 2019)¹

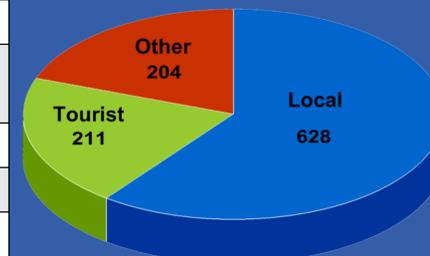


Figure 4: Demographics of reported victims worldwide¹

Mitigation

“The simple existence of a water body attracts the public²”

As the awareness around Public Safety becomes increasingly important, so does the need for control measures to be put in place. The most commonly used hazard controls include:

- Signage and barriers
- Booms and buoys
- Audible and/or visual alarms
- Incremental gate or valve openings and machine discharges
- Public education



Photo 1: Training course



Figure 5: Signage example³

Potential consequences of Public Safety Control Measures on Dam Safety

Some control measures can have adverse effects on dam operation and therefore Dam Safety. E.g. constraining the operation rate of spillway gates to reduce risks to downstream river users reduces the Owner's ability to safely manage a large flood event, and further breaching the Health and Safety in Employment Act².

Who is Really Responsible?

It is important to consider the various other groups who also have responsibilities of the land surrounding a dam. These groups may include, but are not limited to:

- Regional and local councils - manage issues specific to its community
- Farmers - manage private land
- Department of Conservation - manage protected conservation land whilst also encouraging recreation on public conservation lands and waters
- NZ Transport Agency - responsible for environmental and social factors relevant to state highways

Public Land Use Across the Waikato River

The Waikato River, New Zealand's longest river with a length of approximately 425 km, consists of eight hydro dams and is also famous for its Huka Falls and Aratiatia Rapids tourist attractions.

Hazards and Risks:

- Strong currents and turbulence
- Rapid changes in flows and water levels
- Local and tourist attractions
- Recreational outdoor sports and activities hot spots

Groups Involved, but not Limited to:

- Mercury NZ Limited
- Waikato Regional Council and local councils
- Department of Internal Affairs and Lake Taupō Harbourmaster
- Department of Conservation (DOC)
- Private land owners
- NZ Transport Agency



Photo 2: Aratiatia Dam Rapids

Control Measures in Place, but not Limited to:

- Signage
- Fencing/barriers
- Booms and buoys
- Audible alarms prior to gate operations

Public Safety in the Last Five Years

- Waikato and Northland Regions combined made up **42% out of 81** preventable drownings in 2016⁵.
- Four incidents and one fatality reported in 2017, occurring within a dam system – people involved were familiar with the area⁶.
- Mercury NZ Limited and DOC install additional signage and barriers.
- Increased public awareness through local high schools, news and media outlets.



Photo 3: Warning sign and fencing at Taupō Control Gates

Public Safety today

Floating bliss to glide down the Waikato River at Taupō

Figure 6: NZ Herald article published January 2020⁷

Despite the events that have taken place in the last five years, it is evident that water bodies will always attract the public. Locals and tourists continue to find ways to enjoy the waters regardless of the control measures put in place through signage and barriers, and even noticing “river levels going up and down”⁷ while actively in waters.

What next?

Similar to current Dam Safety practices, continued improvements to Public Safety processes can include:

- Routine inspection and maintenance of control measures
- Raising public awareness around general dam hazards/training
- Keeping records of all Dam Safety and Public Safety incidents/fatalities
- Continuing to understand the linkage between Dam Safety and Public Safety

References

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2. NZSOLD (2015) *New Zealand Dam Safety Guidelines*. New Zealand.
3. CDA (2011) *Guidelines for Public Safety Around Dams*. Canada.
4. ICOLD European Club (2012) *Working Group on Public Safety at Dams*. France.
5. Water Safety New Zealand. "Spike in River Deaths the Stand Out in 2016 Drowning Stats". Updated 2017. <https://watersafety.org.nz/spike%20in%20river%20deaths%20the%20stand%20out%20in%202016%20drowning%20stats>
6. Jared Savage. "Swept Away". NZ Herald. Updated 2018. <https://www.nzherald.co.nz/indepth/national/aratiatia-dam-drowning-tragedy/>
7. Rachel Canning. "Floating bliss to glide down the Waikato River at Taupō". NZ Herald. Updated 2020. https://www.nzherald.co.nz/rdp-taupo-turangi/news/article.cfm?c_id=1503734&objectid=12302004