COMMUNICATING LOCAL CLIMATE & HAZARD RISK INFORMATION TO AT-RISK RESIDENTS

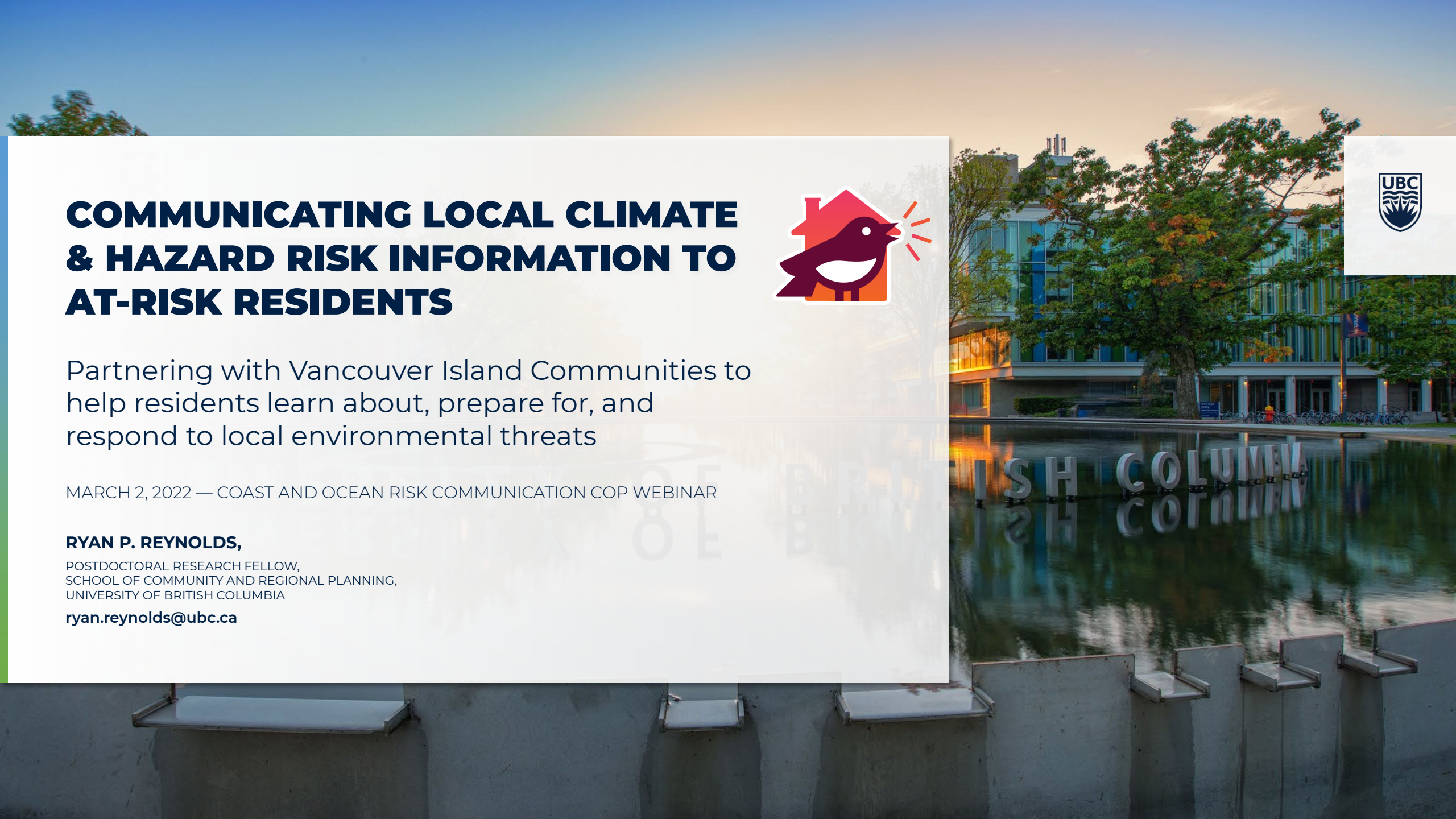
Partnering with Vancouver Island Communities to help residents learn about, prepare for, and respond to local environmental threats

MARCH 2, 2022 — COAST AND OCEAN RISK COMMUNICATION COP WEBINAR

RYAN P. REYNOLDS,

POSTDOCTORAL RESEARCH FELLOW,
SCHOOL OF COMMUNITY AND REGIONAL PLANNING,
UNIVERSITY OF BRITISH COLUMBIA

ryan.reynolds@ubc.ca



Ryan P. Reynolds, MGIS, PhD

Post Doctoral Research Fellow
School of Community and Regional Planning,
University of British Columbia

Ryan's research aims to help Canadian communities and households to better understand, prepare for, and respond to local hazard risk. His work combines elements from geospatial modelling, risk communication, and application development to assess and communicate hazard risk and vulnerability at the community, neighbourhood, and household scales. His research interests focus primarily on tsunamis and related coastal hazards in Canada, with special attention to communities on Vancouver Island.

Ryan is the lead researcher and app developer for the CHERP research initiative.

ryan.reynolds@ubc.ca

We would like to respectfully acknowledge that ***UBC s Vancouver Point Grey campus*** *is situated on the traditional, ancestral, unceded territory of the xʷməθkʷəy̓əm (Musqueam) people.*

Community-University
Engagement Support

Knowledge Mobilization Fund

Study Area

Communicating hazard risk on Vancouver Island

LOCATION OF BRITISH COLUMBIA IN CANADA

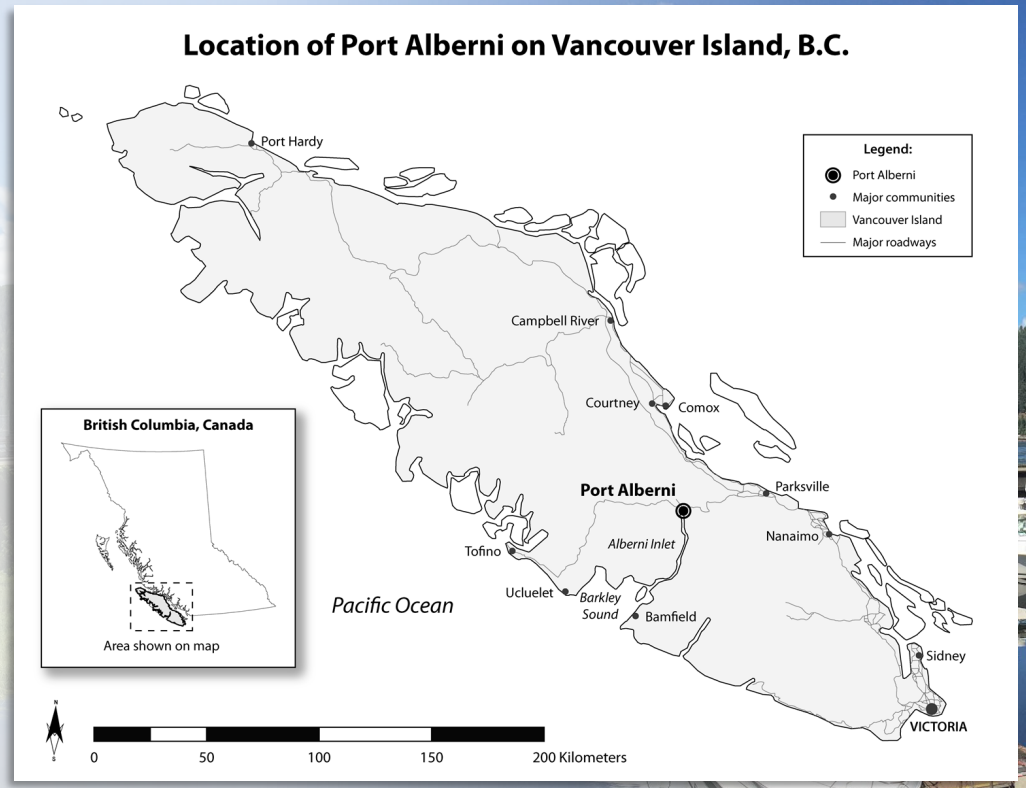
Source: Reynolds, R. P. / CHERP

HAZARD RISK ON VANCOUVER ISLAND

Much of my research has focused on tsunami risk on **Vancouver Island**, particularly in the area around Port Alberni known as the Alberni Valley

In addition to tsunamis, communities in the area are **exposed to several different hazards**, including coastal and overland flooding, wildfires, and weather events, to name just a few

Most recently I've been exploring how residents of these communities perceive and prepare for future hazard events as one aspect of **community resilience-building**

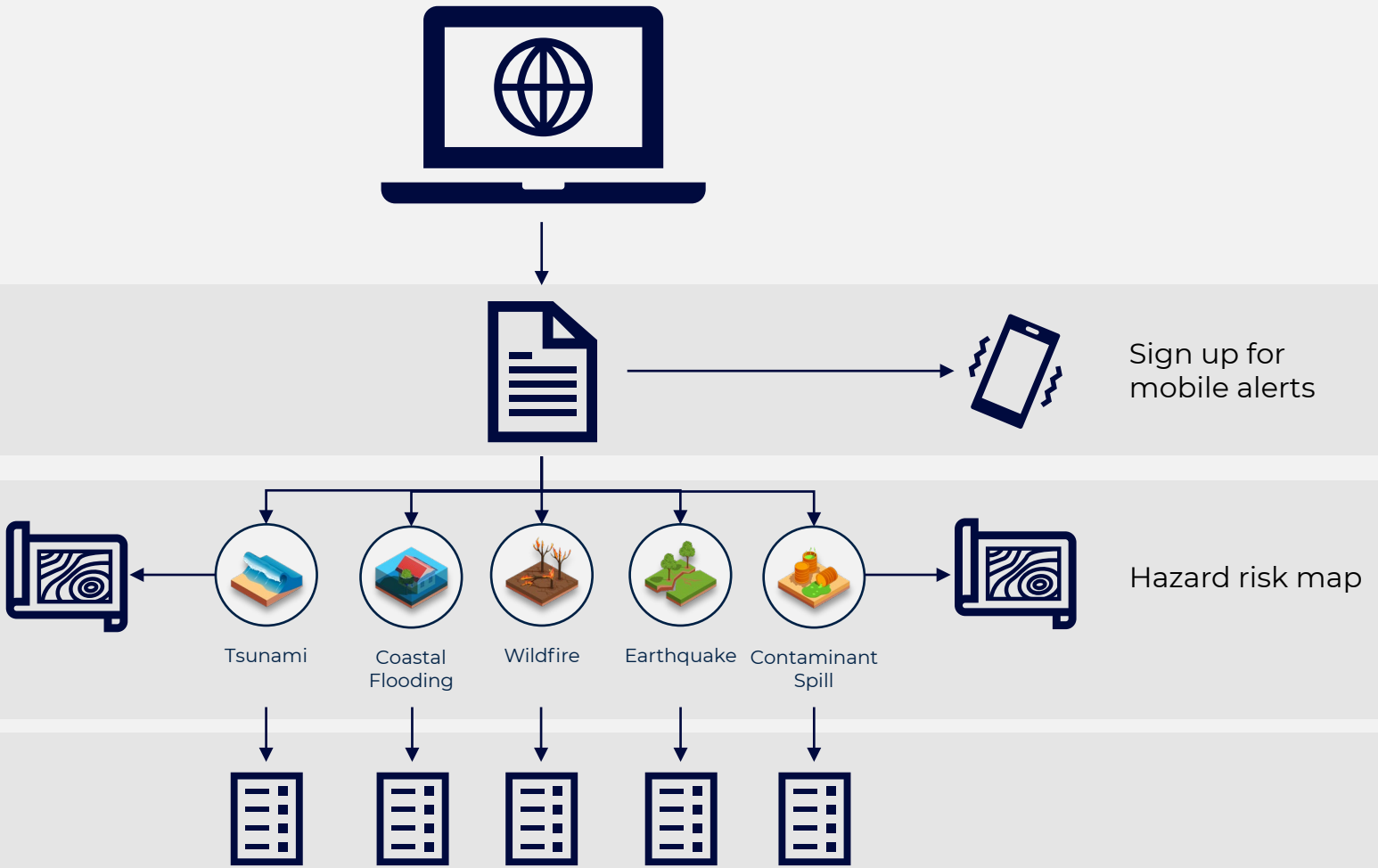


Source: Reynolds, R. (2017)

Communicating Hazard Information

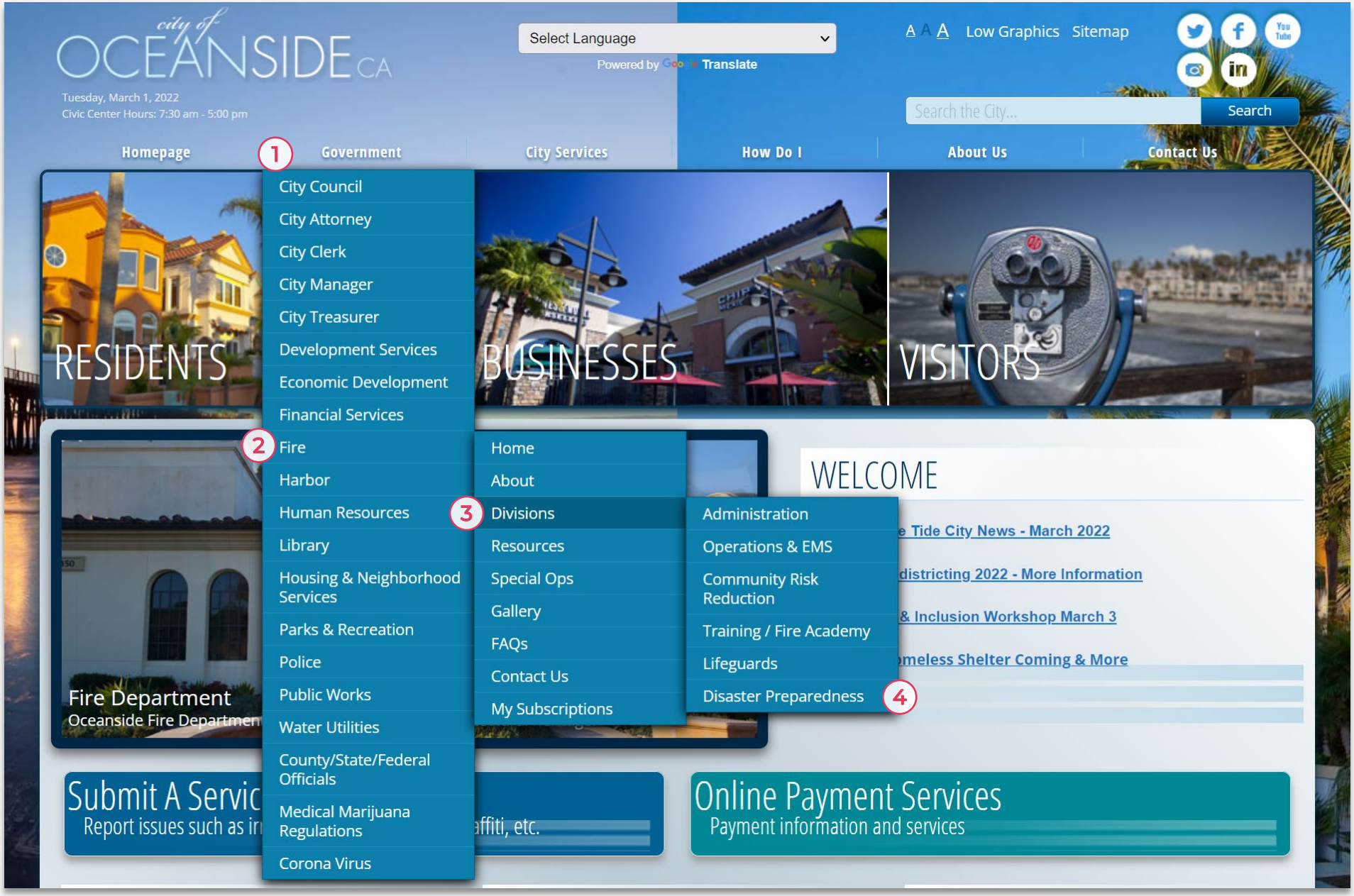
Typical approaches communities use to communicate hazard info to residents

TYPICAL COMMUNITY HAZARD RISK INFORMATION PAGES



WEBSITE WAYFINDING

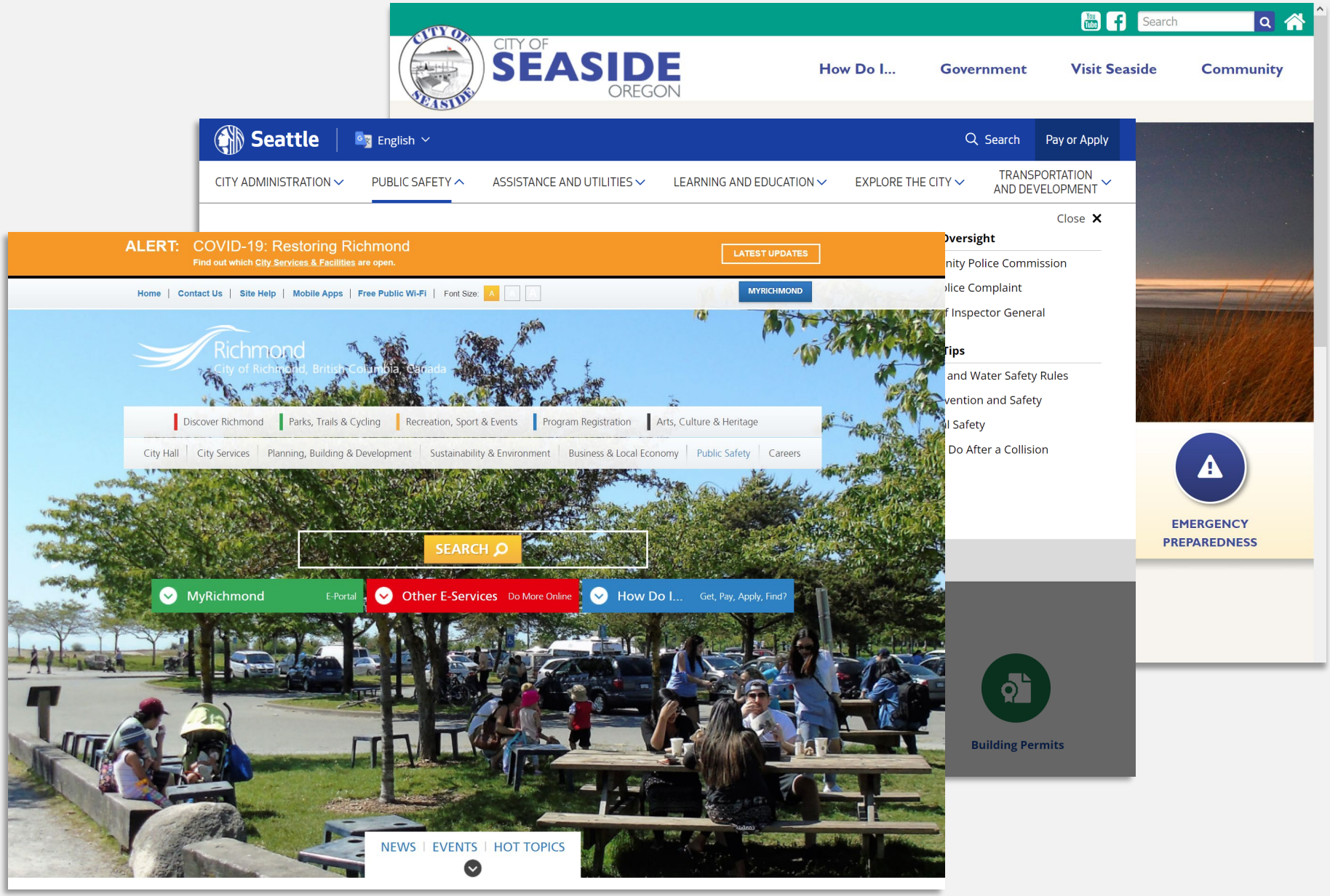
It's not uncommon hazard information critical for residents to understand and prepare for disasters to be buried deep within a community's website structure, such as with the City of Oceanside, California



Source: City of Oceanside, California website (n.d.)

WEBSITE WAYFINDING

A better approach is to ensure there is a link directly on the home page, as with these examples



Sources:
City of Seaside, Oregon website (n.d.),
City of Seattle, Washington website (n.d.),
City of Richmond, BC (n.d)

THE STATE OF RISK MESSAGING TODAY

Public risk messaging tends, by necessity, to be **general and generic**. This makes sense when trying to reach and educate the largest possible audience about specific risks.

This messaging **commonly includes**:

- A general description of the hazard mechanisms,
- Things to look for before a disaster,
- Some actions that can be taken in advance to help reduce potential impacts to homes, and
- A short preparedness checklist

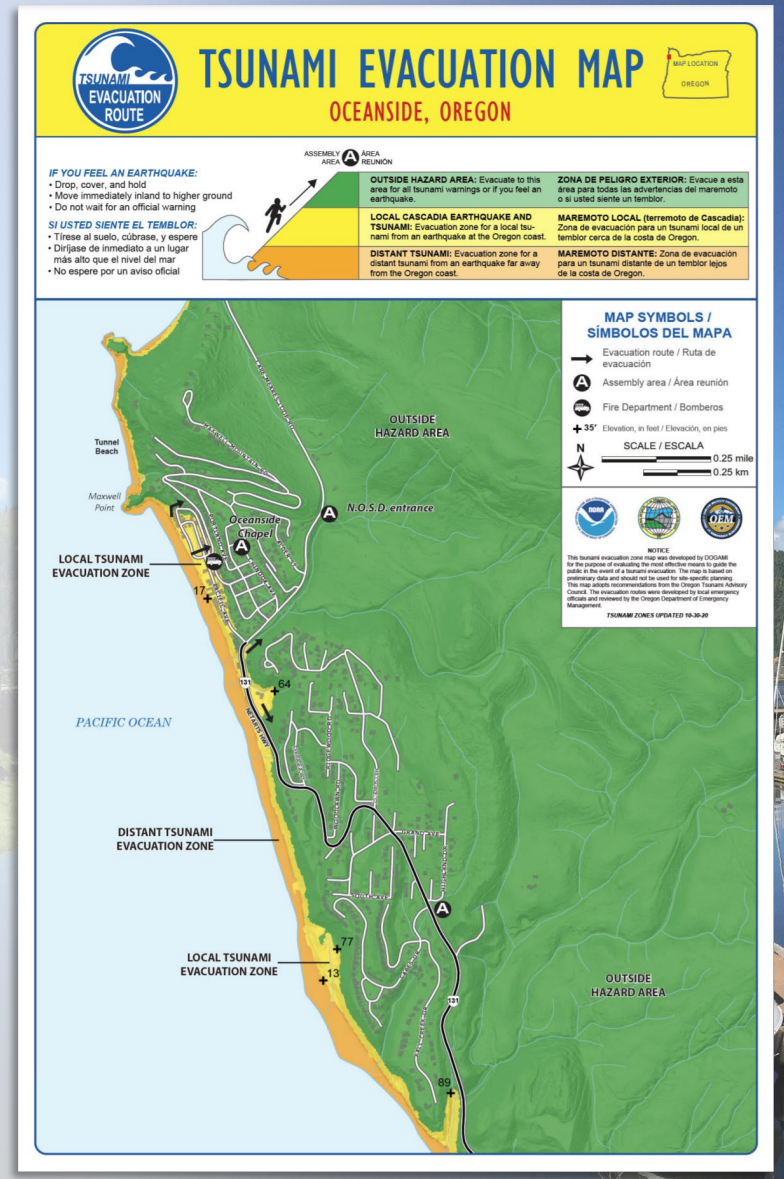
Source: PreparedBC's Landslide Information for Homeowners and Home Buyers Guide (n.d.)

MAPPING RISK ZONES

In some cases, hazard information guides will include a detailed **hazard risk map** that identifies areas of the community most likely to be impacted by a specific hazard.

This messaging commonly includes:

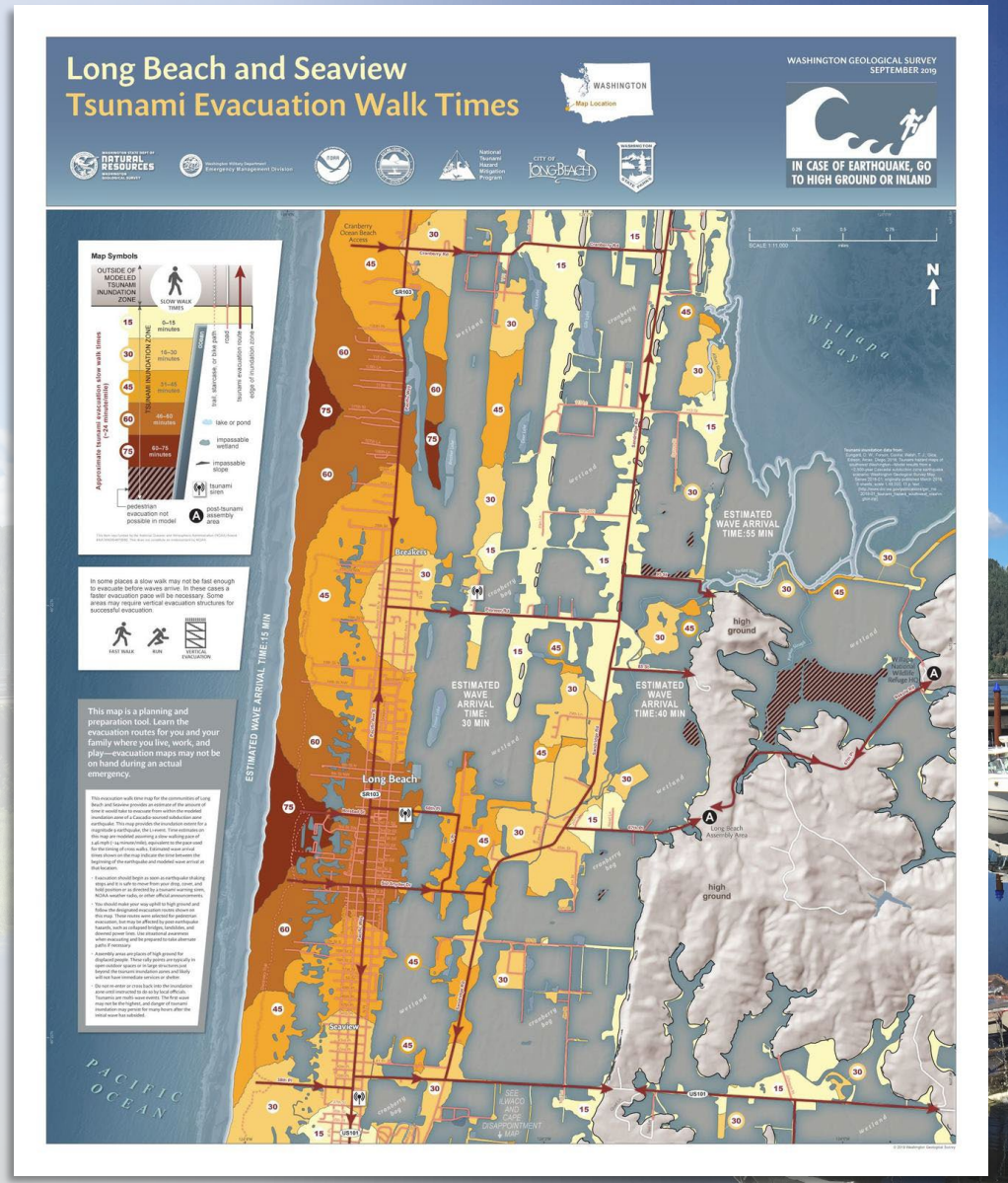
- Identified hazard risk zone(s),
- Major road and pathways,
- Key landmarks,
- Evacuation routes, and
- Safe destination locations



Source: Tsunami Evacuation Map for Oceanside, Oregon (Oregon, 2020)

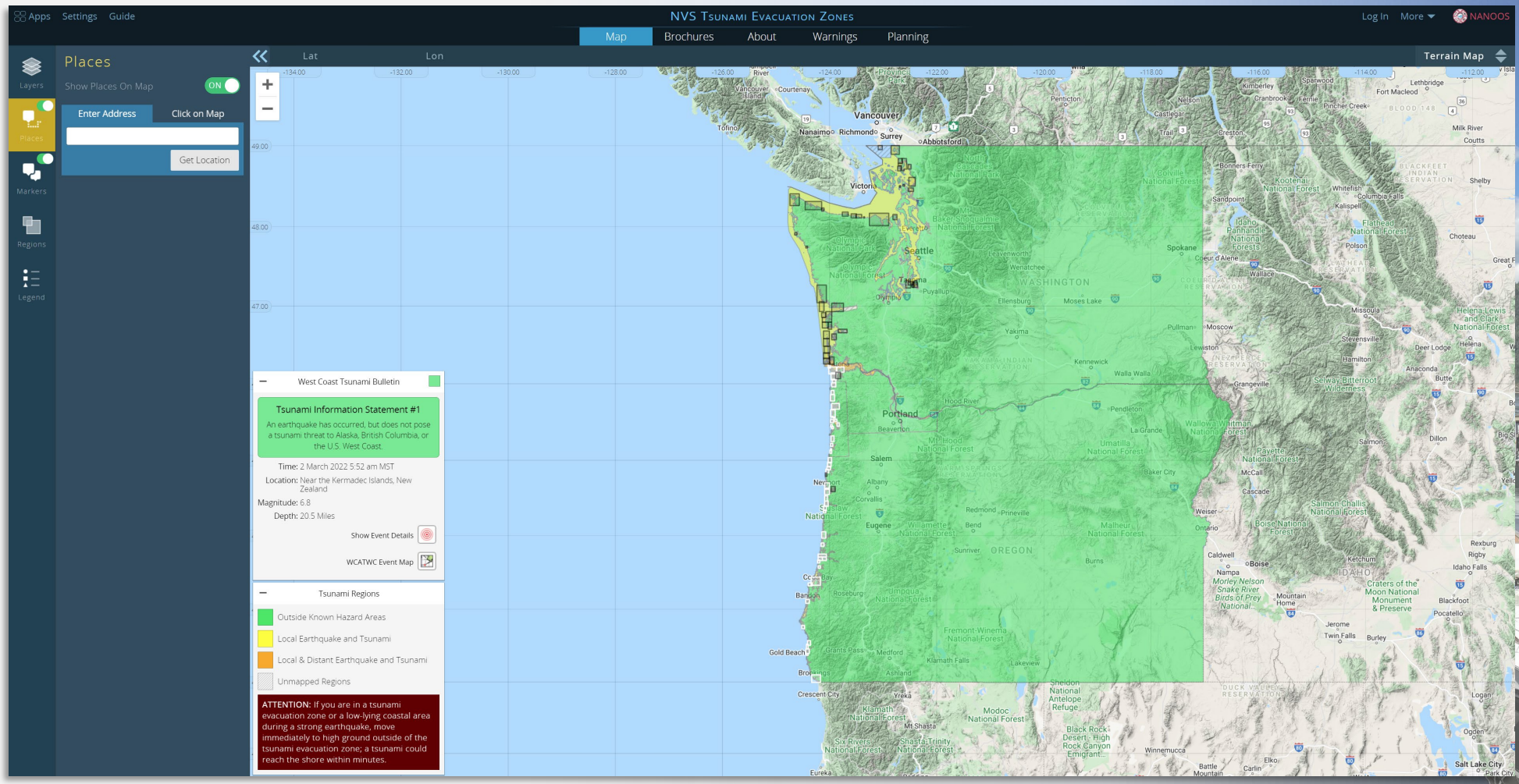
NEXT LEVEL: WALKING EVACUATION MAPS

For cases where rapid evacuation may be required, evacuation maps that include walking times can be used to clearly communicate areas that may have more difficulty evacuating on foot



Source: Long Beach and Seaview Tsunami Evacuation Walk Times (WGS, 2019)

NEXT LEVEL: INTERACTIVE WEBSITE TOOLS



Source: NVS Tsunami Evacuation Zones (Nanoos, n.d)

Household Preparedness

Are we prepared? And if not, why **don't** we prepare for disasters?

TO PREPARE OR NOT TO PREPARE...

Household emergency preparedness is a leading contributor of **overall community hazard resilience**

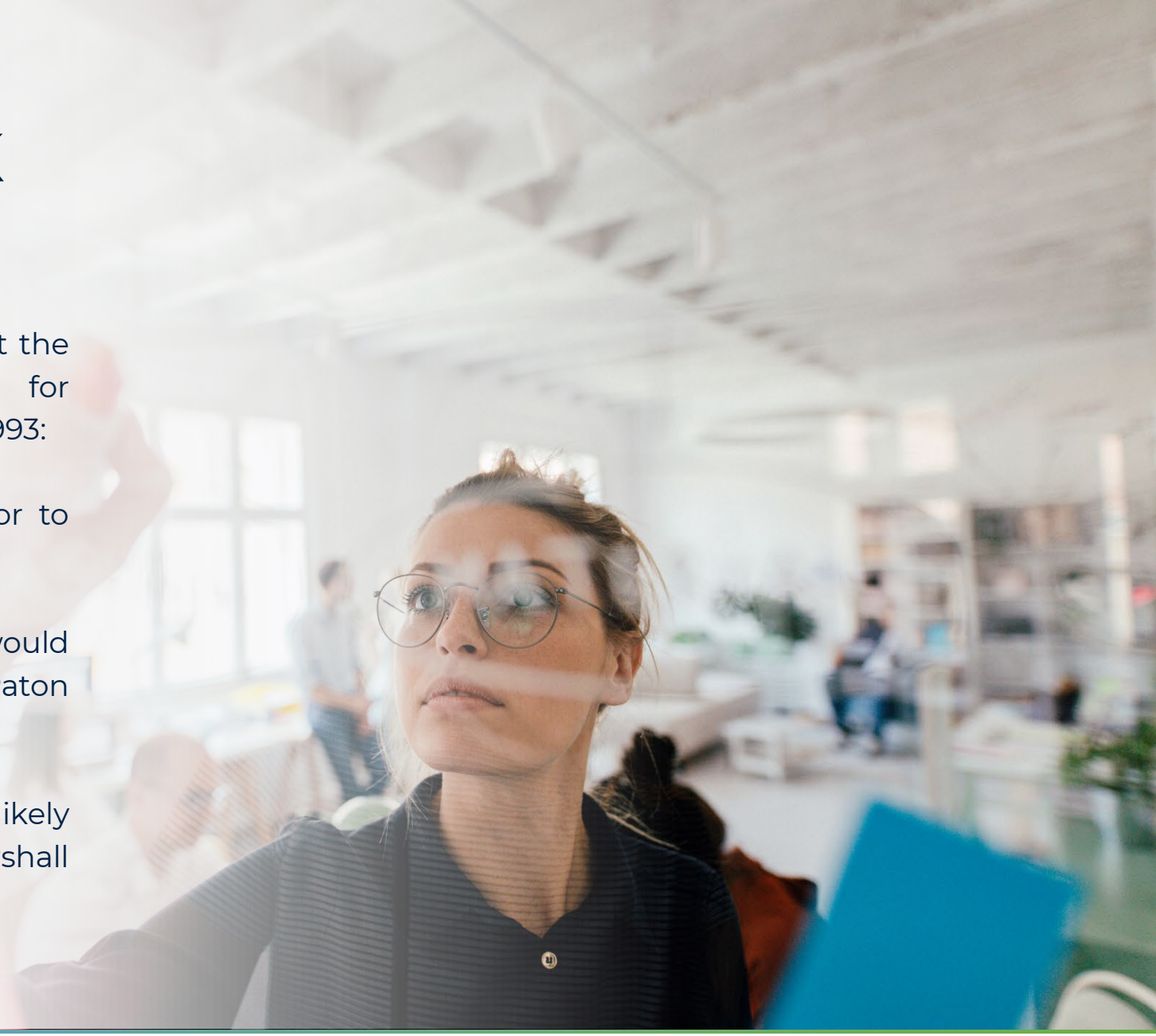
We know from studies of past disaster events globally that prepared households are **better able to respond** and have **faster recovery times** and **better recovery outcomes compared** to similar households that did not prepare

Prepared households can begin putting their plans in place immediately, putting them at the **front of the line**

POST-DISASTER LOOK AT PREPAREDNESS

We conducted a review of the literature to see what the average level of household preparedness was for communities that had experienced a disaster since 1993:

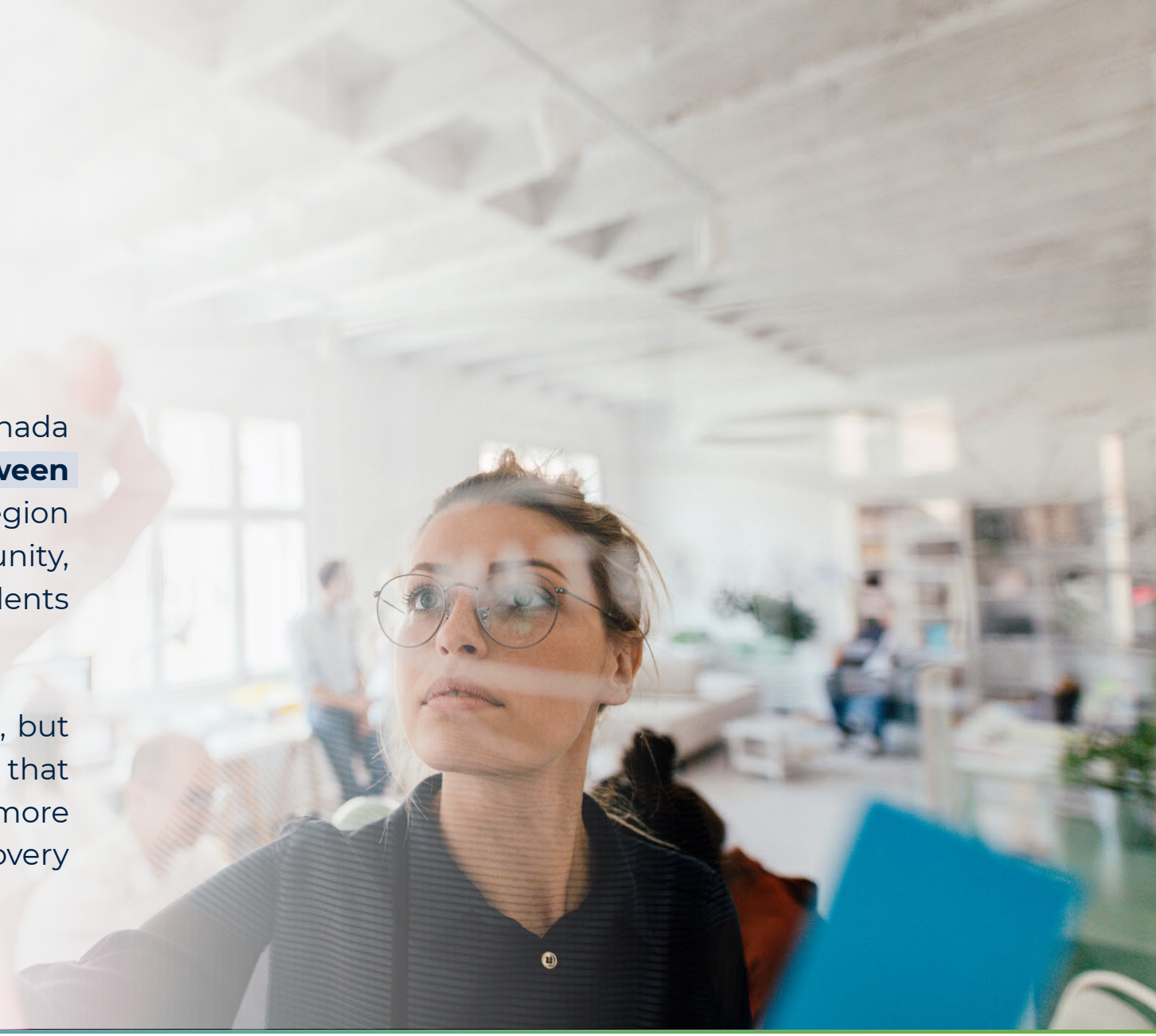
- **17% to 51%** of households were prepared prior to experiencing a disaster (Kohn et al., 2012),
- **27%** of Australian households indicated they "would not develop a household … emergency plan" (Paton & Johnston, 2008)
- **Persons with disabilities** were 1.22 times more likely to report being unprepared for a disaster (Marshall et al., 2007)



LOW HOUSEHOLD PREPAREDNESS IN CANADA

The few studies of household preparedness in Canada estimate actual preparedness levels to range **between 20% and 50%**, depending on the study, the region studied, recency of disaster experience in the community, and how risk information is communicated to residents by officials

This presents problems for all types of communities, but **especially for smaller, more remote communities** that already face challenges not shared by their larger, more urban peers, and often have lower response and recovery capacities



PUT TO THE TEST: JANUARY 2018 WARNING

On **January 23rd, 2018**, a tsunami warning was issued for communities on Vancouver Island following a **M7.9 earthquake in the Gulf of Alaska**, resulting in the 3 am evacuation of residents in the Alberni Valley

My colleague, Alexa Tanner, and I used this as an opportunity to better understand public perceptions of tsunami risk, household preparedness, and evacuation responses in Port Alberni through a **pair of doorstep and online surveys** funded by the Institute for Catastrophic Loss Reduction

Some key take-aways from our reports:

- **10%** of survey respondents were uncertain if their home was located within the official tsunami inundation zone;
- When verified, **8%** were incorrect about whether their home was located within the inundation zone;
- **17%** were unclear where they should evacuate to;
- **16%** were unclear where to find official instructions; and
- Only **40%** indicated their household had an emergency plan in place prior to the evacuation

Source: Reynolds, R., & Tanner, A. (2019): https://ryanreynolds.ca/whats-that-sound

KEY BARRIERS TO HOME PREPAREDNESS

While there are several barriers that may prevent residents from preparing, four are most cited:

- Lack of time
- Lack of resources
  (e.g., money, space, vehicles)
- Lack of knowledge
- Assignment of responsibility

BEHAVIOURAL BIASES

In addition, we have identified a number of behavioural biases that work against taking action to prepare:

- **Optimistic bias:**
  Some people judge themselves less likely to be harmed by future events than others
- **Normalcy bias:**
  Some people tend to underestimate both the likelihood and severity of potential future risks and "assume the best"
- **Status quo bias:**
  Some people tend to assume the future will be much like the past, downplaying a need to prepare for an unlikely future event
- **Small odds = no odds:**
  Some people tend to believe that small odds mean that an event is simply so unlikely they need not consider it
- **Prospect theory:**
  Immediate costs are felt more acutely than potential future costs
- **Anchoring on Past Events:**
  Some people who have experienced past disasters believe that future events will play out much as those they've experienced did

ENCOURAGING PREPAREDNESS

Given these barriers and biases, what can we do to encourage community residents to undertake preparedness actions?

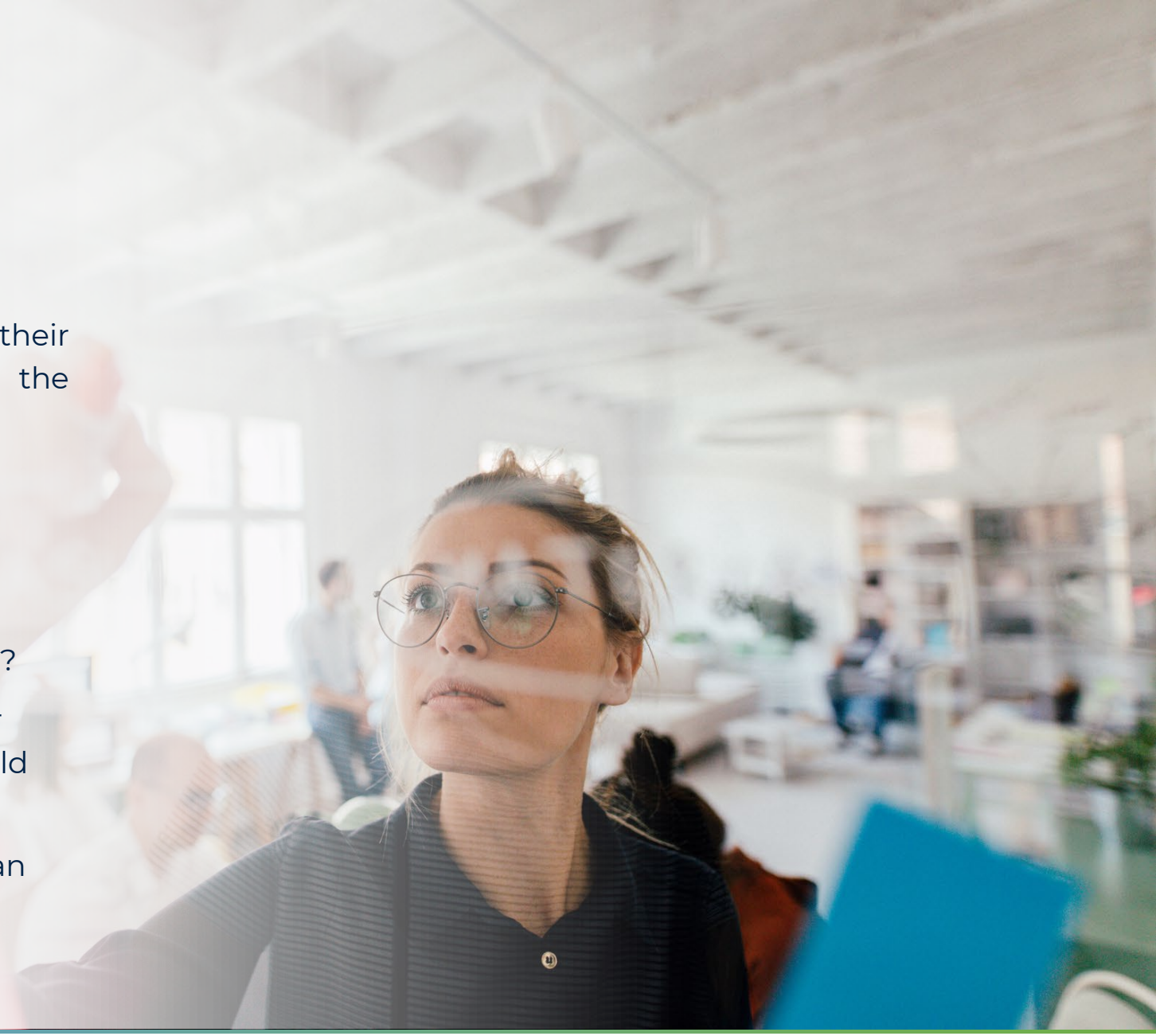
- Clearly communicate the risks residents are most likely to experience and provide easy access to more information
- Reinforce your messaging across multiple platforms
  (e.g., “Did you know” sections on tax assessments, host community events and workshops)
- Build confidence using small actions with materials they are likely to already have at home
- Make hazards preparedness a family affair
  (e.g., Encourage local schools to make emergency planning part of “Back to school” at the beginning of each year)

REVIEW AND REVISE YOUR MATERIALS

Residents are looking for quick and easy answers to their questions, not long technical articles about the mechanisms behind local hazards

Make sure you have the following right up front:

- Who is most likely to be affected?
- What actions should they take to prepare?
- What actions should they take in an emergency?
- Where should they go if they need to leave their homes? How should they get there? What should they bring?
- Where can they look for current information in an emergency?



NEXT LEVEL COMMUNICATIONS: MAKE IT PERSONAL

Provide a way for residents to enter their address and find out:

- What hazard zone(s) they may live in
- Primary and backup official evacuation routes
- Primary and back safe destination points, shelters, or emergency service centres

CHERP

The Canadian Hazards Emergency Response & Preparedness Initiative

ONE SIMPLE QUESTION

CHERP seeks to address one simple question:

"What would happen if we helped to make it quicker and easier for community residents to prepare for and respond to local hazard threats?"

PHASE I PARTNER COMMUNITIES

For Phase I of the project, our team partnered with **seven communities on Vancouver Island** to learn about some of the barriers and planning issues faced by different types of communities.

Together, we identified a **basic template of information** residents need to better understand, prepare for, and respond to future hazard-related events.

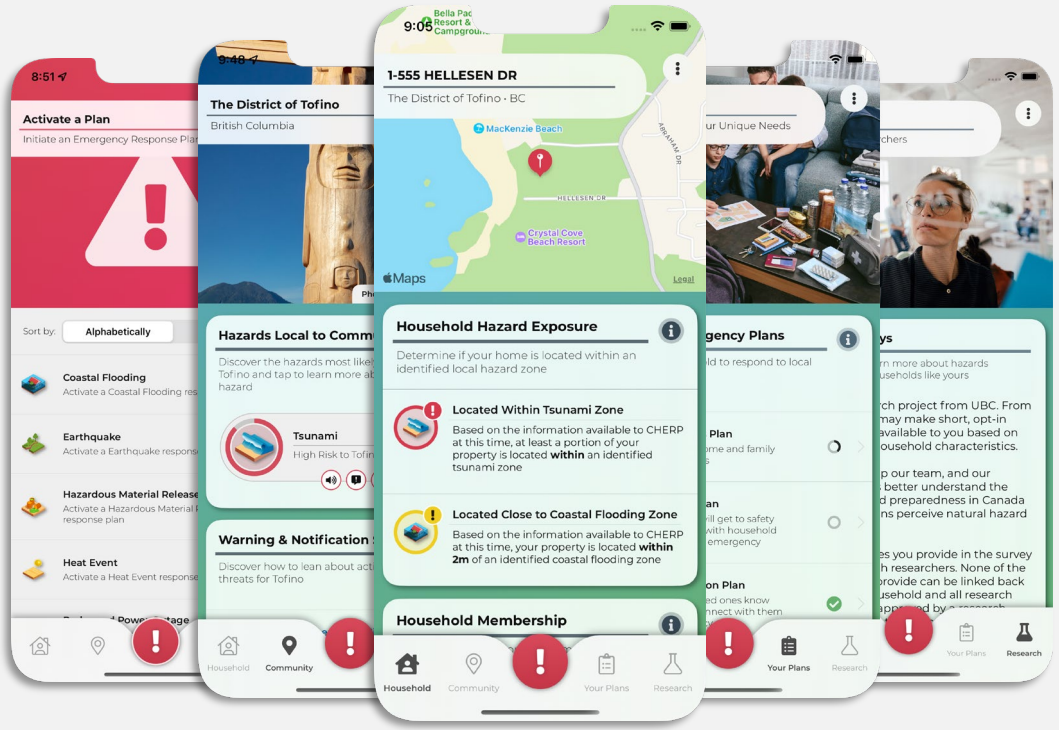
We explored how best to share this information with their residents and what actions residents could take to **become more hazards resilient**.

THE CHERP MOBILE APP

This work resulted in the development of a **mobile app** for iPhone and iPad devices.

The app **helps educate residents about local hazard risks** based on information from official planning documents, hazard risk and vulnerability assessments, recent hazard studies, and national risk datasets.

CHERP uses information provided by residents and our partner communities to determine which **preparedness and response actions best fit their household's unique needs**. This results in a set of dynamic emergency plans that adapt as the family ages and changes.



COMMUNITY PROFILES

CHERP contains a community profile for **each of our partner communities** with content specific to that community

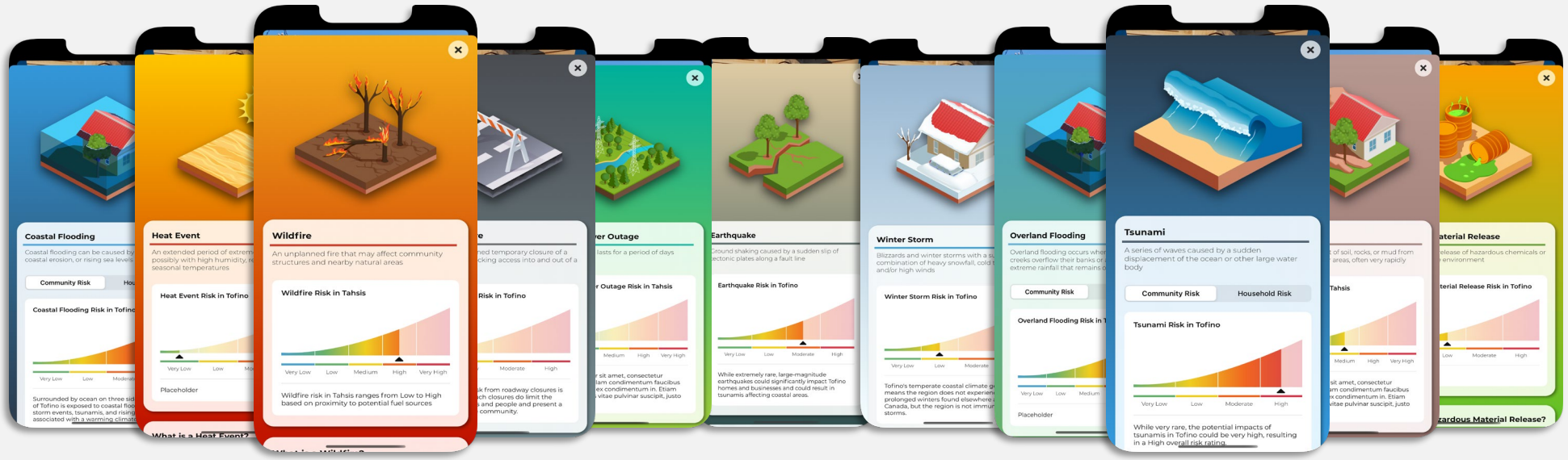
Each profile begins with a **list of hazards** local to the community with relative risk ratings derived from official planning documents; tapping on one opens a profile for that hazard

Where implemented, information about **warning and notification systems** is presented along with links to register for alerts

Finally, we include links to **official community websites, social media accounts**, and other information critical to residents in an emergency — no more needing to hunt down the information

COMMUNITY HAZARD RISK

Our team has developed profiles for **11 hazards** common to communities on Vancouver Island



Coastal Flooding | Heat Event | Wildfire | Roadway Closure | Power Outage | Earthquake | Winter Storm | Overland Flooding | Tsunami | Landslide | Hazards Material Release

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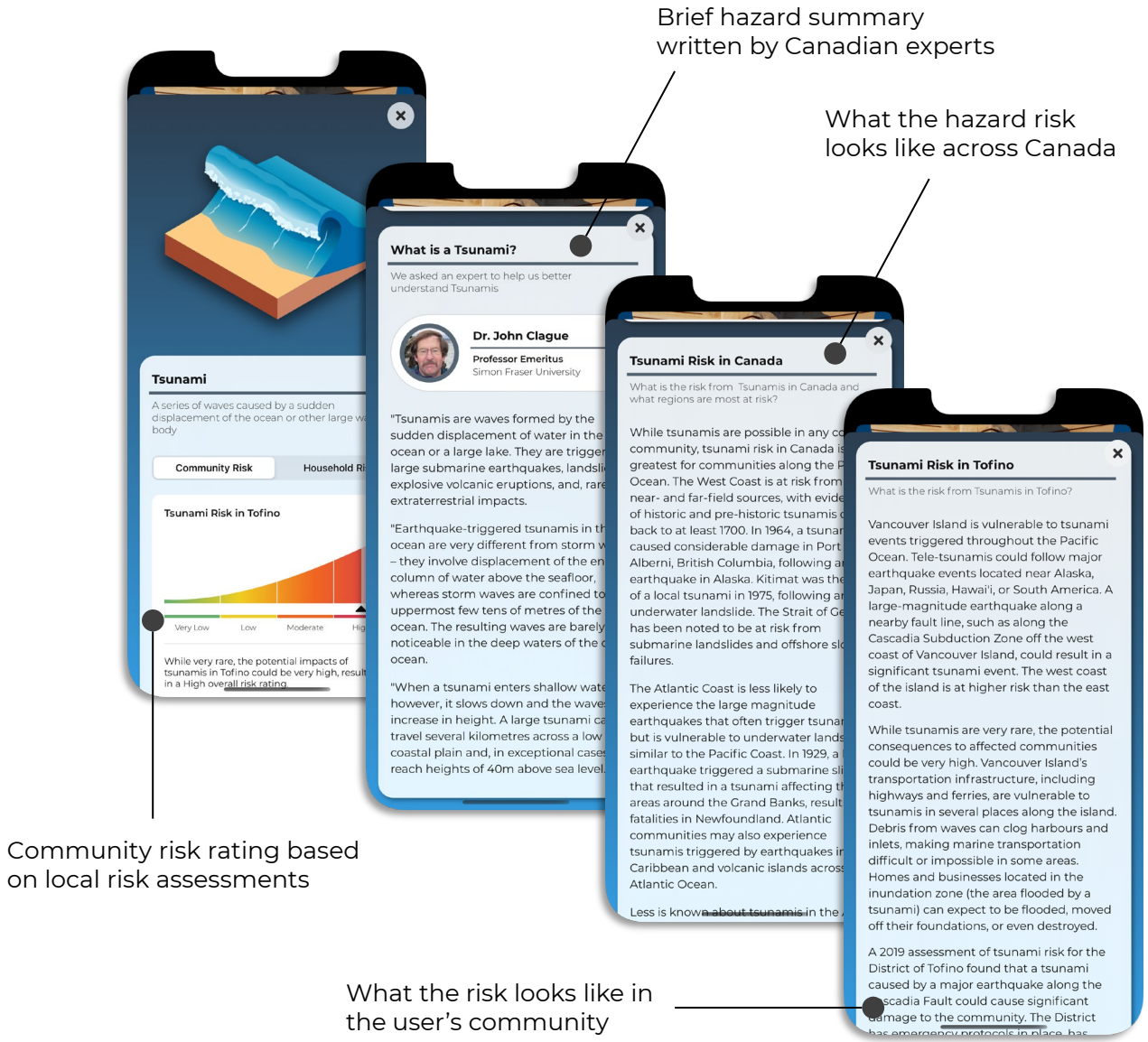

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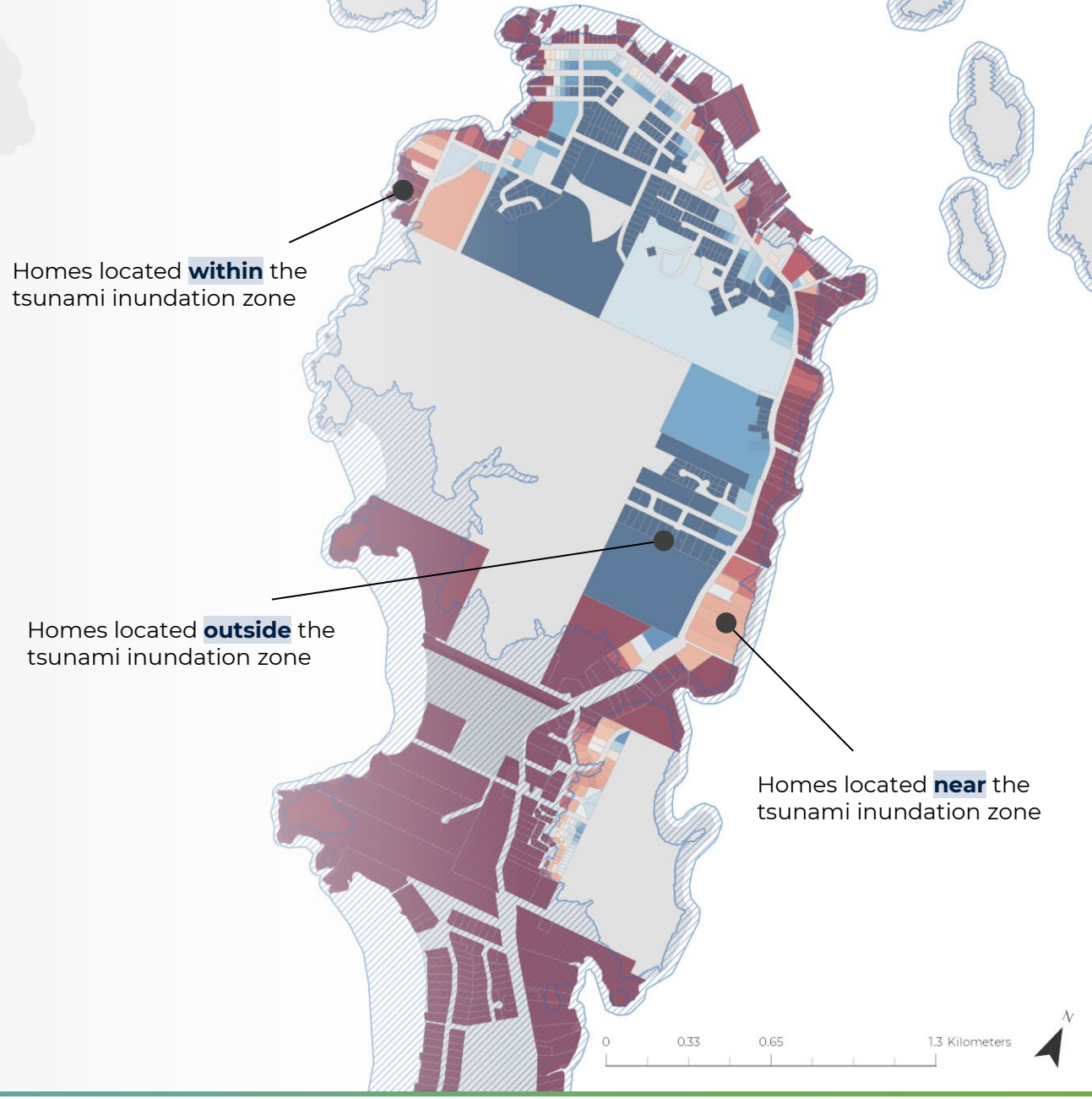
Our sources and links to additional information are also provided, allowing interested users to learn more about specific hazards

HOUSEHOLD HAZARD RISK

Where detailed risk assessments and geospatial hazard information exists, our GIS models establish household-level risk ratings for **each residential property** in a given community based on their proximity to identified hazard zones.

For example,* in the District of Tofino, CHERP allows users to quickly check if their home is located within a tsunami inundation or coastal flood zone based on recent studies completed for the District. Users will receive different preparedness and response guidance based on whether their home is located within, near, or well outside of these hazard zones.

* Tsunami risk ratings shown for business and residential properties in Tofino, along with the official tsunami inundation zone (shown in dashed lines)



EMERGENCY RESPONSE PLANNING DATASET

To ensure residents receive relevant preparedness and response planning information from authoritative sources, our team has developed a **dataset of hundreds of possible actions** along with items for emergency kits and Grab ‘n Go bags.

- Actions sourced from Canada, the U.S., and abroad, including Public Safety Canada, Prepared BC, and the Canadian Red Cross;
- Action descriptions have been simplified and worded to follow risk communication best practices;
- Each action and item is coded to appear only when it is relevant to a household’s unique profile; and
- General actions are supplemented with community-specific information, including local evacuation plans, safe destinations, and local emergency information sources

HOUSEHOLD PROFILES

To determine **which actions are appropriate** for a given household, CHERP collects information about users' homes, vehicles, family members, and pets.

This profile includes information on:

- Age
- Physical & mental disabilities
- Medical & mental health conditions
- Assistive aids
- Non-fluent speakers
- LGBTQ+ status
- Recent immigrants
- Pets
- Car-less households
- Basements, crawlspaces, elevators, etc.

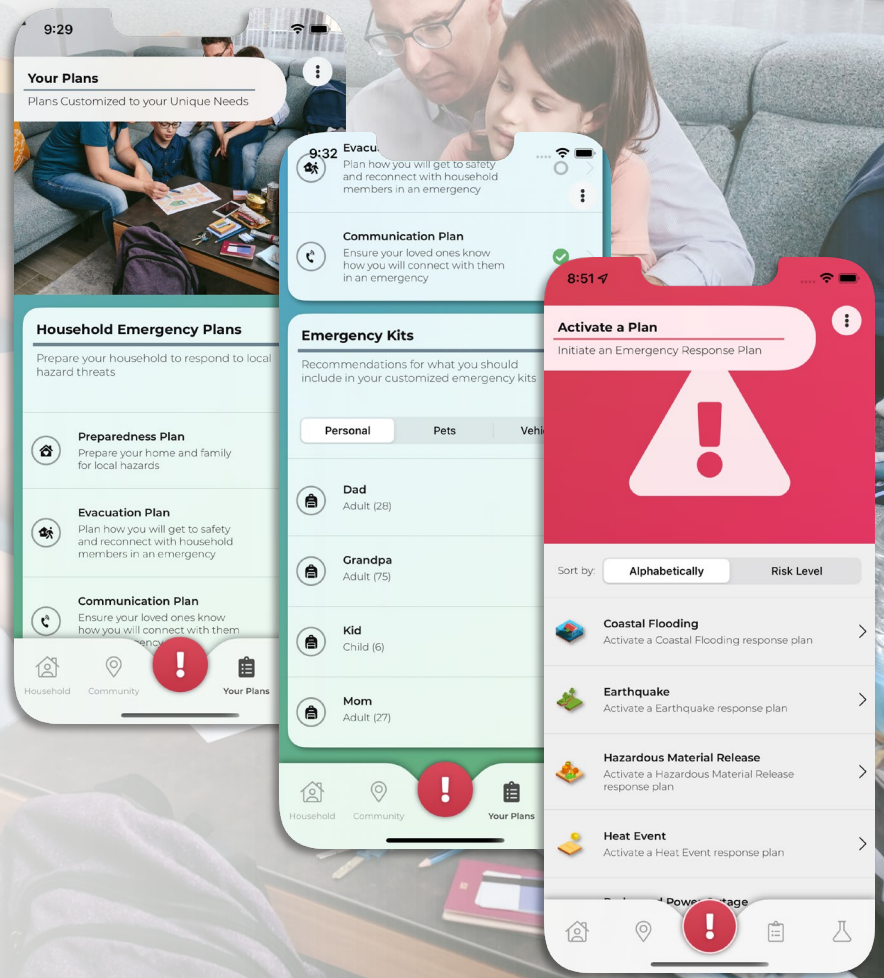
BRINGING IT ALL TOGETHER

EMERGENCY PLANS

CHERP provides users with a set of **emergency preparedness checklists** that they can complete in advance of an emergency and track their progress

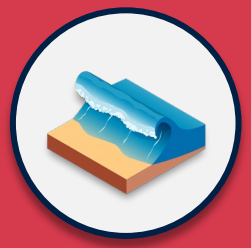
They also receive customized **emergency kit lists** for each household member, pet, and vehicle based on the information that was provided by the users

Should the need ever arise, they can **activate one of these plans** by taping on the red exclamation button at the bottom of the screen....



EMERGENCY PLANS

Emergency plans can be enacted in just a couple of taps and each item can be checked off as they are completed



Tsunami

- Immediate
- 20 minutes
- 1 hour
- 3 hours
- 6 hours or more

Coastal Flooding

- Immediate
- 20 minutes
- 1 hour
- 1 day

Wildfire

- Immediate
- 20 minutes
- 1 hour
- 1 day

Earthquake

- Immediate

Contaminant Spill

- Immediate

USER PRIVACY

CHERP collects some **sensitive information** from our users, so the protection of our users' personal information is paramount. All information is stored on user devices and their encrypted iCloud storage.

Our team only receives a **monthly "ping"** that contains broad categorical data in an anonymous and aggregated form. This is enough to help us understand our users' needs and to help our partner communities with their planning while making it impossible to tie responses to individuals or households.

We also include information **next to each item** we ask for about why we collect it, how it is used, and with whom it will be shared (and how it will be shared)

CLEARING THE FOG OF UNCERTAINTY

If you recall the study from Port Alberni following the 2018 tsunami warning, **10% of households were uncertain and 8% incorrect** about whether their home was located within the official tsunami inundation zone

CHERP seeks to address this by clearly labeling household **hazard exposure** for each hazard where that information is known in advance

We use clear, color-coded iconography to reinforce the message that a home is outside, near, or within these identified zones

Within Hazard Zone:
Located in identified risk zone

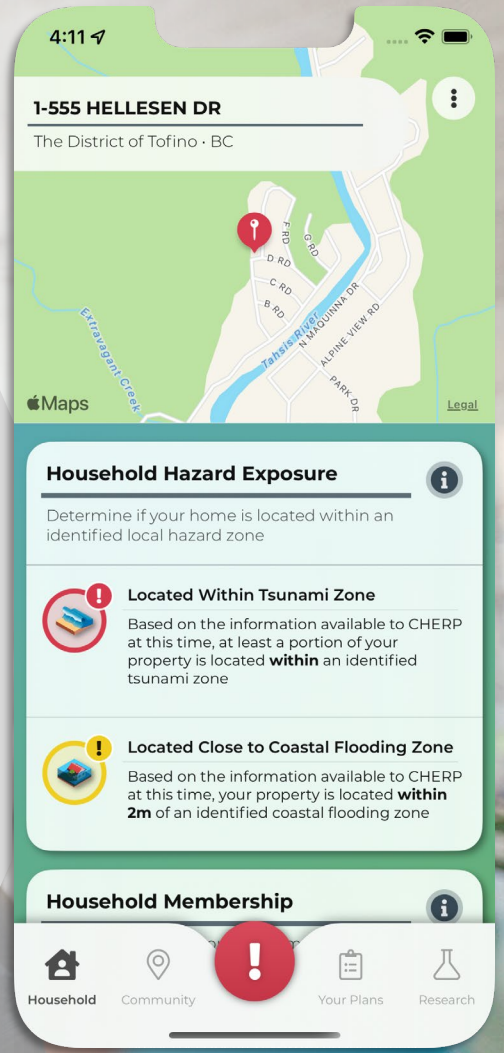
Located Within Tsunami Zone
Based on the information available to CHERP at this time, at least a portion of your property is located **within** an identified tsunami zone

Near to Hazard Zone:
Located within 100m of risk zone

Located Close to Coastal Flooding Zone
Based on the information available to CHERP at this time, your property is located **within 2m** of an identified coastal flooding zone

Outside Hazard Zone:
Located at least 100m from risk zone

Not Located Within Tsunami Zone
Based on the information available to CHERP at this time, your property is located **at least 100m** away from an identified tsunami zone



THE USE OF COLOR TO CONVEY RISK

Color is a commonly-used method to quickly communicate information about risk to the public

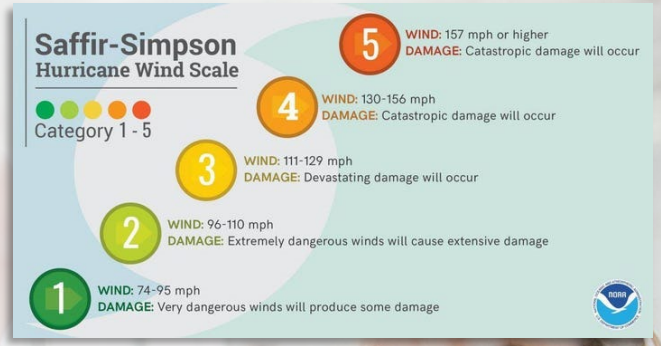
The use of specific colors can **instantly convey information** to us:

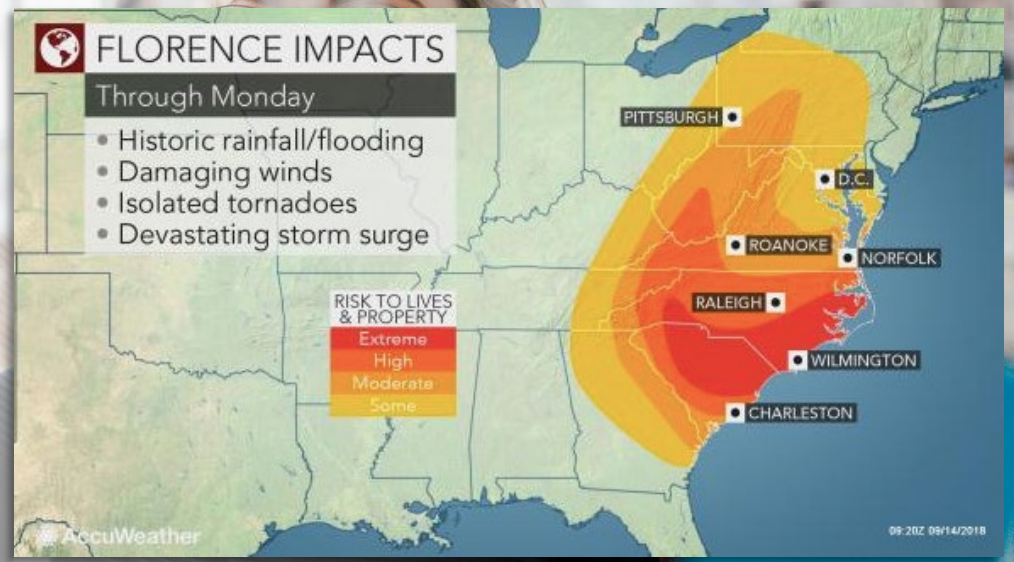
- Green = good, red = bad
- Blues & purples = cool, reds & oranges = warm
- Reds & oranges = danger, greens & blues = safety

However, about **8% of men**, and **0.5% of women** have a color vision deficiency. For some, it can be difficult to discern some colors or shades from others, while a small percentage see no color at all.

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	*<0.02*	*0.1*	*1.4*	*4.7*	*9.6*	*20*	*41*	*86*	*>178*
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)





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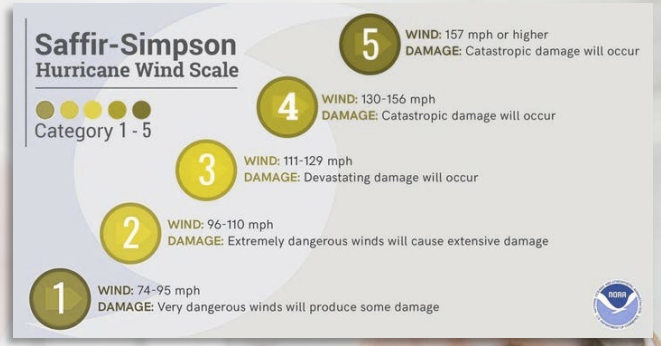

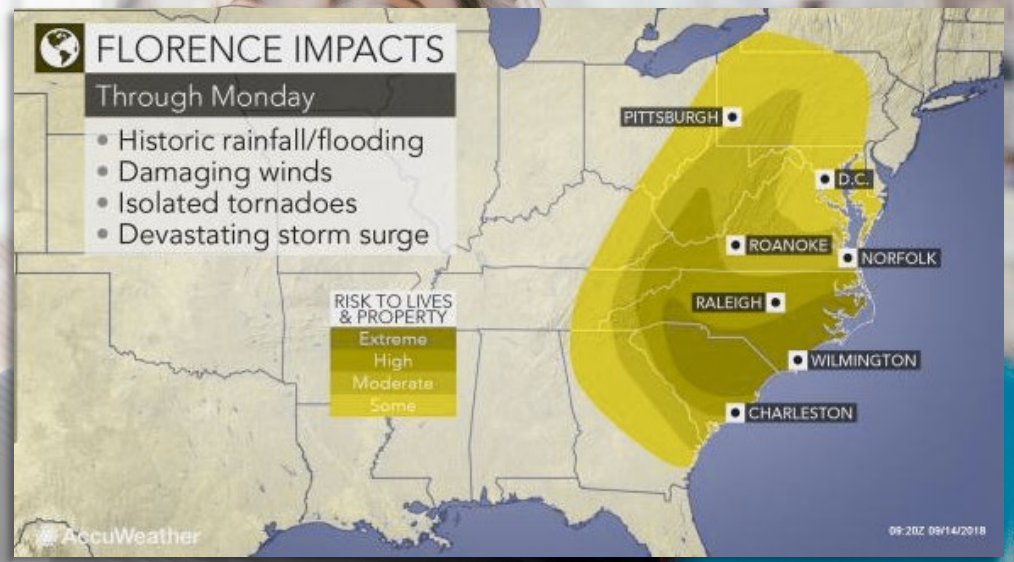

Default Scheme:
Blue-Green-Yellow-Orange-Red

High Contrast Colorblind Scheme:
Optimized for colorblind users with high contrast

THE USE OF COLOR IN CHERP

CHERP uses a **default color scheme** ranging from **Blue** → **Green** → **Yellow** → **Orange** → **Red** to represent increasing risk

We include options that allow users to **adjust that scheme** to fit better if they are colorblind, require higher contrast, or both

We also supplement these cues with text labels, and physical size changes to ensure that there are **multiple methods** of conveying key information about risk to app users

Colorblind Scheme:
Optimized for colorblind users

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High Contrast Colorblind Scheme:
Optimized for colorblind users with high contrast

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PUBLIC LAUNCH

We will be launching the app in six of our partner communities in a staged roll-out in **early 2022**, starting with the Village of Tahsis and District of Tofino and then moving east from there

LOOKING FORWARD TO PHASE II

Phase II of the project, starting in late 2022, will focus on **five key components**:

- Development of an Android version;
- Expansion to new communities and provinces;
- Inclusion of Indigenous communities;
- New hazard profiles for additional hazards, such as hurricanes, tornadoes, and avalanches; and
- Continued updates to our dataset of household preparedness and response actions, emergency kit items

We will be seeking additional community partners from BC and across Canada for upcoming funding applications.

Ryan P. Reynolds
Postdoctoral Research Fellow
School of Community and Regional Planning
University of British Columbia

ryan.reynolds@ubc.ca

Learn more about CHERP:

https://ryanreynolds.ca/cherp