



Solutions for a healthy indoor environment.

Protecting Canadian Homes & Buildings from Toxic Radon Gas

What You Need to Know to Build Right and Save Lives

BCBEC Seminar, May 19th, 2016

Alan J. Whitehead

President & CEO, Radon Environmental Management Corp.

President, Canadian Association of Radon Scientists & Technologists



ALAN J. WHITEHEAD BIOGRAPHY IN BRIEF

- **President & CEO, Radon Environmental Management Corp.**
- **Founding Member and President, Canadian Association of Radon Scientists & Technologists (CARST)**
- **Member, Canadian National Radon Action Month Campaign Committee**
- **Board Member, Coalition of International Radon Associations (COIRA)**
- **Board Member, Cancer Survivors Against Radon (CanSAR)**



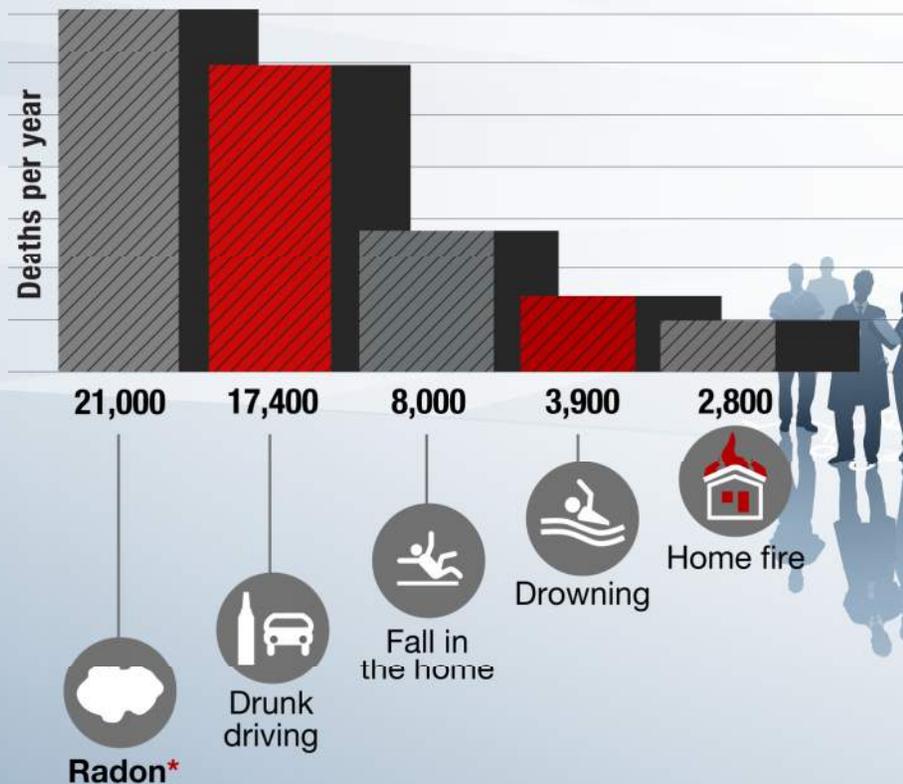
Alan is dedicated to the prevention of radon-induced lung cancer through his leadership at Radon Environmental Management Corp. and as President of CARST.

He has a proven track record of realizing well-planned initiatives with key strengths in strategic development and stakeholder relationships.

Speaker Bio



Radon is Deadlier Than...



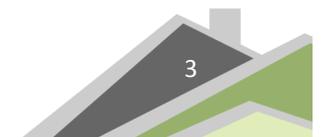
* Source: EPA Assessment of Risk from Radon in Homes

**“Saving lives is our mission.
Raising awareness is our passion.”**

– Alan Whitehead, *President & CEO*

Radon Environmental is a building and health sciences company focused on reducing public exposures to radon gas. The leading environmental cause of lung cancer is radon exposure. The company is a recognized leader in raising radon awareness and education in Canada, and provides radon mapping and measurement services together with new and high performance radon mitigation solutions.

Radon Environmental: The Company





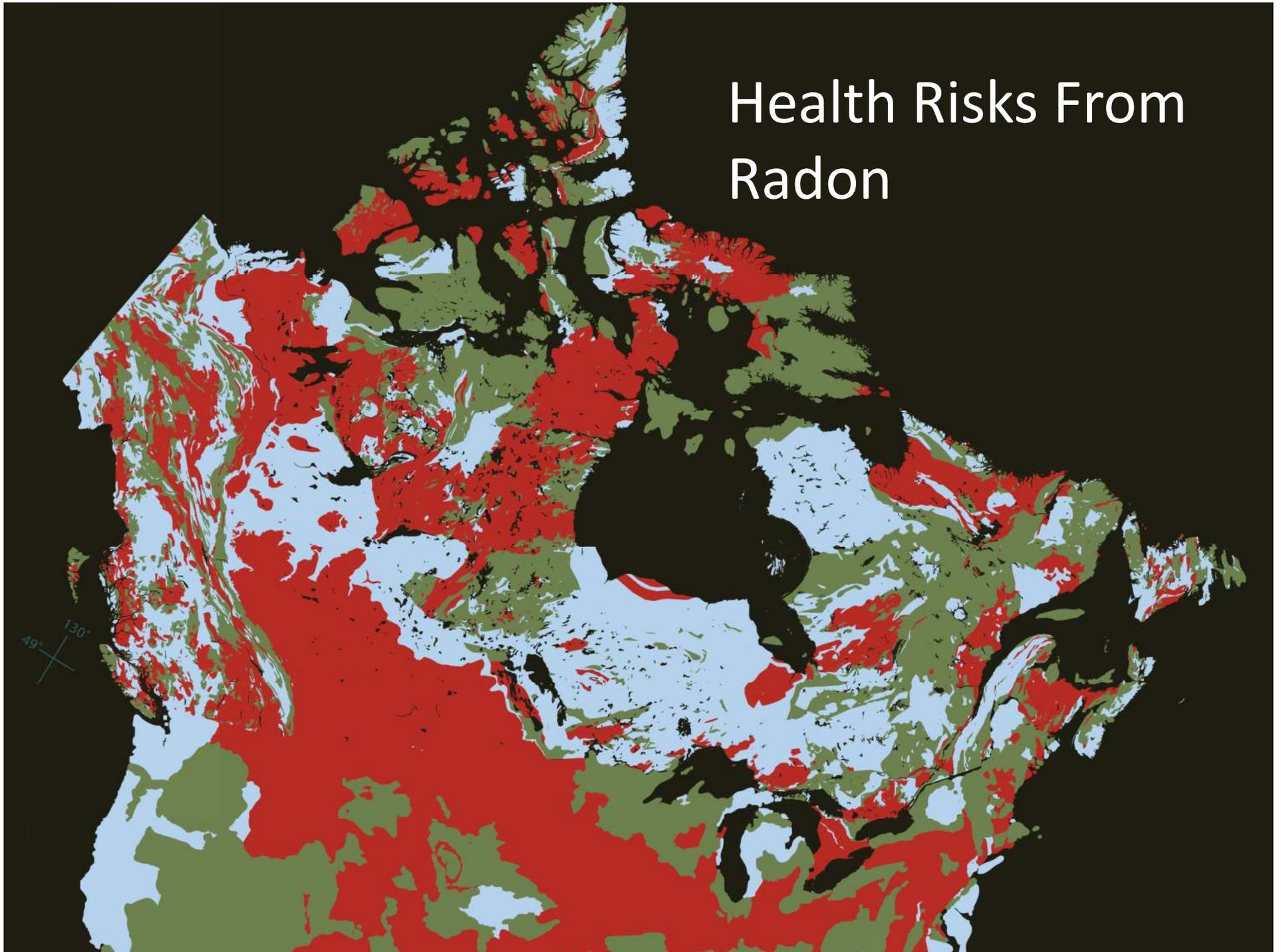
Radon is responsible for thousands of lung cancer deaths every year. **Radon is present in all buildings to some degree.** The hazard can be prevented during construction and in the way we maintain our homes, schools and workplaces.

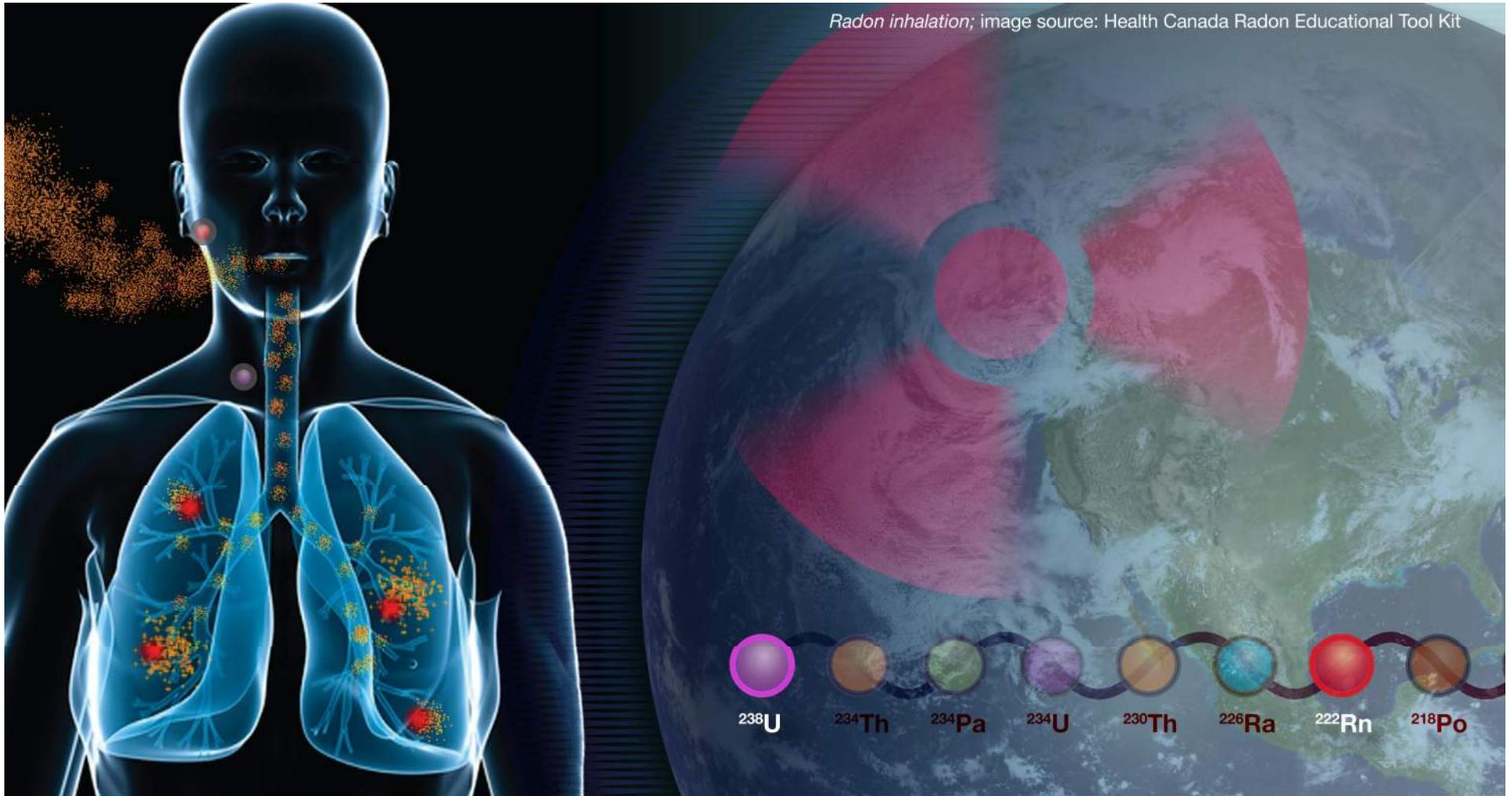
This presentation will cover the basic facts and how to avoid this serious air quality and health issue. **Build right and save lives.**

Overview



Health Risks From Radon





Radon is a tasteless, odourless, colourless and lethal gas. It occurs in the environment from the radioactive decay of uranium found in rocks and soils and accounts for over 50% of our annual radiation exposure. Radon is measured in **Becquerel's**, an absolute measure of radioactivity.

As radon decays, it emits alpha particles that damage the DNA and can lead to lung cancer.

What is Radon?

**“The lower the radon concentration in a home,
the lower the risk as there is no known threshold
below which radon exposures carries no risk.”**

– WHO Handbook on Indoor Radon



The Health Canada guideline is 200 Bq/m³. UN study concluded relative risk of lung cancer increases approximately 16% for every 100 Bq/m³. **The WHO guideline is 100 Bq/m³** David Suzuki Foundation, CELA, and Public Health Ontario recommend adopting a reference level of 100 Bq/m³.

Radon exposure during “youth” linearly increases risk of lung cancer. The younger you are, at age of exposure, the greater is your chance of living long enough to develop lung cancer.

Radon Safety Worldwide



RADON-INDUCED LUNG CANCER STATISTICS *

	Canada	USA	World
Annual lung cancer deaths	20,100	158,000	1.38 million
Percent lung cancer deaths attributable to radon exposure	16%	14%	14%
Estimated annual radon induced lung cancer deaths	3,200	22,100	192,500

* Canadian Cancer Statistics 2012
Health Effects of Exposure to Radon: BEIR VI
WHO Handbook on Indoor Radon

Health Canada reduced the radon action guideline fourfold in 2007 from 800 to 200 Bq/m³. They advocate for testing in all homes, and mitigation if above 200 Bq/m³.

There is a preventable health care burden due to inadequate public awareness of radon, which is a recognized **Class A carcinogen**.

Scientific Evidence Indisputable



RISK DWELLINGS:

**Homes
Schools
Daycares
Workplaces**

AFFECTED SECTORS:

**Building
Trades
Home Buyers
Real Estate**

Radon is present in all indoor air environments. It affects the air quality of homes, schools and workplaces.

Air quality is a concern to new home builders, home inspectors and potential home buyers. Employers must ensure workers are not exposed to harmful substances in the workplace.

Who is At Risk?





**RESULTS OF HEALTH CANADA'S 2012
CROSS-CANADA SURVEY OF RADON
CONCENTRATIONS IN HOMES**

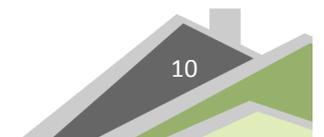
**16% lung cancer
deaths attributable to
indoor radon exposure**



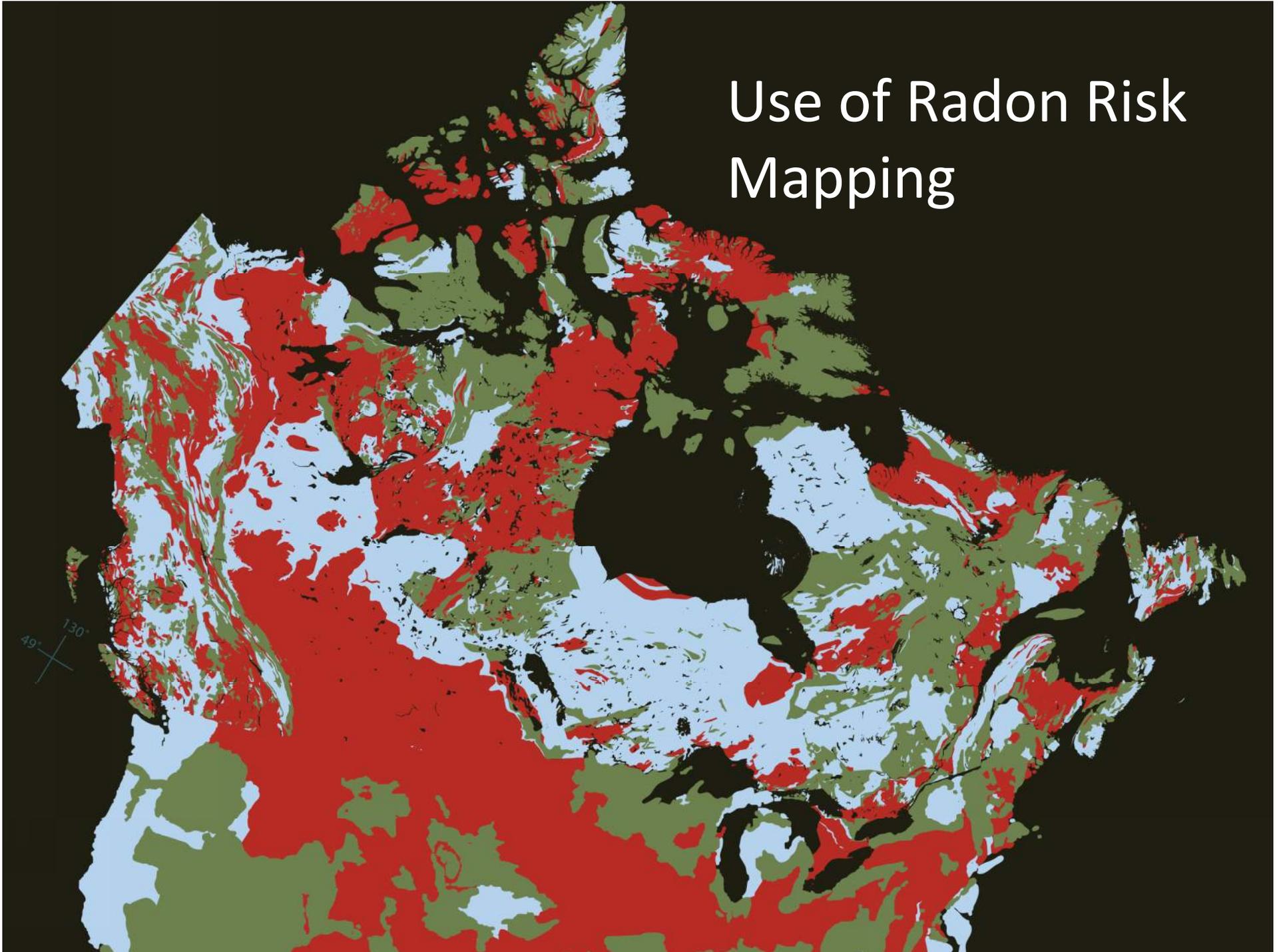
The response in Canada to radon risk is increasing among community health units, provincial and territorial lung associations, Canadian Cancer Society and the Centre for Disease Control.

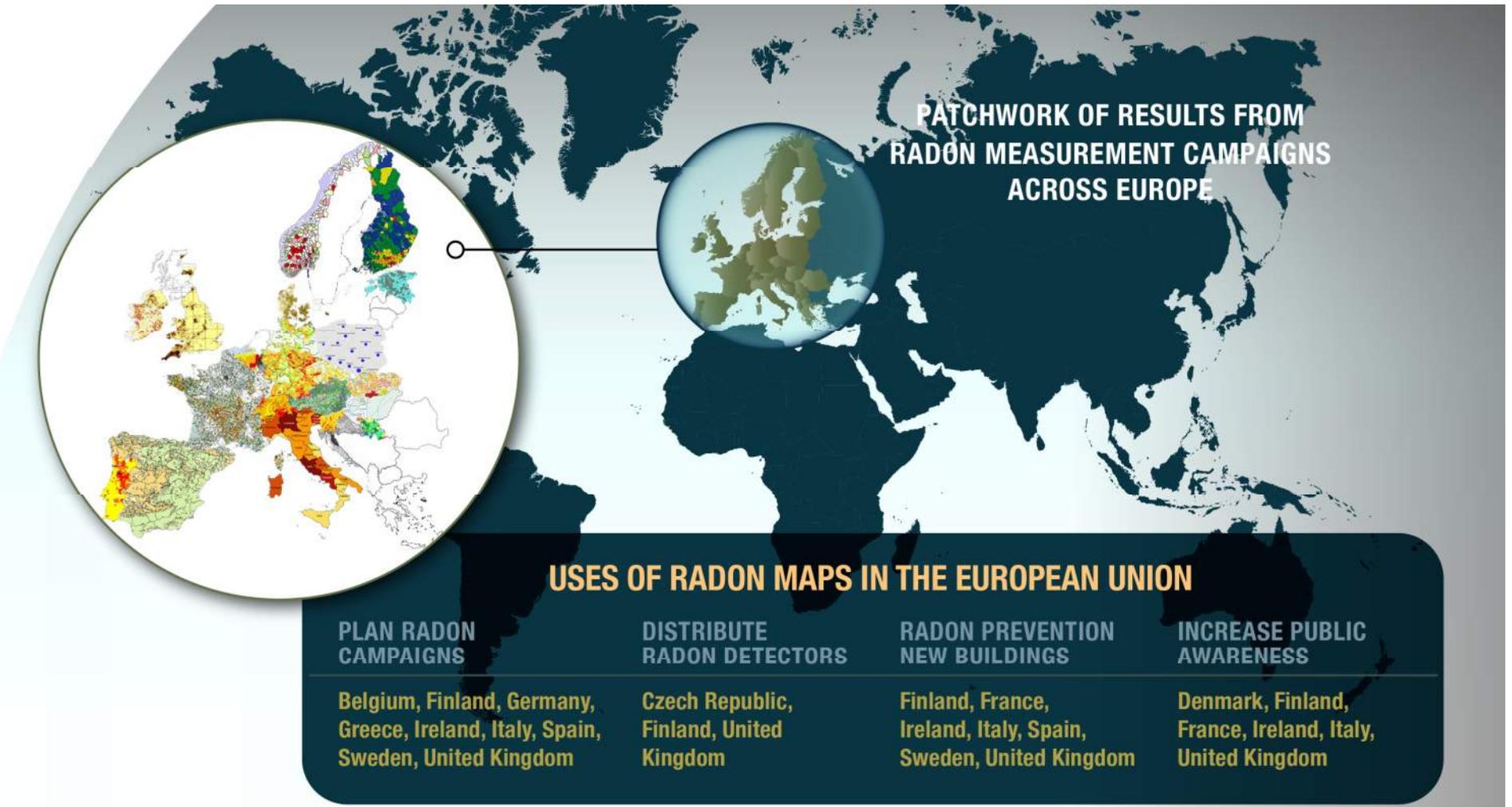
Health Canada conducted across-Canada surveys of radon levels in homes and public buildings. At a local level, many testing projects have been completed in BC's radon hotspots.

Risk Response and Testing



Use of Radon Risk Mapping





Natural hazards like radon have a strong spatio-temporal component. Because of this, maps play a decisive role in risk communication.

The European Union uses radon map prediction to plan their campaigns, distribute detectors, prevent radon in new dwellings, and increase public awareness.

Risk Communication



Health Canada recognizes the effectiveness of geoscience data as a **predictive tool** for identifying areas prone to elevated radon. Mapping based on geological, geophysical and geochemical surveys has been done in Canada, the United States and Europe.

General predictive maps have also been produced in Canada based on relatively small sample sets of indoor air readings.

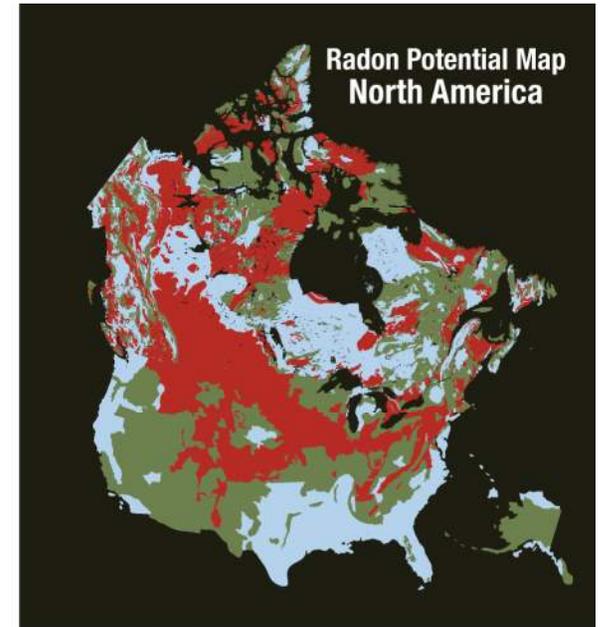
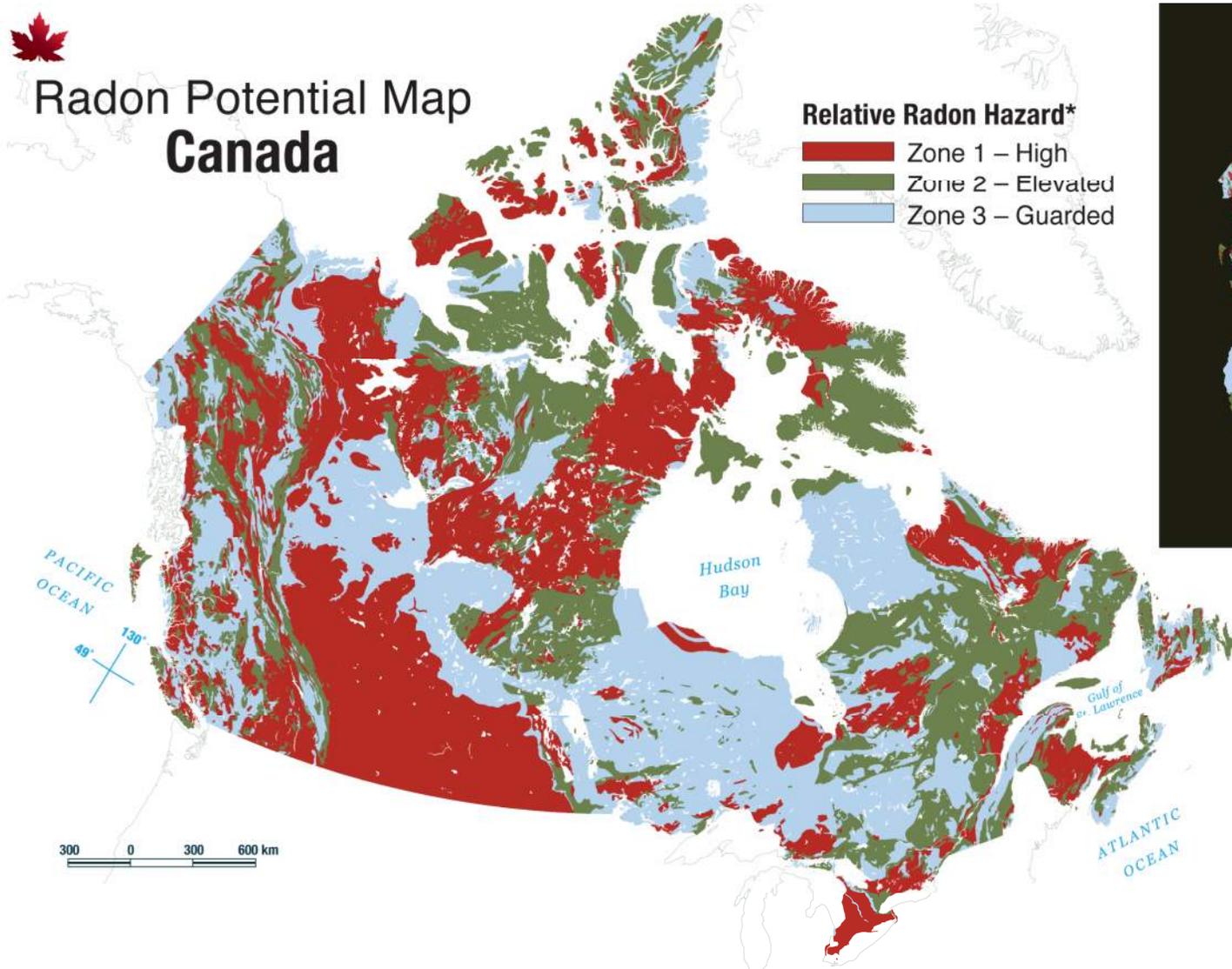
Radon Mapping



Radon Potential Map Canada

Relative Radon Hazard*

- Zone 1 – High
- Zone 2 – Elevated
- Zone 3 – Guarded



*Important

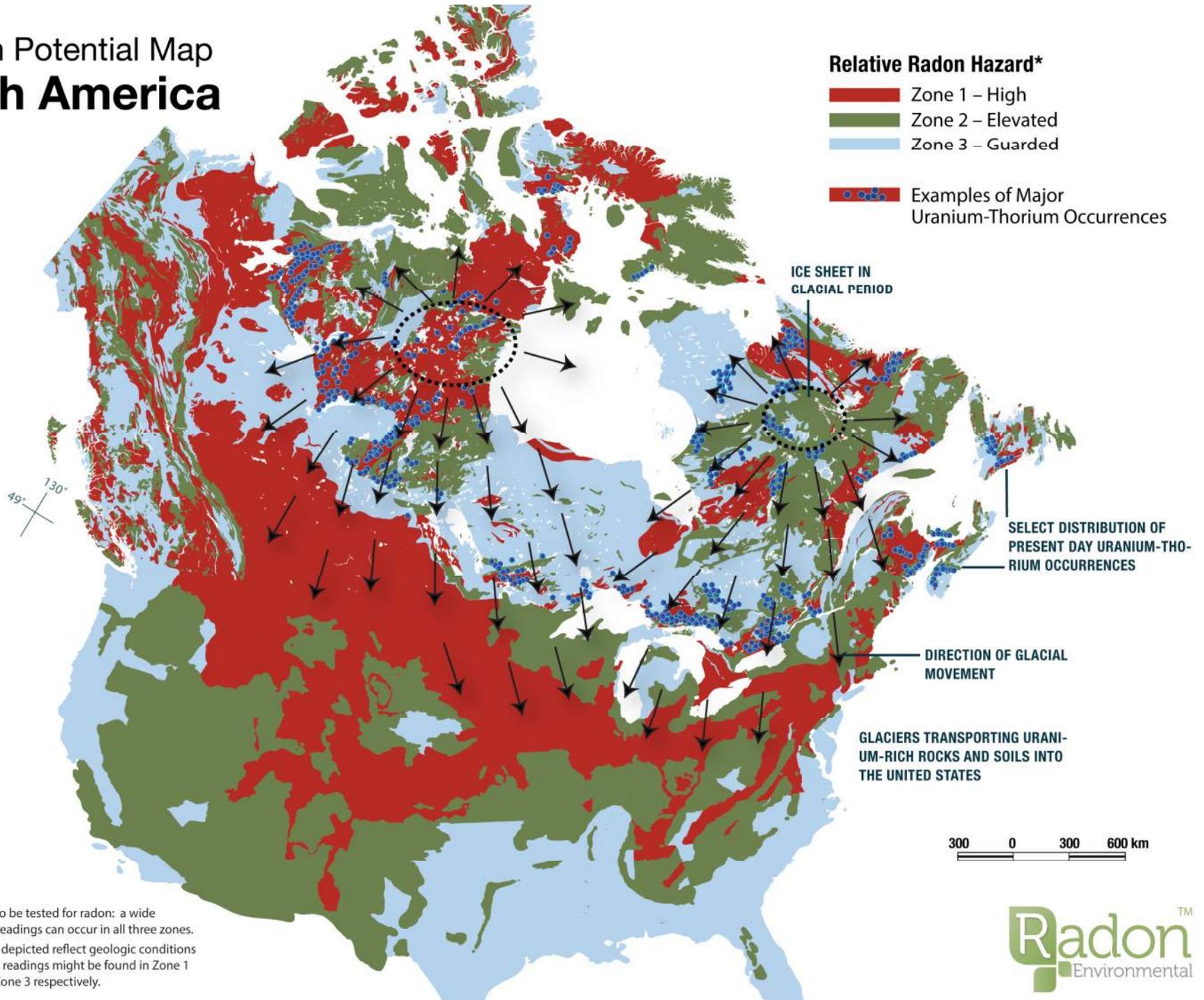
All dwellings need to be tested for radon. A wide spectrum of radon readings can occur in all three zones.

In this map, regions depicted reflect geologic conditions where higher radon readings might be found in Zone 1 versus Zone 2 and Zone 3 respectively.

Approximately 80% of the most densely populated areas of Canada are in elevated or high radon potential zones. The Canada map matched seamlessly with the US Geological Survey map, providing a North American picture of radon risk.

Mapping Methodology

Radon Potential Map North America



***Important**

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Radon Potential Map Canada

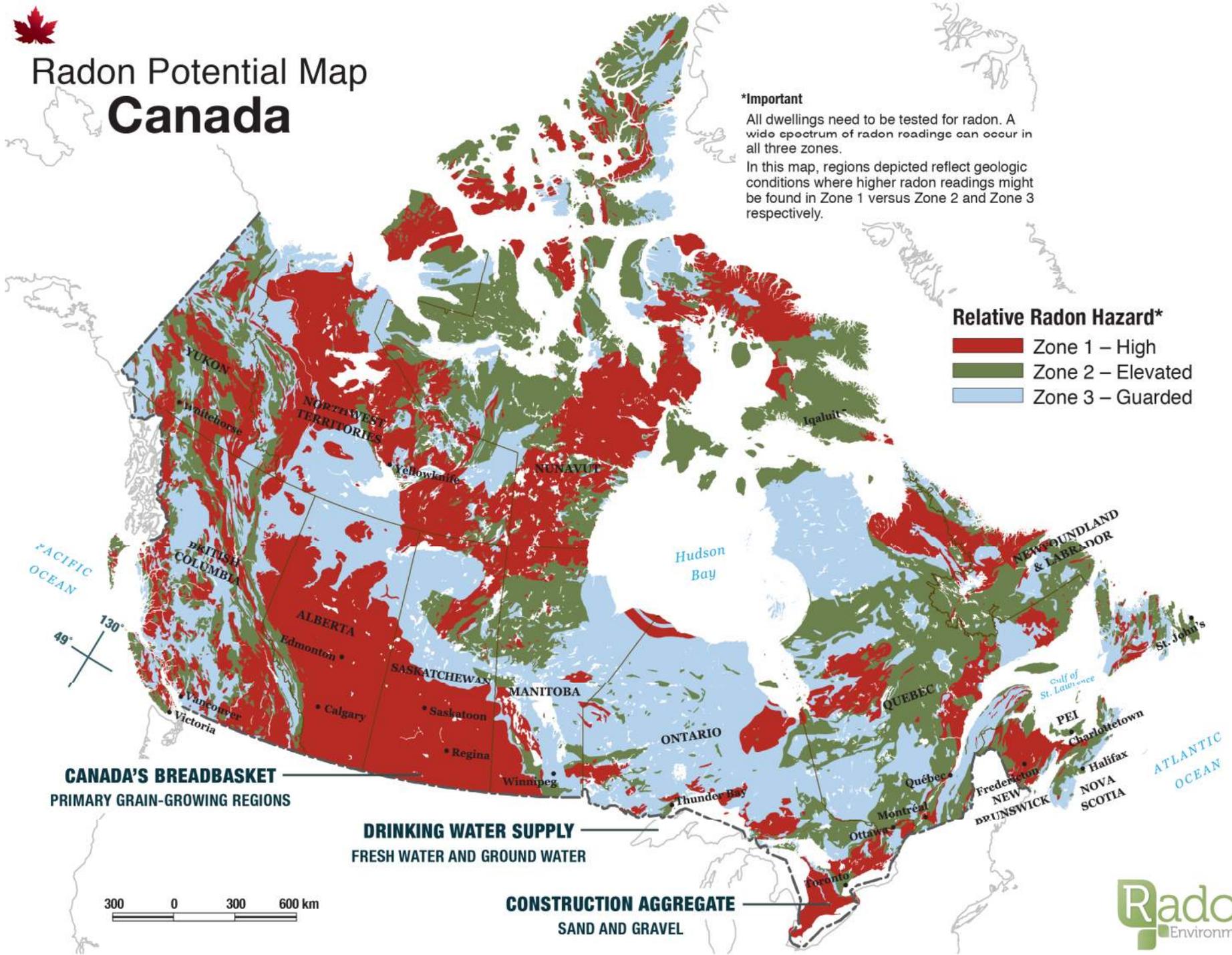
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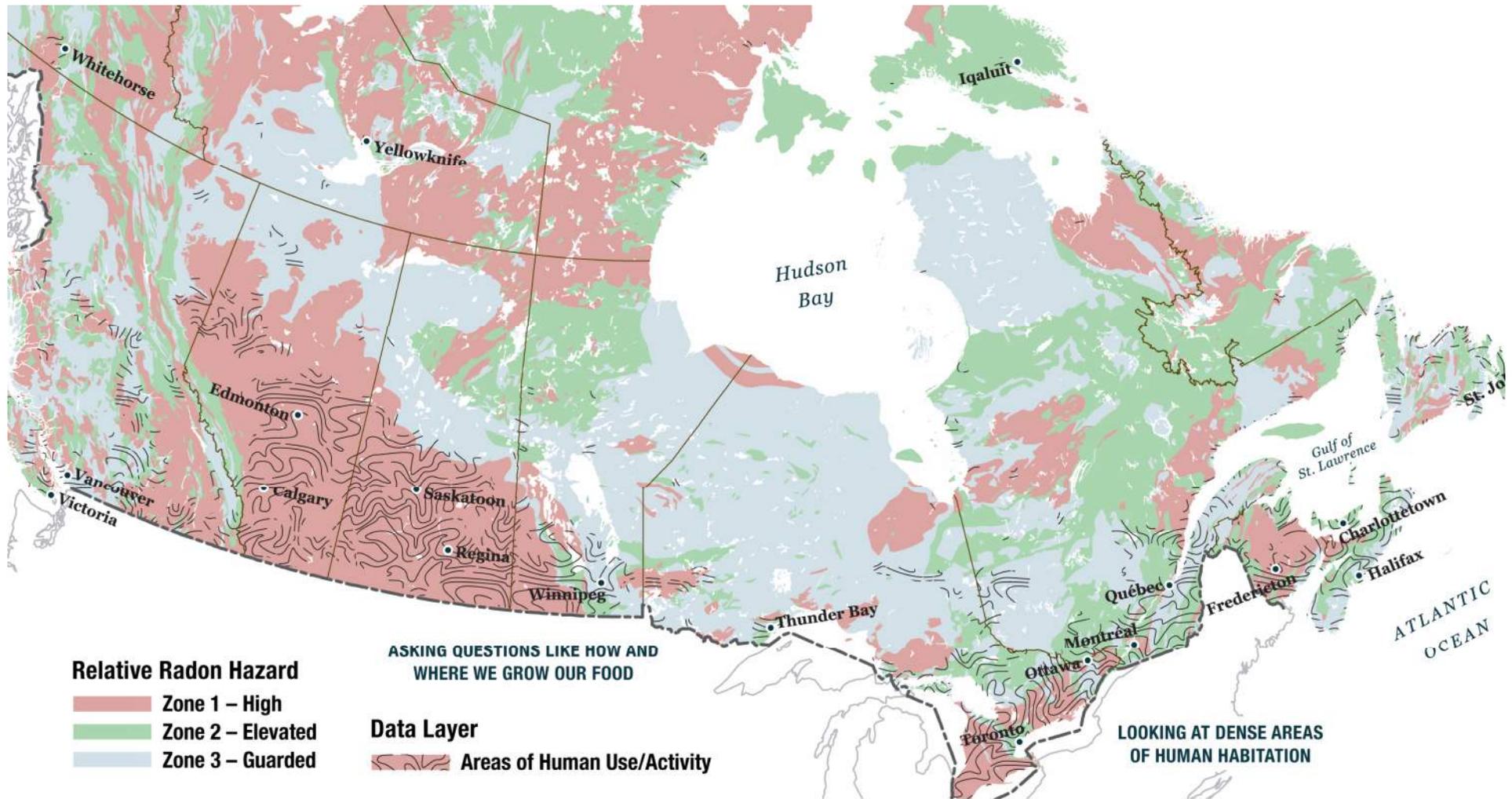
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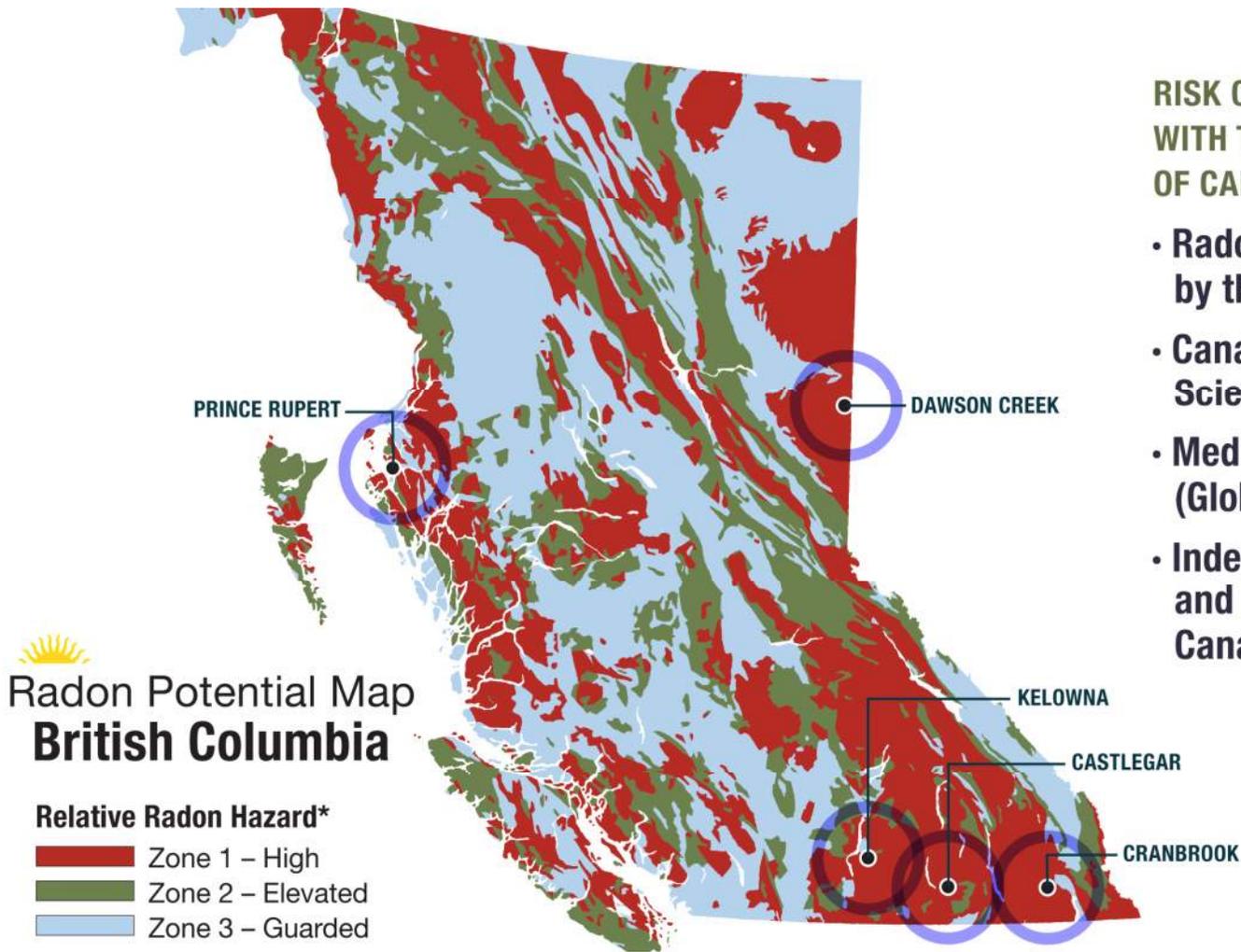
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Through mapping it's possible to examine relationships between radon hazard and populations – a factor in urban and rural planning. Is the chosen site for a seniors community, public school or hospital in a high radon hazard zone? The map can be a tool for responsible decision-making.

Relationships: Assessing Impact



RISK COMMUNICATION EXAMPLES WITH THE RADON POTENTIAL MAPS OF CANADA AND BC

- Radonaware, a website operated by the BC Lung Association
- Canadian Association of Radon Scientists & Technologists
- Media newstories on radon (Global News BC)
- Independent radon measurement and mitigation operations across Canada

***Important**

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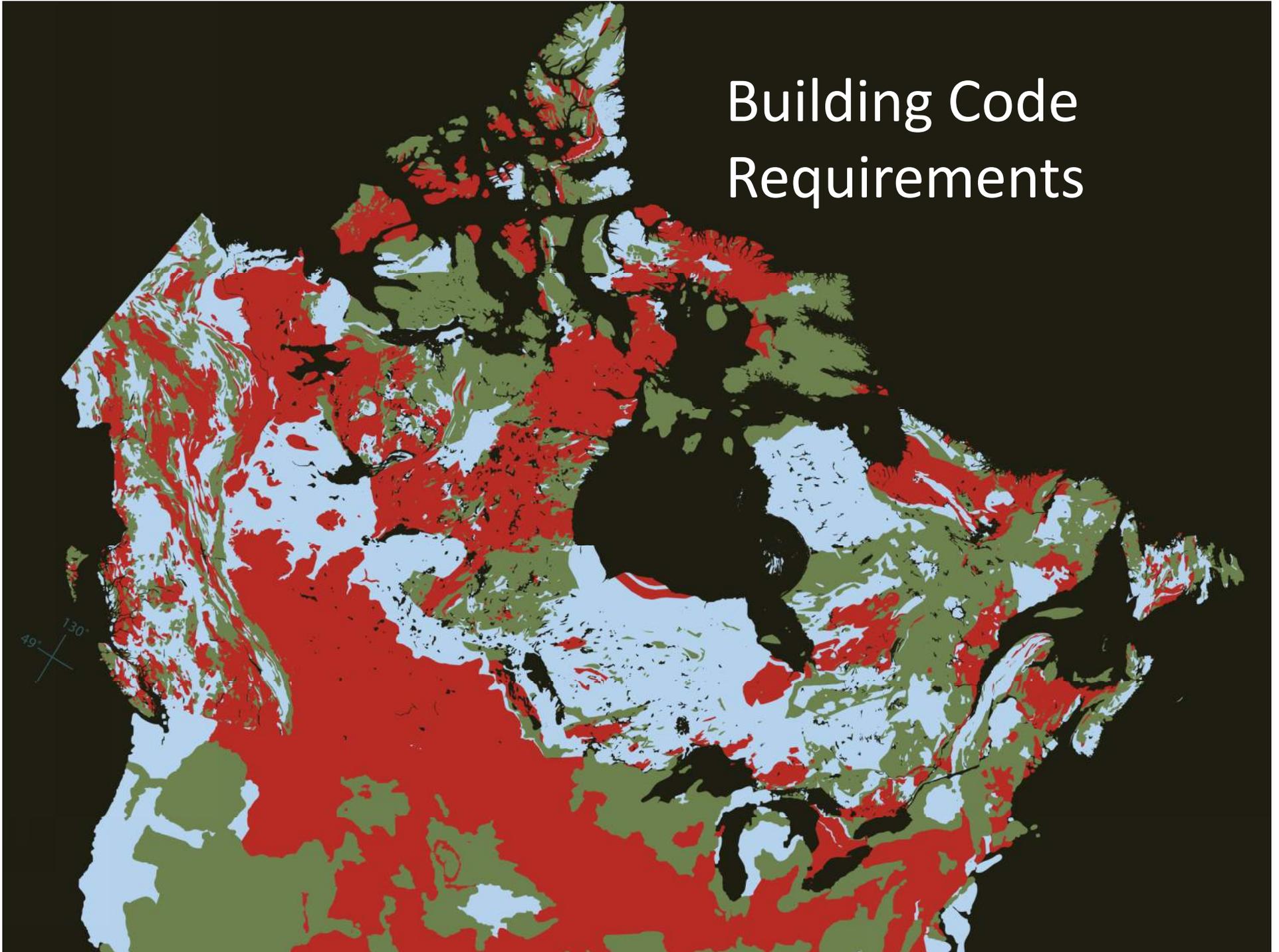
Responding to the demand from local health authorities, provincial maps were created.

Municipal mapping programs are now underway for planners in the Ottawa and Sudbury regions.

The Radon Potential Map of Canada and its regional maps are being used by various organizations in education and awareness campaigns.

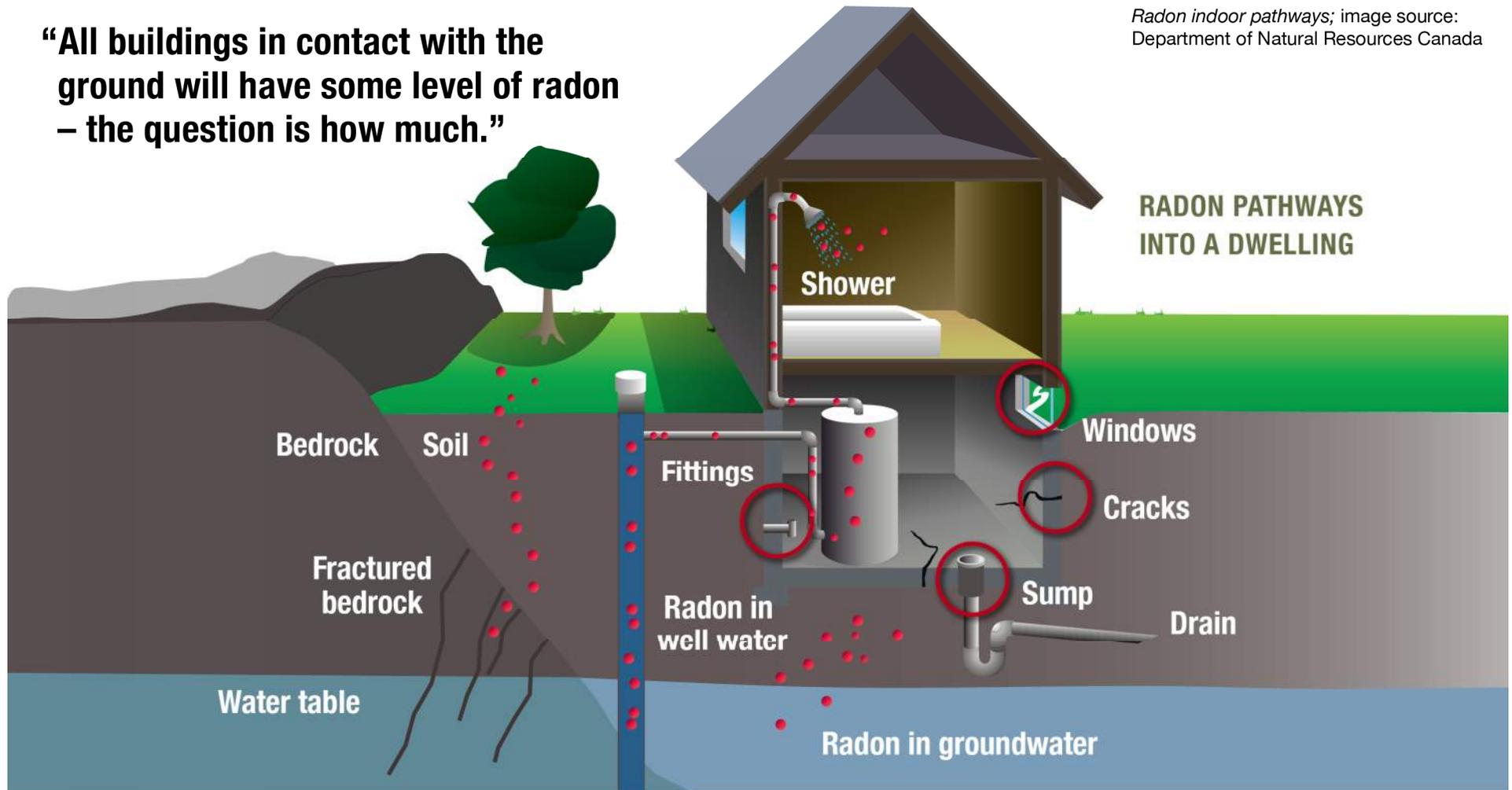
Regional Radon Mapping

Building Code Requirements



“All buildings in contact with the ground will have some level of radon – the question is how much.”

Radon indoor pathways; image source: Department of Natural Resources Canada

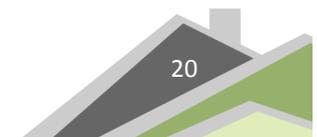


Building design can inhibit or allow radon entry.

Building code changes, Ontario Radon Awareness & Prevention Act, Tarion new home warranties in Ontario, Landlord Tenancy Act (ON), Labour Codes.

National and provincial building codes along with international Green Building Councils now recognize radon as an **indoor air quality issue**.

New Policies and Building Codes



“The only way to know the radon level in a building is to test for it.”

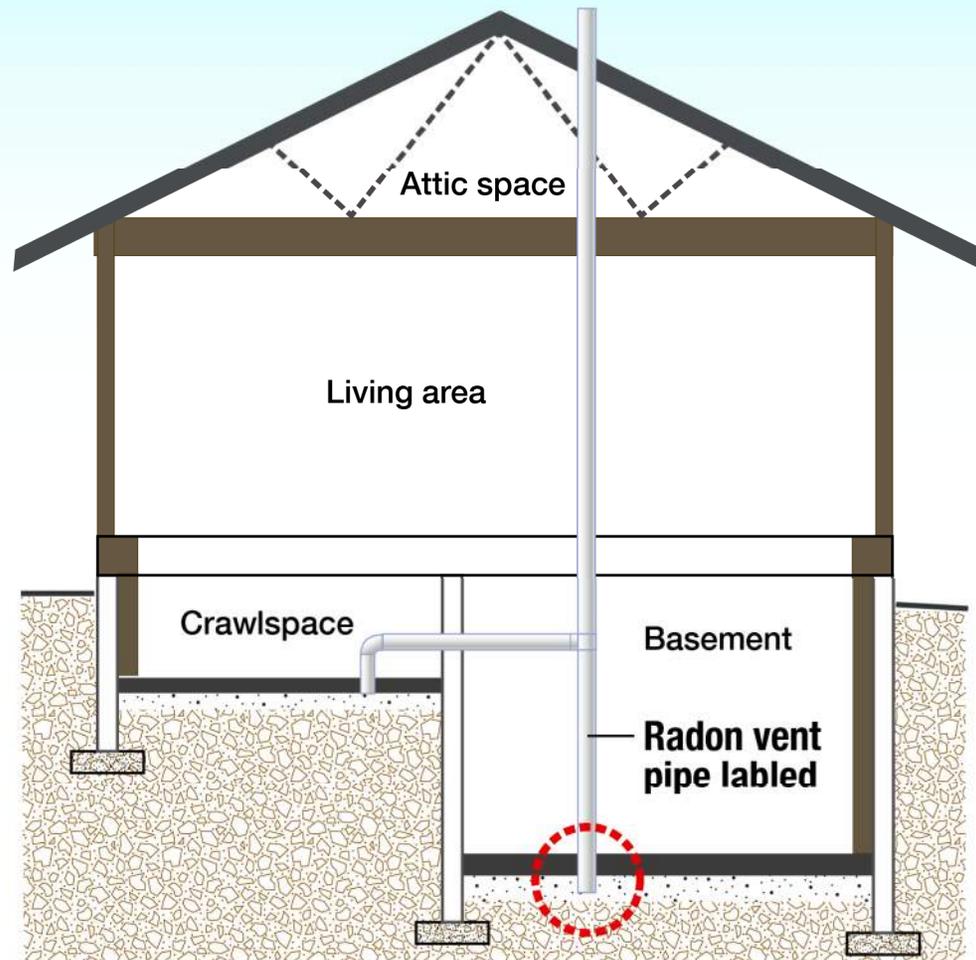
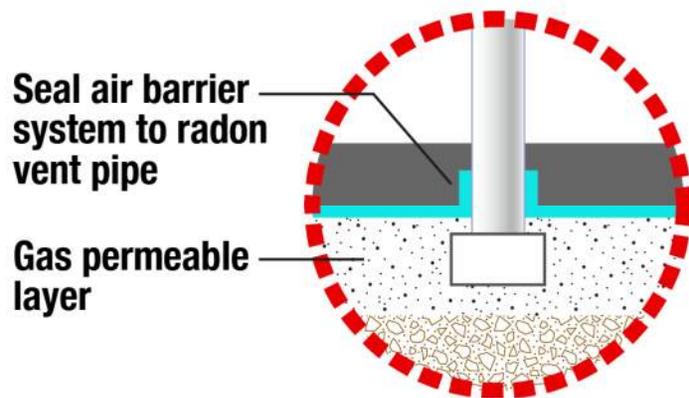


Radon provisions of the 2010 National Building Code were fully adopted by BC.

The province is divided into two zones within its code: Area 1 and Area 2. The 2012 BC Building Code required a minimum rough-in within Area 1 for a sub-slab depressurization system consisting of a capped pipe and 100mm of granular material.

BC Building Code Development

“There are well-established, cost-effective methods for reducing elevated radon levels.”

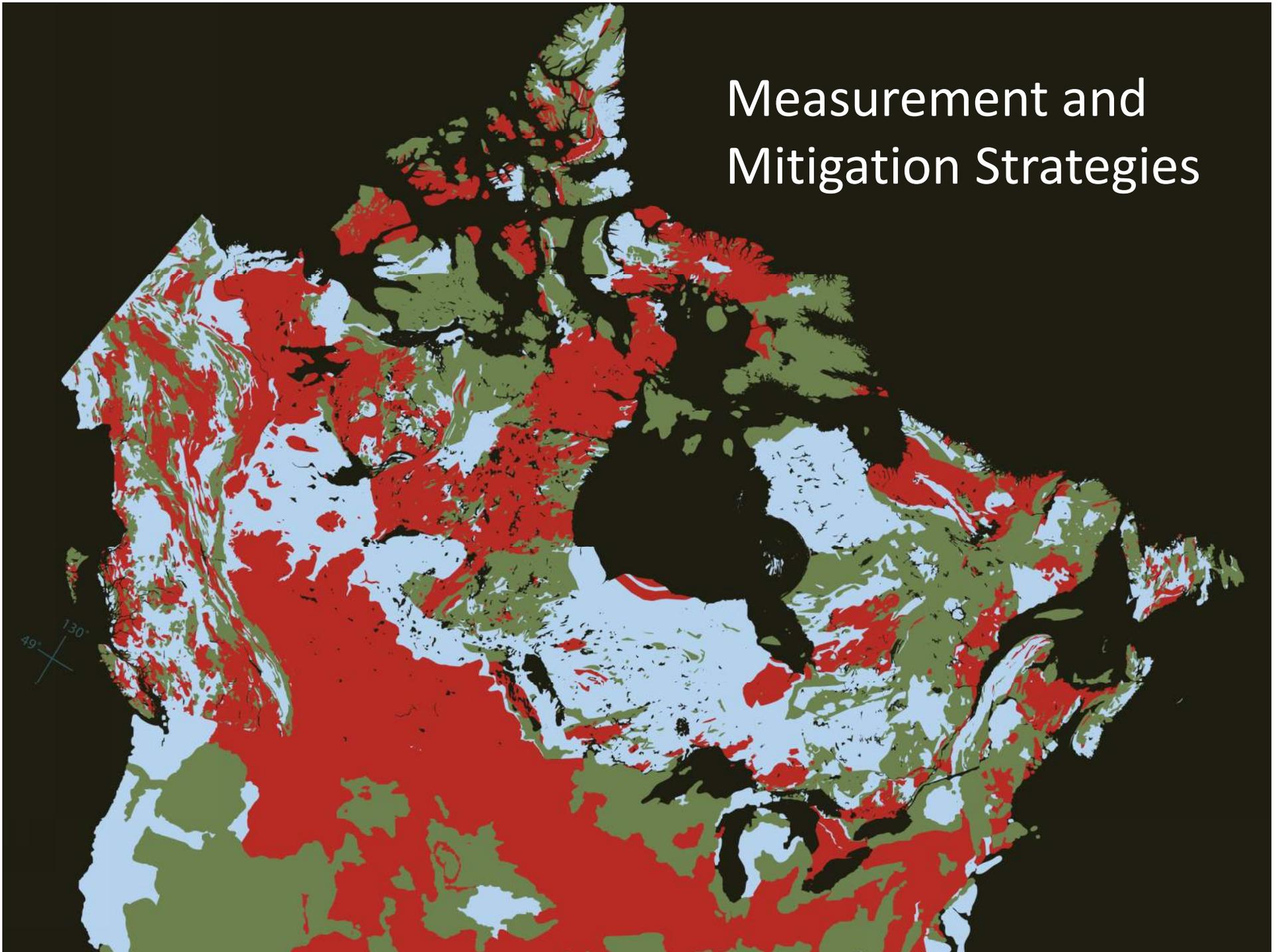


Updates to the 2012 BC Building Code include extending the radon pipe to the exterior of a dwelling at time of construction and the pipe must be clearly labeled.

The passive radon vent piping system for new construction, focusing on sub slab depressurization as applied to Area 1, are some of the **strongest protective measures in Canada.**

BC Building Code 2015

Measurement and Mitigation Strategies





Indoor radon levels are dependent on a number of factors including: the uranium content of the ground beneath the building, underlying pathways in the rock and soil for radon to travel, radon in water, building design and construction, and seasonal weather conditions.

This is why it is important for **every building** to test. **One building is not like another.**

Necessary Action: Testing



SHORT TERM TESTING

- less than 3 months



LONG TERM TESTING

- 3 months to one year



There are two broad categories of testing devices: those for short term measurements and those for long term. Short term radon tests are often used under time sensitive conditions when immediate results are required, like real estate transactions. Long term tests provide an average of radon levels and account for seasonal variations.

Measurement Device Categories





ALPHA TRACK MONITOR

- alpha track technology
- most common type of radon monitoring globally
- reliable and fast, economical for large testing projects



RADON ALARM

- true real-time radon detection from France
- function analogous to CO₂ detector



AIR GRAB SAMPLE

- Lucas-type scintillation cells for collection
- analysis via Pylon AB6A laboratory-grade monitor



RADON IN WATER

- laboratory-grade bottle for sample collection
- analysis via Pylon AB6A laboratory-grade monitor

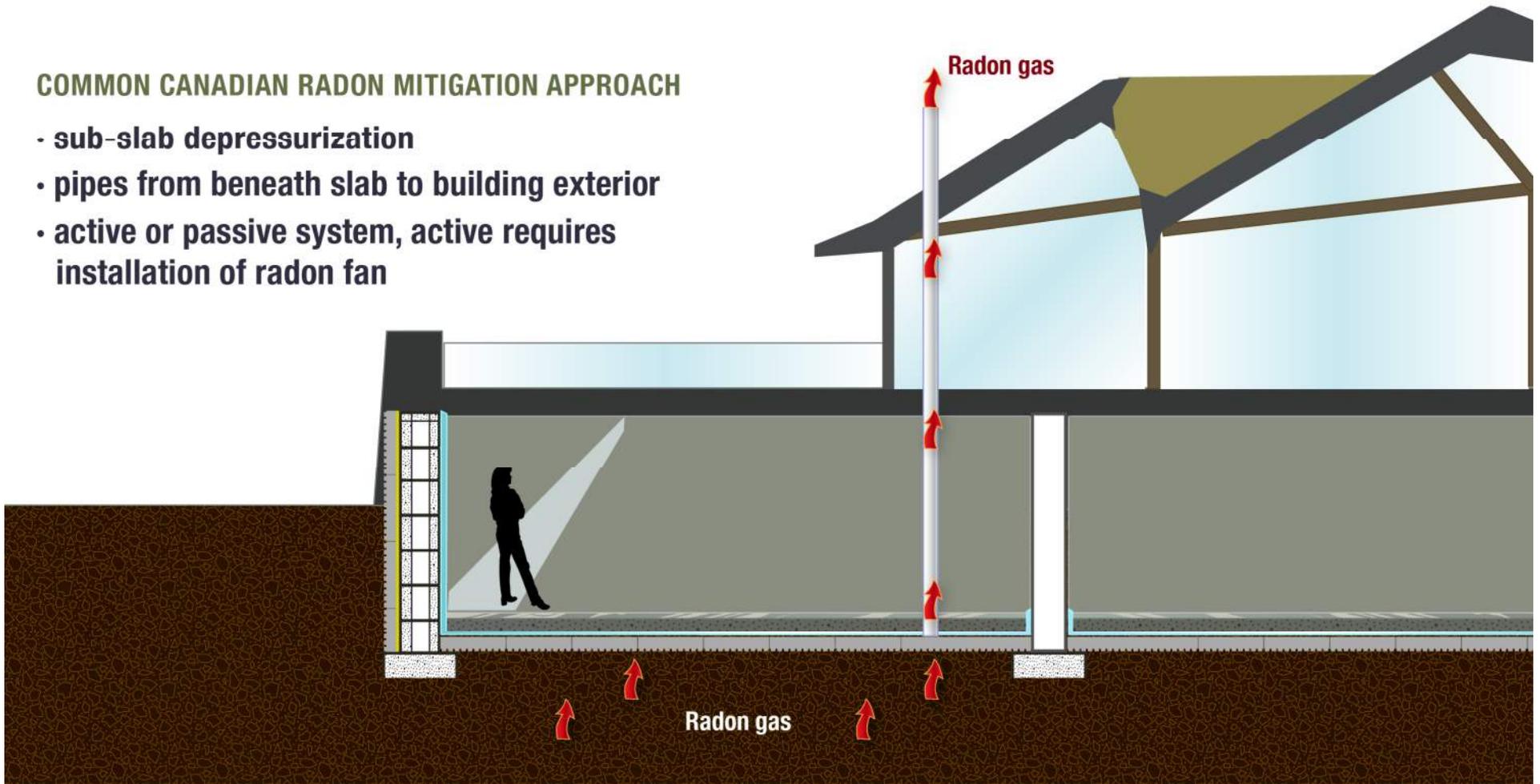


Radon measurement instruments vary in function, cost and accuracy. Many are simple enough for the homeowner to use. More advanced equipment is employed by measurement professionals certified by the Canadian National Radon Proficiency Program (C-NRPP). Some detection methods are approved by Health Canada, C-NRPP, and the National Institute of Standards and Technology (NIST).

Measurement Instruments

COMMON CANADIAN RADON MITIGATION APPROACH

- sub-slab depressurization
- pipes from beneath slab to building exterior
- active or passive system, active requires installation of radon fan

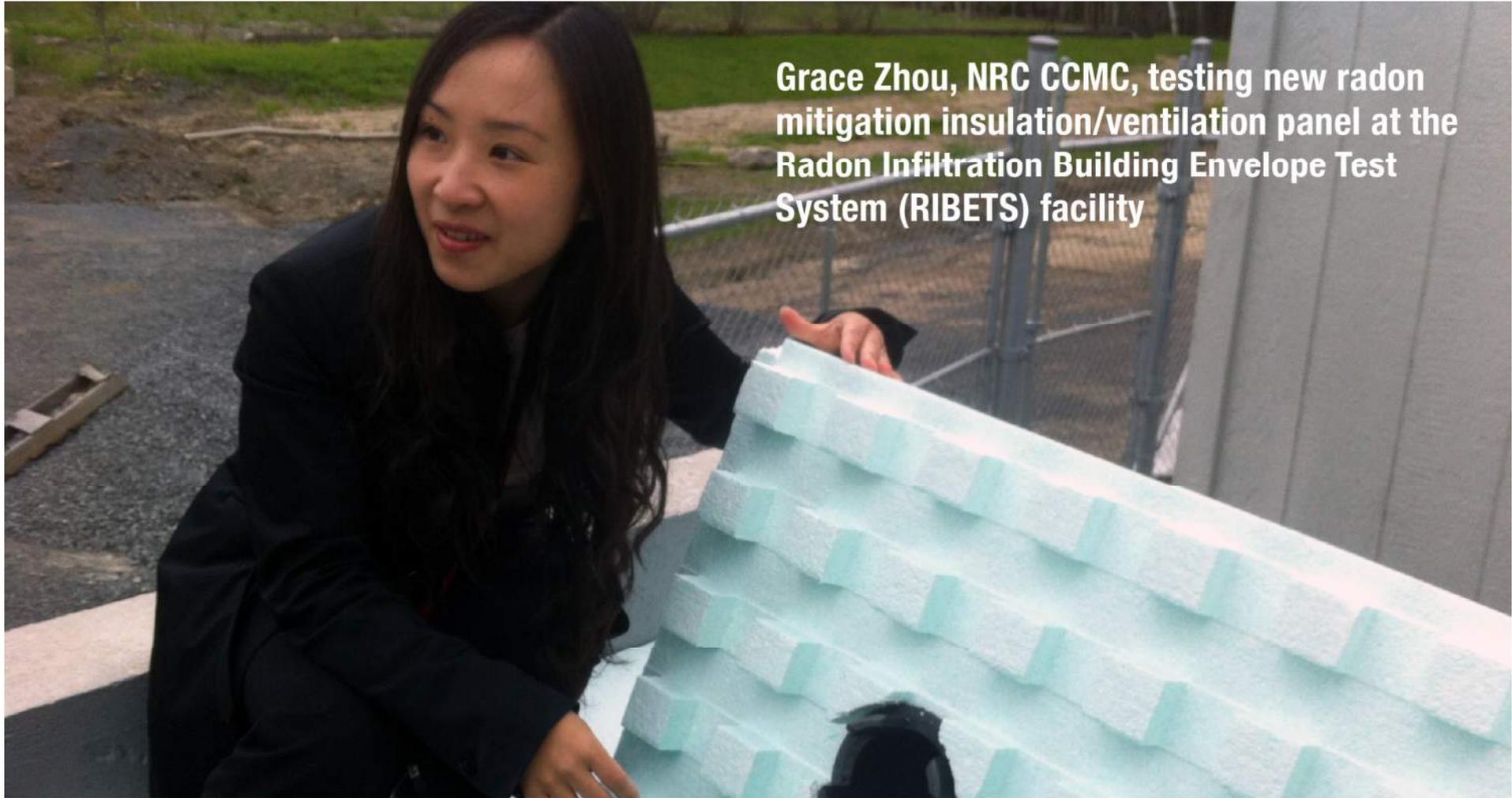


When radon levels are elevated, mitigation of the building is necessary. A C-NRPP radon mitigation professional will ensure it is done right.

In large buildings, an HVAC adjustment may be the solution to dilute elevated radon concentrations. In homes, active sub-slab depressurization (ASD) is a common choice.

Radon Mitigation

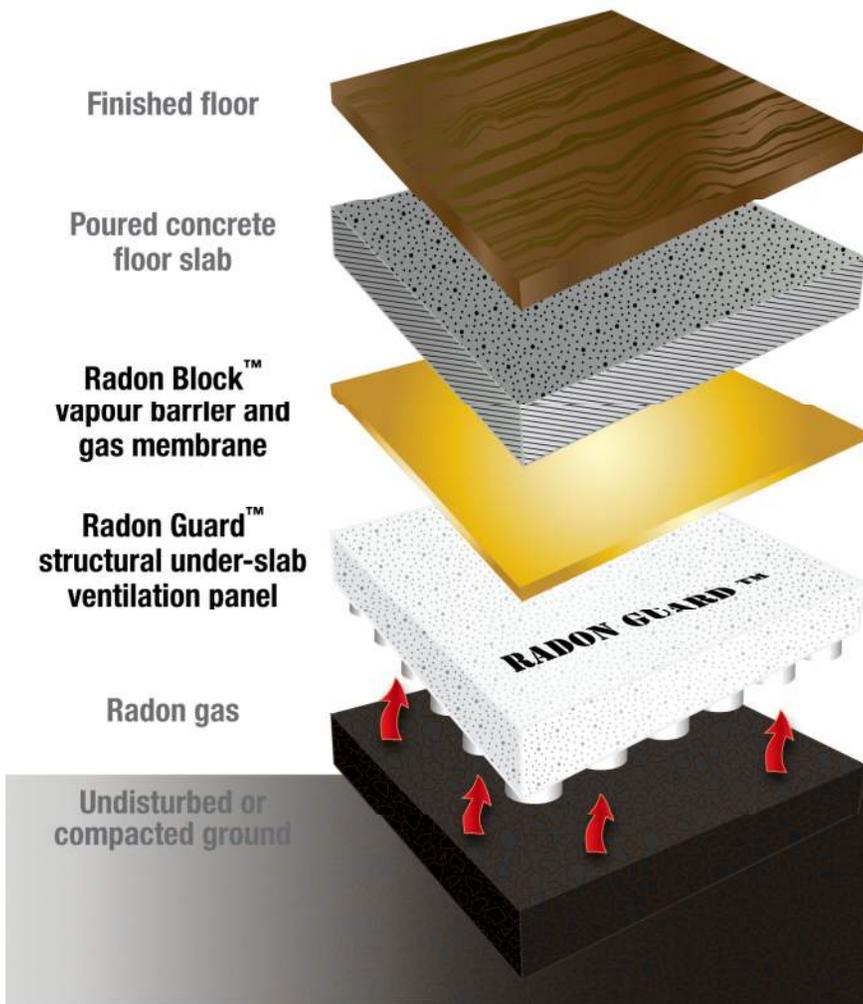




New mitigation technologies for new construction keep radon from entering the building envelope. Some new products are high performance, functioning as insulation as well.

The Canadian Construction Materials Centre (CCMC) has tested and approved a number of new radon products within their RIBETS facility to be building code compliant alternatives.

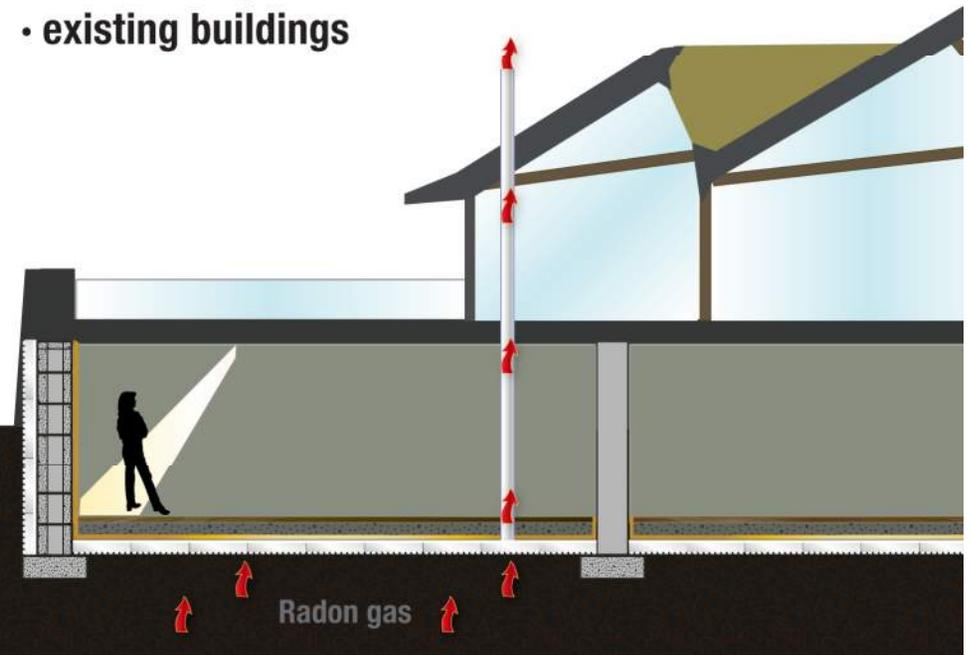
New Mitigation Technologies



**RADON ENVIRONMENTAL MITIGATION TECHNOLOGY
RESEARCH & DEVELOPMENT**

Product Applications:

- preconstruction new homes and buildings
- existing buildings



Radon Environmental has developed new mitigation technologies to improve methods of keeping poisonous gases away from indoor spaces. Radon Guard™ combined with the polyethylene membrane Radon Block™ provides a level of protection far superior to existing standard building materials.

Mitigation Technologies

SMART MITIGATION APPROACH

- device pilots ventilation system for radon elimination
- real-time protection from radon peaks, operates as needed
- discreet design, integrated into existing ventilation system



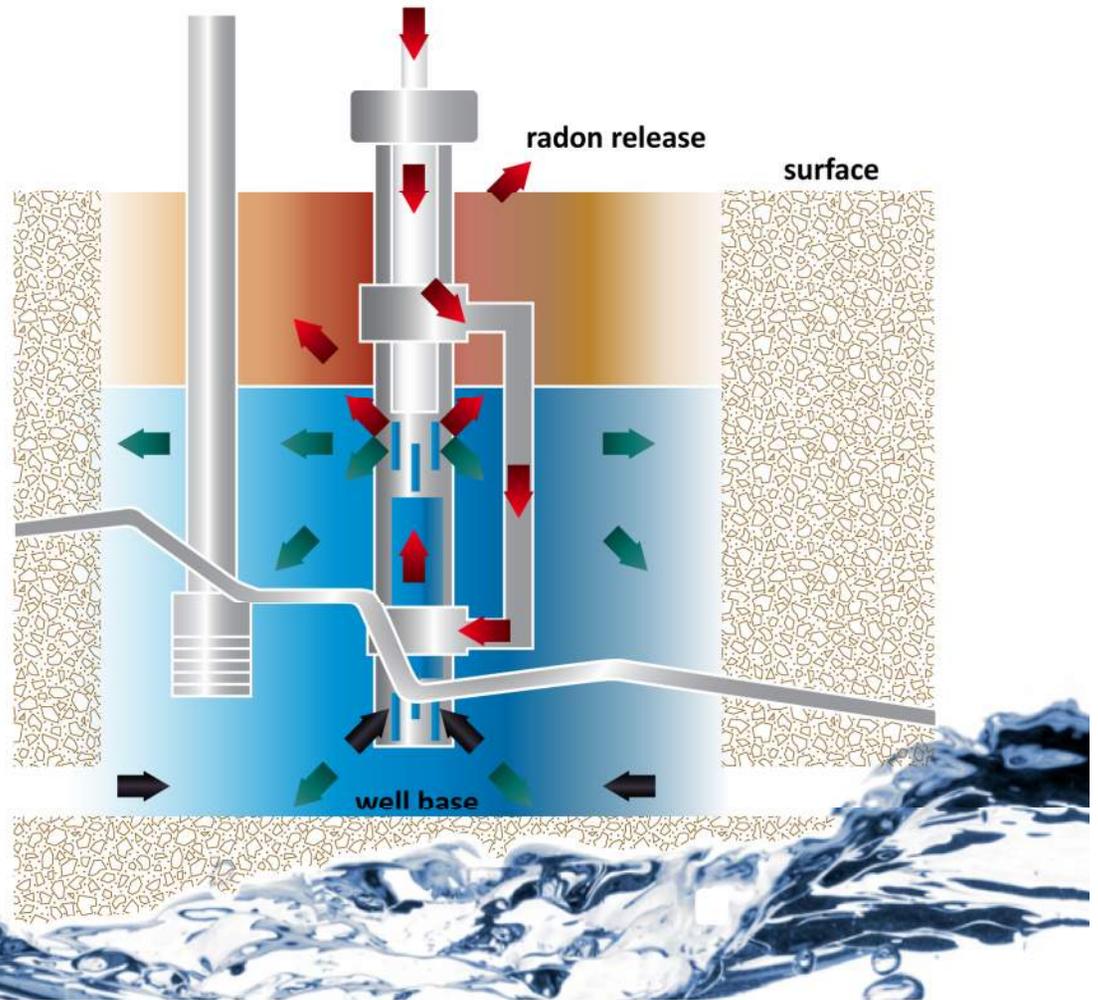
As recognition of the hazard presented by radon exposure grows in Canada, new approaches to reduction and monitoring are being introduced. Products from Europe manage radon with solutions that are less invasive to building design and prioritize energy efficiency along with proper indoor air quality. Smart systems respond only when radon levels are elevated and make use of existing ventilation systems.

New Mitigation Technologies



AIRWELL RADON MITIGATION IN RESIDENTIAL WELL WATER

- pipe with aeration section inserted top to bottom in well
- steady source of air lifts water from bottom, creating aerated flow to surface
- injected air strips previously trapped gases
- sustains a “down the well” process indefinitely without debilitating scaling and bio-fouling



Airwell is a new technology that solves the problem of radon in well water before water enters the home. The Airwell system improves water quality by injecting air into the water source through an aeration pipe. Pressurized air pumped to the bottom of the well lifts contaminated water to the surface where contaminants (excess iron, manganese, hydrogen sulphide, methane, carbon dioxide, in addition to radon) release.

Mitigation Technologies: Airwell Science



Radon is a radioactive gas present in **every indoor environment**.

The hazard comes as a result of the way **we build and maintain** our homes, workplaces and schools. Radon exposure and the associated risk of lung cancer is a **preventable danger** to Canadians.

A Preventable Risk