



# RADON: Recommendations for a BC Action Plan







For more than a hundred years, the BC Lung Foundation has fought threats to lung health in all its forms: smoking/vaping cessation, asthma, COPD, pulmonary fibrosis. We've also fought hard for lung patients, such as promoting low-dose CT scans, and supported life-changing lung transplantation.

Now, we draw attention to the dangers of radon gas in the home and workplace. Radon causes lung cancer and kills more than 3,300 Canadians every year. It's the leading environmental carcinogen in our society today.

While our work in prevention is heartening, lung cancer rates are still high. It remains the most prevalent and deadly cancer in British Columbia. It's time to address the leading cause of lung cancer, after smoking -- radon gas exposure.

Radon is an odourless, colourless, and radioactive gas that comes from the soil. It can accumulate to high levels inside buildings, putting occupants at higher risk of lung cancer. Radon levels vary in British Columbia, but some areas of the province stand out as national hotspots.

As a radioactive gas, radon decays, and the process creates alpha particle radiation. When we breathe in air that contains radon, alpha particles can pierce our lung tissue and break DNA bonds. Across Canada, sixteen percent of lung cancer deaths are from radon. We have the technologies and know-how to avoid elevated radon in buildings. We just need to take action.

In this report we set out our recommendations for a comprehensive, made-in-BC strategy to tackle the problem. We suggest a bold goal of eliminating elevated radon in all homes and workplaces, and an action plan for making this happen.

For far too long, we've ignored the importance of good indoor air quality. But as we've seen with wildfire smoke and heat domes, our indoor environment is vital to keeping us safe. Having healthy indoor environments is central to keeping our population healthy and ensuring the right to a healthy environment for everyone.

Governments across the world have adopted radon action plans. In Canada's division of powers, legislation and action to protect indoor spaces falls largely on provinces and territories. It's time for British Columbia to take the necessary steps to address this problem, prevent preventable lung cancer at the source, and save lives.

CHRISTOPHER LAM  
President and CEO, BC Lung Foundation



## executive summary

Radon is a naturally occurring radioactive gas, emanating from the ground and entering and accumulating in buildings. Radon gas is found in every building in Canada at some level, but health risks increase with higher concentrations. Radon exposure is the leading cause of lung cancer after smoking, and accounts for an estimated 16 percent of lung cancer deaths in Canada—over 3,300 people a year or about 1 percent of all deaths.

Yet radon risk reduction is easy to address through testing and mitigation. Simple tests involve placing a long-term radon detector in the lowest lived-in level of a building for three months during the fall-winter months. Many parts of British Columbia, especially in the Northern and Southern Interior, have exceptionally high levels of radon. Once average radon levels in a home or workplace measure over the Canadian Radon Guideline of 200 Bq/m<sup>3</sup>, mitigation can be done quickly by trained professionals at reasonable cost—in homes for less than the cost of a new furnace.

In Canada, health and safety of indoor spaces falls primarily under provincial jurisdiction. Unfortunately, BC has not had a clear radon policy to date, and the issue has been treated haphazardly, taken up on a piecemeal basis by individual agencies. Too often, awareness initiatives have fallen on non-profit organizations such as the BC Lung Foundation, Take Action on Radon—a national radon awareness program—and the Donna Schmidt Lung Cancer Memorial Society, which operates in the Kootenays. This report does document existing government action, such as radon provisions in the BC Building Code or the new map from the BC Centre for Disease Control. However, efforts to date have been insufficient and poorly coordinated, leaving the work of testing and mitigation largely to individuals without significant support. There are very few reliable protections for workers, renters, and low-income homeowners.

BC needs a good Radon Action Plan with clear targets for reducing radon exposure, which builds in health equity, and ensures, over time, that

**Radon gas is found in every building in Canada at some level, but health risks increase with higher concentrations.**

no one is exposed to elevated radon in indoor spaces. The case for radon action has been extensively spelt out in international guidance, in specific plans by many countries around the world, and recently by Health Canada in its *Radon Action Guide for Provinces and Territories*.<sup>1</sup> We suggest a visionary approach for BC—eliminating elevated radon (over Canada's Radon Guideline of 200 Bq/m<sup>3</sup>) in all buildings by 2035. We outline key actions for meeting this goal. We evaluate how BC currently measures up, where there are gaps, and provide detailed suggestions for policies, programs, and legislative and/or regulatory change.

Radon action is a cost-effective health intervention that saves lives and helps protect everyone's right to a healthy environment. It's part of a broader project for our collective future-- transitioning our building stock to ensure adequate and affordable supply, low carbon, made of sustainably sourced materials. and to ensure good occupant's health.

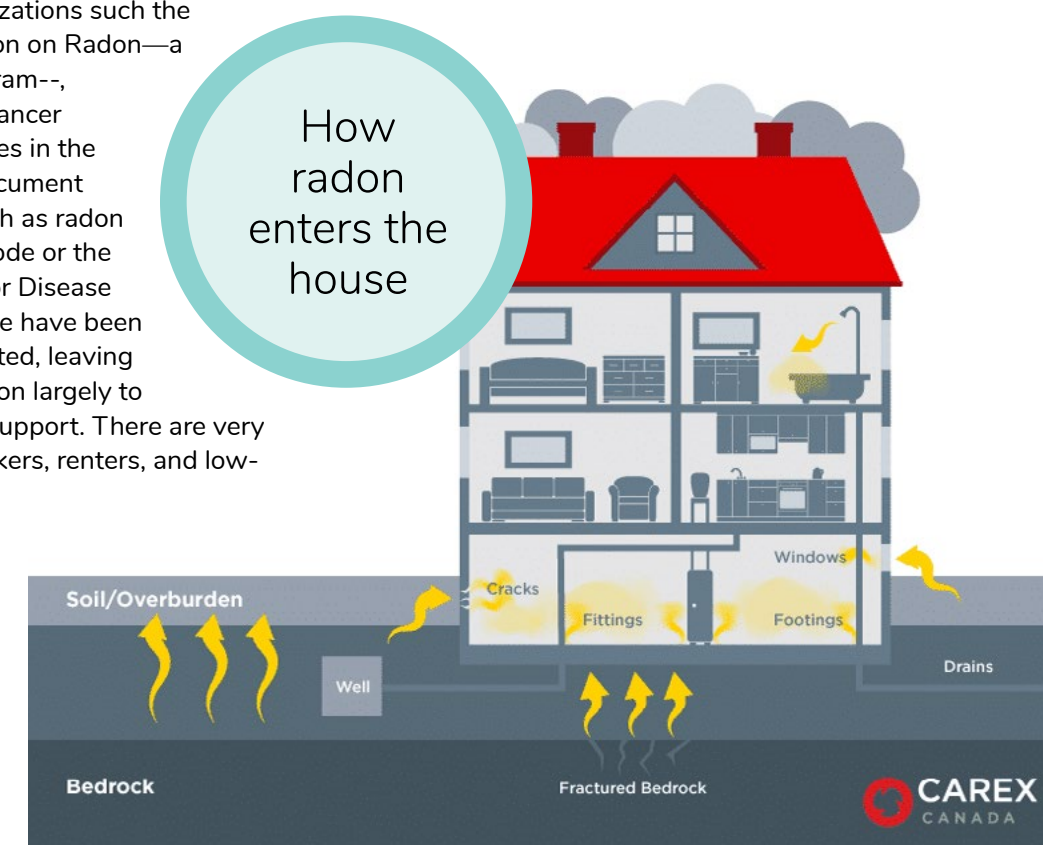


Figure description: Radon Infiltration. Courtesy of CAREX Canada, available at <https://www.carexcanada.ca/profile/radon-environmental-exposures/>

# key recommendations

## Planning

- Adopt a Radon Action Plan with the goal of eliminating elevated radon in homes, workplaces, and other occupied buildings by 2035. Give the plan a clear home in government, with the power to integrate policies, laws and/or regulations across ministries, departments, and agencies, and to coordinate with health agencies, local governments, and civil society.

## Surveillance and Education

- Create a funded program of mapping that can ensure the long-term viability of the British Columbia Centre for Disease Control Radon Repository and Map and ensure that all communities in BC have good sample testing to know local radon risks.
- Roll-out an education and outreach program to spread radon awareness, and ensure specific training on radon for health professionals, architects, engineers, builders, and municipal building inspectors. Target practical support and advice to persons at higher risk due to location or because they smoke.
- Local governments test their buildings.

## Radon Professionals

- Require persons offering radon services for a fee to be certified through the Canadian National Radon Proficiency Program (C-NRPP).
- Monitor the radon mitigation industry to estimate whether services are available in all radon-prone areas or whether additional support is needed.

## Newer Owner-Occupied Homes

- Update the BC Building Code radon provisions to more precisely specify technical standards, improve the radon systems to be installed, and ensure radon resistant construction is required in all locations with significant radon risk.
- Clarify New Home Warranty coverage for radon with new policies and guidelines, including requirements for new homeowners to receive guidance on radon testing and mitigation.

## Older Owner-Occupied Homes

- Mandate radon information for home buyers, such as having sellers give buyers standard forms produced by public health agencies.
- Provide free test kits in locations with known radon risks and cover the costs of necessary mitigation.

## Rented Homes

- Clarify BC's Residential Tenancy Act and/or Regulations to make clear that radon levels over Canada's Guideline of 200 Bq/m<sup>3</sup> is unacceptable, require landlords to test for radon (Following Health Canada's Guide for Measurements in Residential Dwellings (Homes), disclose results to tenants, and pay for necessary mitigation.
- Update the Health Hazards Regulation to include protection from radon and empower public health officers to investigate and enforce radon protections.
- Ensuring radon testing and mitigation in public and social housing, and where portable rent subsidies are used.
- Work with municipalities to improve standards of maintenance bylaws.

## Workplaces

- Revise the Occupational Health and Safety Regulation to explicitly include radon and incorporate Canada's Radon Guideline of 200 Bq/m<sup>3</sup>.
- WorkSafeBC mandates testing in workplaces located in areas with elevated radon risk, requires reporting of radon testing by employers, revises exposure registries to include radon, and discusses radon in its informational resources.
- Local governments add radon protection to businesses and public buildings through Clean Air or Health bylaws.

## Schools

- The Ministry of Education makes specific health and safety orders for radon testing and mitigation in schools, backed up with financial support.

## Child Care

- The Ministry of Education should issue guidelines on radon and make the issue clear through educational materials, guides, practice standards, and design standards, following examples from lead in water and COVID-19 protocols.
- Direct grants to childcare operators to cover the costs of radon testing and mitigation.

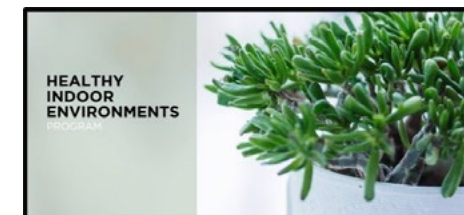
## Energy Efficiency

- CleanBC grant and incentive programs cover radon mitigation technologies, including sub-slab depressurization and mechanical ventilation.
- Targeted educational outreach to the efficiency community.
- Add the goal of healthy indoor environments and radon reduction to long-term energy and sustainability transition plans for BC's building stock.



**BC LUNG FOUNDATION**

The BC Lung Foundation's Healthy Indoor Environments is focused on providing education, resources, and policy options for addressing priority indoor air pollutants in British Columbia. Canadians spend 90% of their day indoors, with about 70% at home and 20% at work or school. The air we breathe indoors can contain particulates, gases, allergens and fumes that can significantly impact our health in both the short and long term. Knowing the main indoor air pollutants, their sources, and how to reduce them are key to reducing harm to our health. For more information visit our website at <https://bclung.ca/programs-initiatives/healthy-indoor-environments-program>.



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# the call for provincial action



Radon gas is a naturally occurring radioactive gas that comes from the breakdown of uranium in the ground. When we breath in air which contains radon, alpha particle radiation can damage lung tissue cells and DNA. Radon exposure is the leading cause of lung cancer after

smoking, and accounts for more than 3,300 lung cancer deaths in Canada.<sup>2</sup> There is a strong synergistic interaction between radon exposures and smoking given the damage both cause to lungs.<sup>3</sup> International guidance from radiation protection organizations suggests countries set radon action levels at between 100 and 300 Becquerels per cubic metre (Bq/m<sup>3</sup>).<sup>4</sup> The World Health Organization chose the lower, precautionary level of 100 Bq/m<sup>3</sup><sup>5</sup> and Health Canada sought a pragmatic compromise and set the Canadian Radon Guideline at 200 Bq/m<sup>3</sup>.

Health Canada and the Canadian National Radon Proficiency Program (C-NRPP) helps set technical standards, including guidance that all regularly occupied places be tested. The standard way to test homes in Canada involves placing a small detector in the lowest lived-in level of the home (basement or main floor) for 3 months.<sup>6</sup> Do-it-yourself long-term test kits are available, typically 30 to 60 dollars, from a variety of online suppliers and hardware stores. “Real-time” digital monitors and radon measurement services from certified professionals are also available. If test results are high, mitigation professionals can install a radon mitigation system in one or two days for about the same cost as other common home repairs such as replacing the furnace or air conditioner.<sup>7</sup>



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Health Canada's National Radon Program, recognizing Canada's division of powers, has prepared guidance from provinces as part of its Radon Action Guides. This includes examples of radon action from around the world. As well, a companion document, *Justifications and Policy Rationales for Radon Action*<sup>8</sup> provides detail on why governments should act, discussing societal values around public health, saving lives, and environmental concern. It outlines how radon action is cost-effective in the long term and protects rights to a healthy environment, and points to current government initiatives that might include radon, from Disease Prevention to Healthy Community Planning.

Building on this work, this report assesses where BC is at and what more needs to be done. the following sections outline action items that can be done individually, or take up as a whole to create a comprehensive radon action plan for BC.

## ACTION ITEMS:

### 1 planning for radon

At the most fundamental level, addressing radon means ensuring buildings we spend time in do not have elevated radon levels. Many different laws and regulations cover the indoor environment, from Building Codes to occupational health and safety regulation to residential tenancies law and more. Addressing radon requires a proactive and integrated approach. Radon Action Plans are a standard part of environmental and health governance in European countries and the United Kingdom.<sup>9</sup> In Canada's federal system, legal change and health programming will need to come at the provincial level. As of writing, we know of no agency, department or individual in the provincial government assigned responsibility for radon. Radon has been a longstanding issue which has too often been sidelined and ignored.

Some health authorities in BC have initiated action—Coastal Health has conducted radon testing in schools, and Interior Health has mandated action in childcare. We support these efforts, and health authorities can clearly advance education and awareness and in some cases have legal jurisdiction to protect public health. However, we think the need for legislative and/or regulatory change covering diverse indoor spaces—and a clear allocation of budgets to help with the costs of testing and mitigation—means radon planning needs to start higher up. We suggest a visionary approach for BC which involves a clear radon plan, backed up by legislation and funding, to ensure success in realizing an overarching goal—eliminating elevated radon (over Canada's Radon Guideline of 200 Bq/m<sup>3</sup>) in all buildings by 2035. This can ensure a consistent, integrated, and comprehensive approach.

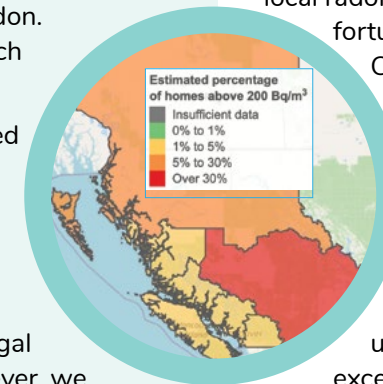
This report represents the first step in radon planning—developing a vision for addressing radon, accounting for what is already being done, and showing gaps that need to be addressed. However, BC needs to adopt clear goals on radon, adopt a strategic plan for meeting those goals, ensure there is a department or person who is coordinating efforts and driving progress, and build in monitoring and evaluation of programs to ensure goals are being met. BC's radon planning should incorporate principles of health equity, to ensure policies that work for lower income homeowners, renters, and employees. We also encourage BC to adopt good planning principles, such as collaboration, public consultation and building-in indicators and targets that are specific, measurable, achievable, and give clear timelines.

Figure description: BC Centre for Disease Control Radon Map.

### 2 databases and mapping

A key piece in understanding the radon problem is knowing what locations are more prone to elevated radon. This is particularly important in British Columbia with its varied geography. Some parts of BC have very high levels of radon— amongst the highest in the world. It is important that policy measures be directed to those areas. People charged with designing, building, buying and selling, and ensuring upkeep of buildings should know local radon levels as part of ensuring spaces are safe and free of defects.

It is generally accepted as best practice to understand local radon levels through testing indoor spaces.<sup>10</sup> BC is fortunate to have a leading resource in the British Columbia Radon Data Repository (BCRDR) at the British Columbia Centre for Disease Control (BCDC). Currently, over a dozen community and advocacy organizations, research groups, government agencies, and industry professionals have signed on to contribute to the BCRDR. This has resulted in the compilation of over 17,000 unique measurements. The BCCDC also has an excellent web-based radon map.<sup>11</sup>

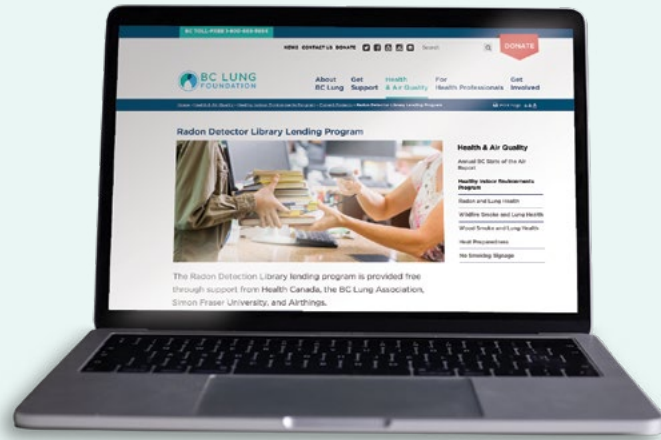


However, there remain two main challenges. First, as a glance at the BCCDC map will show, many communities have insufficient data. British Columbia has not, to date, had a coordinated radon testing program ensuring a good sample size at local levels. Sporadic initiatives mean some locations, such as Prince George and Castlegar have large numbers of tests, but many communities have insufficient data (or not a sufficient sample size) to provide a good indication of the radon problem. BC Lung is currently preparing a report detailing which communities lack sufficient radon data to have high confidence in reported radon levels. A funded program is needed to ensure all communities in BC—and especially in the Northern and Southern Interior, have sufficient sample testing conducted to ascertain radon levels. Second, the BCCDC Radon Data Repository and Map needs stable funding. To date, the initiative has been running on short term grant funding from the Canadian Public Health Association and Health Canada.

We also suggest a coordinated system for radon data collection. BC can follow many jurisdictions which regulate radon professionals, and as part of that process collect radon test data (see section 4 on p.8). Further, WorkSafeBC needs better policies (and regulatory change) which can include collecting radon data from employers and sharing it with the BCCDC (see section 9 on p.14).



### 3 education and awareness



There are now a number of web-based resources on radon in BC, such as from the BC Cancer Agency<sup>12</sup>, the BCCDC,<sup>13</sup> and some health authorities such as Interior Health.<sup>14</sup> Nevertheless, Statistics Canada continues to show low knowledge and action in BC among the public, with only 57% of households having heard of radon, only 62% of those households giving an accurate description, and only 6% of households that had heard of radon having tested.<sup>15</sup> Clearly more needs to be done—and measures that go beyond merely making information available. There are many ways to reach out to the public, from educating doctors and builders to advertising campaigns. These would be helpful steps. We think adopting a Radon Action Plan with clear policies, regulatory and legal change and incentives and subsidies for homeowners, landlords, and tenants will help change the situation.

Because radon risks are so geographically varied, we emphasize targeted outreach. For instance, where homes with exceptionally high radon levels are found, Public Health England provides additional individual practical support to the householders that can include on-site visits, individual advice, assistance in remediating, and periodic radon monitoring.<sup>16</sup> There are also examples of programs that have directed efforts at smokers in high radon areas.<sup>17</sup> BC can draw on the BCCDC's radon map to find locations where targeted interventions would be most helpful.



### 4 recognizing certified radon professionals

There is a high level of technical knowledge in Canada concerning how to test and mitigate radon. Health Canada, C-NRPP, and the Canadian General Standards Board have already developed many guidance documents on best practices for testing and mitigating different types of buildings.

Currently, radon mitigation and measurement professionals can be certified through the C-NRPP. However, certification remains voluntary. Consumers may be faced with advertisements and offers for radon abatement from unqualified providers. Consumers who do not know the details of radon may be drawn to providers who offer services at a low cost, and this creates a danger that substandard work could drive out better qualified providers and become normalized.

We suggest the BC government move to regulate radon professionals, following the precedent of 24 U.S. states.<sup>18</sup> We recommend C-NRPP certification as the appropriate standard. Currently, Technical Safety BC administers the Safety Standards Act which provides for licensing of contractors and for regulations for particular types of work. We suggest new regulations pertaining to radon mitigation services.

Another advantage of certified professionals is they can be directed to contribute testing results to centralized databases such as that held by the BCCDC. C-NRPP certified professionals already do this in Canada on a voluntary basis and so help produce C-NRPP's radon map.<sup>19</sup> Where radon mitigation professionals are regulated, there is often also requirements for test results to be delivered to government agencies.<sup>20</sup>

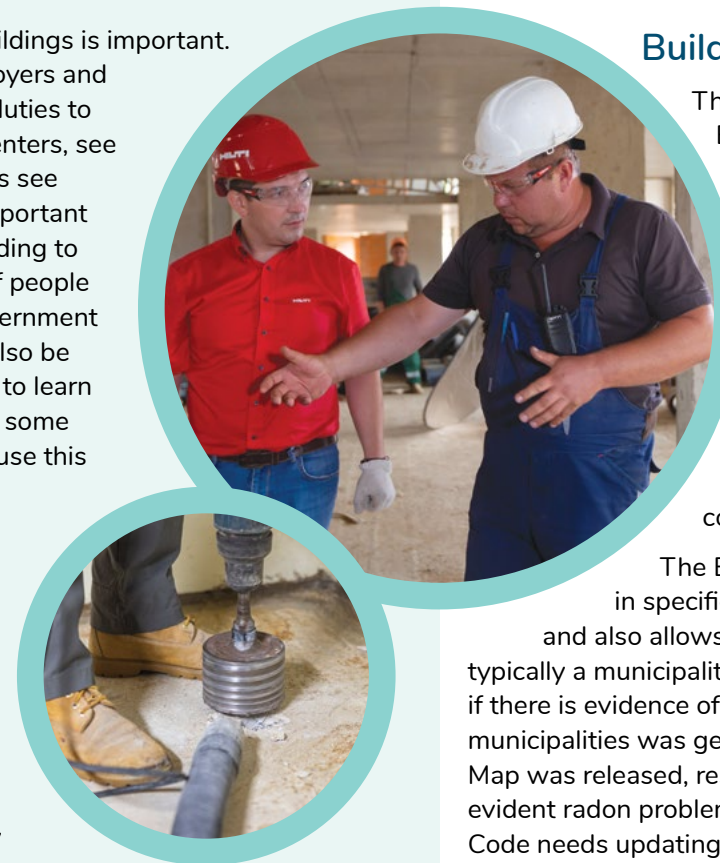
Some locations in BC do not now have nearby radon mitigation professionals.<sup>21</sup> BC should have a program to regularly monitor the radon mitigation industry to estimate whether services are available to consumers or whether additional training or other supports are needed.

### 5 government buildings & operations

Testing government buildings is important. Governments are employers and landlords and so have duties to keep spaces safe (for renters, see section 8, for employees see section 9). Testing is important for reducing risk—including to the health and safety of people who live or work in government buildings. Testing can also be a way for governments to learn radon prevalence—and some local governments can use this information to learn whether they should apply the BC Building Code radon provisions (see section 6) or adopt other policies, such as amending Clean Air bylaws (see section 9). We also think it is important for governments to lead by example—to show they are first movers in important trends, to spread awareness of the issue and of best practices in building construction and maintenance, and help build a market for radon mitigation services.

So far in BC there has been strong recognition of the need for testing of government buildings at the provincial level. Shared Services BC has tested BC government buildings and told us that the data will be released publicly. BC Housing has also begun radon testing and we expect it will also share data with the BCCDC Radon Repository.

However, the performance of local governments has not been as strong. We have been told informally by a handful of municipalities that they have tested their own facilities. As it currently stands, we know of no local governments that have publicly released radon data. There is an outstanding need for local governments to share any radon data they hold with the BCCDC Radon Data Repository.



### 6 reducing radon in new homes

#### Building Codes

The BC Building and Safety Standard Branch has a good history of considering radon—and has taken steps beyond following the National Building Code. Nevertheless, the current Code provisions have significant problems and need to be updated. BC Lung has an ongoing project to study the BC Building Code's radon provisions from which we draw the following conclusions.<sup>22</sup>

The BC Code requires radon provisions in specific municipalities which are listed, and also allows 'the authority having jurisdiction'—typically a municipality—to apply the radon provisions if there is evidence of elevated radon. The list of municipalities was generated before the BCCDC Radon Map was released, resulting in many locations with an evident radon problem not being listed in the Code. The Code needs updating to incorporate new BCCDC data.

The radon provisions point to a 'rough-in,' something less than a full radon system. Occupants need to test and, if radon levels high, add a fan to complete the system. Occupants typically do not know the purpose of the rough-in nor understand that there is a need to test—and there is a widespread public belief that the rough-in is sufficient to protect from radon. We suggest the Code be changed to require a proper radon system which will reduce radon levels—and for which Canadian General Standards Board and Standards Council of Canada has produced detailed technical guidance (in CAN/CGSB-149.11-2019).<sup>23</sup> Passive radon systems can also work effectively in tandem with heat recovery ventilation systems (which are a good idea for other indoor air quality and energy efficiency reasons).<sup>24</sup> BC Lung's Radon and the Building Code project also detailed a series of gaps in the Code provisions which now result in very poor and malfunctioning radon rough-ins being built. We suggest incorporating specific technical requirements from CAN/CGSB-149.11-2019 as well as better education for builders, trades, and municipal building inspectors.



## New Home Warranty

We found large gaps concerning radon in BC's New Home Warranty system, with no specific language concerning radon in the Homeowner Protection Act and Regulations, no policies by service providers nor legal cases offering helpful interpretation. An alternative situation exists in Ontario. Tarion, the government agency that serves as the sole warranty insurance provider, explicitly warrants construction against levels of radon exceeding 200 Bq/m<sup>3</sup> for seven years, indicating it is treated as a major structural defect.<sup>25</sup>

BC's Home Warranty system provides "2-5-10" protection. There should be no controversy that when Building Code provisions have not been met adequately, a builder would be responsible (or a warranty provider cover repairs) for 2 years for materials. However, we think elevated radon in homes should also be considered a problem of envelope failure, signally a 5-year coverage period. The Homeowner Protection Act Regulation defines 'building envelope' as "assemblies, components and materials of a new home which are intended to separate and protect the interior space of the new home from the adverse effects of any exterior climatic conditions".<sup>26</sup> The BC Building Code, 2018 sections on radon fall more generally into a set of provisions designed to control ingress of water, moisture and soil gas—clearly outside climatic conditions.<sup>27</sup> However, we do not expect private warranty providers to voluntarily adopt this as policy, and we do not predict this will get resolved by courts, given the current emphasis in the Homeowner Protection Act and Regulations on informal dispute resolution.

There is a need for policies, and guidelines to provide explicit direction on radon under New Home Warranty. Radon information should also be included in applicable guidance documents, such as Construction Performance Guides for warranty-approved builders and continuing education requirements for building contractors. There is a clear role—and need—for guidance and requirements to ensure radon testing after occupancy. We suggest a procedure whereby home builders provide information to new homeowners about the risks of radon and the importance of conducting a long-term radon test. Such information could be provided through a BC Housing (and industry) approved guidance document, which also discusses other important indoor air quality and home maintenance issues.



# 7 reducing radon in owner-occupied homes

While Building Code changes can be an important way to address radon, only 1 to 2% of the housing stock is newly built each year. There are, however, a suite of interventions that can help reach the existing housing stock.

## Real Estate Transactions

BC Lung conducted a major research initiative on radon in real estate transactions in 2019 to 2020, recognizing that when people buy and sell homes they are more likely to be concerned about indoor air quality and health issues in a building.<sup>28</sup> Significant movement was made in BC in 2020. The British Columbia Real Estate Association (BCREA) told its membership that radon was a latent defect<sup>29</sup>, and added radon to the Property Disclosure Statement.<sup>30</sup> The British Columbia Financial Services Authority (BCFSA) now also instructs real estate licensees that radon is a latent defect and has produced Radon Precautions Guidelines.<sup>31</sup>

BCREA and BCFSA drew on common law and real estate professional standards concerning working in the best interests of clients and the need to disclose latent defects. The rule concerning latent defects holds that a seller (or his or her agent) must disclose any underlying and hidden problems that cannot be found in a normal inspection process. This creates a clear gap in cases where the seller does not know—for instance if they never happened to test for radon, they will not have pertinent information to disclose. We know most people do not test for radon and so do not know radon levels. At minimum, we think there is a need for follow-up research to evaluate whether the new BCREA and BCFSA provisions are making a positive difference.

New legislation and regulation could do more to make sure that real estate transactions include reference to radon. We suggest mandating information for home buyers, such as having sellers give standard forms, typically produced by public health agencies, concerning

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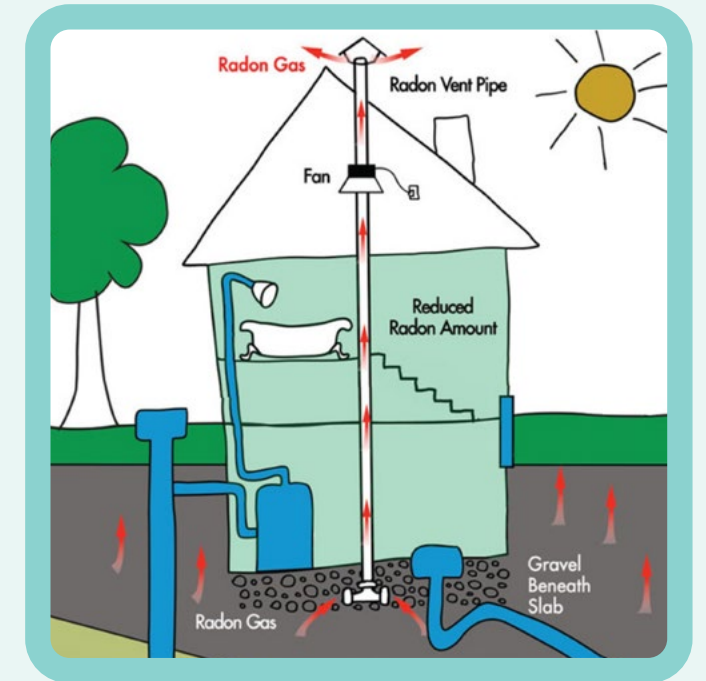
radon, its risks, and the importance of radon testing.<sup>32</sup> An alternative approach might be to work with trade associations/regulators to streamline information that realtors give to clients as part of their own professional duties. In the longer term, we would like to see all homes be tested for radon prior to sale or in the period immediately after occupancy.

## Subsidies & Financing for Homeowners



To date, some homeowners have been able to access radon detectors as part of testing efforts. These include the RadonAware program, the Donna Schmidt Lung Cancer Memorial Society which has offered free kits in the Kootenays, BC Lung's Community Testing Program, and Take Action on Radon's 100 Test Kit Challenge. These have been primarily earmarked at raising awareness and learning community radon levels rather than providing mass access to free or subsidized testing. One bright spot is that the Canada Revenue Agency will allow tax deductions for home testing for people who are self-employed or work from home.<sup>33</sup> This will not reach most homeowners.

The situation with mitigation is worse. A recent study from the Evict Radon group of researchers emphasizes that there has been a reliance on individual responsibility for testing and mitigation in Canada. As the authors note "This can result in inequitable exposure and hence increased risk for lung cancer in those groups less likely to take personal action to mitigate risk". Drawing on surveys of 2,390



Above: Sub-slab depressurization in a house

Testing and mitigating elevated radon is a cost-effective health intervention. This means testing and mitigating radon is a cheaper way to prolong life and avoid disease than many routine procedures that are now paid for in hospital.

persons, the authors found that of those who felt radon levels were high in their home, 28.5 percent indicated that, although they desired to mitigate their property for radon, they were not able to afford it. A further 1.9 percent declined to take action, which the authors concluded was due to their socio-economic condition.<sup>34</sup> To date efforts to subsidize mitigation have been modest, such as the 2021—2022 efforts of Take Action on Radon and the Regional Air Quality Coordinator of the Regional District of Central Okanagan to allocate \$25,000 to a grant program for mitigation area residents, offering reimbursements up to \$500 or up to \$1,500 for low-income households.<sup>35</sup>

Testing and mitigating elevated radon is a cost-effective health intervention.<sup>36</sup> This means testing and mitigating radon is a cheaper way to prolong life and avoid disease than many routine procedures that are now paid for in hospital. Just as our health care system pays for heart surgeries, our system should pay to mitigate radon. Radon testing and mitigation is most cost effective in higher radon regions—because fewer homes need to be tested before one is found to need mitigation. To maximize use of health care funds, we suggest using the BCCDC database and maps to target subsidies and grants to higher risk areas.



# 8 rented homes



Thirty-three percent of British Columbia households rent.<sup>37</sup> From a public health perspective it is important that this significant sub-set of the population is protected from radon. To date there is no explicit guidance on radon protection from legislation, regulation, or policy of the Residential Tenancy Branch. One interesting new development has come from

BCFSA, which regulates rental property managers: If a landlord (or rental property manager) is aware of elevated radon, they need to disclose this to prospective and existing tenants as a material latent defect.

BC Lung has written legal opinions, a Guide for Landlords (endorsed by Landlord BC)<sup>38</sup> a Guide for Renters (endorsed by the Tenant Resource and Action Centre–TRAC)<sup>39</sup>, and a Checklist for Radon Testing, (endorsed by Landlord BC, TRAC, and the Canadian National Radon Proficiency Program (C-NRPP)<sup>40</sup> to help ensure renters and landlords can agree on how to test for radon.

Landlord-tenant tribunals in Ontario and Quebec have ruled that landlords are responsible for ensuring radon levels are not over 200 Bq/m<sup>3</sup>.<sup>41</sup> BC's Residential Tenancy Act has similar provisions on accommodation being in good repair and the RTB should make similar findings. However, there exist significant obstacles to cases being brought forward. Renters tend to move every few years, meaning they are unlikely to put their mind to longer term air quality issues in their units. In a tight rental market renters often do not want to upset their existing landlords. We are also concerned about current provisions in the Residential Tenancy Regulation that allow for landlords to apply to the RTB for rent increases for capital expenses. This provision provides ambiguity. On the one hand, the regulation allows capital expenditures install, repair or replace a major system or major component in order to maintain the residential property in a healthy and safe state of repair.<sup>42</sup> On the

## Thirty-three percent of British Columbia households rent. From a public health perspective it is important that this significant sub-set of the population is protected from radon

other hand, further provisions say the RTB can decline a landlords application for capital expenditures required due to inadequate repair or maintenance by the landlord.<sup>43</sup> This creates considerable uncertainty concerning who will have to pay to ensure renters are protected from radon.

Some BC municipalities have standards of maintenance bylaws, which in principle could provide levels of health protection for renters. We reviewed the 62 largest municipalities in BC (representing a vast majority of the population), searching not only explicitly named "Standard of Maintenance" bylaws but others (with names

such as "Good Neighbour", "Property", or "Nuisance") that might potentially contain renters' protection. Most communities do not have any specific maintenance standards for rentals (42 out of 62), and none explicitly mention radon.<sup>44</sup> Clearly, the current system of delegating standards of maintenance to municipalities is not working. We were particularly concerned about 14 larger municipalities without any radon protections in bylaws, and in which public radon databases show over five percent of homes tested at or over 200 Bq/m<sup>3</sup> — Creston, Fort St. John, Kelowna, Lake Country, Nelson, Penticton, Prince George, Quesnel, Salmon Arm, Summerland, Terrace, Vernon, West Kelowna, and Williams Lake.

A further potential source for renters' protection is through the Public Health Act. The current Health Hazards Regulation contains some provisions relating to minimum airspace and potable water in rentals, but is silent on other health and indoor air quality concerns, including radon. Alternatively, the Public Health Act provides more general language that

empowers public health officers to do various things to stop "health hazards". This includes inspecting places to see if health hazards exist<sup>45</sup> and making orders to prevent health hazards.<sup>46</sup> This might point to wide ranging interventions by health officers concerning radon, such as inspecting and issuing orders in rental accommodation. The Public Health Act currently provides a very general definitions of "health hazard" as "a condition, a thing or an activity that endangers, or is likely to endanger, public health." While radon is clearly a public health problem in the sense of being a preventable cause of disease, it is not specifically included as a "health hazard" in the Health Hazards Regulation or other regulation pursuant to the Public Health Act. Further, health officers have viewed the Public Health Act in "public" rather than private terms, and so have been reluctant to investigate private residences. Things do not need to be so restrictive. Alberta Health Services has ordered radon mitigation in rental accommodation and developed a guidance document on radon in rental accommodation. Inspectors drew on general nuisance clauses in Alberta's Public Health Act to inspect rental accommodation for radon and to speak to landlords.<sup>47</sup> We think legislation and regulation in BC can be improved to send a clearer message for health officers concerning radon.<sup>48</sup>



## We call on the province to implement measures to protect renters' lung health, including:

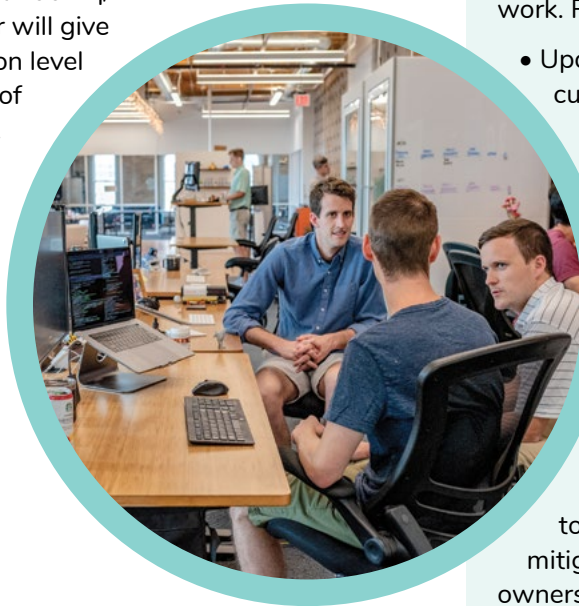
- New legislation and/or regulation that makes clear what counts as a problematic state of disrepair (including radon), requires landlords to test for radon (Following Health Canada's Guide for Measurements in Residential Dwellings (Homes)), disclose results to tenants, and pay for necessary mitigation. Landlords should be directed to provide a written notice to tenants concerning radon risks. Ideally, standard form rental agreements will include formal recognition by the tenant that they have received this information (such as through initialization).
- Clarifying regulations to the Public Health Act to specify indoor air quality standards for housing, and to give health officers the power, mandate, and funding to investigate radon and issue orders against landlords.
- Making it easier for renters to ensure radon testing and mitigation happens, such as explicit wording including it as 'emergency repairs' for which renters can recoup costs from landlords. Clarification is needed to ensure radon protection is not deemed a capital expenditure which legitimates rent increases and discourages low-income renters from seeking protection.
- Ensuring radon testing and mitigation in public and social housing— as well as updating internal standards, guides and toolkits for housing managers, such as BC Housing Design Guidelines and Construction Standards.<sup>49</sup>
- For non-profit housing providers or when rent subsidies are provided, ensure radon testing and mitigation is included in required standards and operating and management agreements, as well as offering financial support.
- For cooperatives, education and outreach on radon, including drafting model policies for housing cooperatives, or providing targeted subsidies and incentives for radon testing and mitigation.
- Working with municipalities, including tying funding for new housing initiatives to improved standards of maintenance bylaws.
- Distribution of subsidized or free radon testing kits, extending tax credits, direct grants and other incentives for radon work in rental accommodation.



## 9 workplaces

Radon in the workplace has long been recognized in Canada—radon is not only a problem in mines, but can affect schools, daycares, banks, educational facilities and other workplaces.<sup>50</sup> Indeed, almost anyone who works in a building can be exposed to radiation from radon, especially in geographic locations where elevated radon is common in buildings. Employers and workers too often fail to make the link to radon. While statistics show radon levels tend to be lower in workplaces than homes, there is now good evidence that many workplaces have radon over 200 Bq/m<sup>3</sup>—the Canadian Guideline for radon in regularly occupied spaces including workplaces. Testing and mitigating workplaces is also an important way to ensure people who visit or live in workspaces are protected (such as visitors to businesses and restaurants, students at schools, young children in daycares, people in incarceration facilities or the elderly in care homes). WorkSafeBC does not currently have clear policies on radon—meaning WorkSafeBC enforcement officers may feel unable to help exposed workers.

BC Lung has completed a lengthy report explaining how BC’s Occupational Health and Safety Regulation (OHSR) should be read to include radon.<sup>51</sup> On the one hand, a detailed analysis shows that the OHSR already protects workers from ionizing radiation (ss. 7.18 to 7.25) and that exposure to air at 200 Bq/m<sup>3</sup> in a full time job for a year will give over the existing action level for ionizing radiation of 1 mSv effective dose. On the other hand, this interpretation is not easy to reach for those without explicit knowledge of radiation science.



### We suggest changes to the OHSR which in turn can drive WorkSafeBC policy.

- Revisions to the OHSR to make it much clearer that radon is covered.
  - Clear rules for testing in areas with high radon prevalence, including home workplaces. We think all workplaces should be tested in geographical locations where ten percent or more of buildings are known to have high radon. (We choose this number given that the prevalence of elevated radon is lower in workplaces than homes, and because we think it’s important to choose some threshold for requiring testing).
  - Better surveillance of radon in the workplace. The BCCDC radon map measures radon in homes, not specifically workplaces. We need more data points on workplace radon. WorkSafeBC has the power to ensure radon test results from workplaces go into a province-wide database. WorkSafeBC has created exposure registries as a way for workers, employers, and others to register exposure to a harmful substance or agent or work. Registry forms should be updated to include radon.
  - Update Information and Resources. WorkSafeBC’s current public resources need updating. This includes webpages that mention radon, occupational cancers, and hazards. Radon should be identified as a fixable problem in the Safety Inspections Workbook, Prevention Manual, publications on Working from Home, and the Occupational Disease Initiative.
- A further way to protect workers is through bylaws at the local government level. Many local governments in BC already have “Clean Air” or “Health” bylaws that protect air through banning smoking indoors. They can be expanded to include rules requiring testing and necessary mitigation of radon in public indoor spaces. Business owners and occupiers of buildings can be asked to test for radon and post results that can be seen by workers or the public, and to mitigate any elevated radon. Local governments could use business licensing, permitting and fines as methods of enforcement.



## 10 schools

From a public health perspective, radon in schools is particularly important given that children spend so much time indoors while at school. Also, children exposed to radon are twice as likely to develop lung cancer compared to adults when exposed to the same concentrations. Children’s smaller lungs, faster breathing rates, and lower proximity to the ground results in higher levels of radon exposure and, therefore, a higher risk of developing lung cancer.<sup>52</sup>

BC Lung has prepared a legal opinion and outreach materials on radon in schools.<sup>53</sup> School testing and mitigation are ways to protect the occupational health and safety of schoolteachers, administrators, and staff, and schools have general duties to protect the safety of students. Also, schools are a good conduit in communicating with parents about the risks of radon and to encourage testing at home.

The Ministry of Education does not have explicit guidance on radon testing in schools, and there is no province-wide program for testing in schools. CAREX Canada researched testing of radon in BC schools in 2017 and 2018 and found that only 239 of BC’s 1,566 schools had been tested (15 percent).<sup>54</sup>



### There is some good news.

- Vancouver Coastal Health (VCH) conducted a widescale radon screening process in area schools. 92 schools were tested in the North Shore/Coast Garibaldi regions of VCH (North Vancouver, West Vancouver, Sea-to-Sky, Sunshine Coast, Powell River and Central Coast) during the 2017/2018 school year. 10 percent of schools had at least one room above the WHO recommended action level of 100Bq/m<sup>3</sup> and three percent had at least one room above the Canadian guideline of 200Bq/m<sup>3</sup>.<sup>55</sup>
- The BCCDC has developed a Radon Measurement and Mitigation Guideline for Schools.<sup>56</sup>
- Interior Health, with funding from Health Canada, spearheaded a testing program in Central Okanagan Public Schools (School District 23) and some participating area Independent Schools during the winters of 2020/21 and 2021/22.
- Medical health officers in Interior Health have sent a letter to schools encouraging schools to test.<sup>57</sup>

In principle, school testing could be overseen by school medical officers/health officers employed by Health Authorities, which could be directed by the Ministry of Health.<sup>58</sup> However, there is a clear precedent for the Ministry of Education to make specific health and safety orders for schools,<sup>59</sup> and has done so for testing lead content in drinking water<sup>60</sup> allergies and anaphylaxis<sup>61</sup>, and provision of menstrual products.<sup>62</sup> School testing (and any follow up mitigation) should be done by persons with C-NRPP training. Some school districts may choose to send their existing maintenance staff to be trained, while others may hire trained radon professionals on a contract basis.





# 11 child care

The BC government has begun to take child care much more seriously—creating a Minister of State for Child Care, promising ten dollar a day care, and switching responsibility for child care to the Ministry of Education. This reflects its importance for early childhood development and parents' access to education and participation in the labour market. Parents of young children are often very focused on the health conditions of childcare spaces and more attention is needed to address indoor air quality issues in childcare. As The Coalition of Child Care Advocates of BC and Early Childhood Educators of BC have recently stated, “As BC builds out a system of universal childcare, there is an opportunity to ensure that childcare centres are built, and programs are operated in ways that advance environmental health for children and staff”.<sup>63</sup> They share our concern with radiation from radon in child care settings.<sup>64</sup>

BC Lung has prepared a legal opinion on radon in childcare settings which shows there are strong legal grounds for children to be protected from radon. Along with the occupational health and safety rights of staff, there are rules specific to childcare spaces. The *Community Care and Assisted Living Act* requires that a licensee must operate a daycare in a manner that will promote the health, safety and dignity of persons in care.<sup>65</sup> The Child Care Licensing Regulation says a licensed daycare must ensure that a healthy and safe environment is provided at all times while children are under the supervision of employees<sup>66</sup> and that children are not to have access to hazardous substances.<sup>67</sup> Yet many daycares in the province do not make the connection to radon.



**Many childcare providers are low on funds. There is a need for financing models—including direct grants—to help cover the costs of radon testing and mitigation.**

There is a clear need for special rules requiring radon testing in daycares.<sup>68</sup> In BC this has happened through Interior Health, which issued an order for radon testing for daycares.<sup>69</sup> However, we think a better approach is for provincial level action: The Ministry of Education should give explicit guidance on radon in education materials, guides, practice standards, and design standards, following examples from lead in water and COVID-19 protocols.<sup>70</sup> The *Community Care and Assisted Living Act* gives the Director of Licensing the power to specify policies and standards of practice for all community care facilities.<sup>71</sup> As well, the Ministry, through the Director of Licensing could also order Health Authorities to make investigations and reports about radon in daycares in their geographic areas.<sup>72</sup>

Many childcare providers are low on funds. There is a need for financing models —including direct grants— to help cover the costs of radon testing and mitigation.



# 12 energy efficiency

There is a complex relationship between radon ingress and energy efficiency measures in buildings. Efficiency measures can make buildings ‘tighter’— reducing air exchange— and in doing so prevent radon from escaping into the outdoors.<sup>73</sup> In older homes, energy efficiency retrofits can drive up radon levels unless there is special attention to the radon problem. A simple intervention, such as putting plastic over windows, can drive up radon levels. Researchers have found that radon continues to be a problem in newer homes—in fact radon levels are increasing over time.<sup>74</sup> In BC, the Building Code radon provisions do not necessarily lead to lower radon levels unless occupants take additional steps to test for radon and add a fan to the rough-in.



other indoor air quality issues is key to ensuring our homes and workplaces reflect a growing societal awareness of the right to a healthy environment.

BC Lung has been running a specific research project on energy efficiency and radon.<sup>76</sup> We think the causal link between energy efficiency measures and increased radon should be a concern for equipment manufacturers, energy advisors and contractors, all of whom have a duty of care not to increase risks of harm through their work. Clients should be warned of the risks of radon, and all efforts taken to ensure homes are tested after construction or any renovation work.<sup>77</sup>



BC has developed a robust system of grants and incentives for energy retrofitting and some federal programs also apply in BC. We reviewed programs including Canada Mortgage and Housing Corporation’s Green Home program, CleanBC Better Homes and Home Renovate Rebate Program, CleanBC Better Homes

**In new construction, efficiency measures when done right can be coupled with design systems to improve indoor air quality, including radon mitigation.**

That said, there does not need to be a conflict between improved energy efficiency and safeguarding against elevated radon. In older homes, addressing radon can be part of a holistic approach to building retrofitting. In new construction, efficiency measures when done right can be coupled with design systems to improve indoor air quality, including radon mitigation. Researchers have found that some energy efficiency and radon systems can work synergistically, such as when a passive sub-slab depressurization system is coupled with a balanced mechanical ventilation system.<sup>75</sup> With the climate emergency we are at a decisive moment concerning transforming our building stock: Addressing radon and

CleanBC Income Qualified Program, and Vancity Credit Union’s Planet Wise Home Renovation Loans. Most grants and incentives require homeowners to seek the advice of energy advisors who are certified through Natural Resources Canada. When we conducted interviews with a sample of advisors, we found poor knowledge of radon and no systematic efforts to warn clients of the radon problem. We also found that none of the grant, incentive and financing programs we looked at specifically mentioned radon nor made funds available to help with radon testing or mitigation.<sup>78</sup>

Provincial radon action should include outreach to efficiency program managers, education to contractors, and ensuring that any government (or agency)-linked incentive and financing programs include incentives for radon testing and mitigation along with efficiency and other ‘green building’ improvements.



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