

Tools for Reducing Pollution from Wood Heating:

Moving Beyond New Wood Stoves & “Better Burning”

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INTRODUCTION

In many communities in BC, and throughout North America, the use of wood heating has been shown to create a significant amount of harmful fine particulate (PM_{2.5}) pollution. According to BC Healthlink:

Particulate matter is considered the air pollutant of greatest concern to the health of the B.C. population. Research has shown that exposure to PM can lead to increased days lost from work or school, emergency room visits, hospital stays and deaths.¹

Many communities are struggling with how best to improve air quality, and health outcomes, by reducing pollution from wood smoke. Air quality advisory committees have been struck, emissions inventories conducted, mobile monitoring studies undertaken and more.

The predominant focus of wood smoke reduction programs across the country, and even nationally, has been to get people to upgrade their older “conventional” stoves to newer, certified ones. Rebate programs encouraging such stove upgrades also usually include education for wood stove users on “better” or “clean” burning practices such as seasoning your wood, keeping it dry, chopping smaller pieces, burning the stove hot and so on.

Until recently, very little attention or effort has been placed on getting people to switch completely from wood heat to non-wood burning appliances (which have substantially lower emissions), or on using other tools to reduce pollution by reducing the use of the appliance causing the pollution.

Purpose of research

The purpose of this research was to explore current, new or innovative regulatory tools or programs that have been used, or could be used, to reduce wood smoke in communities (in BC, Canada or internationally).

As wood stove upgrades and better burning education approaches have been discussed extensively elsewhere² and have dominated the field of wood smoke reduction initiatives for years, the focus of this research was placed on other approaches.

The research also focused exclusively on tools targeting the reduction of wood smoke specifically from home heating; it did not address approaches to reducing smoke from different forms of outdoor burning.

¹ <https://www.healthlinkbc.ca/healthlinkbc-files/outdoor-air-pollution>

² For example, see:

- BC Wood Stove Exchange Program: Program Evaluation (2008 to 2014): https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/wsep_evaluation.pdf
- Rebates for new wood stoves: Not an effective solution to pollution <http://breathecleanair.ca/wp-content/uploads/2017/10/Wood-stove-rebates-not-solution-to-pollution.pdf>
- What makes a successful woodsmoke reduction program, <http://breathecleanair.ca/wp-content/uploads/2019/01/What-makes-successful-woodsmoke-programs.pdf>

BACKGROUND

Regulatory tools in BC

At a provincial level, BC's *Solid Fuel Burning Appliance Regulation*, passed in 2016, governs the required certification level of wood stoves that can be sold by retailers in the province and the type of fuel that can or can't be burned in any wood burning appliance.

However, the regulation of wood stove installation and use has for the most part been left up to local governments (the BC Building Code outlines safe installation requirements for wood burning appliances and chimneys but does not address anything related to the type or use of the appliance).

In 2006, the Government of Canada released the "Model Municipal Bylaw for Regulating Wood Burning Appliances".³ This document provides an overview of selected regulatory tools that may be used to regulate wood burning appliances. The report summarizes each tool, highlighting the advantages and disadvantages of each, and identifies places in Canada and elsewhere that have implemented this type of tool.

According to inventories of BC wood stove bylaws, some of the tools from the 2006 model bylaw have been adopted in BC communities.⁴ In 2007, 22.7% of local governments in the province reported having bylaws governing wood burning appliances; this number increased to 78% according to a similar inventory in 2015.⁵

However, a review of the 2015 inventory highlights that most of these new regulations are limited in scope.

Of the 147 communities that had some sort of bylaw related to wood stoves in 2015:

- The majority simply require a permit for installing a new stove and, in some cases, specify that these new stoves must meet CSA or EPA standards.
- 36 have restrictions related to the fuel that can be burned.
- 11 specify no burning during an air quality advisory.
- 9 require removal of non-certified appliances (or prohibit their use) under certain conditions.
- Just 7 have bylaws nuisance provisions related to smoke from wood stoves.
- Only 3 have opacity limits on emissions.

The value of some of these specific tools is discussed later in this document.

³ <http://publications.gc.ca/site/eng/286238/publication.html>

⁴ The most recent inventory was done in 2015: <https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/bylaws-2015.pdf>

⁵ See p. 11 in 2007 inventory (https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/air_bylaws_bc.pdf) and p. 4 in the 2015 inventory.

BC program tools

In BC, the Wood Stove Exchange Program (WSEP) has been the primary program used to address residential wood heating pollution in different communities in the province.

The focus of this program has been twofold:

1. Getting people to remove older wood stoves and upgrade to newer stoves that have improved emission standards or to other heating appliances; and/or
2. Teaching people how to use their wood burning appliances in a way that will reduce emissions.

According to the website for the WSEP, since 2008, 29 programs have been offered in the province, involving 20 regional districts and over 45 municipal partners.⁶ Over \$3 million has been spent by BC on this program, with some additional contributions by local communities and other stakeholders. Rebates have been provided for the replacement of well over 7000 non-certified wood-burning stoves since the program began.

While most of these stoves have been replaced with newer, certified stoves, some have also been replaced with pellet, gas or, as of 2018, with ductless heat pumps. Additionally, starting in 2018, some local programs have allowed certified stoves more than five years old to qualify for rebates for non-biomass burning appliances.

The “better burning” education component has also been an integral part of the WSEP. However, the education methods used (e.g. advertising, workshops, door-to-door work, pamphlets, videos) vary from community to community according to the 2015 evaluation of the program.

Education about the health impacts wood smoke pollution (the ultimate reason the program was created) is not a required element of the program and is often mentioned briefly, if at all, in most WSEP programs.⁷ There may be general references to the need for “improving air quality”, but there has seldom been any mention of the impacts of wood smoke on public health.

⁶ <https://www2.gov.bc.ca/gov/content/environment/air-land-water/air/air-pollution/smoke-burning/exchange>

⁷ For example: <https://www.kamloops.ca/our-community/environment-sustainability/air-quality/wood-burning/>; <https://lavingtonlifesociety.wordpress.com/coldstream-woodstove-exchange-program-coldstream/>; <http://www.metrovancouver.org/services/airquality/AirQualityPublications/WoodStoveExchangeProgramBrochure.pdf>; <https://www.nanaimo.ca/docs/property-development/rebates/regionalwoodstoveprogrambrochure.pdf>

OTHER REGULATORY AND PROGRAM OPTIONS

This section looks at different approaches that may already be in use in BC, that could be improved upon or that could be created in order to secure a greater reduction in wood smoke pollution from home heating.

Health Education

As noted above, education on health impacts of residential wood heating has been missing from many programs and communications materials in WSEP programs. Even external resources some of these programs direct citizens often fall short on the health messaging.

For example, the program in Lumby, BC links to the federal CMHC's 82-page "Guide to Residential Wood Heating" from 2008. This guide does not mention 'health' once in the entire document.⁸

A 2009 report (prepared for the National Collaborating Centre for Environmental Health) titled "Residential Use of Wood-Burning Appliances in Canada: Emissions, Health Effects, and Intervention Strategies"⁹, noted

... public attitudes and perceptions can represent a significant barrier to change, given that wood-burning appliance users often perceive far fewer health risks from wood smoke and exhibited far less support for woodsmoke control policies or changing wood-heating practices than non-users.... Additionally, in many regions in Canada, public health authorities report that woodsmoke from residential woodburning is viewed by local municipalities or health agencies as a public nuisance issue, rather than being perceived as a threat to public health. (p.7)

The report authors highlighted that health practitioners and policymakers were often unaware of the potential health risks associated with residential wood-burning. One recommendation in the report outlined the need for a clearinghouse of information related to residential wood burning, including information on the health impacts. This ten-year old recommendation does not appear to have been implemented.

The importance of education on health effects was also highlighted in an analysis of different wood smoke reduction programs in Australia and New Zealand.¹⁰ The author noted that people were more likely to move away from wood heating and/or to support regulatory change if they were aware of the health effects of wood smoke.

In one community in Australia, a survey of people who burn wood showed that only 28.6% agreed with the statement "particles in the smoke coming out of the chimney can be harmful to my family and my neighbours' health." Efforts to reduce wood smoke pollution, which focused on teaching better burning techniques, had not successfully reduced PM2.5 levels in this community.¹¹

If wood stove users in particular are either unaware of or, worse, disbelieving of health effects of wood smoke, it is not surprising that motivation to change behaviors (whether to burn better or upgrade to

⁸ https://www.regionaldistrict.com/media/207292/CMHC_guide_to_residential_wood_heating.pdf

⁹ http://www.nccch.ca/sites/default/files/Wood-burning_Appliances_Dec2009.pdf

¹⁰ http://breathecleanair.ca/wp-content/uploads/2019/01/What-makes-successful_woodsmoke_programs.pdf

¹¹ Ibid.

cleaner heating appliances) will be low. It is surprising, therefore, how little mention of health impacts there have been in most Wood Stove Exchange programs.

Mixed messages

When governments fund or teach better burning practices, and even use taxpayer resources to help people install better stoves, they can be seen to be normalizing and condoning wood burning.

As noted in the analysis of wood smoke reduction programs in New Zealand and Australia:

Governments are expected to regulate harmful substances. Lead in petrol and asbestos were banned. Regulations also protect people against passive smoking. The public sees a simple, consistent message about cigarettes because adverts promoting tobacco are banned. In contrast, public information about wood heaters consists mainly of glamorous adverts for new heaters. None ever give the faintest impression that woodsmoke could be harmful. Instead, prospective purchasers are told that wood heaters benefit the environment. Together with the current lack of regulation on woodsmoke, these messages negate current efforts to reduce woodsmoke and give the impression that woodsmoke cannot possibly be harmful, or anything like as bad as passive smoking.¹²

It is hard to change the culture of wood burning when governments are actively supporting the use of residential wood heat, even within densely populated towns and cities.

Additionally, the participation of national and provincial health agencies in programs that support the installation of new stoves and provide materials on burning practices, even though wood heat is known to be the unhealthiest source of heat available, sends a message that some wood smoke really isn't that unhealthy. This conflicts with messages from sometimes the same organizations that there is no safe level of exposure to fine particulate matter.

Examples of approaches to health education about wood smoke

There are many different ways to implement health education and to integrate it into programs like WSEP and other health outreach initiatives. Below are some examples of different tools that have been used elsewhere.

It is of course important that any planning for communications or outreach needs to ensure it will reach the right audiences, with the right messaging, at the right time.

San Francisco Bay Area

The *Spare the Air* program in the Bay Area has been communicating the risk of wood heating for a number of years. They use a variety of tools including videos like these:

- <https://www.youtube.com/watch?v=DXBEnvOUISE>
- https://www.youtube.com/watch?v=f8ILWyl_BqY

And they use pointed images like the one on the right.



¹² Ibid, p. 23

An additional tool for health education in the Bay Area is the requirement that anyone offering for sale, selling or installing a new or used wood-burning device must provide public awareness information to each purchaser of a wood-burning device in the form of pamphlets, brochures, or fact sheets addressing proper installation, operation, and maintenance of the wood-burning device *and* the health effects of wood smoke.

The requirement states that the information on health effects of wood smoke shall include the following statement: “Wood smoke contains harmful particulate matter (PM) which is associated with numerous negative health effects.”¹³

The Bay area also requires that anyone selling, renting or leasing a home with a wood burning appliance must get the buyer or renter to sign a disclosure statement which clearly outlines a range of health impacts of wood smoke pollution.¹⁴ The statement also includes information about possible bans on use of wood burning devices during times of poor air quality.

New South Wales, Australia

The Environmental Protection Authority in New South Wales puts health in the forefront of their communications on wood smoke pollution. They use the very clear health related tag line “Wood smoke isn’t good smoke” in a series of communications materials.¹⁵

This series provides local councils with access to a package of animations, print resources, Facebook ads, ‘myth buster’ graphics, radio ads and website resources that highlight health impacts as well as better burning practices.

Animations



- Practical tips for wood heater owners (MP4, 38MB)



- Harmful impacts of wood smoke pollution (4MB)

Radio ads



- Woodsmoke awareness radio ad (WAV 14MB)
- Woodsmoke tips radio ad (WAV 5MB)

Print resources



Facebook ads



Myth busters



No burn times

One regulatory tool described in Canada’s Model bylaw discussed earlier is about instituting a ban on burning during times of poor air quality. The federal document talks about the possibility of voluntary or mandatory bans, typically during an air quality advisory.

According to the 2015 inventory of wood stove related bylaws in BC, 11 communities have instituted mandatory bans during air quality advisories. These advisories are called by the BC Ministry of Environment and Climate Change.

¹³ http://www.baaqmd.gov/~media/files/compliance-and-enforcement/advisories/wood-smoke/adv6_3-heat-retailers-reminder-11-10-11.pdf

¹⁴ <http://www.baaqmd.gov/~media/files/communications-and-outreach/wood-smoke/residential-fireplace-disclosure-031516-pdf.pdf?la=en>

¹⁵ <https://www.epa.nsw.gov.au/your-environment/air/reducing-wood-smoke-emissions/council-resource-kit>

The wording used in the BC bylaws is often similar to this bylaw from Duncan, BC:

“No person shall use a Wood Burning Appliance or Pellet Stove Appliance at any time when an Air Quality Advisory is in effect, except to heat premises that are equipped with no heating appliance or facilities other than the Wood Burning Appliance.”¹⁶

Implementation Challenges

There are a few challenges with the BC approach to no burning during air quality advisories:

- Enforcement, particularly in smaller areas with limited bylaw resources, is very difficult. Most home heating occurs in the evening when bylaw officers in smaller communities are not working.
- Air quality advisories are often not in place during some of the worst periods of winter air quality. If called, they are typically called *after* an area has exceeded the 25 ug/m³ for 24-hour average. This usually means the air was well over this BC objective the evening *before* the advisory is issued, and advisories are usually only issued on days that meteorological conditions indicate ongoing poor venting will continue. And even that may not be enough. For example, in December 2018 in Courtenay, the area was over the BC objective for 24-hour average for almost four full days, yet no advisory was called. Like many other communities, this area frequently hits a ‘high’ health risk on BC’s revised Air Quality Health Index in the evenings, even when there is no advisory in place.
- Air quality advisories may not be reflective of local conditions. For example, the community of Parksville has a no-burning during advisories provision in their bylaw but, as there is no government monitor in the community, Nanaimo air quality must be poor enough for an advisory to be called that will include Parksville.
- Local communities may not have appropriate communications systems in place to make it clear when someone may or may not use a wood stove even when burn bans are locally regulated. Air advisories are provincially issued and communicated.
- Bylaws that include a burn ban exemption for homes with no other heating source typically do not include a requirement to apply for an exemption on these grounds. This complicates enforcement.

Examples of other types of no-burn periods

In the US, a number of states or regions have different mechanisms for implementing no-burn times. Below are a few examples.

Compared to BC, where advisories are called *after* an exceedance, most of the US locations establish their burn ban *before* the standard is actually exceeded. The bans are based on forecasts of poor air quality.

Two stage ban examples

In some areas (e.g. Puget Sound or San Joaquin Valley), there is a 2 stage burn ban process. During a first stage ban, only homes with certified stoves or homes that have no other source of heat are allowed to use wood heat. In the second stage, no use of wood heat is allowed, unless

¹⁶ See <https://duncan.civicweb.net/document/37471>

it is a home's only source of heat. These homes typically must apply for an exemption if they need to burn during a no-burn period.

In Northwest Washington, there are four exemptions to their 2-stage burn bans:

1. Low income (exempted "if there is economic need to burn solid fuel during a declared burn ban for residential heating purposes only");
2. Temporary breakdown of primary heat;
3. One-time 10 day temporary exemption (to allow home to apply for 1 of the other 3 options);
4. No adequate source of heat.

One-stage ban examples

A number of other areas in the US have a one-stage burn ban. For example, the Bay Area calls a ban on all wood heating when air quality conditions are *forecast* to exceed 35 ug/m³ for PM_{2.5} (the EPA 24-hour average standard). The only exemption, for homes that have no other source of heat, has been tightened up. Rental units in areas with natural gas, for example, are no longer exempt from burn bans. Homes where the second source of heat has broken down may obtain a 30 day exemption (and it is subject to verification). Some homes may still get an exemption if they have an EPA stove or pellet stove and are registered to use it.

In Libby, Montana, air pollution alerts are actually called when particulate matter concentrations have exceeded, or are reasonably forecast to exceed, the level that is 20% *below* the 24-hour standard *as averaged over a four hour period*.

Montreal also has a one stage no-burn period. No solid-fuel burning device may be used when a smog warning, issued by Environment Canada, is in effect for the area. Montreal has also banned the anytime use of all home wood burning appliances unless they are certified to burn 2.5 g/hr or less (when there is an extended power outage any type of stove or fireplace may be used).

Option for improving burn bans in BC

Use AQHI as a trigger

Given air advisories are often not in place in BC during all periods of poor air quality, one option to consider is the use of the Air Quality Health Index (AQHI) as a trigger for a burn ban.

Prior to 2018, AQHI readings could often read as "low risk" even during advisories or times a community may be in exceedance of the Air Quality objective for a 24-hour average (25 ug/m³) for PM_{2.5}. However, in 2018 the AQHI was adapted in BC to better reflect real-time risk of PM_{2.5} exposure. Additionally, forecasting for the AQHI has been improved to reflect these changes (although these forecasts appear to continue to underestimate the level of risk for the next day or evening).

As an example, had such a system been in place in the Comox Valley in December 2018, the AQHI would likely have triggered a no burn alert at the beginning of the four-day period the area ended up exceeding the air quality objective for a 24-hour average.

There were also many evenings in 2018-19 when the AQHI reached a “high” health risk in the Comox Valley, yet no advisory was in place on these evenings. When comparing the frequency of an advisory being called to the frequency of higher AQHI readings, it is clear that an AQHI trigger for a burn ban would increase the number of bans and, as a result, the protection of public health.

At minimum, a coordinated use and communication of the AQHI could be trialed on a voluntary basis in a place like the Comox Valley. Local websites could highlight the actual and forecast AQHI, and implement voluntary burn bans when the is higher than 5 (mid-moderate) to help prevent it from going even higher. Even if it did not successfully impact burning behaviours, it would give a higher profile to the link between public health risk and wood smoke pollution.

Include a public complaint mechanism

Another concern with burn bans, particularly in smaller communities, is the limited level of enforcement in the evening. BC bylaws with a burn ban provision do not appear to have a process in place to allow for public complaints about people who burn during a ban or a procedure for the public documenting such burning. Given limited staffing resources in most communities, it would seem that a broader allowance of public complaints and involvement would be valuable.

Registration of wood burning appliances & licensing fees

A barrier to both implementing and evaluating a number of regulatory and program initiatives is the lack of information about the numbers of wood burning appliances, their age and certification levels.

For example, although Port Alberni has a bylaw that requires the removal of uncertified appliances upon the sale of a home and then, after a five year period, banned their use altogether, the town has no idea how successful this approach has been. They did not have baseline information about the number of uncertified appliances, where they were located or when they may have been removed. And, although the use of uncertified stoves is technically illegal now, the town cannot be sure if a stove currently in use is certified or not without entering the home.¹⁷

Additionally, burn bans in BC typically exempt homes that only have wood as their one source of heat. However, none of the communities with this regulation in place require homes with no other source of heat to apply for an exemption or register in any way, so it is unclear how the bylaw would be enforced effectively. Registration, however, could include a requirement for an initial inspection, if requested, to confirm the state of the stove and other heating options for the home.

In addition to providing governments with information to help manage and evaluate the impact of intervention strategies, registration of wood burning appliances can also be a source of revenue for funding further woodsmoke reduction work and enforcement of wood smoke related bylaws.

17 Pers. Comms, Spring 2018, with Tim Pley, Chief Administrative Officer (and past Fire Chief); Anna Lewis, Chair, Air Quality Council; Chris Alemany, Port Alberni Councillor

For example, a population of 30,000, with 30% stove ownership would result in 9,000 registrations. An annual fee of even \$10 could be used to first cover the costs of setting up the registration system, and then be put towards a low or no interest loan program to help people move away from wood heat.

EXAMPLES of registration requirements in other jurisdictions

Bay Area

Registration in the Bay Area is only required for people seeking an exemption to the Spare the Air Alerts. This is for people who claim to have wood as their only source of heat. Only those with pellet stoves or an EPA certified stove can be exempted under this provision.¹⁸ People who do not register for this exemption will be subject to penalties for violation of burn bans alerts.

Puget Sound

Similarly, Puget Sound only requires registration for people who want a burn ban exemption based on the lack of any other 'adequate' source of heat.¹⁹

San Joaquin Valley

Registration of stoves is required for homes that want to be exempt from phase I of the Air Pollution Control District's burn bans ("No burning unless registered"). Registration is valid for three years.

People may voluntarily register their EPA Phase II certified stoves, or pellet stoves, in order to qualify for this exemption (no registration means no exemption). Additionally, as part of the registration, the appliance must be inspected every three years by an independent, District-registered Wood Burning Heater Professional. The inspection determines that the appliance qualifies for an exemption, is in good working order and is clean and maintained appropriately. A small fee is collected.²⁰

Montreal

Montreal adopted a bylaw in 2015 that instituted a mandatory declaration of *all* fireplaces and solid-fuel burning appliances, whether certified or not.²¹ Stoves that are certified to emit no more than 2.5 g/hour of PM2.5 are allowed to use their stoves (except during "smog" alerts when no wood burning is allowed). Others with no or poorer emission standards are only able to use their appliances if there is an extended power outage.

People who do not complete a declaration for their wood burning appliance are subject to fines. It appears as if there is currently no registration fee, and registration is a one-time thing, unless the appliance is removed or upgraded.

¹⁸ <https://baaqmdgov.wufoo.com/forms/zzg5c3d1yxldb5/>

¹⁹ <https://www.pscleanair.org/DocumentCenter/View/3325/2018-2020-No-Other-Adequate-Source-of-Heat-Exemption-Application?bidId=>

²⁰ <http://www.valleyair.org/CBYBregistration/>

²¹ http://ville.montreal.qc.ca/portal/page?_pageid=7418,142240304&_dad=portal&_schema=PORTAL

Hampstead, Quebec

In 2008, Hampstead, Quebec (a borough of Montreal), passed a complete ban on the use of wood stoves and fireplace inserts that burn solid fuel, the first in Canada to do so. Appliances were to be removed within 7 years of the bylaw. Fireplaces were exempted in the belief they were only used for aesthetic purposes now and again.

However, in 2018, Hampstead adopted the Montreal wide bylaw which allows for the use of wood stoves that meet the 2.5 g/hr standard. (which would prohibit fireplace use). The Mayor of Hamstead indicated this was legally required as they are part of Montreal.²²

Decommissioning of uncertified stoves

As of 2015, 9 communities in BC had requirements in their bylaws for the decommissioning or removal of uncertified wood stoves. Newer stoves, or other heating sources, could replace the old appliance, or the homeowner could choose to not replace the stove at all.

Port Alberni

In Port Alberni, this requirement was phased in. One year after the bylaw was passed, disconnection and removal was only required upon the sale of a home. After five years from implementation, all uncertified stoves in homes in Port Alberni were to have been decommissioned.²³ However, as there was no registration system in place, the town has no way of confirming if stoves have been removed as required. They can only make this determination if the homeowner allows them inside to inspect.

At the outset of the initiative, WETT certifications were done by a town employee who could then decline certification (required by insurance agencies) if the stove did not meet the requirements of the bylaw. However, this service was then privatised which removed this oversight and there is no current requirement for WETT certifiers to report to the town. Port Alberni staff acknowledged that more outreach could be done with realtors and home inspectors to help increase compliance upon the sale of a house. However, the perception was that realtors was not supportive of this provision as they were interested in selling without delays.

Additionally, if bylaw inspectors found an uncertified stove in an inspection or through other means, they are not currently clear on how they would respond. If a person, for example, was low income and it was their only source of heat, some sort of timeline for a transition period would need to be put in place.

²² Pers email communication with Mayor Steinberg January 28, 2019.

²³ Pers comms, Tim Pley, Chief Administrative Officer, Port Alberni, March 2018

Disclosure statements

The real estate sector and others in the Bay Area of California was resistant to plans to implement a requirement to decommission uncertified stoves upon the sale of a house. As a compromise, a requirement for a disclosure statement, specific to homes with wood heat, was instituted. This statement must be used for both the sale and rental of a home.

Bay Area

As of June 1, 2016, any person selling, renting or leasing real property has been required provide sale or rental be provided with a Residential Fireplace Disclosure. The statement, which must be signed by the buyer or renter, details the health impacts of wood smoke from wood burning fireplaces and inserts, encourages cleaner home heating options and provides information about the Winter Spare the Air program.²⁴

Rebates for decommissioning, and for non-solid fuel appliances

As noted earlier, the vast majority of rebates available under BC's WSEP program have been used to help homes upgrade from uncertified stoves to newer stoves.

While there are estimates of reductions in PM2.5 as a result of these upgrades (typically based on certification amounts, not real world use), it is indisputable that far greater reductions in PM2.5 emissions will happen if people move from away from different forms of wood heat to a non-solid fuel heating appliance (e.g. gas or electric).

Emission reductions for non-wood appliances are also guaranteed and predictable; the manner in which the appliance is operated is not an issue.

This section looks at some programs that focus on eliminating the use of wood heat in a home rather than encouraging or supporting a stove upgrade.

Sunshine Coast, BC

The Sunshine Coast Wood Stove Exchange Program in BC was the first area under the WSEP program in BC to stop offering rebates for installing new wood stoves. Rebates are currently only available for gas appliances or heat pumps. Additionally, in 2019 rebates are available for any wood stove that is older than 5 years (so in many cases the replaced stove may be certified under older standards). The Comox Valley in BC instituted similar measures in 2019.

Marin county

The rebate program for Marin County offers a rebate of \$250 for simply decommissioning a non-EPA Phase II wood stove or fireplace. There is no need to replace the appliance to qualify.

Larger rebates of \$325 are offered for those who do want to replace their stove or fireplace with either a gas appliance or electric heat pump.²⁵

²⁴ http://www.baaqmd.gov/~media/files/communications-and-outreach/publications/news-releases/2016/fpdisclosure_160324-pdf.pdf?la=en

²⁵ <https://www.marincounty.org/depts/cd/divisions/sustainability/green-building-program>

Bay Area

Residents who live in a designated *High Wood Smoke Area* or a *Highly Impacted Community* can access rebates to simply decommission any wood stove or fireplace, apparently regardless of age. Rebates for decommissioning are \$750.

There are no rebates available for installing new wood stoves. As noted in the FAQs on the website, “this Program is designed to reduce wood smoke pollution; therefore, replacing a woodburning device with another wood-burning device is not an eligible project option.”²⁶

Ban on stove installations

The evaluation of the WSEP program highlighted that there were no measurable reductions in PM2.5 in the affected communities, possibly due to the ongoing installation of wood burning devices not related to the program.

The prevention of new installations is one way of capping the number of stoves in a community so that, over time, there will be an ongoing decrease with every home that moves away from wood heat. If new stove installations are allowed, the number of stoves may never decrease.

Comox Valley, BC

Comox, BC recently passed a new bylaw that prevents the installation of new stoves in new and existing construction where there is no wood burning appliance already in place. Only homes that currently have a wood burning appliance will be able to upgrade to a more efficient stove.

Last fall, Cumberland, BC also passed a bylaw to prevent new installations. It is not clear if this only applies to new construction or also to existing homes currently without wood heating.

Bay Area

As of November 2016, no wood-burning devices are allowed in new buildings constructed in the Bay Area. Gas-fueled fireplaces and logs, gas inserts, and electrical fireplaces are okay (prior to November 1, 2016, the only wood-burning devices allowed in new construction are EPA-certified wood-burning or pellet-fueled devices).

For homes that already have a wood burning device in this area, residents who begin a chimney or fireplace remodeling project that costs over \$15,000, and requires a building permit, will only be allowed to install a gas-fueled, electric or EPA-certified device.

²⁶ <http://www.baaqmd.gov/funding-and-incentives/residents/wood-smoke-rebate>

Waverley, Australia

Waverley banned the installation of new wood stoves in 2003 because of air quality concerns.²⁷

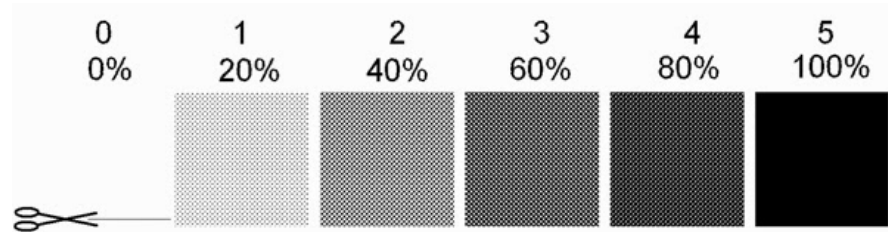
Multiple annual reports indicate that they also have a prohibition on the use of wood fire heaters throughout the Local Government Area.²⁸

Visibility/Opacity rules

Opacity measurements for stove emissions is another regulatory tool on the books in many areas of the US, and a few in BC. According to EPA documents:

“Opacity” measures how much your view is blocked by smoke. One hundred percent opacity means you are not able to see anything through the smoke. At 20 percent opacity, there is very little smoke and you can see almost perfectly through it. A well-controlled wood-burning appliance will have less than 20 percent opacity and typically no visible emissions.²⁹

Opacity testing is based on the Ringelmann Chart.



In many areas of the US, excessive emissions are defined as smoke that has more than 20% opacity. However, there are a range of exceptions for start up time and, at times, for stoking the fire.³⁰ Some jurisdictions, such as Juneau, Alaska, set the limit at 50% for more than 15 minutes in an hour period.

In Saanich, BC, no wood stove is to have more than 20% opacity for any 3 minutes in an hours, except for start up (20 minutes) and stoking time (6 minutes).

Barriers to implementation of opacity rules

While opacity testing has the opportunity to crack down on excessive smoke of individual chimneys, there are some important barriers to using this approach.

Bylaw officers must be trained in opacity training (typically offered outside of BC) and they must have specific equipment which requires periodic re-calibration.³¹ These two factors can be a financial barrier for smaller communities. Each newly hired bylaw officer, for example, would need to be sent for

²⁷

<http://www1.waverley.nsw.gov.au/council/meetings/2007Minutes/0710/CommServReports/ReporttoCouncilPelletHeaters.pdf>

²⁸ For example: <http://www.waverley.nsw.gov.au/?a=29166>

²⁹ <https://www.epa.gov/sites/production/files/documents/strategies.pdf>

³⁰ <https://forgreenheat.blogspot.com/2015/01/sample-wood-smoke-nuisance-regulations.html>

³¹ Pers. Comm with Markus Kellerhaus and Earle Plain, BC Ministry of Environment and Climate Change.

training. Additionally, the test needs to be done in the light, whereas most excessive wood smoke happens at night.

A primary reason excessive smoke is even included in regulations is to limit the nuisance to neighbours and other members of the public in the area. However, other types of nuisance do not typically require documented testing with specialized equipment before a bylaw officer is allowed to determine if it is a nuisance or not. For example, they do not use a decibel meter to determine if a neighbour's dog's incessant barking or a late night party constitutes a nuisance or a violation of a noise bylaw. Much is left up to the expertise and judgement of the bylaw officer.

Use of a simpler *visibility* test would remove many of the barriers presented by more complicated opacity testing. Simply seeing smoke within a certain distance of the chimney, for a specified length of time, should be enough to be considered excessive, particularly if that smoke is leaving the property and is visible on public or private property nearby.

Tasmania

In Tasmania, the emphasis is on *visibility*, not opacity, of emissions. An information brochure for wood stove users indicates:

The regulations are breached if a smoke-plume is visible from a chimney at a distance of 10 metres or more for at least 30 seconds. The smoke must also be generally visible for ten minutes.³²

While penalties are very significant (\$1590 in 2018), Tasmania uses a staged enforcement process³³:

1. Education
2. Warning Letter
3. Fines

After receiving a warning letter, residents have 21 days to comply.

In the last 4 years, no fines have been issued but there has been a reduction in complaints and in caution letters³⁴.

Selling of firewood

BC's *Solid Fuel Burning Appliance Regulation* and a number of local government bylaws state that only seasoned firewood with 20% or less moisture content can be burned.

However, this rule is almost impossible to enforce as enforcement officers would need to witness the wetter wood being loaded into a wood stove to confirm a contravention of the regulation.

³² <https://epa.tas.gov.au/Documents/Air%20quality%20brochure%20Revised%20February%202018.pdf>

³³ <https://www.examiner.com.au/story/5386525/homeowners-to-be-slapped-with-hefty-fines-for-excessive-smoke-emission/>

³⁴ Ibid.

At best, this rule is used as a tool to educate people about using drier wood. In Port Alberni, for example, bylaw officers will inspect an outdoor wood pile of a home they have received a complaint about, test the moisture of the wood, and talk to the resident if the moisture is too high. The local bylaw sets a norm that citizens are expected to follow.

In BC, there are no rules governing the sale of wood; however, this is a tool that could possibly increase the likelihood of dry wood being used. The Bay Area has, for example, has created a requirement that wood be labelled as seasoned or unseasoned to increase the likelihood of drier wood being purchased or at least seasoned before burning.

While this approach would likely be difficult for a small community to create and enforce, it highlights the value of working with firewood sellers to help increase awareness that only seasoned wood is legal to burn.

Bay Area

As noted above, firewood suppliers are required to appropriately label their wood as “seasoned” or “unseasoned”.

The firewood labelling is a way to extend awareness of regulations related to moisture content and no burn times, and to share information on how to properly season the wood.

According to their regulations, any person offering for sale, selling or providing solid fuel or wood intended for use in a wood-burning device within District boundaries shall:

- Attach a label to each package of solid fuel or wood sold that states the following: “Use of this and other solid fuels may be restricted at times by law. Please check 1- 877-4-NO-BURN or <http://www.8774noburn.org/> before burning.”
- If wood is seasoned (not to include manufactured logs), then the label must also state the following: “This wood meets air quality regulations for moisture content to be less than 20 % (percent) by weight for cleaner burning.” Bay Area Air Quality Management District October 21, 2015 6-3-8
- If wood is not seasoned (not to include manufactured logs), then the label must state the following: “This wood does NOT meet air quality regulations for moisture content and must be properly dried before burning.” In addition to the disclosure listed above, any person offering for sale or selling wood that is not seasoned for use in a wood-burning device shall also provide written instructions on how to properly dry the wood to achieve a 20% (percent) by weight moisture content.

Disincentives

While there are many incentives for upgrading to cleaner sources of heat, namely through rebate programs, the only disincentives to using wood heat are regulatory measures that limit things like times of use, the type of fuel that may be used, and excessive emissions. These all come with financial penalties if they are contravened.

Disincentives are a common approach governments use to regulate pollution from other types of sources, or from things that are considered harmful to human health or the environment. Cigarettes and alcohol, for example, have very high tax rates to deter their use. People pay tipping fees at waste

facilities for their garbage. Many municipalities have instituted charges for water usage and, more recently, carbon taxing is being used to deter the use of fossil fuels.

Even though wood heating has a strongly documented impact on human health (at a high cost to our healthcare system), and contributes notably to greenhouse gas emissions,³⁵ its use is currently tax free.

Research on disincentives

A research paper from Australia titled the “Economic Appraisal of Wood Smoke Control Measures”³⁶ discusses different financial disincentives that could be implemented for wood heating.

Fee on new wood stoves

The paper outlines the idea of implementing an annual licensing fee (and possible license test) for wood heater owners. This would be done at the point of sale. As the analysis notes, this could be implemented immediately and consistently across a large jurisdiction. Revenues from these fees could be used to support low income people to install and use non-wood heating systems.

Licensing fee

This type of licensing fee would apply to all wood stove owners. The report acknowledges the challenges of implementing this retroactively and highlights the likely resistance to this approach, noting it would be potentially costly to implement and enforce given there is no current data on ownership (see earlier section on benefits of requiring the registration of stoves). The report also notes it may require implementing a means test. In the absence of registration, the implementation of this fee would help identify areas of high use.

Excise on fuel

A third option discussed in the paper is a sales or excise tax on the fuel used in wood stoves. This may lead to an increase in scavenging of wood (and, although the report does not mention this, the use of illegal fuels).

The analysis also notes that the acceptance of any government financial measures is likely to be more successful if people are aware of the externalities (i.e. health impacts and costs) and feel revenues are going to appropriate purposes.³⁷

The following table from the report highlights the public benefits from the three disincentives, as well as for providing cash incentives for phasing out (not upgrading) wood heating.

³⁵ Compared to natural gas, wood puts out 2 times more CO₂, 60 times more methane and 400 times more Nitrous Oxide (N₂O) for each unit of energy burned. It also puts out more CO₂ and N₂O than the burning of oil or even coal. https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf

³⁶ <https://www.epa.nsw.gov.au/~media/EPA/Corporate%20Site/resources/air/WoodsmokeControlReport.ashx>

³⁷ Ibid. P. 12

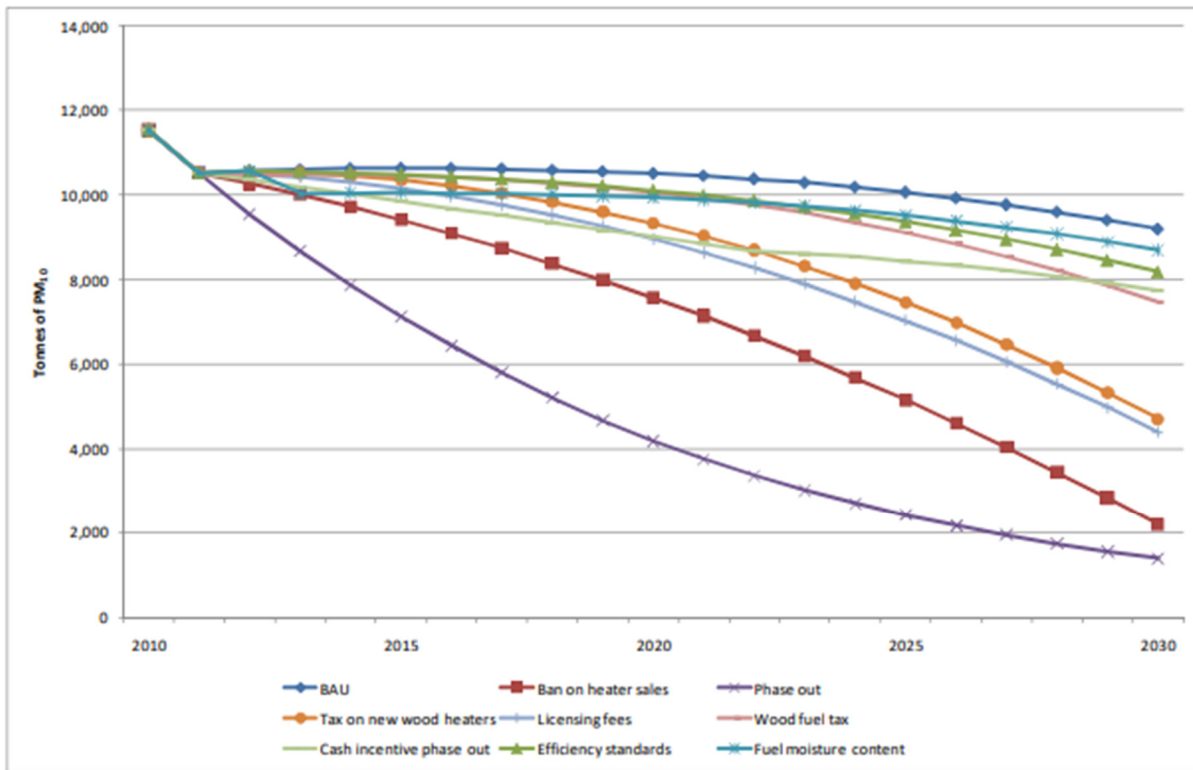
Table 14 Contribution to public benefit

Option	Extent of wood smoke control				Economic impacts and costs		
	Efficiency	Heaters Impacted	Emissions Reduction	Timing	Industry	Consumers	Admin Costs
Tax on new wood heaters	Medium	Med/High	Medium	Med/High	Low cost	Low cost	Low cost
Licensing fees	Med/High	High	Med/High	Med/High	Minor cost	Low cost	Medium Cost
Tax on fuels	Med/High	Medium	Medium	High	Low cost	Low cost	Low cost
Cash incentive phase out	Med/High	High	Med/High	High	Minor cost	Minor cost	High cost

The chart below highlights that the two approaches with the greatest reduction results are banning sales and “phasing out” (which refers to requiring the removal of wood stoves on the sale of a home—estimated to occur every 7 years—and possibly introducing a sunset clause for all wood stoves in homes in particular areas). The two financial disincentives resulting in the greatest predicted reduction are licensing fees and a tax on new wood heaters.³⁸

Other than “Business As Usual (BAU), improvements to certification standards and requirements for fuel moisture content were two initiatives that resulted in the *least* reduction of Particulate Matter (these two tools were the primary focus of BC’s 2016 *Solid Fuel Burning Appliance Regulation*).

Figure 2 PM₁₀ emissions projects for each option



³⁸ Ibid. P. iii

CHALLENGES TO IMPLEMENTING APPROACHES

In addition to the need for sufficient political will, there are a few notable challenges to implementing some of the approaches discussed in this document.

1. Lack of evaluation or evidence

As noted in the 2009 report on wood burning interventions in Canada:

Despite the different types of residential wood-burning intervention strategies that have been implemented in Canada, few attempts have been made to evaluate the efficacy of these strategies and most programs have not included an evaluation component. For example, in the CCME (2004) review of 12 wood stove change-out programs in Canada, none of the public education campaigns were found to include any follow-up, making it impossible to gauge the effectiveness of these campaigns on changing public behavior.³⁹

And the 2007 inventory of bylaws in BC also highlighted that future studies should “evaluate the effectiveness of these bylaws, given that a few municipalities have never enforced their regulations due to the small size of the community and a lack of available resources”.⁴⁰

A similar concern was highlighted in the 2015 evaluation of the WSEP program and the assessment of outreach approaches in particular.

And interviews with Port Alberni staff in 2018 highlighted that they had established no baseline data or evaluation framework for evaluating the success of their wood stove bylaw.

As a result, there is also no clear evidence in most communities that interventions in the last decade have actually resulted in the application of regulatory tools or, more importantly, in a reduction of fine particulate pollution.

2. Limited enforcement resources and powers

Many of the regulatory approaches also require an ongoing investment in enforcement resources, which can be a huge barrier for smaller communities with already limited capacity.

Additionally, enforcement of indoor activities (e.g. fuel use) or appliances (e.g. use of uncertified stoves) is particularly problematic as few bylaw officers are willing or able to enter a resident’s home without the resident’s permission.

Enforcement of the part of BC’s *Solid Fuel Burning Domestic Appliance Regulation* related to legal fuels is similarly impossible to enforce, effectively making this part useless as a regulatory tool.

External enforcement (e.g. of visibility of emissions or contravening a burn ban) is easier, but most burning happens in the evening when bylaw officers from smaller jurisdictions seldom work. The cost of increasing staffing resources is prohibitive.

³⁹ P.8, http://www.ncceh.ca/sites/default/files/Wood-burning_Appliances_Dec2009.pdf

⁴⁰ <https://www.for.gov.bc.ca/hfd/library/documents/bib106845.pdf>

While these barriers are well-known, it continues to be left to local governments to pass wood stove laws that will regulate their use and installation.

3. Limited capacity of local governments

A further concern is that most smaller, local governments simply do not have the knowledge or resources to create effective health education campaigns or write workable bylaws that may at least help to address wood smoke pollution or protect neighbours from significantly excessive emissions (and one could argue all wood smoke emissions are excessive).

Additionally, local governments are typically not aware of the latest research on effective approaches to changing behaviours, or of the data and information on the health impacts of wood smoke pollution. They do not have the staffing resources to keep up to date and guide decision-makers through the issues.

The provincial government is much better positioned to provide the resources and guidance needed to implement province wide measures that will ensure all citizens receive equal protection from wood smoke pollution. Downloading to smaller local communities creates a patchwork of protections that are largely achieved because of the work of local citizens.

Similarly, when smoking bans in restaurants and bars were first instituted in BC, it was left up to the municipalities to institute the relevant bylaws; but at some point the province created a province-wide regulation, thus protecting all of its citizens equally.

CLOSING THOUGHTS

With the exception of applying an outright ban on the use of all wood burning appliances, or implementing strong health messaging about the dangers of wood smoke, most of the tools and approaches outlined in this document assume that continued use of wood heat is going to happen, at least for the near future.

However, some of these approaches will have a far greater impact on the reduction of wood smoke, and therefore the protection of public health, than others. Some are also compatible and can be instituted in tandem or phases, while others may create conflicts.

For example, if government and health agencies continue to promote the upgrading of old to new stoves as a common, acceptable solution—and in some cases even a preferred or only option—the possibility of phasing out of wood heating (particularly in populated areas as other jurisdictions are doing) will be significantly limited as the new appliances will last for at least 20-30 years.

Additionally, if governments continue to provide tax dollars to help install new stoves, it becomes problematic to then develop measures that limit their use (e.g. no burn periods) or to tell another homeowner they can't install a stove at all.

Additionally, if bylaws do allow for the continued installation of new stoves, the number of wood stoves in some areas may actually increase and compromise other reduction efforts.

Are new stoves an appropriate solution for reducing wood smoke pollution?

There is very clear, well-documented evidence that shows that even the newest wood stoves emit *exponentially* more fine particulate matter than any other non-biomass home heating appliance, even if they are run according to factory testing standards.

They also pollute more than most diesel vehicles. A study from the Air Quality Expert Group in the UK showed that the new certification levels of Eco-design Directive stoves (rated at 3.1 grams/hour) would put out more PM2.5 than 18 of the latest generation of diesel cars (or 6 Heavy Goods Trucks). This of course occurs in one fixed location, in residential areas.

And there is research showing that, during real world use, most homes fail to achieve the grams/hour the stove is rated for (which are mostly based on crib wood tests). Results from a 2005 study that looked at real world use in New Zealand “suggests that the emission factor currently used could be too low by a factor of up to 4 or 5.”⁴¹ (So the comparative number of diesel cars would be far higher, even for a stove with a lower emissions rating).

Furthermore, stoves degrade with time and so emission levels will increase. As noted in this online Hearth and Home industry article:

“Further, stoves degrade with time due to gasket failures, metal warping, catalyst failure, etc., suggesting the earliest certified models are no longer producing emissions as low as when they were new. Bottom line is that the impact of the NSPS [the EPA standard] on particulate emissions levels from residential wood heaters will be slow.”⁴²

Furthermore, because actual real world emissions depend so much on how the stove is operated, this creates a need for ongoing government involvement and expenditures (for education, regulation and enforcement). However, with other forms of home heating, once the appliance is installed there is no further cost to the taxpayer and a guaranteed significant reduction of PM2.5 emissions.

Finally, research is showing that newer certified stoves create high levels of ultra-fine emissions which are a significant health concern. As the particles are so small, they are often invisible (and small enough a HEPA filter will not capture them). Often claims are made that newer stoves are “clean” and do not emit much smoke. Research, however, indicates that a lack of visibility does not mean a lack of ultrafine pollution:

The emission measurements show that chimneys without any visible smoke connected to a new eco-labelled stove emit high levels of ultrafine particles even during optimal stove operation.⁴³

This indicates that today’s ‘solution’ of newer stoves may well be tomorrow’s problem of harmful ultrafines.

⁴¹ Scott, AJ. Real-life emissions from residential wood burning appliances in New Zealand August. 2005
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.615.2369&rep=rep1&type=pdf>

⁴² https://www.hearthandhome.com/magazine/2017-04-25/straight_talk.html?fbclid=IwAR1VyVEUnZ3vXU1m4ZNB4YhIW5SVoMoVfrP7XBOE_6U9H0RixM9_aVf-jg

⁴³ https://www.clean-heat.eu/fileadmin/user_upload/CleanHeat/pdf/NPC_2016_Poster_Residential_burning.pdf?fbclid=IwAR1JUcDL1KbvAxM9XCyg9w2g953m5lxjqWf37y4vRyoaPVgRzfYafTva6cA

Different solutions can result in uneven protection

Protection of air quality for non-wood burning citizens will also be inconsistent even across the same community. One resident with even a well run new wood stove will still expose their neighbours annually to hundreds of pounds more of fine particulates than a resident who converts to or uses a non-biomass heating source.

As an example, a resident in Cowichan highlights how the long running WSEP program has resulted in a taxpayer rebate creating higher levels of pollution from one home in her area:

Of the nine wood stoves that have cropped up in my area, the worst by far is the one next door, which belongs to a North Cowichan Wood Stove Exchange recipient. This neighbour's volume of smoke doubled and I thought he was having a chimney fire, when he relayed to me the good news that he had a brand new stove courtesy of North Cowichan!⁴⁴

Many others have similar complaints about neighbourhood smoke that they know is coming from certified stoves.⁴⁵

Many tools normalize wood burning

As noted earlier in this paper, perhaps the most important, but least discussed, downside to many interventions aimed at reducing wood smoke pollution is that they continue to normalize wood burning as an acceptable, safe source of heat.

On the one hand, we have governments and organizations starting to educate the public about the many health impacts of smoke and PM2.5. But, at the same time, we have governments spending taxpayer dollars on rebates to install newer wood stoves (which will last for decades, degrade with time and have very unpredictable results) and on teaching people how to use it.

Wood smoke reduction tools that focus on supporting the continuation of wood heating serve to normalize wood burning as a perfectly acceptable form of heating. Many of these tools communicate that, providing there are some restrictions on the type of device and/or the fuel, the pollution levels are acceptable. Even educational materials sponsored or created by health agencies use aesthetically pleasing images of a fire burning in a home, rather than images of the smoke coming out of the chimney, or language that romanticizes wood heating.⁴⁶

As a result, any community-wide reduction in wood smoke pollution can be expected to happen very slowly, despite the expenditure of millions of dollars on programs like BC's WSEP.

⁴⁴ <https://woodsmokepollution.org/personal-stories.html>

⁴⁵ Ibid.

⁴⁶ See <https://bc.lung.ca/how-we-can-help/wood-smoke-and-lung-health/issue-burning-better-solutions> or Health Canada funded videos <https://www.youtube.com/watch?v=yWcUkUiWuzM> and <https://www.youtube.com/watch?v=R9RU5qbY9is>. Of a series of 3 educational videos funded by Health Canada, only one mentions, in one partial sentence, the idea of transitioning to non-wood forms of heat.