

# BC Wood Stove Exchange Program

**Program Evaluation** (2008 to 2014)

Final Report

August 18, 2015

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## DISCLAIMER

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This report has been reviewed by staff of the BC Ministry of Environment, and the Ministry of Environment supplied the consultant authors with data and information on the Wood Stove Exchange Program. However, the conclusions and recommendations expressed herein represent the views of the consultant authors and these views may or may not be supported by the Ministry of Environment.

## ACKNOWLEDGEMENTS

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This report was prepared by Pinna Sustainability Inc. We heartily thank the numerous people throughout BC that took the time to contribute their expertise and ideas to this program review. In particular, we would like to thank the following (alphabetical by first name):

**Alan Murphy**, Blaze King Industries

**Angelo Kouris**, Vancouver Coastal Health

**Barbara Oke**, Northern Health Authority

**Barry Watson**, BC Ministry of Environment

**Charmaine Enns**, Vancouver Island Health Authority

**Christina Toth**, Fraser Basin Council

**Cozy Homes**, Sechelt retail partner

**Dales Plumbing and Heating**, Prince George retail partner

**Dave Baker**, Councillor, City of Merritt

**Derek Jennejohn**, Metro Vancouver

**Earle Plain**, BC Ministry of Environment

**Fraser Plumbing**, Prince George retail partner

**Glen Okrainetz**, BC Ministry of Environment

**Goran Krstic**, Fraser Health Authority

**Grace Cockle**, Metro Vancouver

**Greg Baytalan**, Interior Health Authority

**Joe Dinn**, Just Wood Stoves, Campbell River retail partner

**Jools Andres**, Sunshine Coast Clean Air Society

**Lisa Mu**, Fraser Health Authority

**Markus Kellerhals**, BC Ministry of Environment

**Menn Biagtan**, BC Lung Association

**Michael Brauer**, Professor, Director Bridge Program, UBC

**Michael Zbarsky**, Comox Valley Regional District

**Nancy Mora**, City of Kelowna

**Paul Hasselback**, Vancouver Island Health Authority

**Pinnacle Stoves**, Quesnel retail partner

**Rebecca Freedman**, BC Ministry of Environment

**Terri Martin**, City of Campbell River

**Ting Pan**, Regional District of Nanaimo

**Trail Bay Home Hardware**, Sechelt retail partner

**Trisha Gustafson**, Fraser Basin Council

**Vicki Morrell**, Canadian Clean Air Alliance

**William Osei**, Northern Health Authority

**Zigi Gadomski**, WETT BC

## EXECUTIVE SUMMARY

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The BC Wood Stove Exchange Program was established by the provincial government in 2008 with the objectives of facilitating the removal of old smoky wood stoves from use, and improving burning practices among users of wood burning appliances. Wood heating in BC is estimated to contribute approximately 23% of the overall emissions of fine particulate matter; a pollutant that is linked with serious health impacts. This report provides documentation of the program activities undertaken to date, a review of the program based on input from key stakeholders across BC and comparison to other similar programs, and a list of recommendations for improving the effectiveness of the program in future years.

Since 2008, the program has transferred over \$2.2 million dollars to communities across the province to deliver local wood stove exchange programs. This had resulted in the decommissioning of 6,067 uncertified wood stoves, and an estimated reduction of 1,590 tonnes of fine particulate matter emissions since 2008, based on those exchanges. Significant effort has also been placed on delivering education and outreach in each participating community to encourage clean burning practices in the form of workshops, community events, one-on-one home visits with wood burners, and by providing tools such as moisture meters and videos that support clean burning habits.

Based on these results, and highly supportive feedback from communities across the province, health professionals and industry partners, the program has been very successful. This is particularly the case when considering the provincial investment per wood stove removed was approximately \$370, a lower cost per wood stove exchanged in similar programs in other regions. This has been achieved by strong support and contributions from participating local governments, as well as retailers and manufacturers of applicable appliances.

Despite these successes, there has not yet been a clear reduction in fine particulate matter pollution coming from residential wood stoves in BC. To some extent this may be explained by a simultaneous increase in the number of households burning wood across the province. There are ongoing concerns from stakeholders that poor wood burning practices (e.g. burning wet or unseasoned wood, not cleaning chimneys, not keeping fires at the right temperature) may still be resulting in significant emissions coming from both old and new wood stoves. There are concerns that lower income households are unable to access the incentive for exchanging an old wood stove for a new certified stove because the incentive is small relative to the full cost of replacement. The



program has also had limited uptake from First Nations communities, where there are very high rates of wood burning.

Twenty recommendations are provided that are intended to combine with the current program strengths and continue to improve the program's effectiveness over the years to come.

1. Increase the Program's emphasis on improving burning practices.
2. Actively communicate a non-wood burning appliance option.
3. Focus additional resources where air quality standards or objectives are being exceeded.
4. Commit stable funding for three or more years.
5. Conduct a province-wide education campaign.
6. Align Program and Provincial legislation for wood stoves with new EPA emissions standards.
7. Link burning education to the wood stove exchange incentive.
8. Measure effectiveness of various outreach materials (e.g. burn kit contents).
9. Shift resources provided for education toward home visits.
10. Provide option to increase incentives or buy-back of stoves for lower income households.
11. Collaborate with a First Nations community to develop a targeted program.
12. Communicate progress with key stakeholders and the public annually.
13. Broaden use of online and social media for education and advertising.
14. Create an information template to engage retailers.
15. Limit funds directed to advertising.
16. Include air source heat pumps in the eligible appliances for rebates.
17. Streamline year-end reporting for local program coordinators.
18. Obtain regulatory commitment from participating communities.
19. Engage and/or regulate the firewood industry.
20. Consider provincial regulation to support the goal to eliminate all non-certified woodstoves in BC.

These recommendations are intended to build on the strong foundation laid by the first seven years of this Program's delivery, including continuing to support incentives for replacement of old smoky wood stoves, and education about clean burning practices through strong partnerships with communities, health professionals, and industry across the province.

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# 1 INTRODUCTION

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In British Columbia, the use of wood to provide heat is a common practice because it can be a readily available and affordable fuel source for many households. However, burning wood releases fine particulate matter and other pollutants such as carbon monoxide, volatile organic compounds, black carbons and some air toxics. Exposure to these pollutants has been linked to respiratory symptoms; increased risk of respiratory illness, including hospital admissions and emergency room visits; and decreased lung function (Naeher, 2007). The BC Ministry of Environment (BC MOE) has identified fine particulate matter (PM<sub>2.5</sub>) as an air pollutant of concern for the health of British Columbians, and has set a goal to reduce health risks by minimizing exposure to smoke from biomass burning (BC MOE, 2011).



Provincial air emission inventories estimate that the use of residential wood heaters contributed 23% of the PM<sub>2.5</sub> emissions outside of the Lower Fraser Valley in 2010 (BC MOE, 2013), which is higher than the previous inventory that estimated 16% of PM<sub>2.5</sub> emissions were from wood heaters (BC MOE, 2009). The proportion of PM<sub>2.5</sub> that comes from wood heaters varies from region to region depending on the local prevalence of wood heating, and the amount of industrial activity in an area. For example, the local inventory for Golden BC estimates that wood heaters account for 30% of PM<sub>2.5</sub> (BC MOE, 2006). Within the Lower Fraser Valley, wood heaters accounted for 28% of PM<sub>2.5</sub> emissions in 2010 (Metro Vancouver, 2013). Based on surveys of the types of wood heaters and extent they are used in BC, it is estimated that wood heaters result in about 11,300 tonnes of PM<sub>2.5</sub> emissions annually (Envirochem, 2012).

Knowing the percentage of PM<sub>2.5</sub> that comes from wood heaters is useful, but it is not the whole picture when it comes to understanding the potential impact on people's health. Because wood heaters are used in homes and neighbourhoods, the risk of exposure may be higher from this source than other sources of pollution that are further away from where people live. Local geography and weather patterns also affect how much people are exposed to these emissions.

Recognizing that residential wood smoke was an important contributor to fine particulate matter emissions and potential health risks in BC, the Province of BC launched the Provincial Wood Stove Exchange Program (BC WSEP) in 2008 with the goal of reducing the emissions that come from using wood for heat. This document presents the results of a review of the BC WSEP activities from 2008 to 2014.

## 1.1 Options for reducing pollution from wood heating

The amount of emissions that are released from wood heating can vary greatly from home to home and generally depends on three key factors: what is being burned, how the appliance is being operated and maintained, and the type of appliance. There are several effective ways to reduce the amount of pollutants coming from the use of wood for heat, of which switching to another source of heat such as natural gas or electricity, is certainly the most effective. Other ways to reduce emissions, and reduce the health risks associated with these emissions, include:

- Replacing uncertified wood heaters with new US Environmental Protection Agency (EPA) certified pellet or wood heaters (Figure 1 shows relative emissions between various stoves),<sup>1</sup>
- Burning only seasoned dry fire wood,
- Operating and maintaining the stove properly by keeping the fire at the right temperature and keeping the chimney clean, and
- Avoiding burning when air pollution levels are elevated (e.g. when an Air Quality Advisory has been issued for the local area).

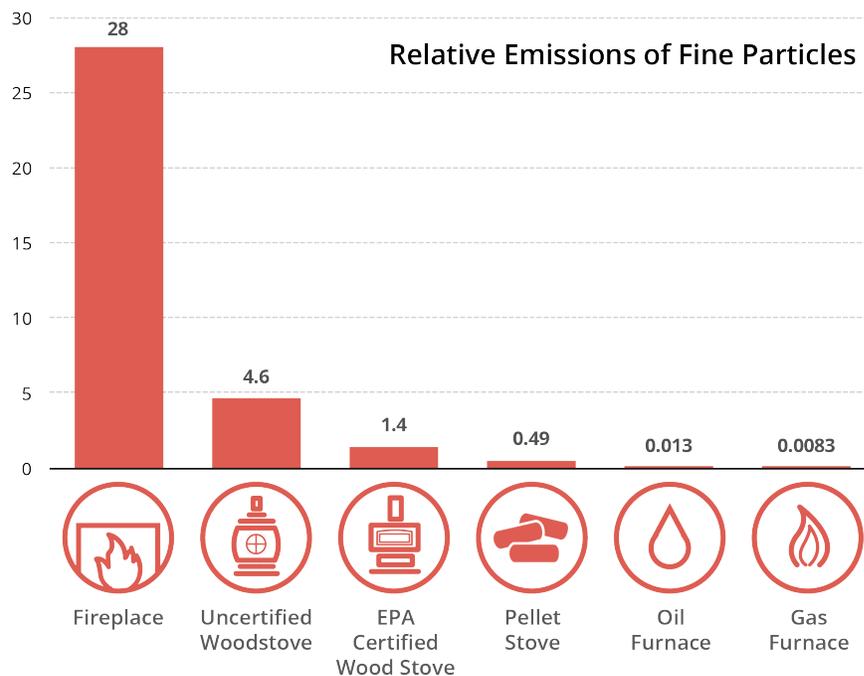


Figure 1. Level of fine particulate emissions (lbs/MMBtu) from various heat sources, based on the US EPA data and diagram for the 1988 standards

<sup>1</sup> In February 2015, the US EPA released updated standards for new residential wood heaters to a maximum emission rate of 4.5 grams per hour (2015) and 2.0 grams per hour (2020). New standards were also released for wood-fired hydronic heaters

Many jurisdictions throughout the US and some in Canada have addressed the issue of pollution from wood heating through wood stove change out programs. These programs typically include providing an incentive to households that remove or exchange old wood stoves for cleaner alternatives (such as US EPA certified wood stoves or natural gas fireplaces), and also typically include education about proper burning practices and maintenance.

Province-wide surveys of households were conducted in 2003 and 2012 to better understand how many homes heat with wood, and whether they are using low emission certified stoves. These surveys show that almost one-third of homes burn wood or pellets at least occasionally, which stayed about the same between the survey years (Envirochem, 2012), while one in ten use wood as the primary source of heat for their homes (Mustel Group, 2012). In the 2012 survey, significantly more homes reported the use of low emission certified stoves (68%) compared to 2003 (44%). These appliances would be certified to the 1988 US EPA standards of a maximum emission rate of 7.5 or 4.1 grams per hour (where the lower limit applies to catalytic stoves).

## 1.2 BC Wood Stove Exchange Program

In 2008, the Province of BC released the BC Clean Air Plan that includes 28 actions to improve air quality across BC. One of these actions was to **get rid of smoky old woodstoves**, with an initial goal to *facilitate the exchange of at least 50,000 wood stoves for newer, more fuel-efficient models or other clean heat sources*. The plan also states a long-term goal to *eliminate the use of all non-certified wood stoves by 2020*.

To address this action, the BC WSEP was launched in the fall of 2008 and has run each year since. There are two key objectives identified for the program:

1. Improving community air quality by providing incentives to change out old smoky wood stoves with cleaner burning options.
2. Providing education on clean burning techniques through Burn it smart workshops, brochures, websites and social media.

The program uses a local delivery model where communities lead local exchange programs that adhere to requirements linked to the grant funding. Communities must apply for funding each year. Applications need to meet a number of criteria, including demonstrating the need for the program, outlining goals and a work plan for the year, and identifying a coordinator and local partners that will assist with program delivery. The Program provides funding for wood stove exchange incentives (\$250 per stove exchanged), delivering education, advertising and, where necessary, supporting staff salaries to deliver the program.



The BC WSEP is the largest and longest-running program of its kind in Canada. New Brunswick recently launched a program in 2015 that will also provide a \$250 rebate per stove exchanged. Some provinces and territories provide incentives for efficient new appliances (including certified wood stoves or pellet stoves), though these do not require decommissioning of an old appliance.

Wood stove exchange programs have been employed more broadly across in the US. One of the most documented programs was held in Libby Montana where 1,200 wood stoves were replaced (out of a total 1,500 estimated stoves in the community). There are numerous state-wide programs (e.g. Maine, Maryland, Massachusetts, Oregon and Vermont); regional programs (e.g. at least six in California, two in Washington, and one in Cheshire County New Hampshire); and community programs in Fairbanks Alaska, and Fort Collins Colorado. These programs offer incentives ranging from \$250 up to \$3,000 per wood stove and often vary the incentive depending on the appliance being replaced, or the income status of the recipient. For example, in Cheshire County, New Hampshire, an incentive of \$1,000 is provided for switching from a non-certified to a certified wood stove, while a higher incentive of \$1,500 is provided for switching to a pellet or natural gas stove. The same program offers an incentive of \$3,000 for qualifying low-income homes switching to a certified wood, pellet or natural gas stove, or indoor gas furnace.

### 1.3 Evaluation purpose, scope and approach

The purpose of this project is to evaluate the impact of the BC WSEP to date, conduct an analysis to understand what impact the program has had on how British Columbians use wood as a heat source, and make recommendations on how the program can be improved in future years. The evaluation involves summarizing the documented achievements of the program, understanding the resources used to deliver this program, interviewing stakeholders connected to or interested in the program, and comparing the BC program with similar initiatives elsewhere.

The methods used to conduct this program review combine obtaining a qualitative understanding of the program that builds on quantitative data previously collected by the program. The evaluation included the following tasks:

- **Document the program:** Reviewed existing program-related documents including program records about communities that have participated, how funding was allocated and annual wood stoves exchanged; community funding applications and year-end reports; communications and educational materials; previous surveys and evaluations; and estimated air quality impacts of exchanges. (Section 2)
- **Design an evaluation framework:** Created a framework to assess the performance of the program based on available quantitative data combined with qualitative inputs from surveys. (Section 3)
- **Conduct interviews and surveys:** Engaged a wide cross-section of stakeholders to provide feedback on the above listed evaluation framework. Stakeholders interviewed included:

Ministry of Environment staff, local program coordinators, local government senior staff, elected officials, local retailers, environmental NGOs, industry representatives, public health experts, and regional air quality experts. (Section 3)

- **Supplement with literature review and web research:** Lessons and examples from other programs were used to provide context and comparison for findings, and to highlight relevant best practices from other areas. (Section 3 and 4)
- **Summarize, analyze, develop recommendations, and report:** Outcomes gathered were analyzed to create recommendations on how the program could be improved in future years. (Section 4)

## 2 PROGRAM DOCUMENTATION

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The BC Wood Stove Exchange Program was first introduced in 2008 and has provided funding for communities throughout BC each year through to the present fiscal year (2014 – 2015), with a one-year gap in provincial funding for the 2013 – 2014 fiscal year. The BC WSEP is designed to provide communities funding to implement local wood stove exchange programs with supporting education in a manner that is most appropriate to each community, while also providing a framework and a set of requirements that must be met in order to participate. Most communities also dedicate staff and volunteer resources to coordinate and deliver the local programs.

Prior to launching the BC WSEP, the Province supported pilot wood stove change out programs in the Skeena region. Based on early successes in these programs, and the commitments in the BC Air Action Plan, the BC MOE launched the provincial program enabling other communities across BC to apply for funding to implement local exchange programs. The provincial program was designed based on the successes of the earlier change out programs, combined with numerous recommendations for improving the programs, and using a community-based social marketing approach. This section of the report documents how the program has been run, the program results that have been tracked, and the amount of funding and resources that have gone into it.

### 2.1 BC WSEP governance and administration

The BC WSEP is administered through the **BC Lung Association**, with funds provided by the BC Ministry of Environment. Each year, funding is confirmed and interested communities submit applications for resources to support their locally delivered programs. The BC WSEP is overseen by a **Steering Committee** composed of members from the following:

- BC MOE: funding partner, experience delivering wood stove exchange programs in BC;
- Hearth Patio and Barbeque Association: funding partner via additional \$150 discount, advice and input on program logistics, partners, advertising and marketing;
- Wood Energy Technicians BC (WETT BC): technical expertise;
- Community groups or local government representatives: advice and input on program delivery, partnership building, advertising and marketing;
- BC Lung Association: program management;
- Environment Canada: advisory role as required;
- Health officials: advisory role as required, program endorsement.

The purpose of this Committee is to “develop and implement a strategy for a provincial level woodstove exchange program.” Their responsibilities include determining incentive values, selecting successful applicants, and supplying guidance and support to communities as required.

Local governments or community organizations from across BC may apply to the program. Successful applicants receive funds to pay for rebates, education, and in some cases to support advertising and/or staff wages. Local coordinators are responsible for managing their community's program, and submit a final report with community recommendations each year. Any unused program funds are reallocated annually. The Steering Committee evaluates all proposals according to the following **application criteria and weightings**:

- Demonstrated high local and/or regional need: 25%
- Monitoring capacity and potential: 10%
- Partnerships and community buy-in: 35%
- Coordinator and organizational capacity: 30%

Participating communities are also provided resources and support for delivering their programs through: regular conference calls between coordinators, BC MOE and BC Lung Association representatives to share successes, challenges and new ideas; a web-based library of documents from previous programs delivered; and outreach materials for distribution such as DVDs, window decals, moisture meters, etc.

The following **program requirements** apply to all local programs:

- A \$250 rebate is provided for each wood stove exchanged,
- An old uncertified wood stove must be replaced with a new approved appliance,
- Type of stoves eligible for removal is based on the approved appliance list (refer to Appendix A for a list of eligible stoves),
- Type of stoves eligible for replacement is based on the approved appliance list,
- Evidence is needed to demonstrate removed stove is decommissioned before issuing the rebate,
- Minimum requirements for outreach / education (as identified during funding allocation), and
- Programs must submit a final evaluation report each year.

## 2.2 Local program delivery

Local programs are designed and implemented by the community to match the needs of the community. Although all programs must meet the program requirements outlined in Section 2.1, there remains opportunity for variations at the local level, including:

**Organization delivering the program:** The program has been offered in communities by various agencies, including municipalities, regional districts, non-profit organizations (e.g. local airshed societies), and this year by a First Nation band. Initially there were more municipalities and airshed societies leading the programs, and over time this has transitioned towards more regional district programs. In 2014, funding was provided to eight regional districts, three non-profit organizations, one municipality, and one First Nation band.

**Education about burning practices:** Every local program is expected to offer education about burning practices, and this typically takes the form of offering one or two workshops per year about proper burning practices. In addition to workshops, program coordinators have tried various other forms of education:

- Booths at community events,
- Live demonstrations using a trailer equipped with certified and uncertified wood stoves,
- Newspaper articles or interviews with local media,
- Educational mail-outs to reach certain areas or people,
- Home visits providing training on proper stove operation and wood storage,
- Use of local champions to convey messages (e.g. Health Authority to interpret PM<sub>2.5</sub> readings),
- Social media to highlight burn practices, and
- Advertisements to prompt good burning practices in spring/ early summer (see Figure 2).



Figure 2. Example advertisement to remind residents to split and dry wood in spring or early summer (BVLD)

Various outreach materials have been distributed as educational aids, including Burn it Smart DVDs, an online master burner course, Canadian Mortgage and Housing Council (CMHC) Guide to Residential Wood Heating in print, kits to build a wood storage rack, moisture meters, and thermometers.

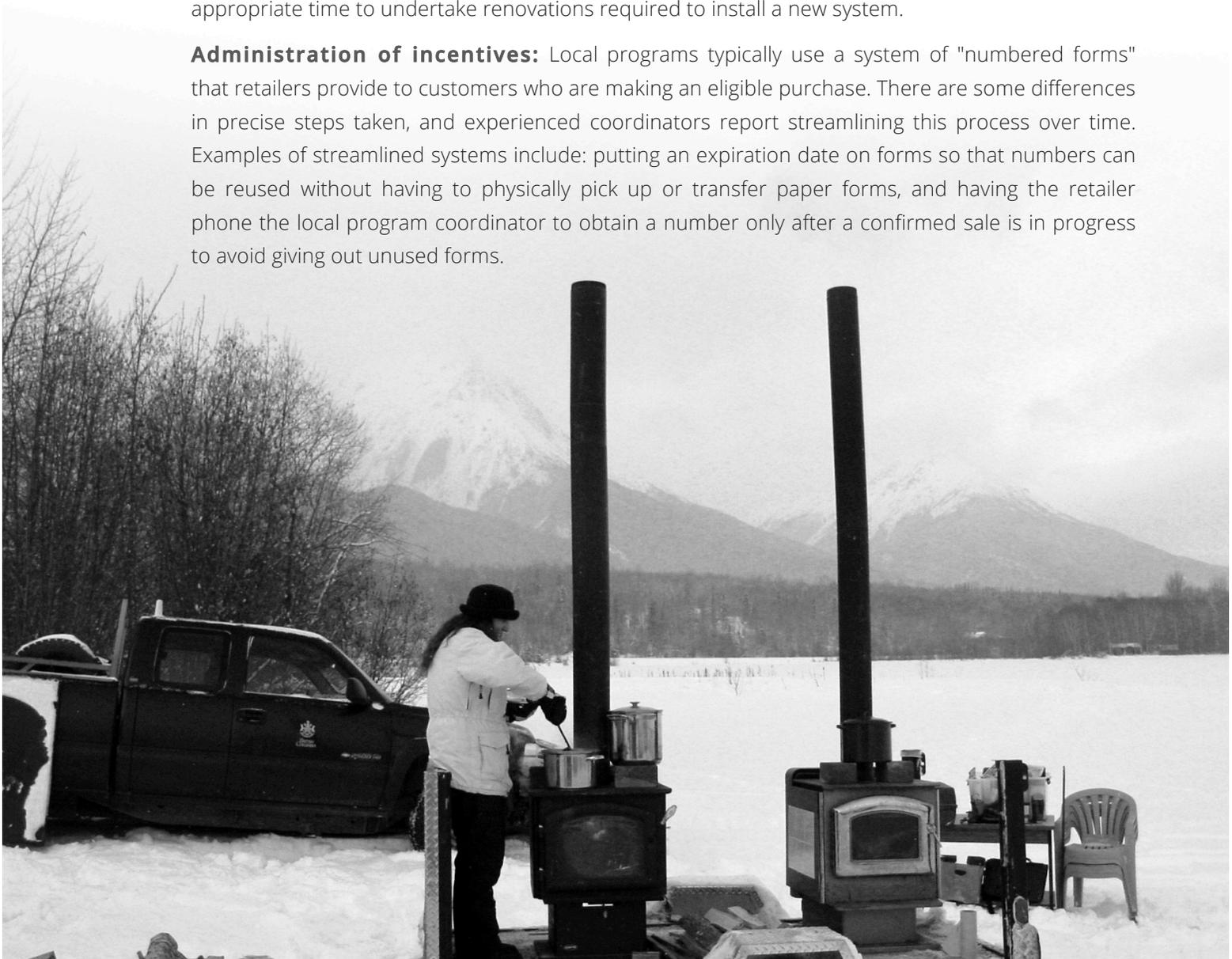
**Partners involved and roles:** Local programs must demonstrate that there are local partners willing to assist with the delivery of the program. Each community must identify retailers that will assist with the program for advertising, raising awareness of incentives, education on burning practices, decommissioning of old stoves, and assistance with completing and submitting incentive forms. The number of retailers involved varies by community. Among 2013 participating communities, the District of Mackenzie had one local retailer, while Metro Vancouver had 17. Typically programs have between four and six participating retailers. In some locations retailers are

actively involved with advertising the program, while in other areas the coordinators take on this role.

In some communities the media is also an active partner. For example in Campbell River, non-paid media coverage was provided in the newspaper and on radio for City media releases, in addition to hosting several interviews on the Morning Show with the program coordinator and a WETT certified technician. In some other areas the local government purchases advertisements in newspapers.

**Timing of incentives:** Local programs have the option to offer the program for a limited period of time, or throughout the year. Both models continue to be employed. When limiting the time period, the typical timing is March, April and/or May to coincide with the end of heating season – an appropriate time to undertake renovations required to install a new system.

**Administration of incentives:** Local programs typically use a system of "numbered forms" that retailers provide to customers who are making an eligible purchase. There are some differences in precise steps taken, and experienced coordinators report streamlining this process over time. Examples of streamlined systems include: putting an expiration date on forms so that numbers can be reused without having to physically pick up or transfer paper forms, and having the retailer phone the local program coordinator to obtain a number only after a confirmed sale is in progress to avoid giving out unused forms.



## 2.3 Summary of local program results

**Location and years of local programs delivered:** Between 2008 and present, 25 local programs have been run, varying from as little as one year to the full seven years. Each program year from 2008 to 2013 was provided annual funding from the provincial government. For the 2014 program, the Province did not provide new funding and the program only ran in communities that had carried over funds from previous years. The funding was renewed for the 2015 program year. Figure 3 lists all of the programs that have been delivered, and summarizes the years that each location participated.

	2008	2009	2010	2011	2012	2013	2014	2015
Nanaimo		■	■	■	■	■		■
Central Kootenay			■	■	■	■		■
Port Alberni			■	■	■			■
East Kootenay	■	■	■			■	■	
Fraser Valley		■	■	■	■	■	■	■
Cowichan Valley		■	■	■	■	■	■	■
Metro Vancouver		■	■	■	■	■	■	■
Prince George	■	■	■	■	■	■	■	■
Bella Coola								■
Skeena		■	■	■	■	■		■
Okanagan	■	■	■	■	■	■		■
Campbell River				■	■	■		■
Kootenay Boundary		■	■	■		■		■
Thompson Nicola		■	■	■			■	■
Sunshine Coast			■	■	■	■		■
Golden	■	■	■	■		■		
Revelstoke		■	■	■		■	■	■
Cariboo		■		■	■			
Vanderhoof		■						
Dawson Creek		■						
Comox Valley				■				
Sea to Sky				■		■	■	■
Port Alice								
Valemount					■			
Mackenzie						■	■	■

Figure 3. Summary of communities and regions participating in the BC WSEP by year (2008 to 2015)

**Number of wood stoves exchanged:** A total of 6,067 uncertified wood stoves have been decommissioned under this program, not including the current year exchanges (funding has been provided to communities for an additional 627 exchanges in 2015). The number of exchanges per year the program has run is shown in Figure 4. Not all participating communities reported the types of appliances that replaced the uncertified stoves, so a complete picture of replacements cannot be provided. Based on 2013 participating communities that reported the breakdown of replacement appliances, 68% were replaced with certified wood burning appliances, 29% were replaced with natural gas appliances, 7% were replaced with pellet stoves, and one was replaced with an electric appliance.

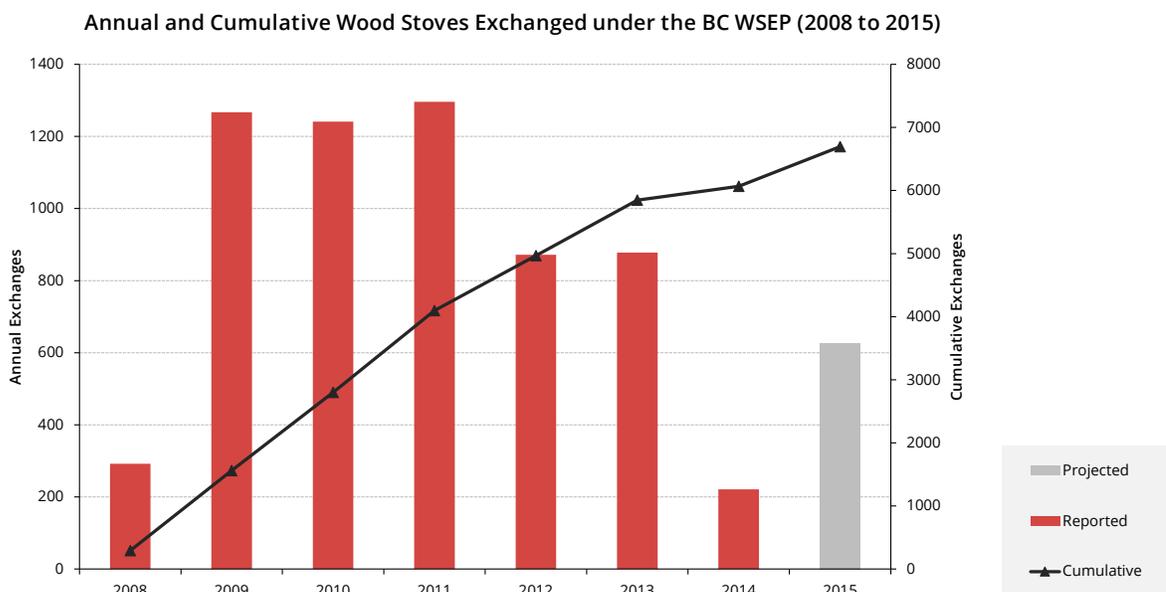


Figure 4. Annual and cumulative wood stoves exchanged under the BC WSEP (2008 to 2015)

**Number and types of education completed:** The total number of people engaged has not been tracked as a program metric and is not available for the full seven years of delivery. Based on information provided by ten local program coordinators for the 2013 programs, here is a summary of people engaged over the course of one year by activity type:

- Number of education events held: 12
- Number of participants in events (workshops, other): 1,459
- Number of media items (news releases, interviews): 57
- Number of telephone inquiries or house visits: 707
- Number of educational resources distributed: 2,182

## 2.4 BC WSEP funding, allocation and resource inputs

**Overall funding and allocation:** From the program launch in 2008 until the current year of funding (2014 – 2015), the program has run a total of 7 years and has allocated a total budget to communities of over \$2.2 million. On an annual basis, these funds are allocated to specific items for each community, and the total amount provided varies by community and by year. Table 1 summarizes how program funds were allocated over the first six years of the program, and how they are allocated for the current 2015 program year. Over time, the program has increased the percentage of funds going directly to the incentives, and decreased the funds allocated to advertising and local program staff salaries.

Table 1. Allocation of budget to local programs by percentage (2008 – 2013) and current budget allocation (2015)

Budget Item	Budget Allocation 2008 – 2013	Budget Allocation 2015 (in progress)
Incentives for wood stoves exchanged (626 x \$250 each)	74%	\$ 156,500 (82%)
Staff salaries for local programs	11%	\$ 14,350 (8%)
Advertising for local programs	9%	\$ 5,100 (3%)
BC Lung program administration	5%	\$ 10,000 (5%)
Education (Burn it Smart workshops)	4%	\$ 12,300 (6%)
Other	1%	\$ 1,750 (1%)
<b>Total Budget</b>	<b>\$2,080,000</b>	<b>\$200,000</b>

**Cost of outreach materials:** In addition to the above program funding, BC MOE also purchased outreach materials that were distributed to each of the participating communities for use in the local programs. Prior to the last two years, some of the material costs were included in the community budgets (incorporated in the "Other" category above). Materials purchased included DVDs about burning practices, moisture meters, thermometers for use inside wood stoves, rack clamps and slings for wood storage, tarps for covering stored wood, window decals, and printed booklets about clean burning practices. MOE has spent about \$16,300 for 900 of moisture meters since the program began (about \$20 each). Wood storage rack clamps, slings and tarps were also close to \$20 each. The thermometers cost approximately \$7 each, and the DVDs were \$1.25 each.

**Program administration:** BC Lung Association is contracted by the BC MOE to administer the program at a rate of 5% of the annual funding allocated to communities. Program administration involves review, scoring and notification of applicants, monitoring and transfer of funds to local programs, follow up to recapture or reallocate unused funds by the end of the program year, and

participation in the Steering Committee. BC MOE allocate staff time to this program to administer the contract with BC Lung, to provide support to local program coordinators (for applications, throughout delivery, and for evaluations), to work with the Steering Committee to review applications and allocate funding, to review coordinator evaluations, and to be responsible for program level communications (maintaining the website and answering public queries). This has required the following level of effort for BC MOE staff since the program pilot and design began in 2007:

- 2007 (pilot and design): 0.4 person years
- 2008 (program launch): 0.4 person years
- 2009 – 2011: 0.15 to 0.2 person years (each year)
- 2012 – 2014: 0.05 to 0.1 person years (each year)
- 2015 (program evaluation): 0.15 person years

**Community inputs to the program:** Communities that participate in the program typically invest staff resources, and some provide additional financial resources for top-up incentives, advertising or education. There is a very large range in staff time reported as being expended on local programs delivered. A review of the 2012 and 2013 year-end reports from each region shows reported numbers of hours spent by local program coordinators range from zero up to 364 hours in one year. The average time spent per local program is approximately 140 hours per year. In most cases, this time is provided in-kind by the local government. Where a non-profit organization is operating the program, the WSEP allocates funding to support staff time. Many communities also dedicate additional local government staff efforts above and beyond the coordinator time, and these range between zero and 112 hours in a year. On average, additional staff time adds to about 60 hours per participating region.

In addition to staff time, some local governments provide top-up incentives. Of communities that provide the incentive in 2013, it ranged from \$50 per exchange (e.g. Cowichan Valley Regional District), to \$130 per exchange (e.g. Regional District of Fraser-Fort George). In past years, some local governments provided up to \$500 in additional rebates.

Higher rebates have been offered in limited quantities in two regions that specifically target lower income households: \$750 from the CVRD and \$300 from the Community Foundation of Whistler. Note that only one lower income household used the CVRD rebate offer. Some local governments provide additional incentives after the provincial funds are expended in a particular year to ensure everyone that responds has the opportunity to exchange (e.g. Cowichan Valley, Nanaimo and Central Okanagan Regional Districts have all extended the incentives in previous years).

Some local governments also waived building permit fees and recycling fees (e.g., District of Mackenzie, CVRD, RDOS, RDKB).

**Industry and retailer inputs to program:** Manufacturers and retailers also provide top-ups or discounts. The level of rebate varies by location, manufacturer and retailer involved. Typical top-ups reported by coordinators range from \$10 to \$40 per exchange in Prince George up to \$100 to 500 per exchange in Campbell River (based on 2012 and 2013 reports). Retailers in some jurisdictions also covered the fees associated with removal and recycling of the old stoves (e.g. Sunshine Coast and Campbell River). In some regions, private recyclers waived the fees (e.g. Prince George).

The level of promotion and advertising support provided by retailers was highly variable across the participating regions. Some participants indicated that retailer support was limited to only verbal in-store promotion. However, the majority of participating retailers provided in-store advertising at minimum, several distributed program materials, and some also supported the program with their own newspaper ads and special promotion events. It was also noted that retailers contribute significant administrative support in the form of processing the paperwork associated with the exchange. For example, Metro Vancouver estimates that retailers spent an average of 2.5 hours per customer to process rebate applications.

Some participants also mentioned substantial in-kind advertising contributions by local media (e.g., Prince George).



## 3 PROGRAM EVALUATION

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After running the provincial WSEP for seven years, BC MOE commissioned this program evaluation to review the impact the program has had to date relative to the program's objectives. The evaluation approach included a review of program documentation, telephone and email surveys of numerous stakeholders across the province, and a review of available data and studies that relate to the program. Refer to Appendix B for a list of survey questions for the various stakeholders contacted. The qualitative and quantitative results of the evaluation are presented in this section using a framework that has five key components: (1) program reach, awareness and impact; (2) meeting program objective #1 – removal of old wood stoves; (3) meeting program objective #2 – education about burning practices; (4) leverage of provincial investment; and (5) program efficiency. At the end of this section, a comparison is drawn between the BC WSEP and best practices identified by a team of researchers for the University of Maryland.

### 3.1 Program reach, awareness and impact

The province-wide program has been available to 83% of BC's population for at least one year since the program began in 2008, and in the current year (2015) is being offered to about 75% of the population. In general, people in communities with wood stove exchange programs are aware of the program and the incentives, and over time limited effort is needed for advertising the incentives. All participating communities reviewed identified a strong need for the program – due to elevated winter pollution levels, episodes of inversions, and/or exceeding provincial air quality objectives. Other communities with potential wood smoke issues that have not participated may not have identified this as a priority and/or may not have sufficient resources for applying to or delivering the program.

One study conducted in four wood stove exchange communities in BC has shown early data indicating a beneficial impact of the exchange program on ambient air quality in those communities. Studies from other regions have also demonstrated this link. Although incentives are usually expended each year (or sometimes carried over to the following year), it is believed that lower income households are not accessing the incentives. First Nation communities are underrepresented in the program, particularly in light of the higher use of wood heat in those communities.

The level of awareness of the program and overall reach and impact is described by the following:

- 
- Geographic spread of the program
  - Awareness of the program
  - Impact on air quality in participating communities
  - Targets populations with the greatest need
  - Targets communities with greatest need
-

**Geographic spread of the program:** Local programs have been delivered throughout BC, with at least one program occurring in 23 of the 28 regional districts in BC. Some programs are held at a municipal level, so not all people in these regional districts may have had access to the program. The proportion of the BC population that has been served by the program for at least one year is 83% (based on 2011 Canada Census populations). The map in Figure 5 summarizes the locations where local programs have been delivered, where the dots represent the relative number of wood stoves that have been removed. The Okanagan has had the most exchanges of any region, with over 900 old wood stoves removed.

**Total Community Wood Stove Exchanges (2008-2014)**

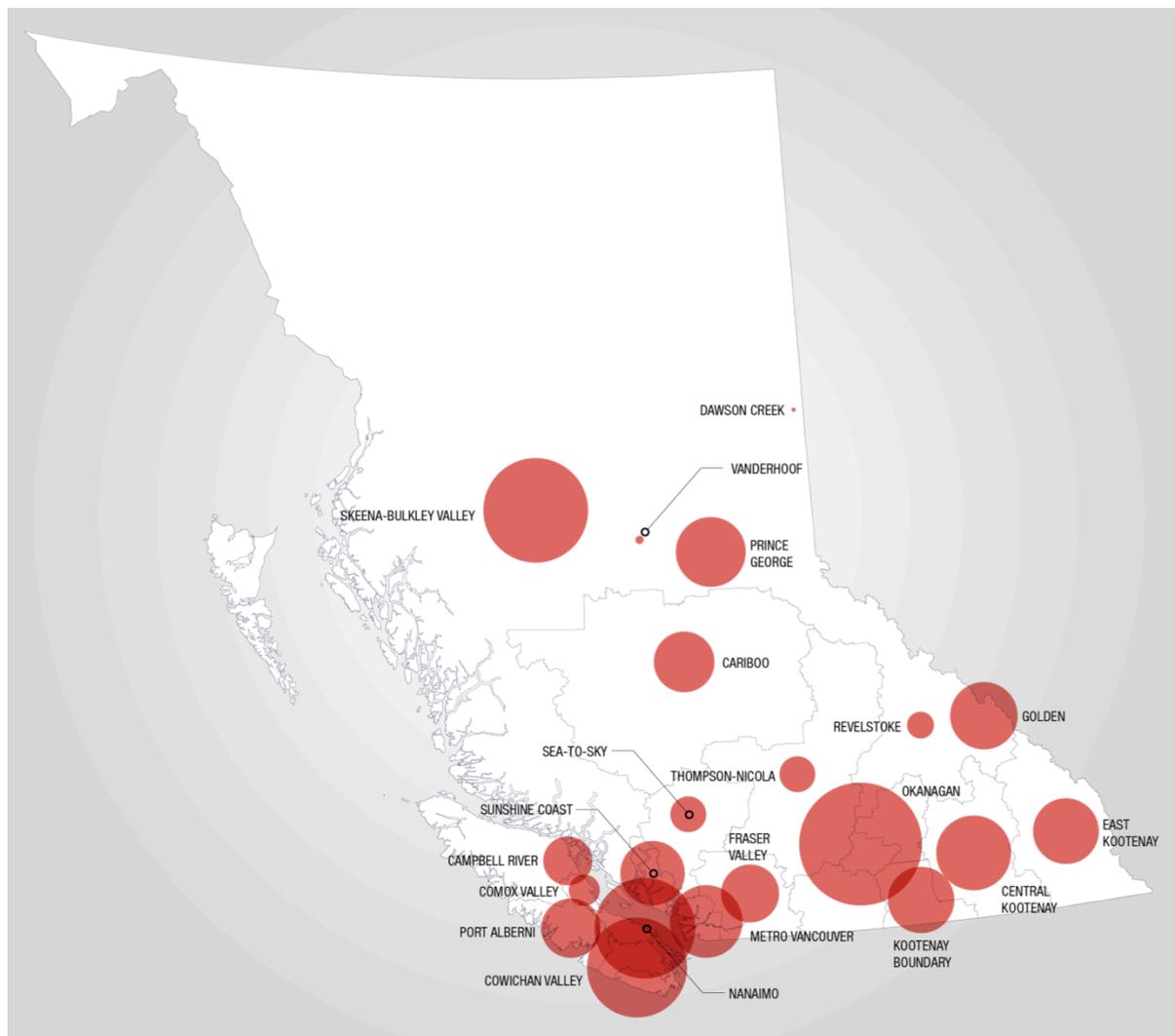


Figure 5. Total community wood stove exchanges (2008 to 2014)

**Awareness of the program:** There appears to be a reasonably good level of awareness of the availability of incentives to exchange old wood stoves within areas that have been served by the program, with higher awareness in areas that have held the program for multiple years. At the provincial scale, a 2012 survey showed that about half of wood burning appliance users were aware of cash incentives available for upgrading to newer, more efficient, cleaner burning wood or pellet stoves (Mustel, 2012), with the highest awareness in the Kootenay Boundary and Cariboo regions and lowest awareness in the South Coast. There was lower awareness of the "Provincial Wood Stove Exchange Program" (34%), and this may be attributed to the nature of the local delivery model where residents may not be aware the funding is coming from the Province.

Based on discussions with stakeholders (program coordinators, elected officials, health authority representatives, retailers), residents in local program areas become more aware of the availability of incentives after multiple years of hosting the program, at which point the residents ask for the incentives.

**Impact on air quality in participating communities:** One study has been conducted in the Bulkley Valley Lakes District (BVLD) of BC that looked at the relationship between a local wood stove exchange program and changes in ambient air quality. Early results indicate there was a beneficial impact of the stove exchanges on the level of wood smoke in four communities in the BVLD (Smithers, Houston, Burns Lake and Telkwa) (Allen et al, 2012).<sup>2</sup> This study also noted that improvements in air quality were less pronounced in one community when the numbers of exchanges went down over time. There are also studies that show a measurable decrease in pollutants after exchange programs were put into place in other regions (Libby Montana and Nez Perce Washington). In Libby Montana a concerted effort was made to replace uncertified wood stoves due to the difficulty in meeting US EPA air quality standards in the wintertime when wood stoves are in use. Over a three-year program, approximately 1,200 uncertified wood stoves were replaced (out of a total of 1,500 registered wood stoves). Ambient air quality readings showed a 20% decrease in PM<sub>2.5</sub> (Bergauff, 2010). A reduction in children's respiratory symptoms and illness was linked to this reduction in PM<sub>2.5</sub> (Noonan, 2011).

This topic had the most varied input among stakeholders surveyed for this evaluation. The input ranged from the belief that the program has had no impact on air quality, to the belief it is having a significant impact. For example, representatives from the Clean Air Alliance (CAA) felt strongly that the replacement of old stoves with new wood stoves only continues the problem because new wood stoves still emit enough pollutants to impact people's health. The CAA also noted that because the BC WSEP supports the installation of new wood burning stoves (certified), it provides a false sense of security to British Columbians that wood burning is healthy.

Other stakeholders interviewed felt the program was having a positive impact on awareness and local air quality, even where local air quality monitoring stations have not shown a measurable

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<sup>2</sup> The study also has additional data from the 2012 to 2013 winter, and the final results have not yet been published.

change. The following statements represent input from the majority discussions held with representatives from participating local governments and health authorities:

- The exchange of wood stoves has a positive impact on neighbours and neighbourhood-level air quality. Exchanging one wood stove can result in significant improvements for the owners, and for their neighbours. The program has been used as a positive way to approach households where complaints have been made about smoky chimneys.
- The percentage of wood stoves exchanged was likely too low to have an overall impact on community air quality, particularly because air quality monitoring stations are not located in wood burning neighbourhoods.
- Even with new certified wood burning appliances, there continue to be problems with improper use of the appliances – primarily concerns that improper fuel is being burned (wet or unseasoned wood and garbage in particular were identified).
- Switching to a certified wood burning appliance still releases emissions and that the most effective way to improve air quality would be to replace with non-wood burning heat sources, which may be appropriate in higher density areas.

A few respondents noted that there were less visible smoky chimneys in the community since the program started and that there was a heightened sense of awareness that use of old uncertified stoves results in more emissions.

**Targets communities with greatest potential impact:** Each community's need for a wood stove exchange program is an important consideration during the proposal evaluations and funding allocation process. As a result, the funds are distributed to communities that demonstrate the need for the program, as long as the other requirements can also be met (sufficient local capacity, partnerships, etc. which are important for successful delivery of a local program). Allowing different types of agencies to deliver the program (regional district, municipality or non-profit community organization) has provided flexibility enabling wider participation in the program.

Based on a review of applications submitted by 2014 communities, every participating region is susceptible to winter time inversions or stagnant air, to varying degrees, that trap pollutants near valley bottoms (often where more people live). Some regions also noted that they are subject to pollutant loading from neighbouring areas. Monitoring studies in most of the regions have indicated elevated levels of PM<sub>2.5</sub> during winter months, and air emission inventories are confirming that wood heating is a significant contributor to these elevated levels. The majority of these communities report exceeding provincial air quality objective levels occasionally, while some regions such as Alberni-Clayoquot, report exceeding the objectives numerous times.

However, not all communities that are affected by wood smoke have participated in the program. This may be because the community has not identified wood smoke as a priority, or does not have resources to dedicate to applying for and delivering the program.

**Targets populations with greatest potential impact:** Local programs are typically set up to provide incentives for exchanges on a first-come first-served basis. This is not uncommon for a voluntary exchange program, as significant investment and effort is involved in the purchase of a new wood stove (and often includes the need to replace ageing chimneys, adding to the cost). However, to have the greatest impact, the programs would target homes that have the oldest, least efficient appliances, and/or that generate the most smoke due to burning practices. Many of the participating regions report having issues with hotspots, and indicate that these hotspots often occur in locations where there is a higher incidence of older homes containing old wood burning appliances, and in areas of low-lying topography. A number of regions also report experiencing an increase in wood smoke pollution complaints. Some of the local programs have attempted to address this as follows, but these are not yet common practice across all programs:

- Providing outreach materials about burning practices and exchange incentives to homes based on complaints about smoky chimneys.
- Using a mobile monitor to map out areas of higher pollutant concentration on a winter evening, then conducting targeted outreach to those areas (including home visits).

Among survey respondents there was also a general belief that **lower income households** may make more use of wood heat, but are unable to access the incentive program due to the unaffordability of purchasing and properly installing a replacement appliance. The Cowichan Valley exchange program ran a pilot project to increase the incentive for low-income households to \$1,000. After significant outreach, there was only one exchange completed by a low-income household, demonstrating that even with a four-fold increase in funds it may still be a challenge for these homes to participate.

**First Nations communities** also make extensive use of wood heating, due to cultural significance of burning wood, affordability, and remote locations. Some local programs have offered the incentives to residents from reserves, but have had limited uptake. In 2014, the Nuxalk First Nation became the first native community to participate in the program. It is estimated that 90% of Nuxalk homes on reserve are heated using old, inefficient wood stoves as the primary or secondary heat source. Residents are encouraged to use wood for heat, as most secondary heat on reserve comes from expensive, inefficient heating oil furnaces. Monitoring data and anecdotal evidence in Bulkley Valley and Lakes Districts also suggests that the program has not yet reached remote and First Nation communities within the BVLVD effectively.

Based on survey input and analysis, additional effort could be allocated towards targeting all of these populations more effectively. Continued efforts are also needed to ensure more First Nations communities have access to the program.

### 3.2 WSEP Objective 1: Removal of old uncertified wood stoves

6,067 uncertified wood stoves have been removed through this program since 2008, and this has resulted in an estimated reduction of 1,590 tonnes of PM<sub>2.5</sub> emissions. These are strong achievements, but there remain numerous uncertified stoves across the province, and significant continued efforts are needed to remove these.

The success in meeting the objective of removing old uncertified wood stoves is described by the following:

- 
- Number of uncertified wood stoves removed
  - Estimated air quality impacts from change outs
- 

**Number of wood stoves removed under the program:** Since the program started in 2008, 6,067 uncertified stoves have been decommissioned and replaced with cleaner alternatives. As shown earlier in the program documentation (see Figure 4), the number of wood stoves removed under the program was highest during the years 2009 to 2011, and this was due to the higher level of funding available for exchanges during those years. 2014 had the lowest number of exchanges because there was no new program funding that year and all exchanges were the result of carried over funds from previous years. 2015 has renewed funding and there are a projected 627 exchanges to be made. This is a success, but it accounts for only 13% of the "stretch" goal that was originally stated in the *BC Air Action Plan* to facilitate the exchange of 50,000 of the province's uncertified stoves, and to eliminate them by 2020. Supportive bylaws in participating communities, as well as natural attrition, have also resulted in wood stoves being removed and replaced over this period. Based on a BC-wide survey conducted in 2012, approximately 68% of wood stoves are certified (Envirochem, 2012). Reaching the provincial target using a voluntary incentive-based approach would require significantly more effort and funding, and a regulatory approach is likely needed to fully achieve the BC Air Action Plan goals.

For comparison, the Puget Sound wood stove exchange program replaced over 1,200 uncertified stoves, which was about 6% of the estimated 24,000, from 2007 to 2011 (5 years). In 2012 the program efforts were increased due to new legislation for Tacoma-Pierce County requiring all uncertified stoves be removed by September 30, 2015 (the region was identified by the US EPA as a "non-attainment area", meaning it was not meeting the air quality standards set out in the federal *Clean Air Act*). With substantial additional investment, combined with impending new regulation, over 1,000 stoves were removed in the first year and a half following the changes. BC's program has made good progress, though significantly more investment may be needed to accelerate the exchange of remaining wood stoves.

**Estimated air quality impacts resulting from change outs:** Based on the total number of uncertified stoves that have been exchanged for eligible appliances, it is estimated that 1,590 tonnes of PM<sub>2.5</sub> emissions have been avoided as a result of the exchange program (also shown in Figure 4 above). This is a conservative estimate of avoided emissions because it is based on a

conversion from wood to wood for every exchange, despite the fact that numerous stoves were replaced with natural gas (particularly in urban areas like Metro Vancouver) or pellet stoves.<sup>3</sup> This conservative estimate is appropriate because the real world avoided emissions may vary based on whether users operate and maintain the stoves properly, use good burning practices, and use the new stove with the same frequency (there is a risk the new stove will be used more as it may be easier to use and more pleasant to have running).

Several survey respondents noted that even new certified wood burning appliances do emit measurable levels of pollutants, and that these may continue to impact neighbourhood air quality, especially in more dense or urban areas. These respondents questioned whether the exchange program should incentivize the continued use of wood, even in certified stoves.

However, any level of avoided fine particulate matter pollution is important for local residents. For context, the US EPA states that removal of one old wood stove is equivalent to the PM<sub>2.5</sub> emission reductions of taking five diesel buses off the road. Further, the US EPA conducted an economic analysis of their new emission standards released in 2015 demonstrating that the public benefits of the new rule vastly outweigh the costs. The US EPA estimates that for every dollar of additional cost to produce the more efficient wood stoves, there is more than \$100 in public benefit (US EPA, 2015), as well as other non-monetized benefits like reducing other pollutants (VOCs, Benzene, Carbon Monoxide, etc), and reduced climate effects related to black carbon emissions in smoke.

### **3.3 WSEP Objective 2: Raising awareness of good burning practices**

The opportunity to reduce wood smoke by addressing burning practices is significant. Almost every stakeholder interviewed reported that improper burning techniques, and the burning of wet or unseasoned wood continue to be key concerns in their regions. Measuring the efforts of good burning practice education is challenging because the affected behaviour largely takes place in the home and therefore relies on surveys and anecdotal information. Efforts have been made by most participating communities to focus education on improving burning practices, yet there is little data to indicate which techniques have been most effective. Based on input from stakeholders, and one behaviour change study conducted, it seems that distributing and training people about using moisture meters is the single most effective form of outreach about burning practices.

The success in meeting the objective of raising awareness of good burning practices is described by the following:

- 
- Changes in burning practices measured or surveyed
  - Perceived impact of various outreach methods employed
- 

<sup>3</sup> The types of appliances installed have not been consistently tracked throughout the program, so the total number of conversions to natural gas or pellet stoves is not available.

**Changes in burning practices measured or surveyed:** There has been one formal behaviour change study completed as part of the local programs. This was done in Prince George, and the results of this work suggest that providing useful tools during a home visit is an effective way of changing wood storage and burning practices. As described in the study report, roughly 70% of participants who received wood storage racks, tarps, moisture meters and canvas totes reported that they used them to improve their wood storage practices. Additionally, 94% of people whom received a clean burning toolkit (containing printed material, the CMHC Guide to Residential Heating, and moisture meter, etc.) recommended that a similar kit be provided to all residents who upgrade their stoves. The study also found that 100% of participants who received a home visit from a Burn Master rated the experience highly and recommend a similar approach for all WSEP participants. All indicated they would use the lessons when burning in future. Visual surveys indicated generally that woodpiles were better stacked once these interventions were employed. This work did not measure changes in burning practices. However, it did show that participants appreciate support with wood storage, tools such as moisture meters, and home visits from Master Burners, and feel they are able to improve their burning practices with these interventions.

No other formal study to measure changes to burning practices has been conducted to date in BC communities, though anecdotal evidence suggest the Burn it Smart workshops provide very useful, helpful content that helps participants improve their burning practices. A study from Australia found an educational campaign significantly decreased visible wood smoke emissions (Hine et al. 2011). The study identified poor operation of heaters, mismanagement of firewood, and lack of knowledge about the health impacts of wood smoke as the main barriers needing to be addressed to reduce wood smoke.

**Perceived impact of various outreach methods employed:** Retailers and coordinators agree that moisture meters have been an effective tool to engage residents on clean burning practices. In addition to offering information that helps residents determine when their wood is ready to burn, these tools serve as a conversation opener with public audiences.

As seen above, the master burner kits, including a moisture meter, drying rack, tarpaulin, tote bag, and other informational material can have a positive impact, especially when delivered with a home visit from a Master Burner.

Some coordinators stated that a mobile burn display is a highly effective tool to illustrate the impact of personal burning practices. This experiential tool is reported to have a high impact with a variety of audiences, and due to its portable nature, can be brought to community gatherings for demonstrations. Not all communities have access to such a trailer.

The Burn it Smart workshops provide useful content that helps participants improve their practices, however, the reach of this tool is limited due to the number of workshops in each community (often only one or two per program) and low participation rates in most communities, while also requiring significant investment of time and resources to organize. Prince George took the lessons from the

Burn it Smart workshop and developed an online Burn Master course that is mandatory for all program participants seeking a rebate. In order to receive the rebate, program participants must achieve 67% on the online course, and supply a printed completion certificate along with the voucher. Stakeholders in Prince George feel this approach has had a strong impact locally.

While there are other outreach tools and methods employed, such as media releases, stories in the local newspapers, brochures, educational DVDs, window decals, etc., these tools are deemed less effective at changing burning practices by stakeholders involved in the programs.

### 3.4 Leverage of provincial investment

The BC WSEP has been very successful at establishing a provincial program that has seen significant investment from communities and industry towards improving air quality. Communities have invested time and funding towards delivery of local programs, as well as adopting supportive bylaws. There are still significant gaps in local bylaws among participating communities. Industry has also offered manufacturer and retail discounts in participating communities making the overall incentives more attractive. Beyond discounts, some industry partners are actively involved with advertising and education.

The success in using provincial investment to leverage additional investment by other organizations in activities that support the primary objectives (through supportive policy, monetary investment, resource investment, etc.) is described by the following:

- 
- |  |   |
|--|---|
| • Level of additional funding or support from communities        | • Level of additional funding or support from industry and retailers  |
| • Extent of supporting bylaws in participating local governments | • Level of awareness, involvement, or support from Health Authorities |
- 

**Level of additional funding or support from communities:** Communities that have identified wood smoke as a concern have made significant investments of staff time, and to varying degrees, financial investments in local program delivery and top-up incentives. This has been a necessary component of the overall success of the provincial program, and one key reason that there continues to be high levels of change outs annually, despite a relatively low provincial investment. The level of investment required by communities may result in some communities not participating that could benefit from the program; however, in some areas non-profit groups have filled this role. The BC WSEP has also provided additional support for staffing in these cases.

**Level of additional funding or support provided by industry and retailers:** Additional top-up incentives and discounts provided by manufacturers and retailers are also an

important component of the continued uptake of the provincial incentives. This is not unique to the BC WSEP, as major programs in the US have also relied on significant funds from the HPBA industry association to roll out incentive programs. In particular, the state or federal government and HPBA have made matching contributions in non-attainment areas where high numbers of change outs have occurred.

One well known example is in Libby Montana, where a concerted effort was made to replace uncertified wood stoves due to the difficulty in meeting US EPA air quality standards in the winter time when wood stoves are in use. The total program funding was \$2.1 million, from the following sources: \$1 million State funding, \$1 million industry funding (Hearth Patio and Barbecue Association), and \$100,000 US EPA funding).

**Extent of supporting bylaws in participating local governments:** Communities in the program are more likely to have supporting wood stove bylaws than other communities. In 2011, 42 local governments, or 22% of BC local governments, had bylaws targeting wood burning appliances (Coccola, 2012). Of the local governments that have participated in the WSEP, about 38% of them have at least one targeted bylaw (i.e. at the regional level or in one or more member municipality). Those participants that do not have targeted wood stove bylaws largely have wood stove burning addressed within their building bylaws and in some case in their fire protection bylaws. Over half of participating communities have requirements that wood stoves comply with the building code and require permits for installation, and about half of them require the installation of CSA/EPA approved appliances.

Several survey respondents from the health sector identified the need for more complete regulations at the local and provincial levels, including bylaws about the types of fuel that may be burned, and ensuring that new appliances are certified to the new US EPA standards. As of 2011, only three participating communities had bylaws addressing the type of fuel that may be burned. Some communities have air quality bylaws in place but lack the resources to advertise and enforce them.

**Level of awareness, involvement, or support from Health Authorities:** Surveys were conducted with representatives from Health Authorities throughout the province. All Health Authorities were aware of the wood stove exchange programs, and several were involved to some degree – in an advisory capacity, or through collaboration about education and dealing with wood smoke complaints. All Health Authority representatives indicated support of the wood stove exchange program and several felt the program had made good progress since it began. However, almost all also identified the need to continue expanding education about burning practices, as poor practices continue to result in potential exposure to pollutants in localized areas. Several also noted that lower income households were unlikely to be accessing the rebate program. Several

representatives noted the need for provincial legislation to be updated in accordance with the new US EPA standards for wood stoves.

### 3.5 Program efficiency

Based on the provincial expenditure per wood stove exchanged, the BC WSEP has been quite efficient to date. A small portion of the total has been dedicated to education about burning practices (approximately 5%). Community stakeholders surveyed noted that the low level of the incentives are likely to become less effective over time as the people most likely to change out will have done so, leaving people that are less likely or able to make the investment to change out.

The program efficiency is described by the following:

- 
- Cost per wood stove removed
  - Investment in education about good burning practices
  - Ease of implementation
  - Adequacy of support
- 

**Cost per wood stove removed:** BC MOE estimates that the program has cost an average of \$370 of provincial government funds per uncertified wood stove removed over the course of the program. This includes the investments made in conducting education and purchasing outreach materials for distribution. In relation to programs that have run in other jurisdictions, this is a cost effective program. In the majority of rebate programs in the US, incentives are in the range of \$1,000 or more per stove exchanged. Typically the state or federal government are contributing at least half of those funds, so costs are higher per stove exchanged. In Libby Montana, costs to the state were about \$900 per stove (with additional funding from industry and the federal government). However, this program had a different outcome, as it targeted all of the stoves in a focused area in a short period of time. To date the BC WSEP has likely accessed the group of people that are more able and willing to pay for a new wood stove, and over time it will likely require more effort to exchange old stoves, or stronger local bylaws that require their removal. One significant difference between the BC program and US programs is that government funding typically comes from both the federal and state levels.

**Investment in education about good burn practices:** Through the course of seven years, the program has spent an average of about \$13,000 on education each year. This is only about 5% of the overall budget allocated by the program to the local communities. Based on feedback from communities and health professionals, the focus, funding and effort for education should be increased.

**Ease of administration:** Local program coordinators surveyed were generally satisfied with the ease of administration of the program, particularly in communities that have offered it for consecutive years. In earlier years the voucher systems were more onerous, but several of the local programs have streamlined these processes. Many coordinators did note that the evaluation and reporting at the close out of the program are quite onerous, and further, that there was uncertainty that recommendations in those reports were being acted upon.

**Adequacy of support:** Coordinators report receiving good support from BC MOE and BC Lung, and also from other coordinators. Information sharing is facilitated through conference calls and a document-sharing site (share point) where a lot of resources have been added over the years.

### 3.6 Comparison to best practices in wood stove incentive programs

The Alliance for Green Heat is an independent non-profit organization that promotes high-efficiency wood combustion as a low-carbon, sustainable, local and affordable heating solution. This organization recently prepared a list of best practices in wood and pellet stove incentive programs for the University of Maryland that looks at the ways to maximize program impact while looking at "environmental, economic, energy efficiency, social equity, and consumer values" using research about exchange programs throughout the US (Alliance for Green Heat, 2014).

Table 2 lists the best practices identified by the Alliance for Green Heat, and provides a summary of the how well the BC WSEP currently incorporates the practice. The best practices document acknowledges that it is unlikely for one program to incorporate all best practices identified, but that programs should be designed to consider all of these and adopt those most appropriate for the local context. Other best practices were also identified that are not included in the table below because they were not supported by successful implementation in any program and do not yet have sufficient information to understand their impact; therefore, they are not appropriate for evaluating the effectiveness of the BC WSEP. These include: setting stove efficiency as a requirement for incentives, requiring an energy audit be performed, and requiring dedicated outside air for new installations.

Overall the BC WSEP has addressed approximately half of the identified best practices fully, or somewhat. Despite significant achievements in the removal of old wood stoves, the development of strong partnerships, and the efficiency of the program delivery, there remain several areas where the program could be updated to ensure continued success in achieving the provincial goals for wood stoves. The following section of the report outlines the identified strengths of the existing program, and provides recommendations about how to address the identified gaps.

Table 2. Comparison of BC WSEP to best practices for wood stove programs

Best Practice for Wood Stove Programs	Has BC WSEP adopted the best practice?
At a minimum, program should only incentivize EPA certified stoves.	Yes. Note the program will need to be updated to address new EPA standards.
Ensure program reduces emissions by requiring the decommissioning of an old uncertified stove to obtain a rebate for a new stove.	Yes.
Create a network of engaged partners that are committed to the program goals.	Yes. The program has an excellent network of partners – local governments, NGOs, retailers, health authorities.
Require professional installation of new stoves.	Mostly. Most local programs require this due to bylaws requiring building permits for installation, but there are some gaps.
Require emission limits below EPA limits (note this is based on EPA limits in effect in 2014), such as in Maryland where limits are 3 grams/hour for wood stoves and 2 grams/hour for pellet stoves.	No. Adopting new EPA standards as soon as possible would help address this.
Provide higher rebates for lower emission stoves (e.g. pellet or natural gas stoves).	No. However, this would increase program complexity and may only be suitable where higher rebates are being provided.
Provide a buy-back or "bounty" option to remove old stoves from circulation without having to replace it.	No. Concern that incentives may be given out for stoves that are not being used anyway.
Provide higher incentives and more marketing to low-income households.	No. However, two local programs have tried this (Cowichan Valley and Whistler).
Attempt to minimize "free-riders" through correct rebate levels (if rebates are used up too quickly, they are likely too high).	Somewhat. Any incentive program will likely have "free-riders", however, the relatively low rebate reduces this. Also, even these exchanges do help achieve the program goals.
Limit installation of new wood stoves to rural areas or areas without access to natural gas to address concerns that installing wood stoves in urban areas still emits harmful pollution.	No. Currently the program has the same eligible stoves regardless of location.
Provide education about correct stove use and efficient burning practices with stove incentives.	Yes. However, survey respondents indicated a need to increase focus here.
Provide moisture meters and/or subsidize woodsheds for each incentive provided.	Somewhat. Moisture meters and tarps are provided in limited quantities, but not to all recipients.
Continually track progress, evaluate, and update program as needed.	Review in progress. Need for improved annual reporting.

## 4 RECOMMENDATIONS

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The BC WSEP has made significant strides in raising awareness about smoky old wood stoves, reaching residents in the majority of the province, and getting old smoky wood stoves decommissioned for a relatively low overall program cost. The program has several strengths, including:

- **Strong partnerships and support from communities, industry and health professionals.** Overall, the program objectives have a high level of support from stakeholders across most sectors and across the province.
- **A local delivery model** that results in an efficient program at the provincial scale, community commitments across the province to reducing smoke from wood heating through policy, staff and financial investments, and support for local businesses in participating communities that actively participate in the exchange program.
- **Flexibility for different agencies to be the delivery agents** of the program (municipalities, regional districts, or non-profit organizations). Although this increases the administrative costs to the program, as local programs offered by non-profit organizations and smaller local governments typically also need support for staff salaries, the flexibility has meant that several communities in need of the program have been able to participate that would not otherwise have been able to.
- **An appropriate incentive package** that continues to be attractive to BC residents, as each year most communities are able to achieve their goals for numbers of old wood stoves exchanged.

These elements should continue to provide the basis for an ongoing program offering. Through the course of this evaluation, a number of areas were also identified that could be changed in order to improve the effectiveness of the program moving forward. Several themes arose through discussions with stakeholders, and together with document review and further analysis, the following recommendations were developed.

1. **Increase emphasis on burning practices:** The one issue that was raised by almost every stakeholder surveyed was the importance of clean burning practices, regardless of whether the appliance in use is certified low emissions. The feedback from all over the province indicates that improving burning practices is the area of greatest need, as it appears that people regularly use wet wood that causes significant smoke in both old and new appliances. The program's high-level goals and communications currently focus more heavily on the appliance in use, than on burning practices.

To address this, consider re-branding the program to address wood stove practices in general (for example, "BC Wood Stove Program", which aligns with BC's neighbouring "Puget Sound Wood Stove Program"; or "BC Wood Stove Smoke Reduction Program"). Also, during annual applications, ask communities to set a target for numbers of active wood burners that will be directly engaged about their burning practices (see further recommendations below about effective means of engaging people). Place further emphasis on the importance of setting and enforcing local bylaws about wood stove use (see further recommendations below about bylaws).

It is recognized that one challenge with a shift in focus on burning practices is the difficulty of tracking progress and effectiveness of the program. Some potential measures that could be used include: number of communities with supportive bylaws in place (addressing fuel restrictions, appliance restrictions, and burning restrictions during air quality advisories); number of local champions trained in burning practices; number of homes visited by champions; number of moisture meters distributed with training on their use; etc. Over a longer timeframe, the contribution of wood stoves to particulate matter emissions in communities would be the most significant measure to report progress.

- 2. Actively communicate a non-wood burning appliance option:** For many communities, the elimination of wood burning for heating may be the desired path to reduce exposure to pollutants. This may be the case for communities that reach or exceed provincial objectives for PM<sub>2.5</sub>, have identified wood burning as a significant source of local pollution, and/or are facing complaints due to smoke in higher density neighbourhoods. In the US, several wood stove exchange programs do not allow replacement appliances that are wood burning – including in the states of Washington and Maryland – unless the home does not have access to natural gas, or is a low-income household. Only allowing pellet stoves or natural gas appliances in densely populated areas is considered a best practice in wood stove exchange programs (Alliance for Green Heat, 2014).

The BC WSEP should clearly provide communities with the option to remove wood burning units from the eligible replacement appliances, whether it is for the whole jurisdiction, or a designated area (e.g. in areas with higher population density). This option should be actively communicated to demonstrate that the program supports community decisions to reduce or eliminate pollution from residential wood burning.

- 3. Focus additional resources where air quality standards or objectives are being exceeded:** Some communities in BC experience fine particulate matter levels that exceed, or are at risk of exceeding, provincial air quality objectives or national standards. Where

residential wood smoke is a significant contributor to the ambient fine particulate matter levels, the current approach of the BC WSEP would not likely achieve substantial changes to fine particulate matter for many years. To accelerate the impact of the program, the BC WSEP could create a program stream that dedicates higher resources to achieve higher rates of exchanges in the affected area. Communities in the US that are exceeding national standards have been provided more significant resources. The increased resources are accompanied by stronger requirements, including not allowing new appliances to be wood burning (with some exceptions for areas without natural gas service), and regulations requiring the removal of uncertified appliances by a specific date. For example, in the Tacoma-Pierce non-attainment area, Washington State provided \$1.5 million in funding for a two-year period, with three options for removing old smoky stoves: \$350 bounty for removal, free replacement for low-income households, and \$1,000 to \$1,500 incentives for non-low income replacements. A new regulation was also passed requiring all uncertified stoves be removed by September 2015. Outside of the targeted area, wood stove exchange incentives are provided at a lower level of \$350 per exchange.

4. **Commit stable funding for 3 or more years:** In 2014, the Union of BC Municipalities endorsed the following resolution B65 put forward by the Regional District of Nanaimo:

*WHEREAS the Provincial Wood Stove Exchange Program is a successful locally delivered program that improves air quality province-wide; supports local, renewable and affordable wood-fuel use; and stimulates small business activity in participating communities;*

*AND WHEREAS the ability of local governments to plan and deliver the Program efficiently and effectively to local residents and small businesses is negatively impacted by uncertainty in the availability and timing of funding:*

*THEREFORE BE IT RESOLVED that UBCM request the Province consider providing stable funding to support the Woodstove Exchange Program for a five year period beginning in 2014.*

Survey feedback also indicated that communities are more likely to put additional effort and resources toward a program that has more than a one-year commitment. It is recommended the Province make a renewed 3-year or more commitment of funding to this program.

5. **Conduct a province-wide education campaign:** Numerous requests were made for a province-wide campaign focusing on messages such as placing an emphasis on a switch to other fuels where feasible, not burning wet wood or garbage, "being a good neighbour", and potential health impacts associated with wood burning. Note that some survey respondents felt that focusing education on the health impacts would be beneficial, while others felt it should

focus on best practices. In Washington State, the Puget Sound Clean Air Agency conducted focus groups about key messages for a behaviour change campaign and determined that: messages should focus on how to get better heat with less work, messages should be delivered with credible partners, and the message of needing to store wood for six to twelve months prior to use is likely the biggest gap to good burning practices (see Figure 6).

The World Health Organization has identified that there is an "urgent need for education around this issue, including active outreach by air pollution, energy and health ministries" (WHO, 2015). Further, the WHO recommends focusing on improving energy efficiency of wood combustion to reduce contributions to both air pollution and climate change.

Washington State funded their state-wide education program by imposing a flat fee on the sale of each wood burning device. In addition to allocating appropriate funding, this recommendation relies on the previous one to commit to more stable program funding; this will ensure the campaign aligns with multiple years of local effort.



Figure 6. Education campaign developed by Puget Sound Clean Air Agency focuses on using dry firewood

6. **Align Program and Provincial legislation for wood stoves with new EPA emissions standards:** New US EPA emission standards were released in February 2015 for wood burning appliances. The BC WSEP replacement appliances should align with and communicate these new requirements. The stakeholders surveyed from local governments, health authorities and non-profit sectors all stated that the Province should adopt a new Solid Fuel Burning Domestic Appliance Regulation that aligns with the new US EPA standards. Ensure other appliances such as outdoor boilers and wood furnaces are also addressed. After adopting the new standards, local programs may also wish to provide briefings or training sessions for building inspectors about new US EPA emission standards (and provincial standards as applicable).

- 7. Link burning education to the incentive:** The exchange program in Prince George instituted a requirement that people must pass a burning practices test online to complete the application for the incentive. The program coordinator found this was very successful, and did not encounter any problems where access to the online test was a barrier for participation.

It is recommended that a burn practices test be set up provincially as a requirement to obtain the incentive for every local program. Once the applicant successfully completes the test, a certificate may be printed or emailed and submitted with the application for the incentive. This tool could be used for broader outreach as well.

- 8. Measure effectiveness of various outreach materials (e.g. burn kit contents):** If emphasis on burning practices is increased, it will be very important for the efficiency of the program to identify and focus on the most effective material(s) that result in changes of burning behaviour. Based on the surveys conducted for this evaluation, the one piece of outreach material that consistently received high marks was the moisture meter. Coordinators, health professionals, manufacturers, and certified trainers all agreed that proper training on and use of moisture meters may be the most important method for improving burning practices. Each of the other outreach materials were valued by at least some of the respondents, though none as strongly as the moisture meters. The DVDs and stickers received the least support, as it was unclear whether people were watching the DVDs, or if they could be replaced by providing links to an online source of the video instead.

In Prince George, a burn kit was distributed to homes with multiple contents, and follow-ups with those homes received very good feedback on the kits. It is recommended that the BC WSEP identify one or two communities to undertake a similar study, but separate the pieces of outreach material to obtain feedback on specific items using before and after surveys (e.g. is the moisture meter alone an effective way of changing burning practices? do the wood rack kits alone result in dryer wood in homes that use them? did the DVD alone change how they burn?). Design the studies to determine if outreach materials can be streamlined to focus on the most effective method. Reduce or eliminate less effective materials, but ensure the same information is easily accessible online (videos, burn guides, etc.).

- 9. Shift resources for education toward targeted home visits:** To date, the primary method for delivering education has been hosting workshops in participating communities. These workshops receive excellent feedback from participants; however, they tend to have low participation rates relative to the effort that goes into organizing and delivering the workshops. More recently, some communities have been testing methods for more directly targeting wood burning homes with education. To date there has been very good feedback for training a group

of burn "champions" (e.g. students, community leaders, retailers) who can then do targeted education and home visits. Home visits include providing outreach materials (e.g. moisture meters or burn kits) and training on how to use the items. Based on the findings from these early trials, this may be an excellent direction to take for all communities, provided the efforts are supported by appropriate time commitment from the local program coordinator. The BC WSEP can provide guidance on how to target homes for this education, including: homes that have had complaints from neighbours, visibly smoky chimneys, readings from mobile monitors (where these studies have been conducted), lower income neighbourhoods, visible concerns with wood piles, or referrals from Health Authorities.

A few communities have conducted mobile monitoring on winter evenings to help identify potential smoky "hotspots" where pollution levels are measurably higher than other areas. In BVLD, these hotspots reached concentrations two to four times greater than the central monitoring stations, were largely in single-family areas, and were typically associated with lower socioeconomic status (Millar, 2012). In Nanaimo, the study identified three areas with consistently higher pollutants that could benefit from focused education efforts (Hall, 2009). This type of information would be invaluable for other communities to obtain where resources are available so that education efforts can prioritize these hotspot locations.

As this new approach has not been formally tracked for effectiveness, it is recommended that the BC WSEP work with a community to evaluate the effectiveness of these home-based visits through follow-up surveys or visits to determine if burning behaviour actually changed following the visits (e.g. one to two months later) and compare to an alternative of just handing out materials without the in-home visit and training. This evaluation should be independent of the above evaluation to test the effectiveness of the various outreach materials.



**10. Provide option to increase incentives or buy-back of stoves for lower income**

**households:** Stakeholders across the province highlighted the concern that wood burning is commonly used in lower income households, yet these households are not accessing the incentives for exchanges as they do not have the capacity to pay for the rest of the cost of an eligible replacement. The WSEP should provide an additional avenue to access this group by providing the option for local programs to provide a higher value of incentive for homes that meet lower income criteria (these could align with those used by BC Hydro and Fortis low-income programs). To be effective, a much more significant incentive is recommended, and therefore, a cost share approach between the local government and the BC WSEP may be the most effective means to make this option available. For example, the BC WSEP could provide an additional \$250 incentive, and the local government could match this. Overall this would result in \$750 of government incentives, and with retailer or manufacturer rebates could result in \$900 to \$1,000 incentives per lower income household. Note that this example may not be sufficient to enable this group to participate, as CVRD's lower income incentive of \$1,000 was only claimed by one home in the year it was offered.

An additional option to consider for lower income homes is buy-back old stoves in a lower income household without requiring a replacement device. This approach is used in numerous places in the US. The Tacoma-Pierce wood stove program provides a \$350 bounty for removal. Other regions buy-back uncertified stoves for \$200 to \$250.

Providing these increased incentives or buy-back options to lower income households are likely instrumental to achieving the earlier noted provincial goal to facilitate the exchange of at least 50,000 old wood stoves, and to eliminate the use of non-certified wood stoves by 2020.

**11. Collaborate with a First Nations community to develop a targeted program:**

First Nations communities generally make significant use of burning as a heat source, but these communities have had limited access to the program to date. The Nuxalk are the only to participate to date (they have funding for 2014 – 2015). To encourage more participation from these communities, it is recommended the program reach out to one or two communities to collaboratively develop a targeted program of education and exchanges. Adjustments that could be made include: having the band replace a set number of uncertified stoves instead of offering incentives (perhaps have the band match funding where feasible), provide in-home training when a wood burning stove is installed, provide assistance for adopting a housing policy that only low emission certified new stoves are installed in new homes, and creating a master burner-style program with messaging that is culturally attuned. The coordinators of the local program in the Squamish Lillooet Regional District recently worked with members of the Mount Currie Band to co-develop a workshop about burning practices and to communicate the

message out to the community. A study in the Nez Perce reservation in Washington State found that in-home assessments of wood burning practices were effective at reducing emissions after wood stoves were changed out (Ward, 2011). Lessons from both of these efforts should be incorporated into future collaborations with First Nations communities.

**12. Communicate progress with key stakeholders and the public annually:**

Surveys indicated interest from various stakeholders in receiving updates about the program annually. An annual program brief that communicates key progress made during the year, and overall, could be assembled into a 1-page digital report or infographic. This could then be distributed to manufacturers, coordinators, health authorities, and others involved in the project. The communication should directly report against the programs goals and objectives (citing the number and types of exchanges completed by community, the education on burning practices completed, and highlighting other key activities undertaken). Streamline the year-end reports to make this information easy to extract from the coordinator reports (see recommendation below about this).

**13. Broaden use of online and social media for education and advertising:**

Social media is a growing avenue for communicating with community members, and feedback from communities this can be much more cost effective than traditional advertising. Ideally, social media communications about the overall program would be provided at the provincial program level – communicating key funding announcements; providing educational information related to impacts of residential wood smoke, importance of good burning practices and importance of removing old smoky wood stoves; and highlighting events or media attention from local programs. Local programs should also engage residents using social media, including re-posting the provincial program posts, and highlighting local media, events and activities underway. Communities that are currently using social media can share their successes with coordinators in other communities to build guidance for the program about using this media effectively.

**14. Create an information template to engage retailers:**

The degree to which retailers are engaged in local programs reportedly varies considerably. Some retailers surveyed requested a cheat sheet that reminds them of the program requirements and processes. This could also be used to communicate expected involvement from retailers that may assist with improving performance. Also use this as an opportunity to communicate and celebrate progress on program accomplishments to date. Examples of what to include:

- Guidelines for education about burning practices to provide to customers,

- Roles of retailers regarding vouchers, advertising, decommissioning, etc.,
- Annual dates of the program,
- Expectations with respect to advertising,
- Guidance on low cost advertising (e.g. tag lines about vouchers in regular ads, social media, notices on outdoor advertising boards),
- Communication about previous program accomplishments – celebrate successes annually!

15. **Limit funds directed to advertising:** Feedback indicates that limited advertising is needed for the incentives (people are aware of the incentives), and should likely be done by retailers. This is particularly applicable in communities that have run the program for a number of years. In recent years the program has moved in this direction already, and where possible this should be further reduced. For communities new to the program, or where programs feel further advertising is needed, consider having coordinators collect sponsorships from local retailers for the advertising. For example, in Spokane Washington the program raised \$10,500 through sponsorships: Gold \$2,000 (TV), Silver \$700 (radio), and Bronze \$500 (newspaper).
16. **Include air source heat pumps in the eligible appliances for rebates:** Air source heat pumps are increasingly available and becoming more affordable forms of supplementary heating. The ductless form could be an appropriate replacement for an old wood appliance. These are not currently on the eligible list of replacement appliances in the BC WSEP, but it would support the program objectives to include these. Air source heat pumps are listed as eligible appliances in Washington programs, where efforts are focusing on removing wood burning appliances altogether. It is recognized that these units are unlikely to be sold by the current retail partners, and therefore the decommissioning of old stoves would become the responsibility of the incentive recipient (rather than being taken care of by the retailer). Communities could facilitate the process by working with local recyclers to streamline this process for these individuals.
17. **Streamline year-end reporting:** Year-end reporting is required of all local programs, and this provides valuable information that is key to tracking the overall progress of the program. Coordinators surveyed stated that the final report is cumbersome, and there was uncertainty that all of the information was actually being reviewed and used to benefit the overall program. A review of completed forms from two years showed significant variation in the completeness of the reports, and variation in the way information is provided making assembly into a high-level progress report very challenging.

It is recommended the year-end reporting be simplified and focused on measuring progress on the program's goals and objectives. Key information to collect includes:

- How many people directly engaged;
- How many outreach materials distributed;
- How many old stoves removed;
- Types of new appliances installed;
- Top-up incentive provided by the local government;
- Top-up incentive provided by retailers and manufacturers (if known);
- Status of local supporting bylaws;
- How many hours the coordinator put into administering the program.

Outreach-specific data collected should tie back to the measures identified by the program (discussed in an earlier recommendation). A template should be created that allows for easy assembly and analysis of results across all programs at end of the year. The reporting could be placed online (for example on the existing share point site) or in an excel spreadsheet template with dropdown style selections. Obtaining uniform responses is important to be able to assemble data across all the programs.

18. **Obtain regulatory commitment from participating communities:** To obtain desired results from an incentive and education-based program, it is also important to have appropriate legislation in place that aligns with the program goals. Survey respondents stated that supportive legislation should be in place both provincially (as noted above) and locally to ensure people are burning appropriate fuels, and to ensure all new stoves installed are emission certified. Communities that receive funding should have a bylaw in place, or should commit to pursuing a bylaw, for indoor wood burning appliances that supports the objectives of the program. Regulatory commitment should also be a criterion for consideration during funding allocation.



A supportive bylaw should at minimum address the following:

- Only low emission certified appliances (aligning with new provincial regulations, as applicable) be allowed for new installations. Note that CSA standards are not yet aligned with the new US EPA standards.
- Only seasoned untreated wood with moisture content less than 20% may be burned.
- Restrictions on burning during poor air quality events.

A model municipal bylaw developed by Environment Canada for Regulating Appliances includes the provisions above, as well as removal of non-certified appliances, and opacity limits on smoke from chimneys (CCME, 2006). These additional provisions should also be encouraged where suitable, based on need as well as the availability of resources to enforce them.

19. **Engage and/or regulate the firewood industry:** Properly seasoned and dried firewood is essential to operating a wood burning appliance in a manner that minimizes pollution. Some wood burning households collect and prepare their own firewood, yet many others rely on firewood providers. Those households that rely on firewood providers typically assume the wood is ready to burn upon delivery (especially if advertised as seasoned), though this wood may have been stored uncovered in wet fields. Firewood providers should be engaged more proactively in local programs by providing them with moisture meters, explaining local bylaws about requirements to burn only dry seasoned wood, discussing storage techniques to ensure wood is kept dry, and inviting them to be trained as champions for proper burning practices that can be passed on to clients.

Although other fossil fuel providers are regulated, firewood providers are not. Survey respondents identified a gap that the Province should investigate means for regulating this group to ensure fuel provided is ready for use in a manner that minimizes pollutants.

20. **Consider further provincial regulation to support the goal to eliminate all non-certified woodstoves in BC:** Although the recommendations identified above are designed to improve the effectiveness of the program at reducing emissions from residential wood heating, it is unlikely a voluntary incentive program will accomplish the provincial goal to remove all uncertified wood stoves by 2020, without substantially higher investment (e.g. 10-fold or more). To support this goal, the Province should explore the feasibility of requiring the removal of old uncertified wood stoves at a particular time, or event (e.g. at the time of home sale) across the province. This approach has been effective in the state of Oregon. The state implemented this regulatory approach due to a patchwork of requirements being developed and implemented at the local government level, and the state-wide approach enabled a more

cohesive message and approach that alleviated challenges of implementing removal programs in specific communities.

Over the course of seven years, the BC WSEP has facilitated the exchange of over 6,000 old wood stoves – approximately 13% of the provincial goal to exchange at least 50,000 wood stoves. This has been accomplished in a relatively efficient manner, with significant contributions from communities and partners across the province. There is still substantial effort needed to achieve both this goal, and the long-term goal to eliminate the use of all non-certified wood stoves by 2020. By combining the strengths of the existing program, with the recommendations above, the BC Wood Stove Exchange Program has the potential to achieve significant reductions in British Columbians' exposure to potentially harmful air pollution that comes from residential wood heating.



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## 6 APPENDIX A: BC WSEP ELIGIBLE STOVES

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The following original appliances qualify for an exchange under this Program:

- A free-standing non-EPA certified “stove” or a “homemade” or “barrel” stove.
- A so-called “airtight” non-EPA certified fireplace insert, or tube type heat exchanger with a face plate and door (like the “Free Heat Machine” or Welenco or Heatalator that is currently installed in an open hearth fireplace.
- A non-EPA certified “wood furnace” (ducted, forced air, home heating appliance) – may only be replaced by an EPA certified wood furnace or pellet furnace.
- A wood-burning cook stove.

The following NEW appliances qualify to replace a qualifying old wood-burning appliance under this Program:

- A high efficiency natural gas or propane stove/fireplace, a pellet stove, an electric stove, or an EPA certified clean burning wood stove.
- A high efficiency natural gas or propane insert, a pellet insert, an electric insert, or an EPA certified clean burning wood insert.
- An EPA certified factory-built fireplace – may ONLY be accepted if it is replacing a non-EPA certified wood stove or insert (NOT an existing factory built fireplace).

The following original appliances do NOT qualify for an exchange under this Program (program funding will NOT be provided to install these appliances):

- A new insert to an existing open hearth fireplace that does NOT currently have an insert installed in it. An exchange of an existing wood appliance must take place.
- Factory built (“zero clearance”) fireplaces.
- Wood cook stoves (These are EPA exempt therefore are not covered by this program. They may be replaced by an EPA certified stove or other “non- cooking” product within the qualification list above).
- Outdoor appliances (replacement unit must be installed in an area with 4 walls, ceiling and a door).
- Tin heaters/tent stoves (something NOT used in a residential application).

## 7 APPENDIX B: STAKEHOLDER SURVEYS

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### Questions for Local Coordinators

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- 1 What years has the program has run in your community, and what was the timing of the program?
- 2 Why did your community choose to start a WSE program?
- 3 Do you think this program has improved air quality in your region? If yes, how?
- 4 How aware are people in your community about the health impacts of wood smoke?
- 5 Are there any local bylaws or regulations governing the use of wood stoves in your community?
- 6 Do you think there would be support for implementing new/additional local air quality bylaws? Explain.
- 7 How many woodstoves were changed out in your community?
- 8 Do you track the type of units that were installed through your program?
- 9 Do you agree with the list of new appliances that qualify for the program?
- 10 Do you agree with the list of appliances that are eligible to be removed under the program?
- 11 Would you like local flexibility on the types of appliances that qualify? Explain.
- 12 How were old wood stoves managed?
- 13 Were there any challenges with decommissioning old stoves?
- 14 What education method(s) were used for to educate people about burning practices? Which were most effective? Recommendations?
- 15 How many people were reached?
- 16 Were the materials provided by the WSEP effective during your outreach activities? Recommendations for improving?
- 17 Recommendations for future education activities?
- 18 Do you think there is a change in the level of awareness about good burning practices in your community since the start of the WSEP? Explain.
- 19 Was any follow up conducted with incentive recipients or workshop attendees? Explain.
- 20 Were community financial resources used in this program? If so, what amount and for what purposes? (e.g. "top-up" incentives, additional marketing...)
- 21 What level of human resources is required to administer this program?
- 22 How were the incentives tracked / administered? (e.g. vouchers?)
- 23 How often does a numbered form get handed out but never gets submitted for the incentive?
- 24 What would you change about the administration of this program?
- 25 What would you change about the application or reporting requirements of this program?
- 26 How many retailers participated in your program?
- 27 Did the retailers conduct any additional marketing about the program?
- 28 Do you have any recommendations about the most effective ways to engage retailers?
- 29 Do you feel the program has been successful at achieving its objectives?
- 30 Do you have any recommendations for improving the effectiveness of the overall program?
- 31 We are trying to speak with a number of stakeholders and would like to speak with elected officials - is there anyone you would recommend we speak with from your region?

### Questions for Local Government Senior Staff

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- 1 Why did your community choose to start a WSE program?
- 2 How does air quality rank in priority among environmental issues?
- 3 How does residential wood smoke rank in priority among air quality issues?
- 4 Do you track the number of complaints issued that are related to wood stoves? If so, can you provide the data?
- 5 Are there any local bylaws or regulations governing the use of wood stoves in your community?
- 6 Do you think there would be support for implementing new/other local air quality bylaws? Explain.
- 7 Do you feel the program is making best use of the incentive funds? Explain.

- 8 Has your municipality provided any "top up" incentives for this program in the past? Would there be a willingness to do this?
- 9 How would you rate the ease of application for the WESP? (if completed the application)
- 10 What would you change about the administration of this program?
- 11 How would you rate the ease of reporting for the WESP?
- 12 What would you change about the reporting requirements of this program?
- 13 How did you measure the success of your program?
- 14 There are 2 overall program objectives. 1) How successful do you think this wood stove exchange program has been in encouraging residents to turn in old wood burning appliances for new more efficient ones?
- 15 2) How successful do you think the program has been in improving burning practices?
- 16 Do you have any recommendations for improving the effectiveness of the overall program?
- 17 Would you recommend participating in this program to staff in other communities? Please explain.  
There are various ways the provincial government could respond to the wood smoke issue. Is this wood stove exchange program an effective component? Are there other things that the provincial government should do instead or in addition?

### **Questions for Local Government Elected Officials**

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- 1 How does air quality rank in priority among environmental issues in your community?
- 2 As far as you are aware, what was the primary driver for your community to start a WSE program?
- 3 Do you think the public's awareness of local air quality issues in your region has changed since the WSEP came into place? Explain.
- 4 Do you feel the program is making best use of the incentive funds? Explain.  
There are 2 overall program objectives. 1) How successful do you think this wood stove exchange program has been in encouraging residents to turn in old wood burning appliances for new more efficient ones?
- 5 2) How successful do you think the program has been in improving burning practices?
- 6 Do you have any recommendations for improving the effectiveness of the overall program?
- 7 Would you recommend this program to councillors in other communities? Please explain.  
There are various ways the provincial government could respond to the wood smoke issue. Is this wood stove exchange program an effective component? Are there other things that the provincial government should do instead or in addition?

### **Questions for Participating Retailers**

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- 1 Why did your company choose to participate in the program?
- 2 Since the woodstove exchange started, have your wood burning appliance sales increased in general? This includes boilers and pellet stoves.
- 3 What is affecting this trend?
- 4 How did you find the system for decommissioning exchanged stoves? Any suggestions for improvement?
- 5 Did you pay an extra fee as part of the registration process to contribute to program advertising?
- 6 How much time did your company put into administering the program incentives?
- 7 Was any other additional time required? How much?
- 8 Was the voucher system easy to use?
- 9 Who filled in the majority of the vouchers?
- 10 Do you have any ideas for how to improve the system?
- 11 Do you agree with the list of new appliances that qualify for the program?
- 12 Do you agree with the list of appliances that are eligible to be removed under the program?
- 13 Were you satisfied with the level of input you had into the program design or execution?
- 14 Were you satisfied with the level of communication with the coordinator during the program?
- 15 Do you think the government incentives were adequate?
- 16 Did you see or hear any of the ads created for the program by the coordinator?
- 17 How satisfied were you with the amount and style of advertising done by the program coordinator?

- 18 Did you supplement the program marketing with your own marketing?
- 19 How successful do you think this wood stove exchange program has been in encouraging residents to turn in old wood burning appliances for new more efficient ones?
- 20 How did sales during the period of the woodstove exchange program compare with your expectations?
- 21 Do you have any recommendations for improving the effectiveness of the overall program?
- 22 Would you recommend this program to retailers in other communities? Please explain.

### **Questions for Industry**

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- 1 What level of incentives do suppliers typically provide for the woodstove exchange program?
- 2 Does the level of incentive vary between communities? From year-to-year?
- 3 Were you satisfied with the level of input you had into the program design or execution?
- 4 Do you think the government incentives were adequate?
- 5 How successful do you think this wood stove exchange program has been in encouraging residents to turn in old wood burning appliances for new more efficient ones?  
A second objective of the program is to educate people about proper burning practices. This takes various forms in each community, but typically involves offering Burn it Smart workshops, handing out moisture meters or thermometers, DVDs, handbooks on best practices. Do you have any recommendations for the best way to do this?
- 6 Do you have any recommendations for improving the effectiveness of the overall program?

### **Questions for Environmental NGOs**

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- 1 How would you rate the quality of the air in your community?
- 2 How much of a priority is residential wood smoke in terms of air quality concerns in your community?
- 3 Do you think the general public is aware of the health impacts associated with wood smoke?
- 4 Do you think the WSEP has contributed to the public's awareness of air quality impacts of wood smoke?
- 5 Does your organization agree with the 2 primary objectives of the wood stove exchange program? (i.e. removal of old stoves and education about burning practices)
- 6 Do you agree with the list of new appliances that qualify for the program?
- 7 Do you agree with the list of appliances that are eligible to be removed under the program?
- 8 Do you think there is a change in the level of awareness about good burning practices in your community since the start of the WSEP? Explain.
- 9 Do you feel the program is making best use of the incentive funds? Explain.
- 10 What other partners would you suggest be engaged in reducing air emissions from residential wood smoke?
- 11 Recommendations for future outreach activities?
- 12 How could outreach materials be improved?
- 13 Do you have any recommendations for improving the effectiveness of the program?  
There are various ways the provincial government could respond to the wood smoke issue. Is this wood stove exchange program an effective component? Are there other things that the provincial government should do instead or in addition?
- 14 What data would you consider in judging the effectiveness of the program?

### **Questions for BC Lung Association**

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- 1 What level of human resources is required to administer this program?
- 2 What would you change about the administration of this program?
- 3 What other partners would you suggest be engaged in reducing air emissions from wood smoke?
- 4 Recommendations for future outreach activities?
- 5 How could outreach materials be improved?
- 6 How successful do you think this wood stove exchange program has been in encouraging residents to turn in old wood burning appliances for new more efficient ones?

- 7 Do you have any recommendations for improving the effectiveness of the program?  
There are various ways the provincial government could respond to the wood smoke issue. Is this wood stove
- 8 exchange program an effective component? Are there other things that the provincial government should do instead or in addition?
- 9 What data would you consider in judging the effectiveness of the program?

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#### **Questions for BC MOE Air Quality Staff**

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- 1 Besides the publicly available monitoring station data for your area, is there any additional data analysis that has been conducted for your area with respect to wood-burning emissions during heating season?
- 2 Has the WSEP had a detectable influence on air quality?
- 3 Do you think WSEP contributed to a change in awareness about the impact of wood stoves on air quality?
- 4 Do you think there is a change in the level of awareness about good burning practices in your community since the start of the WSEP? Explain.
- 5 What other partners would you suggest be engaged in reducing air emissions from wood smoke?
- 6 Did you see or hear any of the ads created for the program by the coordinator?
- 7 Recommendations for future outreach activities?
- 8 How could outreach materials be improved?
- 9 Do you have any recommendations for improving the effectiveness of the program?  
There are various ways the provincial government could respond to the wood smoke issue. Is this wood stove
- 10 exchange program an effective component? Are there other things that the provincial government should do instead or in addition?
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Report prepared by:

