



**Reduction of Black Carbon Emissions  
from Residential Wood Combustion**  
An ACAP Project co-lead by Norway and Finland



SAO Meeting Yellowknife  
March 2014

## Project aims

- ▶ Study existing data from the Arctic countries on emission factors, activity data and relevant measures for reduction of black carbon emissions from wood stoves.
- ▶ Recommend possible measures, technologies and approaches to reduce black carbon from residential wood combustion.

## ACAPWOOD participation

- ▶ Canada, Denmark, Finland, Norway, Sweden, USA
- ▶ Excellent contributions from the nominated national experts; questionnaires, workshop, comments, teleconferences



## Black carbon emission inventories -an important foundation for policy making

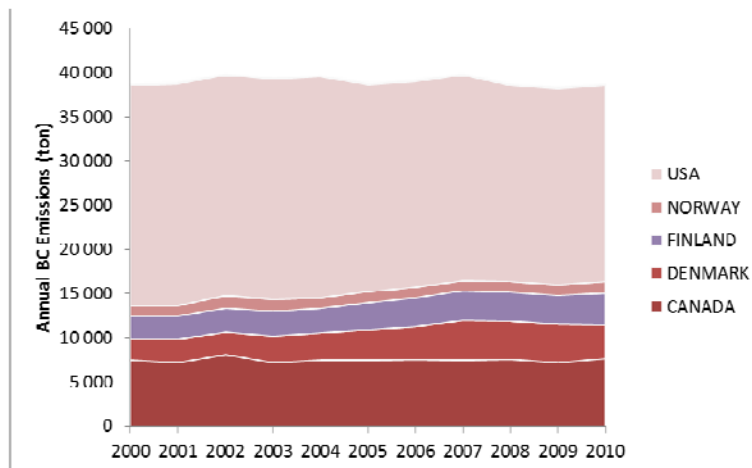
- ▶ All the six countries have national black carbon inventories that specify residential combustion.
- ▶ Table: residential wood combustion is an important source of BC emissions.

Country (inventory year)	Residential sector (%) of anthropogenic total BC (without open biomass burning)
Canada (2006)	14%
Denmark (2010)	59%
Finland (2010)	47%
Norway (2010)	26%
Sweden	n.a.
The United States (2005)	6%



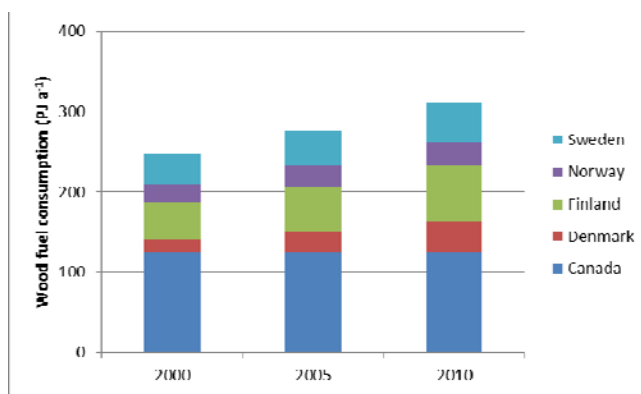
## Black carbon emissions from wood stoves in 5 Arctic nations

- ▶ The last decade: relatively stable emissions



## The wood use estimates

- ▶ Wood consumption estimates in all the six countries: periodic surveys, but frequency varies



Example: Annual wood consumption in 5 Arctic nations, PJ energy input



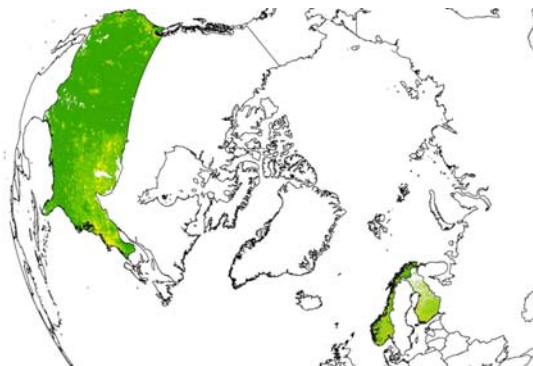
## The BC emission factors for wood stoves

- ▶ BC emission factors have been established based on relatively few measurements and varying methods
- ▶ Black carbon assumed to be similar to elemental carbon
- ▶ The BC emission factors indicate significant potential for emission reductions if switching from old to advanced technologies
- ▶ BC is co-emitted with other pollutants, which should be also considered when assessing impacts of mitigation measures



## Emissions from wood stoves – spatial distribution

- ▶ Spatial distribution of the emission data is a cornerstone for robust impact analyses of BC
- ▶ Four participating countries have high resolution spatially distributed residential sector BC emissions (but all have PM2.5)

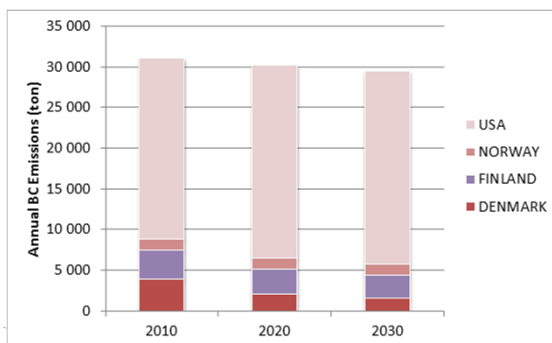


Spatially distributed BC emissions from FI, NO and the US



## BC emission reduction strategies for wood stoves

- ▶ Emission projections show only slight reduction
- ▶ Wood consumption is expected to continue to be important
  - ➔ climate effect (all though magnitude uncertain) and health impact makes policy for further reductions highly relevant



## Measures and instruments to reduce emissions from wood stoves in the Arctic countries

- ▶ With current knowledge, the most feasible way to reduce BC is significant PM reductions
- ▶ Many factors influence BC emissions (stove, chimney, fuel, operation...) ➔ mix of instruments and measures needed in effective policy
- ▶ The report gives an overview of measures and instruments in use ➔ menu to learn from for countries

## Project status

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- ▶ The report will provide two lists of potential mitigation measures and instruments that can be considered at national level or at pan-Arctic level respectively.
- ▶ The project report will be put forward for ACAPWG approval this spring.
- ▶ The recommendations will be subject to separate discussions and considerations.

