

Controlling Emissions from Wood Burning for Domestic Heating



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International Cryosphere
Climate Initiative

TFTEI Meeting in Rome, Italy

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Recommendations by the Policy Working Group of LRTAP

25. The group recommends:

(a) Implementing emission standards based on best available techniques (BAT) and energy-efficiency requirements for new domestic stoves and installations for solid-fuel burning in any future revision of the Gothenburg Protocol (short-term; Working Group on Strategies and Review, Task Force on Techno-economic issues);

(b) Asking the Task Force on Techno-economic issues to consider including additional measures for integration in their database, and to develop a code of good practice for solid-fuel burning and small combustion installations (short term; Working Group on Strategies and Review, Task Force on Techno-economic issues).

39. (b) Establish emission standards based on BAT and energy-efficiency requirements for new residential and small-scale appliances, including solid-fuel burning (Task Force on Techno-economic Issues) and implement the standards under the current emission reduction commitments for $PM_{2.5}$ (short term);

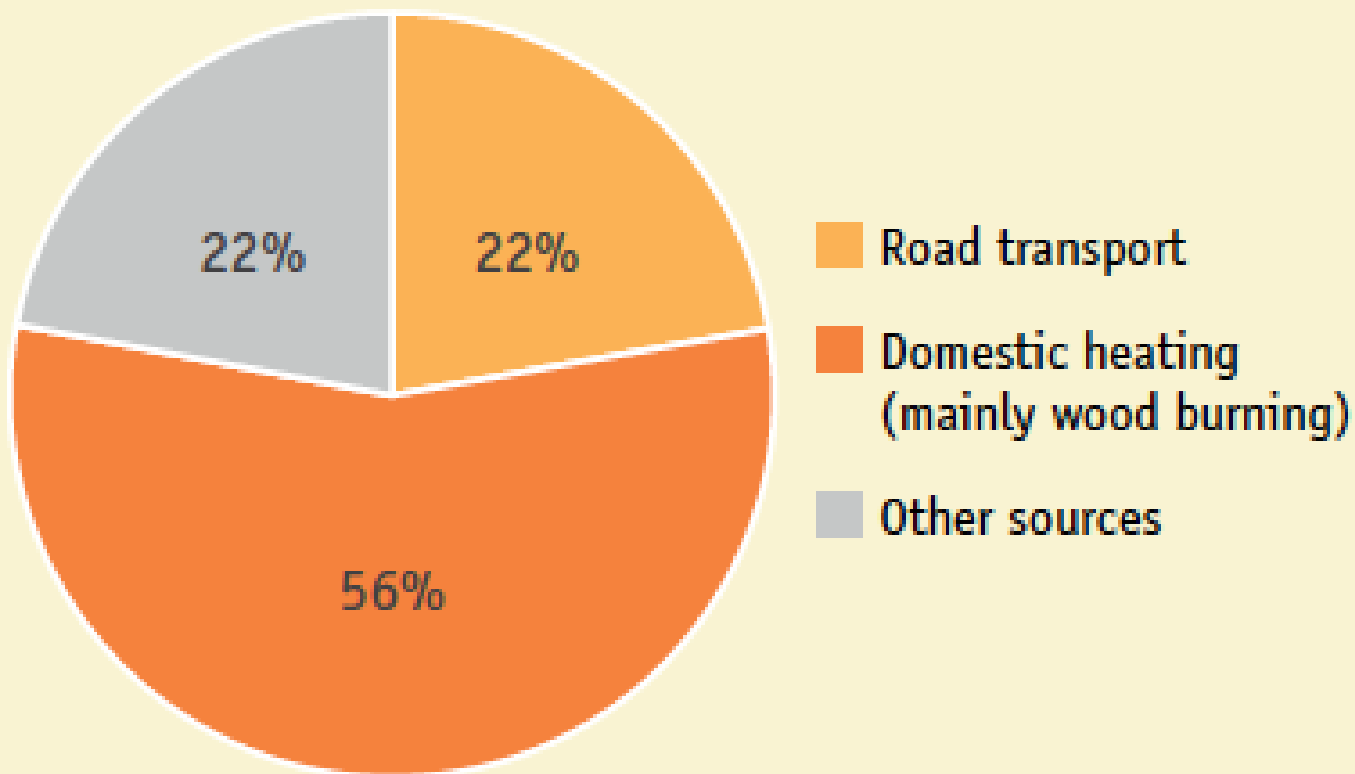
Recommendations by the Working Group on Strategies and Review to the Executive Body

2. (d) Encourage Parties to pursue reductions in ozone, black carbon and other short-lived climate pollutants that have direct or indirect effects on climate and air quality;
3. h) (i) Encourage Parties to establish emission standards based on best available techniques and energy efficiency requirements for new residential and small-scale appliances, including solid-fuel burning, and to implement the standards under the current emission reduction commitments for fine particulate matter (PM_{2.5});

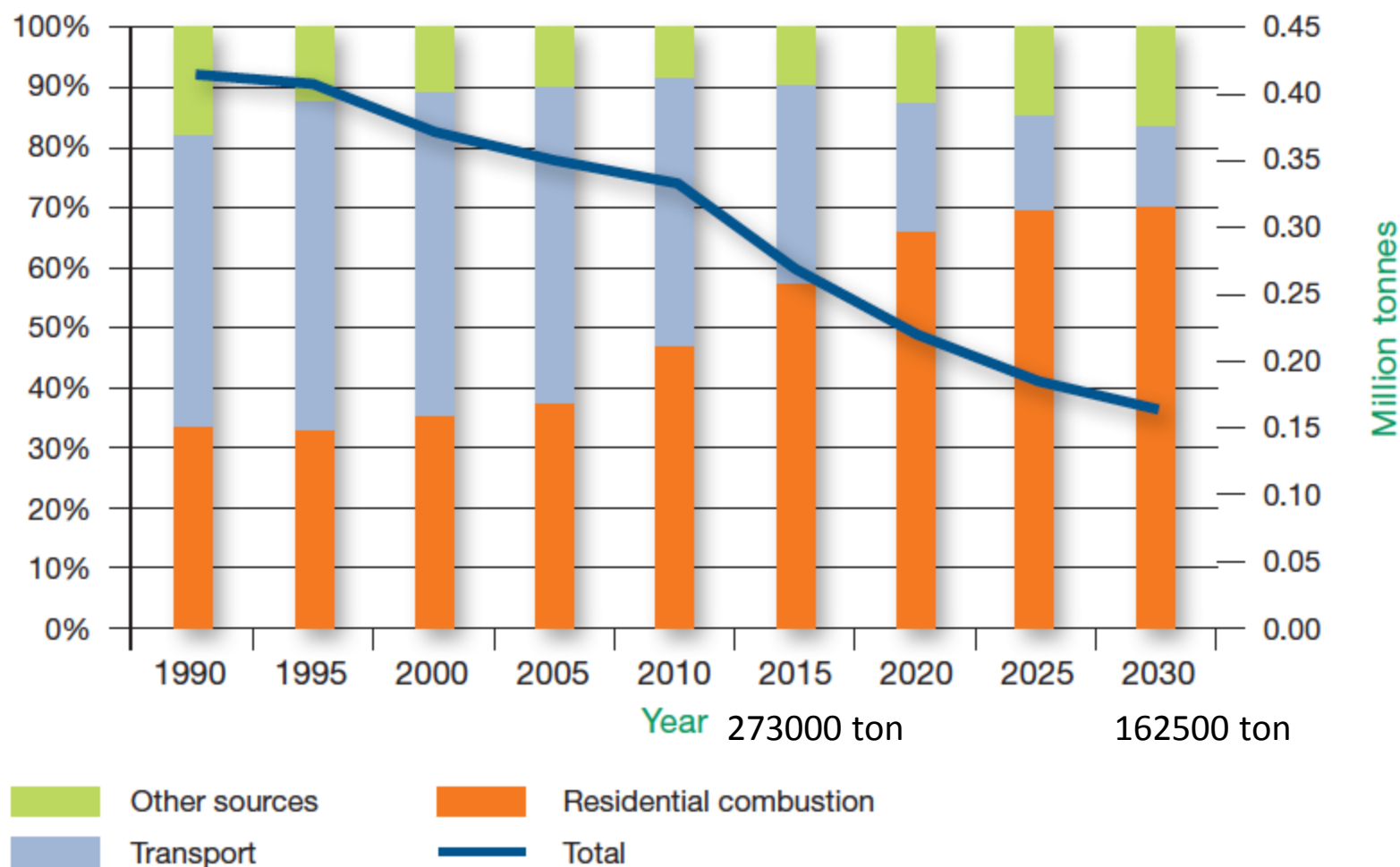
Focus on BC and PM2.5

- Keeping in mind that all emission reductions of BC also reduces PM2.5 proportionally (and BaP)
- The reverse, however, is not always true
- So far little focus on BC but urgency has increased since the revised Gothenburg Protocol was negotiated, along with more experience of dealing with BC, e.g.
 - More knowledge on BC emissions and emissions trends
 - Large sources of BC like domestic heating and open agricultural burning are not being adequately addressed
 - More knowledge and experience on effective abatement measures
 - More information on costs and financing needs
- The PWG points explicitly on these sources and the need for additional action

Sources of soot in Europe (2015)



Baseline emissions of Black Carbon from various sources in EU-28



Note: EU-28 is countries belonging to the EU after July 2013; current legislation scenario as in Amann et al. (2014), using the carbonaceous particles module (Kupiainen and Klimont, 2007) of the GAINS model (Amann et al., 2011).

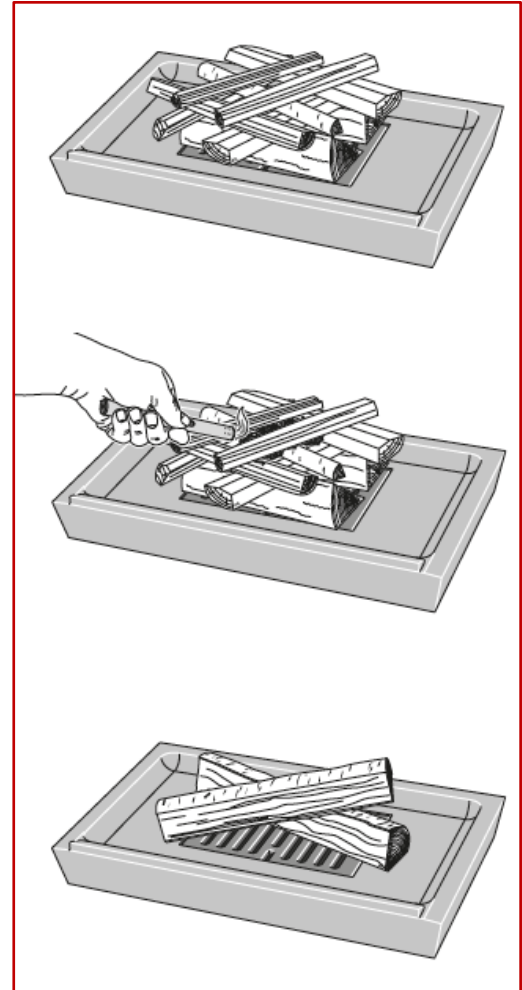
Source: reproduced with permission from IIASA.

BC and Wood Burning – Three Approaches

- **EXISTING STOVES: "Burn Right!":**
 - Emissions reduced 30-50%-even up to 80 % where people "burn very wrong"
 - Good first step with low costs - local or national campaigns
 - Guidance aimed at reducing BC/PM2.5 for climate/glacier and health benefits
 - Lighting phase most important for emissions of BC
- **NEW STOVES:** Development/introduction of low-BC/PM2.5 stoves and measures/regulations
 - Low-BC and PM2.5 stoves using whole logs already exist ("Bionic stove")
 - Nordic Council new BC testing protocol found low-BC stoves, one BETTER than normal pellet stoves
 - No country (including EU, Nordics and U.S./Canada) has BC standards – great potential for regulation and voluntary "climate-friendly" standards by producers
 - Incentives for buying new stoves-phasing out old stoves: phase-out programs, banning use of old, inefficient stoves in regions and locally.
- **FUEL or TECHNOLOGY switching:**
 - Change to pellets, wood chips, gasol, propane etc. or other domestic heating systems like heat pumps-geothermal, waterborne systems/boilers, district heating

Four Simple Steps to Better Burning

- 1) ***Burn the right fuel*** – pellets or properly seasoned, dry wood but not paper, cardboard, magazines or other waste, in particular not any toxic stuff.
- 2) ***Flip your fire upside down – light the fire from the top***
Larger logs on the bottom and smaller and sticks at the top is more efficient and releases less pollution
- 3) ***Keep the fire burning hot*** – don't let the fire burn down before adding more wood as this uses more fuel and creates more pollution. Reload when the last flames die out.
- 4) ***Watch the color of the smoke*** –black, gray or yellow smoke is polluting; white smoke on a really cold day are harmless small water drops, like in a fog.



Burnright.org

Burn Right

More heat, better for health and climate

Home

Five Simple Steps to “Burn Right” for Health, Climate and Better Heating

Short-Lived Climate Pollutants and Woodburning

Climate Impacts

Health Impacts

Economic Impacts

Resources

CHOOSE A LANGUAGE

 English  Swedish
 Finnish  German
 French  Spanish
 Russian

Sweden 2017

TÄND I TOPPEN

Lär dig det rätta sättet att tända och bränna ved, så minskar du utsläppen av skadliga luftföroreningar.



Fire grunner til å fyre riktig

Miljøvennlig

Fyre du riktig, reduserer du sot- og partikkelutslippene og bidrar dermed til mindre lokal luftforurensning.

Klimavennlig

Ved er en fornybar energikilde og derfor et klimavennlig alternativ til fossil oppvarming. Sot fra vedfyring i Nord-Europa bidrar til reduksjon av klimagassutslippene. Soten legger seg på snø og is, og tilfører seg varme. Riktig vedfyring reduserer disse negative klimaeffektene.

Økonomisk og effektivt

Fyre du riktig, utnyttes veden bedre og du oppnår mer varme på mindre ved.

Trygt og brannsikkert

Fyre du riktig, får du kontroll over ilden og unngår brann. Det betyr mindre vedskjell, renere glass og redusert risiko for sot- og pipetei. Vedfyring varmer også ved strømbudi.

• Investert i et nedbrannt hus? Det betyr varme og trygghet.

Norway 2013

Hvis du opplever at du ikke klarer med vedfyring, så kan du søke om støtte. Norsk Varme eller annen lagoppvarming. Eller du kan søke om støtte til å skaffe deg en ny kamin eller kaminovn. Du kan også søke om støtte til å skaffe deg en ny kamin eller kaminovn.

INTERNATIONAL CRYOPHERE CLIMATE INITIATIVE

Finland 2014

ENEMMÄN LÄMPÖÄ VÄHEMMÄN NOKEA

KÄYTÄNNÖN OHJEITA
TULISIJAN TEHOKKAASEEN KÄYTTÖÖN
– VÄHEMMILLÄ PAASTOILLA

MIKSI JUURI NOKI ON VAARALLISTA?

Puun polttaminen on tällä hetkellä yksi suurimmista nopeapäästöjen aiheuttajista Pohjoismaissa. Hengitystie- ja sydänsairauksille altistavia nopeapäästöjä voi vähentää oikealla polttopöydällä. Saman lämmön saa vähemmällä polttopöydällä, huonontamatta lähiympäristön ilmanlaatua ja nopeuttamatta arktisen alueen lämpenemistä. Nyös nokipalon riski savu- ja hönnössä pienenee.

Nokipöydäkäset imevät auringon säteiden lämpöä ja lämmittävät ilmaa: Arktisilla alueilla ja lumen peittamilla seuduilla – myös Suomessa ja muissa Pohjoismaissa – noki tummentaa lumen pöytänsä sen päälle. Tumma lumi imee enemmän auringon säteilyä ja sulaa nopeammin. Nokipäästöjen pienentäminen jarruttaa tehokkaasti lumien sulamista ja vaikuttaa paitsi arktiseen jääpeitteeseen kokoon, myös lumenottomien talvien esiintymiseen Pohjoismaissa.

norsk varme

Norsk Varme er brannsikringsorgan for miljøvennlige kaminer og skorstein. Følgende attester for utvefyring fortsett skal dukke en viktig del av behovet for oppvarmingsbehov i hjemmene.

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Naturvernforbundet

Naturvernforbundet har i 2013-året utdelt 100-årsjubileum 1914 og 100-årsjubileum 1914 og 100-årsjubileum 1914 og 100-årsjubileum 1914.

Bli medlem i Naturvernforbundet

Sjekk om du er medlem i NATUR 237 eller på www.naturvernforbundet.no/midlem.

RIKTIG VEDFYRING

skåner miljøet og klimaet,
reduserer kostnadene
og øker brannsikkerheten.

norsk varme

Annex X of the Revised Gothenburg Protocol

Table 12

Recommended limit values for dust emissions released from new solid fuel combustion installations with a rated thermal input < 500 kWth to be used with product standards

	<i>Dust (mg/m³)</i>
Open/closed fireplaces and stoves using wood	75
Log wood boilers (with heat storage tank)	40
Pellet stoves and boilers	50
Stoves and boilers using other solid fuels than wood	50
Automatic combustion installations	50

Note: O₂ reference content: 13%.

(ii) Emissions from existing residential combustion stoves and boilers can be reduced by the following primary measures:

a. Public information and awareness-raising programmes regarding:

i. The proper operation of stoves and boilers;

ii. The use of untreated wood only;

iii. The correct seasoning of wood for moisture content.

b. Establishing a programme to promote the replacement of the oldest existing boilers and stoves by modern appliances; or

c. Establishing an obligation to exchange or retrofit old appliances.

(b) Non-residential combustion installations with a rated thermal input 100 kWth–1 MWth:

Ecodesign solid fuel local space heaters

Adopted 24 April 2015.
Requirements for 2022:

Product		Energy efficiency		
Open fronted		30%		
Closed fronted		65%		
Closed fronted pellets		79%		
Cookers		65%		
Product	PM mg/m ³ *	OGC mg/m ³	CO mg/m ³	NO _x mg/m ³
Open fronted	50	100	2000	200
Closed fronted	40	100	1500	200 (300 fossil fuel)
Closed fronted pellets	20	40	300	200
Cookers	40	100	1500	200 (300 fossil fuel)
* also Norwegian and British test methods allowed with separate limit values				



EU versus GP emission limit values

- **Dust** versus **PM** – but not PM2.5 - nor BC
- Dust/PM limits are more stringent for the EU Eco-design directive
- No mentioning of testing protocols for GP limit values (at least not here)
- More work is needed and highly desirable on requirements on BC emissions and a common testing protocol for BC.
- Experiences from a new testing protocol developed by the Nordic Council of ministers are very promising.

Regulatory Actions in North America

United States

- Mandatory emission standards for new residential wood heating units – **4.5 g/hour PM_{2.5}**, tightening to 2 g/hour of PM in 2020 for cribwood and 2.5 g/hour for cordwood. Requires testing and certification of new stove.
- Regulates PM_{2.5} and VOCs, and requires reporting of CO and efficiency. No testing for or regulating of Black Carbon
- **Temporary bans:**
Puget Sound, US, Sacramento, California: Burn ban reduced PM_{2.5} levels by 12 ug/m³

Canada

- Voluntary at a national level, but provinces and cities have adopted strict mandatory standards and programs, often adopting USEPA standards and testing protocols.
- Canadian Council of Ministers developed *Code of Practice for Residential Wood Burning Appliances* – models for provinces and cities in regulating wood stoves

“Other Stove” Considerations

- **Coal Stoves:** wide use in Poland, other parts of Central and Eastern Europe
- **Combined Stoves:** Used for BOTH heating and some cooking
- Heating water often most important auxiliary to heating function
- Often poorest households, with very low-quality coal = high emissions and health impacts
- Poorly characterized; CCAC/ICCI Warsaw Summit (May 2017) began examining, CCAC may follow up with additional project work
- Not suggesting these be addressed at this time due to lack of data – but may prove important future focus. However, there are emission standards under the Eco-design directives also for coal fired stoves.

Testing Protocol for BC (EC)

- A black carbon (BC) Testing Protocol was developed in two 2014-16 projects with fundings from the Nordic Council of Ministers and the CCAC in cooperation with three Nordic national laboratories: DTI (Danish Technological Institute, Århus, Denmark), SINTEF (Trondheim, Norway) and SP (SP Technical Research Institute, Borås, Sweden).
- The Protocol is based on Norwegian standards NS3058/NS3059, which are similar to U.S.EPA 5-G methods.
- Carbon is analyzed as BC (EC, elemental or black carbon) and OC (organic carbon).
- PM measurement is for inorganic dust from the combustion.
- The results showed in the following slides are produced in 3 laboratories in Scandinavia and 1 laboratory in Czech Republic.

Reference: A Protocol for Measuring Emissions of Elemental Carbon and Organic Carbon from Residential Wood Burning, TemaNord, 2016:541, Nordic Council of Ministers

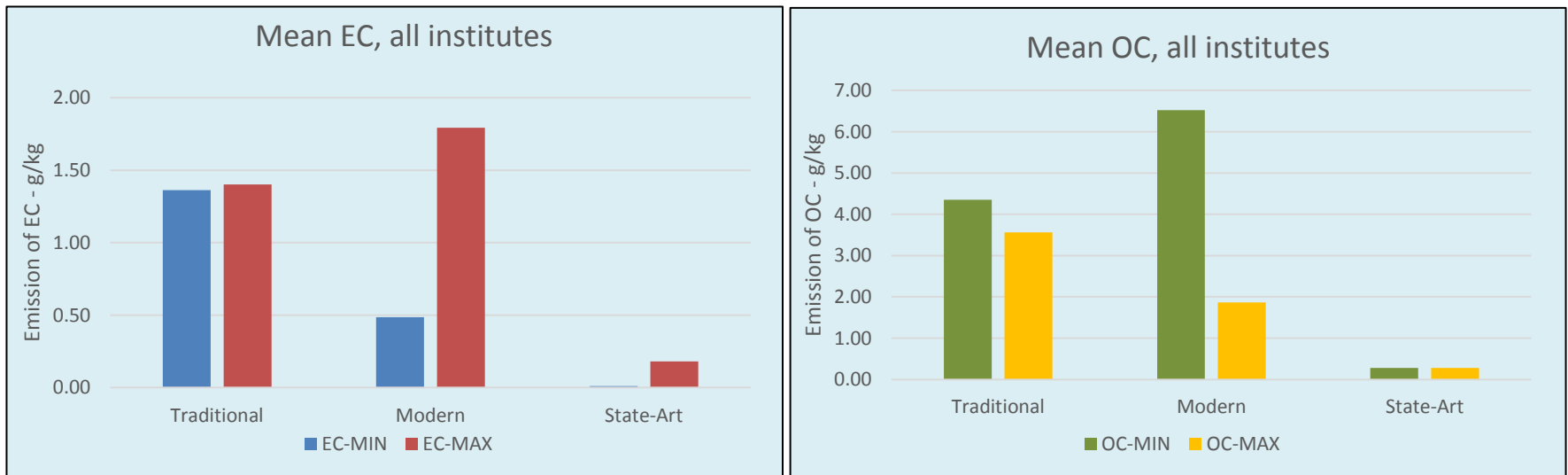
Testing Protocol for BC and OC emissions from Wood Stoves

(Results of the 2015-16 CCAC Domestic Heating Beta-Testing Project)

The figure illustrates the mean black carbon (EC) and organic carbon (OC) emissions per stove technology class. State-art is Bionic stove

MIN is Minimum Heat output

MAX is Maximum heat output



- The results demonstrate that it is possible to get **comparable results** in different laboratories using the Protocol
- **The new “state-of-the-art” bionic stove has negligible emissions of black carbon, lower even than those measured from pellet stoves.**

Batumi Action for Cleaner Air Initiative (2016)

Open Agricultural Burning:

Section: Develop National Actions Programs and Improve Public Awareness

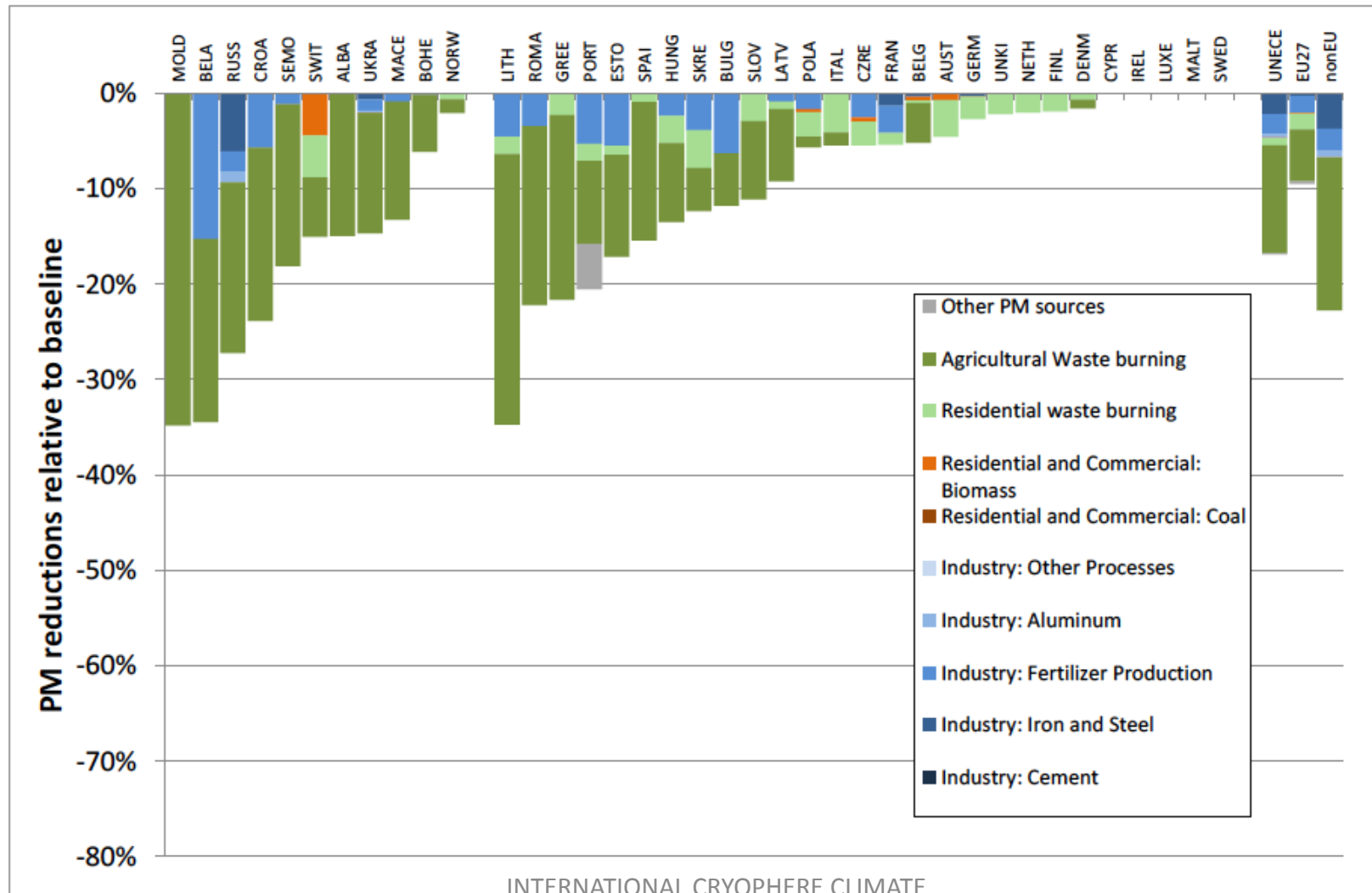
(vi) Promote the development of good agricultural practices to avoid losses of ammonia in the environment ***as well as alternatives to open agricultural burning to avoid harmful emissions*** (Action 14);

Open Agricultural Burning -

The other huge, unaddressed source of PM2.5 and BC in Europe.

- Low cost abatement options/alternatives exist and have been demonstrated in Russia and currently in Ukraine
- Eastern Europe largest source region of BC emissions from open agricultural burning, but burning also takes place in the EU in some countries as well as in North America
- Alternative methods preserve soil quality, increases yield, improves farm economy, improves health by reducing PM2.5 and BC emissions, and slow down climate change in Arctic and glaciated regions.

Low cost options for reducing PM_{2.5} under the revised Gothenburg Protocol



Recommendations to TFTEI for further work

- **Develop guidance document on Burn Right:** Awareness Raising, National Campaigns, Burn Right Instructions and Material, economic incentives and phase out programs.
- **Review and revise Table 12 of the Annex X of the revised GP** concerning emission limit values for new stoves on the market:
 - Addressing testing protocols for BC and PM2.5
 - Reviewing and revise emission limit values, taking into account BAT since 2012
- **Voluntary Eco-labelling:** Consider guidance on undertaking voluntary performance labelling of new stoves using more stringent emission limit values for PM2.5
- **Cooperation with stove producers:** Initiate early contacts with producers to establish a common understanding of regulations and voluntary actions, including Burn Right campaigns
- **Agricultural Burning:** TFTEI and the TF on Reactive Nitrogen include in their work programs an activity to jointly develop of a Guidance document on BAP for reducing or eliminating the practice of Open Agricultural Burning. The case of action to reduce open agricultural burning has previously been presented to WGSR.