

# Black Carbon in Europe: Mitigation Priorities for Health and Climate

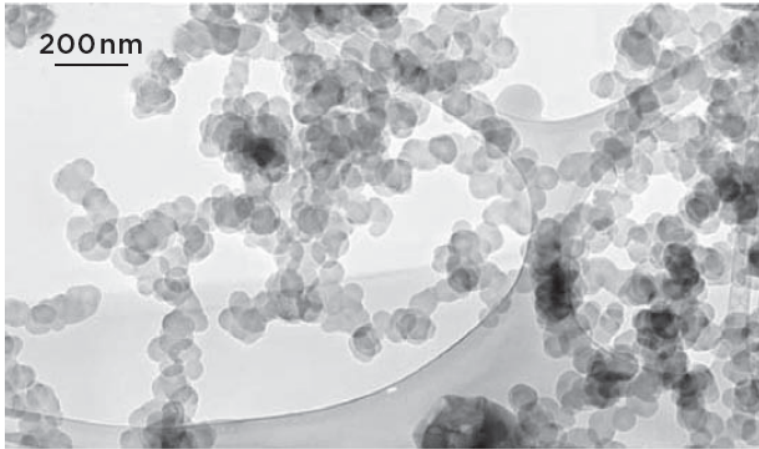
Kathleen Mar  
Dec. 3, 2018



Sustainable solutions to combat climate change: contribution of engineers and reduction of air pollutants. At the EU Pavilion of COP24 in Katowice, Poland.

- I. What is Black Carbon (BC?)
- II. Impacts on Health
- III. Impacts on Climate
- IV. Sources of BC Emissions in Europe
- V. Relevant Policy and Recommendations

# What is Black Carbon (BC) ?



## Black Carbon – Soot – Elemental Carbon

- Formed during combustion of carbon-based fuels
  - Fossil fuels
  - Biomass
- Part of fine particulate matter (PM<sub>2.5</sub>)

# Health Impacts of BC and PM2.5

- PM2.5 causes negative health outcomes, including cardiovascular deaths
- Evidence that BC *probably* one of the most health-relevant components of particulate matter
- In 2017, 80% of the urban population in the EU-28 were exposed to PM2.5 in excess of the WHO guideline (source: EEA)



# Climate Impacts of BC

- BC has a net warming effect on global climate
  - Absorbs solar radiation
  - Deposits on snow and ice, reducing their reflectivity (albedo effect) and accelerating melting
- Together with CO<sub>2</sub> and CH<sub>4</sub>, BC is part of the "top 3" of anthropogenic climate warmers
- Also important for *regional* climate
  - extremely relevant for the Arctic



# Why reduce BC?

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- Health and Air Quality
- Climate

## Revised EU NEC Directive

- EU National Emissions Ceiling Directive revised in 2016
  - Covers the "new" pollutant PM<sub>2.5</sub>
  - Goes into effect in 2020
- Reductions of BC need to be prioritized in national plans (NAPCPs) when taking action on PM<sub>2.5</sub>

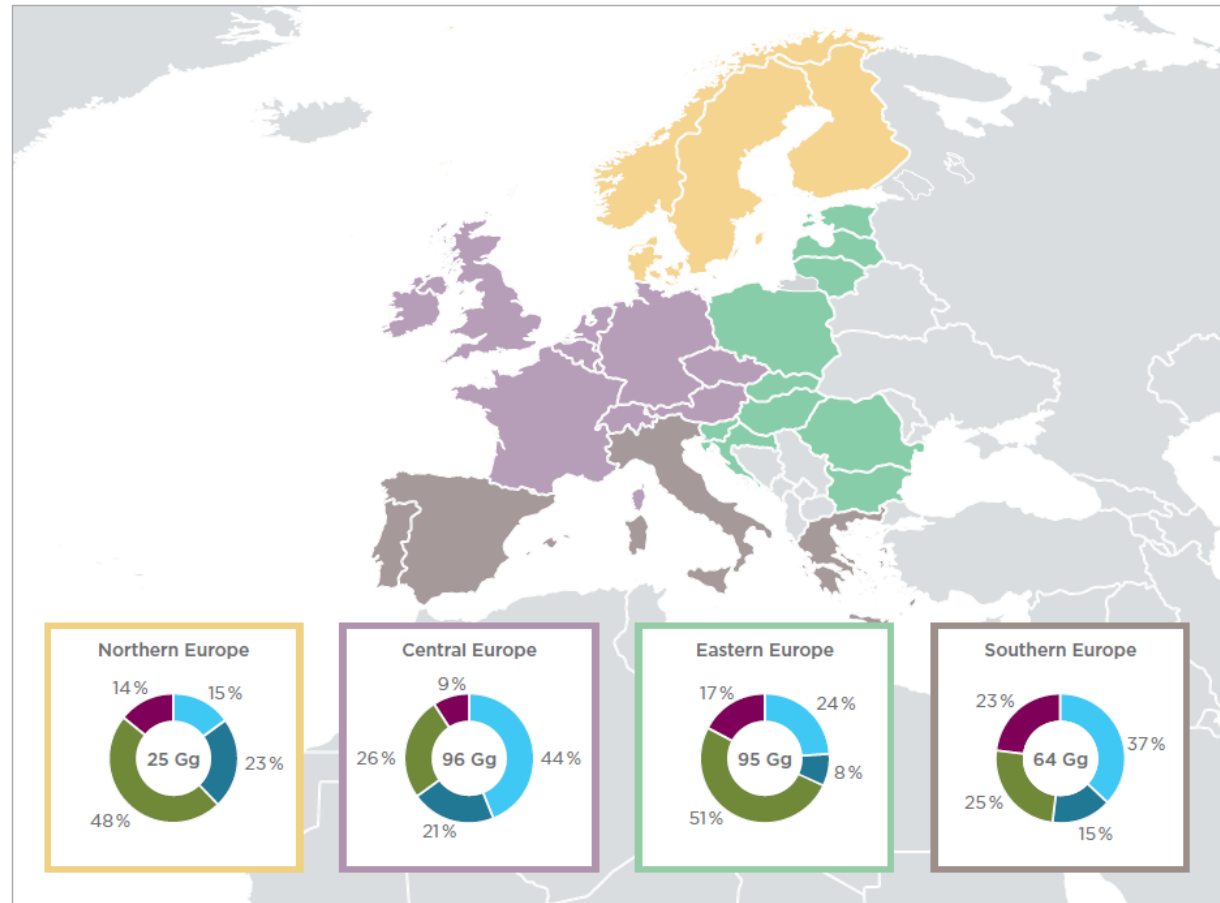
# Key sources of BC in Europe

## Diesel Transport

- on-road diesel
- non-road transport

## Residential Combustion

- residential combustion



on-road diesel non-road transport residential combustion other



# Looking towards 2030 and beyond

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## **Diesel transport**

- As on-road vehicles are subject to tighter emissions controls (requirements for particulate filters), non-road diesel engines will become an increasingly important source of BC

## **Residential Combustion**

- By 2030, expected to account for nearly 70% of BC emissions in the EU

# Coordinate Policymaking on Air Quality and Climate

## Diesel Transport

- on-road diesel
- non-road transport



**Promotion of diesel vehicles for climate led to air quality problems (and didn't help climate).**

## Residential Combustion

- residential combustion



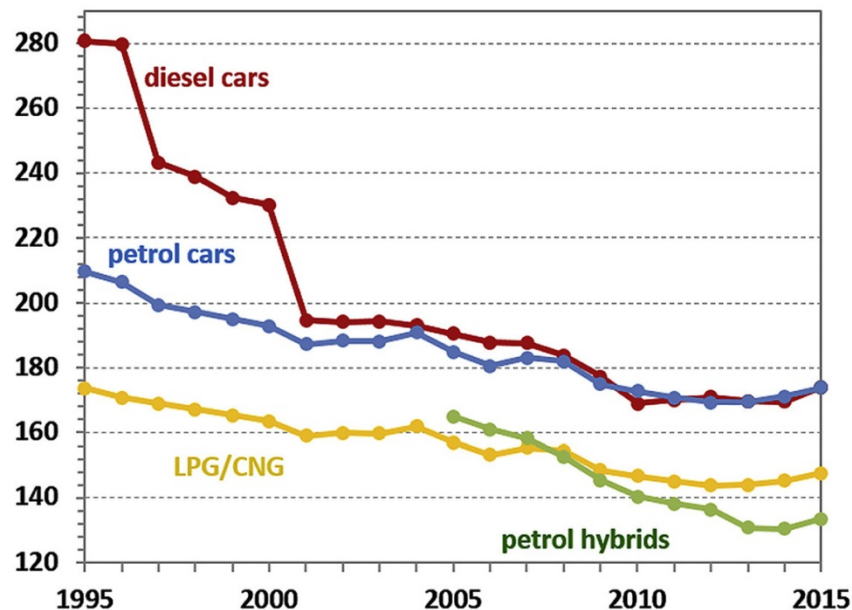
**Promotion of biomass fuel in residential sector could compromise air quality AND not achieve the intended climate benefits if BC's climate impact is not considered**

# Europe's Diesel Boom Brought No Climate Benefits

In a new study, colleagues conclude that:

“ *The diesel boom that started in the EU in the mid-1990s most likely delivered no climate benefit...* ”

g CO<sub>2</sub>-eq/km



- Diesel cars became heavier, were built with bigger and more powerful engines
- From 1995-2000, diesel cars were sold WITHOUT diesel particulate filters
  - High BC emissions, unfavorable for climate

# Self-interested action on BC

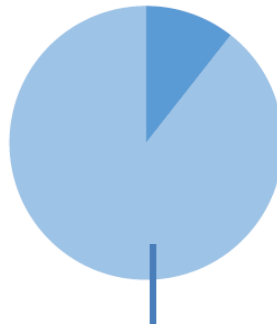
From Aakre et al.

## EU BC Mitigation



## Benefits for the EU

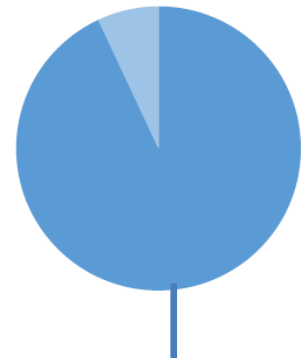
\$25 billion



Health Benefits

## Benefits for others\*

\$11 billion



Climate Benefits

**\*Others are Nordic, Canada, USA, Russia, China, India**

From Aakre et al., Incentives for small clubs of Arctic countries to limit black carbon and methane emissions, Nature Climate Change 2018

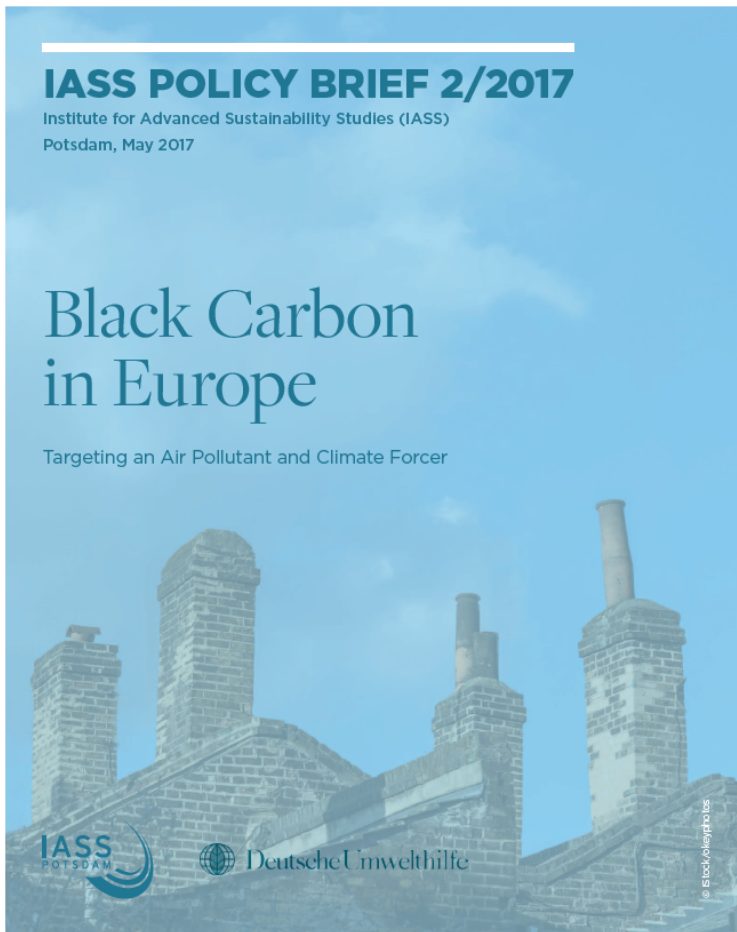
# Take-home messages

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- Two key sectors to address for reducing EU BC emissions:
  - Diesel transport (on-road and non-road)
  - Residential heating
- Beware of air quality effects when promoting biomass in the residential heating sector
- Reducing BC in Europe
  - Has direct health and climate benefits for Europe
  - Has climate benefits for the globe
- Coordinating and communicating between air quality and climate policy communities is key to designing effective policy and avoiding unintentional trade-offs

# Thank you!

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