Black Carbon in current regulatory/policy frameworks – gaps and challenges

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Black carbon in regulation/policy – 3 areas

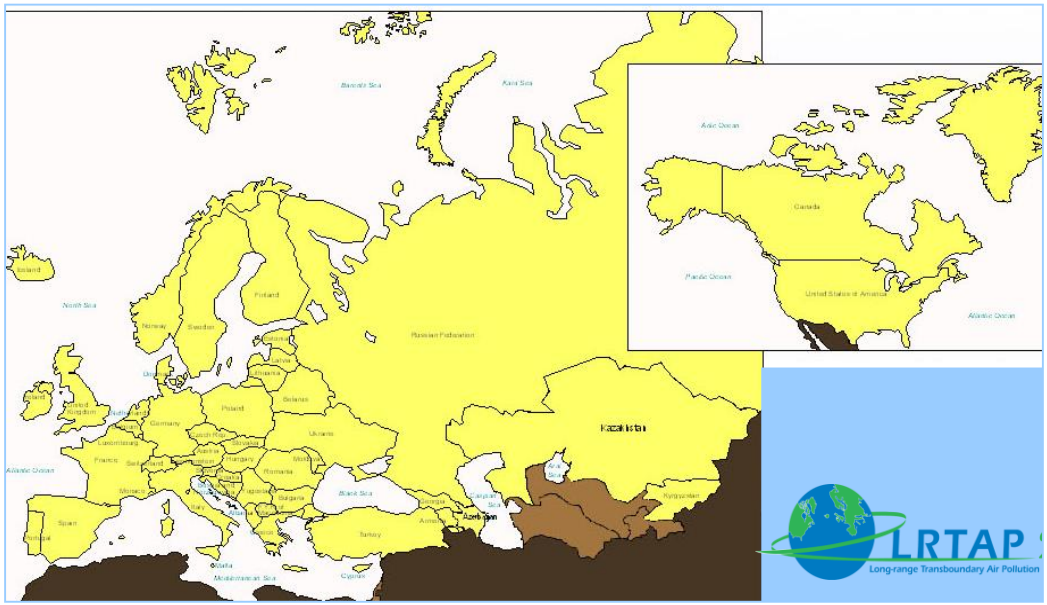
- Emissions – climate & air quality
- Air quality
- Health

Emissions

- Gothenburg Protocol – CLRTAP
- NECD – EU
- Arctic Council
- California
- Climate Regulation/Policy?

Gothenburg Protocol

- Agreed in 2012 – before more recent science emerged
- Parties were not persuaded to agree binding emission reduction commitments
- But binding $PM_{2.5}$ ceilings out to 2020 with obligation to reduce BC as a priority



Gothenburg preamble

- *Recognizing* the assessments of scientific knowledge by international organizations, such as the United Nations Environment Programme, and by the Arctic Council, about the human health and climate co-benefits of reducing ***black carbon*** and ground-level ozone, particularly in the Arctic and in the Alpine regions,
- *Noting furthermore* that this Protocol is the first agreement under the Convention to deal specifically with reduced nitrogen compounds and particulate matter, including ***black carbon***,

Gothenburg obligation on BC

- Parties should, in implementing measures to achieve their national targets for particulate matter, ***give priority***, to the extent they consider appropriate, to emission reduction measures which also significantly reduce ***black carbon*** in order to provide benefits for human health and the environment and to help mitigation of near-term climate change.

EU National Emissions Ceilings Directive (NECD)

- Agreed 2016 – ceilings out to 2030
- “promotes the reduction of emissions of black carbon “
- “Member States shall:….. ***prioritise*** emission reduction measures for ***black carbon*** when taking measures to achieve their national reduction commitments for fine particulate matter;
- Consistency of reported emissions? EMEP Guidance – “ % of $PM_{2.5}$”

The Arctic Council

- Framework for ‘Enhanced black carbon and methane emissions reductions’
- Obliges Member States to report on emissions and track progress
- Reporting is well respected, all 8 MSs and 8 Observer states all submit

Regulations on PM from diesel vehicles reduces BC, in the EU and the US

EU Emission Standards for HD Diesel Engines, g/kWh (smoke in m^{-1})

Tier	Date	Test	CO	HC	NOx	PM	Smoke
Euro I	1992 (< 85 kW)	R-49	4.5	1.1	8.0	0.612	
	1992 (> 85 kW)		4.5	1.1	8.0	0.36	
Euro II	October 1996		4.0	1.1	7.0	0.25	
	October 1998		4.0	1.1	7.0	0.15	
Euro III	*Voluntary EEV (October 1999 to January 2013)*	*ESC & ELR*	*1.5*	*0.25*	*2.0*	*0.02*	*0.15*
	October 2000	ESC & ELR	2.1	0.66	5.0	0.10 0.13[a]	0.8
Euro IV	October 2005		1.5	0.46	3.5	0.02	0.5
Euro V	October 2008		1.5	0.46	2.0	0.02	0.5
Euro VI	January 2013	WHSC	1.5	0.13	0.4	0.01	

Notes:

a - for engines of less than 0.75 dm^3 swept volume per cylinder and a rated power speed of more than 3000 min^{-1}

EEV - enhanced environmentally-friendly vehicles

California strategy on SLCPs

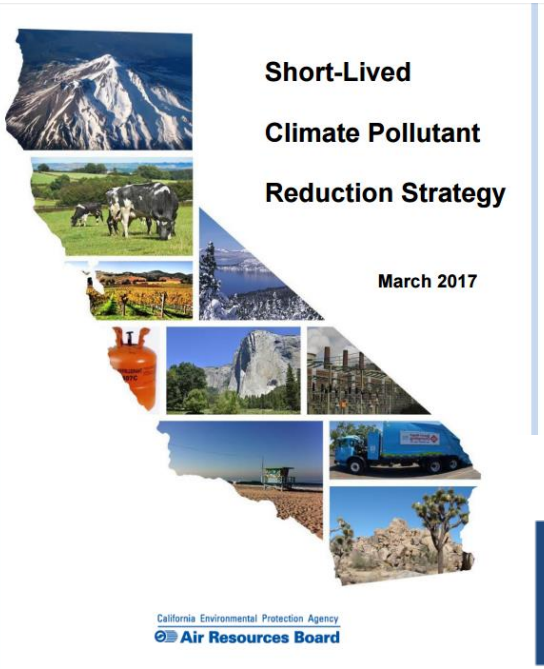
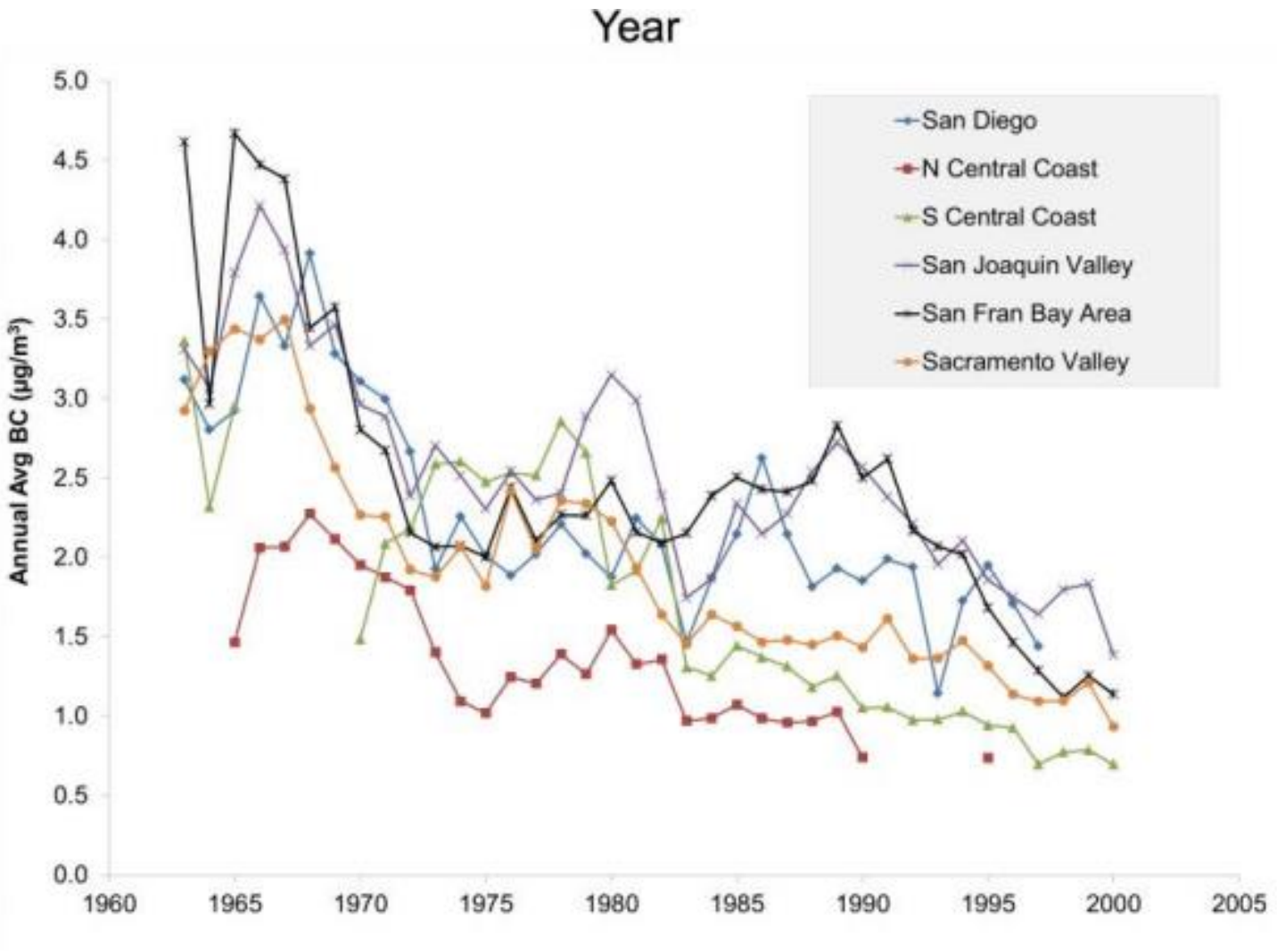


Table 1: California SLCP Emissions and Emission Reduction Target Levels (MMTCO2e)*

Pollutant	2013	2030 BAU**	2030 Emission Reduction Target (percent reduction from 2013)
Black carbon (anthropogenic)	38	26	19 (50%)
Methane	118	117	71 (40%)
Hydrofluorocarbons (HFCs)	40	65	24 (40%)

BC concentrations in California



Air quality & health

- There is currently no regulatory pressure on ***ambient*** BC concentrations
- Nor is there any such pressure on primary PM
- Two problems:
  - Lack of standard measurement method
  - Absence of health effect consensus

Standardised measurement method

- CEN TC 264 WG35 is about to publish the standard EN 16909 on Organic Carbon and Elemental Carbon measurement by laboratory analysis of filter samples.
- The work of the WG is expected to continue with the extension to automated, real-time methods, which will include consideration of Black Carbon because of its close historical association with Elemental Carbon.

Health effect consensus?

- WHO REVIHAAP 2013 - equivocal
- “Even when BC ***may not be the causal agent***, BC particles are a valuable additional air quality metric for evaluating the health risks of primary combustion particles from traffic…”
- “Reducing BC…is beneficial for public health..”

- To date there are no specific concentration-response functions for BC
- ‘BC’ reduction measures are evaluated via their impact on $PM_{2.5}$ and by using $PM_{2.5}$ CRFs
- Is this a problem?
- Possibly not but it could hinder regulation of ambient BC per se?

WHO Global AQ Guideline Development Group 2016-

- GDG decided to monitor and collect evidence on ultrafines and PM components including BC, for discussion and decision-making at the next GDG meeting - ~Sept 2017.
- Will form part of an introductory chapter of the Guidelines on UFPs and PM components.
- Should relevant evidence on the independent health effects of BC become available this may justify the development of a recommendation in the updated AQGs, based on a systematic review of evidence
- The GDG would discuss whether a recommendation should be developed, and if so, of what type, at its next meeting
- An eventual recommendation would not necessarily be a numerical guideline, it could also be a research or a more qualitative recommendation.

Gaps and Challenges?

- How to persuade regulators to act specifically on BC as opposed to PM more generally – “ what more do we need to do than we’re doing already”
- An ambient guideline/standard would be a major step forward
- Need an agreed BC measurement method
- Health effect evidence is currently not adequate to formulate legal ambient standards for BC or any primary PM component
- Consistent and comprehensive emission inventories