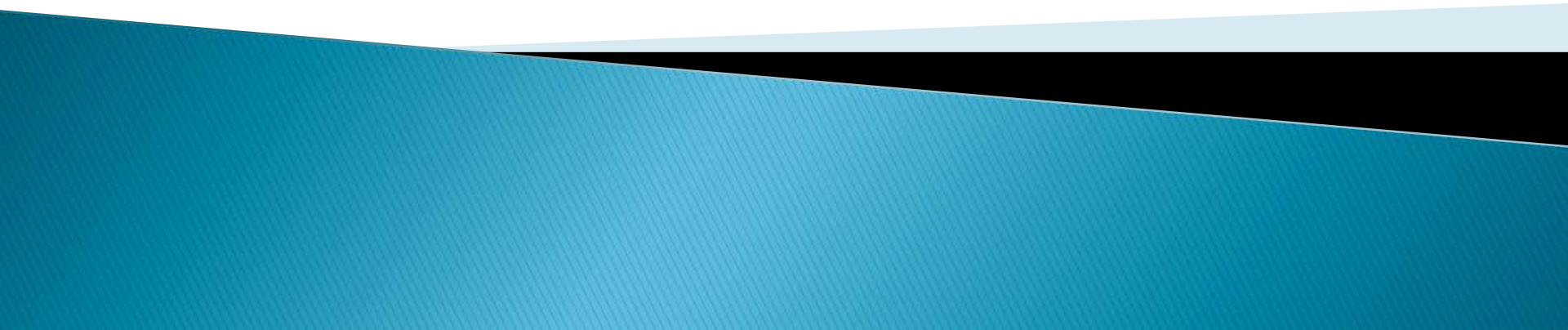


The Arctic Council's Work on Short-Lived Climate Forcers

Global Methane Initiative Meeting
Krakow, Poland
October 2011

Håvard Toresen, Deputy Director General
Norwegian Ministry of the Environment



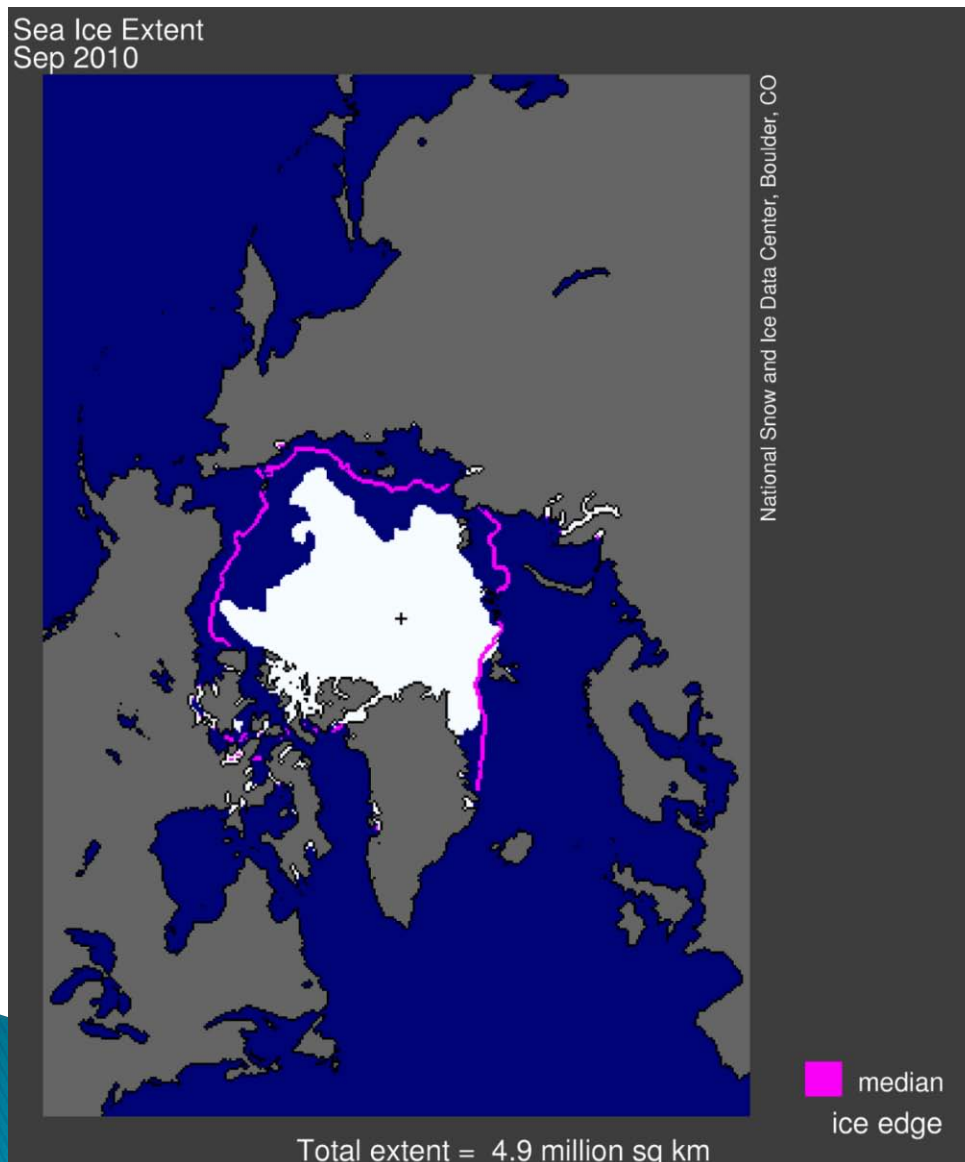
Overview

- ▶ The Arctic Council
- ▶ SLCF Task Force history and accomplishments
- ▶ How we have worked together within the Council
- ▶ Findings & recommendations
- ▶ Future work under Arctic Council and Norway's contributions

Arctic Council

- ▶ Formed in 1994
- ▶ Norway, Canada, Denmark, Finland, Iceland, Sweden, Russia, U.S. (countries with territory above the Arctic Circle)
- ▶ Permanent Participants: six indigenous peoples groups that participate fully in discussions
- ▶ Observer nations such as Poland, UK, Italy
- ▶ Informal observers (EU, China) and NGOs

Arctic Sea Ice Extent for September 2010 compared to 1979 – 2000 Median



- The Arctic is warming at twice the rate of the global average
- Attributed to warming due to long-lived greenhouse gases
- More recently, the role of short-lived climate forcers is being considered

Task Force Participation and Process

- ▶ Formed by Arctic Council foreign ministers at Tromsø Ministerial 2009, mandate to look at black carbon, methane and ozone
- ▶ Initial decision to focus on black carbon due to greater uncertainty on Arctic impacts and emissions inventories
- ▶ Participation in the Task Force has included:
 - National representatives named by SAOs
 - Some participation by Permanent Participants and observers
 - Co-chairs and members of AMAP Expert Group on SLCFs
 - Ad hoc group of experts invited by co-chairs (e.g., IIASA)
- ▶ Reported back to ministers at Nuuk Ministerial May 2011

Other Arctic Council SLCF Work

- ▶ AMAP Expert Group: science and impacts
- ▶ ACAP Black Carbon working group: Demonstration projects in Russia
- ▶ Bilateral efforts
 - U.S. black carbon funding: \$5 million for open burning, diesel and district heating in Russia
 - Norway, Sweden and other bilateral funding, much through NEFCO
- ▶ Outreach to International Maritime Organization (IMO) and Convention on Long-Range Transboundary Air Pollution (UNECE/CRTAP)

Task Force Focused on Black Carbon

- ▶ Summary Findings and Recommendations for Policymakers
- ▶ Technical Report: New contributions:
 - Current BC and OC Emissions from AC Countries
 - Projected Future Emissions
 - Current Regulations, Policies and Programs (by country)
 - Additional Mitigation Opportunities (by sector)

Main Task Force Findings

- ▶ *The largest sources of black carbon emissions in Arctic Council countries have been identified*
- ▶ *Unlike the case for methane and other well-mixed greenhouse gases, the most effective black carbon control strategies for Arctic climate benefits will vary by location and season*
- ▶ *Controls on black carbon sources that reduce human exposure to particulate pollution improve health, and in that regard many measures can be considered no-regrets*

Task Force Findings (2)

- ▶ *All BC controls also reduce particulate matter (PM), but not all PM controls reduce black carbon to the same degree. To maximize climate benefits, PM control programs must aim to achieve maximum black carbon reductions.*
- ▶ *Land-based transport emissions will decrease substantially in coming years, however only if planned regulations are implemented both on time and effectively. If not, transport will remain a major contributor to black carbon impacting the Arctic.*
- ▶ *Emissions from sources other than land-based transport -- residential heating, open burning, shipping and potentially oil and gas -- will likely remain the same or increase without new measures*

Task Force Recommendations:

Emission Reduction Options (1)

- ▶ *Measures to reduce black carbon from transport, especially diesel-powered, could include more retrofitting of older vehicles and equipment, retirement of old engines, vehicles and equipment, and enhancing or expanding current controls to the extent that PM standards are not in place.*
- ▶ *Similar retrofit, retirement, or replacement measures could be applied to reduce black carbon emissions from stationary engines and equipment.*
- ▶ *Measures to reduce black carbon from residential heating could include standards, change-out programs, technologies for more efficient combustion and retrofits addressing wood stoves, boilers and fireplaces.*

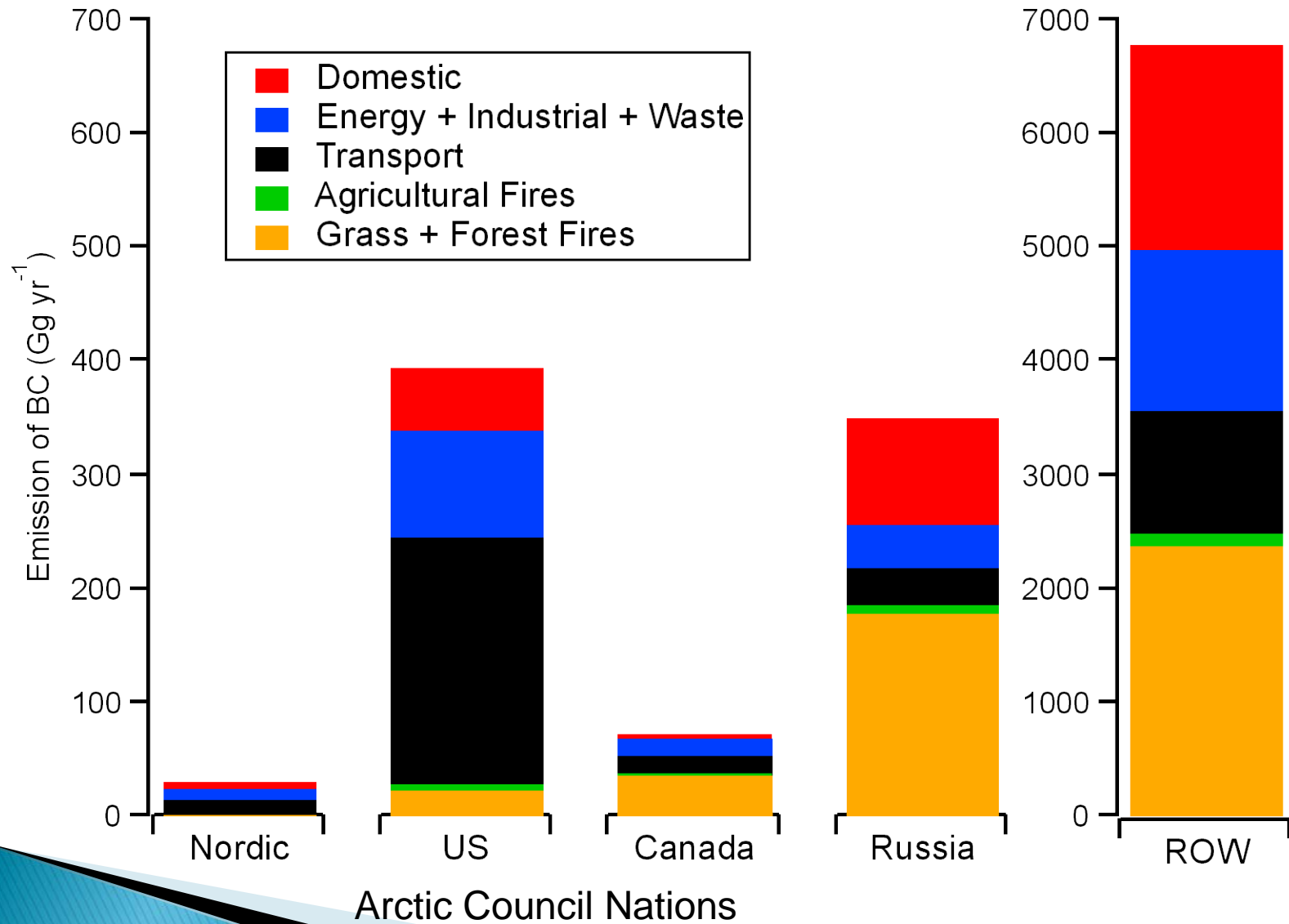
Task Force Recommendations:

Emission Reduction Options (2)

- ▶ *To reduce black carbon from agricultural burning, prescribed forest burning and wildfires, measures could include demonstration projects for management alternatives to burning, prevention of accidental fires, and greater resources devoted to fire monitoring and prevention. When controlled burning is necessary, management techniques may help reduce emissions or limit their impacts.*
- ▶ *Measures to reduce black carbon from marine shipping in and near the Arctic could include Council-wide adoption of voluntary technical and non-technical measures and collaboration with IMO on other certain actions.*

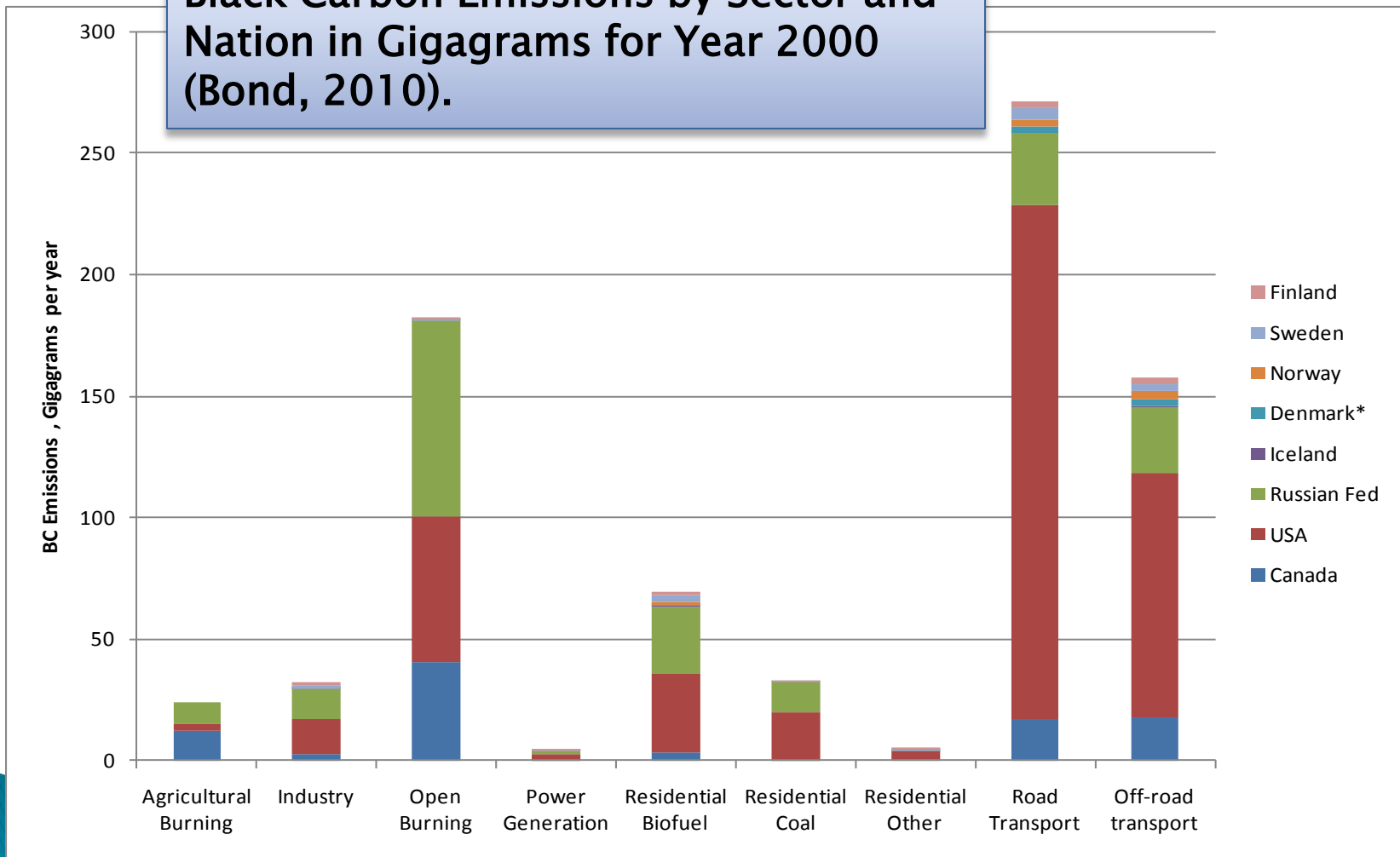
Emissions of BC by Sector and Region

Note different y-axes for Arctic Council Nations and ROW!

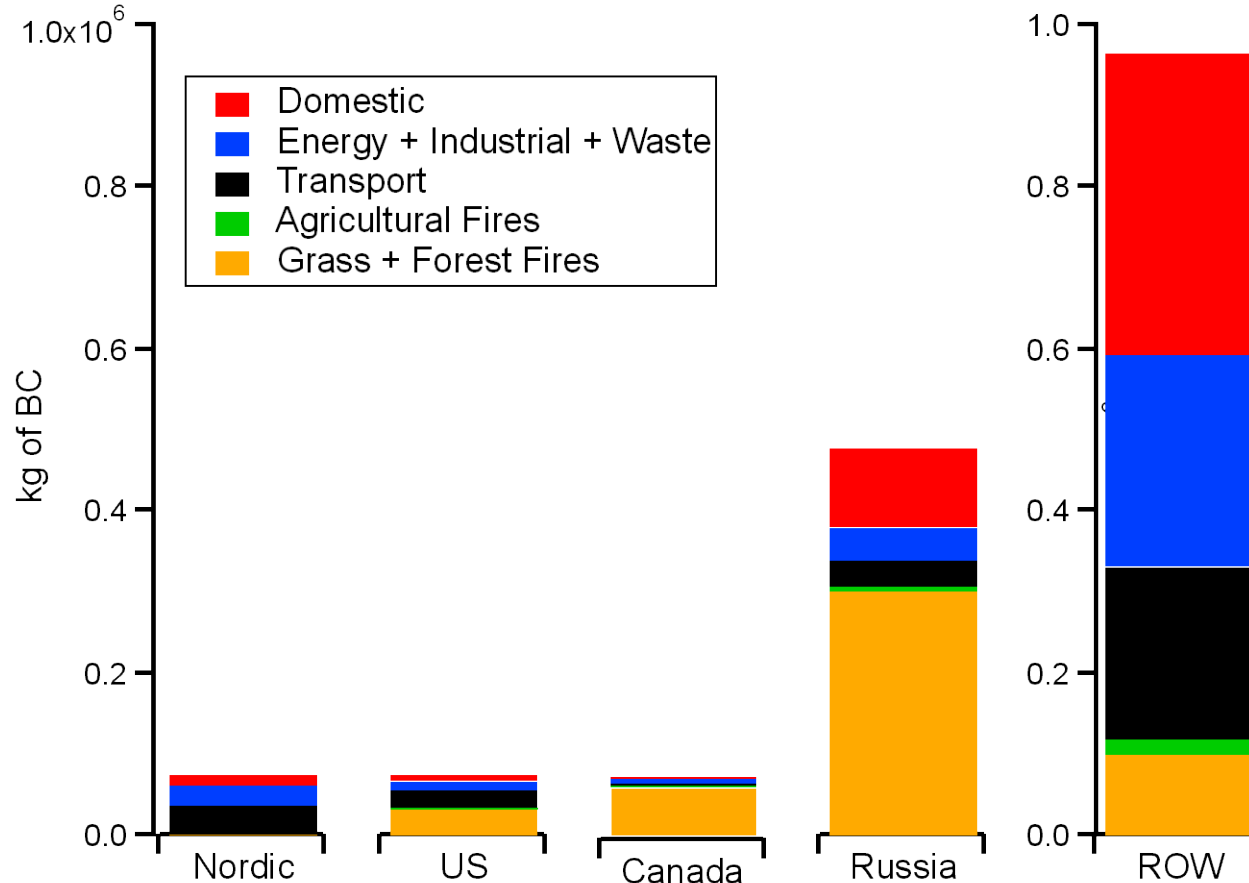


Arctic Council Emissions Clarified

Black Carbon Emissions by Sector and Nation in Gigagrams for Year 2000 (Bond, 2010).

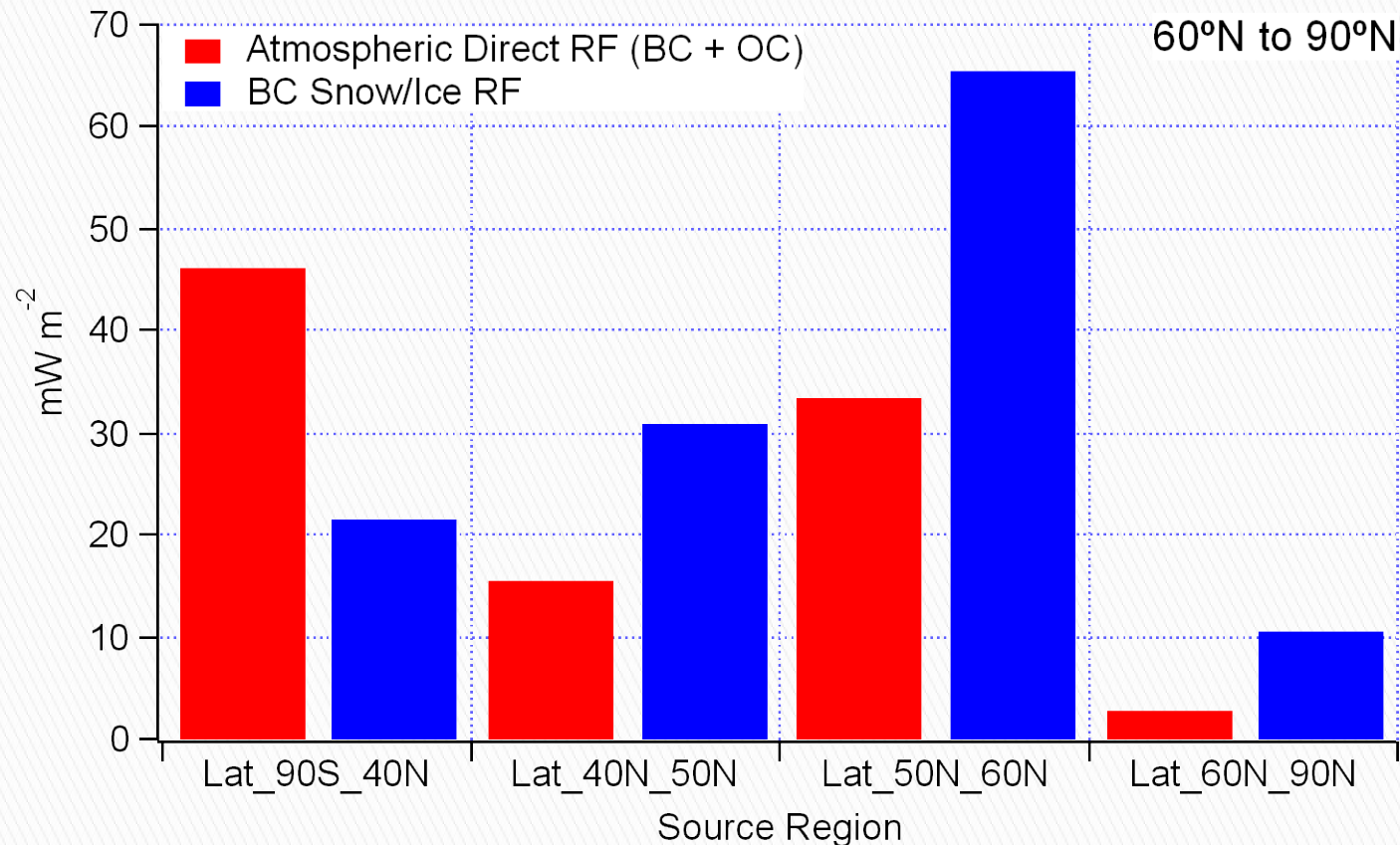


Model-calculated change in the annual tropospheric burden of BC (kg) in the Arctic atmosphere (60°N to 90°N) due to emissions in indicated regions



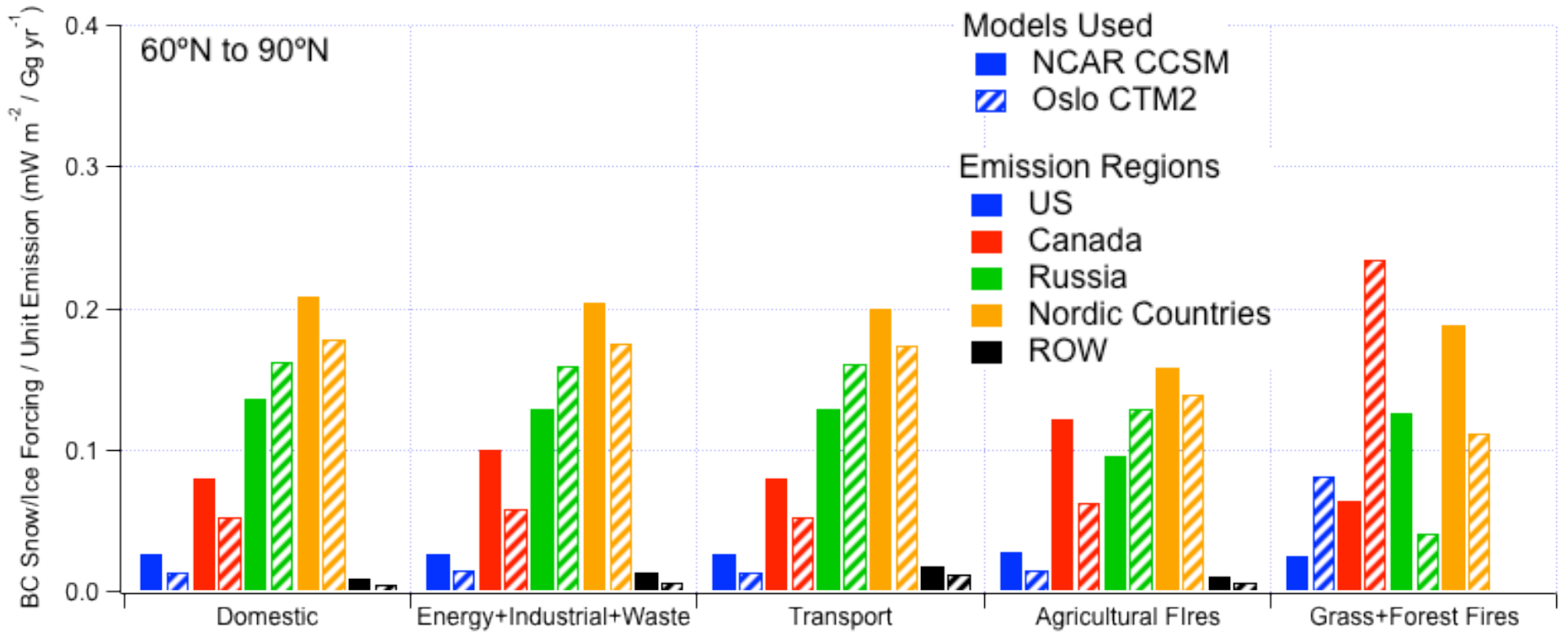
- Burdens for Arctic Council Nations and Rest Of World are on the same scale since a large fraction of the BC emitted around the globe is not transported to the Arctic.
- Russian and Canadian BC burden dominated by Grass + Forest Fire emissions
- US burden – Transport and Grass + Forest Fire emissions
- Nordic countries – Transport emissions

Absolute forcing due to emissions in indicated latitude bands

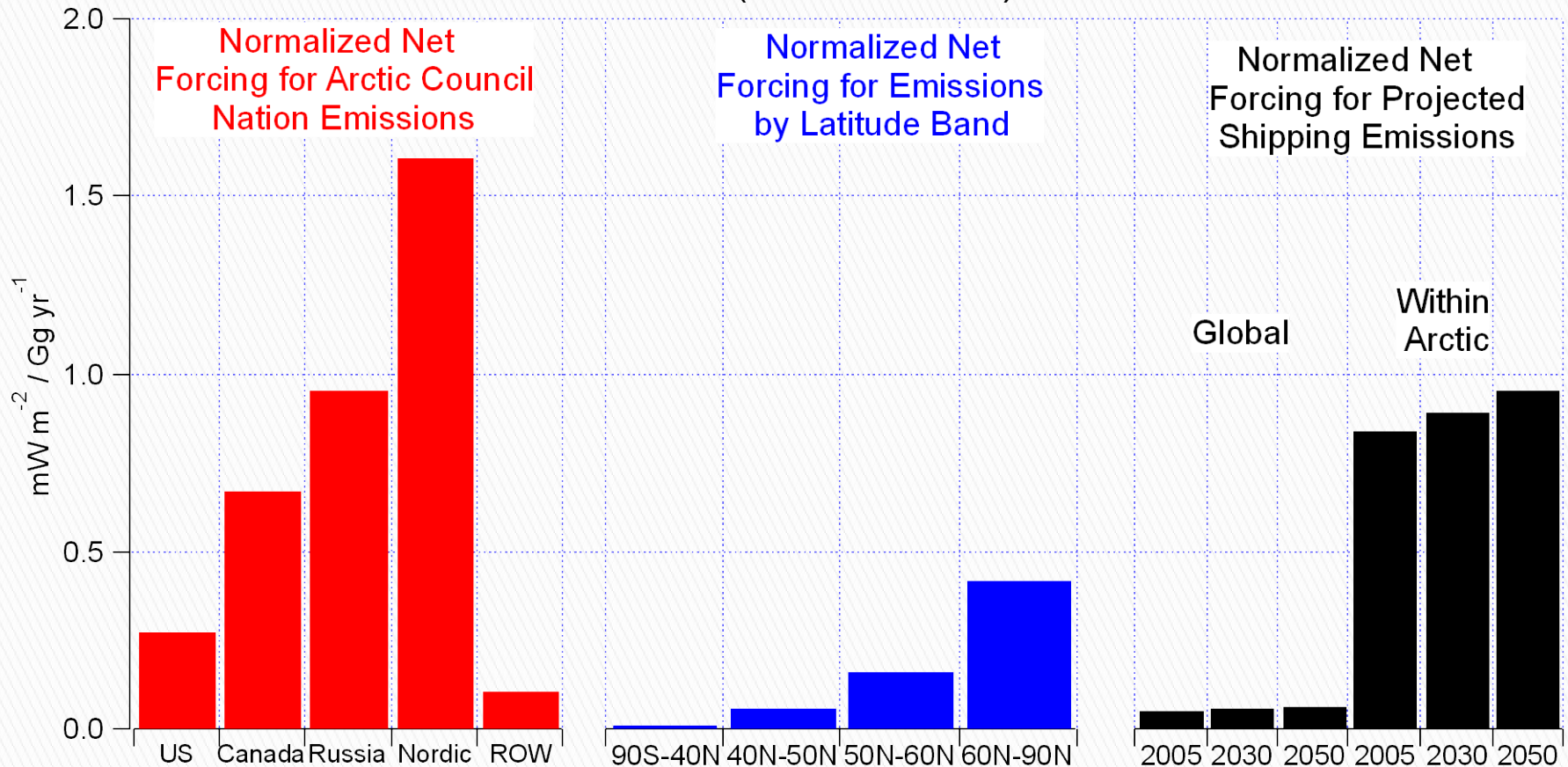


- BC Snow/Ice forcing increases with proximity to the Arctic indicating sources close to the Arctic are more likely to deposit within the Arctic.
- Atmospheric forcing $>$ BC Snow/Ice forcing at lower latitudes indicating the transport of BC at high altitudes.

Relative Level of Impact: Normalized BC-Snow/Ice Radiative Forcing as Calculated by the Two Models



Summary of Normalized Net Forcing (Atmospheric Direct RF (BC) and BC-Snow/Ice RF) due to Emissions from Arctic Council Nations, Considered Latitude Bands, and Global and Within-Arctic Shipping (NCAR CCSM)



- Near Arctic and within Arctic sources have large forcings per unit emission due to their likelihood of being transported to the Arctic and being deposited at the surface.
- Indicates importance of limiting near- and within-Arctic emissions of BC.

Future Arctic Council Work on SLCFs (2)

▶ Regarding methane

- *Given this strong starting point, plus ongoing methane mitigation efforts (e.g., whether under legal instruments such as the Kyoto Protocol or voluntary efforts such as the Global Methane Initiative), the Arctic Council and Council nations may be able to leverage these efforts to encourage additional methane reductions, both within and outside Arctic Council nations, by communicating and demonstrating the climate benefits of such measures specifically for the Arctic region.*

▶ Regarding the specific source of gas flaring

- *For gas flaring, it is premature to identify specific black carbon mitigation options but increased research and better emission inventories are recommended to improve understanding of the significance of this source.*

Nuuk Declaration (2011):



- ▶ ***Welcome*** the Arctic Council reports on Short-Lived Climate Forcers (SLCF), that have significantly enhanced understanding of black carbon,
- ▶ ***encourage*** Arctic states to implement, as appropriate in their national circumstances, relevant recommendations for reducing emissions of black carbon, and
- ▶ ***request*** the Task Force and the AMAP expert group to continue their work by focusing on methane and tropospheric ozone, as well as further black carbon work where necessary and provide a report to the next Ministerial meeting in 2013.

New Charge to Task Force: Methane and Ozone

- ▶ Focus on how to decrease emissions of methane and other ozone precursors impacting Arctic climate
- ▶ Strong air quality co-benefits
- ▶ Challenge: more globally mixed than black carbon, so emissions reductions theoretically could occur anywhere: could engage Arctic nations in regional and global as well as national actions
- ▶ Outreach to GMI community in Arctic nations helpful
- ▶ Synergy with black carbon (flaring) in oil and gas sector (methane leakage)

Norwegian Efforts

- ▶ Funding to demonstration projects (in talking points what) in Russia through ACAP and NEFCO
- ▶ Spearheading Scandinavian woodstoves efforts
- ▶ Weaving SLCF concerns into bilateral oil and gas cooperation with Russia
- ▶ Upcoming Nordic Council chairmanship will include SLCF work
- ▶ Joining Global Methane Initiative!