

# Arctic Black Carbon: Reduction of Black Carbon from Diesel Sources

## **Overview of Inventory of Black Carbon from Diesel Sources**

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# Outline

- Objectives and Major BC Sources
- Overall Inventory Approach
- Transportation Emissions: Methodologies and Surveys
- Off-road Emissions and Diesel Generators
- Uncertainty, Scope Limitations and Extrapolation

# Project Objectives

- Assess primary sources of black carbon in the Russian Arctic and general scoping;
- **Develop a targeted baseline emission inventory for black carbon from diesel sources in key areas;**
- Implement targeted, on-the-ground demonstration projects for reducing black carbon from diesel;
- Establish policy recommendations and financing options for reducing black carbon diesel sources.

# Assessment & Scoping

- Kick-off conference Moscow Oct 2011
- Established Technical Steering Group and contact list
- Stakeholder Meetings Moscow and Murmansk Jan/Feb 2013
- Assessment Report

# Pilot Mitigation Projects

- Addressing top 2 sources of emissions – on road and off-road transport
- Case study of bus company purchasing more energy efficient buses
- Guidelines for mining and off-road vehicles

# Purpose of the Inventory, Defining BC

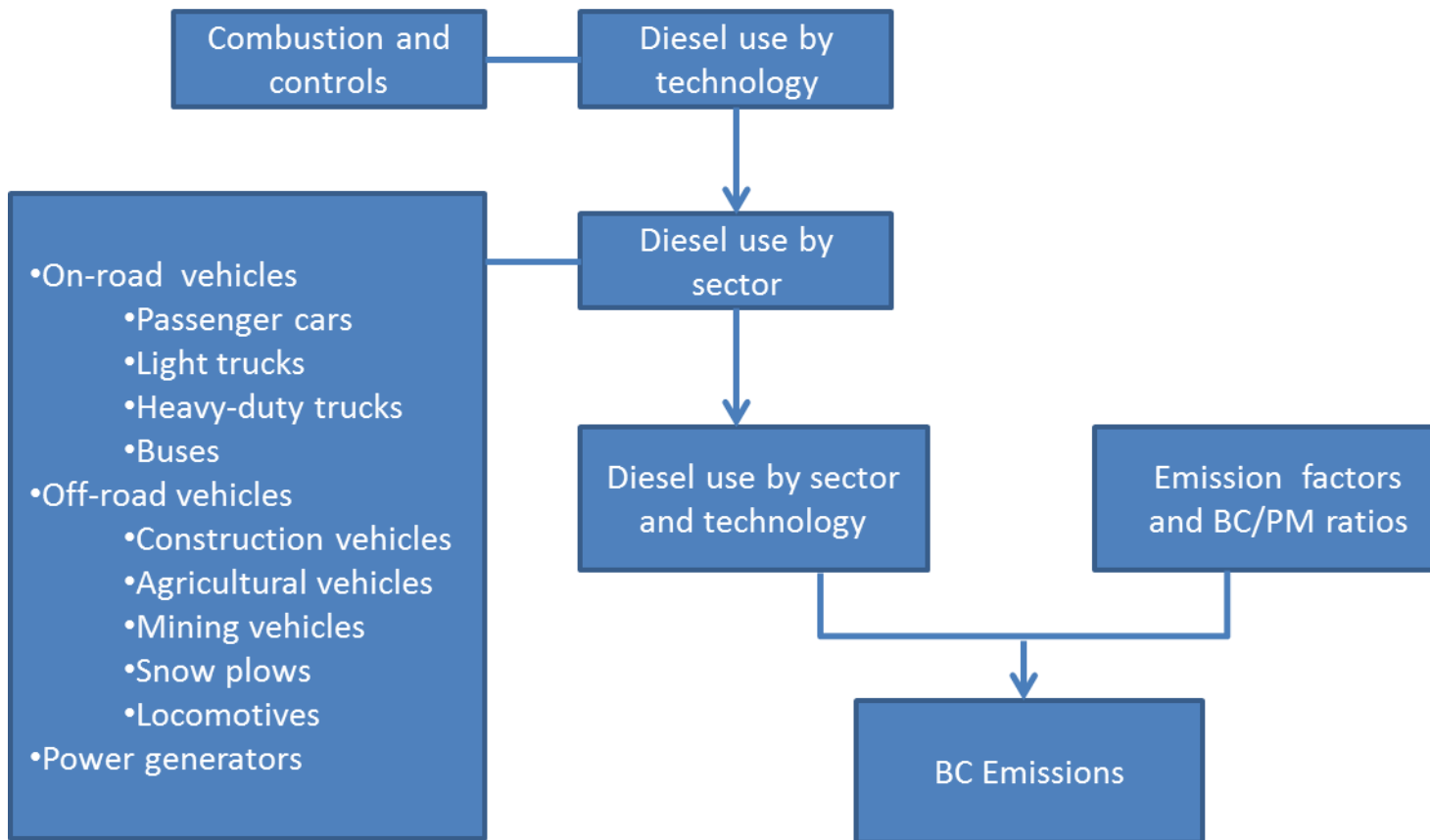
- Purpose:
  - Develop bottom-up accounting of BC emissions from diesel sources in Murmansk
  - Enhance understanding of Russian BC emissions
  - Serve as a resource to build capacity in Russia

# Scope of the Inventory and Major Emission Sources

- On-road mobile sources:
  - Cars, Buses, Trucks
- Off-road vehicles:
  - Mining equipment
  - Locomotives,
  - Construction vehicles, Snow plows, Farming equipment
- Stationary: Diesel generators and equipment



# Inventory Approach



In simple terms:

$$\text{BC emissions} = \text{Activity} \times \text{Emission Factor} \times \text{Speciation Ratio for BC}$$



# Fuel Use Estimate in Murmansk Region, 2012

Activity	Diesel Use (tons)
Mines	139,000
On-road transport	<i>212,700</i>
Off-road transport (ag. and construction)	6,500
Fishing and marine shipping	87,100
Rail	15,700
Other non-road transport	14,900
Trade and services (back up generators?)	7,600
Off-grid generators (large)	<i>1,700</i>

Statistical data from Murmanskstat; items in italics estimated based on bottom up calculations

# Preliminary estimate of BC Emissions in Murmansk Region (tons per year)

Source	BC emissions, tons per year
Mines	306.1
On-road-transport (Murmansk City only)	72.8
Locomotives	16.5
Construction	16.2
Diesel generators	2.6
Snow plows	5.3
Agriculture	1.4

# Preliminary estimate of BC Emissions from On-Road Transport in Murmansk City (tons per year)

Type	BC emissions
Cars	12.2
Light trucks and buses	11.3
Buses	8.2
Trucks	41.1

Based on NIIAT methodology on emissions calculation

# National Diesel Use and Extrapolation

Russian diesel use, 2012	Thousand tons oil equivalent
Road transport	12,727
Rail	1,469
Other transport	1,069
Mining	1,172
Construction	642
Other industry	779
Agriculture	2,878
Residential, comm. and pub. services	2,566
Other	357
Total	23,659

Source: IEA Statistics

Murmansk data can help with extrapolation of road transport (adjusted use coefficient, fuel share); mining data based on output

# Key Findings in Murmansk

- Off road vehicles like mining--largest source because large diesel use, few controls
- On road vehicles also major source, but major gaps in fuel data make detailed bottom up analysis essential
  - Share of diesel is now about 12% and growing, but many vehicles are luxury, high Euro class
- Fishing may be a large source, but mostly outside of Russian waters
- Diesel generators old, but represent small source, even when estimating all off grid villages. Back-up and temporary generators also small

# Conclusions and Further Research

- Detailed, bottom up inventory important in understanding major sources
- Emission controls and fuel standards are reducing emissions significantly
- Further research: extrapolation to all of Russia, integrating all the inventory pieces from different USG projects, and covering additional sectors (such as flaring and marine)

# Pilot Project: Murmanskavtotrans

**Goal:** replace old Euro 0 and Euro 1 buses with new Euro 5 buses to improve fuel economy and reduce emissions

First stage (fall 2013):

- Bought 31 new MAZ buses
- Retire 50 old buses
- BC savings – 2.1 tons per year



Second Stage (summer 2014):

- Will buy 21 new buses
- Will retire 30 old buses
- Potential BC savings – 0.8 tons per year

