

Reducing black carbon emissions in Murmansk: the value of bus fleet upgrades

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Outline

- Project overview
- Diesel consumption in Murmansk Region
- Black carbon emissions from on-road transport
- Case study: fleet upgrades at the bus company “Murmanskavtotrans”
 - Fuel economy and economic effects
 - Market value
 - Social value
- Conclusions

Project Objectives

- Assess primary sources of black carbon in the Russian Arctic;
- 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.

Diesel Fuel Use Estimate in Murmansk Region, 2012

Activity	Diesel Use (tons)
On-road transport	<i>212,700</i>
Off-road transport	
Mines	139,000
Agriculture and construction	6,500
Other non-road transport	14,900
Fishing	68,300
Marine shipping	18,800
Rail (without industrial locomotives)	15,700
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

Black Carbon Emissions Estimate in Murmansk Region, 2012

Activity	Black carbon (kg)
On-road transport (Murmansk only)	73,000
Off-road transport	
Mines	160,000
Agriculture and construction	21,000
Fishing (off-shore)	6,000
Rail (without industrial locomotives)	16,500
Trade and services (back up generators?)	11,400
Off-grid generators (large)	2,500

Black Carbon Emissions by On-Road Vehicles, kg per year

	Cars	LCVs	Buses	Trucks
Euro 0	10,057	9,461	7,725	36,955
Euro 1	636	518	69	634
Euro 2	869	412	282	1,536
Euro 3	502	410	182	1,795
Euro 4	230	593	16	197
Euro 5	16	22	2	98

Calculations are based on simplified NIIAT methodology

Bus company: Murmanskavtotrans (MAT)

- Largest public transport company in Murmansk Region
- Intercity routes, and recently won tender for suburban routes
- MAT owns about 200 buses
- Most buses: Inefficient, Euro 0 and Euro 1 ecological classes. Only 19 buses before fleet upgrade were in Euro 3 and Euro 4 classes



MAT bus fleet upgrade

Made decision to lease 52 new buses in 2013

Phase 1, 2013:

- MAT leased 31 new MAZ buses with Mercedes engines
- Retired 50 old Euro 0 buses

Phase 2, 2014:

- MAT leased additional 21 new MAZ buses
- The company will retired additional 30 old Euro 0 and Euro 1 buses

* In addition, Murmansk city bus company retired 26 buses when MAT won contract for suburban routes in 2014.

New buses began to arrive in December 2013



MAT bus fleet upgrade: summary

	New buses	Buses being retired
Make and model	52 MAZ-103 buses	80 buses, mixed makes
Average fuel economy, liters per 100 km	25	40
Emission controls	Euro 5 (exceeding Euro 4 minimum for new buses)	Euro 0
Year of production	2013 and 2014	Between ~1970 and 1985

This does not reflect additional buses owned by Avtokolonna, the company that suburban routes until 2014. Most of these Avtokolonna buses are also being retired from use in Murmansk.

Fuel economy and economic effects

- The fuel economy is between 590,000 and 660 liters of diesel per year
- Amount of money saved on fuel is between \$640,000 and 730,000 per year
- Murmanskavtotrans closed a maintenance facility for old buses
- Still assessing other costs and savings, like financing, AdBlue, costs/savings of fully retiring old buses for city routes (those not owned by MAT).

Market Value

- Key issue: including environmental and efficiency criteria in tender documents for route licenses or bus purchases is one way local governments can encourage more efficient, sustainable transport.

Value from company perspective:

- Increased reliability and comfort of the buses increases customer base, and the sustainability of bus transport.
- MAT has the lowest level of passenger complaints in Murmansk
- Better business image of the company because of modern fleet
- Better position in future tenders (depending on tender terms)

Social value

- Increased reliability of the buses
- Increased comfort for passengers
- Black carbon emissions reduction is between 2,100 and 2,200 kg per year
- Less pollution – reduction of health risks:
 - Exposures to fine particles, including black carbon, can cause premature death and harmful effects on the cardiovascular system (the heart, blood, and blood vessels);
 - The people most at risk include people with heart or lung disease (including asthma), older adults, children, and people of lower socio-economic status
 - Decreases in long-term PM_{2.5} exposures have been associated with an estimated increase in average life expectancy.

Conclusions

Lessons for companies

- It is important to have a long-term vision for business development
- Bus upgrade can have positive economic, environmental and social effects

Lessons for local and central government

- Push companies to upgrade their fleets
- Include stricter requirements on Euro classes in tender documentation
- Include requirements on fuel economy in tenders