Baltic Biogas Bus

The use of biomethane in urban transport

Wojciech Gis
Motor Transport Institute

International Conference
CNG and LNG
Blue Corridor 2012

Warsaw, 12 September 2012

A project to stimulate the use of biogas as fuel for city buses, aiming to reduce environmental impact.

Baltic Sea Region Programme 2007-2013

PART-FINANCED BY THE EUROPEAN UNION (European Regional Development Fund)

Drivers for Biogas in public transport

Global climate change

- **Rapid environmental change is underway**
- **Current policies are far from enough**
- **Transport sector is one of the fastest growing emitters**

Source: ”BBB project, aims, objectives & results” L. Hallgren

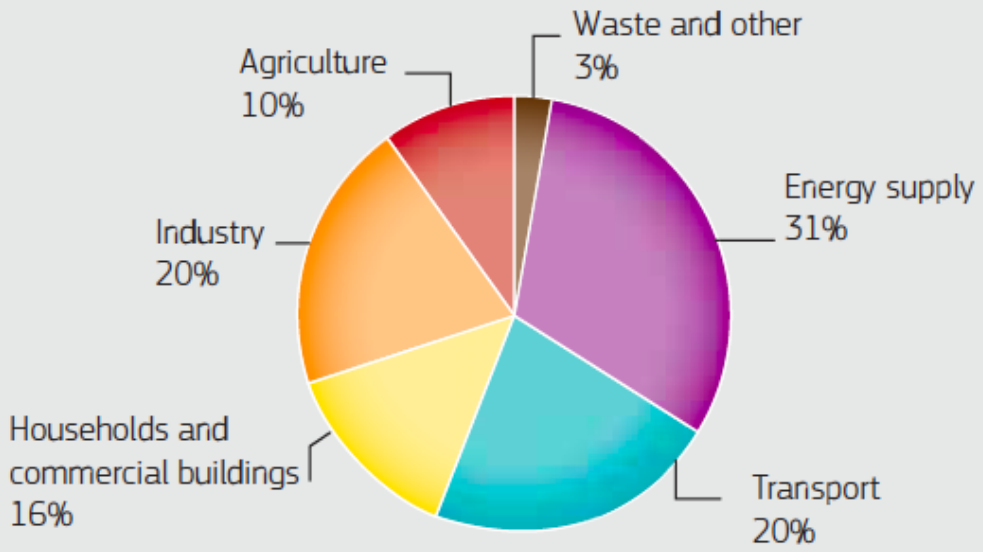
Drivers for biogas in Public transport

Air Quality & Congestion

- Over 50 % of World's population live in big cities → 80 % in 2050?
- More people die from air pollution than from traffic accidents

Source: "BBB project, aims, objectives & results" L. Hallgren

Sources of EU greenhouse gas emissions

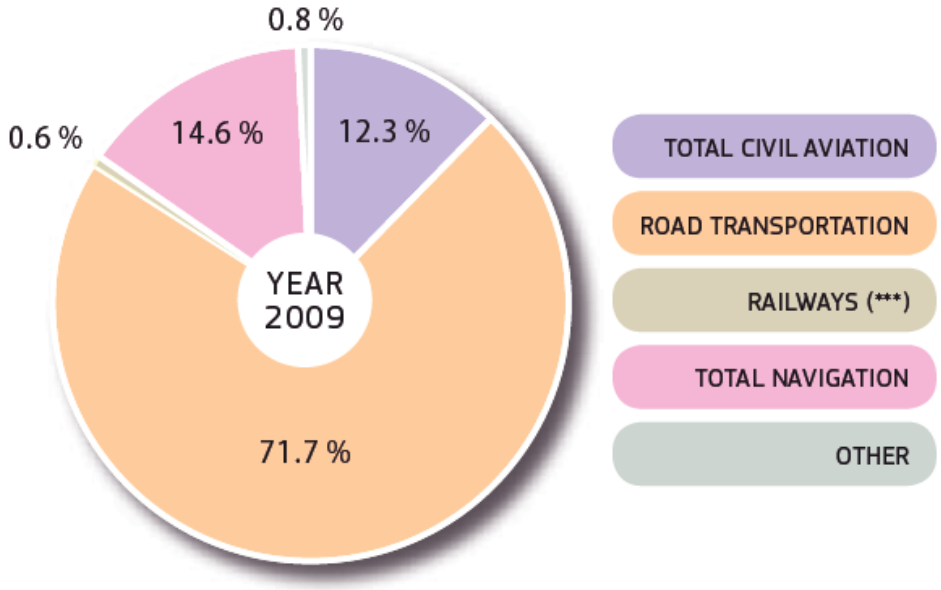


Source: European Environment Agency

Note: The category 'households and commercial buildings' shows emissions from fuel used directly but not from the use of electricity and heat produced by the power sector

Road transport, a large scale green house driver

- ✓ The road transport accounts for 72 % of CO_2 emission from transport - EU-27

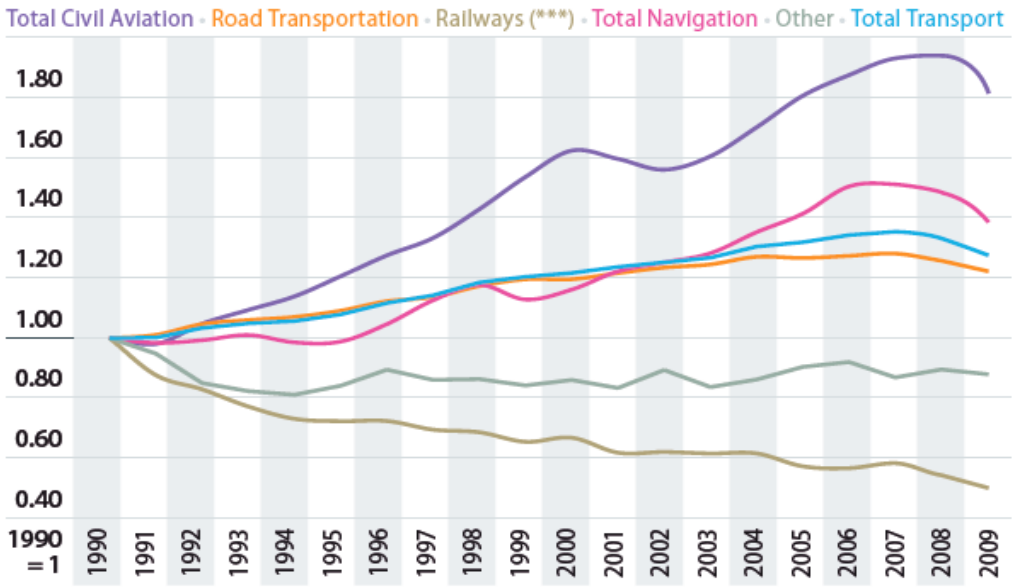


Notes: (*) Excluding international bunkers (international traffic departing from the EU);
(**) Including International Bunkers but excluding LULUCF;
(***) Excluding indirect Emissions from Electricity Consumption;
(****) Combustion emissions from all remaining transport activities including pipeline transportation, ground activities in airports and harbours, and off-road activities;
(*****) Total Transport share in Total Emissions.

Source: European Environment Agency (EEA). August 2011

Road transport, a large scale green house driver

- ✓ Congestion and local emissions
- ✓ Oil & Gas reserves decreases, cost of fossil energy increases



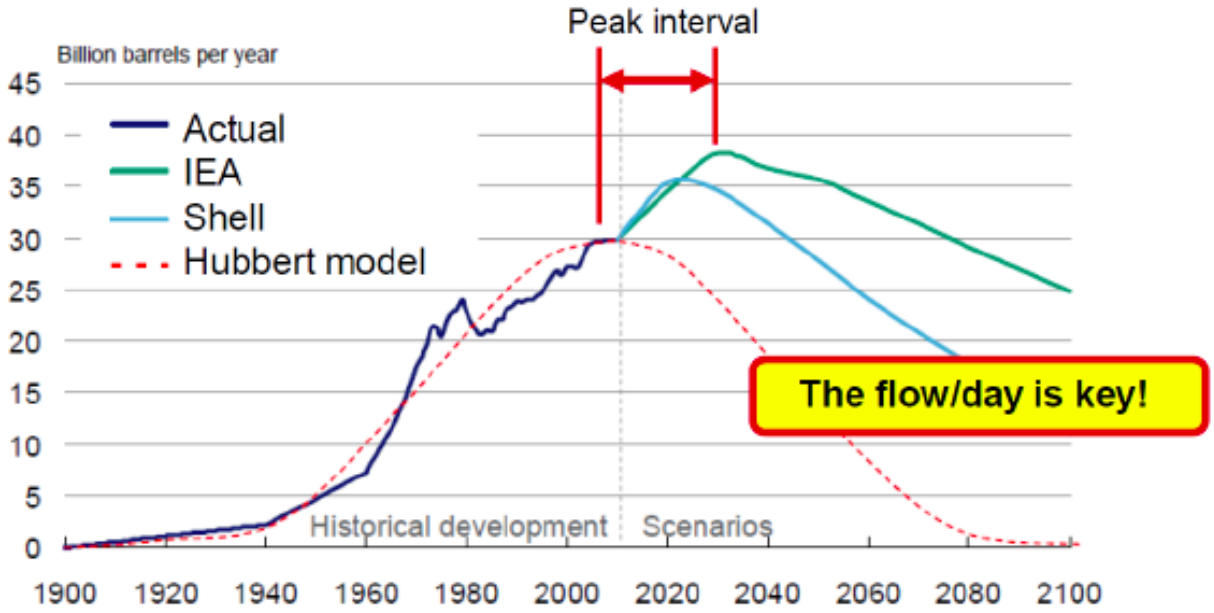
Notes: (*) Excluding international bunkers (international traffic departing from the EU); (**) Including International Bunkers but excluding LULUCF; (***) Excluding indirect emissions from electricity consumption; (****) Combustion emissions from all remaining transport activities including pipeline transportation, ground activities in airports and harbours, and off-road activities.

Source: European Environment Agency (EEA). August 2011

Source: "BBB project, aims, objectives & results" L. Hallgren

Drivers for biogas in Public transport

Drive for local energy security - End of cheap oil..?



Source: "BBB project, aims, objectives & results" L. Hallgren

Public transport is a part of the solution

- Offer an attractive public transport service
- Increase the market share
- A sustainable public transport with bio fuels

Source: ”BBB project, aims, objectives & results” L. Hallgren

Biogas is a part of the solution

The benefits of biogas

- Biogas is a renewable fuel
  Reduction of CO2 emissions
  Reduction of pollutants
- natural degradable processes of waste products
- from households, restaurants and sewage treatment plants
- similar to natural gas CNG but renewable
- locally produced and a strategic energy source

Source: ”BBB project, aims, objectives & results” L. Hallgren

The Project: Baltic Biogas Bus a part of the climate change solution

A project to stimulate the use of biogas as fuel for city buses aiming to reduce environmental impact.

12 partners around the Baltic Sea

Source: ”BBB project, aims, objectives & results” L. Hallgren

Some achievements

WP3. Policies, strategies & recommendations

- Strategies how to introduce biogas buses in public transport
- Impacts from regulations & taxation on biogas use
- Life cycle cost analyses
- Support cities in Poland to set up a strategy for the introduction of biogas buses

Source: ”BBB project, aims, objectives & results” L. Hallgren

Strategies how to introduce Biogas buses

- Recommendations

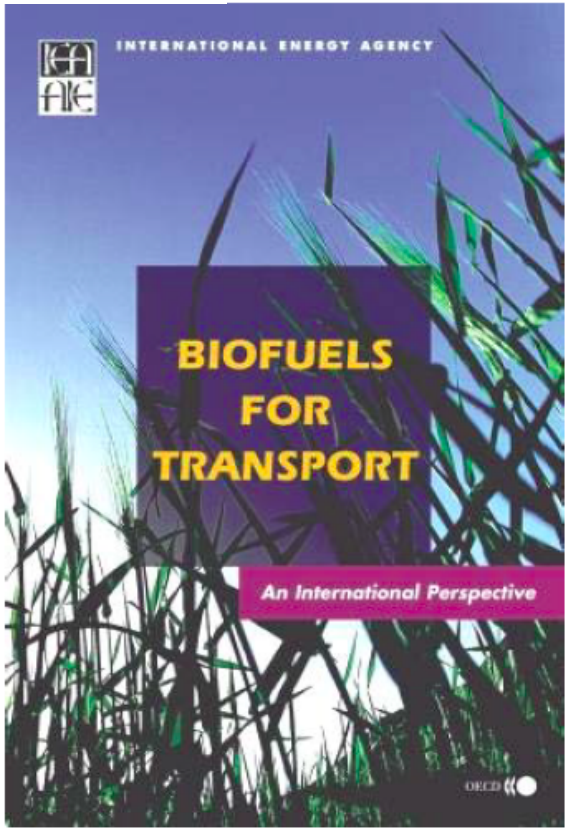
- Use the best available technique of today
- Set ambitious targets
- Long term contracts
- Economic incentives
- Cooperation, awareness, increased knowledge

Source: ”BBB project, aims, objectives & results” L. Hallgren

Some achievements

WP4. Biogas supply and production potential

- Biogas production options experience including production potential in the Baltic Sea Region
- Biogas and hydrogen

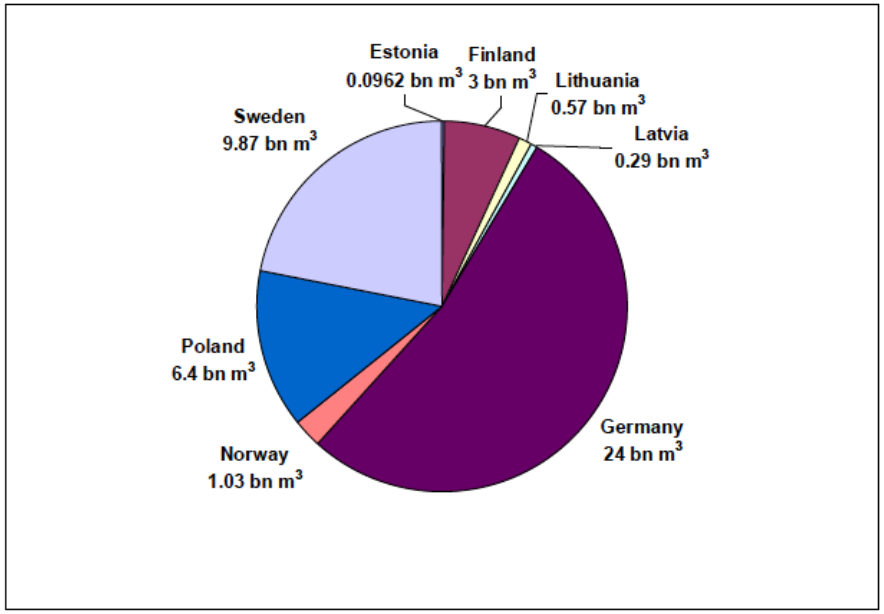


Source: "BBB project, aims, objectives & results" L. Hallgren

Biogas potential in the Baltic Sea Region

Comparison of potential and production of biogas in several BSR countries

Country	Total production (2009)	Total potential (2010/2011)	Percentage use of the potential
	PJ	PJ	%
Denmark	4,17	39	10,7
Estonia	0,12	2,09	5,7
Finland	1,73	26,0-65,3	2,6-6,6 (average value 4,6)
Germany	176,41	414-432	40,8-42,6 (average value 41,7)
Latvia	0,41	3,77-6,28	6,5-10,9 (average value 8,7)
Lithuania	0,20	3,1 - 12,6	1,6-6,5 (average value 4,1)
Norway	1,65	22,61	7,3
Poland	4,10	52,3-115 (*410,4*)	3,6-7,8 (*1,0*)(average value 4,1)
Sweden	4,57	50,4-61,2 (*214,8*)	7,5-9,1 (*2,1*)(average value 6,2)



Total biogas potential in BBB countries [bn m^3]

Some achievements

Distribution, bus depots and infrastructure (WP5)

- Infrastructure planning, bus depot, distribution and fuelling system alternatives
- BSR biogas infrastructure
- Feasibility studies biogas in Rzeszow and other regions

Biogas bus use (WP6)
Sustainable achivements

259 Biogas buses in Stockholm, June 2012

Bio (gas) buses in the Baltic Sea Region

Source: ”BBB project, aims, objectives & results” L. Hallgren

Results from emission tests

Greenhouse gases CO2

1. Biogas
2. Diesel

Emissions NOx

1. Biogas
2. Diesel

Emissions PM

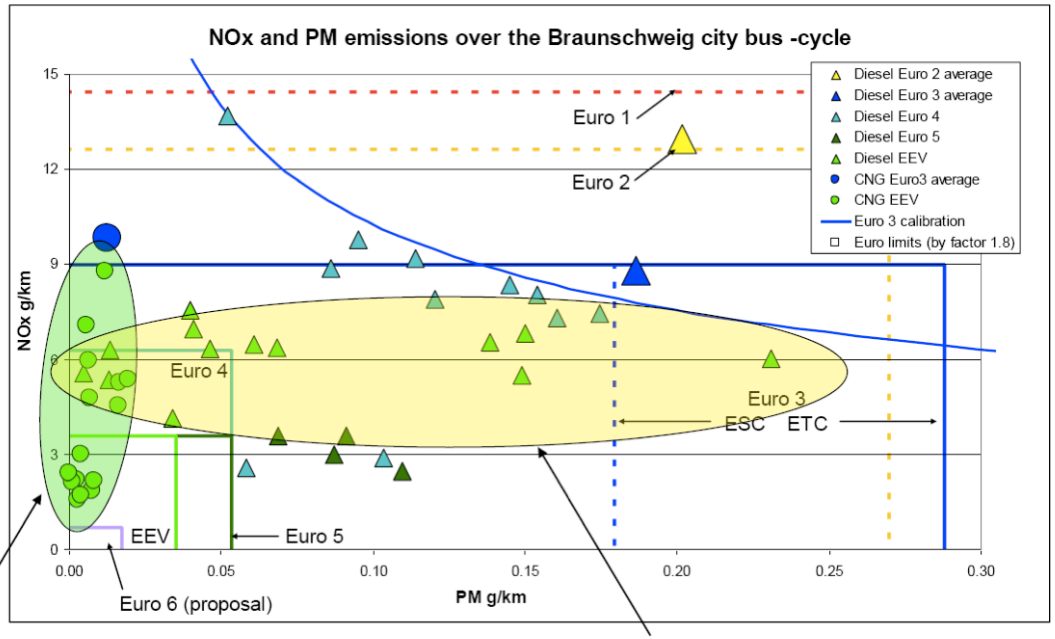
1. Biogas
2. Diesel

Noise

1. Biogas
2. Diesel

Source: ”BBB project, aims, objectives & results” L. Hallgren

Results from emission tests



Newest EEV natural gas buses

EEV diesel buses

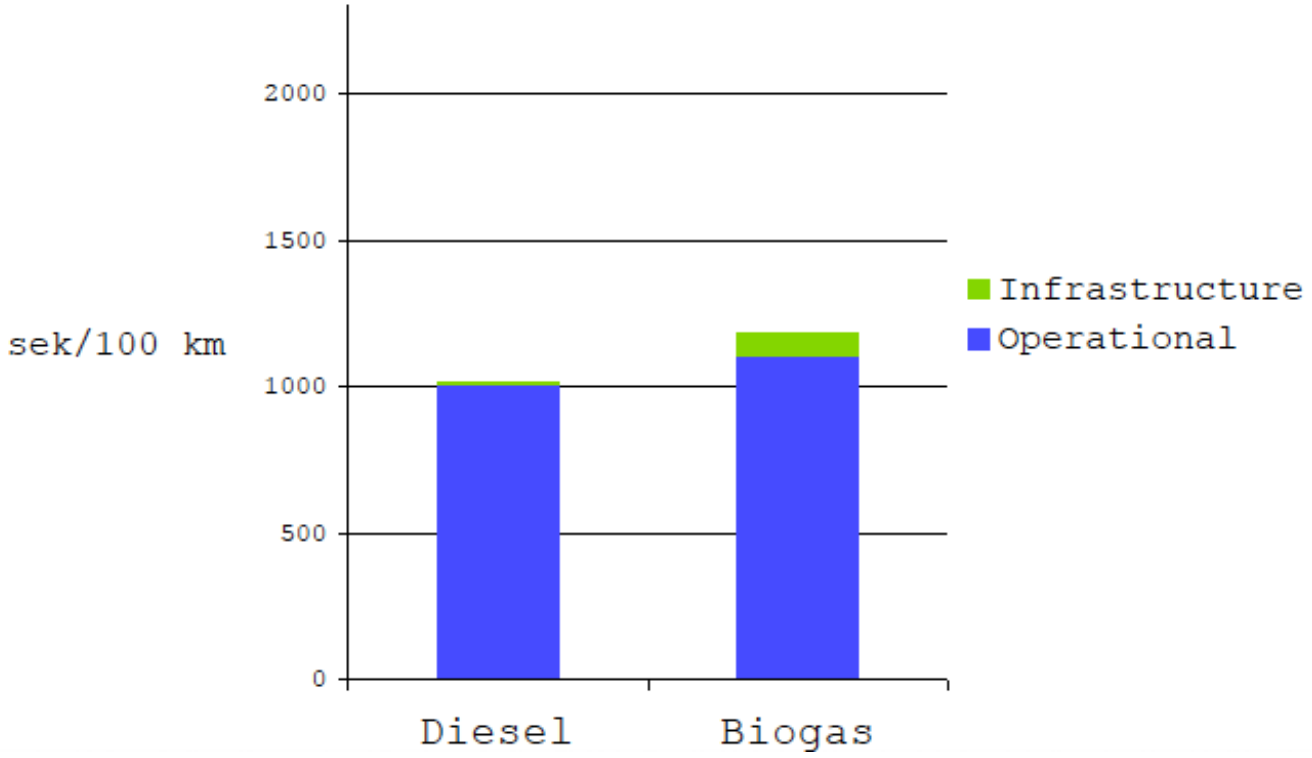
Results of exhaust road emission in Braunschweig test

Emission measurement CNG buses in real road conditions

Source: Praca nr 6114/COŚ

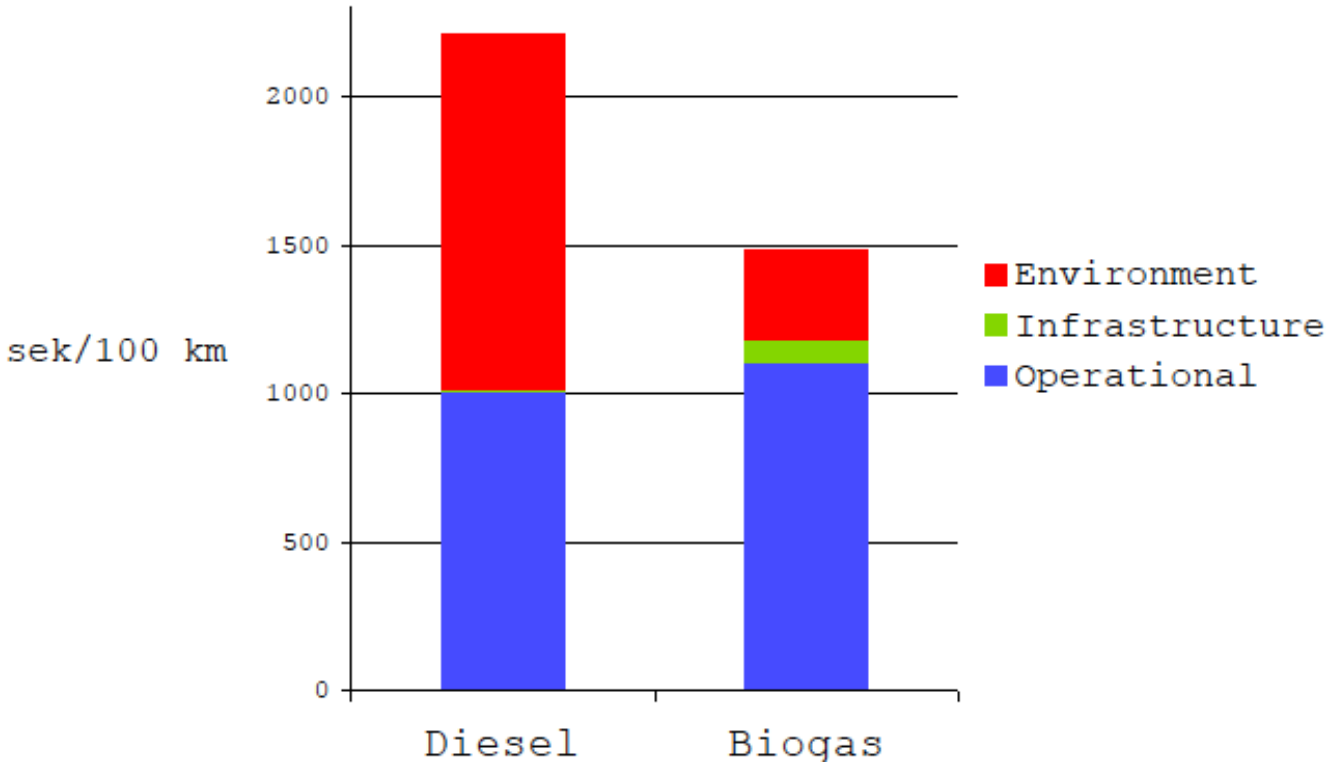
Total cost, operation and infrastructure

(marginal cost sek per 100 km)



Source: ”Operational and environmental costs for biogas buses – The Stockholm experience” S. Anderson

Total cost, operation, infrastructure and environmental cost (marginal cost sek per 100 km)



Source: "Operational and environmental costs for biogas buses – The Stockholm experience" S. Anderson

Developments and improvements

- **Costs of Biogas is close to Diesel in Stockholm.**
- **Biogas is the best alternative when environmental costs is included**
- New buses have more efficient engines, lower maintanance costs
- Positive learning curve, Improved knowledge in the workshops

- A new gas grid in Stockholm will lower biogas costs and stimulate more local production of biogas.

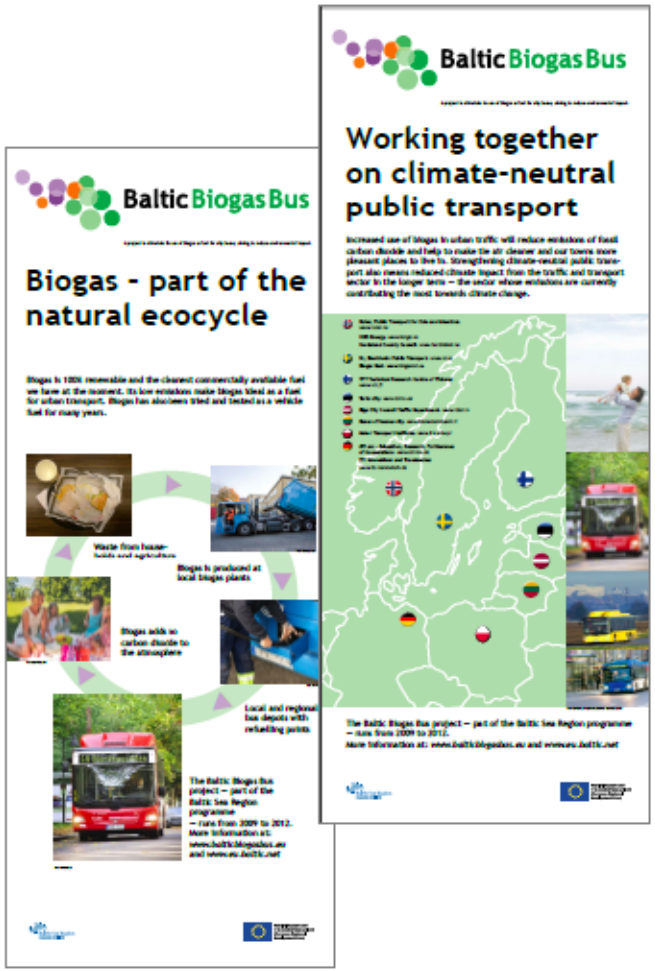
Source: ”BBB project, aims, objectives & results” L. Hallgren

Biogas - the natural choice for city buses

Core messages

- Biogas is almost 100 % renewable
- Biogas is very efficient as fuel
- Biogas improves urban air quality and climate
- Biogas produced locally improves energy autonomy and creates jobs

Biogas improves life in the Baltic Sea region



Source: "BBB project, aims, objectives & results" L. Hallgren

Baltic Biogas Bus Project
2009-2012

Thank you for your attention

Wojciech Gis, Motor Transport Institute

wojciech.gis@its.waw.pl