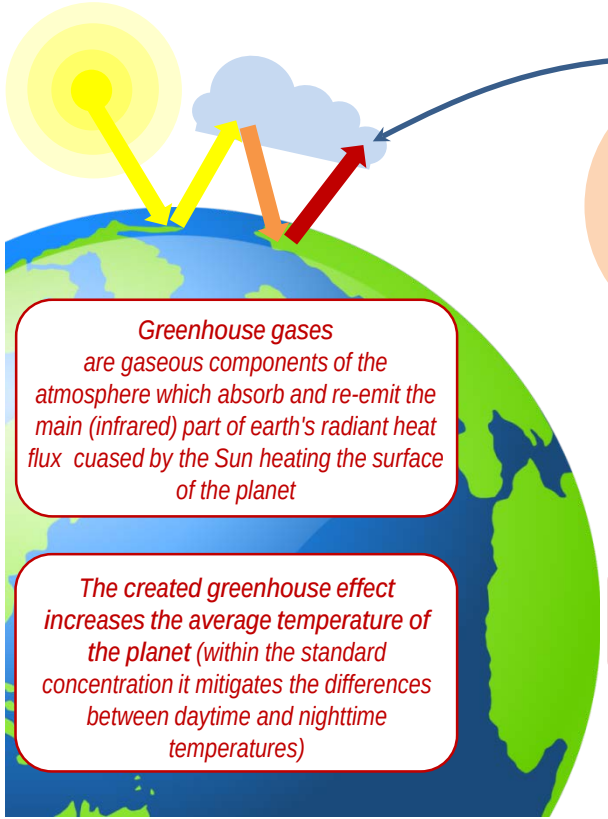
METHANE IMPACT ON THE CLIMATE



Greenhouse gases are gaseous components of the atmosphere which absorb and re-emit the main (infrared) part of earth's radiant heat flux cuased by the Sun heating the surface of the planet

The created greenhouse effect increases the average temperature of the planet (within the standard concentration it mitigates the differences between daytime and nighttime temperatures)

GHG CONTRIBUTION TO WARMING

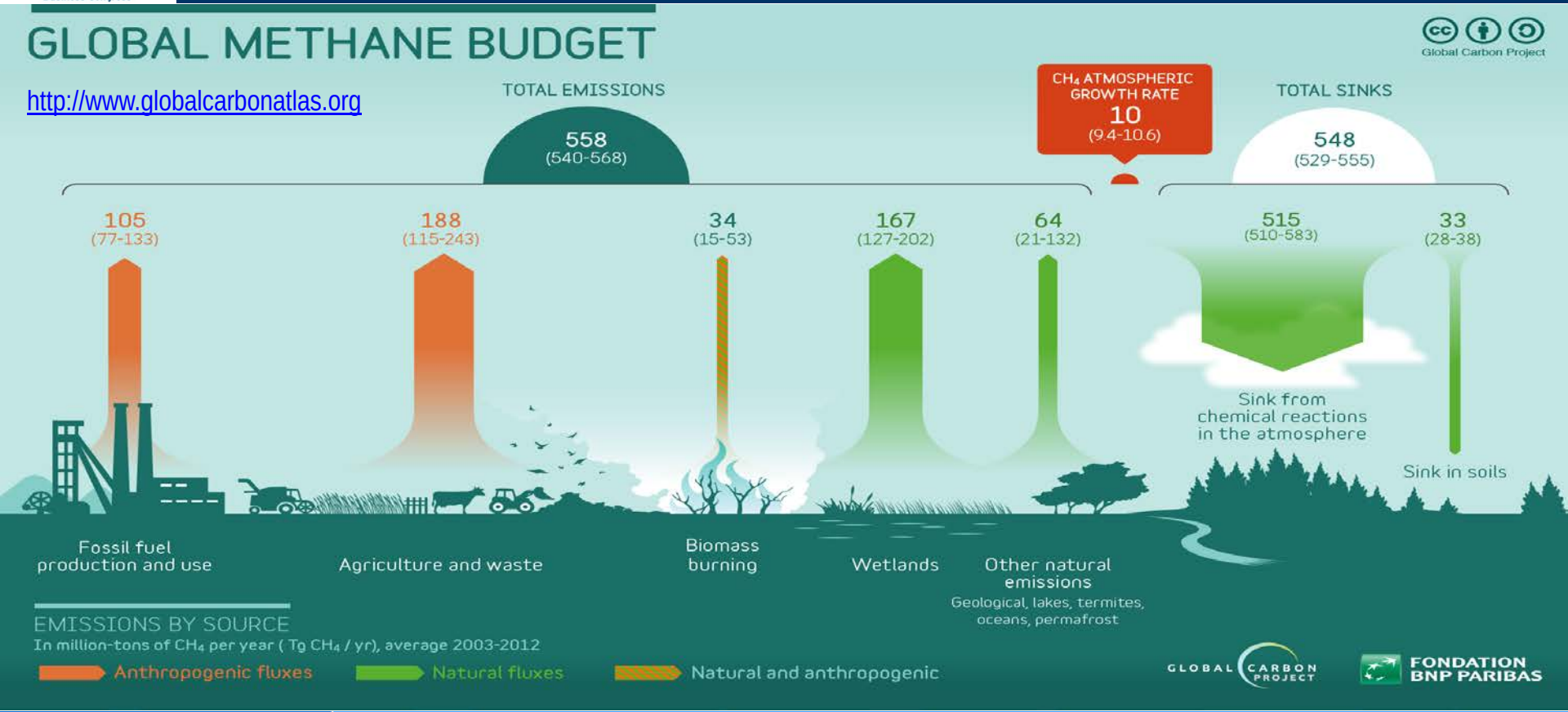
H_2O	CO_2	CH_4	N_2O	PFC-14	PFC-116	SF6
36-72 %	9-26 %	4-9 %				
2-3	1	25	298	7390	12200	22800

UNREGULATED BY THE INTERNATIONAL LAW

GLOBAL WARMING POTENTIAL OF SUBSTANCES

GLOBAL METHANE BUDGET

(2003-2012)



GLOBAL ANNUAL NATURAL AND ANTHROPOGENIC METHANE EMISSIONS, Mt

(2000-2009)

NATURAL METHANE EMISSIONS

- **217** SWAMPS *(177-284)**
- **54** OCEAN *(33-75)*
- **40** LAKES AND RIVERS *(8-73)*
- **15** WILD ANIMALS
- **11** TERMITES *(2-22)*
- **6** HYDRATES *(2-9)*
- **3** FIRES *(1-5)*
- **1** PERMAFROST *(0-1)*

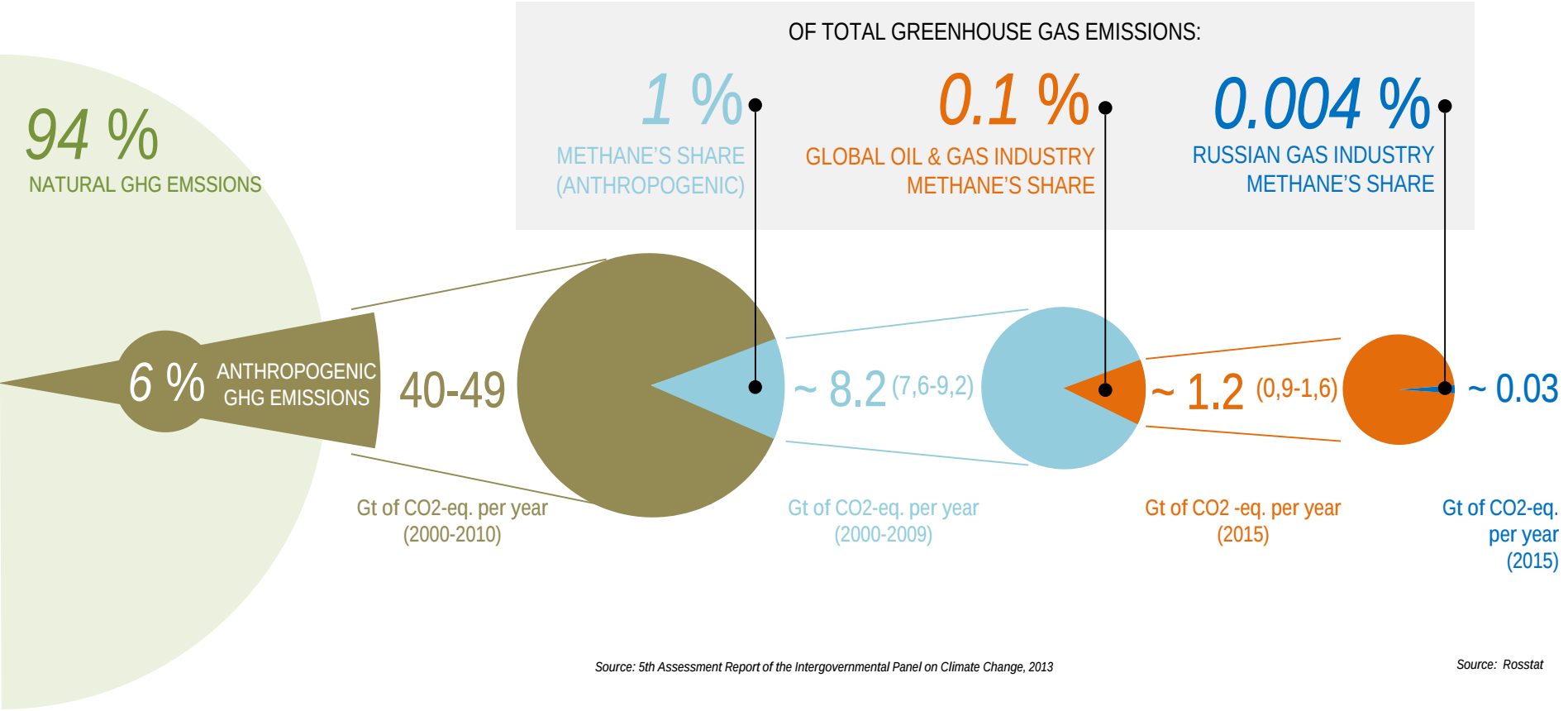
ANTHROPOGENIC METHANE EMISSIONS

- **89** RUMINANTS *(87-94)*
- **75** WASTES *(67-90)*
- **50** OIL AND GAS INDUSTRY *(36-64)* *(biofuel included)*
- **36** RICE *(33-40)*
- **35** BIOMASS COMBUSTION *(32-39)*

* *Range of estimations*

Source: 4th and 5th Assessment Reports of the Intergovernmental Panel on Climate Change, 2007, 2013

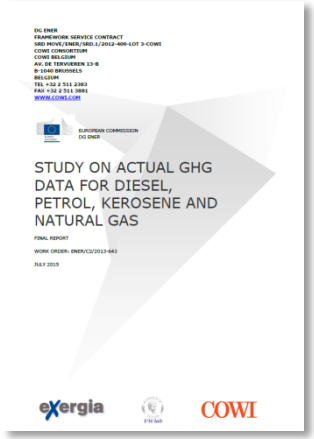
THE RUSSIAN GAS SECTOR'S SHARE OF TOTAL GREENHOUSE GAS EMISSIONS



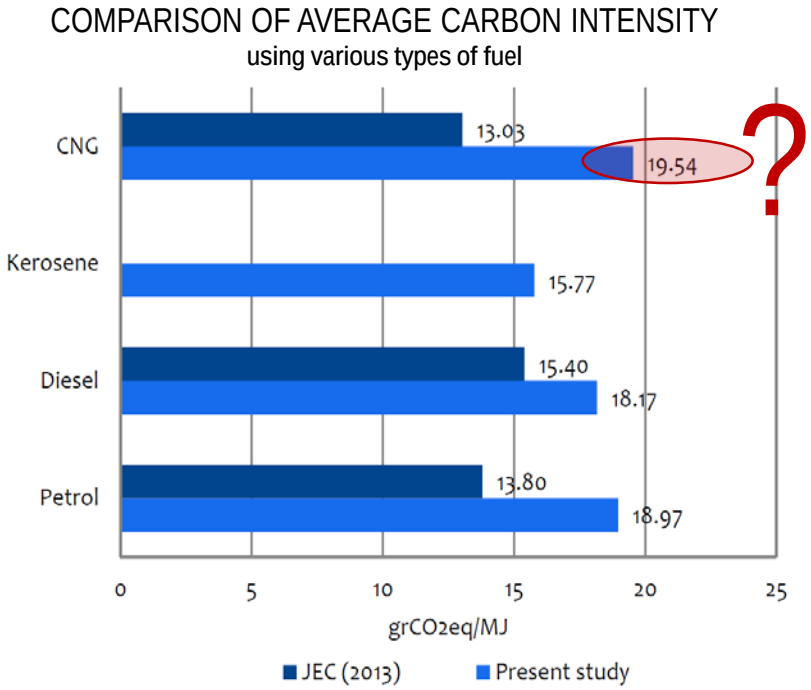
Source: 5th Assessment Report of the Intergovernmental Panel on Climate Change, 2013

Source: Rosstat

PREREQUISITES FOR A CORRECT «CARBON FOOTPRINT» ASSESSMENT OF RUSSIAN NATURAL GAS



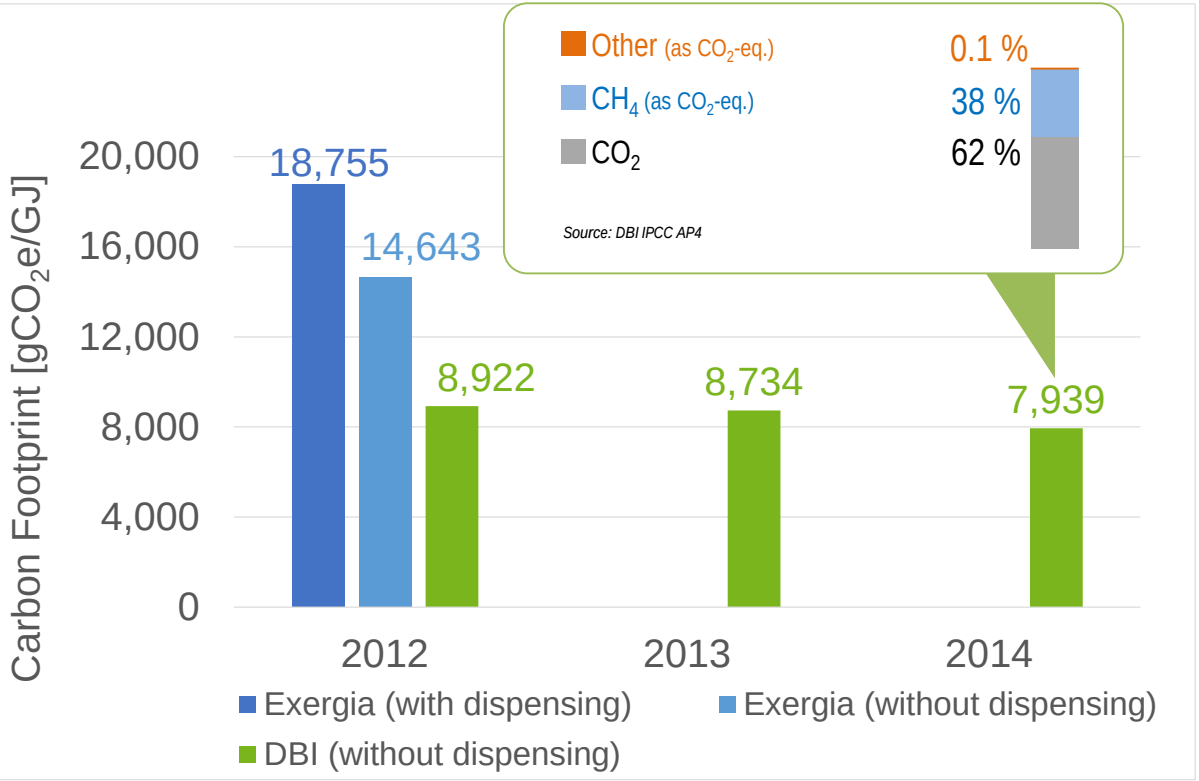
In this study, the lifecycle Carbon Intensity (CI) of petrol, diesel, kerosene and natural gas have been assessed in a "Well-To-Tank" approach. A chain of significant process stages of oil and gas, such as exploration, exploitation, upgrading, transportation, transmission, refining, distribution, dispensing etc. are considered; thus excluding the final stage of combustion in the vehicle internal combustion engines



The previous version of this report has been published by the JEC Consortium in July 2013 (JRC - EU Commission's Joint Research Centre, EUCAR - the European Council for Automotive R&D and CONCAWE – the oil companies' European association for environment, health and safety in refining and distribution)

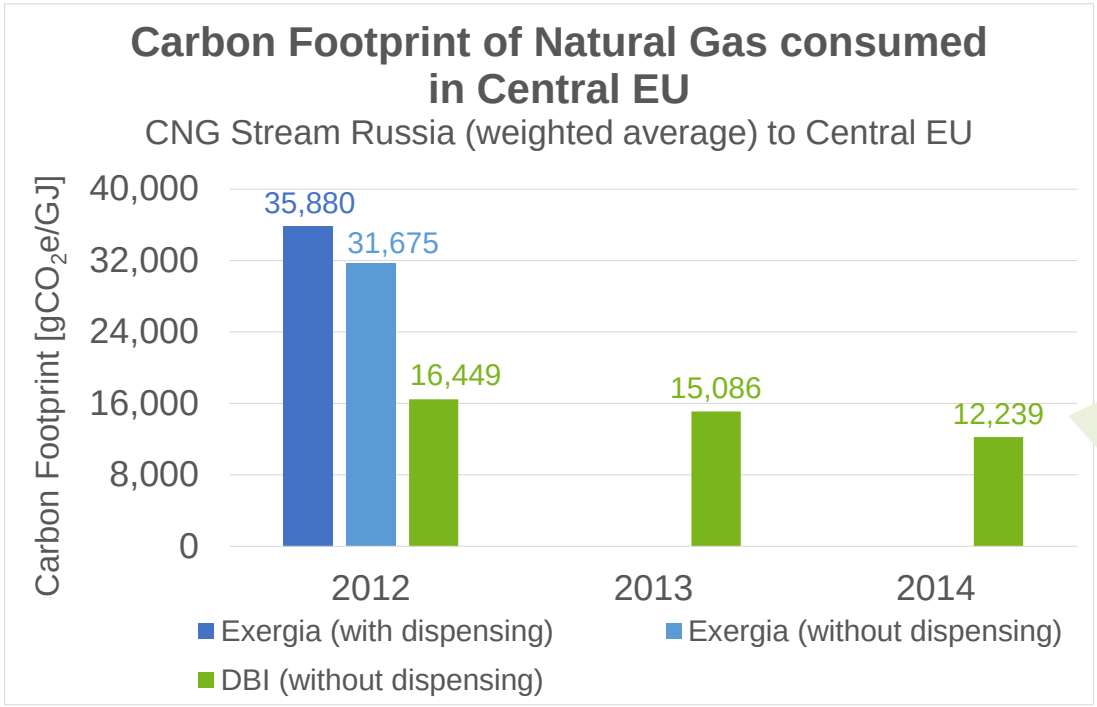
CARBON FOOTPRINT OF NATURAL GAS CONSUMED IN CENTRAL EU

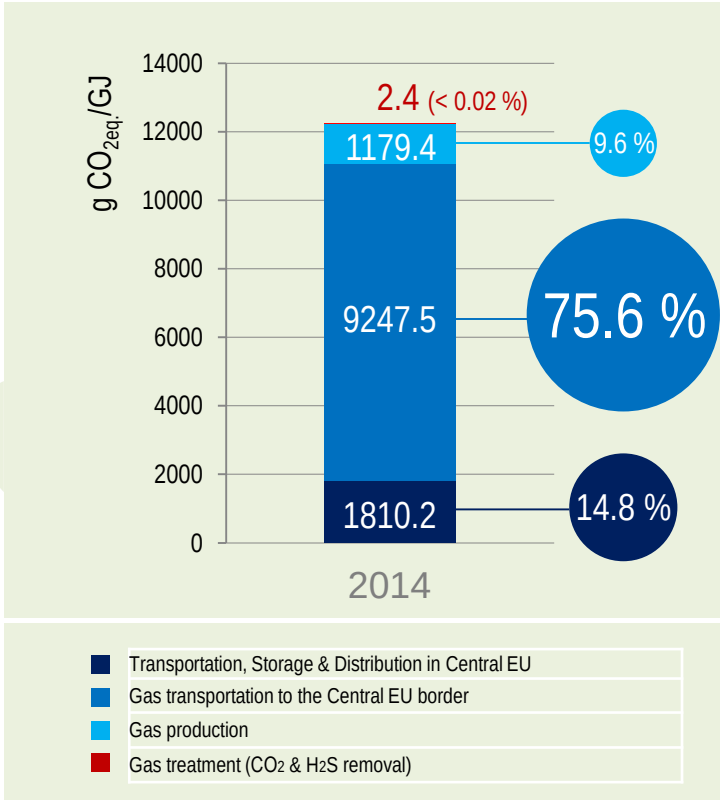
Updated best available data for Germany, The Netherlands, Norway, Russia used within GHGenius



Source: Own illustration DBI based on https://de.wikipedia.org/wiki/Datei:Major_russian_gas_pipelines_to_europe.png

«CARBON FOOTPRINT» OF NATURAL GAS FOR THE RUSSIAN EXPORT FLOW TO CENTRAL EUROPE

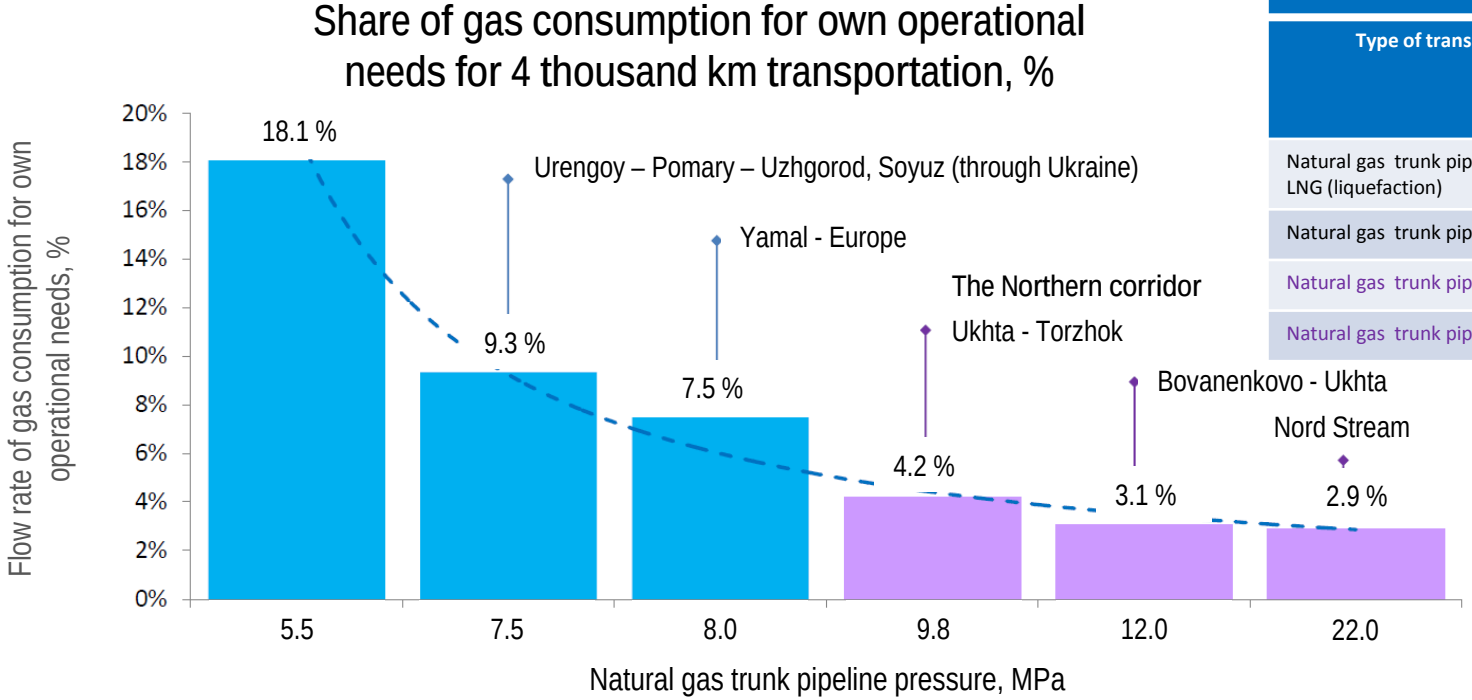




Source: Own illustration DBI based on https://de.wikipedia.org/wiki/Datei:Major_russian_gas_pipelines_to_europe.png

* Gas transportation to the border of Central EU (in the case of Norway and Russia)

ENERGY EFFICIENCY OF RUSSIAN GAS EXPORT FLOWS

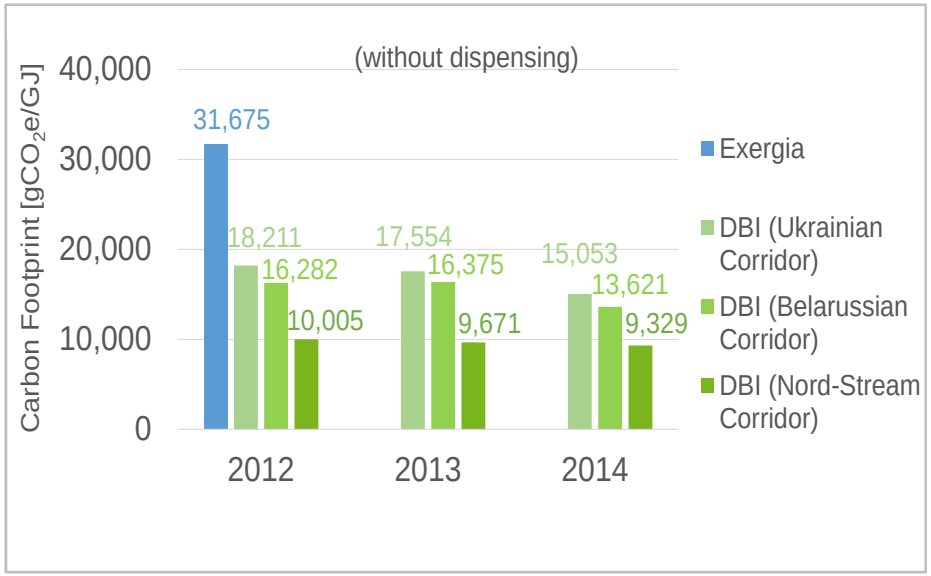


Environmental driver	
Type of transportation	**Emissions of CO2-eq., thousand tones/bcm per 100 km**
Natural gas trunk pipeline of 5.5 MPa, LNG (liquefaction)	4.5 – 5.4
Natural gas trunk pipeline of 7.5 MPa	2.7 – 3.0
Natural gas trunk pipeline of 12 MPa	0.8 – 1.0
Natural gas trunk pipeline of 22 MPa	0.7 – 0.8

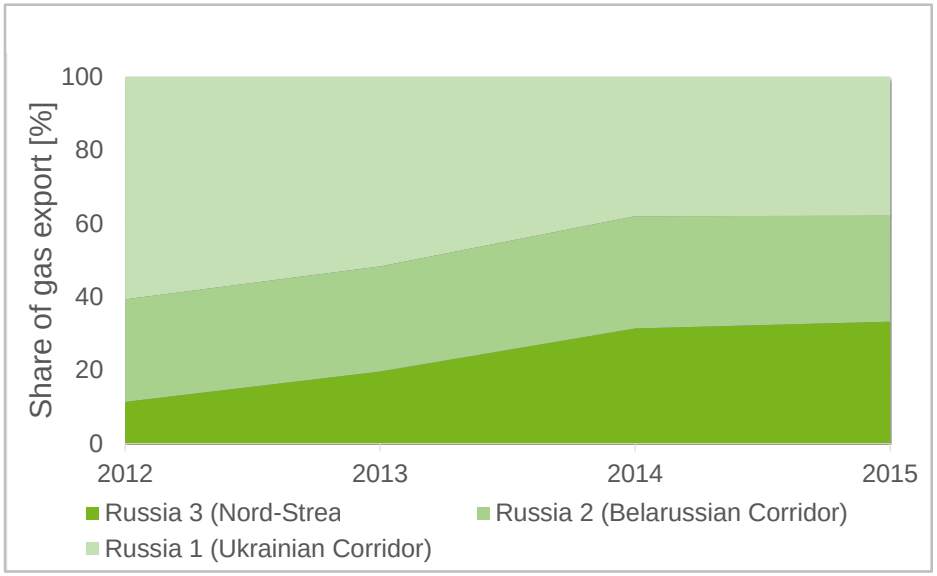
New technologies from the Northern corridor reduce the gas consumption for own transportation needs by 6 times in comparison with the Gas Transportation System (GTS) of 5.5 MPa and 3 times in comparison with the GTS of 7.5 MPa

RESULTS STREAM RUSSIA TO CENTRAL EU. DBI STUDIES

Result for the Russian stream is a weighted average of the 3 different corridors



Rising share of gas transport via the Nord-Stream decreases the Carbon Footprint of Russian gas consumed in Central EU



«CARBON FOOTPRINT» OF «NORD STREAM 2»

NORD STREAM 2

YAMAL — L = 4 166 — GREIFSWALD

55 bcm / yr

BOVANENKOVO-UZHGOROD-BAUMGARTEN

YAMAL — L = 6 051 — WAIDHAUS

DIFFERENCE
IN GHG EMISSIONS

Mt of CO_2-eq.

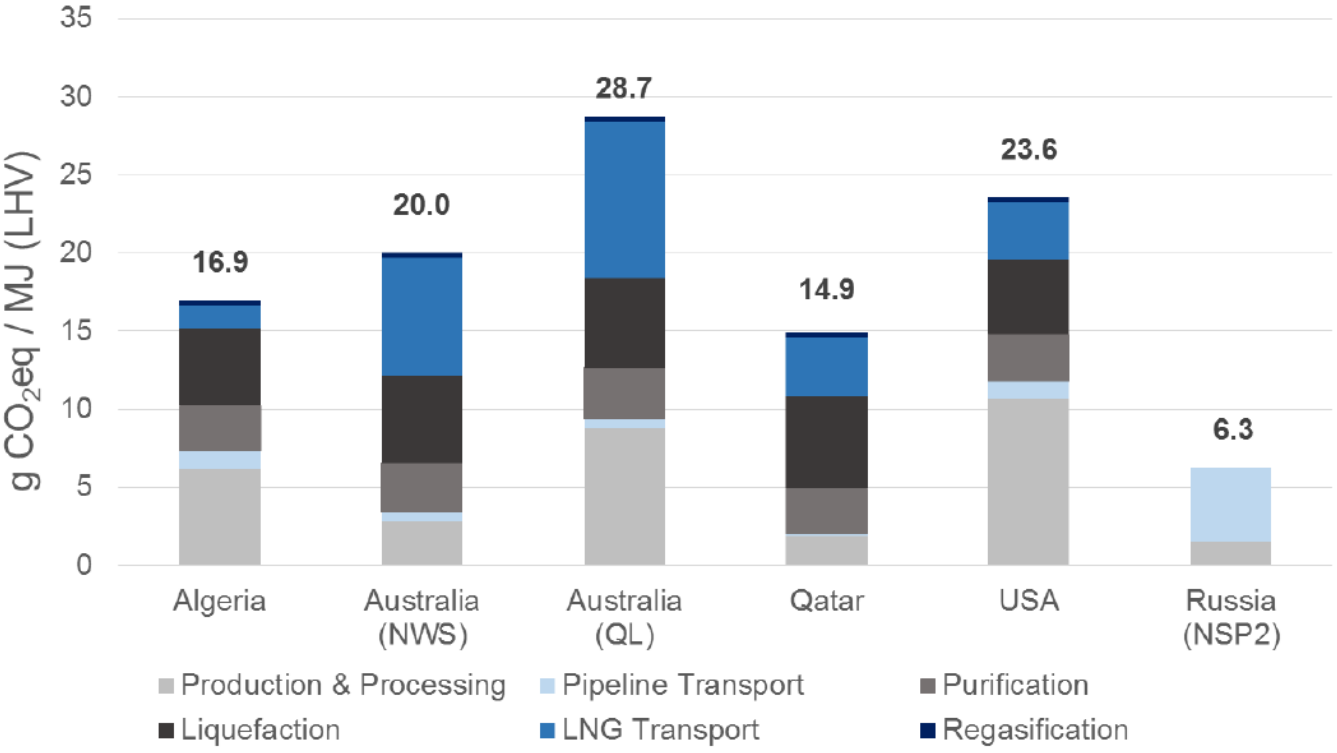
Calculated according to GHGenius 4.03

ANNUAL EMISSIONS

PER YEAR → 8.9 — More than ICELAND + MALTA or CYPRUS

IN 25 YEARS → 223 — More than the NETHERLANDS or THE WHOLE TRANSPORT SECTOR OF GERMANY

COMPARISON WITH LNG. THINKSTEP STUDIES



ALTERNATIVES TO «NORD STREAM 2»

55
BCM PER YEAR

1 NORD STREAM 2

140 OIL TANKER VOYAGES
275 TT PER UNIT, VLCC

645 LNG-VESSEL VOYAGES
138 MCM OF LNG PER UNIT

250 UNITS OF COAL-FIRED POWER PLANTS
400 MW PER UNIT

68 NEW NPP POWER UNITS
1100 MW PER UNIT

220 000 WIND TURBINE
2 MW PER UNIT

90 000 SQUARE KILOMETERS OF CORN FIELDS FOR BIOETHANOL PRODUCTION