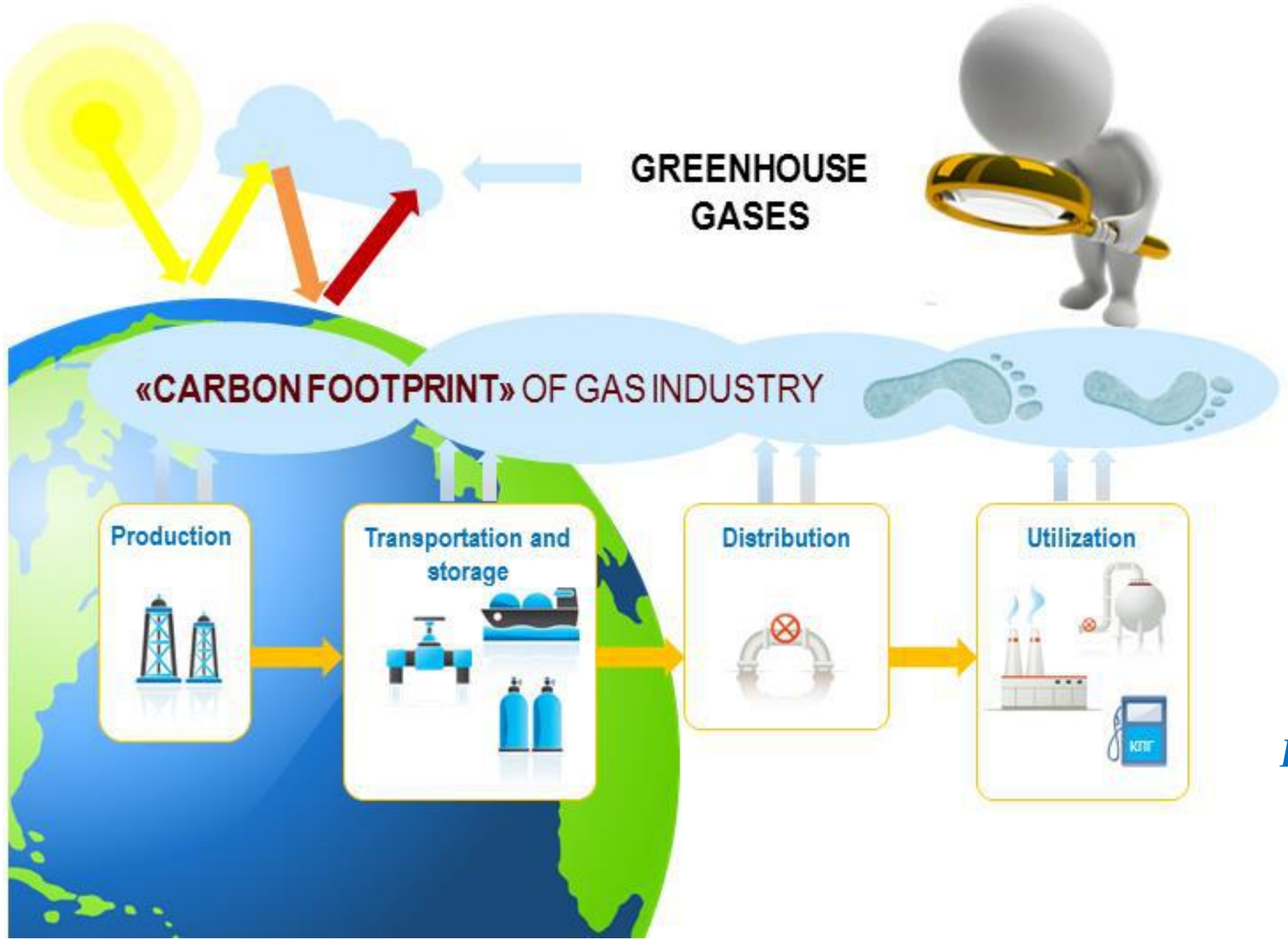
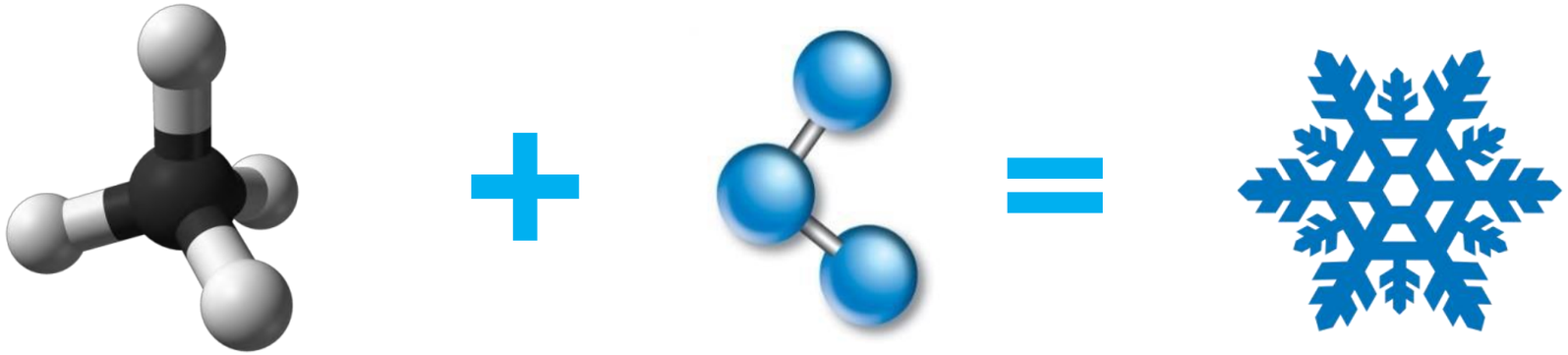


Dr. Konstantin Romanov

Head of Division

COOLING EFFECT OF METHANE



“Controls on anthropogenic emissions of methane to lower surface ozone have been identified as ‘win–win’ situations, referring to both global **cooling** and **warming**”

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

DIFFERENT EMISSIONS METRICS

IPCC's research on the global warming effect

Various metrics can be used to compare the contributions to climate change of emissions of different substances. No single metric can accurately compare all consequences of different emissions, and all have limitations and uncertainties

Global Warming Potential GWP

on the cumulative radiative forcing over a particular time horizon

Up to 4th IPCC report , the most common metric has been the Global Warming Potential (GWP)

"The uncertainty in the GWP increases with time horizon, and for the 100-year GWP of well-mixed greenhouse gases **the uncertainty can be as large as ±40%**"

"Several studies also point out that GWP **is not well** suited for policies with a maximum temperature target" - ***like in Paris agreement***

based on

Global Temperature change Potential GTP

the change in global mean surface temperature at a chosen point in time

"There is now increasing focus on the Global Temperature change Potential"

"The GTP metric is better suited to target-based policies"

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

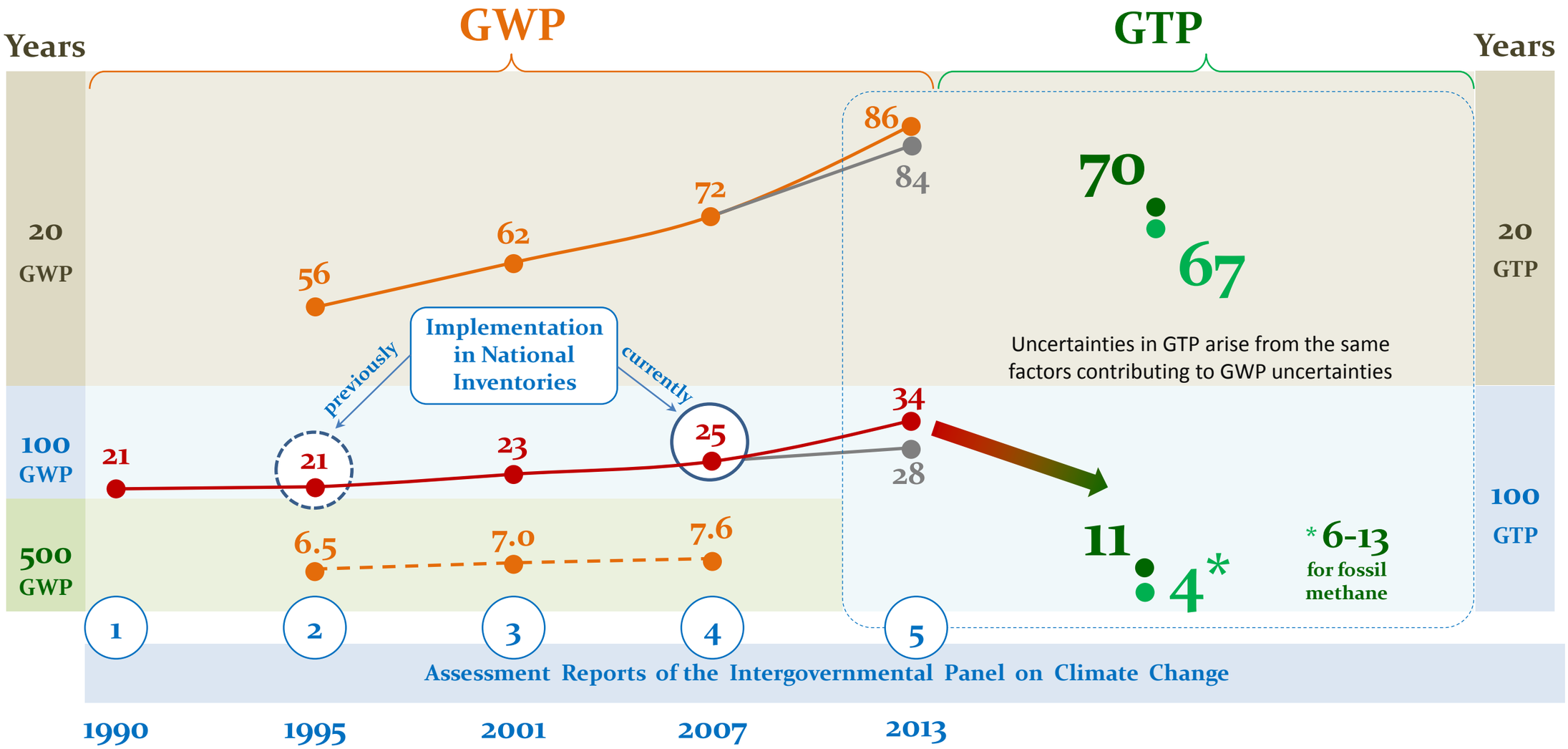
25* ← *values for **fossil methane** for 100 years* → **6**

*(28** or 34 with ccf ***)* *(13 with with ccf ***)*

Sources: Fifth Assessment Report of the IPCC (2013)

* 4 Assessment IPCC Report (value implemented in Inventories)
** 5 Assessment IPCC Report
*** carbon-climate feedback

GLOBAL WARMING POTENTIAL VS GLOBAL TEMPERATURE CHANGE POTENTIAL



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** (0-1) Permafrost

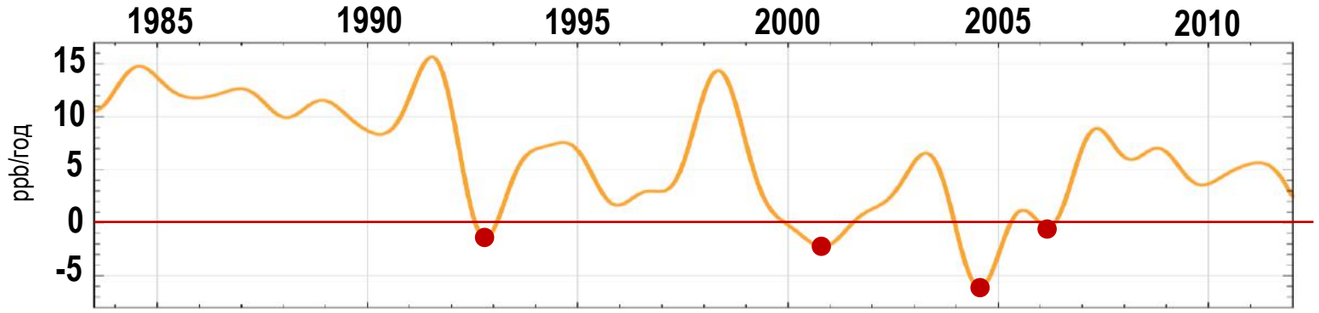
ANTHROPOGENIC METHANE EMISSIONS

- **89** Ruminants (87-94)
- **75** Wastes (67-90)
- **50** Oil and gas industry (36-64) (biofuel included)
- **35** Biomass combustion (32-39)
- **36** Rice (33-40)

Source: 4th and 5th Assesment Report s of the Intergovernmental Panel on Climate Change, 2007, 2013

* *Range of estimations*

DYNAMICS OF METHANE CONCENTRATION INCREASE/DECREASE IN THE ATMOSPHERE



Rates of methane concentration changes in the atmosphere

~ 678 (542-852) Mt

total methane emissions into the atmosphere (average 2000-2009)

Including:

natural

~ 347 (238-484) Mt

anthropogenic

~ 331 (304-368) Mt

~5,000

Mt

total methane in the Earth's atmosphere

~ 632 (592-785) Mt

methane removal from the atmosphere (average 2000-2009)

Removal mechanisms:

- *OH hydroxyl radical (tropospheric, stratospheric),*
- *tropospheric Cl,*
- *oxidation in soils.*

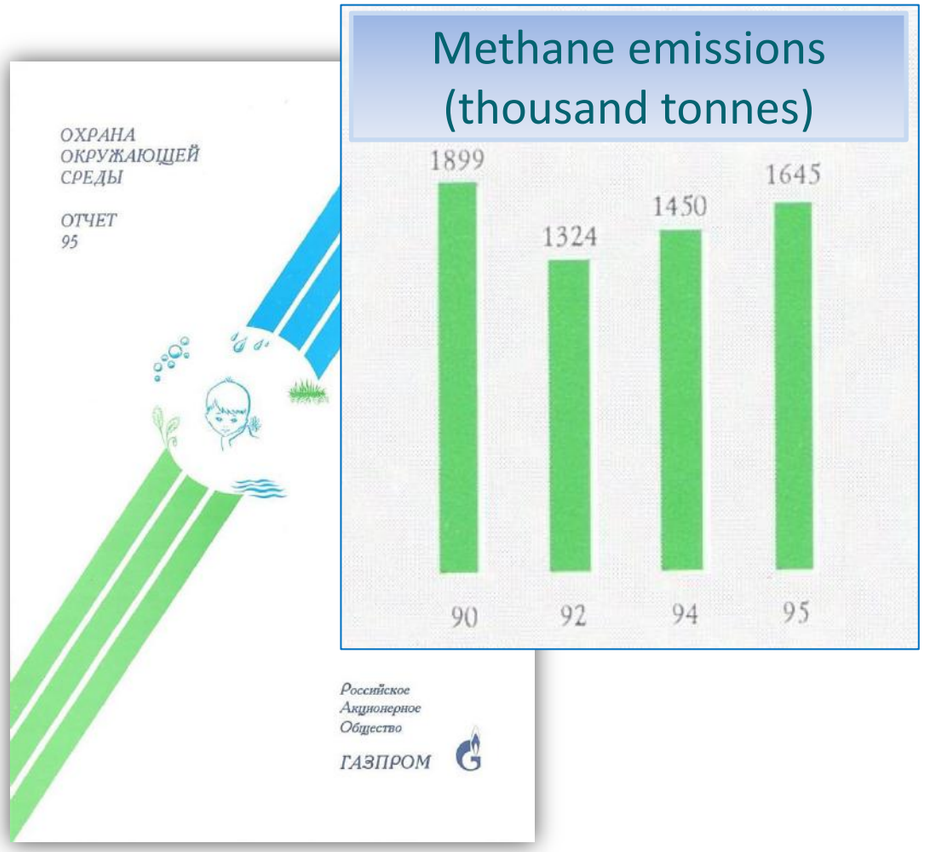
Source:
5th Assesment Report of the Intergovernmental Panel on Climate Change, 2013

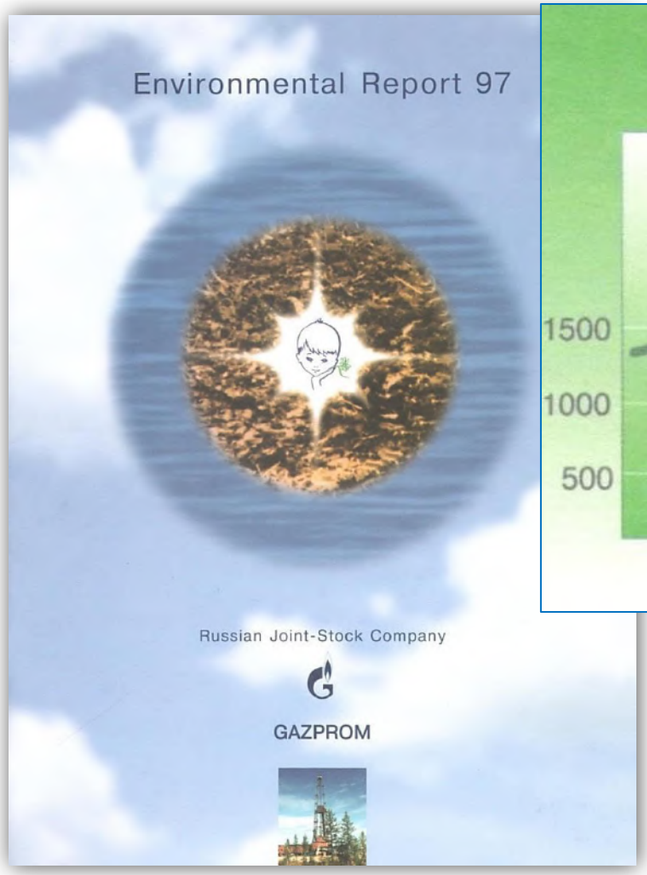
METHANE EMISSIONS REGULATION IN RUSSIA

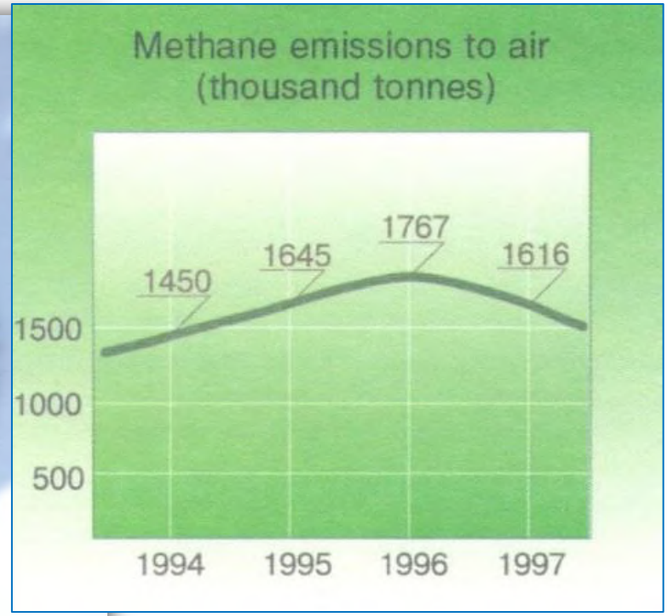
Greenhouse Gas

Toxic Gas

➡ **FEE** ➡ **KPI** (Reduction in GHG Intensity CO_2-eq, %)







PERMITTING

LIMITATIONS OF EMISSIONS FOR EVERY FACILITY BY STATE BODIES

Official reporting

FEE COLLECTION

5 %
FEDERAL BUDGET

40 %
REGIONAL BUDGET

55 %
MUNICIPAL BUDGET

SUPERVISION

ENVIRONMRNTAL AND TAX AUTHORITIES (EMISSIONS MONITORING AND PAYMENT CONTROL)

All methane emissions in Russia, kt

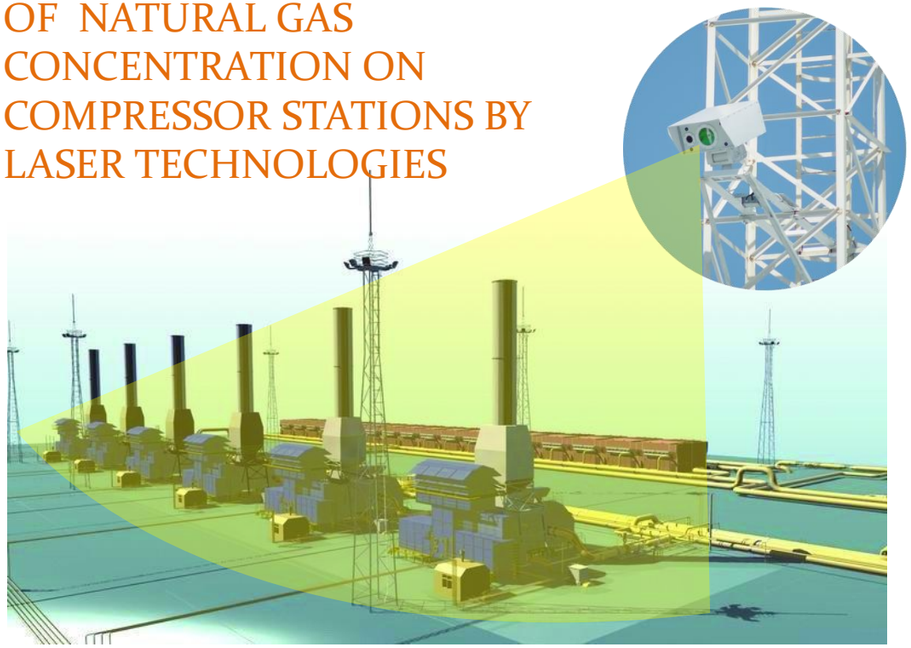
2012	2013	2014	2015
3,241.3	3,382.3	3,221.8	3,302.0

Source: Rosstat, 2016

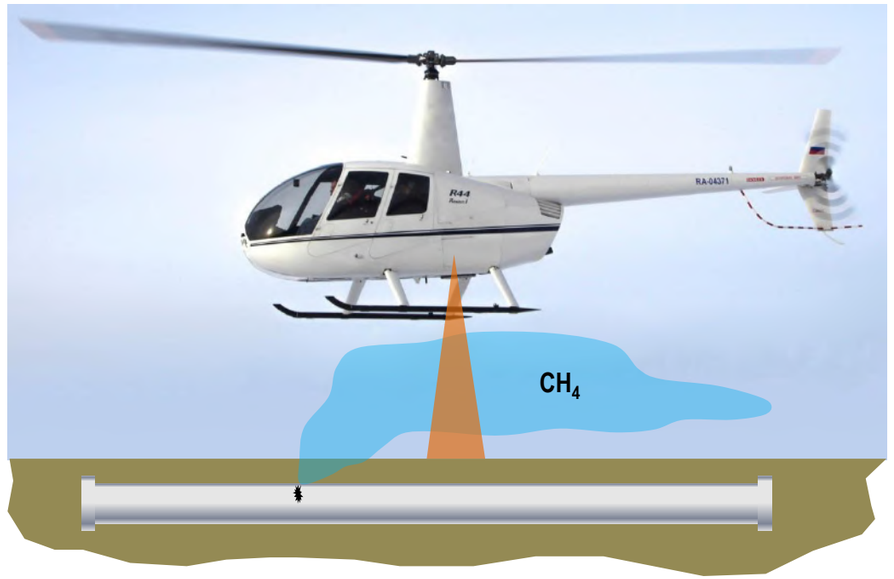
State Environmental bulletins
http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/publications/catalog/5e9010042cb5cc99b49bf307f2fa3f8

METHANE EMISSIONS DETECTION, MEASUREMENT AND ELIMINATION

CONTINUOUS MONITORING OF NATURAL GAS CONCENTRATION ON COMPRESSOR STATIONS BY LASER TECHNOLOGIES



DISTANT PERIODIC MONITORING OF METHANE EMISSIONS WITH TOTAL QUANTITATIVE ASSESSMENT



LOCALIZATION OF LEAKAGES BY PORTABLE INSTRUMENTS

INSPECTION

PERIODIC MONITORING OF NATURAL GAS EMISSIONS ON COMPRESSOR STATIONS BY HAND-HELD CONTROL DEVICES

DISCOVERED LEAKAGE ELIMINATION

- Replacement of leaky facilities
- Bandaging
- Sealing of shut-off valves

EVALUATING METHANE EMISSIONS AT GAZPROM FACILITIES WITH FOREIGN PARTNERS

YEAR	PARTNERS	SUBJECT OF INVESTIGATIONS
1995	**US EPA**	*1 compressor station; 1 compressor shop*
1996-1997	**Ruhrgas (Open Grid Europe)**	*3 complex gas treatment plants; 2 well clusters; 3 compressor stations; 6 compressor shops; 5,000 km of linear routes of mains*
2002-2003	**Ruhrgas (Open Grid Europe), Wuppertal Institute for Climate, Environment and Energy, Max Planck Institute for Chemistry**	*5 compressor stations; 10 compressor shops; 4,000 km of linear routes of mains*
2004-2005	**Sumitomo Corporation, Agra**	*1 compressor station; 3 compressor shops; 750 km of linear routes of mains; 5 pipeline branches; 5 gas distribution stations*
2006, 2008	**Sojitz Corporation**	*2 compressor stations; 4 compressor shops; 600 km of linear routes of mains; 100 valve nodes; 80 valve nodes of pipeline branches; 32 gas distribution stations, 4 gas measuring stations*
2010	**Global methane initiative, US EPA**	*162 km of gas main pipeline; 2 compressor shops; 41 valve nodes*
2011	**GDF-SUEZ (ENGIE)**	*1 compressor shop; 2 junction points*
2013	**Gasunie**	*1 shop; 10 valve nodes*

CALCULATED VALUES

activity type * **IPCC coefficients**
(for developing countries and countries in transition)

All national emissions (National Inventory Report, 2013)

41.8 Mt

Energy industry of Russia: **gas sector** (2013)

12.7 Mt

National Inventory Report
(Federal Service for Hydrometeorology and Environmental Monitoring)

Basis for accusing Russian gas industry of major leaks

ACTUAL VALUES

measurements + fuel and energy balance

Stationary sources of all industries (Federal State Statistic Service, 2013)

3.4 Mt

Gazprom (2013)

1.5 Mt

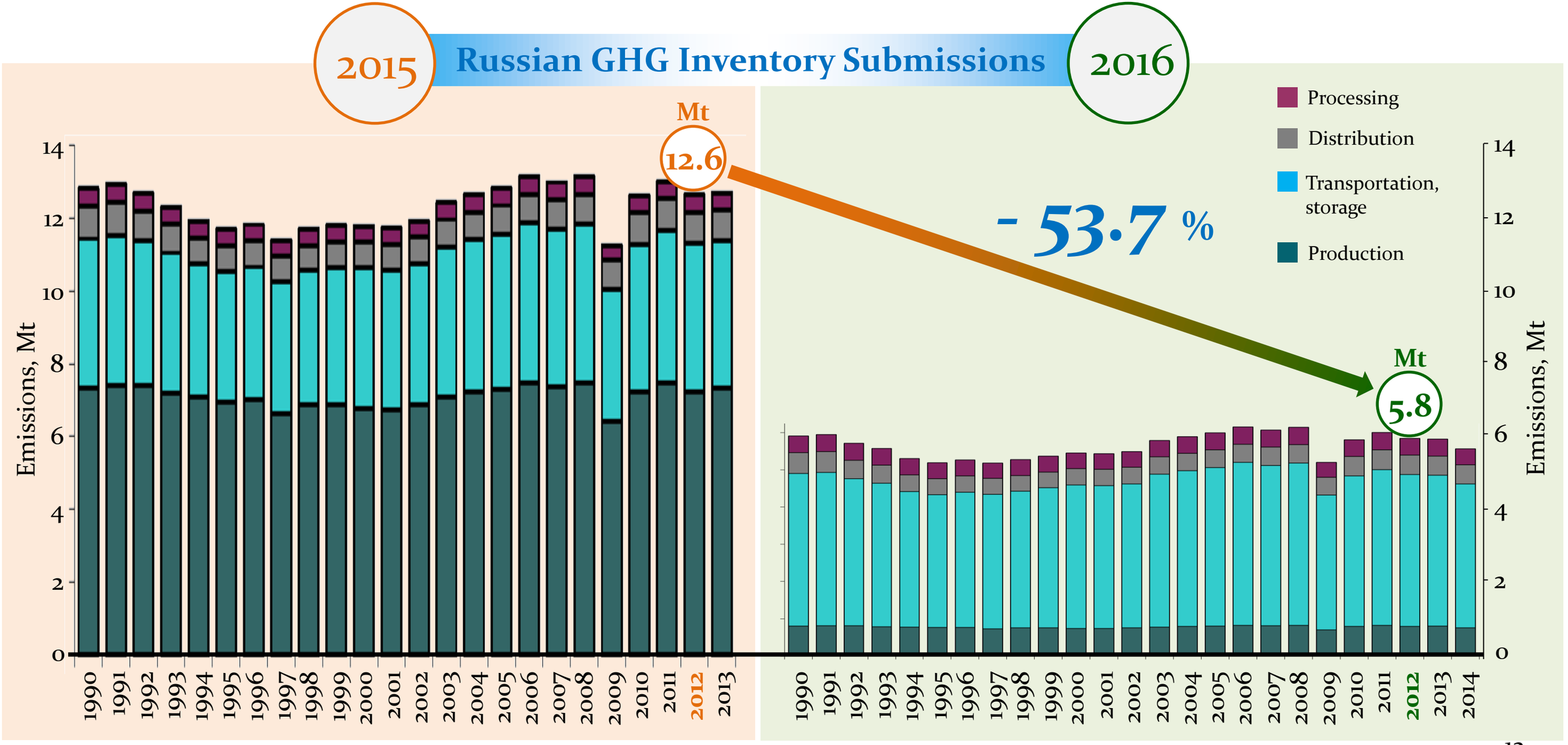
Corporate Report

State Report

emission fees, CDP, scientific papers

METHANE EMISSIONS

Russian GHG Inventory Submissions



ERDGAS

DBI GUT
Gas- und Umwelttechnik GmbH

CARBON FOOTPRINT OF NATURAL GAS CONSUMED IN CENTRAL EU

REPORT – OCTOBER 2016

NGVA Europe
for sustainable mobility

thinkstep

GHG INTENSITY STUDY ON NATURAL GAS

DATA COLLECTION – OCTOBER 2016

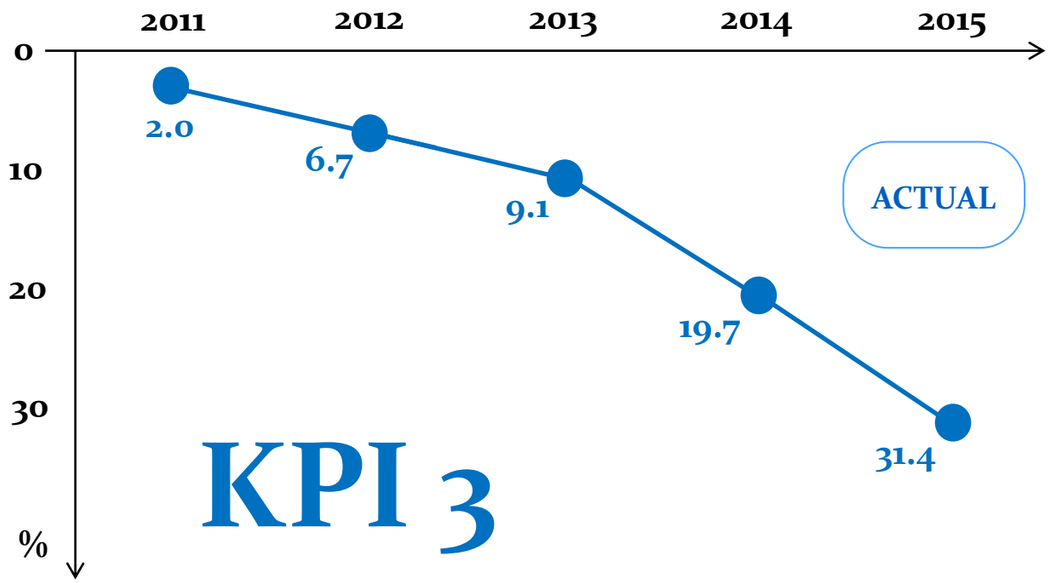
REPORT – NOVEMBER 2016

DELIVERY UPDATED BEST DATA TO PUBLIC

THANK YOU FOR YOUR ATTENTION!

GAZPROM KEY PERFORMANCE INDICATORS

REDUCTION OF SPECIFIC FUEL CONSUMPTION FOR TECHNOLOGICAL NEEDS (RELATIVE TO 2010), %



REDUCTION OF SPECIFIC EMISSIONS OF GREENHOUSE GASES (CO_2-EQ.) (RELATIVE TO 2010), %