

European road traffic control measures

V. Vestreng¹, L. Ntziachristos², A. Semb³, S. Reis⁴, I. S. A. Isaksen⁵, L. Tarrasón⁶



- [1] Air Pollution Section, Research Department, Norwegian Meteorological Institute, Oslo, Norway. Now at the Norwegian Pollution Control Authority (SFT), Oslo, Norway
- [2] Lab of Applied Thermodynamics, Aristotle University Thessaloniki, Greece
- [3] Norwegian Institute for Air Research, Kjeller, Norway
- [4] Centre for Ecology & Hydrology, Edinburgh, Scotland
- [5] Department of Geosciences, University of Oslo, Oslo, Norway
- [6] Air Pollution Section, Research Department, Norwegian Meteorological Institute, Oslo, Norway.

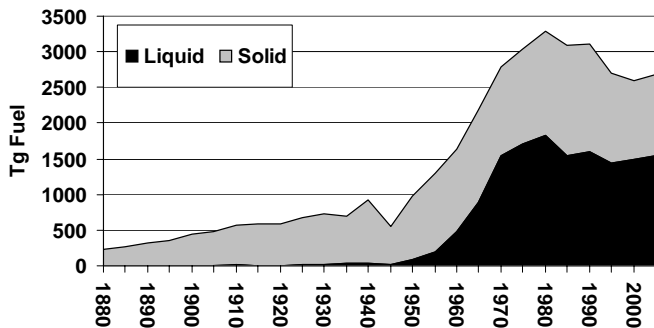


Fig. 1 European solid and liquid fossil fuel consumption 1880-2005. Data from the GAINS model 1990-2005 (Tg fuel/year)

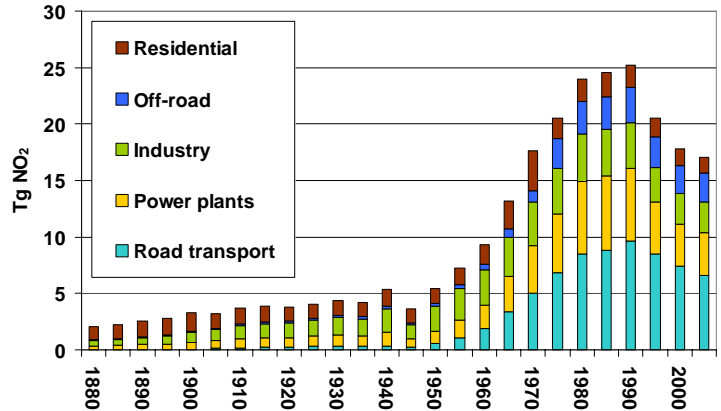


Fig. 2 Sector trends in European NO₂ emissions 1880-2005 (Unit TgNO₂)

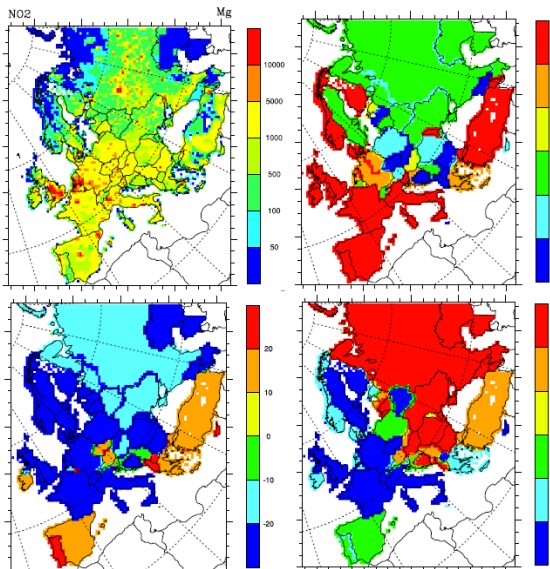


Fig. 3 Road transport emissions of NO₂ in 2005 (top left). Unit Mg. Difference in road transport emissions between 1980 and 1990 (top right), 1990 and 2000 (bottom left), 2000 and 2005 (bottom right). A negative number indicates a reduction. Unit: Percent

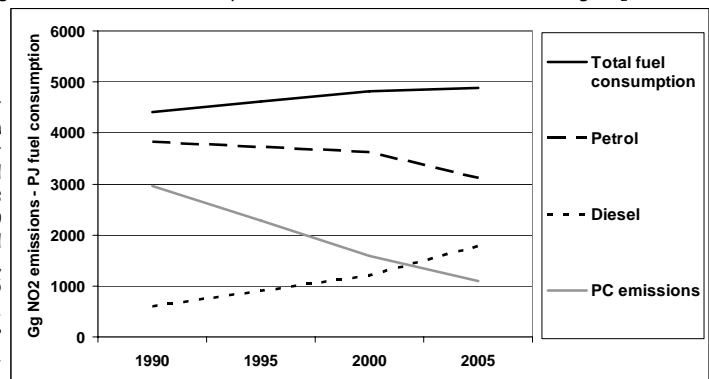


Fig. 4 Trends in Western European fuel consumption and emissions from PC

Tab. 1 NO_x trends per European country 1980-2005. Unit: Gg NO₂. Percentage contribution from road transport in brackets¹.

	1980	1985	1990	1995	2000	2005
Albania *	25 (55)	29 (57)	23 (37)	16 (65)	22 (62)	25 (65)
Armenia *	15 (44)	45 (49)	60 (41)	18 (20)	31 (59)	38 (61)
Austria	249 (45)	236 (46)	211 (47)	192 (49)	204 (54)	225 (58)
Azerbaijan	85 (45)	93 (41)	93 (21)	85 (8)	76 (4)	85 (4)
Belarus	234 (43)	238 (42)	285 (33)	232 (28)	208 (41)	184 (30)
Belgium	442 (46)	325 (56)	382 (48)	372 (47)	330 (46)	293 (43)
Bosnia and Herzegovina *	66 (48)	73 (38)	73 (28)	51 (23)	53 (28)	52 (34)
Bulgaria	357 (50)	375 (49)	363 (38)	264 (33)	184 (31)	233 (39)
Croatia	60 (48)	73 (38)	86 (38)	60 (45)	72 (43)	69 (40)
Cyprus	13 (56)	14 (58)	16 (42)	19 (44)	23 (43)	17 (39)
Czech Republic	937 (21)	831 (22)	742 (19)	413 (43)	398 (42)	278 (35)
Denmark	273 (26)	291 (32)	274 (38)	264 (37)	207 (39)	186 (37)
Estonia	67 (43)	74 (41)	74 (41)	38 (42)	35 (38)	32 (34)
Finland	295 (36)	275 (44)	299 (53)	258 (51)	235 (45)	177 (32)
France	1942 (43)	1726 (51)	1840 (59)	1654 (60)	1405 (52)	1207 (45)
Georgia	121 (43)	140 (41)	64 (57)	13 (11)	30 (10)	32 (12)
Germany	3334 (35)	3276 (38)	2861 (47)	2170 (53)	1817 (65)	1443 (45)
Greece	242 (40)	306 (39)	299 (36)	320 (39)	328 (37)	317 (34)
Hungary	273 (41)	263 (42)	276 (42)	193 (45)	194 (52)	203 (62)
Iceland	21 (21)	21 (20)	26 (21)	27 (21)	28 (22)	29 (27)
Ireland	73 (36)	91 (40)	121 (36)	123 (38)	130 (40)	116 (37)
Italy	1606 (40)	1661 (41)	1943 (46)	1808 (51)	1373 (51)	1173 (46)
Kazakhstan	164 (21)	179 (19)	179 (18)	162 (8)	119 (8)	151 (8)
Latvia	61 (43)	67 (41)	67 (30)	40 (37)	38 (42)	41 (43)
Lithuania	152 (36)	166 (34)	158 (34)	65 (36)	49 (51)	58 (58)
Luxembourg *	23 (40)	21 (40)	20 (44)	32 (75)	33 (80)	29 (80)
Malta	12 (39)	15 (38)	14 (20)	13 (22)	12 (27)	12 (24)
Netherlands	583 (40)	589 (44)	558 (47)	468 (45)	394 (45)	344 (42)
Norway	181 (32)	213 (31)	213 (35)	212 (30)	212 (21)	197 (18)
Poland	1229 (38)	1500 (26)	1581 (25)	1121 (28)	838 (27)	811 (28)
Portugal	166 (33)	166 (37)	246 (32)	278 (32)	287 (39)	281 (36)
Republic of Moldova	58 (43)	66 (42)	131 (26)	79 (26)	27 (30)	31 (28)
Romania *	523 (27)	542 (24)	527 (23)	400 (22)	331 (25)	346 (34)
Russian Federation	3280 (37)	3600 (33)	3600 (31)	2563 (36)	2357 (40)	2795 (43)
Serbia and Montenegro *	118 (48)	145 (38)	165 (32)	133 (30)	137 (36)	149 (36)
Slovakia	226 (28)	201 (29)	215 (21)	174 (23)	109 (31)	97 (38)
Slovenia	51 (52)	53 (50)	63 (58)	66 (65)	60 (61)	58 (59)
Spain	1045 (33)	954 (37)	1178 (41)	1254 (39)	1349 (39)	1405 (34)
Sweden	404 (44)	426 (41)	314 (55)	280 (54)	231 (49)	205 (41)
Switzerland	170 (61)	179 (71)	158 (59)	122 (53)	104 (53)	86 (49)
TFYR of Macedonia *	37 (48)	47 (38)	46 (23)	35 (30)	39 (34)	30 (33)
Turkey *	364 (43)	483 (39)	691 (42)	789 (44)	942 (36)	932 (42)
Ukraine *	1598 (15)	1754 (13)	1753 (12)	1245 (15)	861 (22)	960 (26)
United Kingdom	2772 (36)	2728 (40)	2966 (45)	2384 (46)	1897 (43)	1627 (34)
Total	23944 (36)	24550 (36)	25256 (38)	20507 (41)	17809 (42)	17059 (39)

1) Countries highlighted in - Grey: Officially reported data. Bold italics: Reported data completed by independent estimates. Stars: RAINS data, interpolation and extrapolation. Normal: EDGAR data, interpolation and extrapolation.

Abstract

European emission trends of nitrogen oxides since 1880 and up to present are presented here and are linked to the evolution of road transport emissions. Road transport has been the dominating source of NO_x emissions since 1970, and contributes with 40% to the total emissions in 2005. Five trend regimes have been identified between 1880 and 2005. The first regime (1880-1950) is determined by a slow increase in fuel consumption all over Europe. The second regime (1950-1980) is characterized by a continued steep upward trend in liquid fuel use and by the introduction of the first regulations on road traffic emissions. Reduction in fuel consumption determines the emission trends in the third regime (1980-1990) that is also characterized by important differences between Eastern and Western Europe. Emissions from road traffic continue to grow in Western Europe in this period, and it is argued here that the reason for this continued NO_x emission increase is related to early inefficient regulations for NO_x in the transport sector. The fourth regime (1990-2000) involves a turning point for road traffic emissions, with a general decrease of emissions in Europe during that decade. It is in this period that we can identify the first emission reductions due to technological abatement in Western Europe. In the fifth regime (2000-2005), the economic recovery in Eastern Europe imposes increased emission from road traffic in this area. Western European emissions are on the other hand decoupled from the fuel consumption, and continue to decrease. The implementation of strict measures to control NO_x emissions is demonstrated here to be a main reason for the continued Western European emission reductions. The results indicate that even though the effectiveness of European standards is hampered by a slow vehicle turnover, loopholes in the type-approval testing, and an increase in diesel consumption, the effect of such technical abatement measures is traceable in the evolution of European road traffic emissions over the last 15 years.

Contact: Norwegian Pollution Control Authority
 Department of Climate and Energy
 P.O. Box 8100 Dep., NO-2032 Oslo, Norway
 e-mail: Vigdis.Vestreng@sft.no
 Phone: +47 22 57 34 27
 Fax: +47 22 57 67 06
 Internet: www.sft.no