Radiative forcing from European passenger vehicles emissions (1995-2015) based on real-world use

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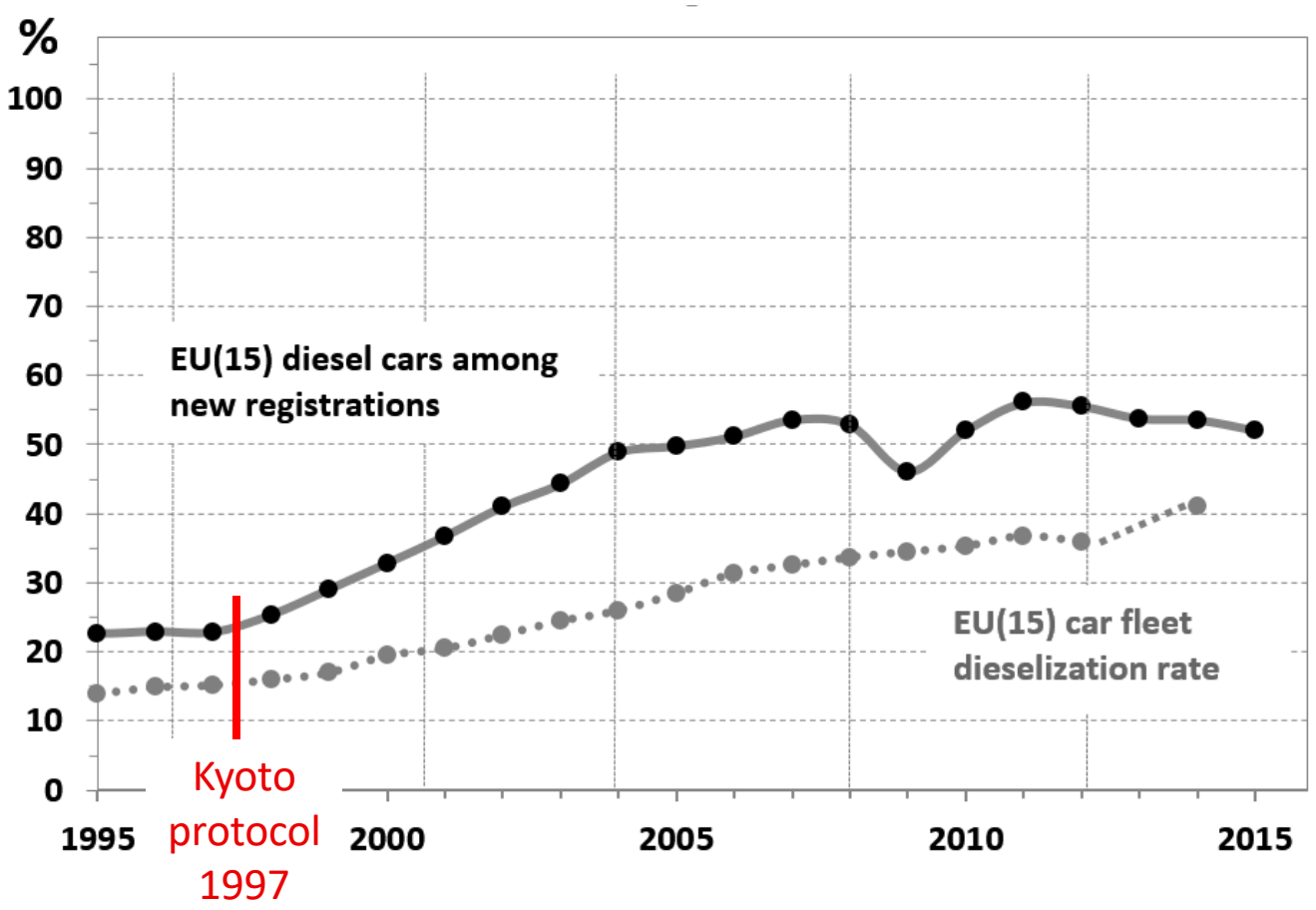
the European „Diesel car boom“

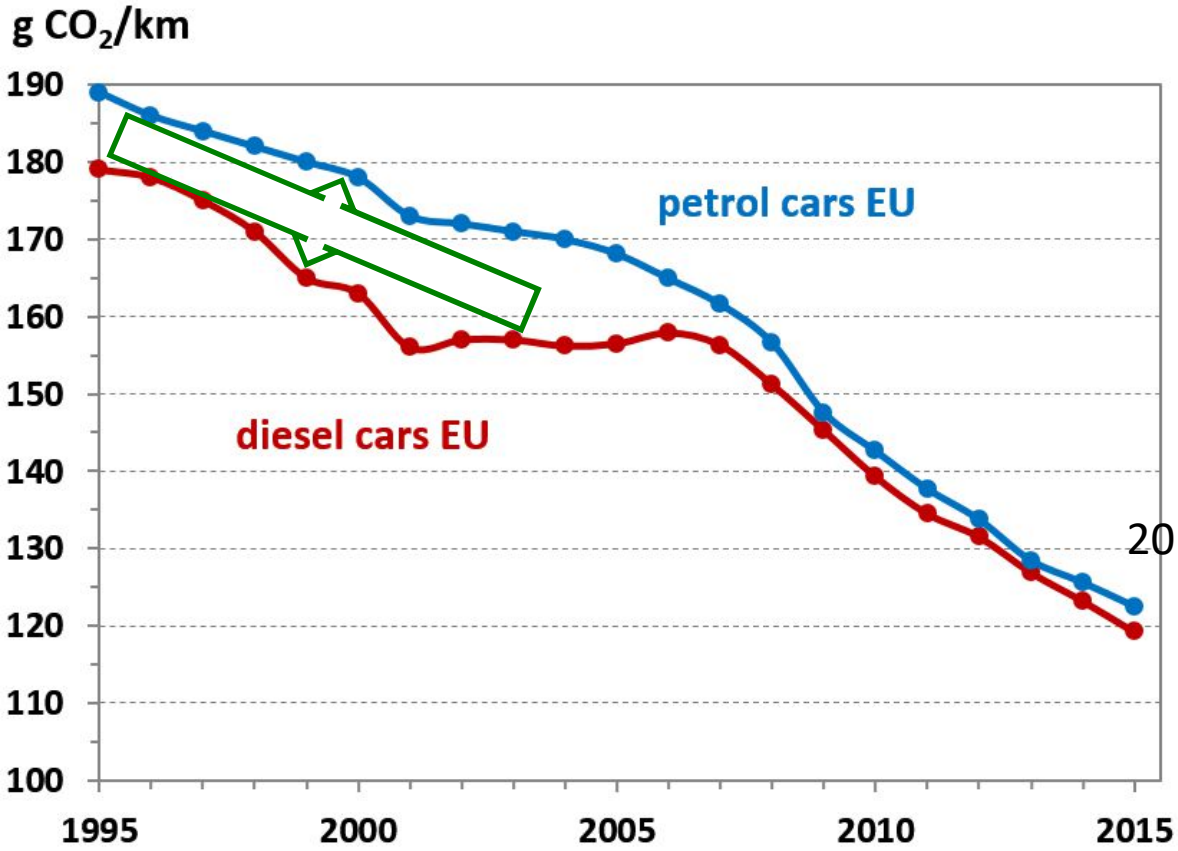
Historic dieselization of the passenger car fleet in Europe



Shares expressed as percentages, either of annual new car registrations or of the entire car fleet in different years. Data taken from Cames & Helmers (2013), and ACEA (2017)

From laboratory .....

Average type-approval CO_2-emissions of new cars in the EU



2015 target: 130

2021 target: 95

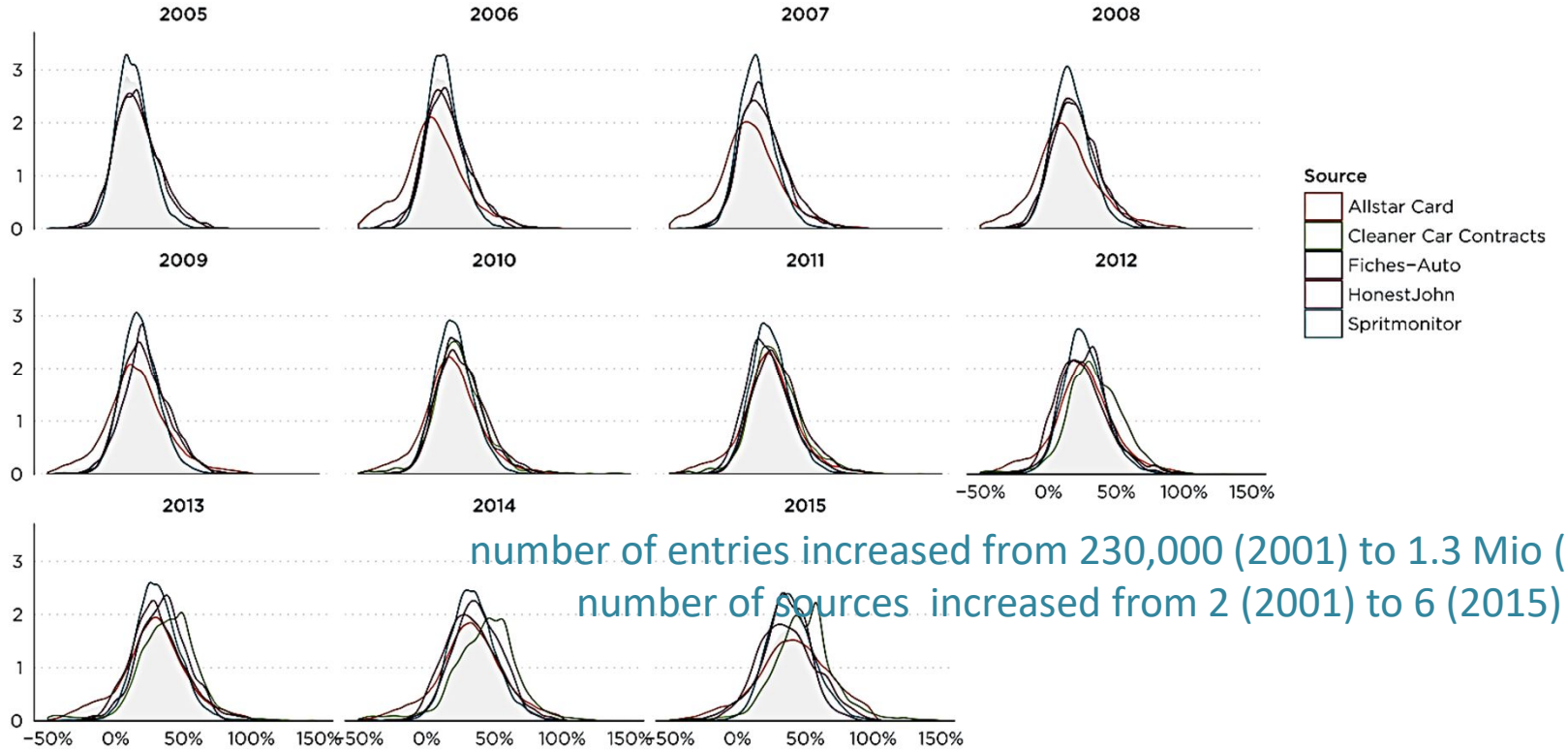
Sources: EU commission, European Environmental Agency; the geographical scope of the data changing from EU-15 through EU-28

From laboratory **to road**

Divergence between type-approval and real-world CO_2-emissions for passenger cars in the EU

data density vs. gap (%)

Fuel consumption data collected from 7 European countries (web services like Spritmonitor.de, service providers, leasing/renting companies, fleet owners, automobile magazine tests)

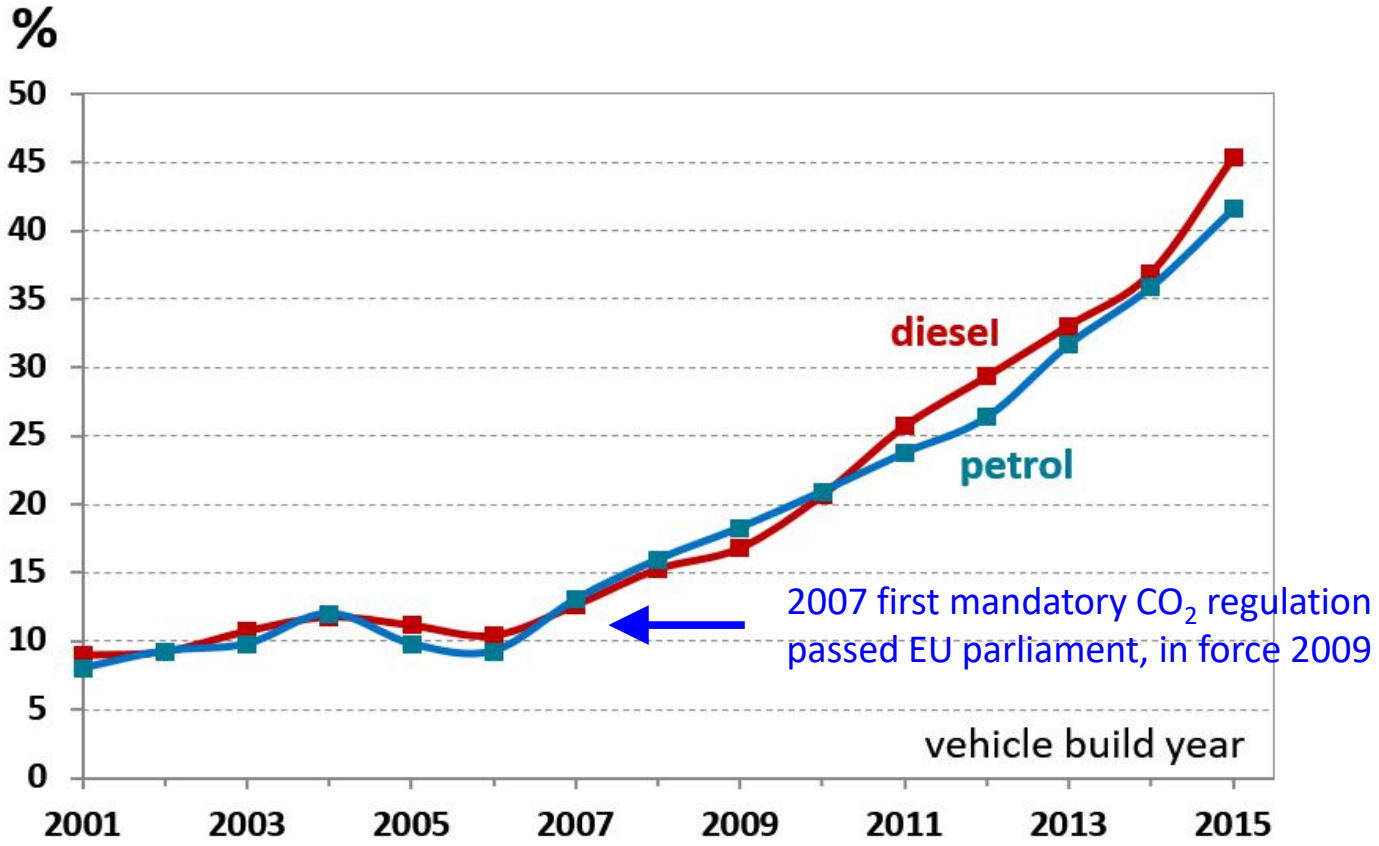


number of entries increased from 230,000 (2001) to 1.3 Mio (2015)
number of sources increased from 2 (2001) to 6 (2015)

Source: Tietge et al. 2016, 2017

From laboratory to road

Divergence between type-approval and real-world CO_2-emissions for passenger cars in the EU



Based on data from Tietge et al., 2016

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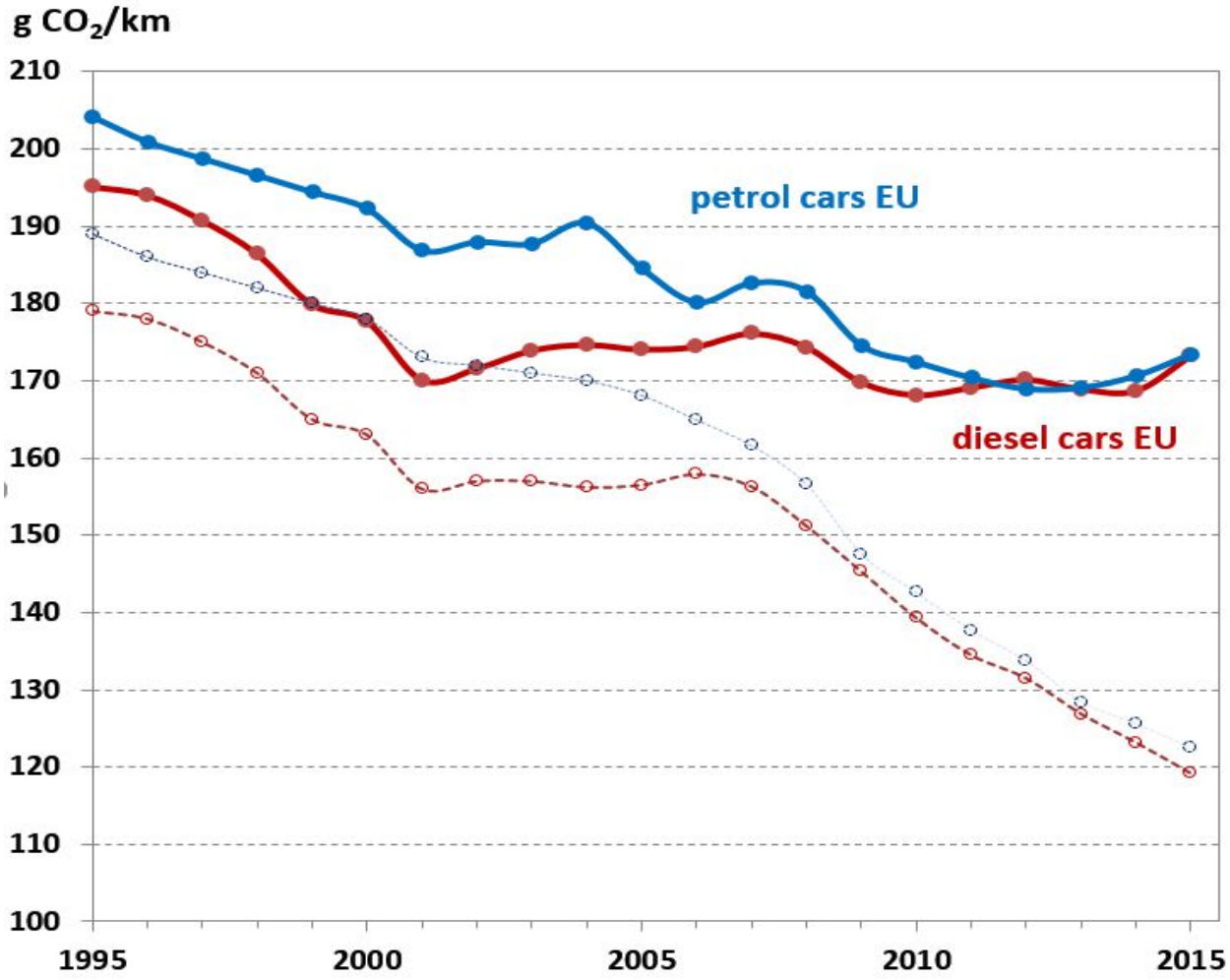
From laboratory to road

Average real-world CO_2-emissions of new cars in Europe.



real-world/ road

type approval/ laboratory

Adding the black carbon warming effect

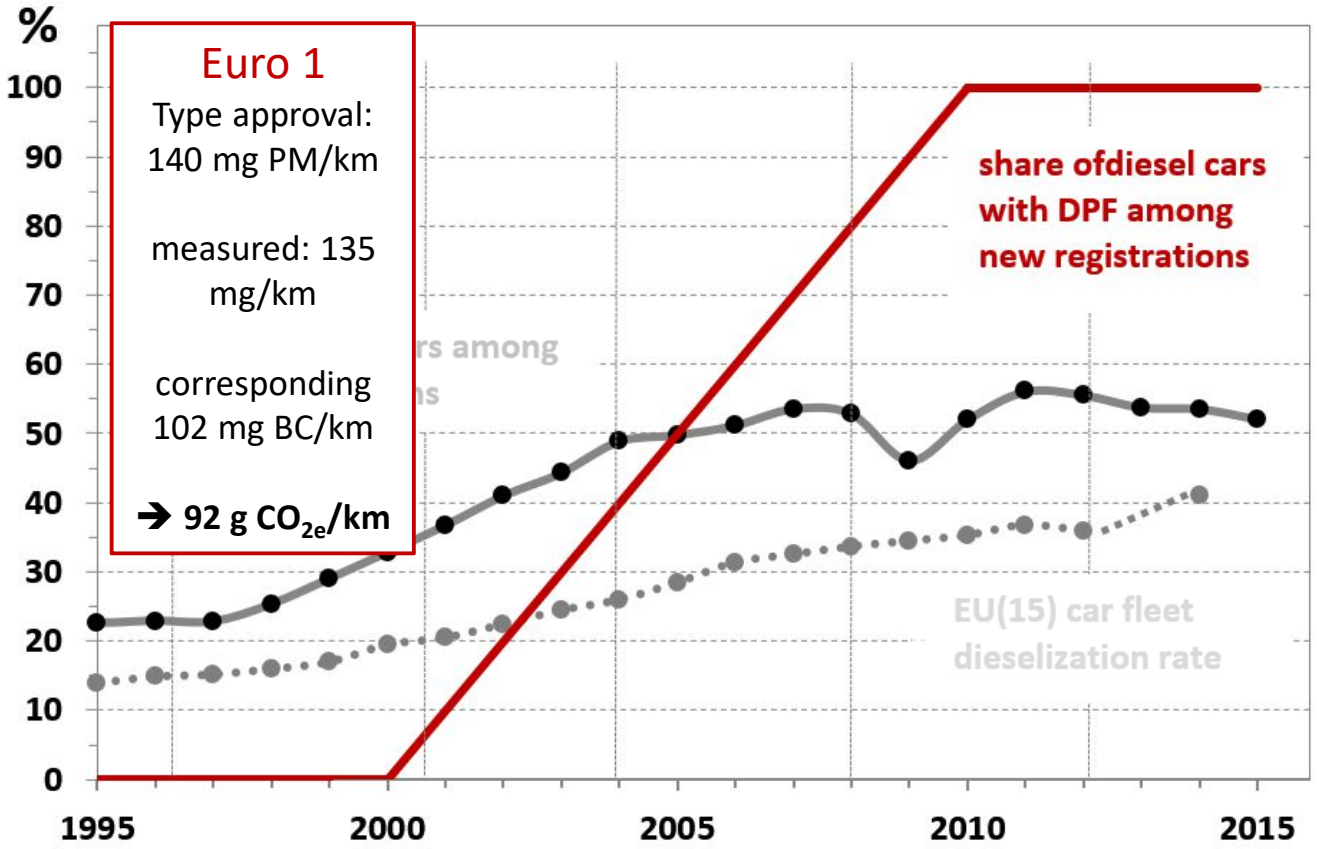
Historic dieselization of the passenger car fleet in Europe, and DPF penetration rates

CO_2-equivalents added due to BC emissions:

GWP20 = 3200
(270 – 6200)

GWP100 = 900
(100 – 1700)

Bond et al. 2013



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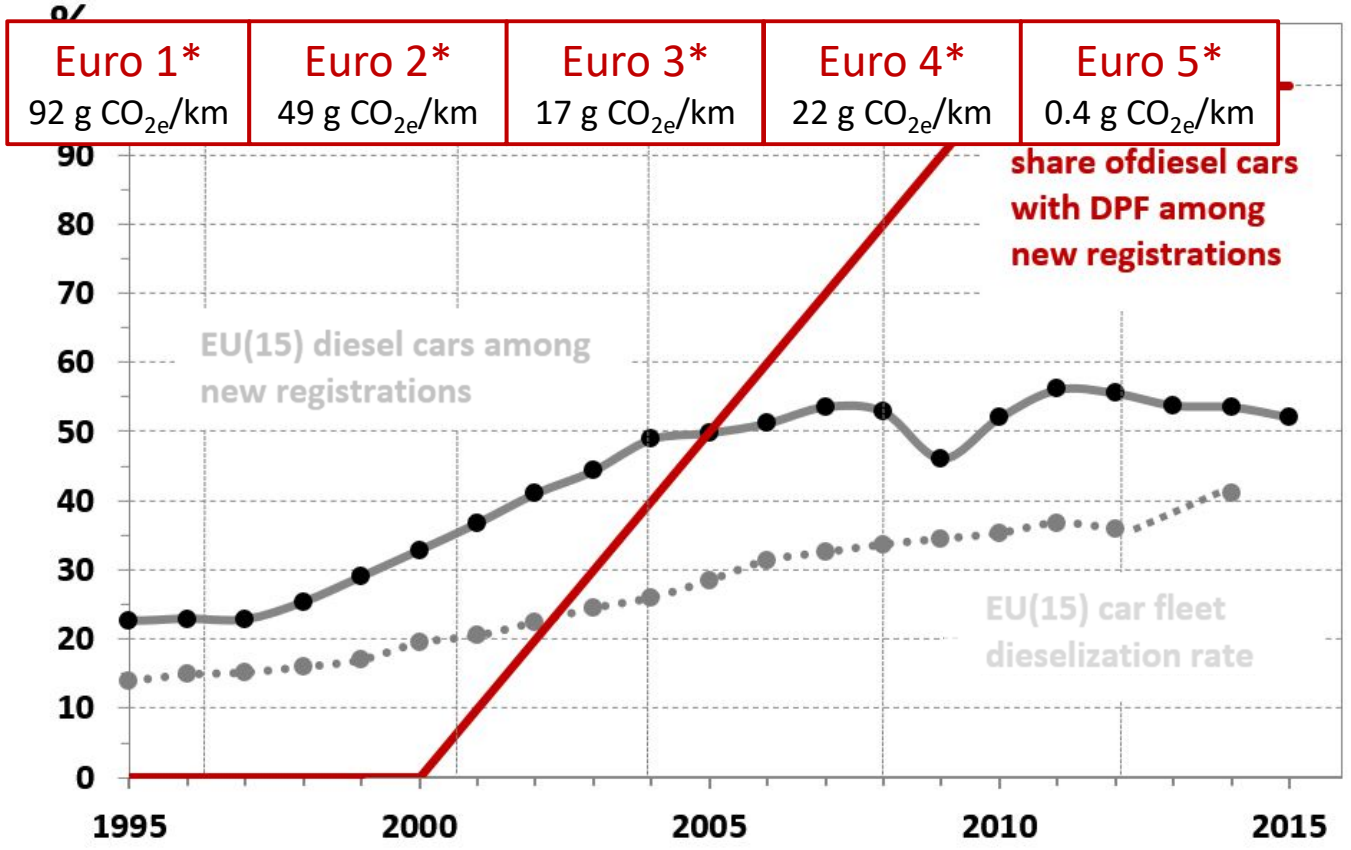

*) recalculated from: Tate 2013, 2015, Kadijk et al. 2015, Hooftman et al. 2016, Pillot et al. 2014, Shields 2016, European Environmental Agency 2013

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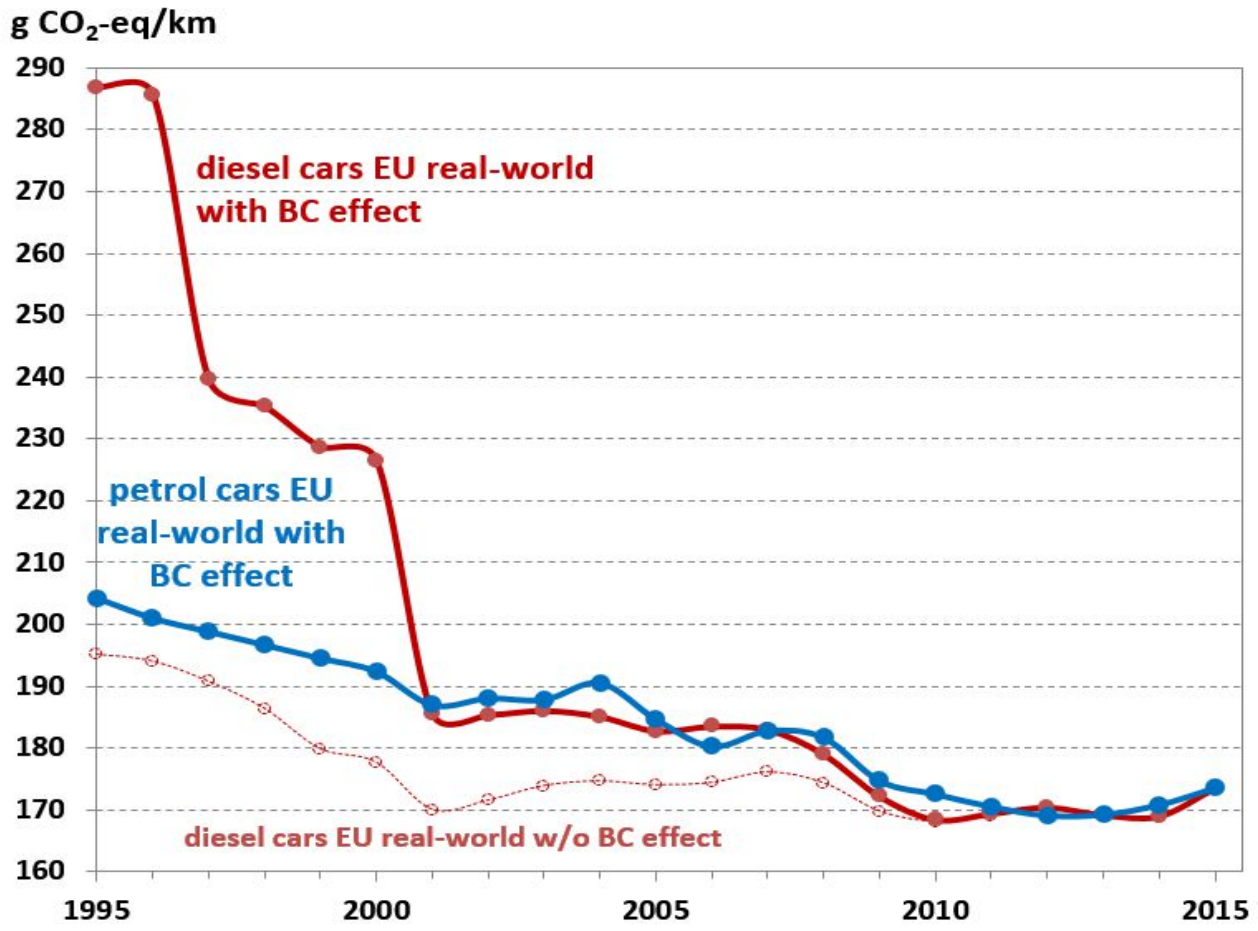
Adding the black carbon warming effect

Average GHG emissions of new cars in Europe including BC emissions



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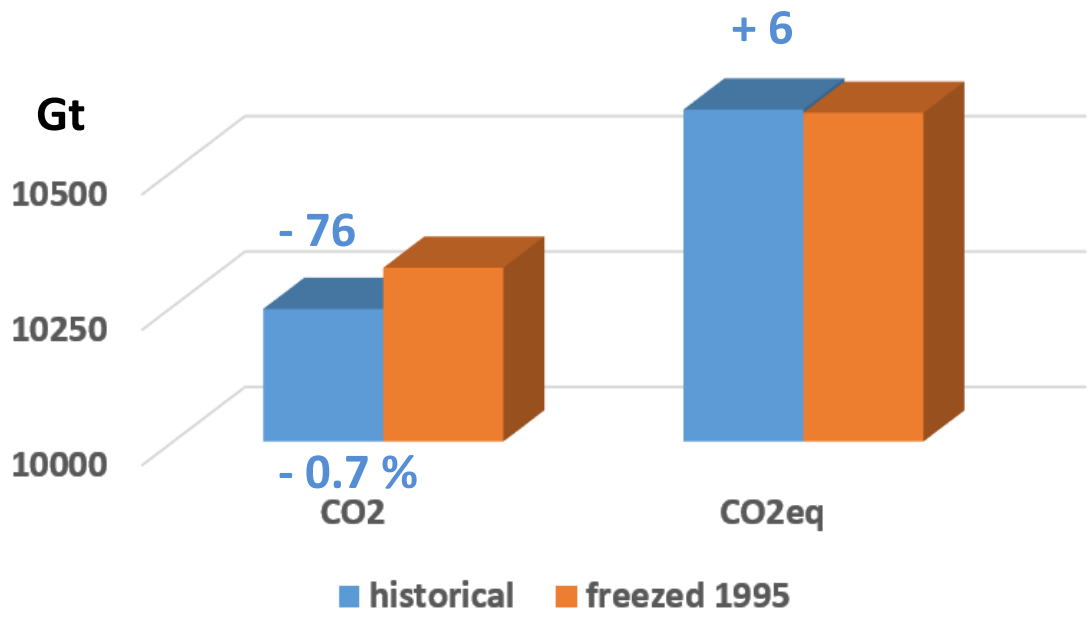
Adding the black carbon warming effect

Modelling the European car fleet emissions (1995 – 2015)



total committed lifetime emissions of CO_2 and total CO_2-eq (including black carbon), for **281 million new cars** registered between 1995-2015 in the EU (each vehicle modelled with 200,000 km). Freezed* 1995 scenario: - 58 million diesel cars

(*= diesel car percentages kept on 1995 level)

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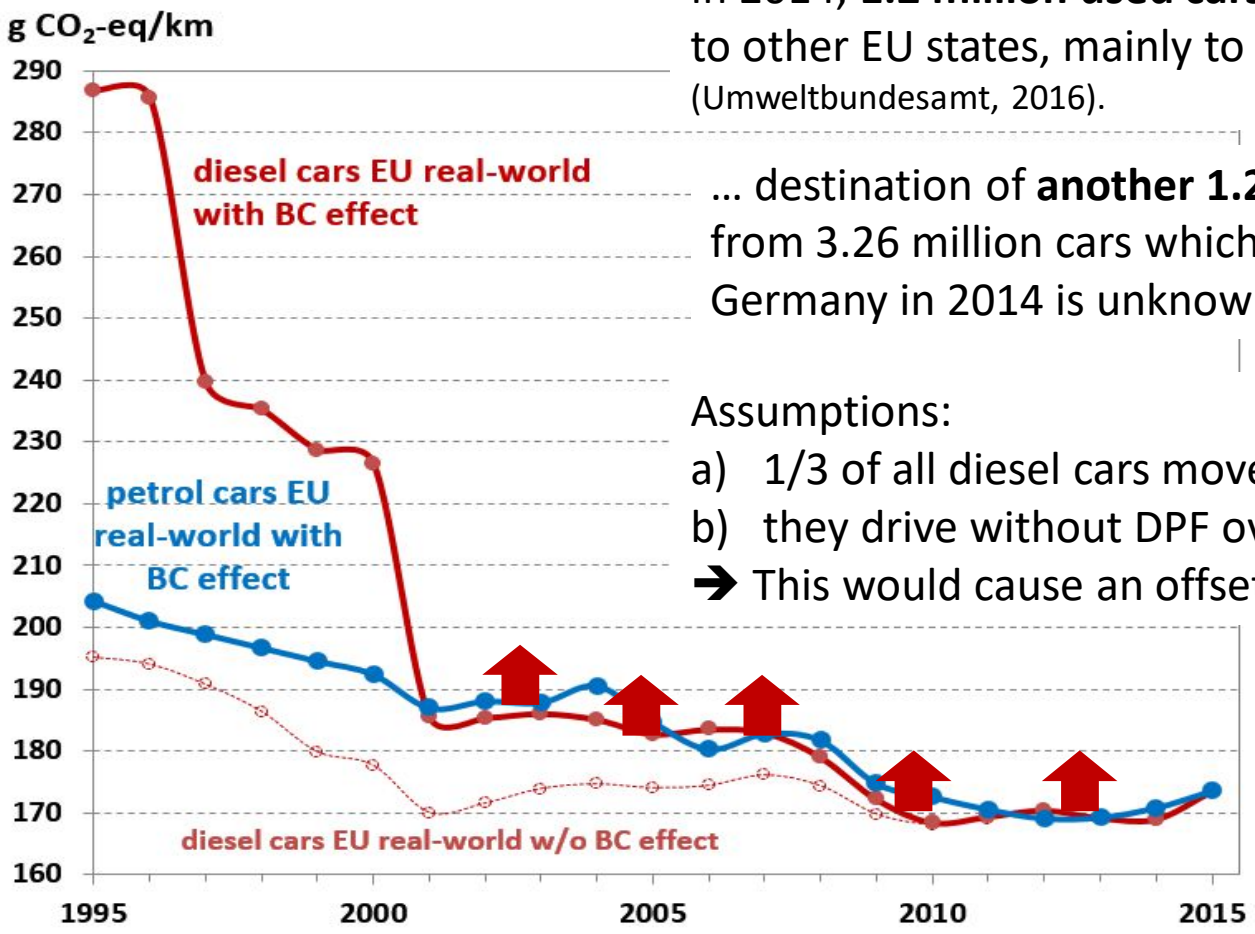

In 2014, **1.2 million used cars** moved from Germany to other EU states, mainly to south-eastern Europe (Umweltbundesamt, 2016).

… destination of **another 1.2 million used cars** from 3.26 million cars which signed out in Germany in 2014 is unknown (Umweltbundesamt, 2016)

Assumptions:

a) 1/3 of all diesel cars move to Eastern Europe
b) they drive without DPF over 1/3 of their lifetime

➔ This would cause an offset of + 8 g CO_2-equivalents

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thank you

for your attention

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