



ROADMAP FOR A LNG FILLING STATION NETWORK IN GERMANY

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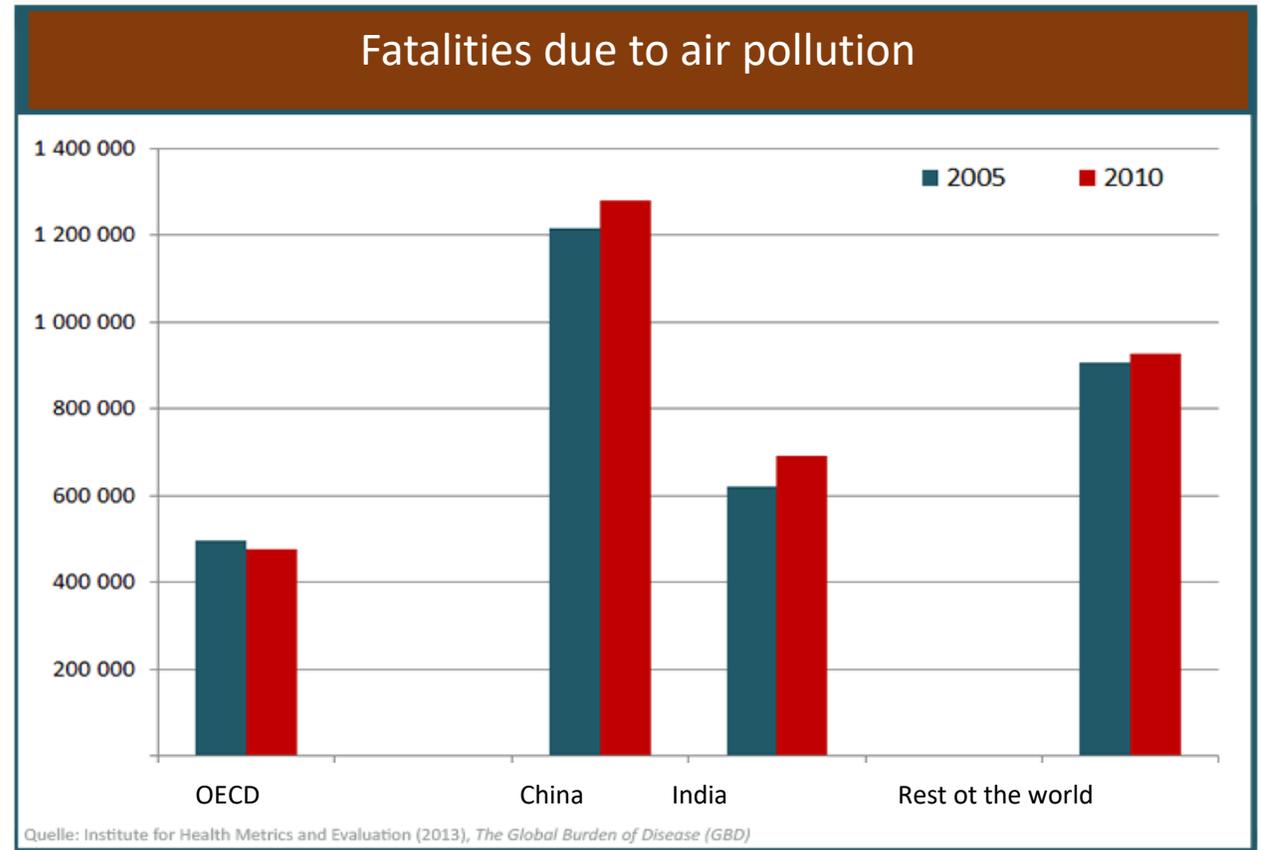
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Fatalities due to air pollution in Germany

3,000 fatalities caused by vehicle emissions in Germany

Source: [1]



Source: [2]



Vehicle emissions including CO₂, particulates, diesel soot, NO_x and traffic noise cause pollution, illness, fatalities and contribute to climate change

Alternative Fuels Infrastructure Directive 2014/94/EU

- Most important aims:
 - Reduce **dependence** on oil imports for transport sector
 - EU targets by 2020:
 - Decrease **greenhouse gas** (GHG) emissions by 20 % (from 1990 levels)
 - 20 % of energy used in EU from **renewable** sources
 - Increase energy **efficiency** by 20 %
 - Improve **air quality** in metropolitan areas
 - Increase **competitiveness** of European industry

Public LNG filling stations in Europe

Country	Number
Belgium	2
Finland	2
France	7
Germany	2
Italy	10
Netherlands	21
Poland	1
Portugal	7
Spain	22
Sweden	6
U.K.	15
Total EU 28	95

Source: [4], Status: 2016



in service



under maintenance

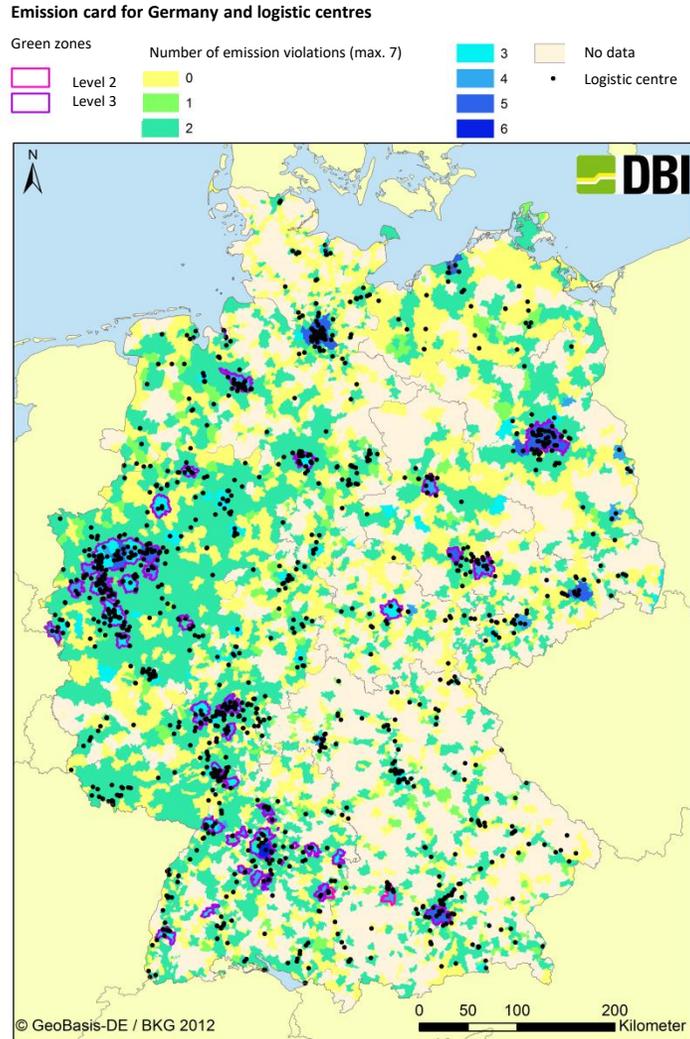


planned / under construction



L-CNG station

Emission card – final results



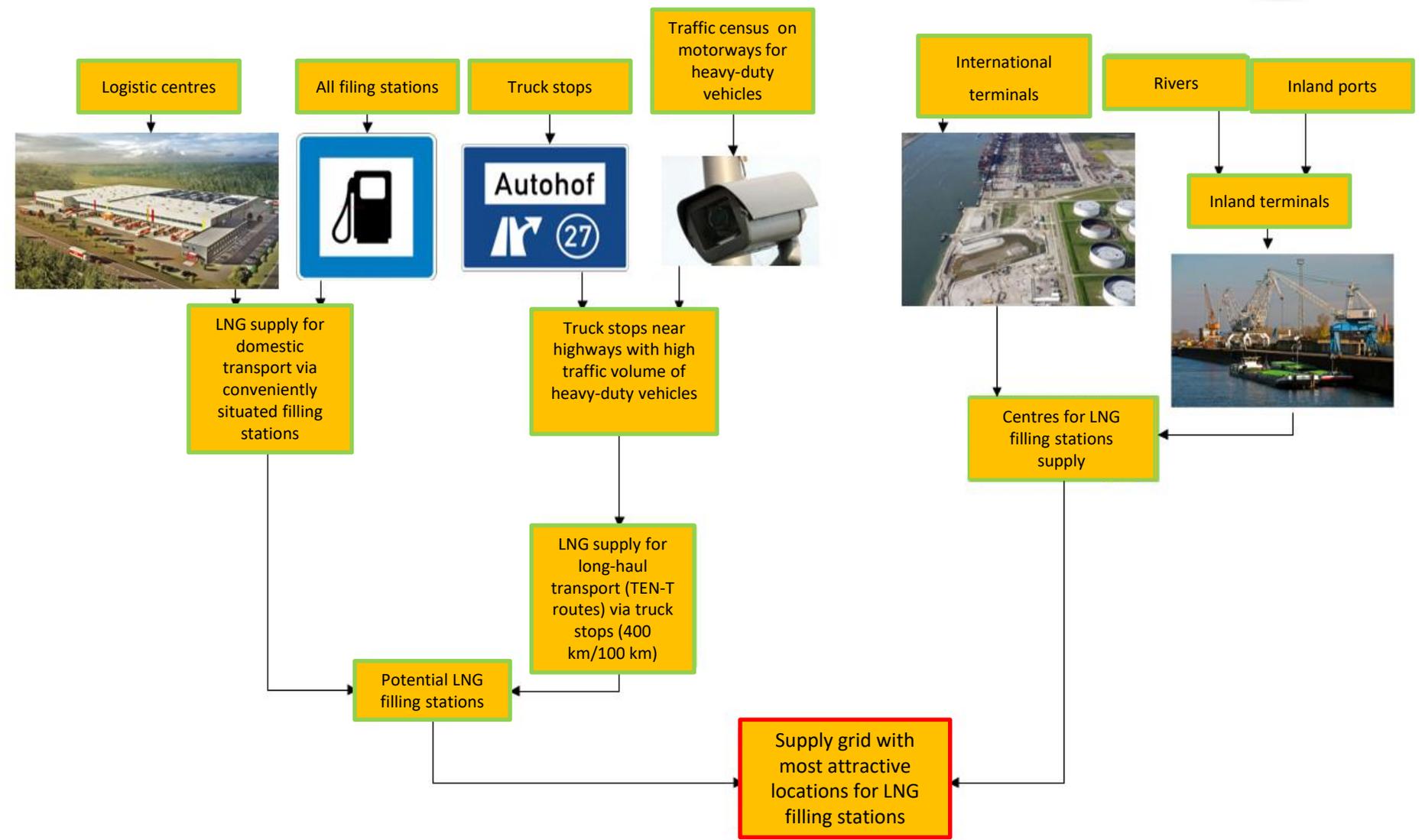
Source: [5]

- Emission centres are located in the vicinity of agglomerations and logistic centres
- Green zones are situated in emission centres
- Nevertheless:
 - Green zones provide only a little improvement
 - Further measures are required

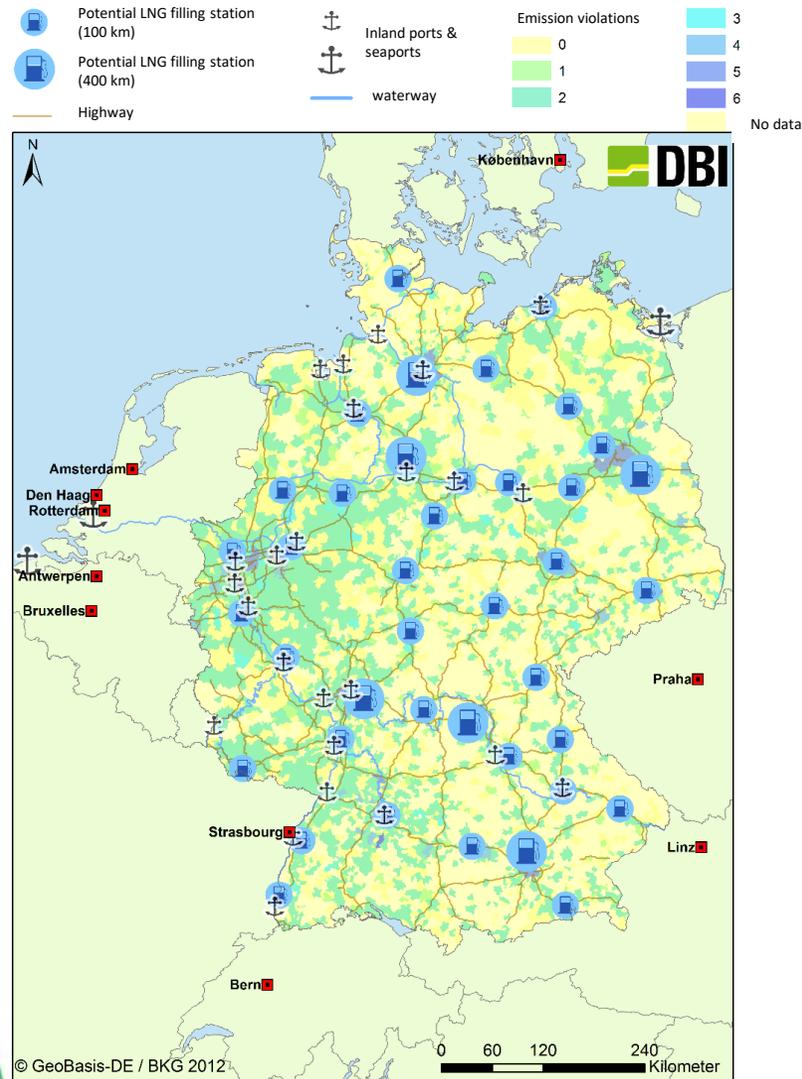


LNG is easy to implement and can help reduce traffic emissions immediately

Locations for LNG filling stations



Required number of LNG filling stations in Germany



- LNG filling stations next to traffic hubs
 - LNG filling stations next to busy roads
 - LNG filling stations next to logistic centres
- 6 LNG filling stations enable pan- European heavy duty vehicle transport (approx. € 10 million)
 - Approx. 40 LNG filling stations enable domestic transport of goods (approx. € 60 million)



Investment for LNG infrastructure is low and quick to implement

Source: [5]

Conclusions

- **Challenge of deploying LNG filling station network as well as assuring minimum demand**
 - Only 6 LNG filling stations in Germany will enable pan-European heavy-duty vehicle transport (approx. € 10 million)
 - At least 40 LNG filling stations required to enable domestic transport of goods in Germany (approx. € 60 million)
 - Synergies between LNG usage for inland water transport and trucks to be identified



LNG is a quickly implementable and ecologically worthwhile alternative to diesel for heavy-duty vehicles

Thank you for your attention!

Literature

- [1] Max-Planck-Institut
- [2] Institute for Health Metrics and Evaluation (2013), The Global Burden of Disease (GBD)
- [3] Alternative Fuels Infrastructure Directive 2014/94/EU
- [4] NGVA Europe
- [5] Study `Potential assessment of LNG`; German Association for Gas and Water, Bonn, 2016
- [6] Federal Environment Agency
- [7] <http://www.dvz.de/uploads/pics/Norma-Rheinboellen-PC-Grafik.jpg>
- [8] <http://www.verkehrsschilder.de/produktbilder/l/11647/Tankstelle-Verkehrsschild-Nr-365-52.jpg>
- [9] https://upload.wikimedia.org/wikipedia/commons/thumb/a/ac/Zeichen_448.1_-_Autohof,_StVO_2000.svg/2000px-Zeichen_448.1_-_Autohof,_StVO_2000.svg.png
- [10] http://www.infranken.de/storage/scl/ft/nachrichten/lokales/coburg/784495_t1w454h300q75v27457_31-28463757.jpg?version=1353683446
- [11] <http://www.lngworldnews.com/wp-content/uploads/2015/09/Watch-live-Gate-LNG-break-bulk-dredging-524x370.jpg>

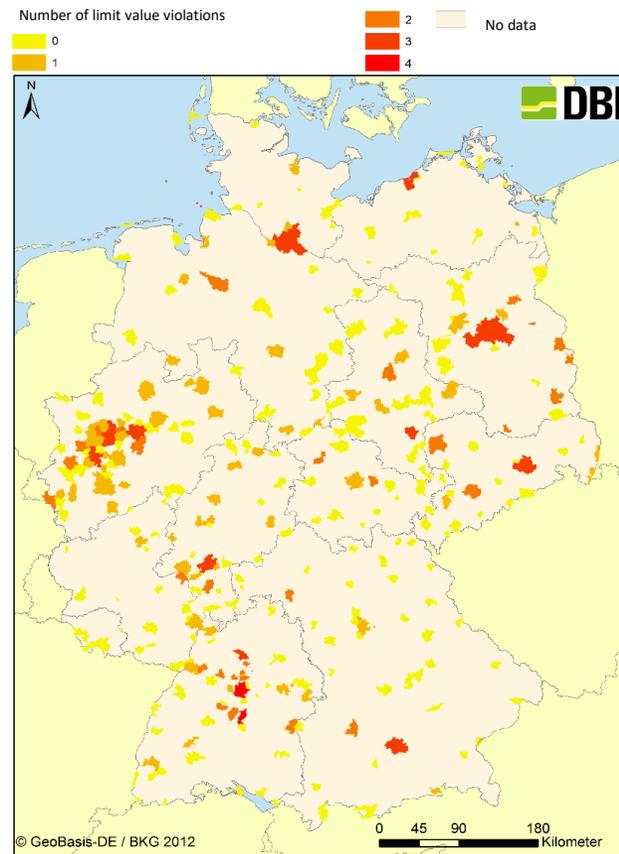
Additional slides

Alternative Fuels Infrastructure Directive 2014/94/EU (II)

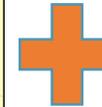
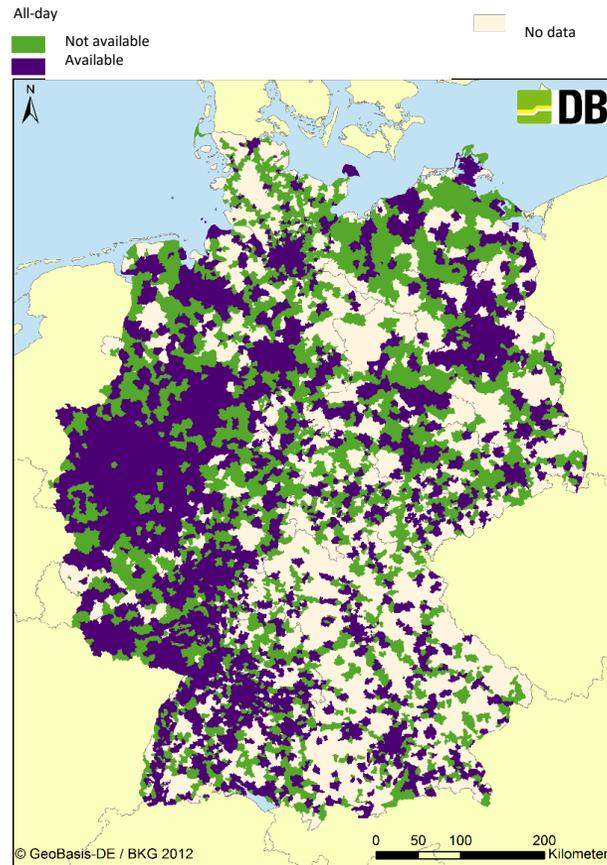
- Establish a **thriving market** for alternative fuels to serve all modes of transport
- Deploy a Europe-wide LNG filling station network (maximum distance between filling stations **400 km**)
- Develop (harmonised) **European standards**
- Provide relevant, consistent and clear **information**

Emission card – intermediate results

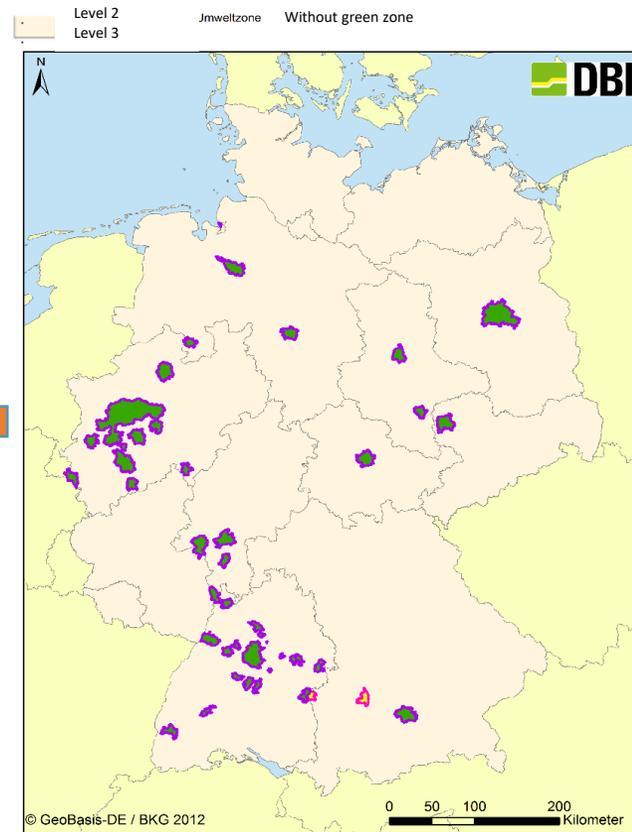
Pollution load (PM10/PM2,5/NO_x)



Harmful noise pollution

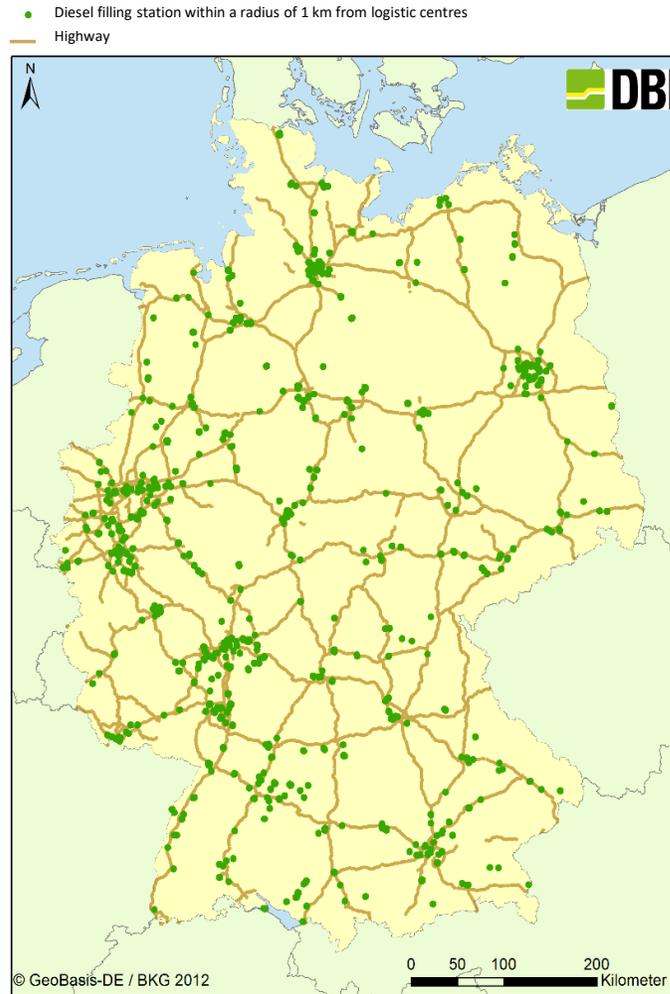


Green zones in Germany



Placement of LNG filling stations near logistic centres

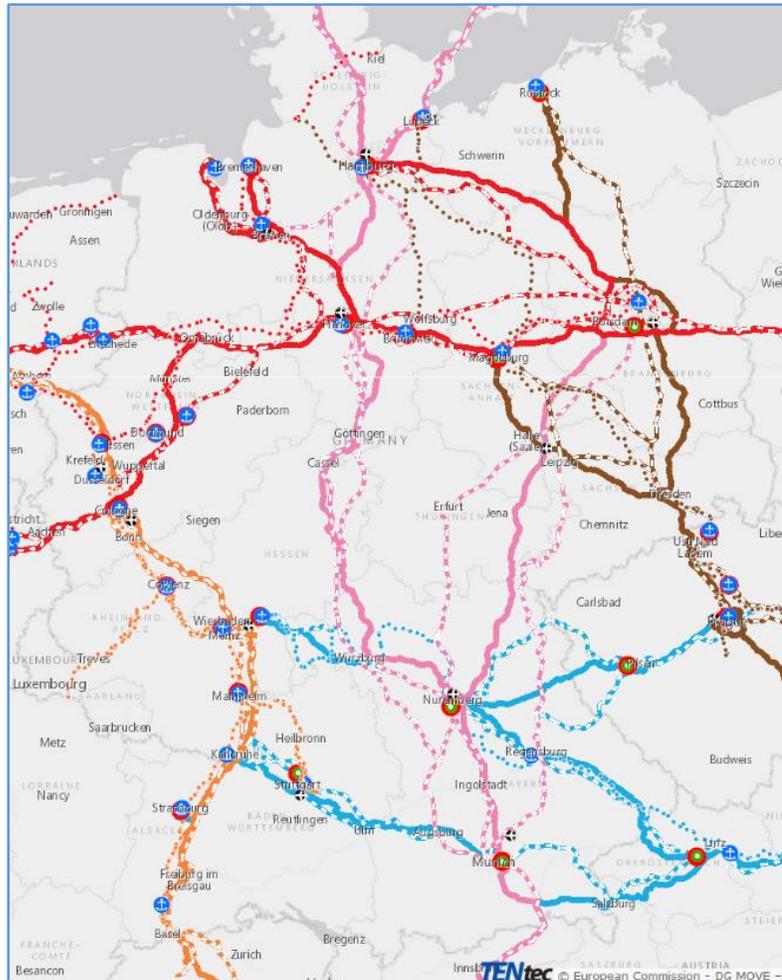
265 diesel filling stations near logistic centres



24 potential LNG filling stations near logistic centres

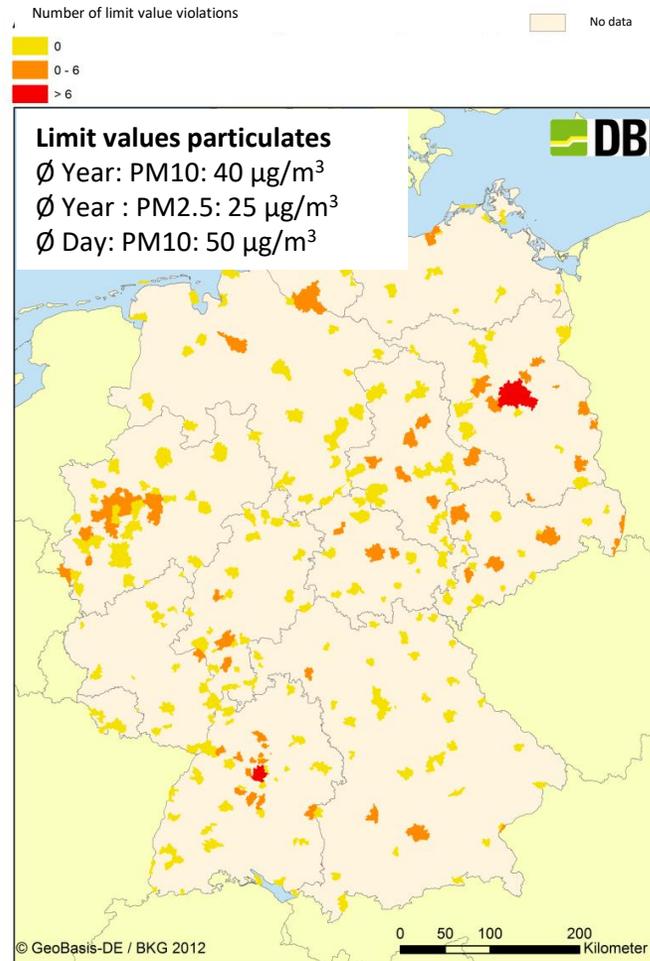


TEN-T routes in Germany



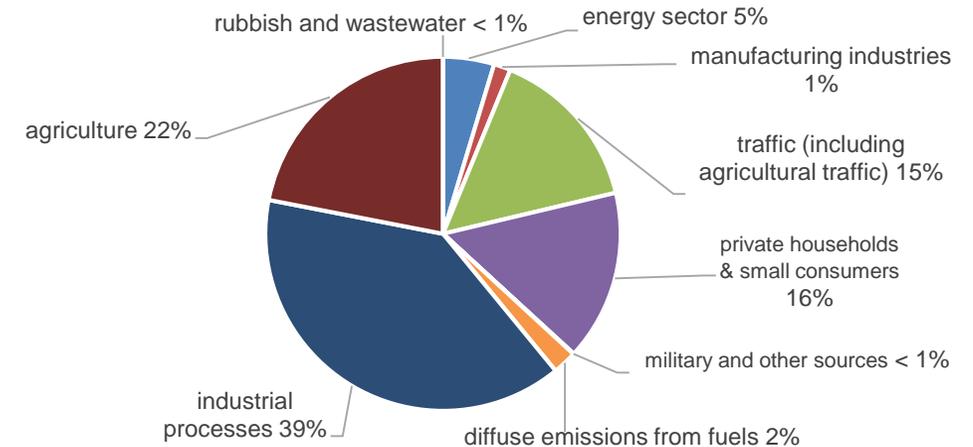
- Identification of filling station locations along TEN-T routes
- Distance between each filling station 400 km

Air pollution: Violations of limit values for particulates

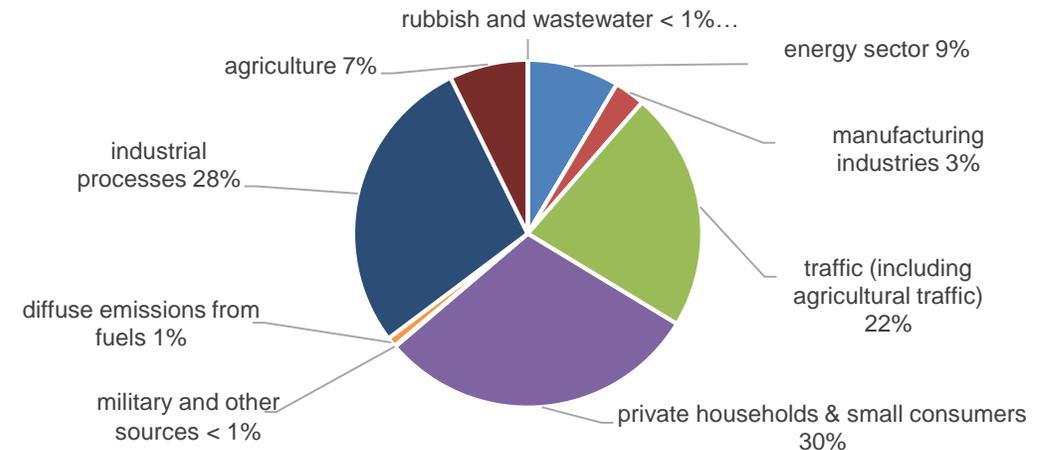


➔ Approximately 10 % of particulates caused by traffic

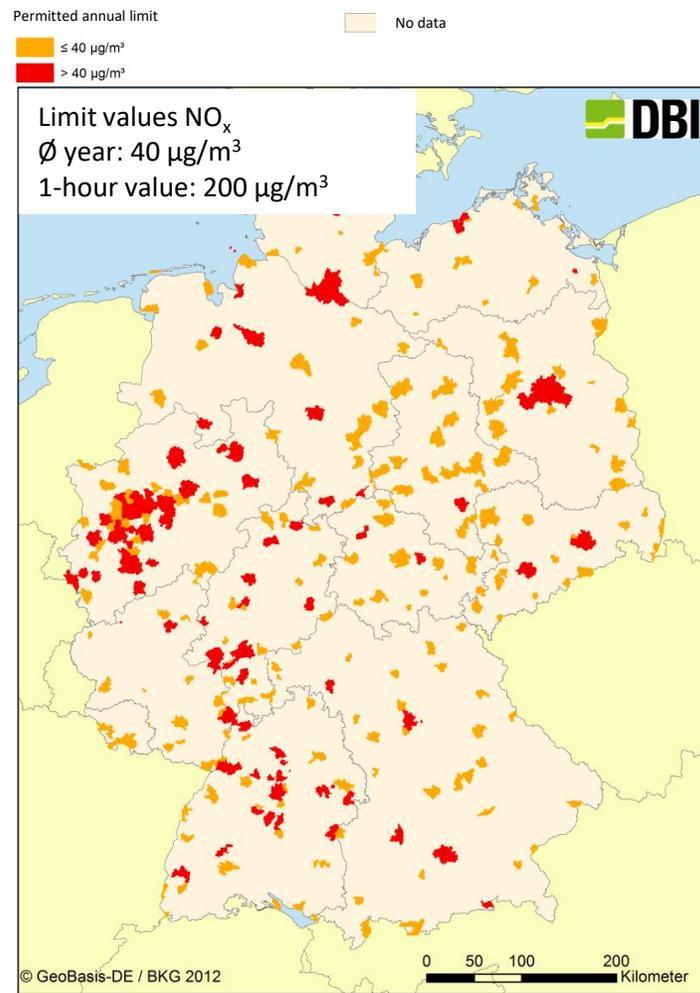
Emitters of particulates PM10



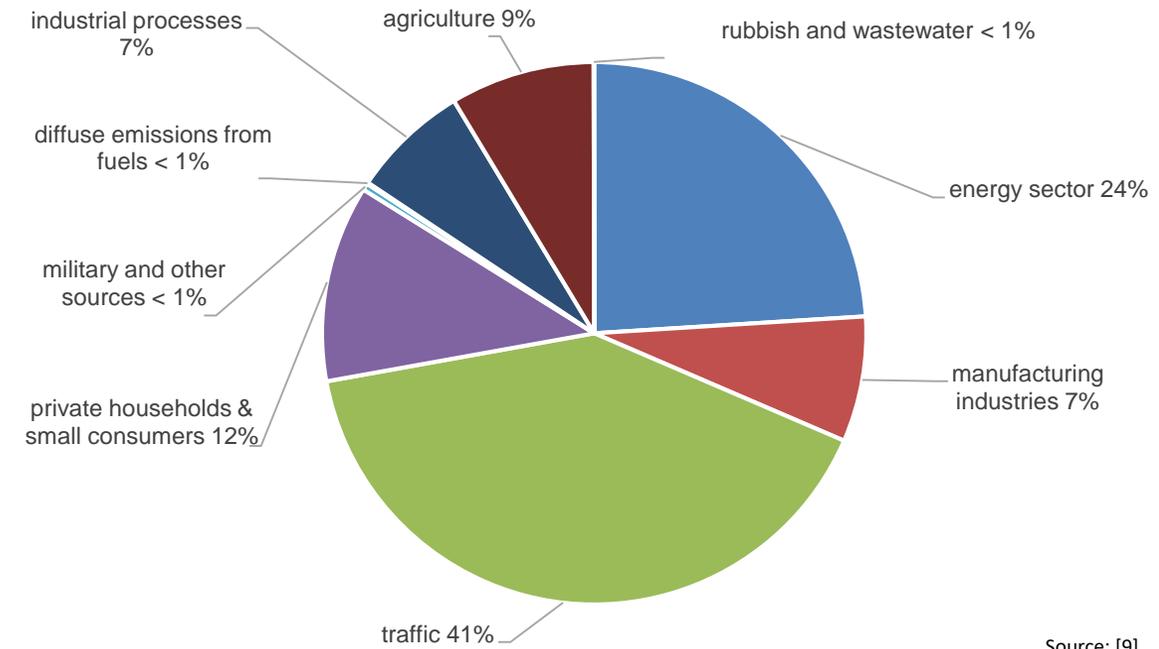
Emitters of particulates PM2.5



Air pollution: Violations of limit values for NO_x



Emitters of nitrogen dioxide

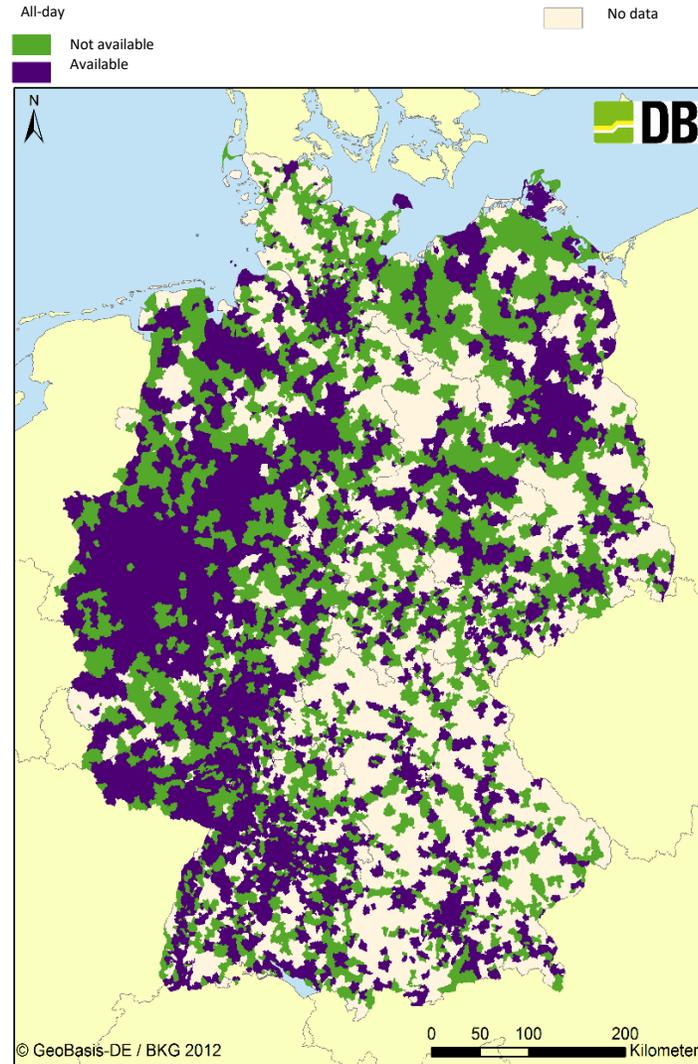


Source: [9]

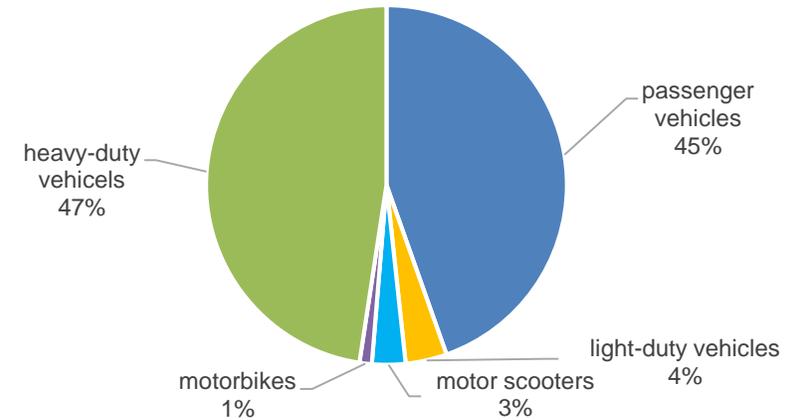
➔ NO_x emissions caused by combustion engines and power plants

Air pollution: Violations of limit values for noise

Harmful noise pollution



Source of vehicle noise on an urban main road



Composition of total noise of heavy-duty vehicles

