University of Stuttgart
IER Institute of Energy Economics
and Rational Energy Use

2017 International Emission Inventory Conference

A global inventory of speciated non-methane volatile organic compounds emissions from anthropogenic sources

Baltimore, August 16th, 2017

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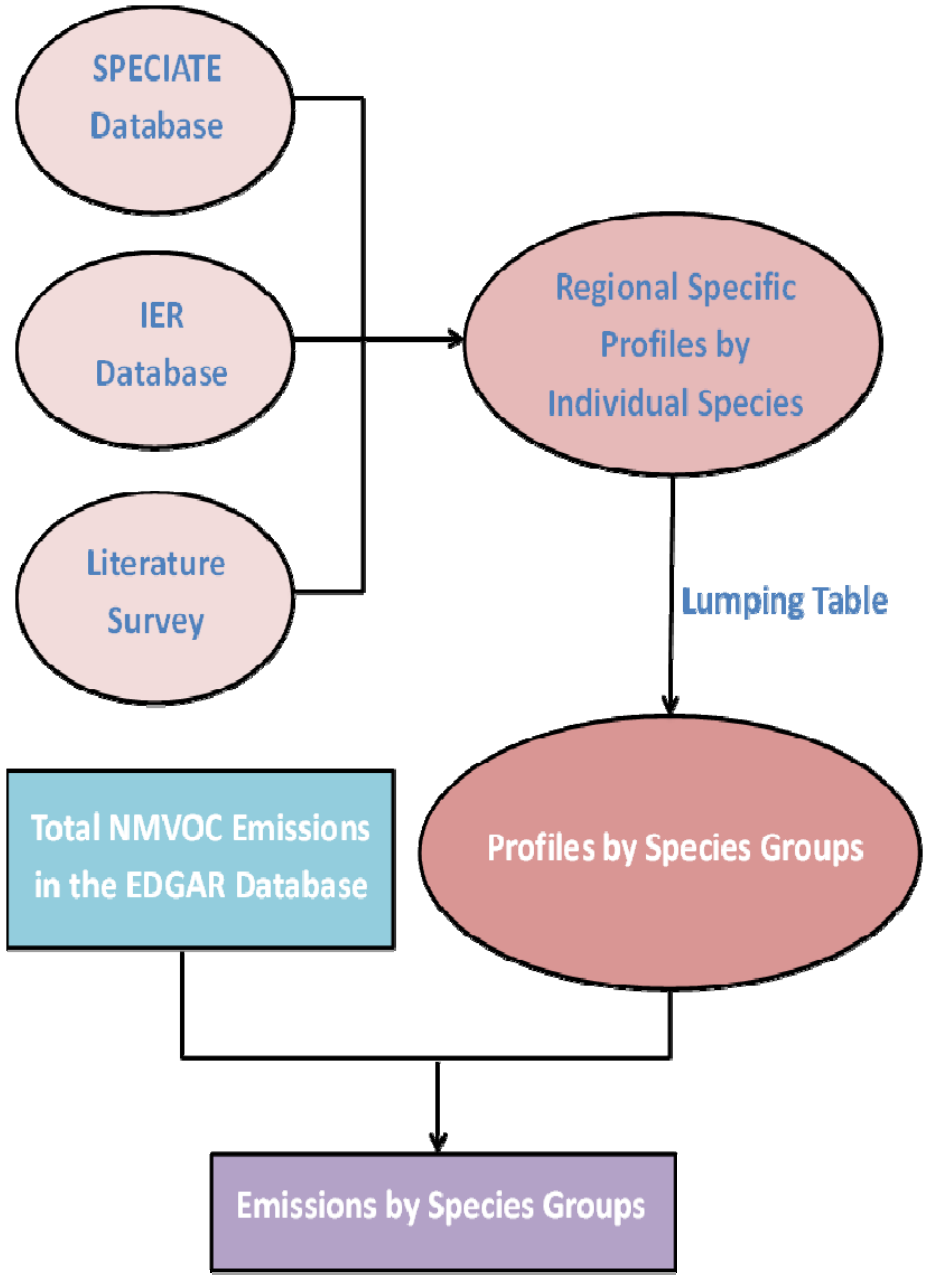
Introduction

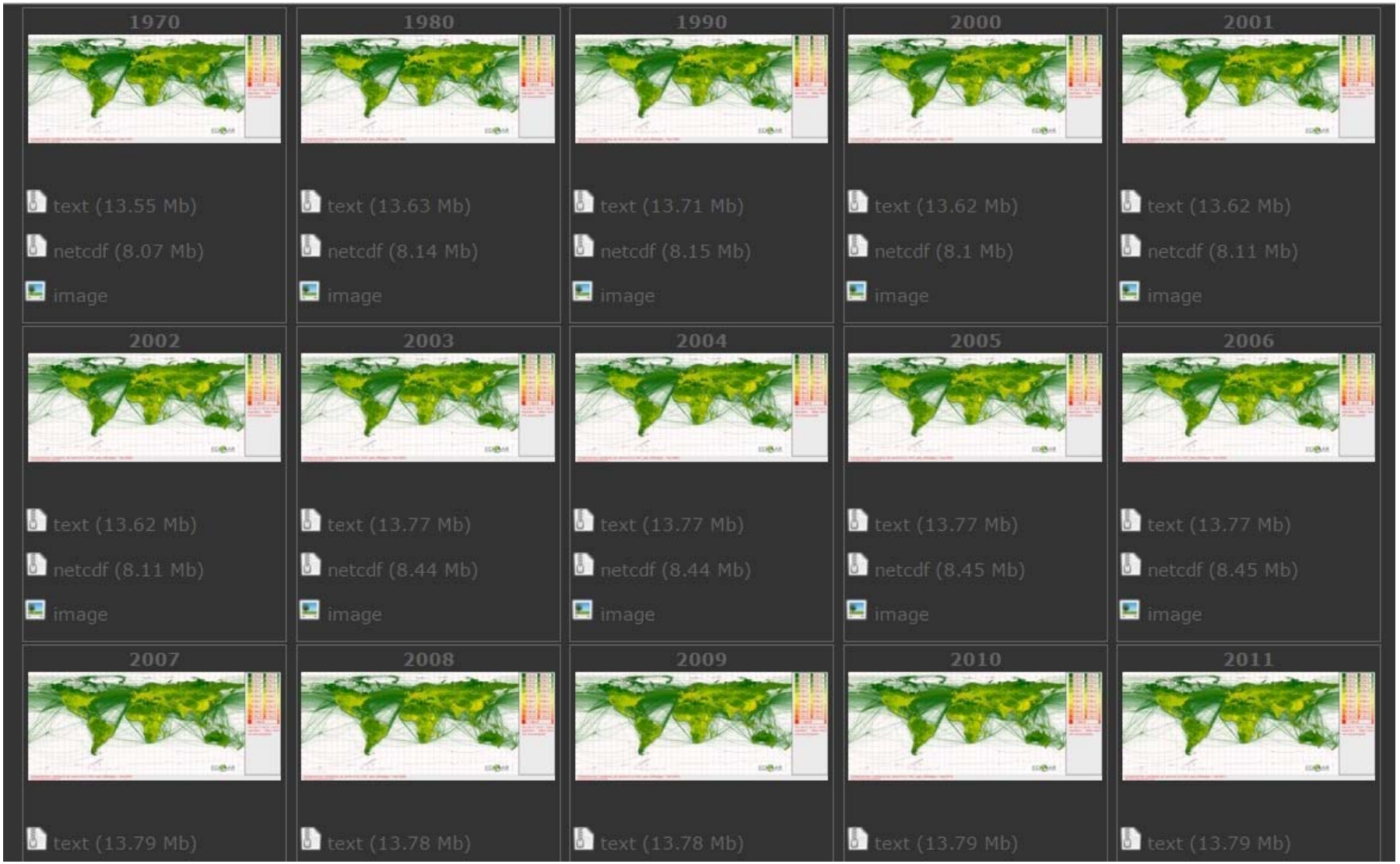
Objective and Framework

- **Background**: NMVOCs need to be **speciated** as they differ significantly in their impacts on ozone and secondary organic aerosol formation.
- **Objective**: decompose Emission Database for Global Atmospheric Research (EDGAR) NMVOC emissions data on a high sector resolution to individual species or species groups.



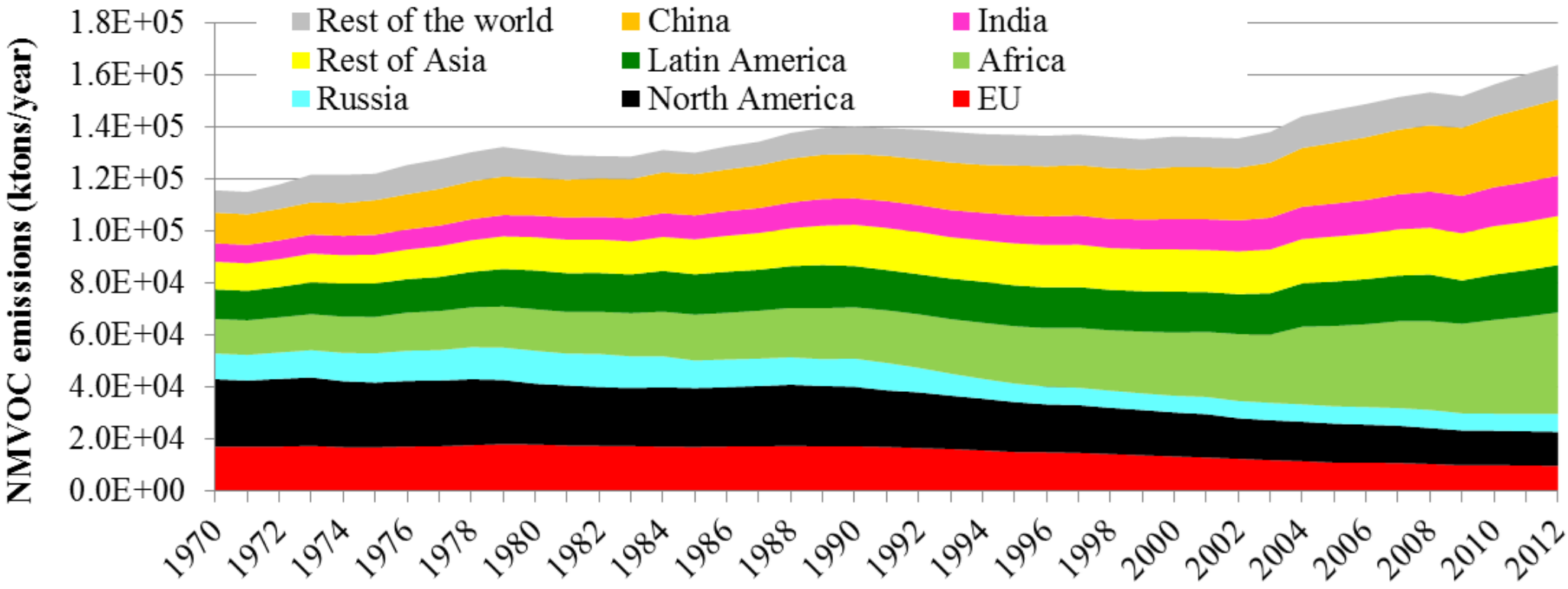
Global speciated NMVOC Emissions: EDGAR v4.3.2_VOC_spec

- time series (1970-2012) by sector and country
- Annual total and sector-specific grid maps (1970,1980,1990,2000-2012) and monthly sector-specific grid maps (2010) with spatial resolution of 0.1 x 0.1degree.



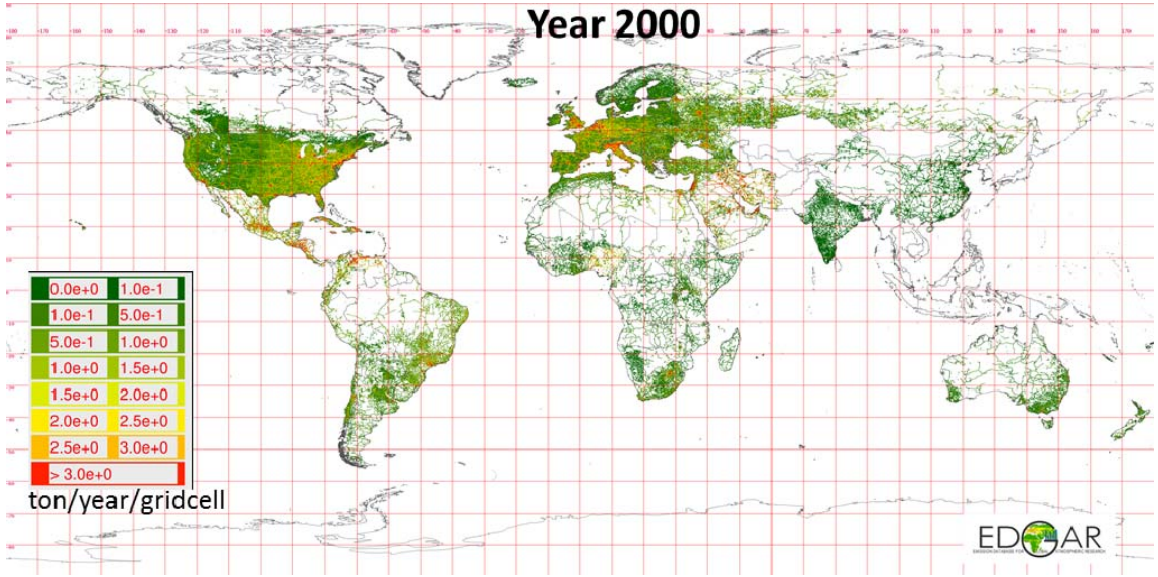
Global trend of NMVOC emissions from 1970 to 2012

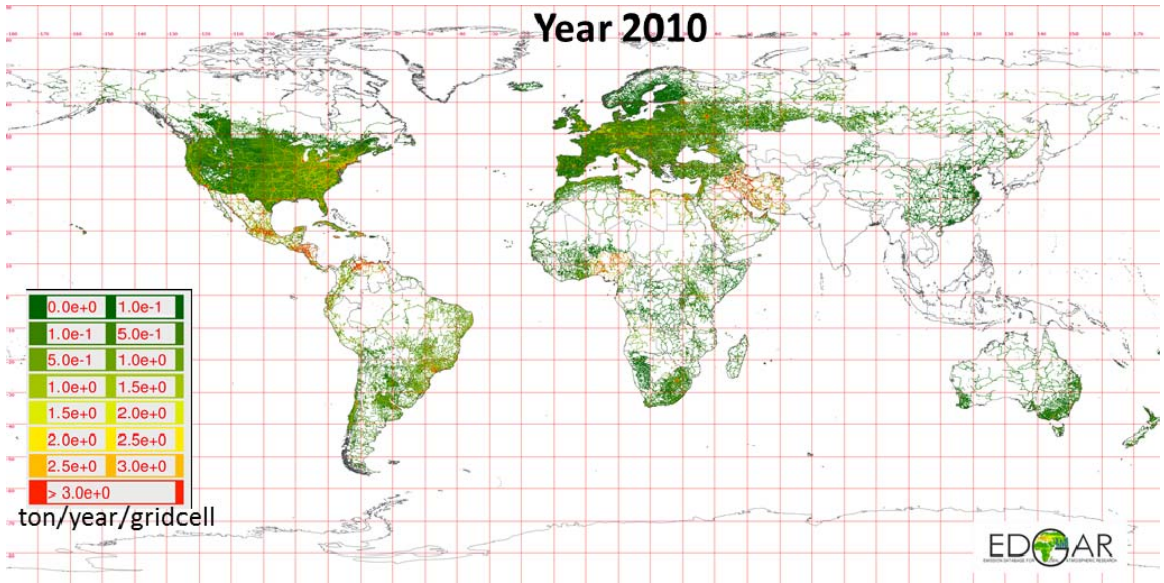
- 42% increase of global NMVOC emissions.
- Decreased contribution of North America and Europe, 37% in 1970 to 14% in 2012.
- Africa, China, and India increased their emissions by factors of 2.9, 2.5, and 2.2, respectively.



Speciated NMVOC grid maps by sector

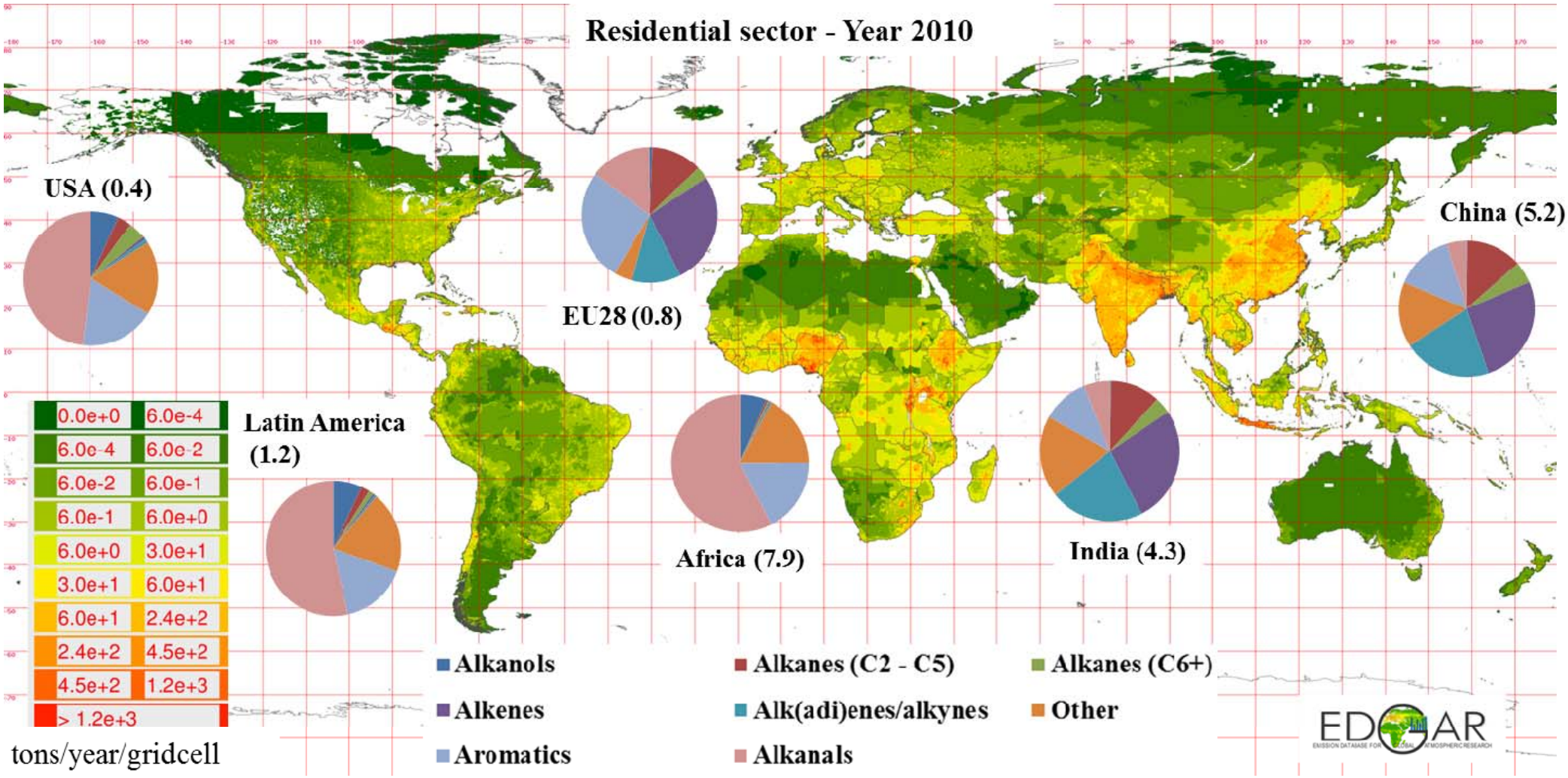
Formaldehyde emissions from road transport



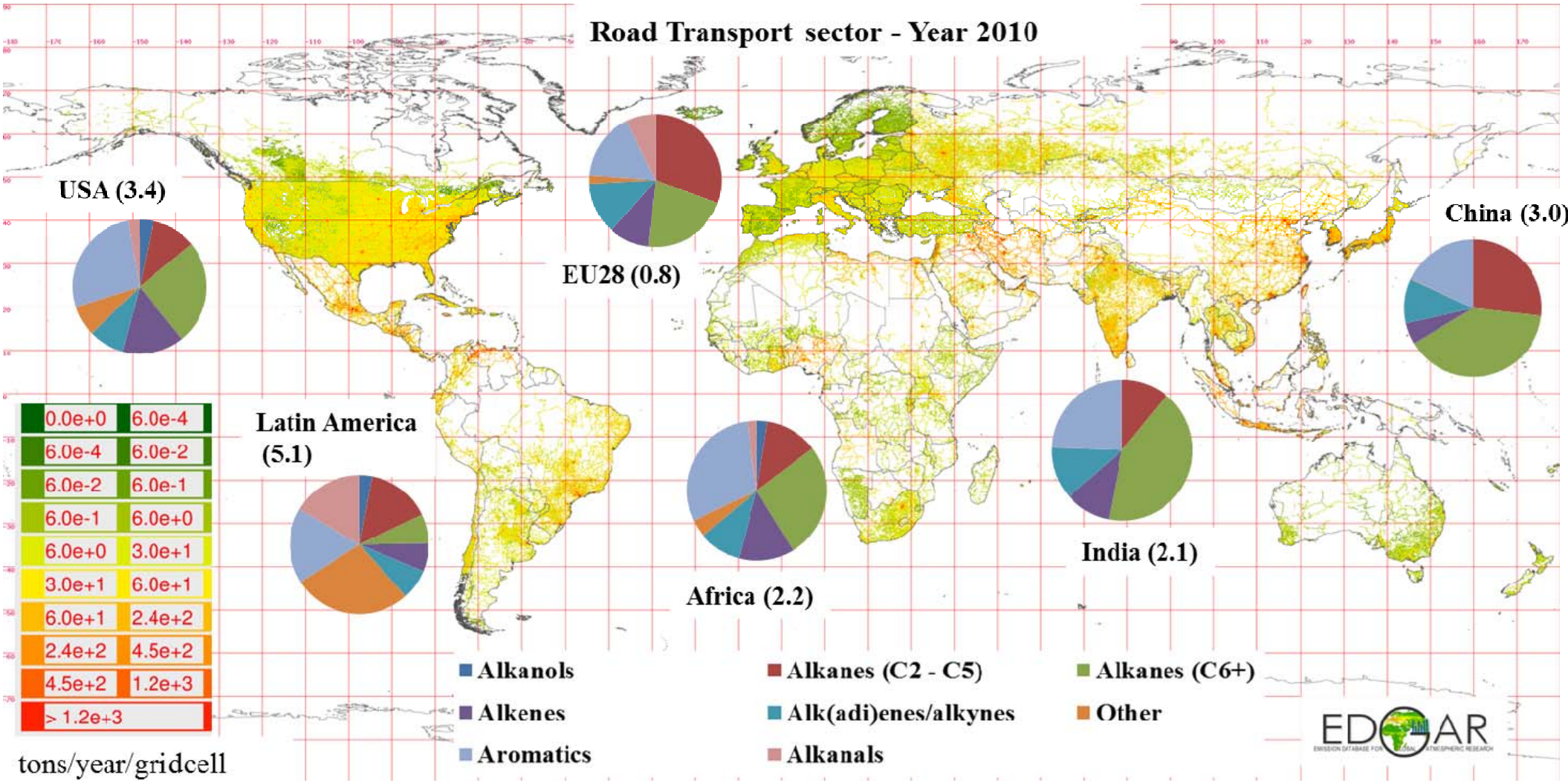


- 0.1×0.1◦ resolution
- Main contributing sectors in 2010: road transportation (16%), residential combustion (15%), transformation industry (18%), fuel production and transmission (16%), and solvent use (12%).
- Significant reduction in formaldehyde emissions from 2000 to 2010, in particular over Europe, which can be attributed to the adoption of increasingly stringent Euro standards.

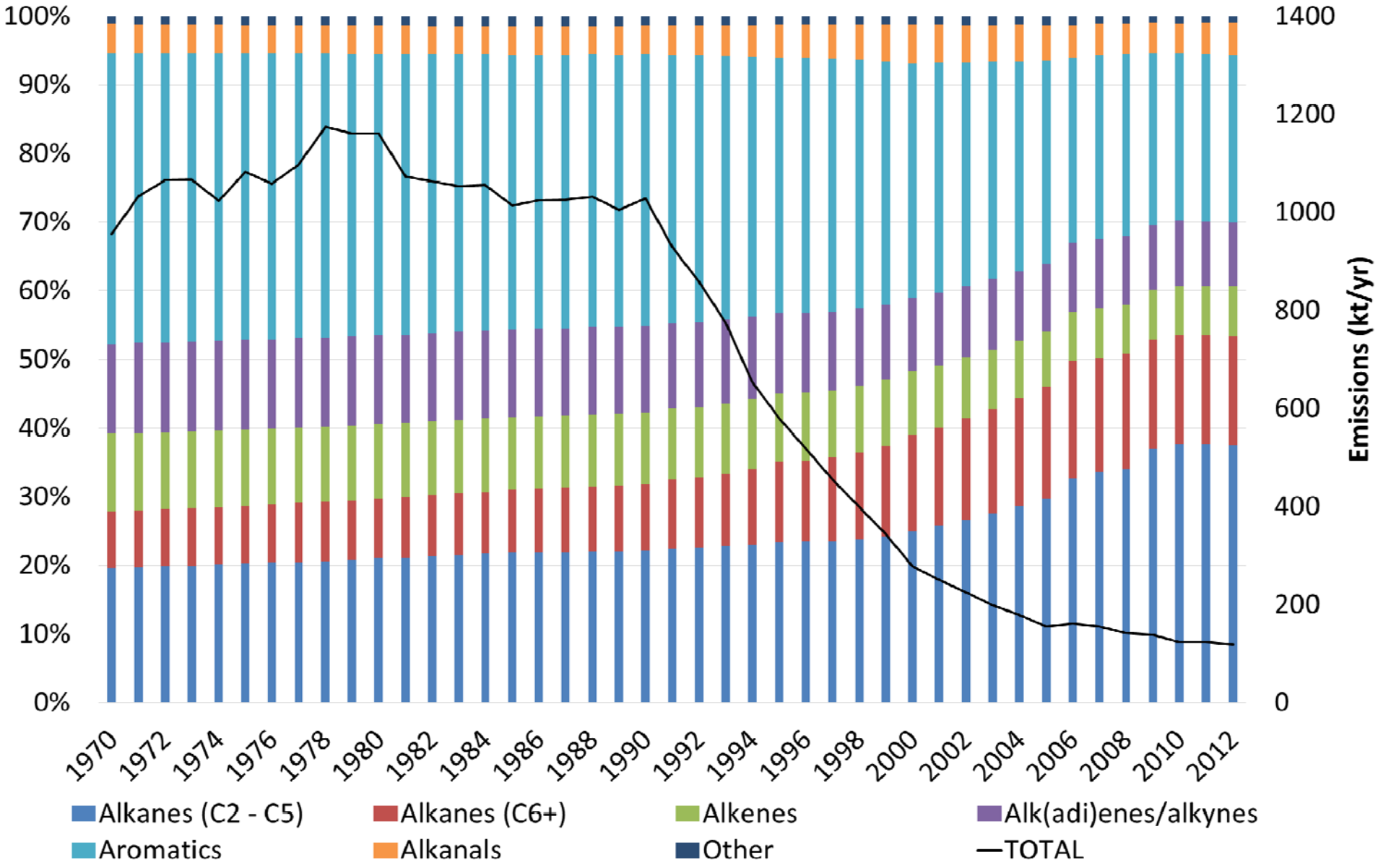
NMVOC emission grid map of residential sector in 2010



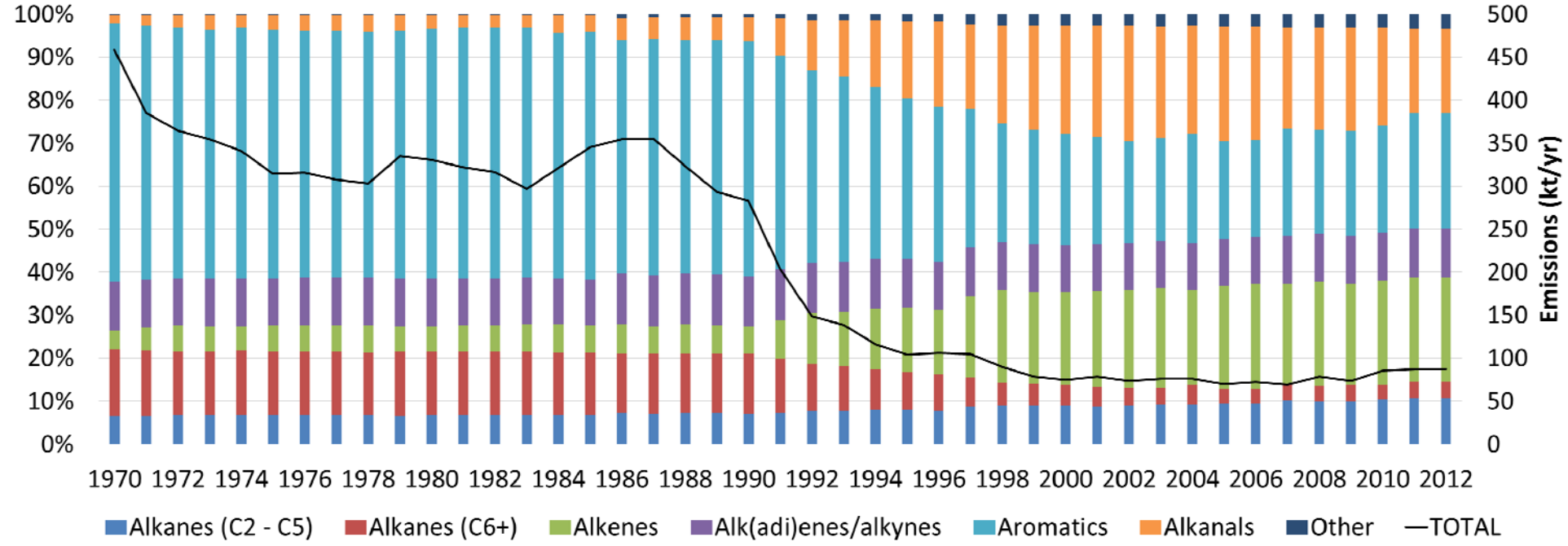
NMVOC emission grid map of road transport sector in 2010

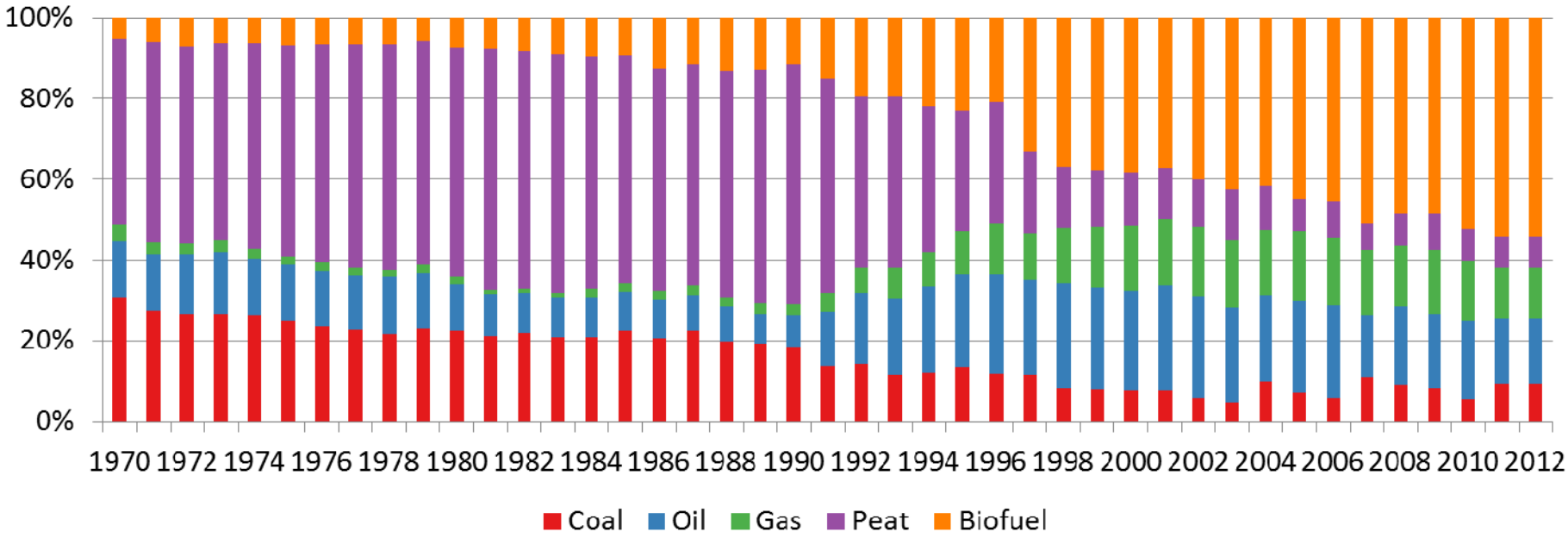


Species time series: road transport in Germany

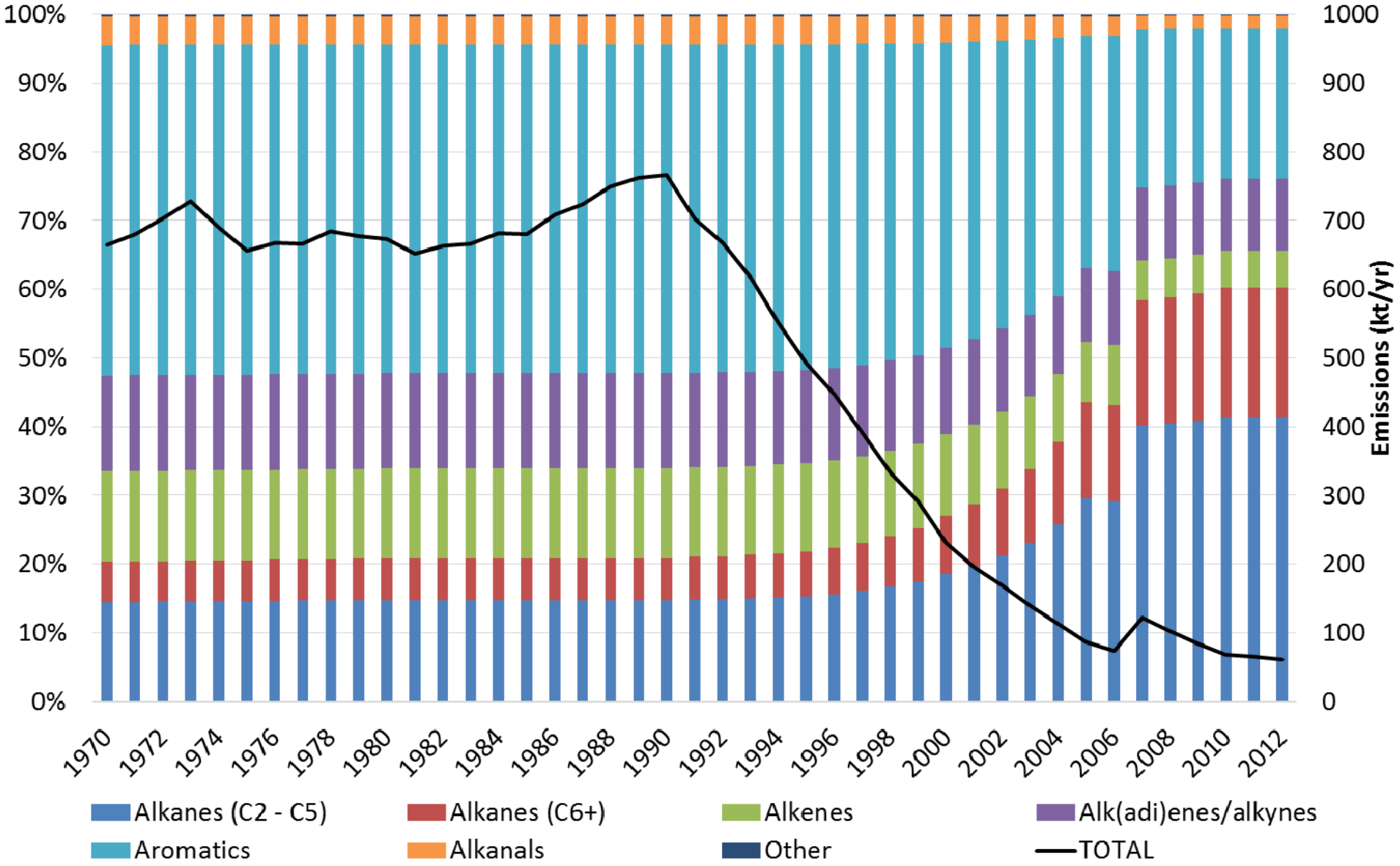


Species time series: residential sector in Germany

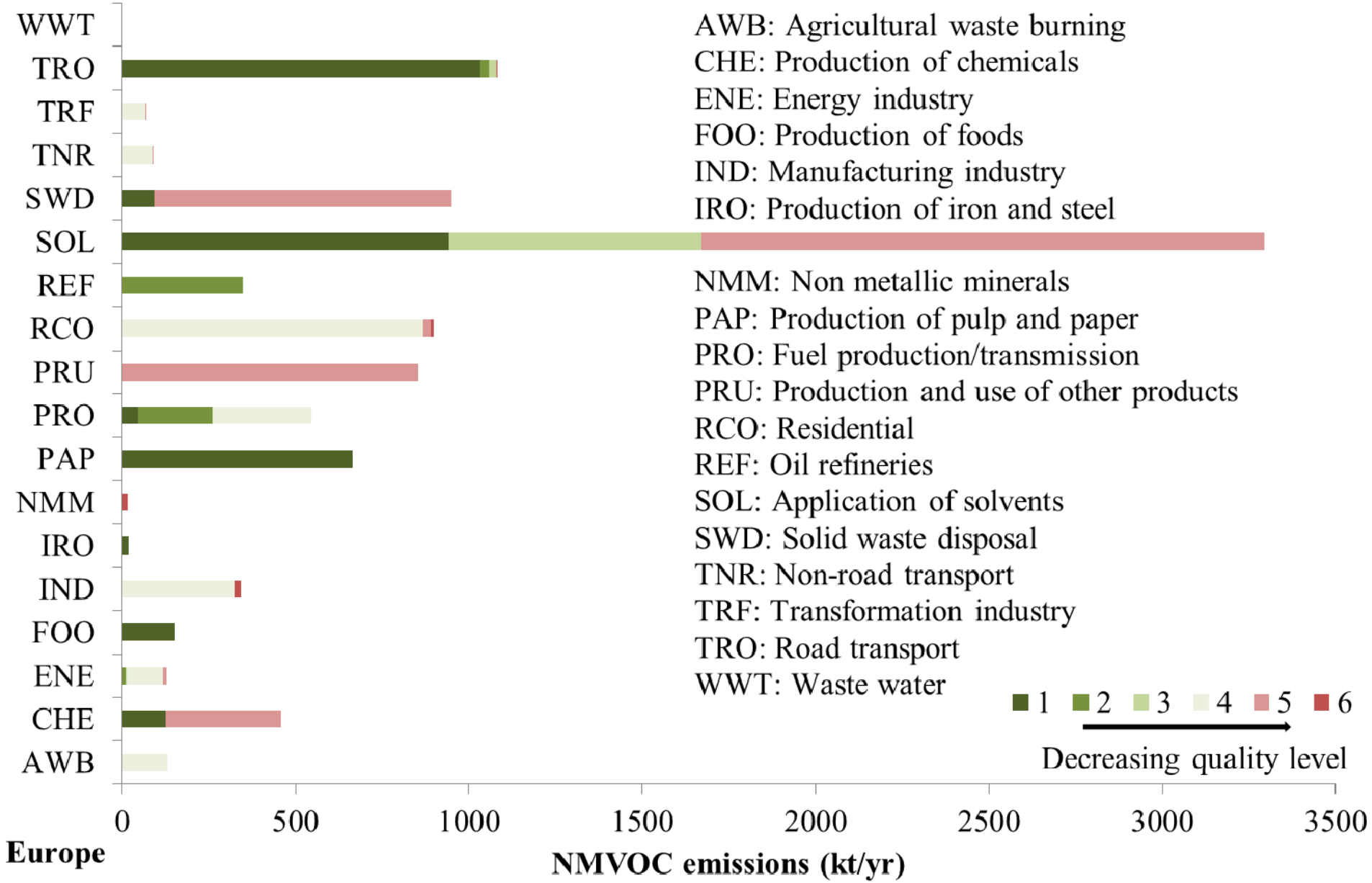




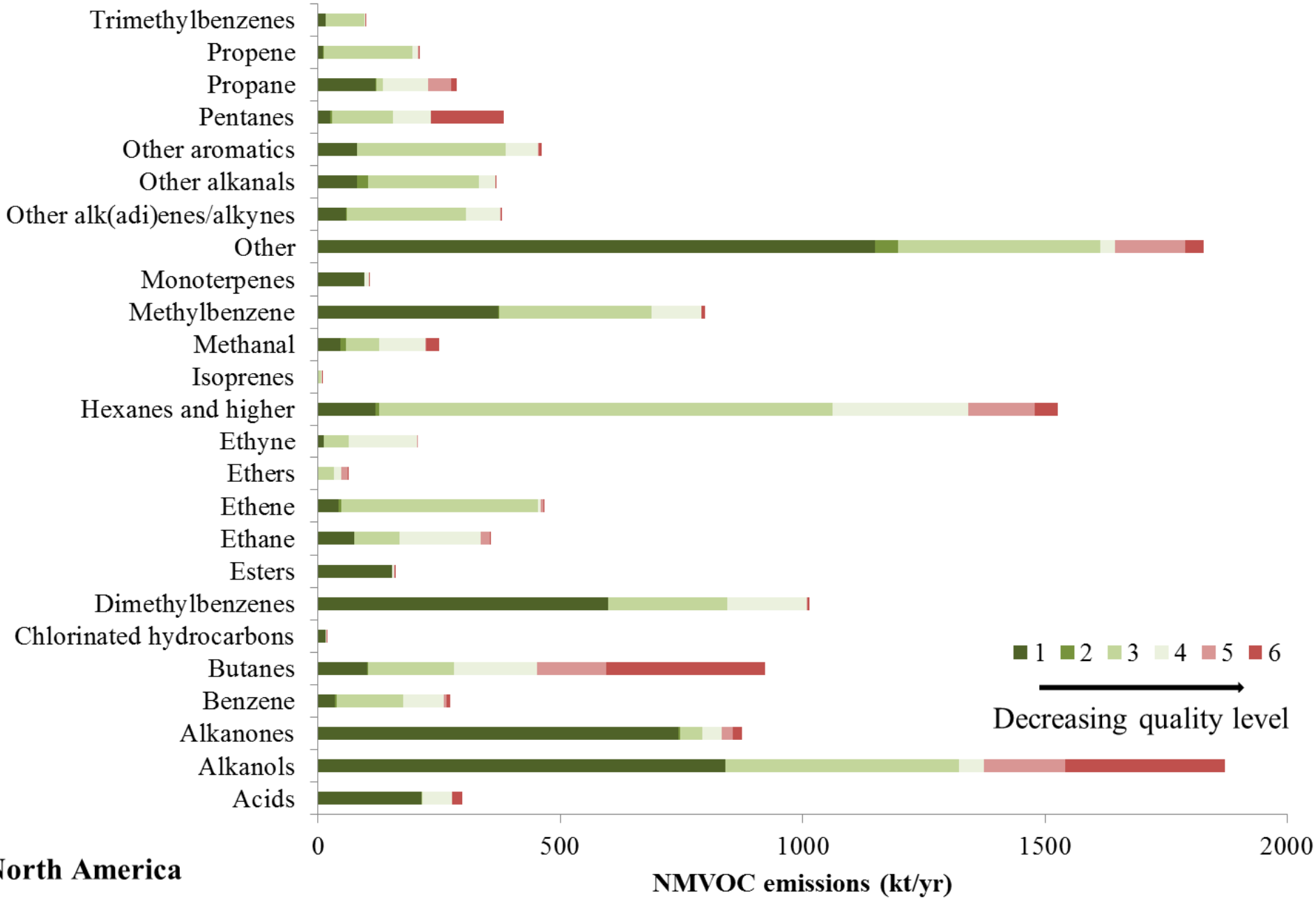
Species time series: petrol vehicles in the UK



Quality assessment – by sector

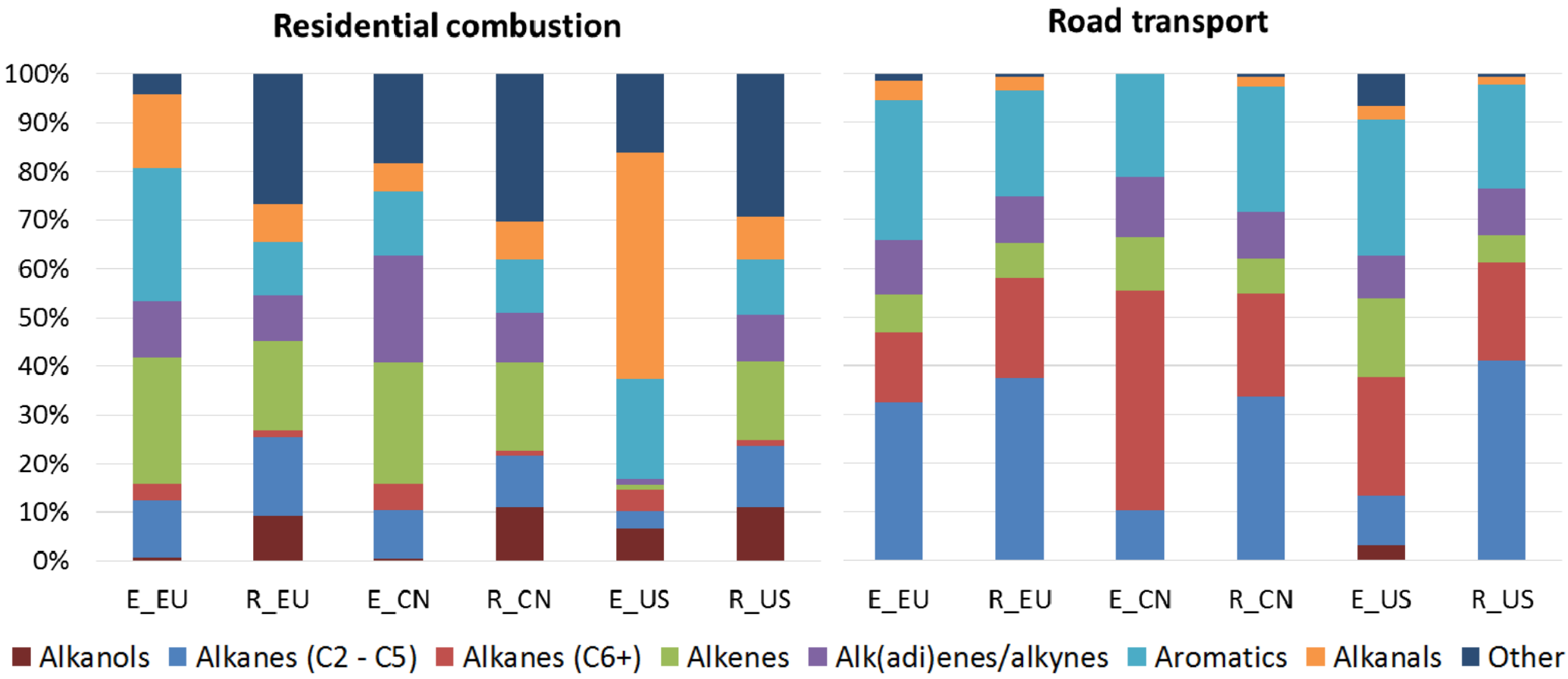


Quality assessment - by NMVOC species



Data Comparison

Speciated NMVOC emissions: EDGAR (E) vs Retro (R) by sector and region in 2000



Conclusions

- A global speciated NMVOC emission data set is developed by compiling and allocating region- and source- specific NMVOC speciation profiles to the EDGAR v4.3.2 emission inventory.
- Species time series for the period 1970–2012 and global grid maps of 0.1×0.1◦ are produced by sector and species.
- Case studies for Germany and the UK show that the implementation of transport emission control strategies and the fuel shift from coal to cleaner fuels (oil, natural gas, and solid biomass) have led to increased shares of alkanes and alkanals and a decreased share of aromatics.
- A quality assessment of the generated data sets has been performed based on mapping quality codes assigned to each matching.
- The speciated EDGAR emission data sets interpret better the regional variations of NMVOC composition compared to the RETRO emission inventory.

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http://edgar.jrc.ec.europa.eu/overview.php?v=432_VOC_spec

Thank You!

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