Energy Use and Environmental Impacts of China's On-Road Transport

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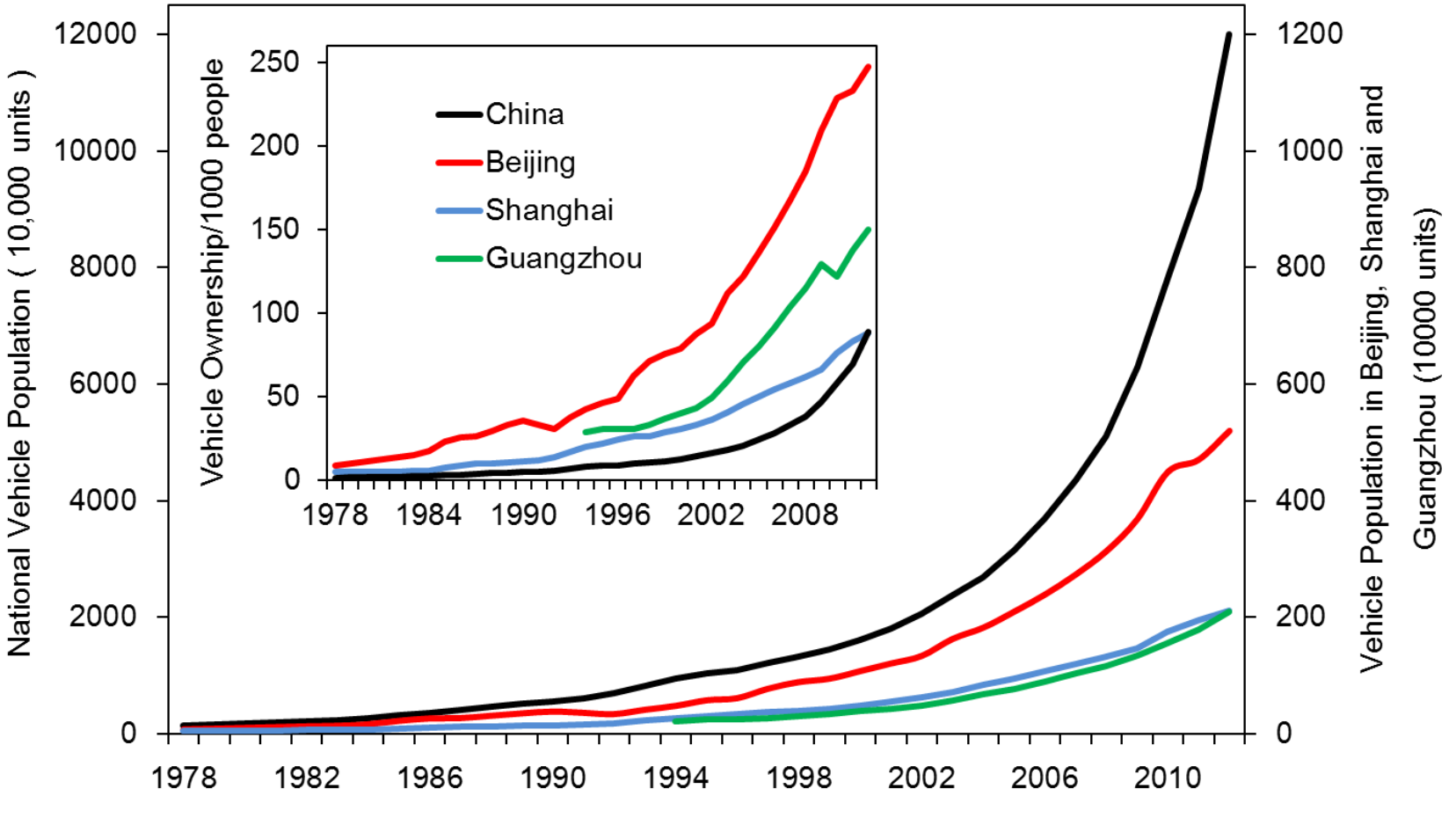
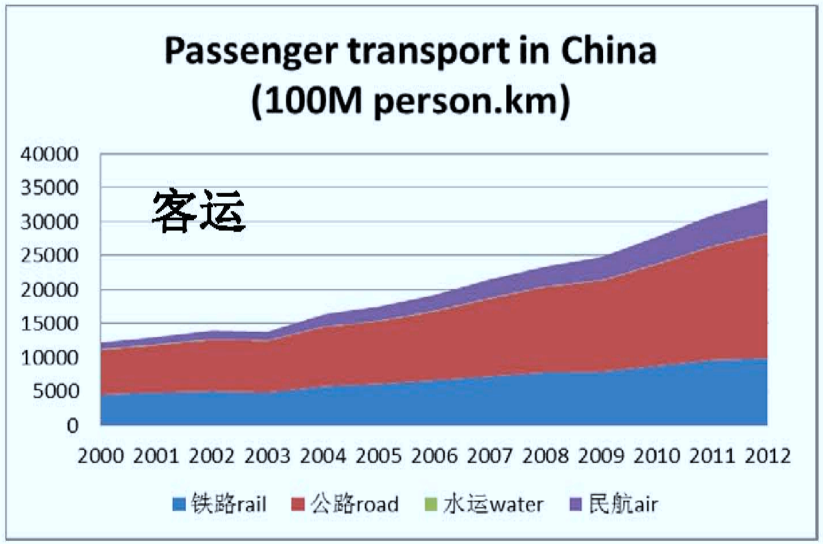
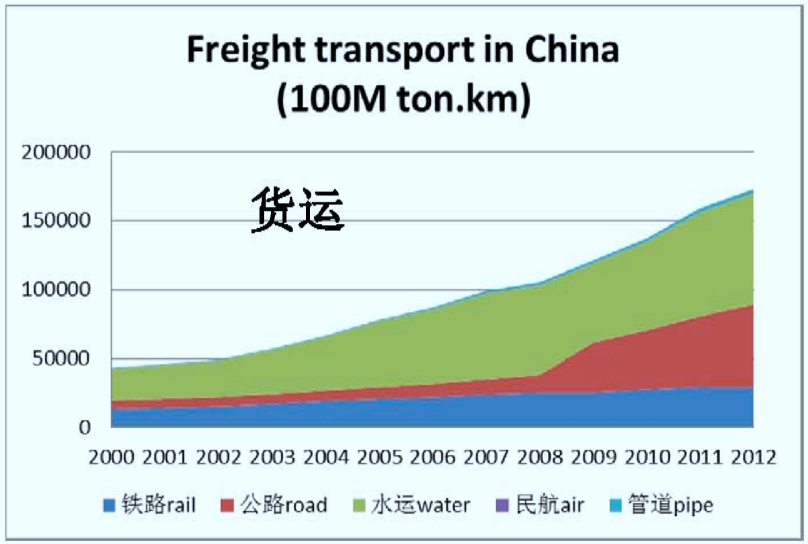
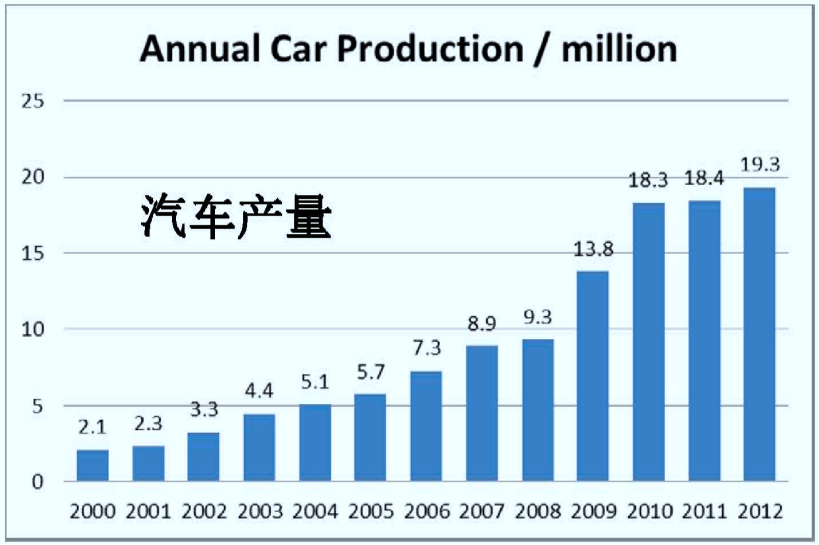
China's Vehicle Population Is Growing Significantly

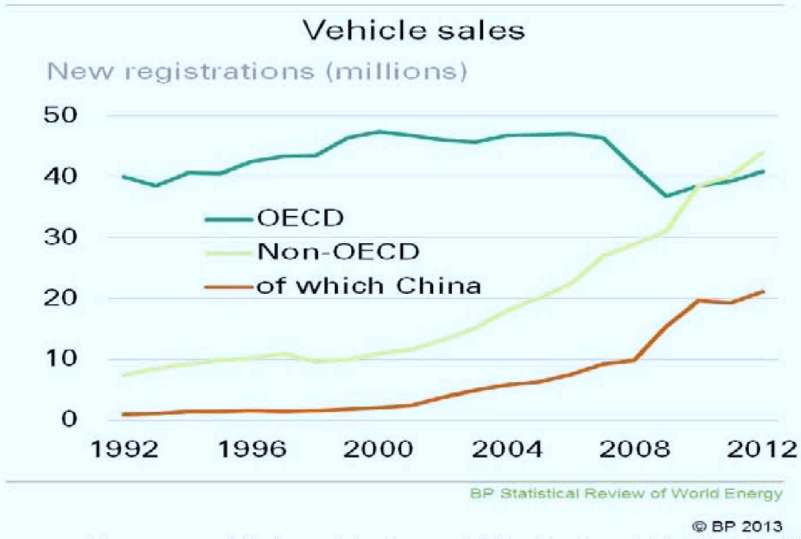


Transportation demand drives oil demand



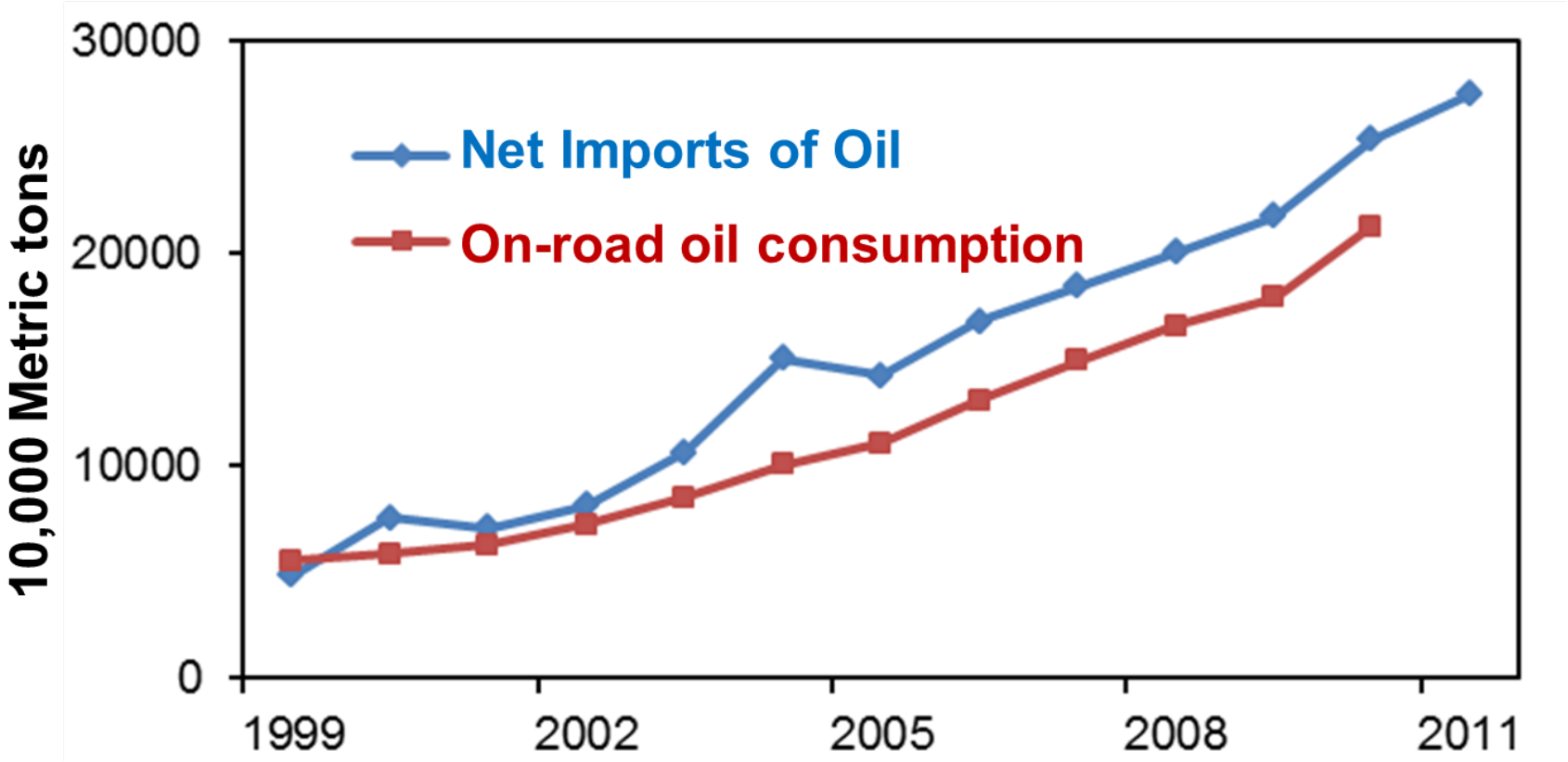






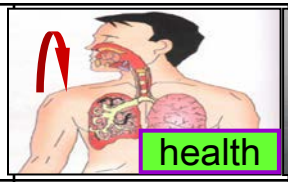
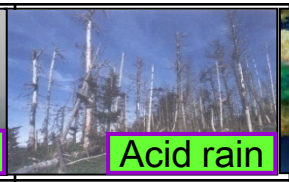
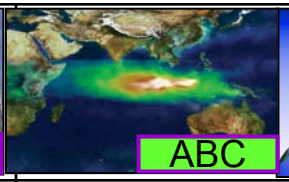
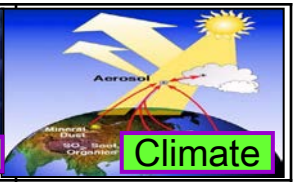
Source: China National Statistical Bulletin 2011

Growth of On-Road Transport Is the Major Driving Force of the Increasing Amount of Oil Import in China

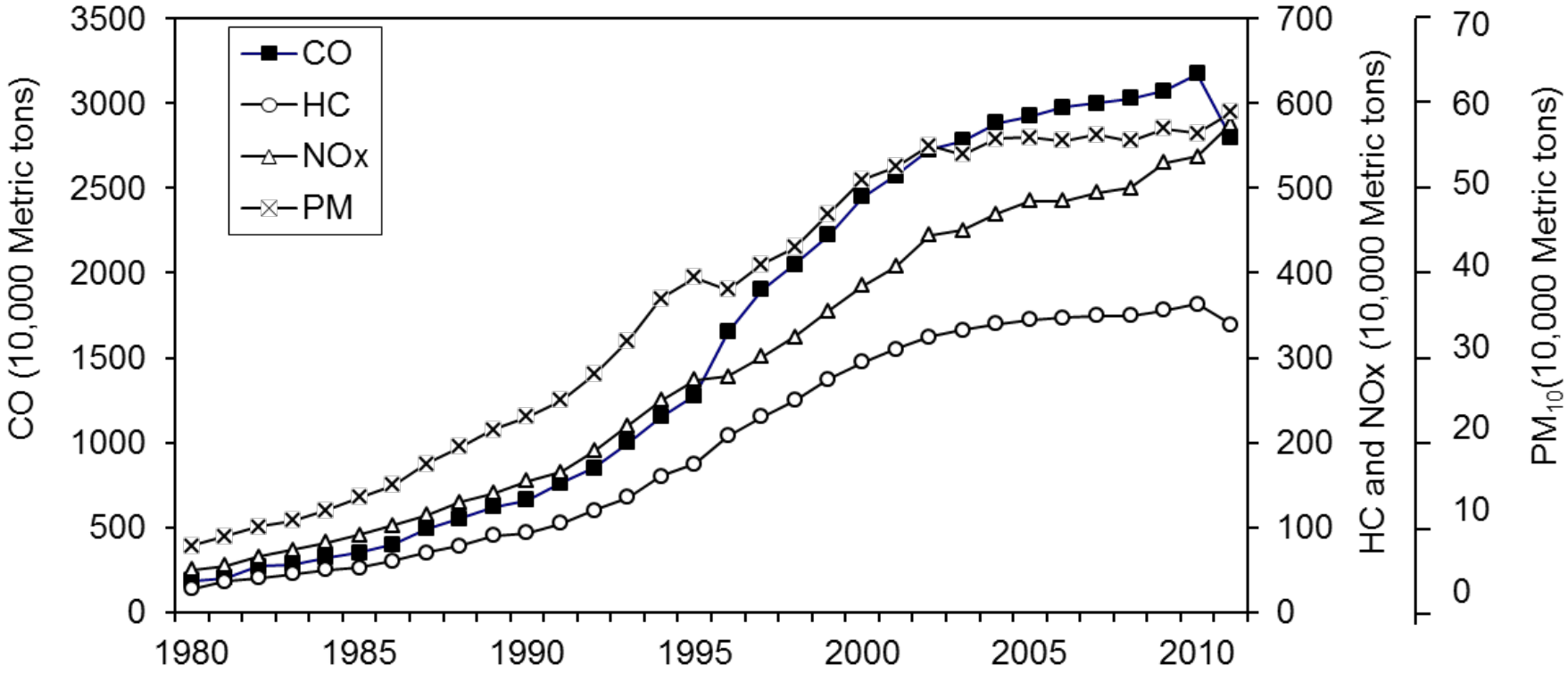


In 1993, China became a net oil-import country, now the dependence on imported oil is close to 60%.

Impacts of Atmospheric Components

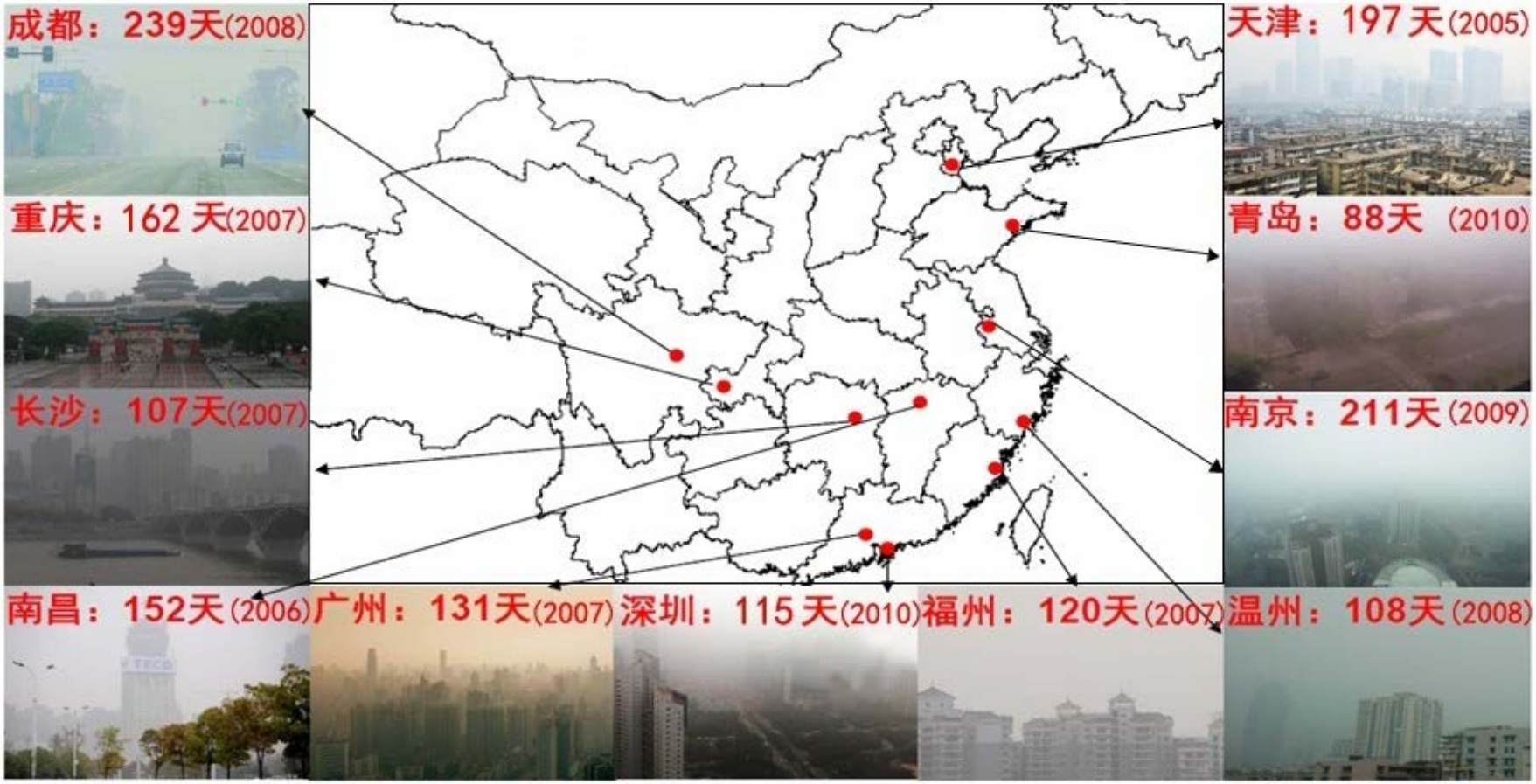
	 health	 Haze	 Acid rain	 ABC	 Climate
SO_4^{2-}	☹	☹	☹	☹	☺
NO_3^-	☹	☹	☹	☹	☺
OC	☹	☹	☹	☹	☺
BC	☹	☹	☹	☹	☹
O_3	☹	☹	☹	☹	☹

On-road CO and HC emissions have shown a decreasing trend, but PM and NO_x emissions keep increasing



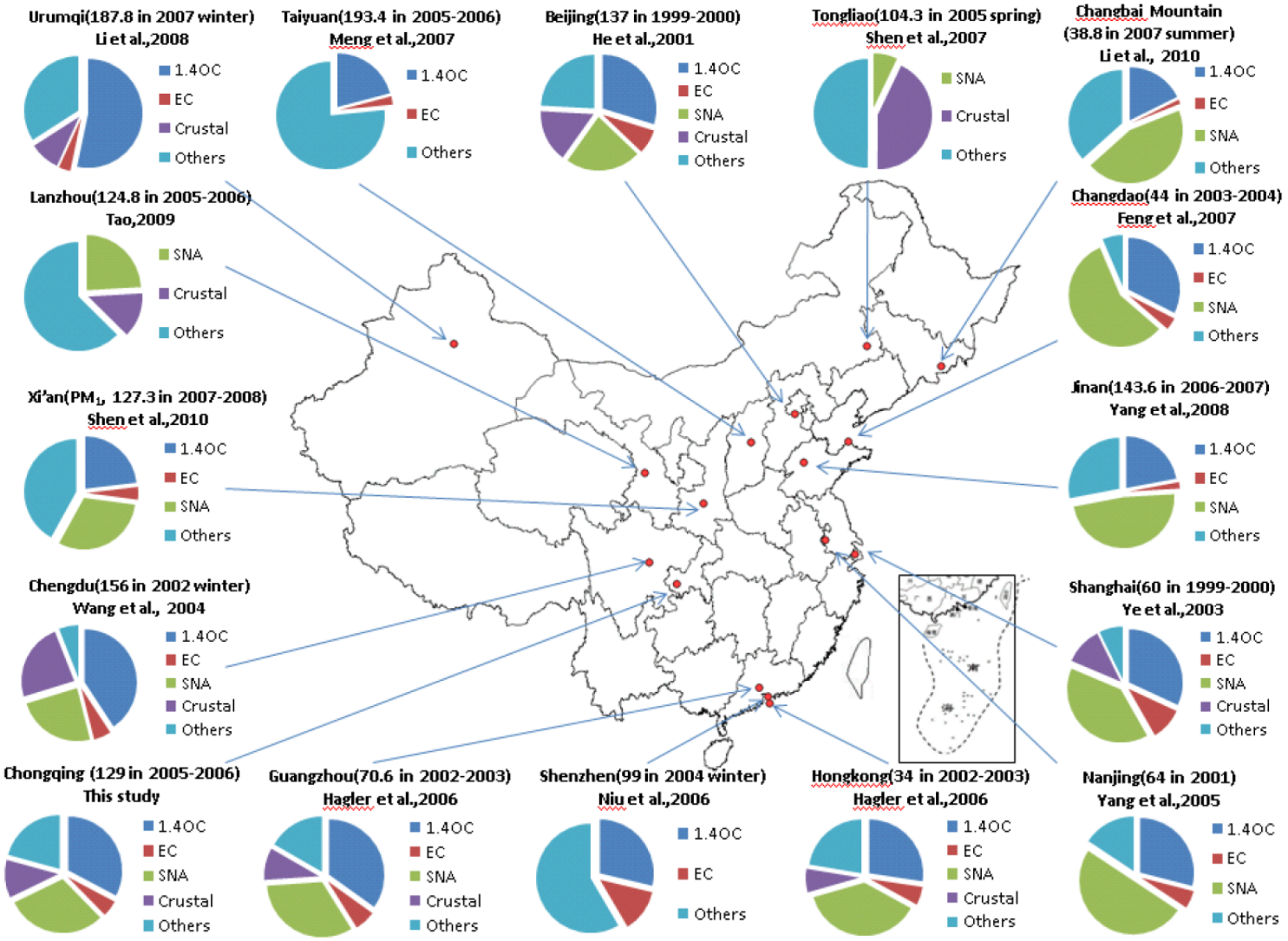
Variation Trend in On-road Emissions from 1980 to 2012 (source: China MEP)

$PM_{2.5}$ Pollution has become a serious concern in China and vehicles are an important contributor



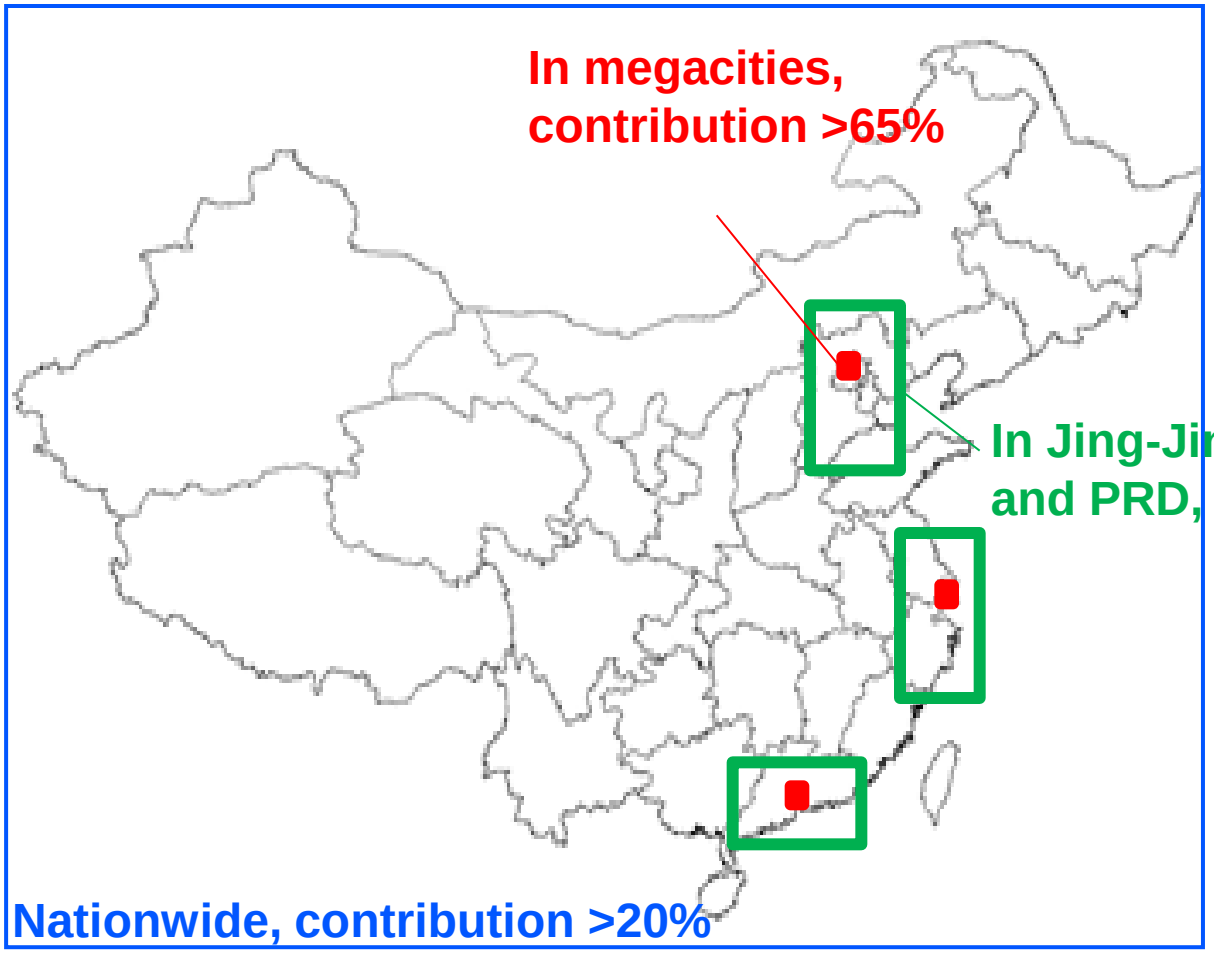
- 40% days of nonattainment.
- Daily concentrations were 4 times higher than AAQS
- It has caused great attentions from the government and the public

SNA (sulfate, nitrate and ammonium) is the major component in $PM_{2.5}$ of Eastern China

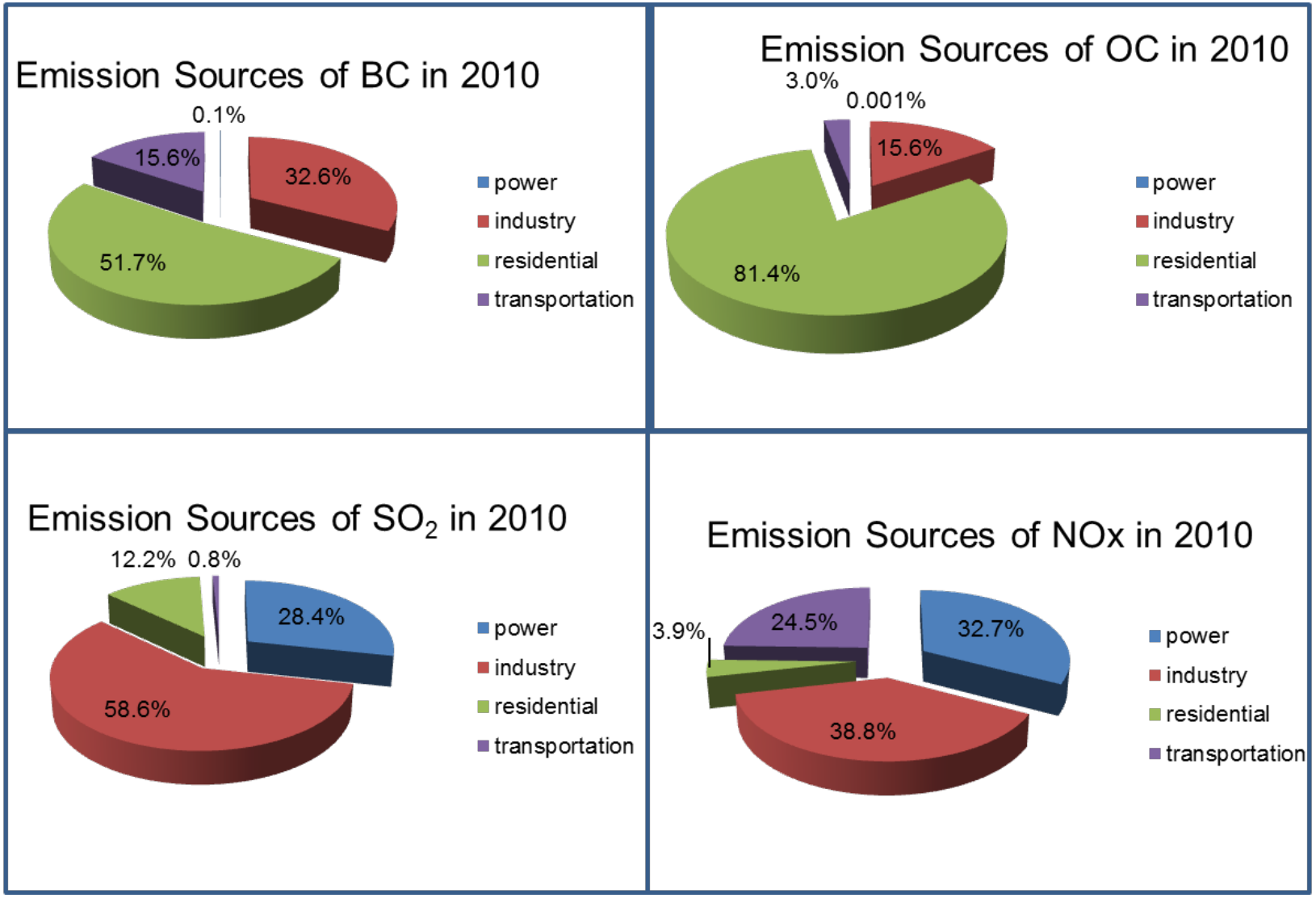


Atmos. Chem. Phys., 2011

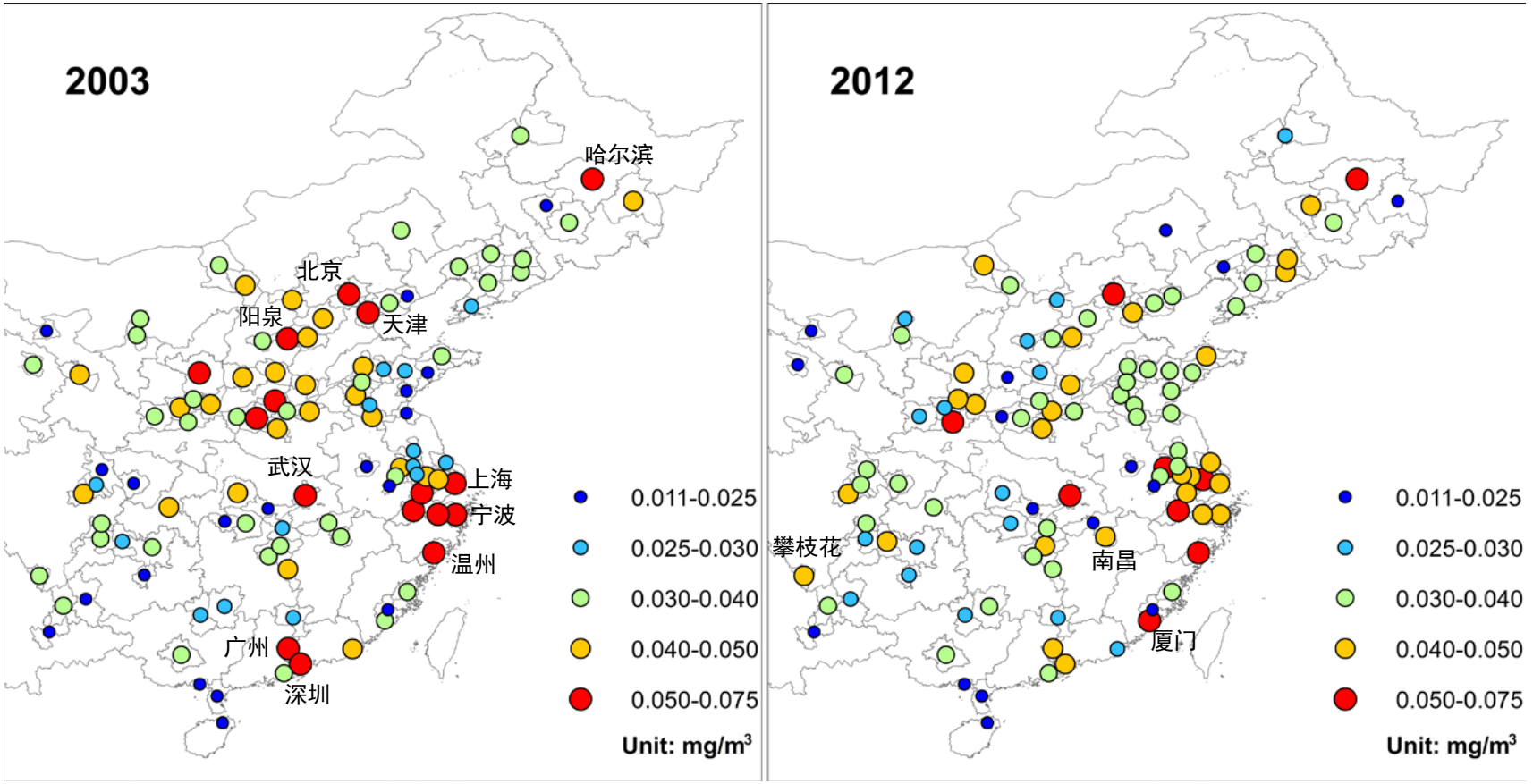
On-Road Transport Has Become a Major Source of Gaseous Pollutants (CO, VOC, and NOx) in China



Transportation is an Important Source of BC and NO_x Emissions

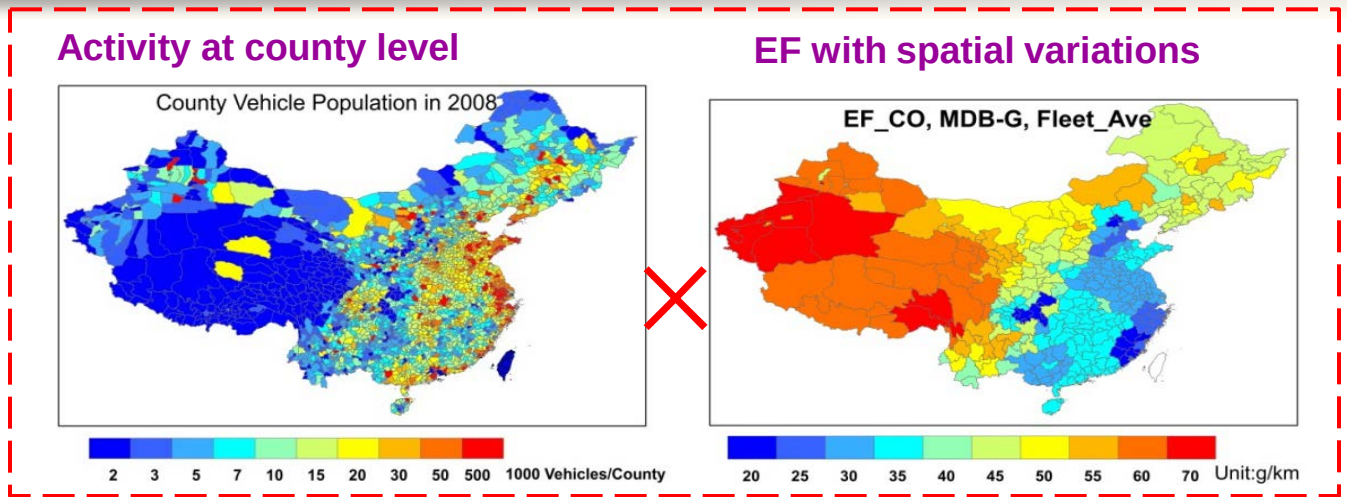


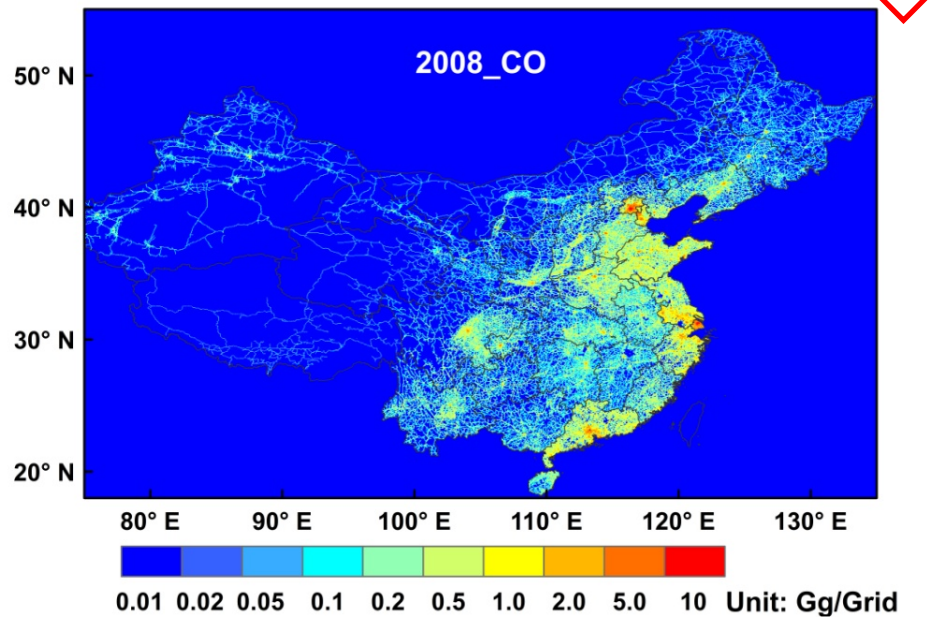
Geographical Pattern of Vehicle Pollution Is Changing

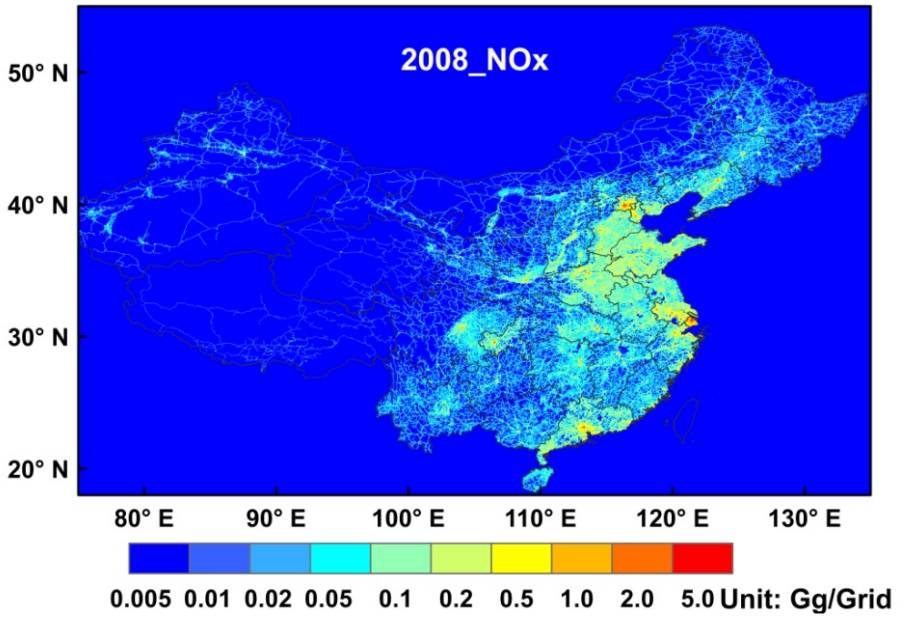


Annual NO_x concentrations of over 100 Chinese cities in 2003 and 2012 shows that annual NO_x concentrations are decreasing in large cities but increasing in medium and small cities.

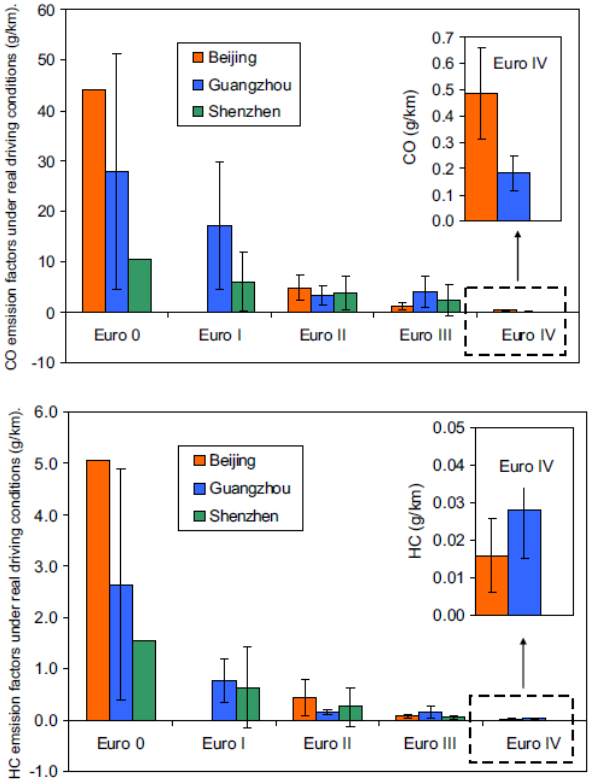
A High Resolution, County-Level Vehicle Emission Inventory is Developed to Analyze the Spatial Distribution of Vehicle Emissions



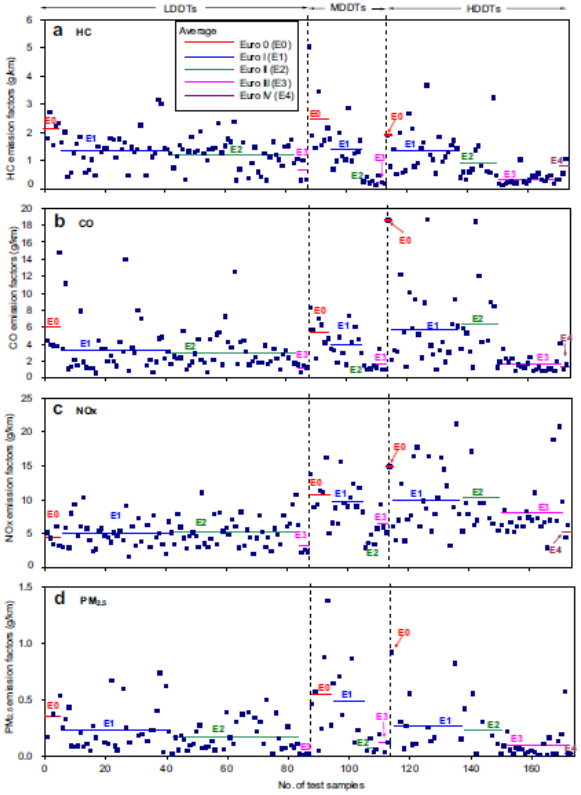




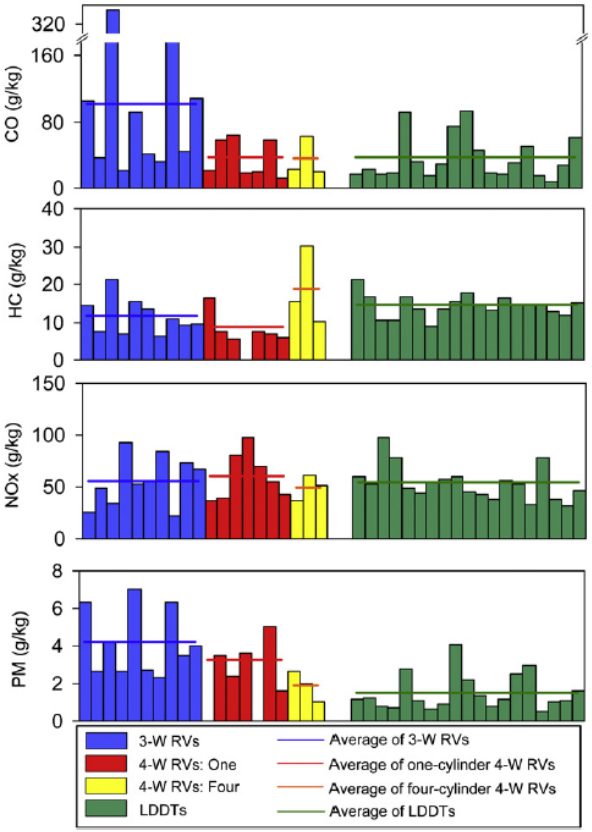
A Large Number of On-Board Emission Measurements on Various Type of Vehicles Have Been Conducted in China



Gasoline Cars

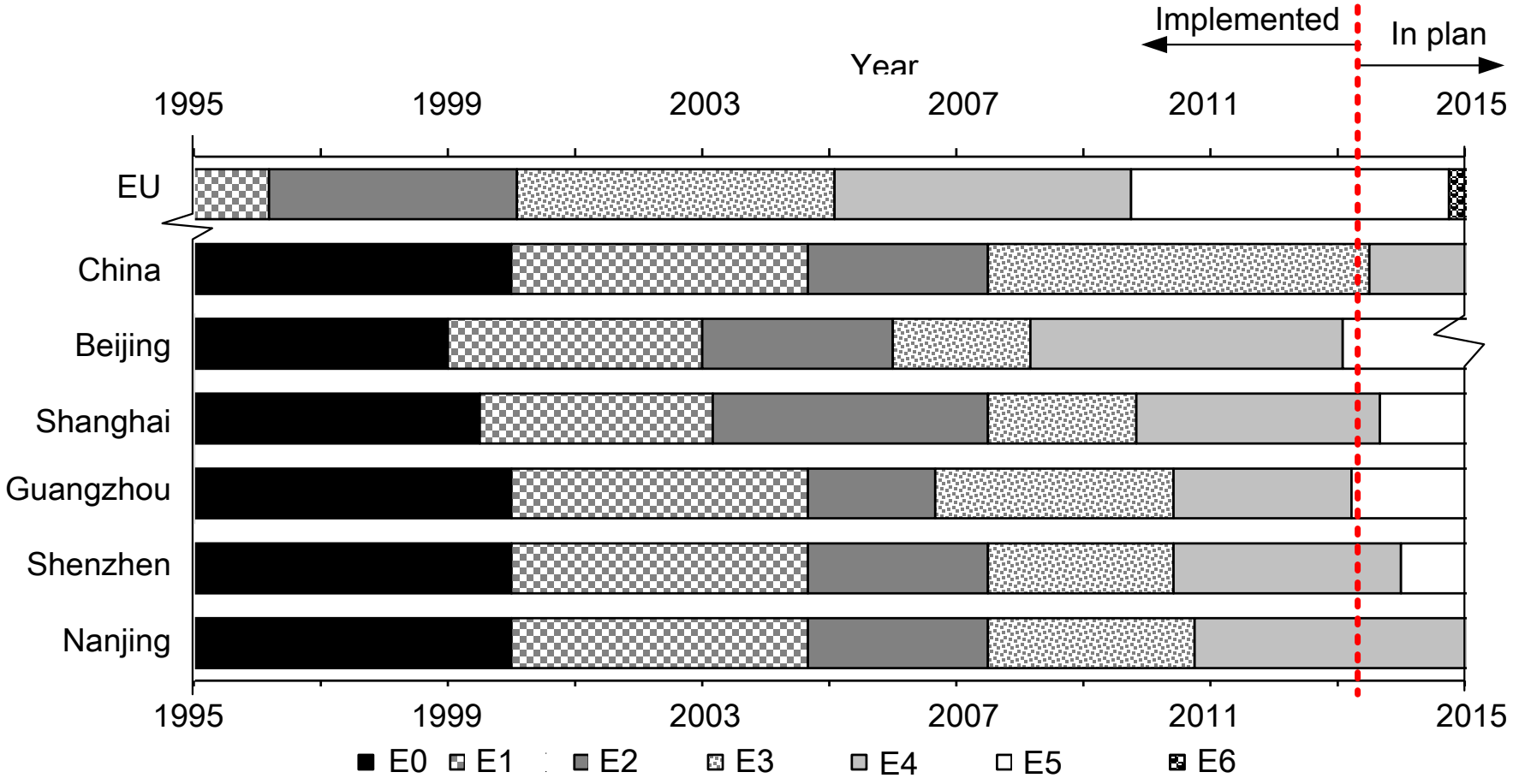


Diesel trucks

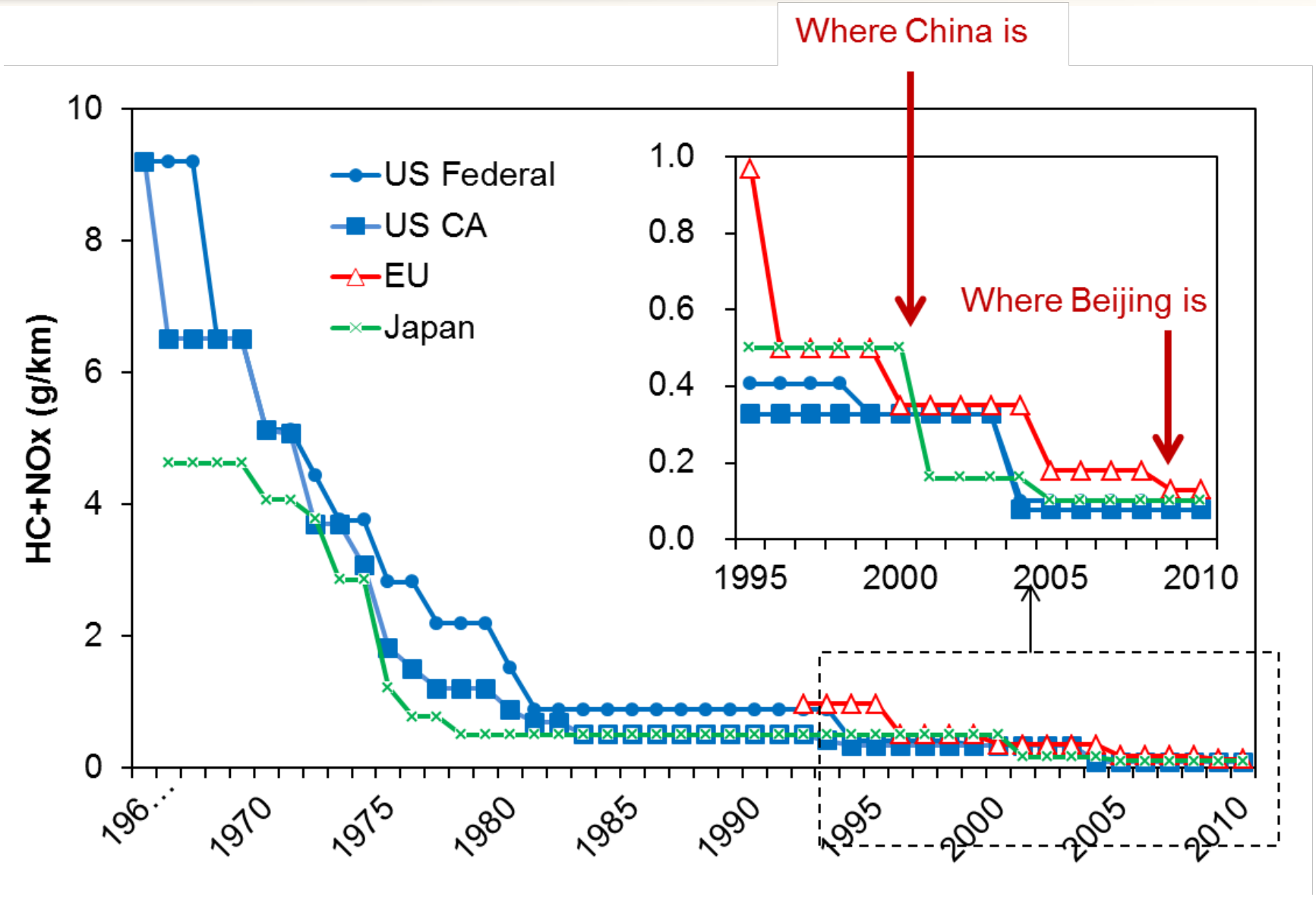


Rural Vehicles

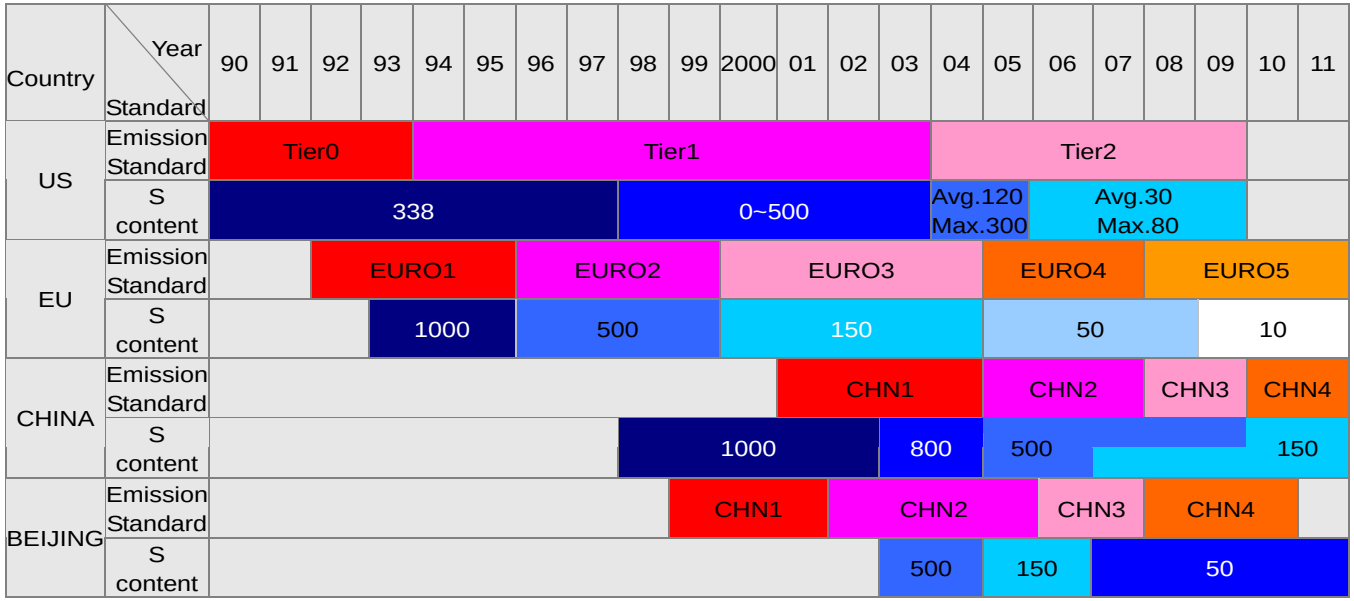
China's Vehicle Emission Standards Are Following EU's Standard System



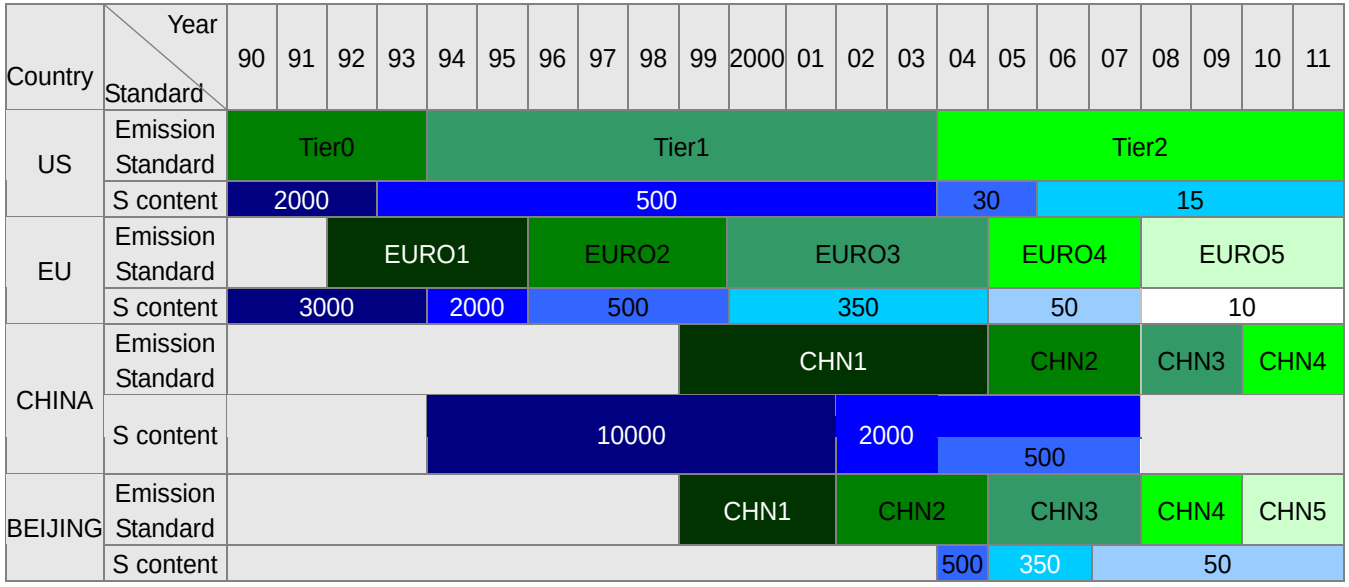
China's Standards Are Years Behind the US and EU Level, and Oil Quality Is the Largest Bottleneck to Further Promote the Standards



Standards for GV



Standards for DV



Policies for Reducing Oil Demand of Vehicles

❖ Fuel economy standards:

For light-duty passenger cars

- Stage I and Stage II: implemented in 2005 and 2008, respectively, improved the fuel economy by 15% (**30mpg** in 2009);
- Stage III: Implemented in 2012, is expected to bring another 15% of improvement in fuel economy by 2015 (**34 mpg** in 2015);
- Stage IV: achieve **47 mpg** by 2020;

❖ Advanced Vehicles:

- Development Plan of Energy-Efficient and New-Energy Vehicles (2012−2020)" : achieve accumulated sales of 500,000 new-energy vehicles (hybrids and electric vehicles) by 2015, and 5 million by 2020.

Policies for Controlling Vehicle Emissions

- **The new national ambient air quality standard was issued in 2012 and will be implemented in 2016, which**
  - Tightens the annual NO_x concentration from 0.08mg/m^3 to 0.04mg/m^3.
  - Includes $PM_{2.5}$ and 8-hour O_3 for the first time.
- **A national goal is set for NO_x emission control in the 12th Five-Year Plan**
  - To reduce the national NO_x emissions by 10% from 2010 to 2015.
  - On-road transport is the second largest NO_x emission contributor after power plants, and thus is targeted as a key control sector.
- **Emission standards**
  - More stringent standards will be implemented in near future
- **Accelerating vehicle scrappage**
  - Subsidies are provided for scrapping old vehicles

Thanks!