Energy and Air Pollution Trends: Germany and China

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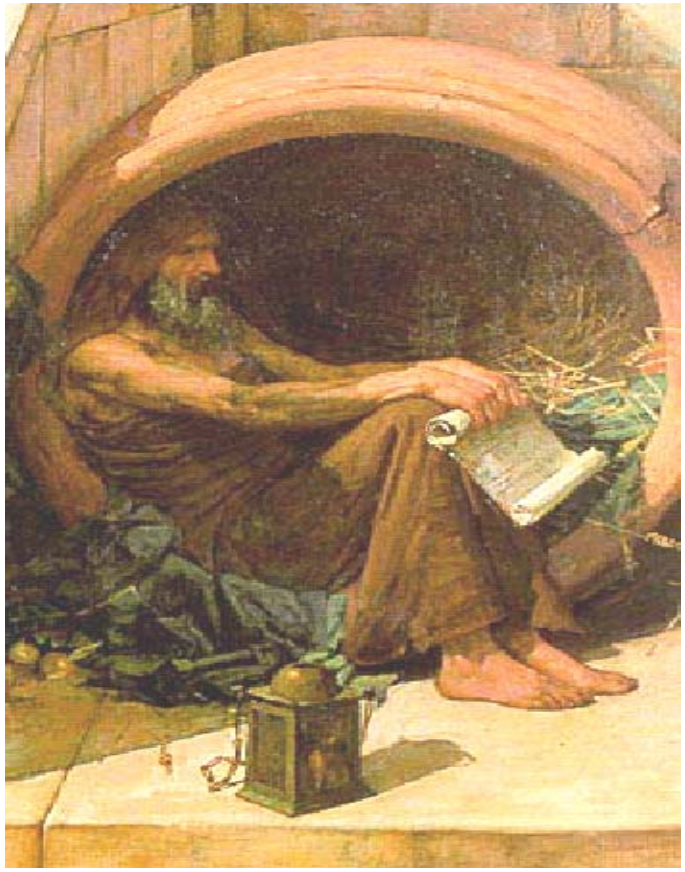
Living in a ton



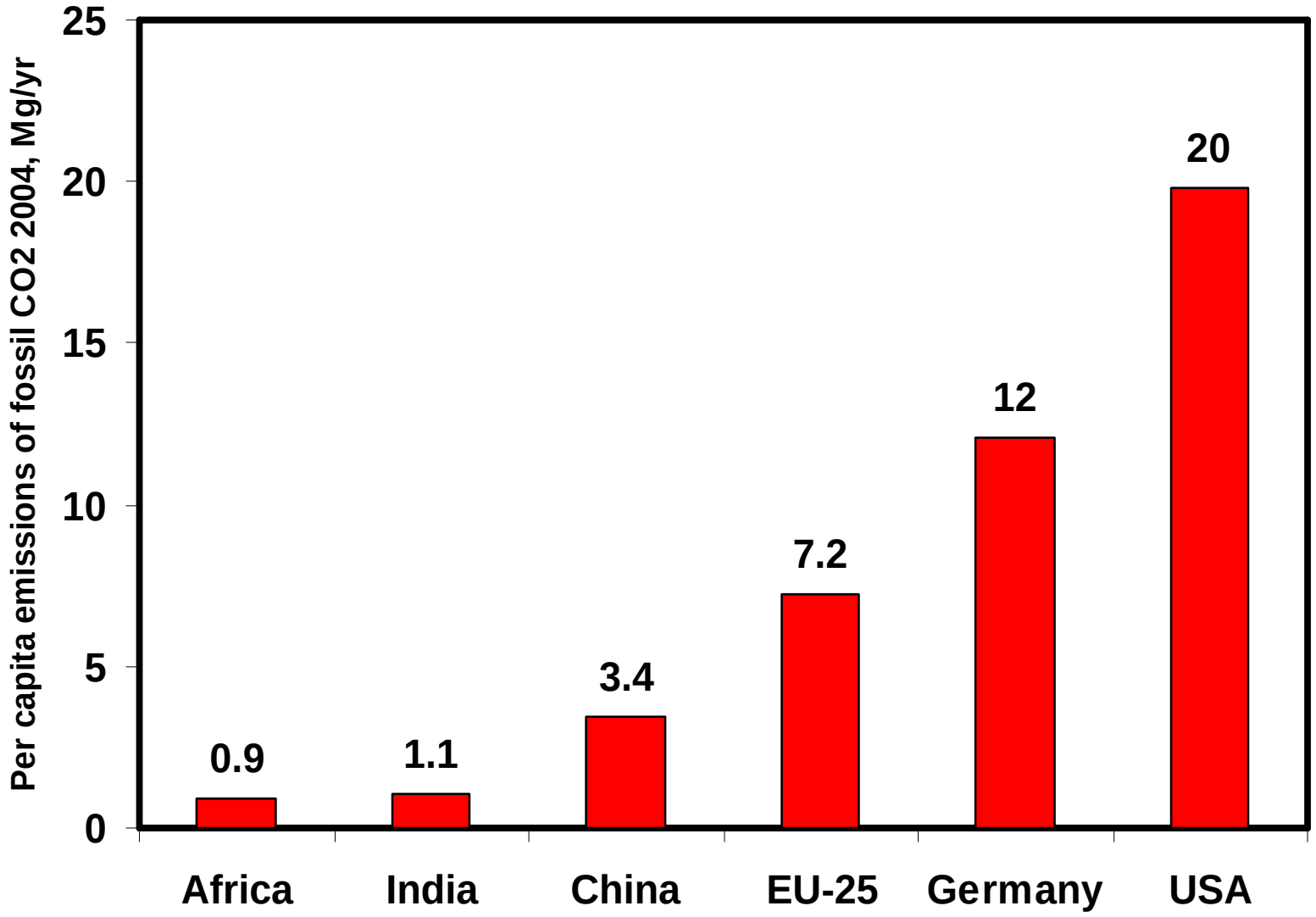
Diogenes von Sinope (412 – 323 B.C.)

Greece

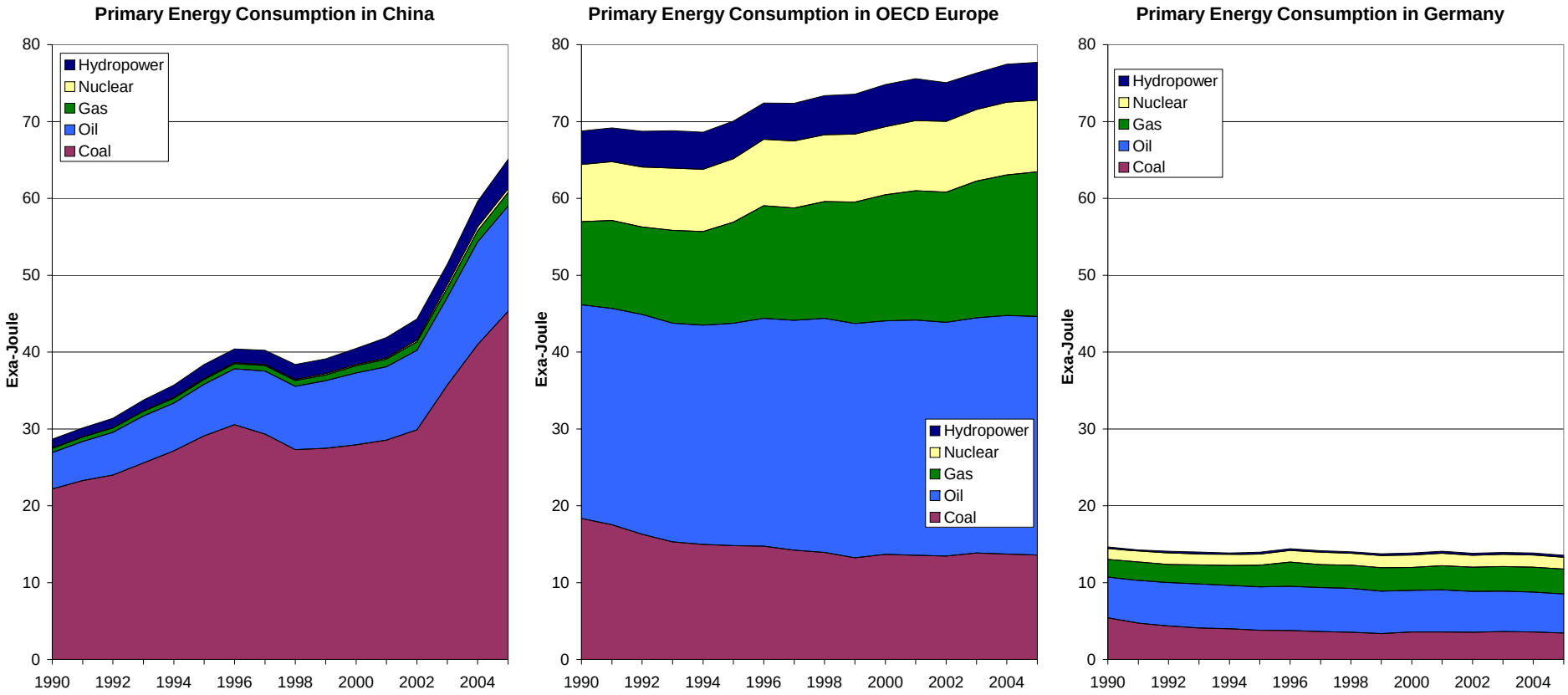
advocated a self-sufficient

and simple lifestyle

Living with tons: how many tons (of CO_2) do we need?

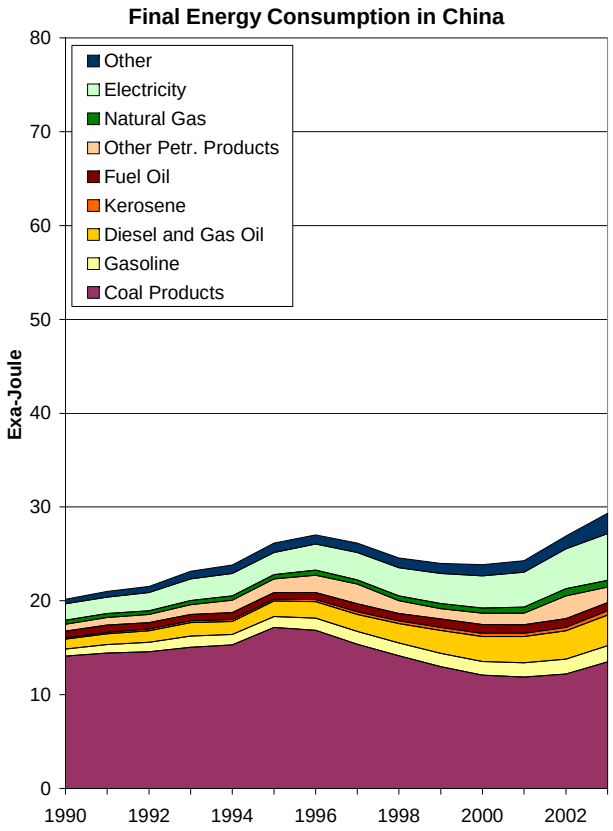


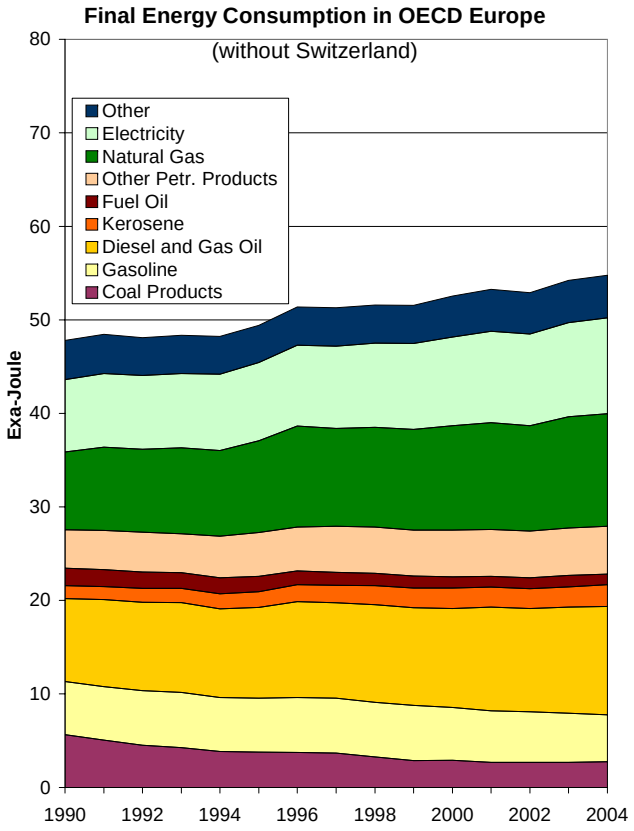
Primary Energy Consumption: China, Europe, Germany

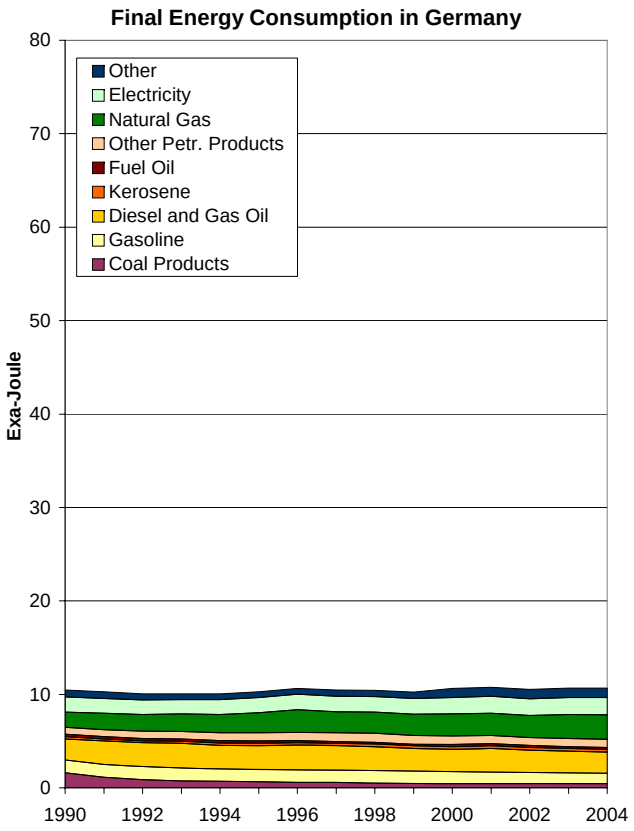


Source: BP

Final Energy Consumption: China, Europe, Germany

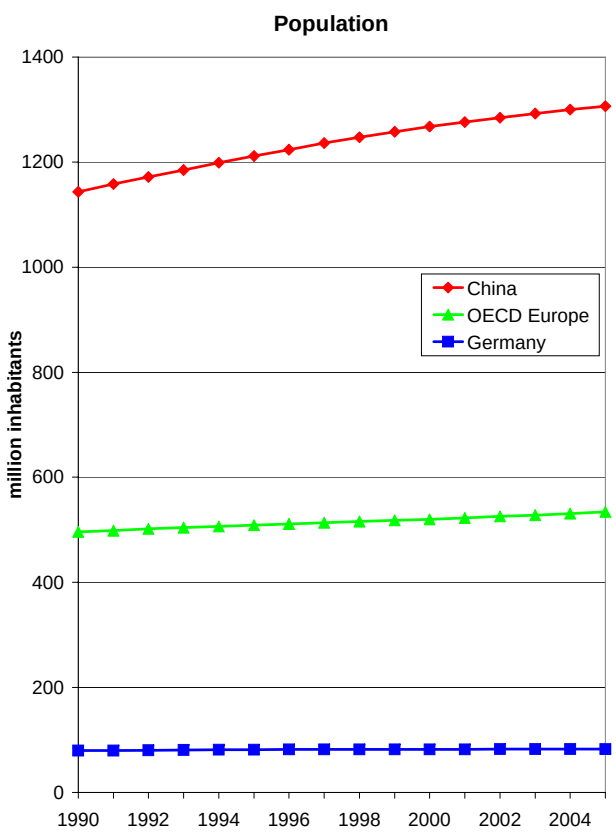


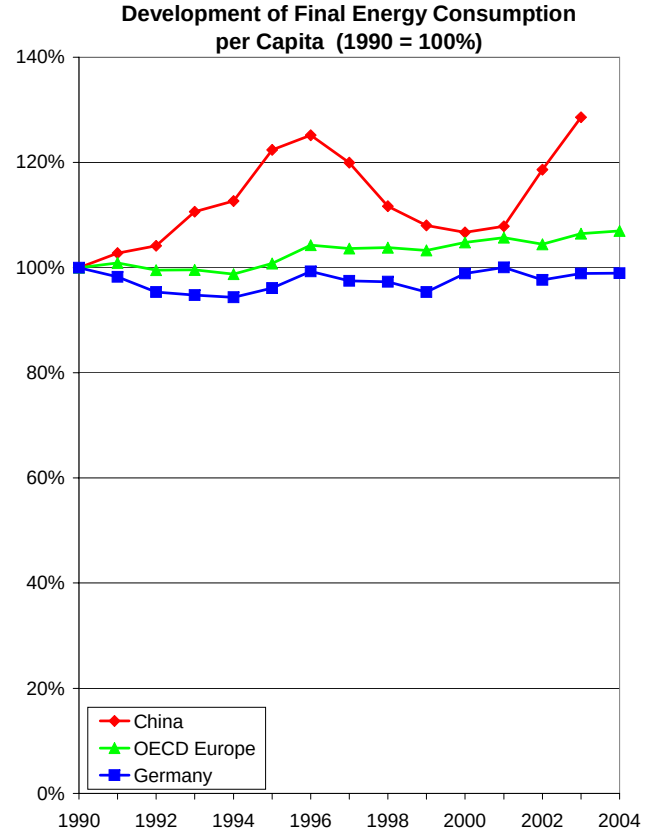


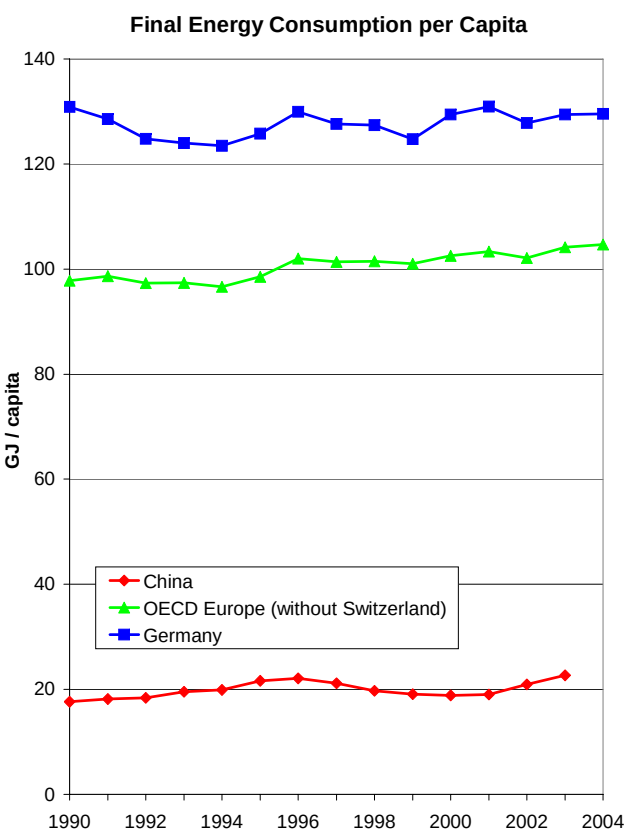


Source: China Statistical Yearbook, APEC, Eurostat

Population Energy Consumption: China, Europe, Germany

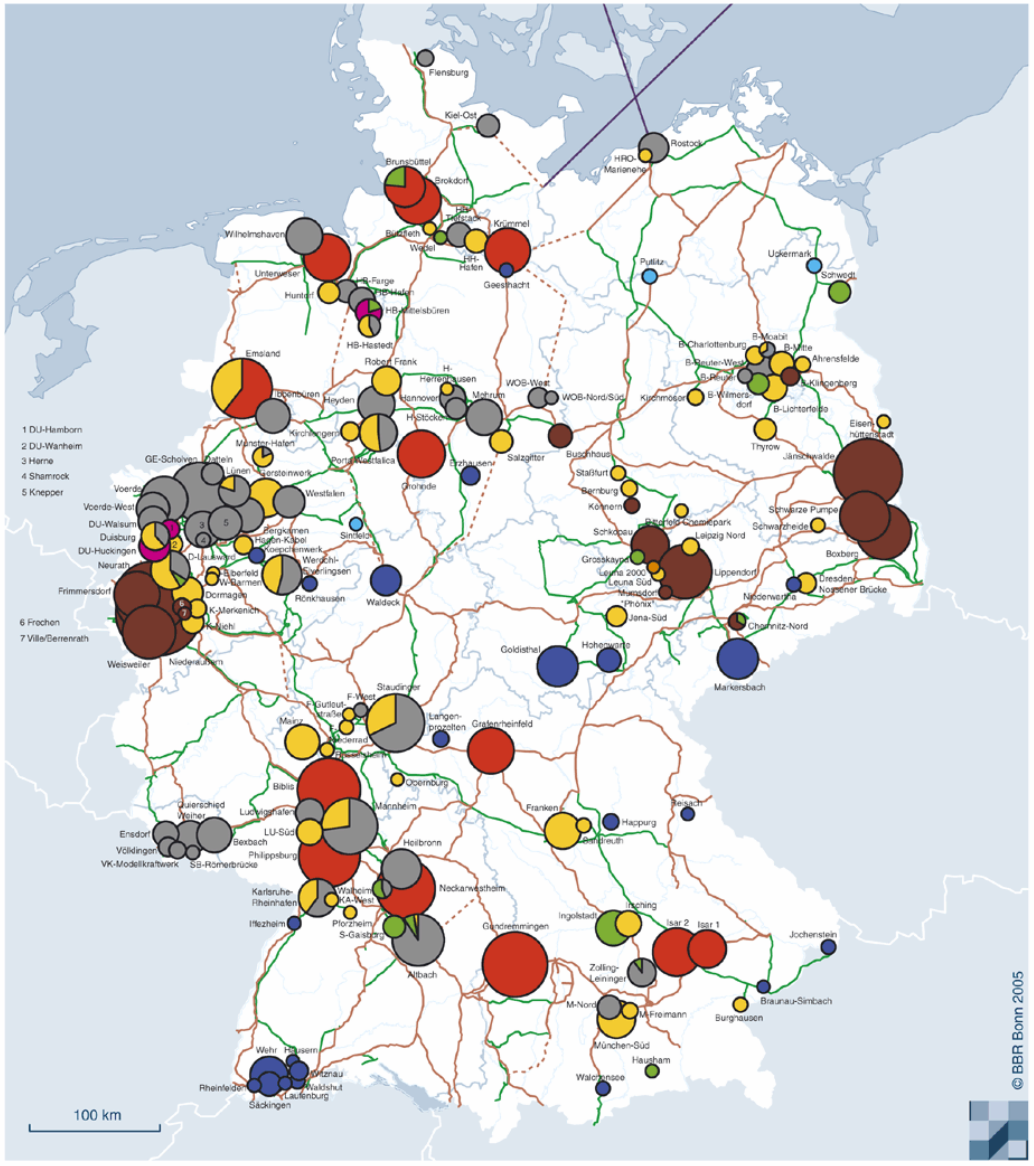






Source: China Statistical Yearbook, APEC, Eurostat, OECD

Power Plants in Germany

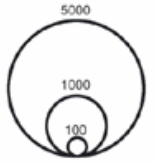


Kraftwerke in Deutschland ab 100 MW

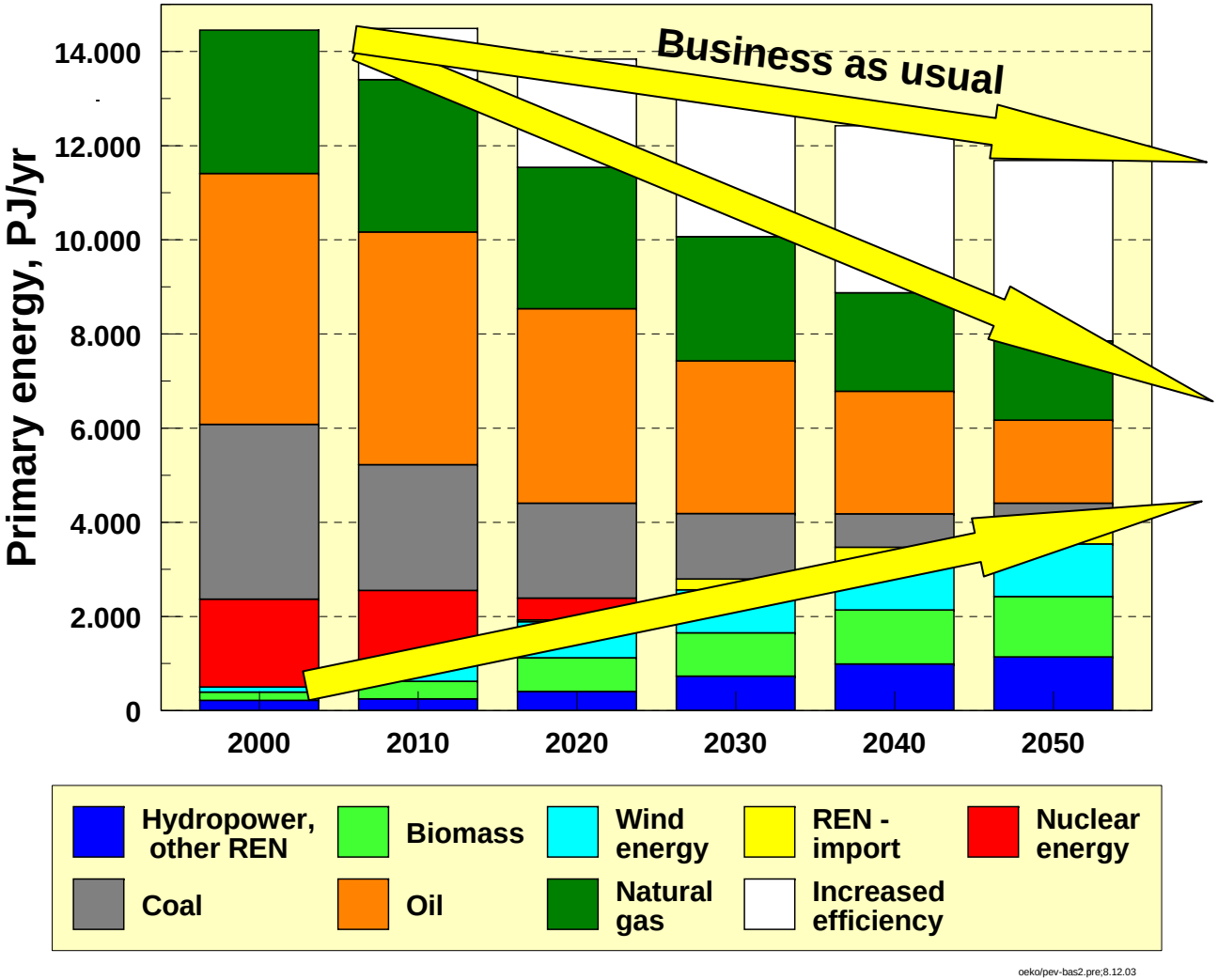
Energieträger

- Steinkohle
- Braunkohle
- Heizöl
- Kernenergie
- Wasser
- Wind
- Erdgas
- Gichtgas
- Raffineriegas

Bruttoleistung in MW



A necessary strategy: Increase efficiency, more renewables



Targets 2050:

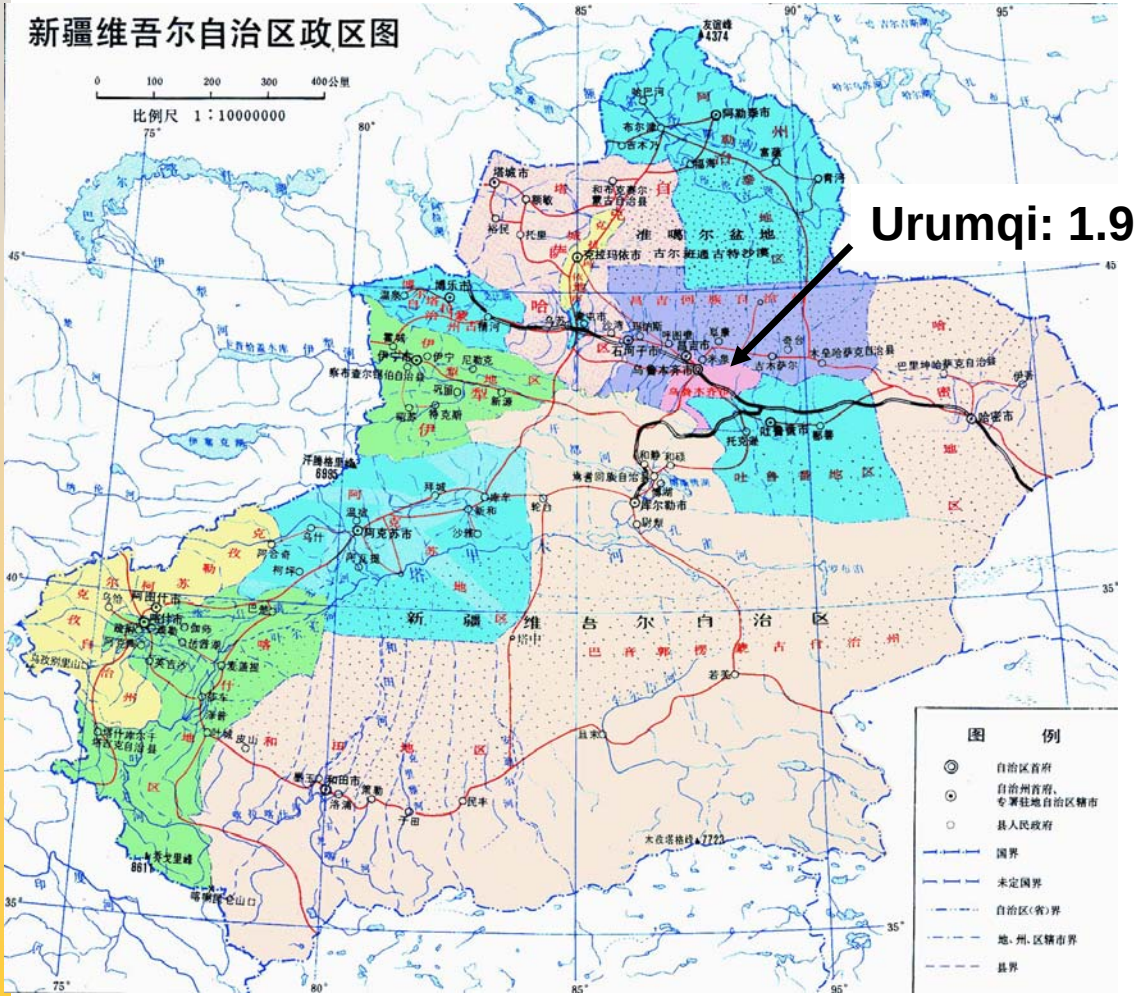
Substantial increase in efficiency = 35%

Substantial growth of Renewables = 35%

- 75% CO_2 (2000)

Source: DLR/IFEU/WI 2004 *Download: www.erneuerbare-energien.de*

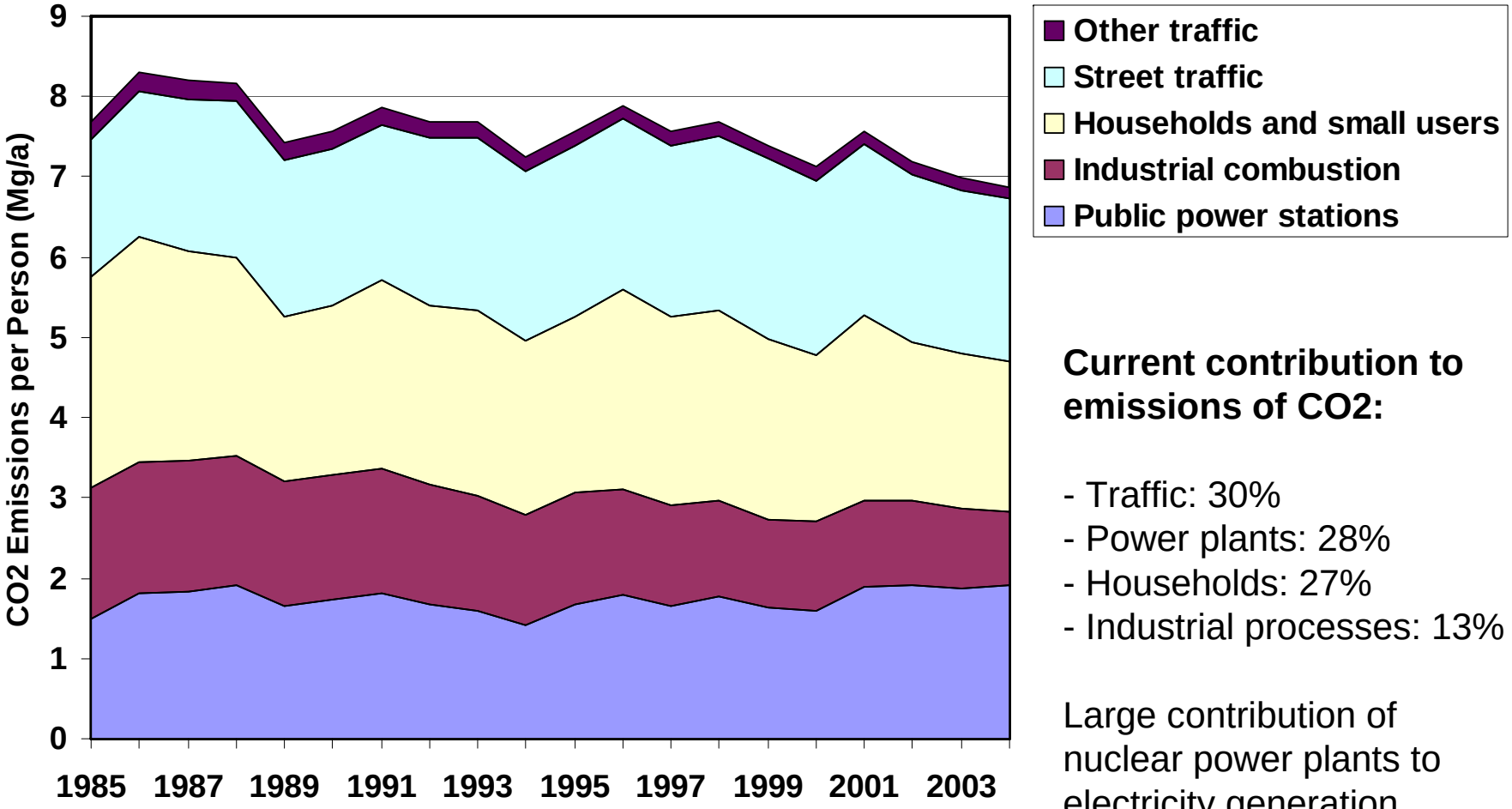
Xinjiang province has 3 times the size of Germany
Urumqi area equals 1/3 of the state of Baden-Württemberg



Urumqi: 1.9 Mio residents (160 per km²)

Baden-Württemberg: 11 Mio residents (300 per km²)

Baden-Württemberg: per Capita Emissions of Fossil CO_2

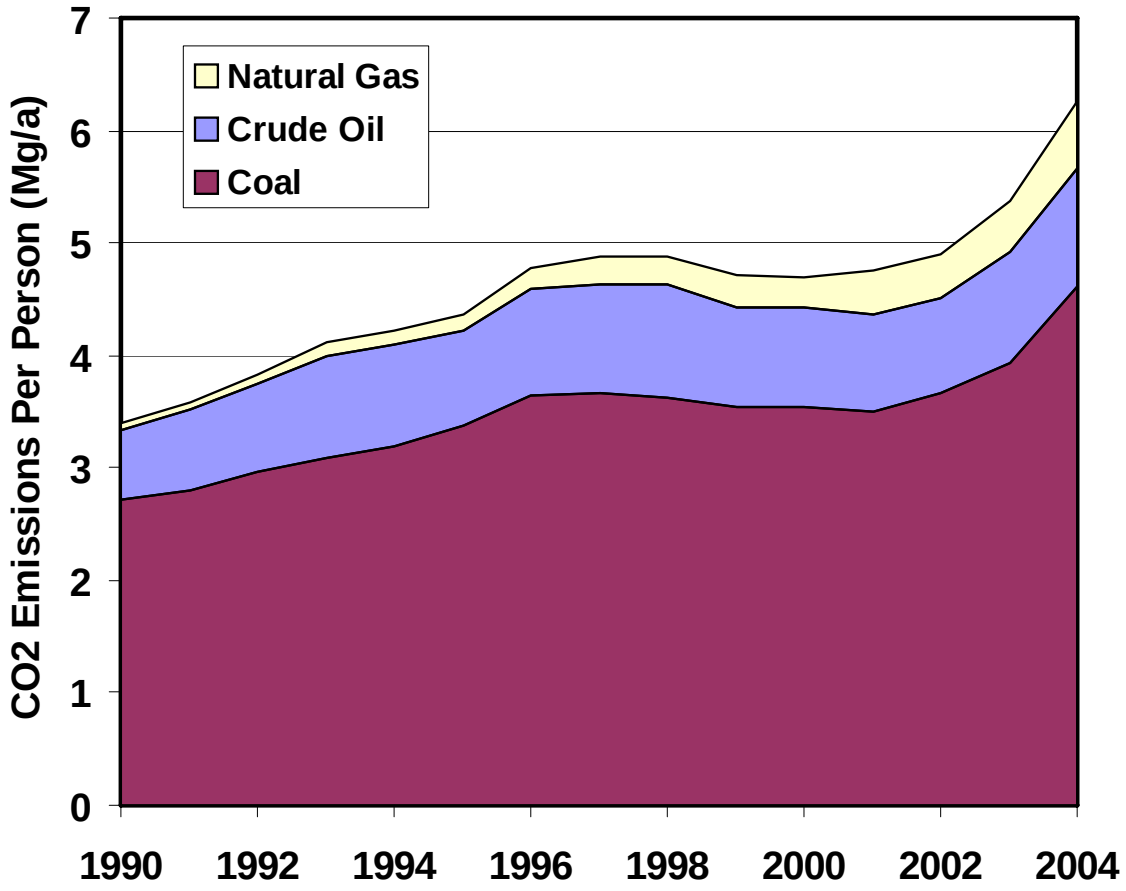


Current contribution to emissions of CO2:

- Traffic: 30%
- Power plants: 28%
- Households: 27%
- Industrial processes: 13%

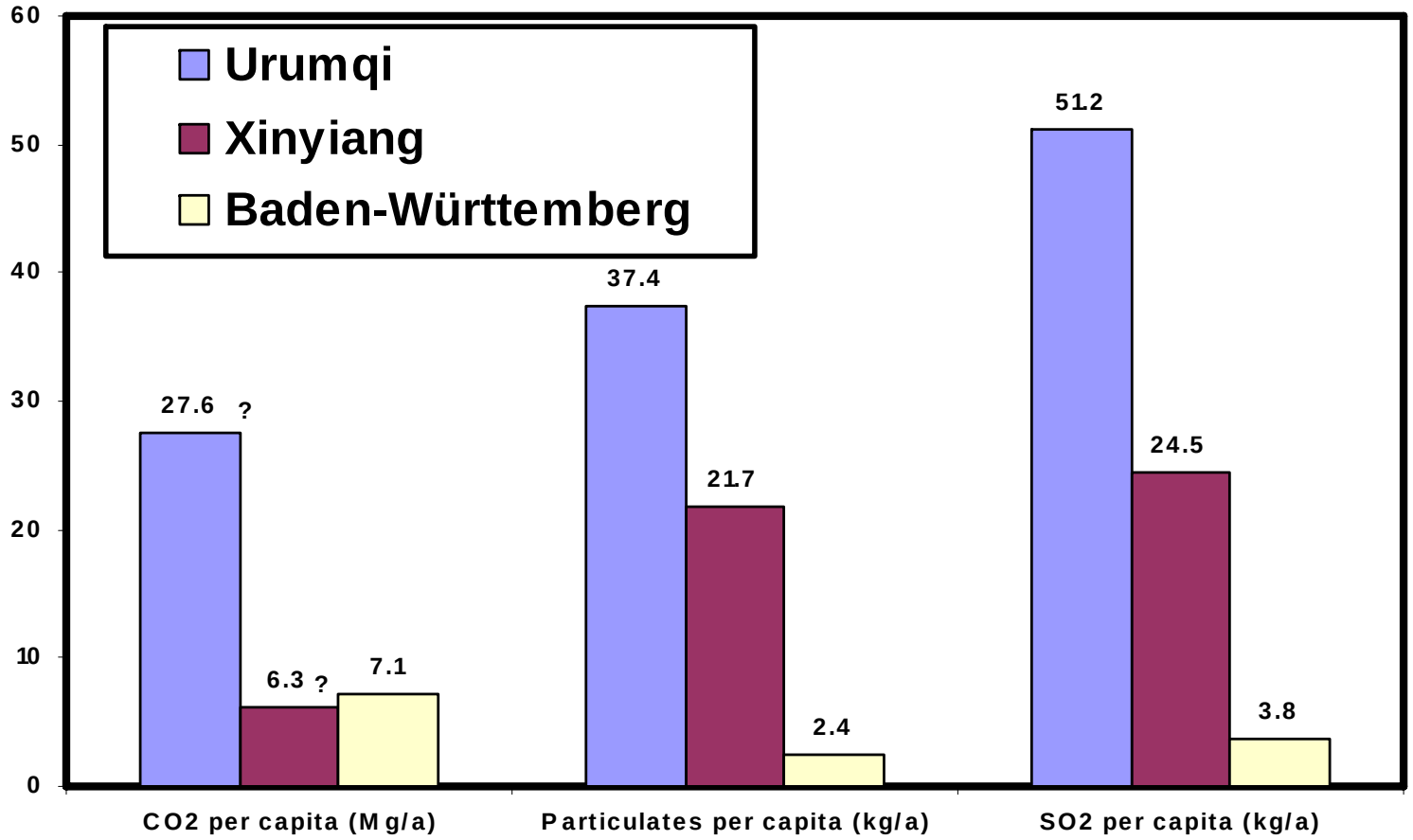
Large contribution of nuclear power plants to electricity generation

Xinjiang: per Capita Emissions of Fossil CO_2

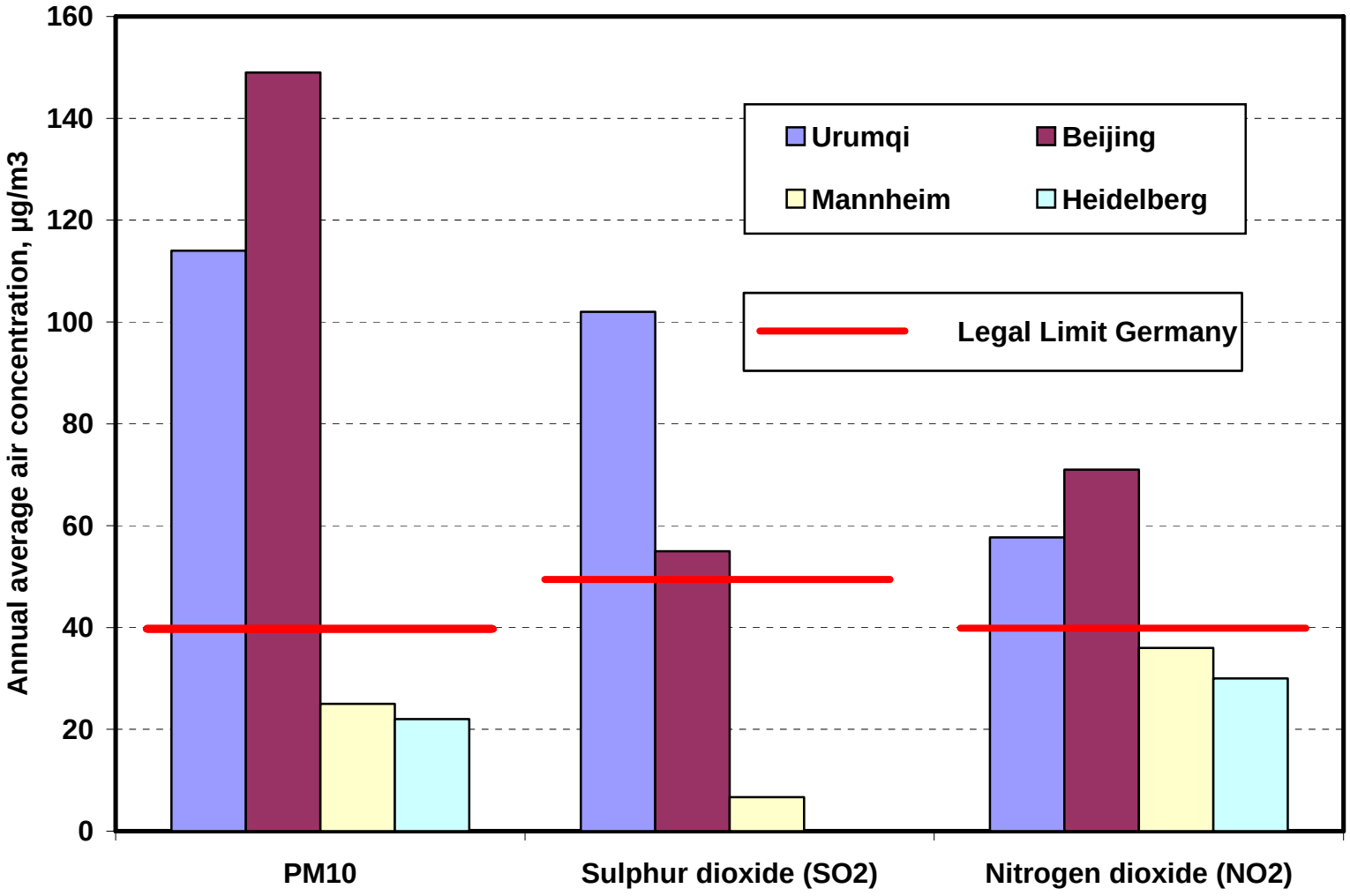


Source: 2005 Xinjiang Statistical Yearbook
IPPC based conversion factors (Mg CO2 / Mg SCE) as follows: Lignite Coal 3.1; Oil 2.1; Natural gas 1.6)

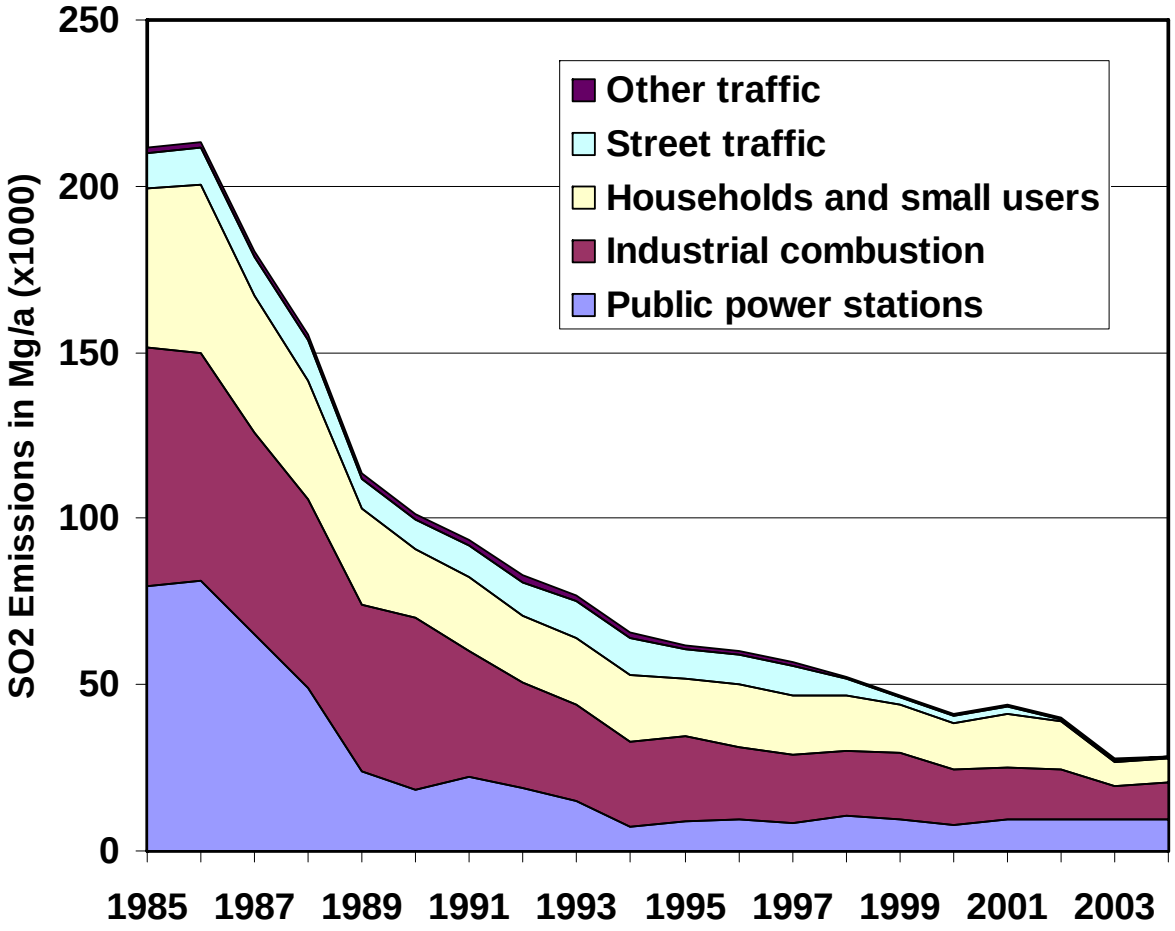
Per capita emissions in 2004: CO_2, particulates and SO_2



Air quality 2004 in comparison



Emissions of SO_2 in Baden-Württemberg



Reduction achieved by:

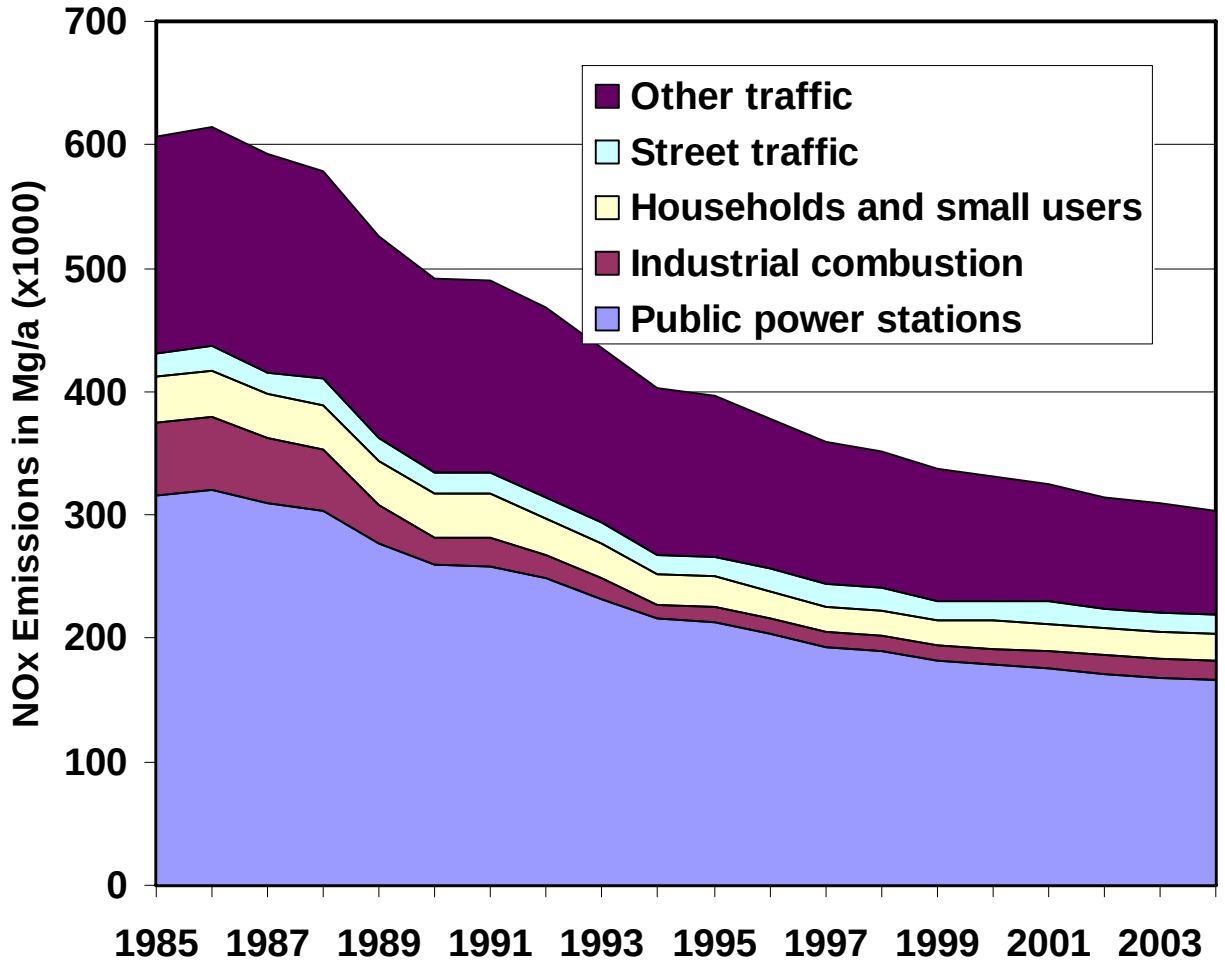
Stricter limits for large combustions plants adopted in 1984

Sulphur reduction in diesel fuel and heating oil

Switch to low-sulphur fuels (e.g. natural gas)

Increased energy conservation/efficiency

Emissions of NO_x in Baden-Württemberg



Reduction achieved by:

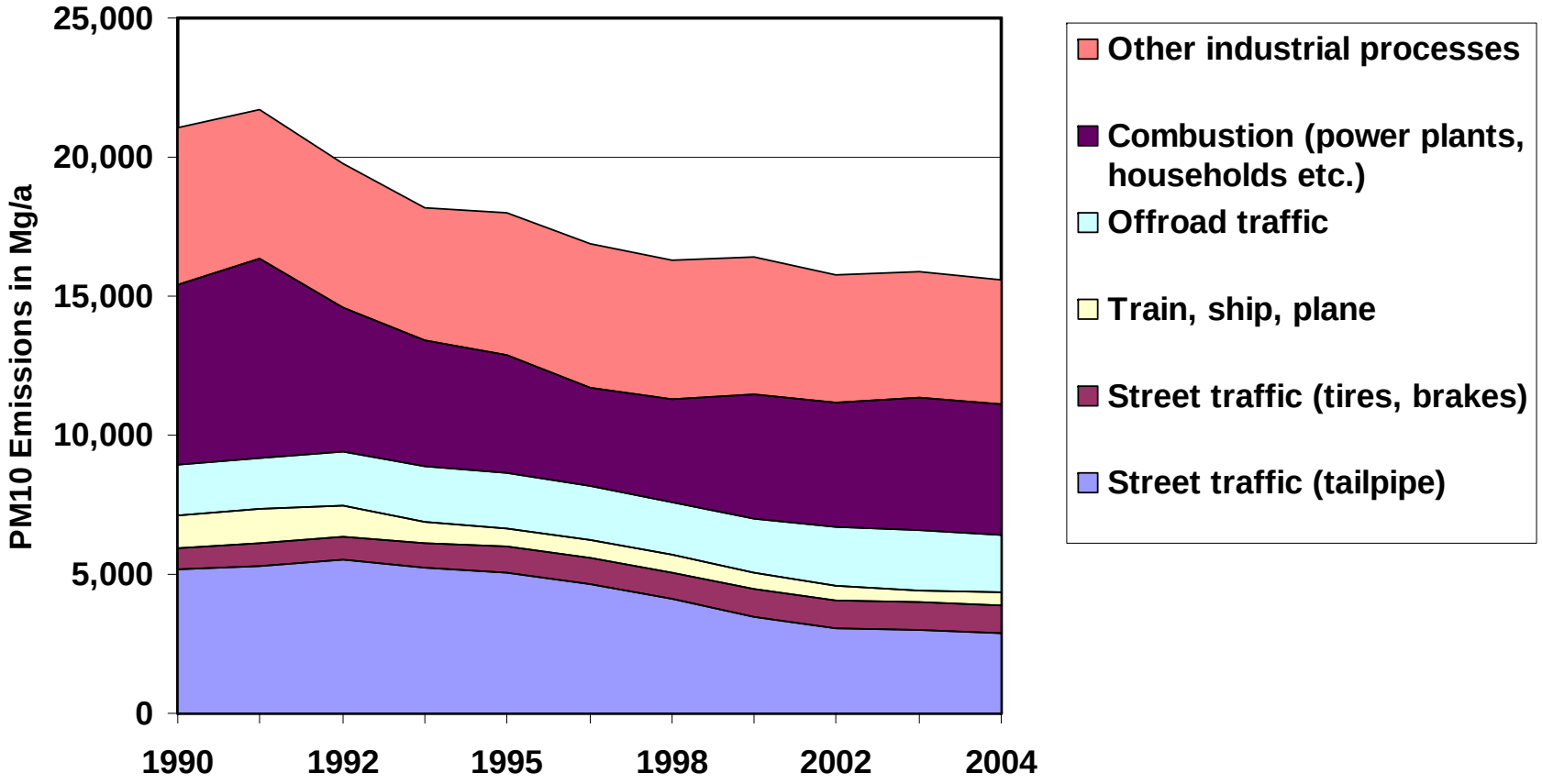
Stricter limits for large combustions plants adopted in 1984

Stricter limits for automobiles and trucks

Improved combustion in household heating

Increased energy conservation/efficiency

Emissions of PM10 in Baden-Württemberg

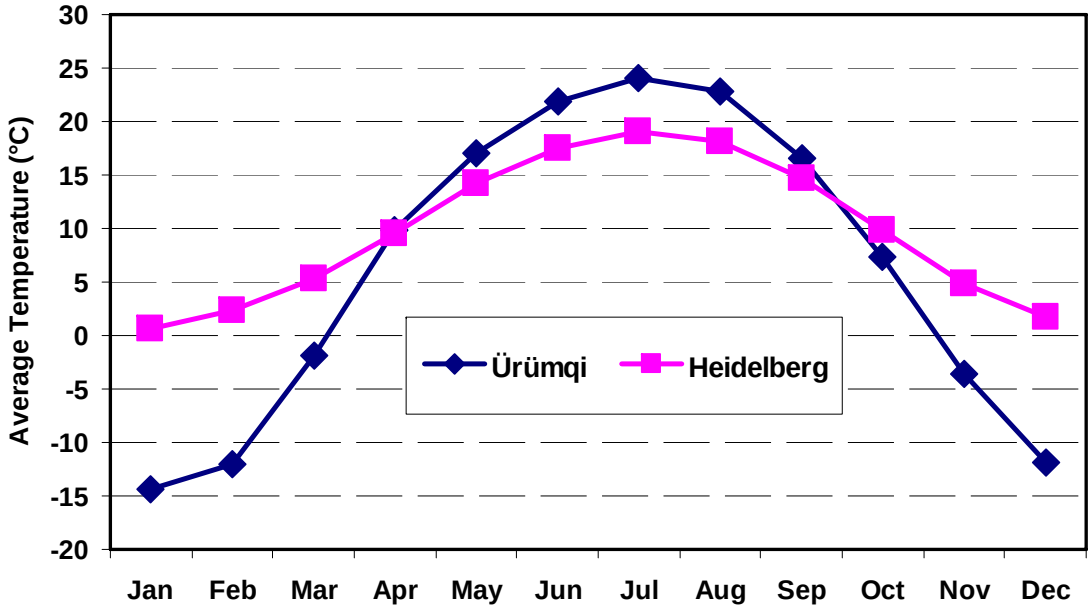


Reduction achieved by:

- Stricter limits for automobiles and trucks
- Improved combustion in household heating / change of fuel

Secondary PM10 from emissions of SO2/NOx/NH3 needs to be considered!

Outside Temperature in Ürümqi and Heidelberg



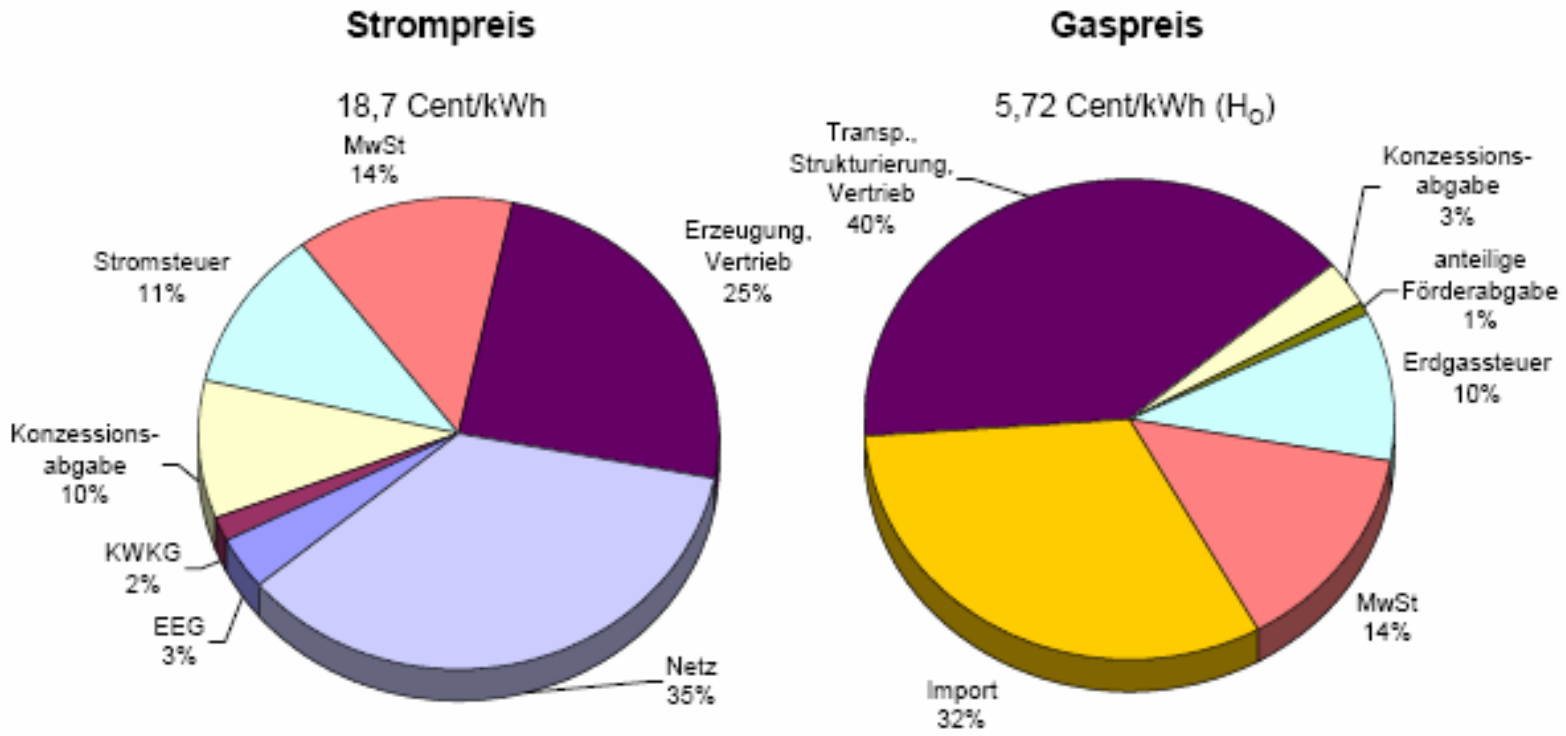
Energy need for heating (based on 20°C room temperature)

Heidelberg = 100%
Urumqi = 164%

Defining end energy for heating one m² of residential space

- Existing buildings without renovation
- Existing buildings with efficient renovation
- New buildings
- Target for all buildings for the year 2050

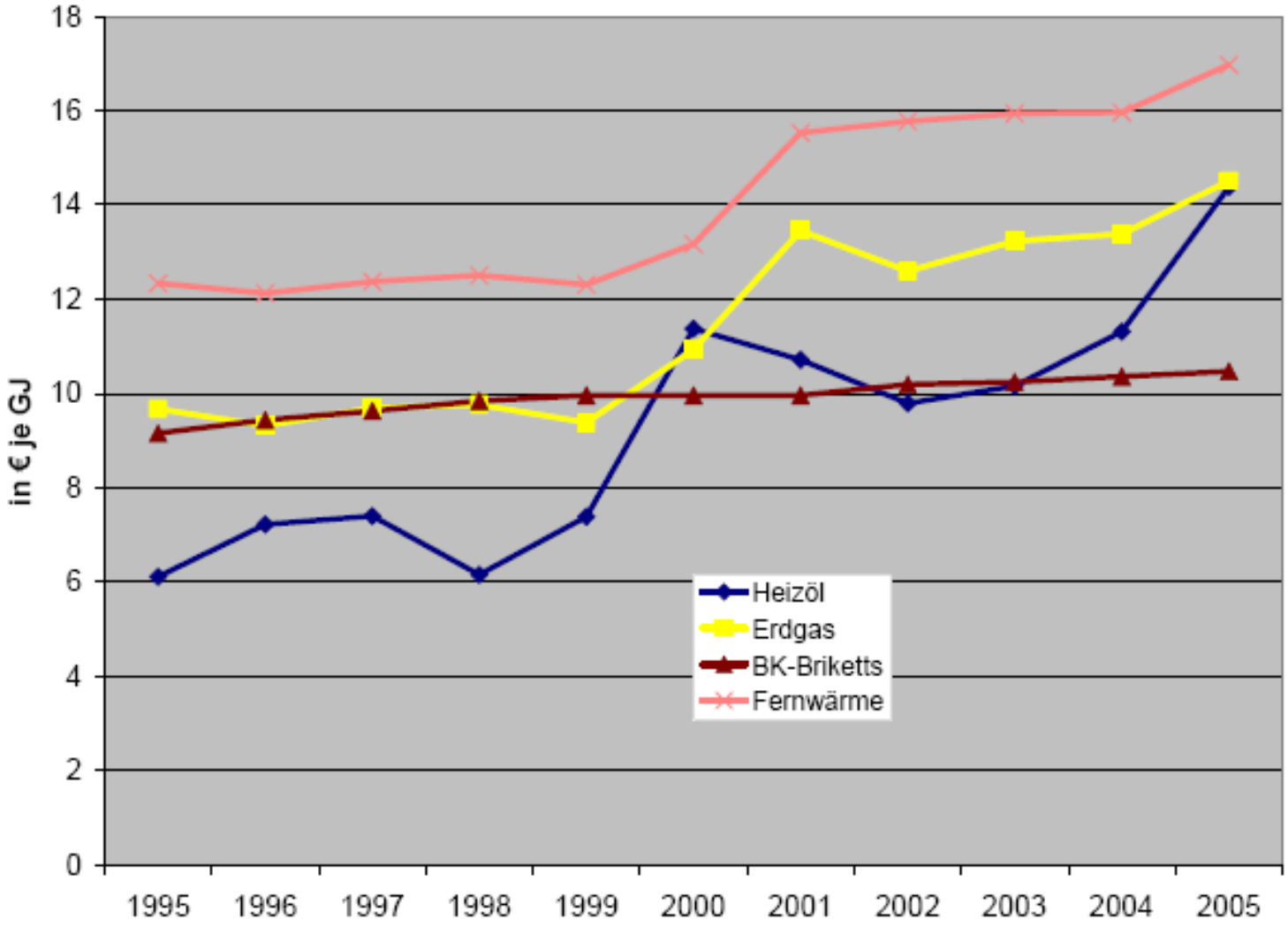
Consumer prices for electricity and natural gas (Germany, 2005)



KWKG Kraft-Wärme-Kopplungsgesetz
Netz einschl. Messung, Energiedatenmanagement und Netzabrechnung

Quelle: Verband der Elektrizitätswirtschaft e.V, Energy Advice Ltd.

Prices for residential heating in Germany, 1995-2005



Quelle: Statistisches Bundesamt

Conclusions

- **We need to limit the emissions of fossil CO_2 worldwide: the target should be 2 tons of CO_2 per person and year**
- **It is possible to meet this target by 2050 in Germany and China**
  - by increasing the energy efficiency in all sectors
  - by increasing the use of renewable energy
- **Significant reduction of air pollutant emissions was achieved in Germany due to a range of measures**
- **We need a careful analysis and detailed plans:**
  - for a sustainable energy society
  - to improve air quality
- **Private households account for a large share of the total energy use and the emissions of air pollutants**
  -> Private residences are a good starting point for action

Working Together for a Sustainable World…..