

U.S. EPA and Asia's Air Quality Challenges

EPA's Mission:

To protect human health and the environment upon which it depends.

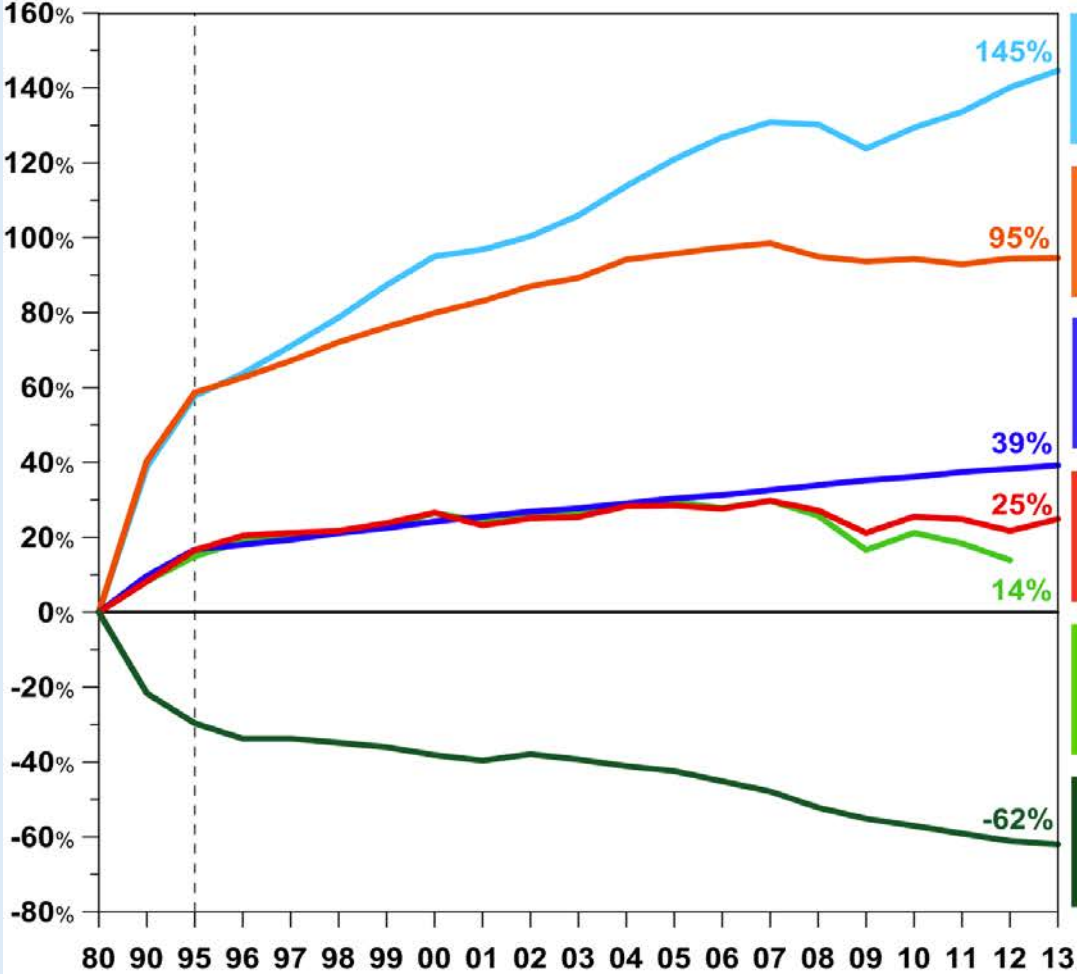
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U.S. Comparison of Growth Areas and Emissions, 1980-2013



Gross Domestic Product



Vehicle Kilometers Traveled



Population



Energy Consumption

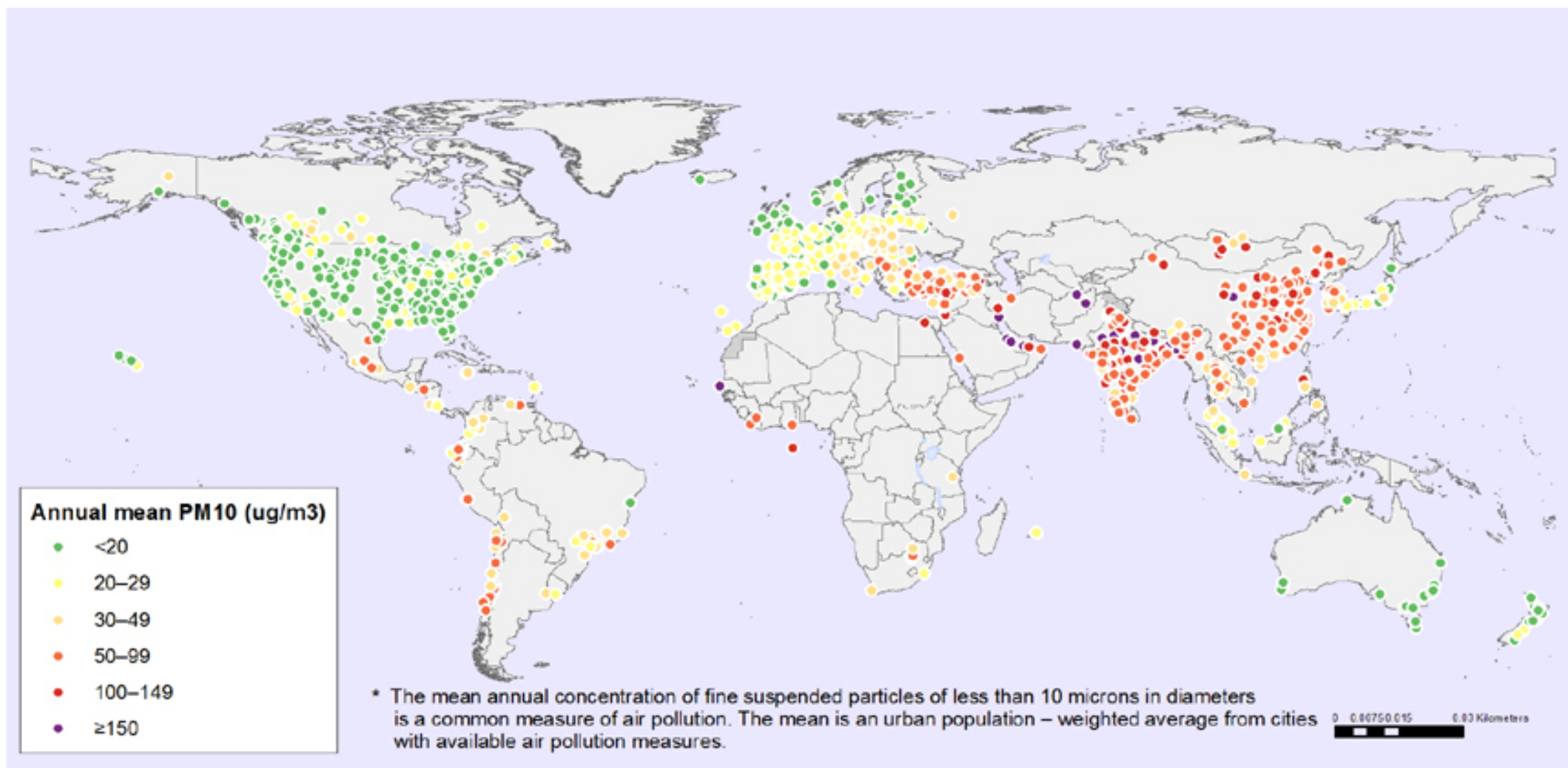


CO₂ Emissions



Aggregate Emissions
(Six Common Pollutants)

Exposure to particulate matter with an aerodynamic diameter of 10 μm or less (PM10) in 1600 urban areas*, 2008–2013



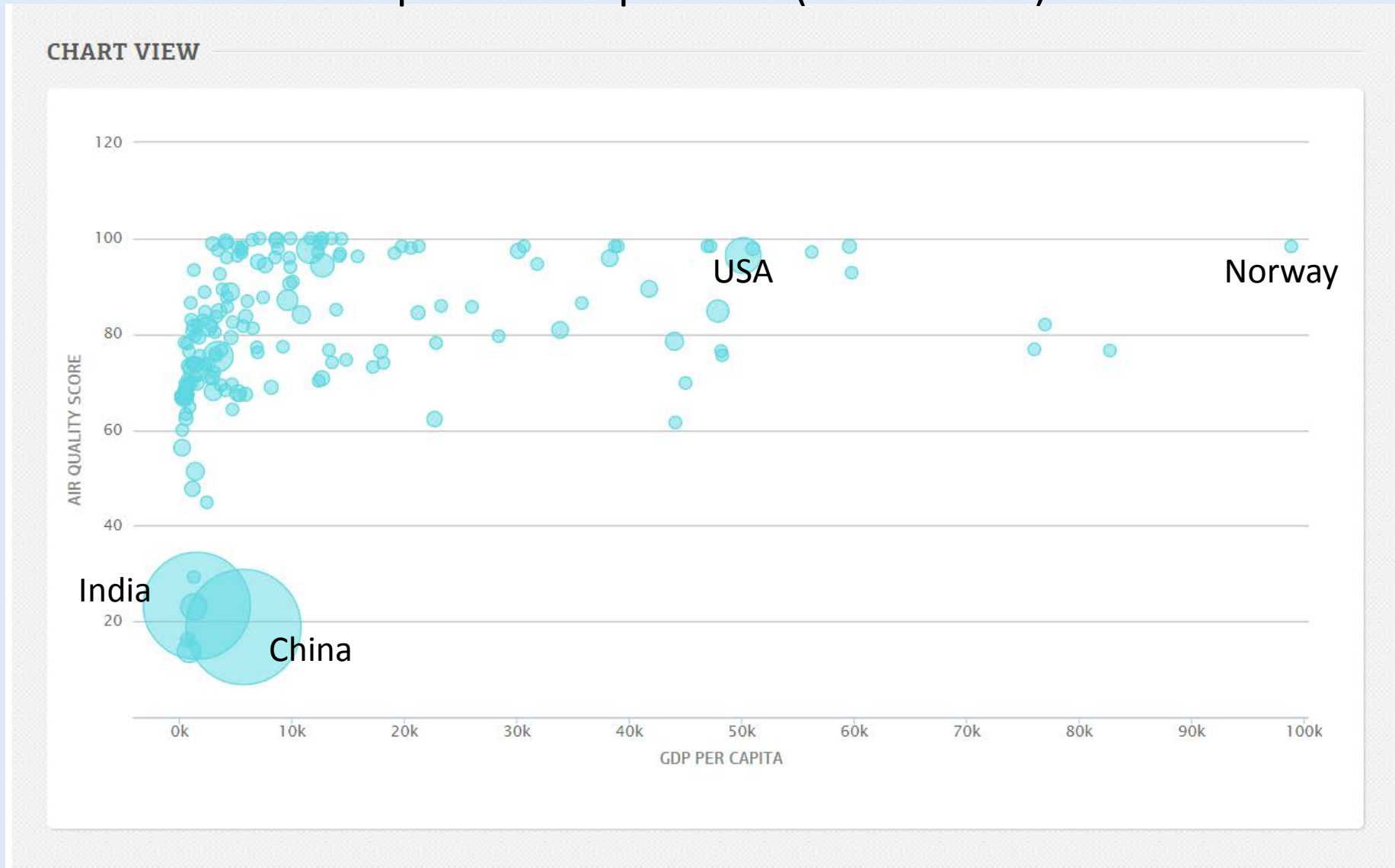
The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Health Statistics and Information Systems (HSI)
World Health Organization



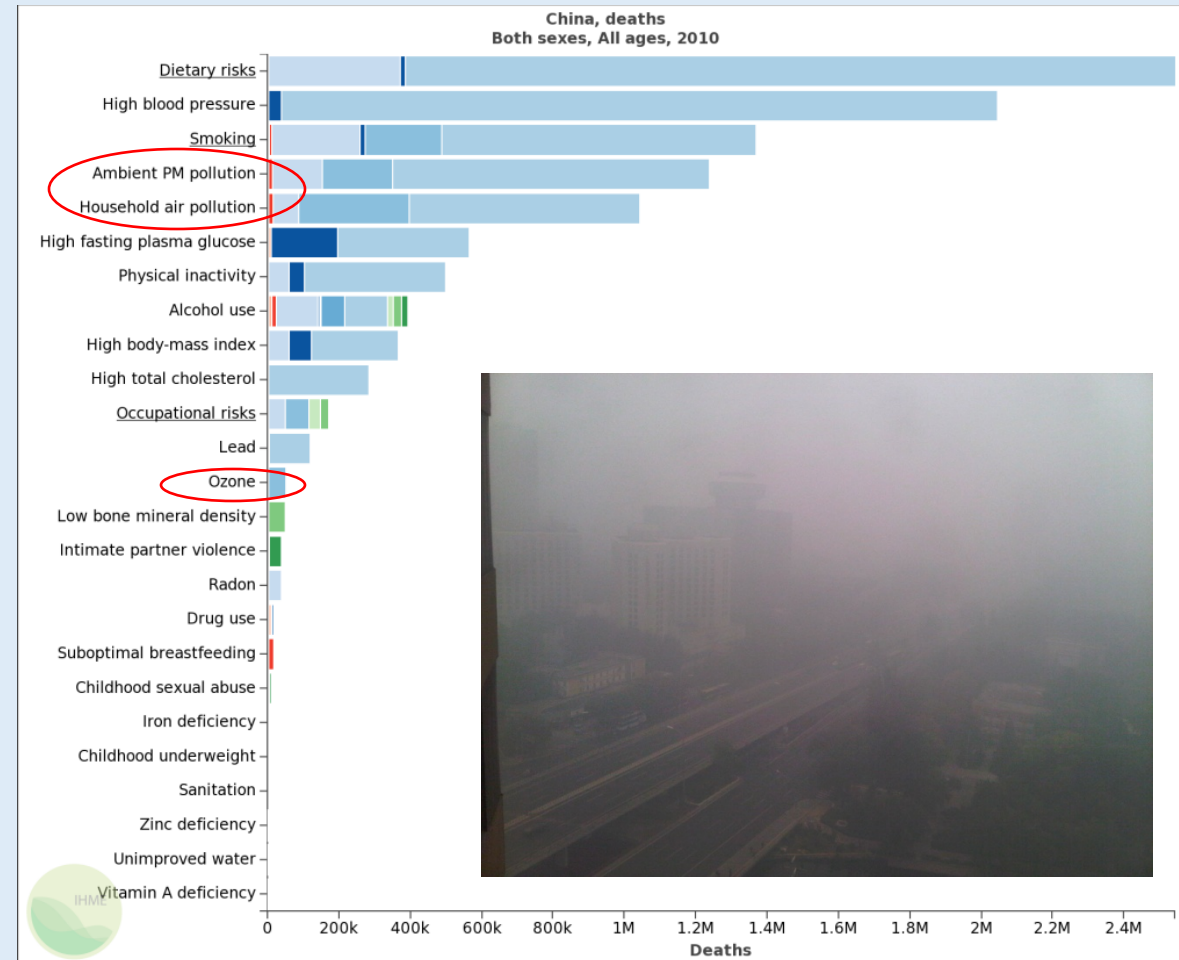
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The Environmental Performance Index: Air Quality Scores by GDP Per Capita and Population (Bubble Size)



Air Pollution and Public Health in China (WHO – March 2013)

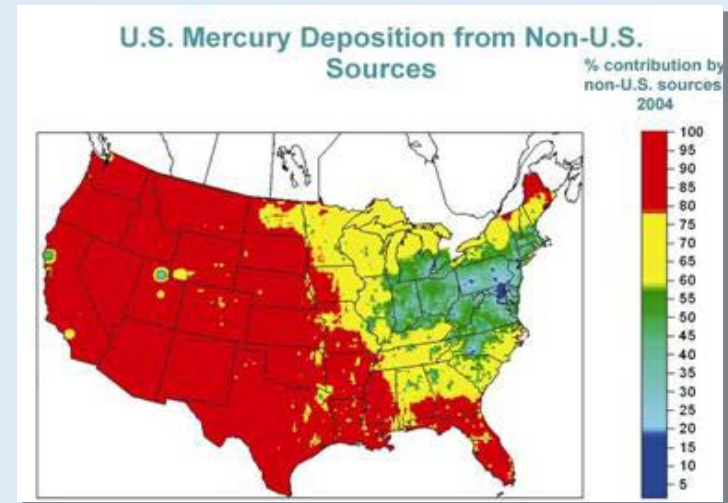
- 33% increase in burden of disease from air pollution in China over past 20 years
- Ambient PM contributes to
 - 1.23M deaths/yr
 - 25M healthy years of life lost
 - 1/3 of global totals (3.7m)
- Household air pollution (cookstoves) leads to
 - 1.04M deaths/yr
- Ozone pollution
 - Additional 47K deaths/yr
- **All total, air pollution is the second worst health risk**
 - 2.32M deaths/yr



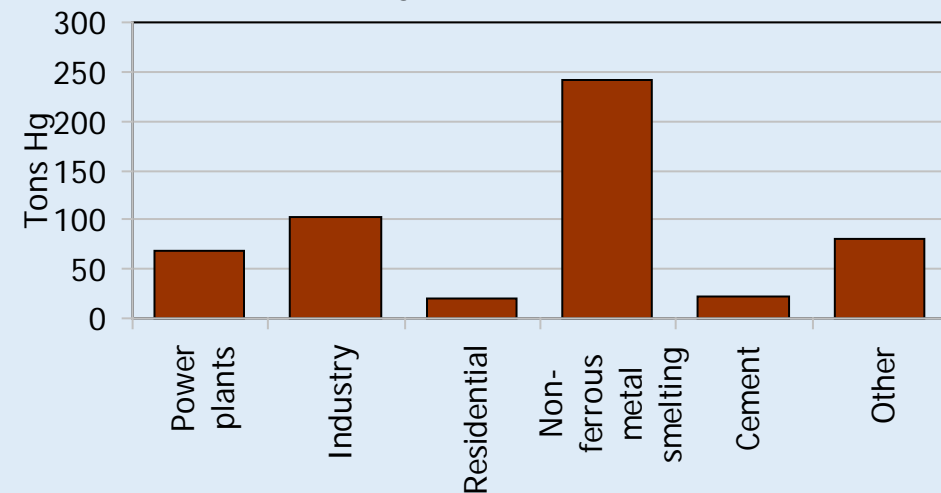
Graphic source: Global Burden of Disease 2010 Study published in Dec. 2012;
photo courtesy Dale Everts

MERCURY

- China is the world's largest source of anthropogenic mercury emissions
 - 45% from non-ferrous metal smelting
 - 38% from coal combustion
- In many parts of the U.S., majority of mercury deposition is from sources outside the U.S.

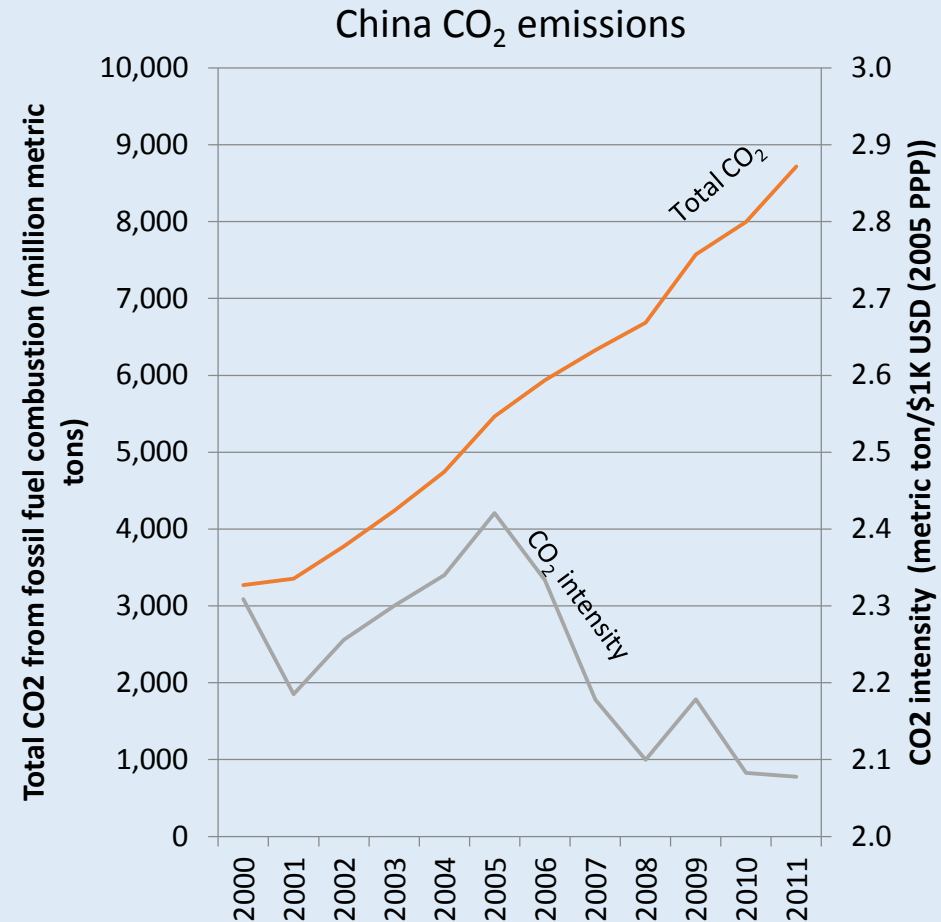


1999 Hg Emissions in China



GHG EMISSIONS

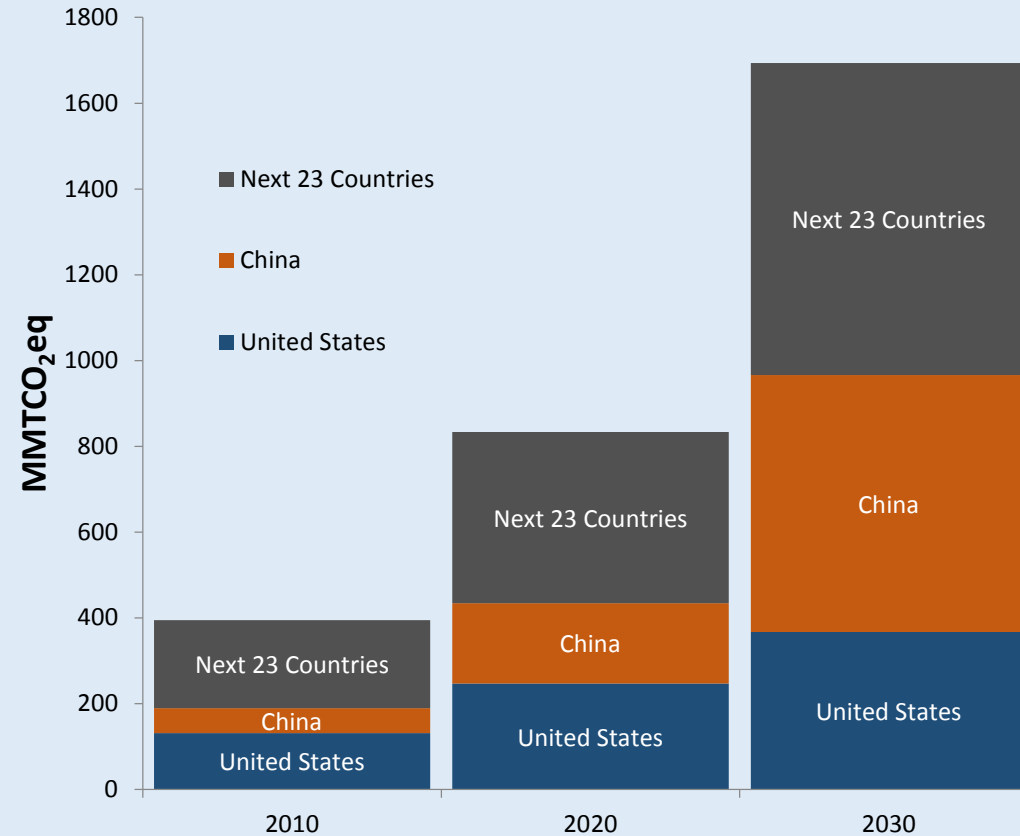
- China is the world's largest source of anthropogenic greenhouse gas emissions.
- China and the U.S. emit approximately 40% of global anthropogenic CO₂ emissions.



HFC Emissions

- China is second largest producer, user and emitter of HFCs after US
- Expected to surpass US within a decade
- Use and emissions of HFCs are growing rapidly (replacements for ozone-depleting substances)
- Unabated, HFC emissions could grow from less than 2% of warming potential to ~ 20% of CO₂ equivalent by 2050
- China will become the largest producer, user, and emitter of HFCs

HFC Emissions from ODS Substitutes



Cookstoves

- **Scale:**
 - 300 million homes in China burn biomass or coal for meals and heating
 - 30% of the global mortality associated with cookstoves occurs in China (~1 million premature deaths annually); 16% of ambient PM in China
 - Previous program reached 180 million homes in the 1980s-1990s
 - Chinese participation essential for Alliance to meet goal of helping 100 million homes by 2020
 - China manufactures many of the world's cleanest stoves for domestic use – could be an int'l game changer



Air Pollution Travels in Asia and Beyond

- Elevated concentrations of elemental mercury in North America have been linked to air masses originating over Asia₁
 - “Analysis of such events suggests that Asian emissions have been underestimated in available emissions inventories”₁
- Asian air emissions, including NO_x, CO and ozone, contribute to increased surface ozone concentrations in North America₂
- In 2006, the production of goods in China for export to the U.S. contributed up to 2% of sulfate and other pollutant concentrations in the United States₃

1. UNECE (2010) Hemispheric Transport of Air Pollution 2010 Part D: Answers to Policy-Relevant Science Questions. UNECE Information Service, Geneva, Switzerland.
2. Zhang L, et al. (2008) Transpacific transport of ozone pollution and the effect of recent Asian emission increases on air quality in North America: An integrated analysis using satellite, aircraft, ozonesonde, and surface observations. Atmos Chem Phys 8(20):6117–6136
3. Lin et al. (2014) China’s International Trade and Air Pollution in the United States. Proceedings of the National Academy of Sciences 2014 111 (5) 1736-1741.

State Council 2010 Regional Air Quality Guidance & 2013 Action Plan



“PM2.5” 细颗粒物 (xi-ke-li-wu)
RAPID EXPANSION – PM2.5 MONITORING NETWORKS
 338 cities by 2015

○ = 3 Economic Zones/Key Regions (incl. 47 cities)

○ = 10 City Clusters

State Council Promotion of Joint Prevention and Control of Air Pollution to Improve Air Quality (21 May 2010)	
Location	
Beijing / Jing-Jin-Ji	
Shanghai / YRD	
Hong Kong / PRD	
10 City Clusters	
PM10 Standards 70 ug/m ³ (annual); 150 ug/m ³ (24 hour)	
Attain PM10 standards in urban areas by 2015	

State Council Action Plan for Air Pollution Prevention and Control (10 Sep 2013)	
Location	Annual PM2.5 Concentration Goals
Beijing Municipality	60 ug/m ³ *
Greater Beijing / Jing-Jin-Ji	25% ↓
Shanghai / YRD	20% ↓
Hong Kong / PRD	15% ↓
Tier 1 & 2 Cities (338)	10% ↓ (PM10)
2012 Baseline, 2017 Target	
PM2.5 Standards 35 ug/m³ (annual); 75 ug/m³ (24 hour) – effective in 2016	
* Annual average in 2013 was ~ 90 ug/m ³	

Regional Air Quality Management

Goal: Reduce air pollution from China's rapidly growing economy

Key Activities:

- 8 annual Regional Air Quality Management (RAQM) Conferences (2005-2013)
- Extensive capacity building on modeling, emissions inventories, monitoring, public reporting, benefits assessment, and regional AQM
- Collaboration on AQ tools development: AirNow, BenMAP, ABaCAS
- Participation in special studies on mercury control, regional AQM

Results/Accomplishments:

- Deep level of trust and influence on China's AP policies
 - 2010 State Council Regional Air Quality Guidance
 - 2013 State Council Action Plan for AP Prevention and Control
- Revision/upgrade of air quality tools to the benefit of both China and the U.S.
 - AirNow real time air quality reporting tool for Shanghai World Expo 2010

Major Partners – MEP; Tsinghua U; Energy Foundation; South China U. of Technology, Provincial EPB's; Regulatory Assistance Project (RAP); RTI International

Power Sector Monitoring and Emissions Control

- **Objective:** Reduce emissions that contribute to China and U.S. air pollution; enhance quality of and confidence in emissions data
- **Activities:**
 - Emissions control policy
 - SO₂, NO_x, PM – pollution control policies, emission trading programs, and emission reduction incentives
 - Mercury – mercury emission control in support of Minamata Convention obligations
 - Power plant optimization and best practices (O&M) – share information – enhance power plant efficiency; reduce GHG and criteria air pollution
 - Emissions monitoring, reporting, and verification
 - Continuous emission monitors technical assistance
 - Mercury – provide technical assistance on monitoring standards
 - QA/QC and verification – provide technical assistance with emission data QA/QC and verification
- **Partners:** MEP, NDRC, Energy Foundation, Regulatory Assistance Project

Transportation Sector Activities

- **Strategy**
 - Cleaner Fuels/Emission Standards
 - Capitalize on China's move to ultra-low sulfur diesel and providing technical expertise regarding benefits of tighter emission standards
 - Vehicle/Engine Compliance
 - Continue to educate MEP on compliance programs. Work to ensure compliance of Chinese exports to the US
 - Heavy-duty GHG/Efficiency
 - Educate China on EPA's current model and future vision for HD GHG standards, including test procedures, standard writing and compliance programs
 - Clean Freight
 - Assist China in further implementing and updating the China Green Freight Initiative
- **Major partners:**
 - Government: MEP, MOT, MIIT; Department of State
 - NGOs: International Council on Clean Transportation; Clean Air Asia

Collaboration With China

- Air & Climate
 - Power and industrial sectors
 - Urban and regional air quality
 - Motor vehicles
 - Marine transport
 - GHG reporting (MRV) capacity
- Water
 - Surface and groundwater
- Chemicals
 - POPs, Mercury, HFCs
- Waste & soil pollution
 - Waste management
 - Soil remediation
 - Environmental emergency response
- Environmental governance
 - Laws and institutions
 - Regulations and policy
 - Compliance and enforcement
 - Judicial capacity
 - Environmental information and transparency
- Research
 - Water sustainability
 - Computational toxicology
 - Characterization of air emissions
 - Soil remediation technologies
 - Waste to energy emissions reduction
 - Cookstoves

Other Asian Partners

- INDIA
- INDONESIA
- HONG KONG
- TAIWAN
- REGIONAL WORK (Cities Clean Air Partnership –CCAP)

7 Key Messages on Air Quality for Our International Partners (1-4)

1. Economic growth AND air quality improvement can go together
2. Coordinated urban/state, regional and national strategies and sustained leadership (at all levels) are needed to successfully reduce regional pollutants such as PM2.5 and ozone [e.g., good neighbor provisions for air quality planning]
3. Strong regulatory programs with clear accountability and enforcement/compliance mechanisms promote the development of new control technologies while achieving clean air [e.g., best available technology requirements, permit programs, good neighbor provisions, air quality planning requirements]
4. Multipollutant sector-based air pollution reduction approaches can achieve multiple benefits at lower overall costs [e.g., multipollutant control policies for power plants]

7 Key Messages on Air Quality for Our International Partners (5-7)

5. Clean fuels (low and ultra low sulfur content) enable advanced vehicle controls
6. Information that is reliably generated and openly shared (air quality, emission inventories, modeling assessments, pollution controls, etc.) is key to finding effective solutions and gaining public trust and support [e.g., public “realtime” reporting of air quality information, public reporting of emissions, etc.]
7. Successful programs and policies are built on a solid foundation of science and ongoing assessment