

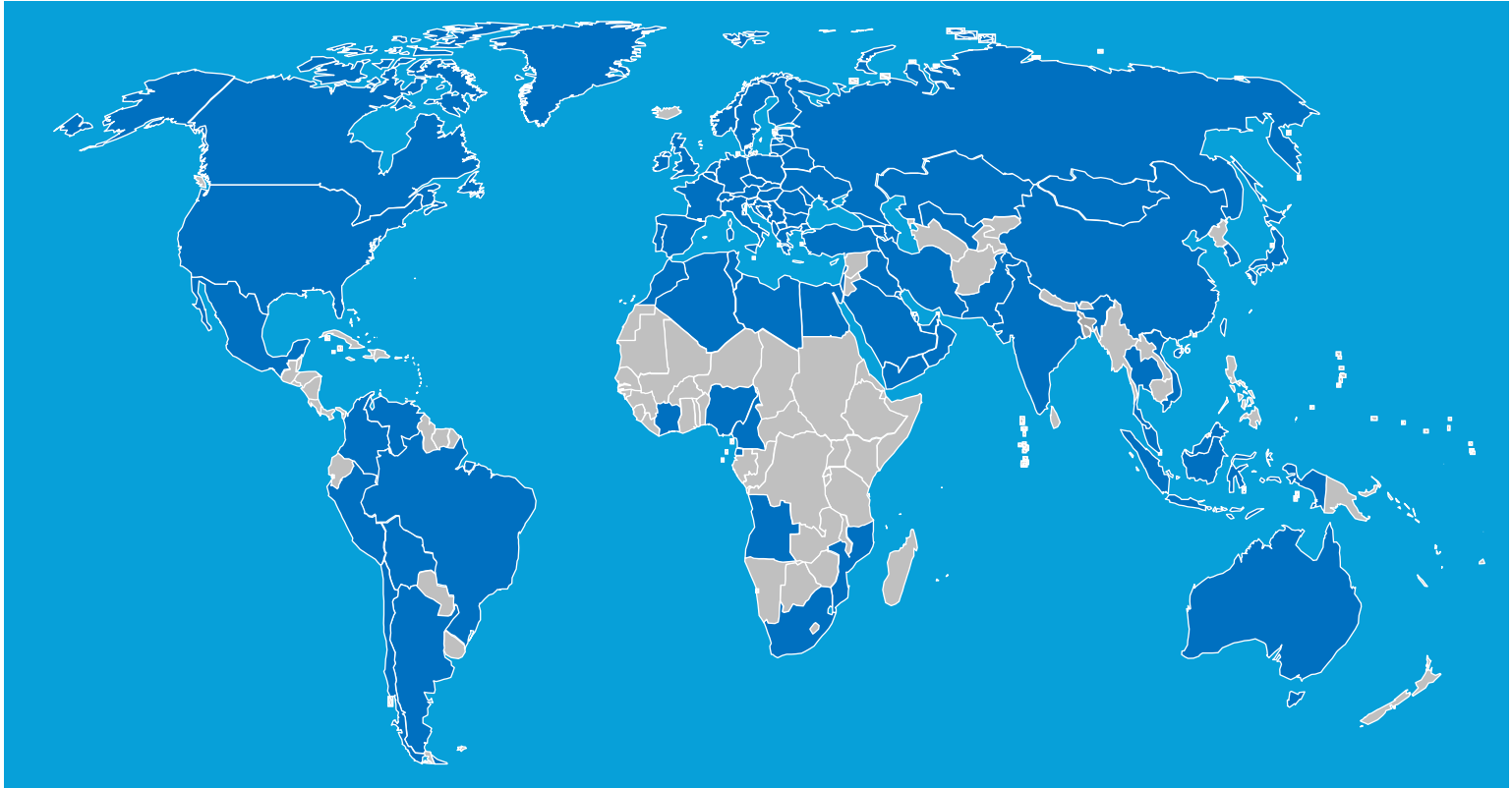


IGU Study on Urban Air Quality: Enhancing and Saving Human Lives



Switch to Natural Gas Helps Mega-Cities Dramatically Improve Air Quality and Reduce Emissions of GHG and Air Pollutants

IGU represents more than 97 % of the gas industry



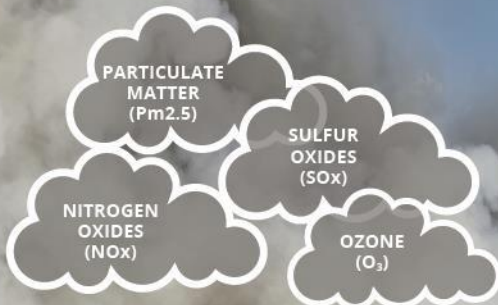
91 Charter, 10 Premium Associate, 47 Associate members

Context: COP 21 and a spotlight on emissions



Natural Gas. An agent of change in the fight against urban air pollution

NATURAL GAS: IMPROVING THE AIR WE BREATHE



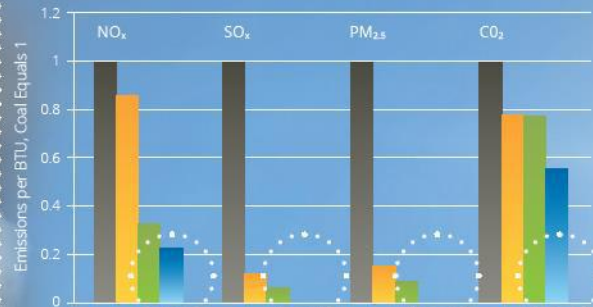
Outdoor air pollution is among the most significant environmental threats to human health:



Premature deaths each year (WHO)



Deaths from outdoor air pollution will double from current levels by 2050 absent policy changes (OECD)



More natural gas = fewer pollutants and CO₂ emissions

SOURCE: EPA AP-42 Compilation of Air Pollutant Emission Factors; CenSARA Area Combustion Emissions Inventory Enhancement Project - Final Report 2011

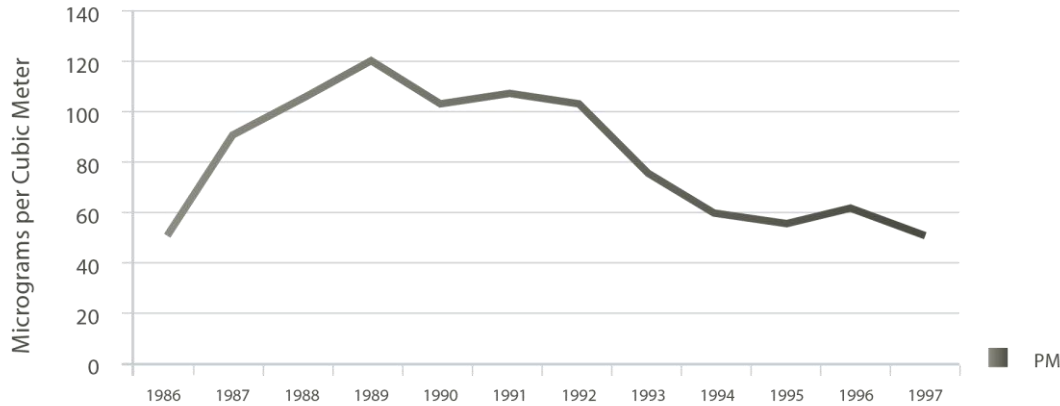


Four global mega cities are taking action



Case Study 1: Istanbul

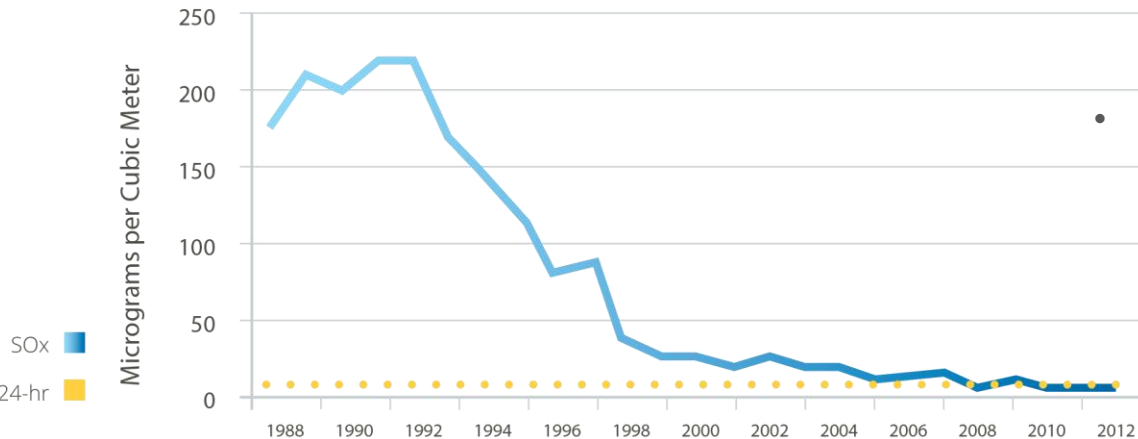
Figure 3: Istanbul Annual Average Particulate Matter Concentrations 1986-1997



SOURCE: OECD Environmental Performance Reviews, Turkey 1999

- By the early 1990s Istanbul had become unliveable, due largely to burning of lignite
- Policy response was massive investment in gas distribution systems.
- As a result of the switch, particulate matter declined from over 100 micrograms per cubic meter in the early 1990s to just above 50 by 1997

Figure 4: Istanbul Annual Average SO2 Concentrations 1988-2012



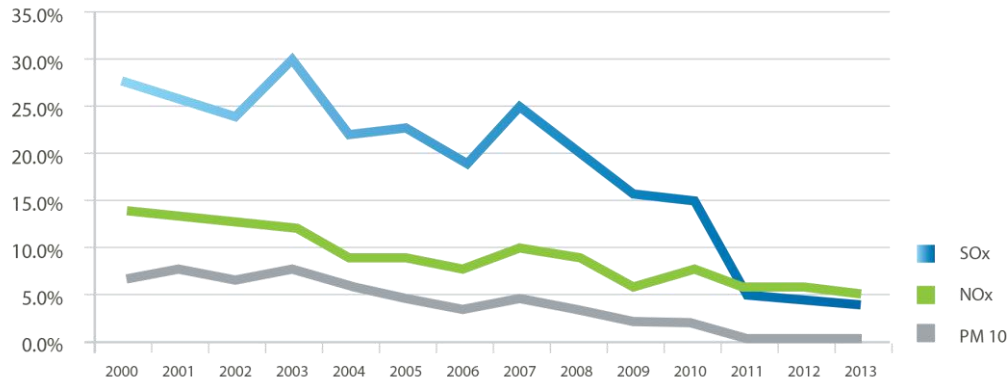
- SO₂ concentrations also began an immediate decline in the early 1990s. By the end of the 1990's SO₂ had fallen nearly 90%

Source: IGDAS

WHO Guideline for 24-hr

Case Study 2: Ontario / Toronto

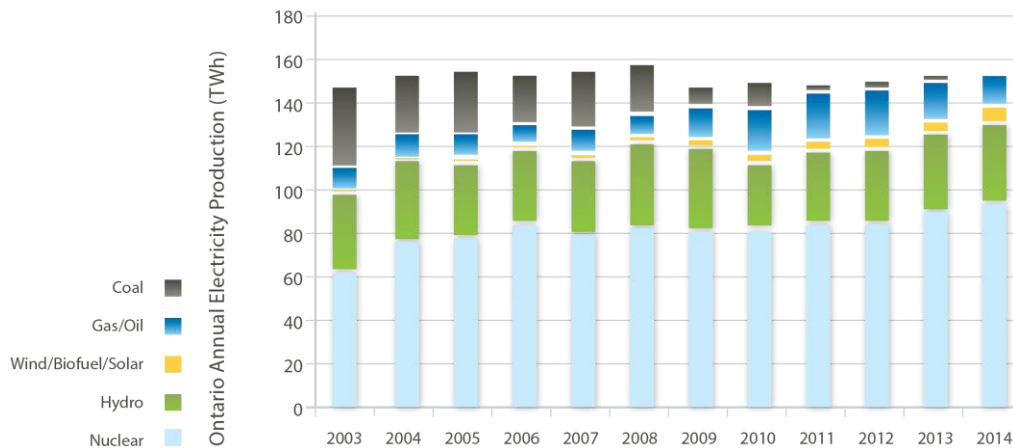
Figure 6: Emissions from Electricity Generation as a Percent of Total Ontario Emissions



SOURCE: Canada National Pollutant Report Inventory, Author's Analysis
(PM10 emissions exclude open sources such as road dust, agriculture, and construction)

- Landmark decision made to entirely phase out coal-fired power in 2004
- Largest population in North America to do so
- Before the switch to gas, air pollution in the city contributed to 1,700 premature deaths and 6,000 hospitalizations per year
- Switch to gas and removal of coal led to reduction in deaths and hospitalizations by 23% and 40% respectively
- Inherent flexibility of gas means that it works very well with wider mix: nuclear / renewables

Figure 5: Fuel Mix in Ontario's Electricity Sector 2003-2014



SOURCE: Ontario Independent Electricity System Operator; IISD

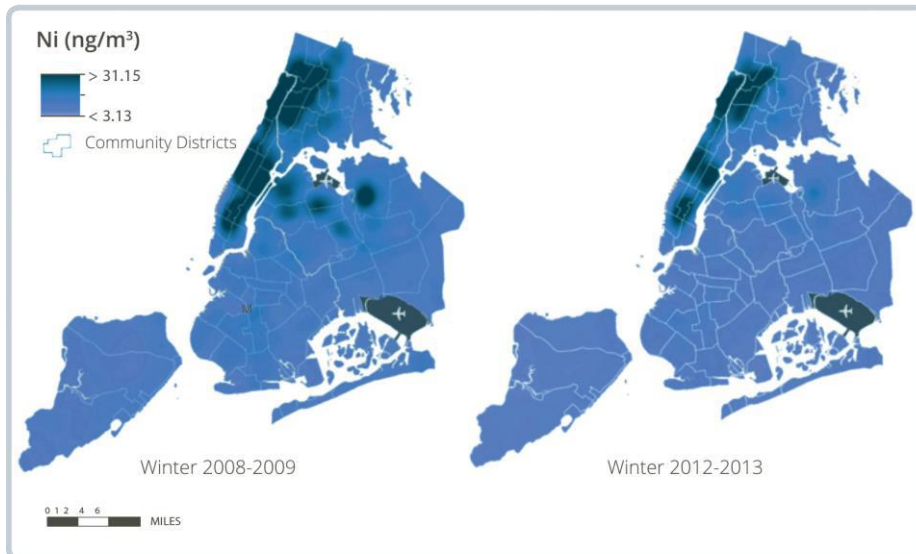
Case Study 3: New York

Table 2: Average Pounds of Pollutant-Forming Emissions per MWh for U.S. Coal and Natural Gas Power Plants, 2005

	Coal	Natural Gas
SO ₂	12	.045
NO ₂	4.1	2.3
PM _{2.5}	.59	.11
PM ₁₀	.72	.12

SOURCE: *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use*, National Academies Press, 2010, Tables 2-11, 2-16.

Figure 2: Comparison of Estimated Nickel Concentrations in PM_{2.5}

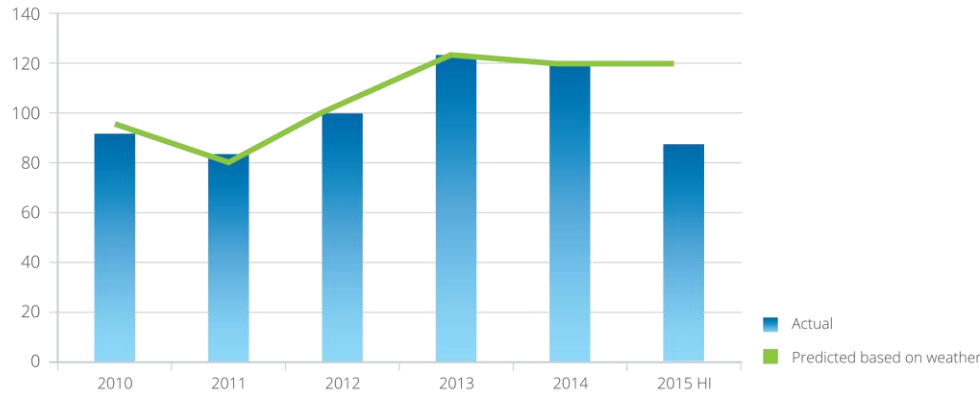


SOURCE: New York City Department of Health and Mental Hygiene

- In 2007, the levels of Ozone and PM_{2.5} exceeded US EPA standards. New policy enacted.
- 30% of heavy fuel-burning buildings in New York City converted to cleaner fuels. Approximately 75% of those that made the switch converted to natural gas or ultra-low sulfur No. 2 oil.
- SO_x concentrations decreased by 69% in four years; PM_{2.5} levels met EPA standards for the first time in 2014.
- 780 fewer deaths in the city and over 2,000 fewer emergency room visits each year.

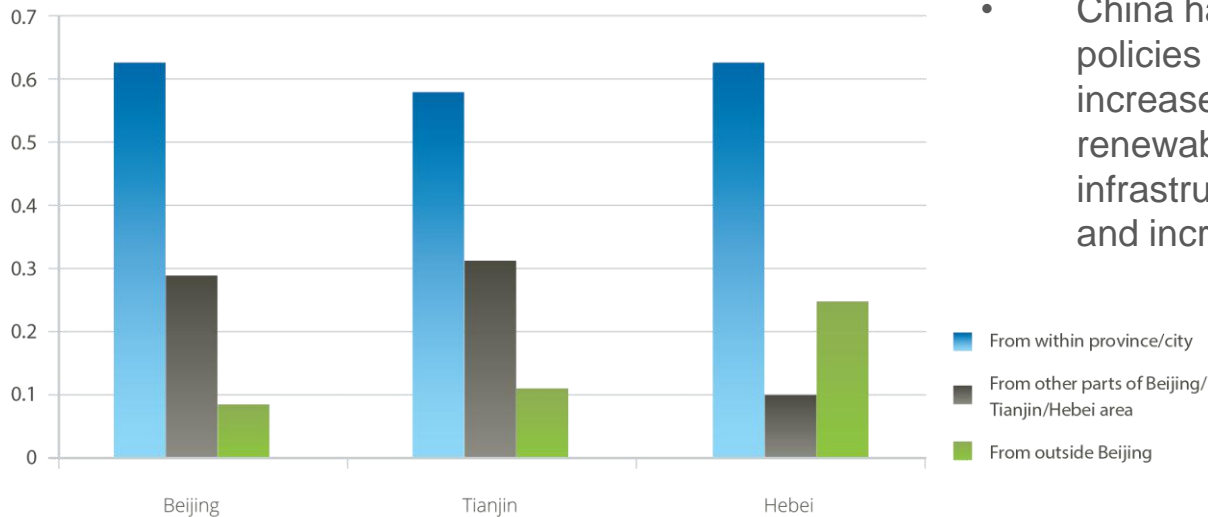
Case Study 4: Beijing

Figure 8: Beijing Actual PM2.5 Levels Compared to Predicted Levels Based on Weather



SOURCE: Greenpeace; Paulson Institute, "Beijing Blue Skies - Is This the New Normal?"

Figure 7: Origin of PM_{2.5} Pollution in Beijing/Tianjin/Hebei Area, 2010



SOURCE: Paulson Institute, *Climate Change, Air Quality and the Economy: Integrating Policy for China's Economic and Environmental Prosperity*

- The average PM2.5 levels in China's urban areas are often 6 times higher than WHO standards. In Beijing they are 10 times higher
- Approximately 50% of this air pollution burden is attributable to coal
- Regional co-ordination vital to protect Beijing
- China has adopted a variety of policies and goals to promote increased generation from renewables, increased supply and infrastructure to distribute natural gas, and increased nuclear generation

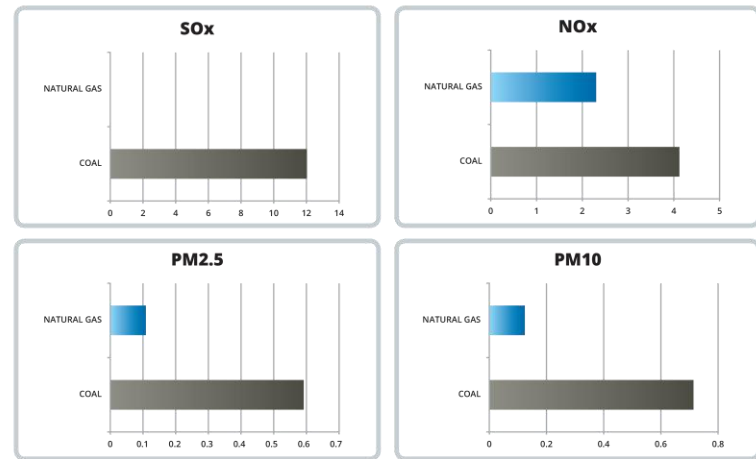
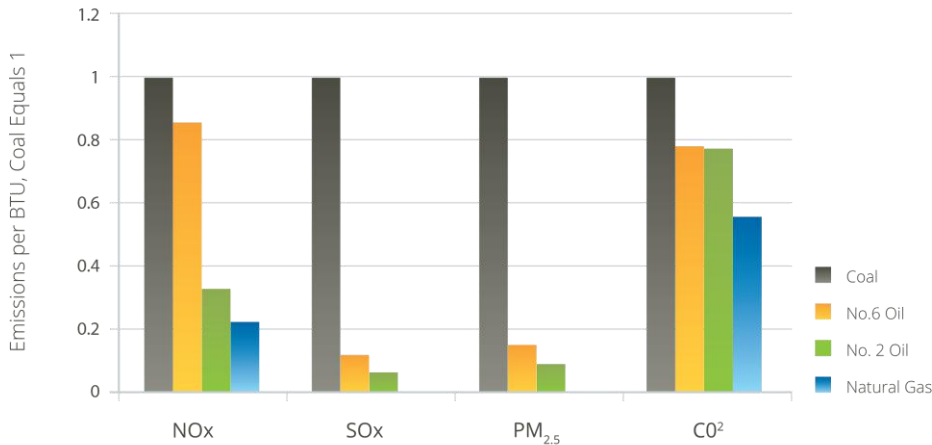
Conclusion: Gas as the positive change agent

Enhanced use of natural gas in energy generation, heating and industry will drastically reduce emissions, mercury and particulate matter, thereby providing enhanced quality of life for virtually everyone in urban society.

We support policies that reduce GHG emissions and emissions of health damaging air pollutants such as:

- Improvement of end-use energy efficiency
- Increases in combustion efficiency
- Encouragement of fuel switching
- Increased use of non –combustion renewable energies

Figure 1: Comparison of Emissions from Different Fuels



Average Pounds of Pollutant-Forming Emissions per MWh for U.S. Coal and Natural Gas Power Plants

Thank you