Climate Change Mitigation Measures in the People's Republic of China

INTERNATIONAL BRIEF 1 APRIL 2007

EMISSIONS OVERVIEW

China is the world's second largest greenhouse gas emitter after the United States and its emissions are increasing rapidly with strong economic growth and rising energy demand. Emissions have grown by about 80% since 1990, driven heavily by increased consumption of electricity generated from coal.[1] Coal accounts for about 65% of China's energy consumption, with demand exceeding 2 billion tons a year (nearly twice demand in the United States).[2]

As total emissions have grown, China has significantly reduced its emissions *intensity* (emissions per unit of GDP), largely through aggressive energy efficiency policies. Greenhouse gas intensity has fallen significantly in China over the past few decades, though it remains among the highest in the world. *Per capita* emissions are below the world average and about one-fifth those of the United States.

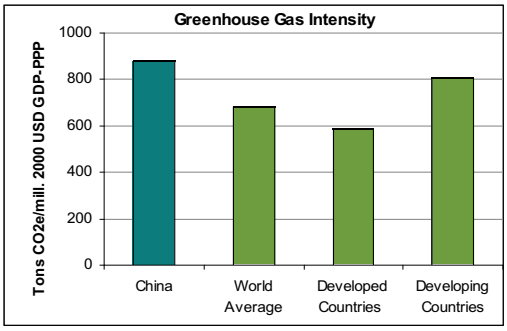
China's emissions are projected to continue rising rapidly – another 65% to 80% by 2020 – and annual emissions may surpass those of the United States as early as 2009. (In *cumulative* terms, however, China's contribution to global emissions is about one-fourth the United States'.) Much of this projected growth will come from coal-fired electricity; in 2006 China installed over 90 gigawatts (GW) of new coal power capacity—the equivalent of about 2 large coal power plants per week.

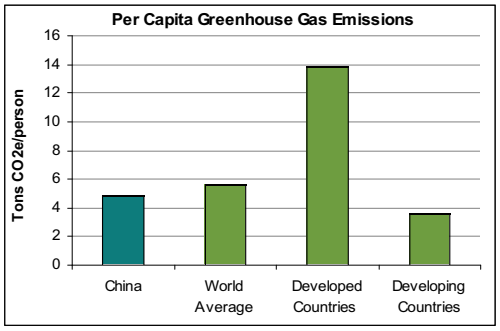
UNFCCC and Kyoto Protocol

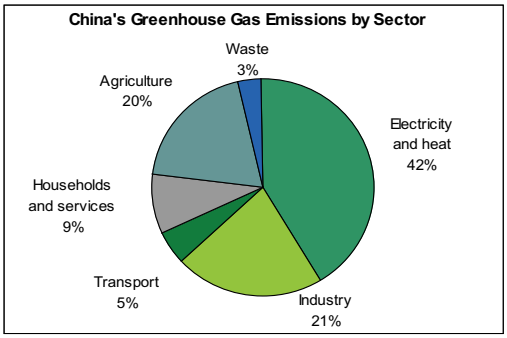
China has ratified both the UN Framework Convention on Climate Change and the Kyoto Protocol. As a non-Annex 1 (developing) country, China has no binding emission limits under the first commitment period (2008-2012) of the Protocol. However, China is an active participant in the Clean Development Mechanism (CDM) established under the Protocol. (The CDM grants emission credits for verified reductions in developing countries, which can be used by developed countries toward meeting their Kyoto targets. This provides lower-cost reductions for developed countries and generates investment in clean development in developing countries).

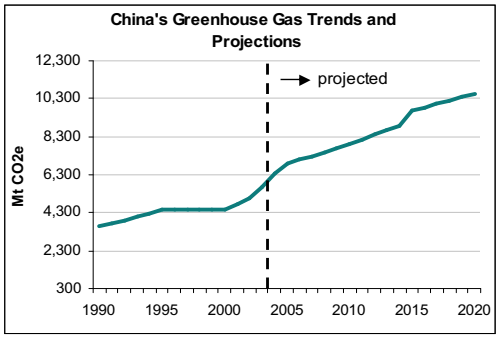
China is by far the largest source of CDM credits, accounting for over 40% of those generated to date. China's dominance in the CDM market is due in part to its entrepreneurship in developing CDM projects, and to its relatively low-risk investment environment (compared with other CDM host countries).

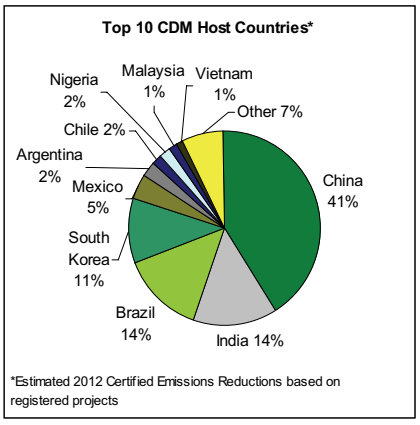
Thus far, most of China's CDM credits come from destruction of trifluoromethane (HFC-23), a potent greenhouse gas that is a byproduct of refrigerant manufacture (HFC-22). HFC reductions account for 52% of expected credits through 2012. Other key project types involve the capture of methane from landfills and nitrous oxide (N_2O), also potent greenhouse gases. Although there are











many renewable energy and energy efficiency projects, these generate fewer net reductions because carbon dioxide, which they displace, has lower warming potential than the other gases. The Chinese government is currently taxing HFC projects at 65%, with the revenues supporting sustainable energy development.

CDM Projects and Associated Emissions Reductions in China (as of 2/1/07)[3]

	Number of projects	Number of credits (ktons CO_2 by 2012)	Percent of China-based reductions
Hydropower	95	57,968	7%
Renewable Energy	73	1,885	6%
Industrial energy efficiency	37	43,999	5%
Coal bed methane	25	93,850	11%
Landfill gas	18	25,697	3%
Biomass energy	16	13,125	2%
Fossil fuel switching	15	69,961	8%
HFC destruction	11	394,921	47%
N20 capture	4	83,960	10%
Reforestation	2	211	0%
Agriculture	1	228	0%
Total	**297**	**835,804**	**100%**

POLICIES WITH POTENTIAL CLIMATE MITIGATION IMPACTS

China is implementing a wide range of energy and industrial policies that, while not driven by climate change concerns, are contributing to climate efforts by slowing the growth of China's greenhouse gas emissions.

Energy Efficiency and Conservation

- **Energy Intensity Target** – China's 11th Five-Year Plan includes a major program to improve energy efficiency nationwide, including a goal of reducing energy intensity (energy consumption per unit of GDP) by 20% below 2005 levels by 2010. The government projects that meeting this target would reduce China's greenhouse gas emissions 10% below business as usual; researchers estimate about that over 1.5 billion tons of CO_2 reductions would be achieved.[4] The energy intensity target is part of a broader goal of quadrupling economic growth while doubling energy consumption between 2000 and 2020.[5] The National Development and Reform Commission (NRDC) is allocating the target among provinces and industrial sectors and energy efficiency improvement is now among the criteria used to evaluate the job performance of local officials. Progress to date has been slower than anticipated. Following increases in energy intensity each year from 2003 to 2005, intensity declined 1.23% in 2006, short of the goal for that year of 4%.[6]

- **Top 1,000 Enterprises Program** – In 2006, NDRC launched a major program to improve energy efficiency in China's 1,000 largest enterprises, which together consume one-third of China's primary energy.[7] The group includes the largest energy users in the energy supply sectors (coal, electricity, oil) and in the largest energy-using industrial sub-sectors (including iron and steel).[8] Under the program, each enterprise will agree to an energy efficiency improvement plan and have its energy use monitored. Objectives will be set for energy intensities of products produced based on advanced domestic and international standards, and incentives will be offered to encourage enterprises to meet and exceed their targets.

- **Retiring Inefficient Power Plants** – An NDRC plan aims to eliminate small, inefficient power plants totaling 50 GW, around 8% of China's total generating capacity, by 2010 (about 40 GW coal-fired and 10 GW of fuel oil-fired capacity). NDRC announced in January 2007 that generators proposing new coal-fired plants will need to shut down smaller, older plants at the same time. In addition, all coal-powered plants with capacity under 50 megawatts (MW), and 100 MW generators operating for 20 years or more, will be ordered to close by 2010. Generators with coal consumption more than 10% above the provincial average or 15% above the national average are also targeted for closure.[9]

- **Closing Inefficient Industrial Plants** – NDRC announced in early 2007 that it would close many inefficient industrial plants manufacturing a range of products including cement, aluminum, ferro-alloy, coking, calcium carbide, cement, and steel. All cement plants with annual capacity of less than 200,000 tons are to be closed by the end of 2008, with 250 million tons of outdated cement capacity to be eliminated by 2010.[10] In the steel sector, outdated pig iron capacity is to be reduced by 100 million tons, and steel capacity by 55

million tons, by 2010.[11] NDRC has set reduction quotas at the provincial and regional levels, and provincial officials are required to sign agreements with the central government holding them accountable for their targets. Provincial officials failing to comply would be referred to the State Council, or cabinet, for potential disciplinary action.

- **Promoting End-Use Energy Efficiency –** The 1997 Energy Conservation Law initiated a range of programs to increase energy efficiency in buildings, industry, and consumer goods. China has efficiency standards and labeling programs in place for many key energy-consuming appliances and is adopting building energy standards in regions with high heating and cooling demands.

Transportation

- **Fuel Economy Standards –** China's fuel economy standards for its rapidly growing passenger vehicle fleet are more stringent than those in Australia, Canada, California, and the United States (and less stringent than those in the European Union and Japan).[12] Implemented in two phases (2005-2006 and 2008-2009), the standards classify vehicles into 16 weight classes, covering passenger cars, SUVs and multi-purpose vans (MPVs). The average fuel economy of new vehicles is projected to reach 36.7 miles per gallon in 2008.

Renewable Energy

- **Targets –** Under a national renewable energy law adopted in 2005, China has set a target of producing 16% of primary energy from renewable sources (including large hydropower) by 2020, up from about 7% today For the electricity sector, the target is 20% of capacity from renewables by 2020, including 30 GW of wind power, 20 GW of biomass power, and 300 GW of hydropower capacity.
- **Incentives –** The renewable energy law offers financial incentives, such as a national fund to foster renewable energy development and discounted lending and tax preferences for renewable energy projects. It also reduces risks for project developers by mandating grid interconnection and guaranteeing minimum prices for certain types of renewable energy.

Industrial Policies

- **Export Taxes on Energy-Intensive Products –** In November 2006, the Ministry of Finance increased export taxes on energy intensive industries. This includes a 15% export tax on copper, nickel, aluminum and other metals; a 10% tax on steel primary products, and a 5% tax on petroleum, coal and coke. Simultaneously, import tariffs on 26 energy and resource products including coal, petroleum, aluminum and other mineral resources will be cut from their current levels of 3 to 6% to between 0 and 3%. These tax shifts aim to discourage the export of energy-intensive products as a means of conserving domestic energy resources. They were triggered by recent large investments in energy-intensive industries in China (particularly copper, aluminum and steel) stimulated by elevated international prices.[13]
- **Promoting Advanced Technologies –** Policies to promote renewable energy include mandates and incentives to support the development of domestic technologies and industries, for instance by requiring the use of domestically manufactured components. Spurred by a requirement that new installed wind turbines contain 70% local content, Chinese manufacturers are now producing commercial large wind turbines selling for approximately 30% less than similar European and US technology. Tax and other incentives have targeted the solar photovoltaic (PV) industry, stimulating a six-fold growth in PV production from 2004 to 2005. A recent market study estimates that the Chinese PV industry will dominate the global market within 5 years.[14]

Forestry

- **Reforestation –** Policies to promote reforestation have helped to increase forest coverage from 13.92% in early 1990s to 18.21% in 2005. From 1980 to 2005, improved forest management has sequestered an estimated 3 billion tons of CO_2.

Energy Diversification

- **Nuclear Energy –** China's National Energy Strategy Plan aims to quadruple installed nuclear capacity to 40 GW by 2020.[15]
- **Natural Gas –** China has significantly increased infrastructure to utilize natural gas, which may displace some coal in future electricity generation. The West-East Pipeline was built to transport natural gas from Xinjiang to Shanghai.
- **Hydropower –** Large-scale hydropower capacity is projected to more than double by 2020, requiring the equivalent of a new dam the size of the Three Gorges Project every two years.

Advanced Coal Initiatives

- **FutureGen –** Huaneng, China's largest coal-based power generation company, is one of ten international energy companies participating in the U.S. FutureGen "clean coal" project, which aims to develop the world's first integrated sequestration and hydrogen production research power plant.[16] Huaneng also is leading its own version of FutureGen

in China called "GreenGen." The project has the ambitious goal of demonstrating a near-zero-emission 400-megawatt plant with entirely home-grown technology by 2020.[17]

- **China-EU Partnership –** A UK-led initiative, part of a broader China-EU partnership on climate change, is promoting carbon capture and storage at coal power plants. Phase one is a three-year study of technology options for the capture of carbon dioxide emissions from power generation and of the potential for geological storage, leading towards a possible demonstration project starting between 2010 and 2015.[18]
- **Asia Pacific Partnership –** China is collaborating with international partners on coal and CCS technologies through the Asia Pacific Partnership on Clean Development and Climate (APP).[19] Officially launched in January 2006, APP brings together China, the U.S., Australia, India, Japan and the Republic of Korea to promote the development and deployment of clean energy technologies.

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