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The Future of China's Energy and Climate Change Policies

By Annissa Alusi

Introduction

Fossil Fuels—*fuels such as coal and oil which are derived from fossilized remains*

Why are China's Energy Usage and Carbon Emissions important?

Global climate change is the warming temperature of the earth caused by man-made emissions of fossil fuels, and over the past several years it has been recognized worldwide as an environmental threat - with China now at center stage. The United States had been the worldwide leader in emissions of carbon dioxide, the primary gas responsible for climate change, for several decades - until China overtook the United States in 2006. Due to emissions from burning fossil fuels for energy and emissions from the industrial practice of making cement, China produced 6.2 billion tons of carbon dioxide in 2006, as compared to the United States' production of 5.8 billion tons. China has experienced rapid economic growth over the past decade, and between 2000-2005, its emissions more than doubled. Energy demand worldwide will increase by 53% from 2008 to 2035, but more than half of this increase will be due to the developing economies of India and China. The use of fossil fuels for energy is what creates the vast majority of greenhouse gas emissions that cause climate change, and by this date of 2035, China is expected to use 68% more energy than the United States.

All international climate treaties and policies have a heavy focus on China because of its projected future of skyrocketing energy usage and carbon emissions. In the future, China will need a robust energy policy plan to power its own development and an aggressive emissions reduction plan in order for the world to meaningfully address the threat of climate change. This brief will explore China's energy and emissions situation and present potential solutions.

Factors Behind China's Skyrocketing Energy Usage

Due to rapid economic growth, urbanization, and a large industrial sector, China has succeeded in becoming one of the world's top economies over the past several years. While this incredible growth has lifted hundreds of millions of Chinese citizens out of poverty, it has also required major increases in energy usage - and therefore caused skyrocketing greenhouse gas emissions. Below we analyze factors behind China's increased demand for energy.

Rapid Economic Growth

China has dramatically reformed its economy over the past two decades, enacting numerous market reforms to encourage business, entrepreneurship, agricultural/rural development, and much more open trade relationships with the outside world. These reforms have led to higher productivity and living standards, and China has maintained an incredible 9.3% economic growth rate since 1989 (whereas the U.S. typically has yearly growth rates between 1% and 4%). In 2010, it surpassed Japan to become the second-largest economy in the world, second only to the United States. The dramatic economic growth has required sharp increases in energy usage

Urbanization



Urbanization is the movement of people from rural areas into urban areas like large cities, and this pattern will become increasingly important over the coming decades worldwide. China has a large rural population currently, but by 2035, 350 million people (equivalent to the population of the United States) will be added to China's cities. In turn, China is expected to have 221 cities with over 1 million people, and cities will account for 90% of China's economic output by 2025. People living in urban areas on average use more energy for buildings, electricity, transportation and technology, and urban growth will result in increased energy demand in China.

GDP—*Gross Domestic Product*

Large Industrial Sector

China has an enormous industrial sector, which accounts for about 47% of Chinese GDP. China's largest industries are mining and ore processing; iron; steel; aluminum; coal; machinery; textiles and apparel; armaments; cement; chemicals; fertilizers; consumer products including footwear, toys, and electronics; automobiles and other transportation equipment including rail cars and locomotives, ships, and aircraft; telecommunications equipment; commercial space launch vehicles; and satellites. These industries, and cement manufacturing in particular (the country also produces about 40-50% of the world's cement, which accounts for 10% of China's total emissions.) are energy intensive and have led China to become the world's leading energy consumer.

Current Status: Energy Sources for China's Growing Demand

China uses several power sources in order to fuel its rapidly increasing energy demand. These energy sources include traditional fossil fuels like coal, oil and natural gas, as well as energy sources that produce zero carbon emissions, such as nuclear energy and renewable energy. Below we analyze the current trends of energy sources in China.

Coal

In 2009, coal accounted for 71% of China's energy consumption, and China is the largest producer and consumer of coal in the world. China's coal demand is projected to rise significantly as its economy grows, and it's estimated that China is building about two coal-fired power plants per week. China's continued reliance on coal as a power source has contributed significantly to China's emergence as the world's largest emitter of acid rain-causing sulfur dioxide and greenhouse gases.

Oil and Natural Gas

China has been a net importer of oil for almost two decades, mostly from the Middle East, and oil comprised 19% of the country's energy usage last year. Experts expect that China's demand for oil will increase as its population quickly increases its number of vehicles, which run oil.

However, China is interested in exploring sources of oil outside the Middle East in order to meet large expected demand in the future. Recently, China made deals for oil with Russia, Brazil, Venezuela, Kazakhstan, Angola, and Ecuador - totally about \$50 billion. Chinese oil companies have also invested in several U.S. oil and natural gas fields.

Natural gas is another source of fuel, and China is interesting in using more natural gas because it is cheaper in price and cleaner with respect to greenhouse gas emissions than oil. Currently, natural gas makes up only 4% of China's energy mix, but the country plans to increase domestic production and imports. China's goal is to eventually have natural gas make up 10% of its overall energy.

Nuclear

Nuclear power currently provides only 1% of China's energy, but the country aims to increase this number to 4% because nuclear power does not emit greenhouse gases and is considered a clean technology. Over the next five years, it is estimated that China will build more nuclear reactors than the rest of the world combined.

Hydropower

Hydroelectric power is produced by converting the mechanical energy of moving water into electricity, often at a dam. It is a form of renewable energy and emits no carbon emission, and hydropower accounted for 6% of China's energy use in 2010, which is double the percentage of natural gas. China has invested billions of dollars in installing hydroelectric dams at rivers across the country, but this often has negative environmental consequences - such as flooding and damage to wildlife areas.

Renewable Energy (non-hydropower)

Renewable energy refers to energy that comes from natural resources and is easily replenished. It includes solar energy, wind energy, and tidal energy, all of which emit no greenhouse gases. Investment in renewable energy is a key step towards fighting climate change, and in 2010, China invested \$51.1 billion in renewable energy - the highest amount of any country in the world. China has the world's largest installed wind power capacity, most of which is in offshore wind farms, and is building more wind power at a far faster rate than any other country in the world. China also produces 30% of the world's solar panels and due to large reserves of the natural minerals and materials needed to make solar panels, they are the leading manufacturer of solar photovoltaic technology (the panels used to capture sunlight for conversion to electric power). However, non-hydropower renewable energy still makes up less than 1% of China's energy portfolio, even though it is the leading nation in renewable energy capacity.

China: To Reduce Greenhouse Gas Emissions?

China's Perspective

Recently, China has faced mounting international pressure to reduce its greenhouse gas emissions. However, Chinese President Hu Jintao has long argued that China is still developing economically and will need large amounts of energy, therefore more industrialized nations - like the United States and European countries - should be the ones to dramatically reduce carbon emissions. This is based on the United Nations principle of "common but differentiated responsibilities", which states that 1) the largest share of historical and current global emissions of greenhouse gases originated in developed countries; 2) per capita emissions in developing countries are still relatively low; and 3) the share of global emissions originating in developing countries will grow to meet social and development needs.

Furthermore, on a per capita basis, China emits 6 tons of greenhouse gases per person each year - whereas the United States emits 18 tons per person. China is only slightly above the world average is about 5 tons per person each year, leading many in China to believe that it is only fair for countries like the U.S., Australia and Saudi Arabia (with very high per capita emissions) to lead the effort to reduce carbon dioxide emissions worldwide.

History of China's Climate and Energy Policies

China has refused to make actual cuts in the absolute amount of greenhouse gases it produces, because its economic development will require the its energy and

carbon emissions to increase. China ratified the Kyoto Protocol, an international climate treaty aiming to reduce greenhouse gas emissions globally, but it was not required to set binding emissions targets since it is still a developing country. Regardless, the U.S. and other nations strongly urged China to set more stringent targets in the future.

**CERC—Clean Energy
Research Center**

Recently, China has made promises to reduce “carbon intensity”. Carbon intensity measures the amount of greenhouse gases produced per dollars of economic output. For example, in 2003, China emitted 700 tons of carbon dioxide for each \$1 million of economic production. It vowed to reduce this by 40% by 2020, which means that in 2020, it should produce 420 tons of carbon dioxide for each \$1 million of economic production. This is a significant commitment to efficiency, but given that China’s economy is going to increase dramatically, China’s emissions will still increase dramatically as well.

Possible Solutions to China’s Climate Change Problem

Over the past few years, China has planned or committed to a number of different initiatives and programs, some of which are outlined below.

China’s “Five Year Plan” for 2011-2015

Chinese President Hu Jintao has vowed that by 2020, renewable energy - meaning hydropower, solar, wind and other non-carbon emitting energy systems - will account for 15% of China’s total energy use. It also promises a 45% reduction in carbon intensity, discussed above, by 2020 based on 2005 levels. Many analysts believe this overall plan will allow China’s greenhouse gas emissions to peak by 2030 and gradually decline thereafter.

U.S.-China Strategic and Economic Dialogue

In July 2009, Chinese and U.S. officials met to discuss economic issues, including climate change. During the conference, the two parties signed a Memorandum of Understanding to “enhance cooperation on climate change, energy, and the environment in order to expand and enhance cooperation on clean and efficient energy, to protect the environment, and to ensure energy security”.

U.S.-China Clean Energy Research Center (CERC)

President Barack Obama visited China in November 2009 signed off on a number of U.S.-China partnerships to speed development of clean energy. The areas of action included: the establishment of a joint research center on energy efficiency measures, clean coal, and and carbon capture and storage; collaboration on joint projects involving renewable energy, smart grid, clean transportation, and green building; and a U.S.-China joint natural gas initiative to increase natural gas production.

Summary

As the world’s number one producer to greenhouse gas emissions and one of the fastest growing economies in the world, China is now a major global priority in the world’s fight against climate change. China’s fast economic growth, urbanization and booming industrial sector will drive carbon emissions upwards well into the future, and as a developing country, China believes in its right to industrialize and provide for its

citizens. However, as the world learns more about threat of climate change and its potential consequences, China is under massive pressure to reduce emissions and commit to targets. While China has plans in place for increased renewable energy and decreasing carbon intensity, the political battle over how far its climate change commitments must go will extend into the future.

Questions to Address

Is it fair to consider China “the world’s biggest greenhouse gas emitter” if their per capita emissions are still only a fraction of per capita emissions in the United States and other countries? By what criteria, per capita emissions or total emissions, should we prioritize countries which need to take action and lower their emissions?

Do some background research on wind energy and solar energy. Which of these energies do you think will be more viable for China in the future? Why?

China has so far agreed to make reductions in “carbon intensity”, an interesting and very important concept that is described in the brief. What is the difference between a reduction in absolute emissions and a reduction in carbon intensity? Which of these ways would be the best way to measure climate change emissions reduction efforts and why? Does it vary by country?

Is it fair for other countries to pressure China into committing to absolute emissions targets?

Do you think China’s “Five Year Plan” is aggressive enough? How might countries in Europe, which have committed to absolute emissions reduction targets, view China’s plan?

China and the U.S. have formed numerous plans to collaborate on climate issues like clean energy and energy efficiency. What other types of collaborations could China form with the U.S. and other developed countries in order to speed its emissions reduction?

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