



Understanding Extreme Weather in China and Climate Change Impacts

Heavy snowstorms this winter across central, eastern, and southern China have severely strained the country's transportation and energy networks. Some of the most severe weather coincided with a period of mass travel during February's Lunar New Year celebration. The bad weather and high travel resulted in significant disruptions. An estimated tens of thousands of travelers were stranded, and congestion on China's freight networks created a significant backlog of coal supplies that fuel much of the nation's power systems.

These energy and transportation problems raise key questions concerning climate change impacts facing China, as well as the rest of the world. Below, the Pew Center answers four key questions in response to these issues.

- 1. What is the direct cause of the snow storms in China and how do they fit into the global picture of today's climate?**
- 2. Do the snowstorms in China have any connection to global warming?**
- 3. Since summer 2007, China has experienced several extreme weather events, including floods and hurricanes in Chongqing and Jinan, and the snowstorms this winter. In the context of global warming, is the frequency of major natural disasters increasing?**
- 4. What are the potential lessons to be learned for China from extreme weather events that seem to be increasing in frequency?**

1. What is the direct cause of the snow storms in China, and how do they fit into the global picture of today's climate?

The Pew Center is not a meteorological center and we are not able to offer a direct explanation of the development of individual weather events. However, what is happening in China seems to fit a larger pattern of frequent extreme weather events in other parts of the world, such as the severe European heat wave that killed many thousands of people in 2003, the powerful hurricanes that have struck China and the Americas in the past three years, the dramatic increase in wildfires in the western U.S. and western Canada, and the historic droughts that have affected the U.S., Australia, and Europe in recent years. So, there appears to be a global pattern of more extreme weather events that many millions of people around the world are experiencing in recent years.

2. Do the snowstorms in China have any connection to global warming?

Science cannot determine whether any single weather event is directly connected to global warming. However, in 2007, the Intergovernmental Panel on Climate Change (IPCC) documented that extreme weather events have become more common globally, including heavy rainfall and snowfall events, intense droughts, heat waves, and tropical cyclones. In some individual regions, the increases in particular types of extreme events have been attributed to global warming, such as extreme droughts in Australia and Europe. For the northern hemisphere or the entire globe, increased average rainfall and increased high temperature extremes have been attributed to global warming.

People are often confused by the idea that severe winter storms could be connected to global warming. How can increasing global temperatures cause heavy snowfall? The explanation is quite simple. Heavy

snowfall requires moist air. Moist air results from warm conditions that evaporate water from the ocean or large lakes. When this air travels over land and meets colder air, the moisture will freeze and fall as snow. If the air over the ocean or large lakes becomes warmer, it will hold more moisture and the snowfall will increase. Also, snow fall can occur at -20 degrees C or 0 degrees C. So even if the cold air warms up, it will still make snow as long as the temperature remains below the freezing point.

So the unusual severe snow storm in China certainly fits a broader trend of increasing severe weather events that is well documented and it could well be a consequence of global warming. Even though it is not possible to say for sure that it is caused by global warming, like Hurricane Katrina and the 2003 European heat wave, it offers important lessons about the types of events society must prepare for in the future as a result of global warming.

3. Since summer 2007, China has experienced several extreme weather events, including floods and hurricanes in Chongqing and Jinan, and the snowstorms this winter. In the context of global warming, is the frequency of major natural disasters increasing?

The simple answer is yes. As the climate changes, extreme events are becoming more frequent on average. Of course, disasters are usually associated with man-made conditions, even in the case of weather events. For instance, as more people live close to the coast, more people become exposed to hurricanes, and a disaster is more likely even without climate change. Adding climate change on top of man-made circumstance simply increases the likelihood of a serious disaster.

4. What are the potential lessons to be learned for China from extreme weather events that seem to be increasing in frequency?

The most important lesson China can take from this event is that climate change has real and potentially severe costs. It is true that the U.S. and Europe are responsible for most of the greenhouse gases currently in the atmosphere. However, given its current path of development, China will be the largest single contributor to greenhouse gases added to the atmosphere in the future and will therefore be the largest contributor to those impacts that can still be avoided in the future. It is important, therefore, for China to understand the tradeoffs that are inherent to any path of future economic development. Today a carbon-intensive economy may seem to be the most expedient path to economic growth, but the real and unpredictable costs to the economy of future climate change could be debilitating.

Historically, risk managers have looked to the past as a guide to the future. But with climate change, the future will no longer resemble the past. To ensure that China and all other societies can cope with climate change, serious reductions in manmade greenhouse gas emissions must be undertaken in the next few decades to reduce the extent of future impacts and all must take stock of current and projected impacts in order to prepare for a future unlike the past we have known.

As an example, these recent snowstorms illustrate that China's energy security is intimately linked to climate security. China currently relies on coal for about 80% of electricity generation. While most of this coal is mined in the northern and western provinces, much of the surging growth in electricity demand has been experienced in the eastern coastal region. The eastern provinces rely on road and rail transport for access to domestic coal reserves which, as the recent storms have shown, can be easily disrupted by extreme weather events. Therefore, diversifying its energy supply and replacing coal with lower-carbon fuel sources produced throughout the country would enhance China's energy security while reducing its contribution to climate change. Hence, as China looks to expand its energy infrastructure in coming years, climate security concerns should be examined hand in hand with energy security concerns.