



Fast

FACTS

CANADIAN CENTRE FOR POLICY ALTERNATIVES - MANITOBA

March 18, 2014

Cold winter a sign of climate change

Some winter we're having, eh? This winter has been cold, no doubt about it. It is probably the coldest we've seen in North America since some time in the 1990s. So, does this mean that global warming isn't happening?

To really understand what's going on, we need to look at this winter in context and look at some of the mechanisms that have brought the cold.

First of all, there is a difference between weather and climate: weather is what is happening outside the door right now. Climate is the pattern of weather measured over decades.

The records clearly show that the earth is warming - especially since 1980 or so. But, that warming is not happening equally to all parts of the world, it is different in different seasons. You have to look at decades of data to separate climate changes from normal weather anomalies. If you look at that trend over decades, the earth on average is indeed warming - and quickly.

Dr Danny Blair and Ryan Smith of the University of Winnipeg have been studying temperature data for Canada. The data shows that Canada's average annual temperature has been increasing. The rate of change is different for different parts of the country; the north is warming more quickly than the south, for example. But the starkest differences appear when you look at the seasons. The average annual temperature has been increasing at a rate of about 2 to 5°C per century since 1970. Canadian summer temperatures haven't really changed all that much but our winters certainly have gotten

warmer - *at rates approaching 10°C per century in some places.*

So, as cold as this winter has been around here - it is probably more in line with winters that were commonplace a few decades ago.

When you step outside your door and it is cold, you may think that this means it's cold everywhere. But, of course, that's not so.

In Winnipeg, according to Environment Canada, December and January combined were the coldest since the winter of 1949-50. Much of North America has also been cold this winter. In many parts of this continent, November, December, and January this winter were colder than normal. However, this winter isn't extreme if reviewed in an historical context. In the USA, December was only the 21st coldest since 1895 and the coldest since 2009. In January, despite some of the coldest Arctic air outbreaks to hit the eastern US in several years, no state had their coldest January on record.

Globally, the combined land and ocean average temperature for November 2013 was the warmest since records began in 1880. December 2013 was the 3rd warmest on record, and January 2014 was the 4th warmest. While much of North America froze, northern Alaska was much warmer (and wetter) than normal and Russia experienced its warmest November AND December on record.

Aside from normal year-to-year weather variation, the key driver of this phenomenon is variability of the polar

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vortex. The polar vortices are large air masses that rotate about both the north and south poles. These systems strengthen and expand in winter. At the outer edges of these vortices are jet streams, where the winds in the upper atmosphere are especially fast.

These vortices and their jet streams are driven by temperature differences between the equator and the poles. With a large temperature difference, the vortex rotates faster and tends to be quite circular. This keeps the cold air near the poles and the warm air in the mid-latitudes.

The polar zone of the northern hemisphere has been getting warmer more quickly than many other parts of the world. This differential warming has been due to a number of factors including loss of the polar ice cap, reduced snow cover, and anomalies in the North Atlantic Oscillation (NAO). As the temperature difference between the pole and equator declines, the jet stream slows.

Just like a river, as the jet stream slows, it starts to meander. This meandering causes the undulations in the vortex - called Rossby Waves - to extend farther down toward lower latitudes. These waves move warm air toward the pole and polar air toward the equator. Hence, warmer Alaska, colder Florida.

A weaker polar vortex also tends to create weather systems that stay in place longer and increase the chance for weather systems to become blocked. This blocking was a key cause of Superstorm Sandy that hit New York in 2012, and has certainly contributed to the historic drought currently affecting California.

As the climate changes due to human-induced global warming, it does affect the weather. Scientists are still learning details about what those affects will be. We are seeing new effects every year because we are getting into uncharted territory. We don't yet know exactly what impacts and changes we should expect. Perhaps, one of those effects may be - ironically, and at least for a little while - a cold winter some years.

To prepare for this uncertain future, there are

two broad objectives we need to embrace with vigor and determination: drastically reduce our greenhouse gas emissions and build local resilience.

The first objective we've all heard before; in order to keep from compounding the coming impacts of climate change, we know we must *drastically reduce our greenhouse gas emissions and our dependence on fossil fuels.*

The second objective may not be as obvious - but may ultimately be more important for meeting basic needs in an uncertain future. We need to *build local resilience.* We need to become more locally self-reliant. This means meeting more of our needs without relying on transportation and imports. Conserve and protect our water; minimize consumption requirements. Build better flood control and water retention systems. Create a system for production, storage, processing, and distribution of local food. Develop the ability to construct buildings with more local materials. Improve insulation and air-sealing in our buildings. Develop local sources of heat (e.g. solar, geothermal, biomass) and an electricity grid, including hydro, built to the highest standards of sustainability in consultation and partnership with Northern and Aboriginal communities. Promote active transportation. Repair our current infrastructure to make it sustainable, robust, and long-lasting.

Done right, embracing these objectives will not only help us build a sustainable local economy - it may also be what we need to see us through some tough winters to come.

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