

# Alberta's Climate Plan: A Burden with No Benefit

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*The Alberta Government imposed a carbon tax of C\$20/tCO<sub>2</sub> on January 1, 2017, increasing to C\$30/tCO<sub>2</sub> on January 1, 2018. This action is not based on the most recent and best quality climate science and economic evaluations. The expected warming from 2016 to 2100 due to greenhouse gas emissions is only 0.6 °C using the best climate science. The net social benefit of emissions is about 5 US\$/tCO<sub>2</sub>. A carbon tax will harm all Albertans for no benefit. The climate plan is forecast to reduce global temperatures by 0.00007 °C by 2030.*

## Alberta's Climate Change Plan

The Alberta Climate Leadership Panel produced a report in November 2015 which proposed actions to reduce greenhouse gas emissions. Alberta's climate change plan is based on that report and includes an economy wide carbon tax, restrictions on methane emissions and oil sands emissions, the phase-out of coal-fired electricity generation and subsidies to businesses for renewable energy projects.

The plan will impose a 6.73 ¢/L tax on gasoline and 1.52 \$/GJ tax on natural gas by January 2018. The phase-out coal plan will cost approximately \$22 billion, including \$11 billion in compensation to industry and \$11 billion to build equivalent natural gas generating plant capacity. The plan calls for \$3.4 billion in payments to businesses over the next five years to produce intermittent and unreliable solar and wind power. Conventional power plants must be rapidly ramped up and down to offset the enormous variability of solar and wind power, which reduces their efficiency and increases carbon dioxide (CO<sub>2</sub>) emissions per unit of energy produced. The plan also requires billions of dollars to upgrade the electrical grid to accommodate the intermittent power sources.

The Alberta climate plan would reduce the CO<sub>2</sub> concentration in the atmosphere by 0.026 parts per million (ppm). The global temperature reduction would be 0.00007 °C by 2030, which is insignificant and undetectable.

The climate leadership report did not contain any cost-benefit analysis of the proposed actions nor any analysis of the social costs and benefits of greenhouse gas emissions. It relied on the a politically motivated report from the US Interagency Working Group (IWG) on Social Cost of Carbon (SCC), which produced estimates of the SCC to support US President Obama's war on fossil fuels. That report is seriously flawed for numerous reasons:

- The climate sensitivity to CO<sub>2</sub> emissions used by the IWG is much too high.
- The IWG uses climate sensitivity estimates by a United Nations panel that is run by a group of natural climate change deniers. All 20<sup>th</sup> century natural climate change is falsely attributed to greenhouse gas emissions in the models and in the UN reports.
- The 2.5% discount rate used is too low.
- The IWG used the average of three economic models, but the PAGE and DICE models should not be used as they do not include the significant benefits of warming and CO<sub>2</sub> fertilization. Only the FUND model should be used to determine social costs and benefits of emissions. CO<sub>2</sub> is plant food and its increase has greened the Earth.
- The PAGE and DICE models assume future society takes no action to mitigate climate change regardless of how much the global average temperature rises.
- Most damages are forecast to occur outside of North America. Alberta's climate policy should be based on the costs and benefits of emissions to Canadians.

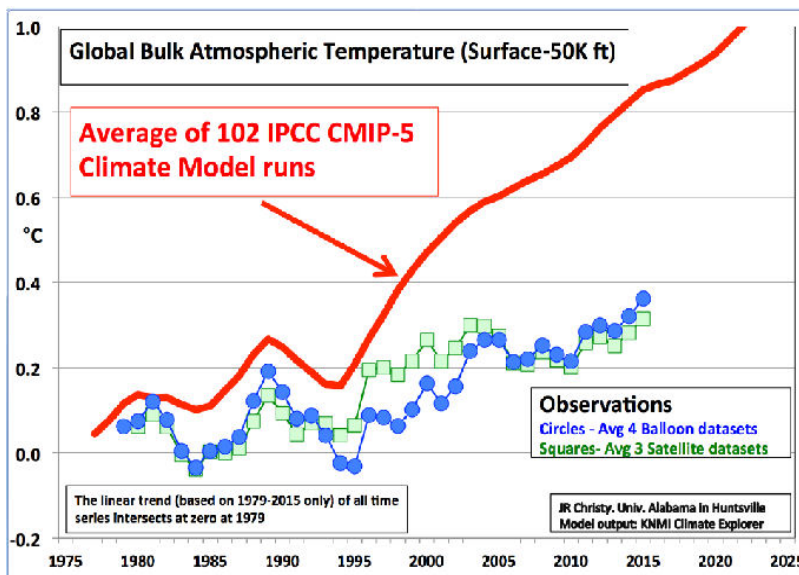


Figure 1. Comparison of the average climate model warming to that of satellite and weather balloon datasets. Models are too sensitive to CO<sub>2</sub> emissions.

Empirically-based estimates of climate sensitivity to CO<sub>2</sub> emissions have been declining dramatically in recent years, but the IWG failed to reduce the estimate of climate sensitivity to the most recent estimates. They instead chose to use high estimates from climate models.

Climatologist Dr. Judith Curry of Georgia Tech says, “**The US IWG used indefensible values of climate sensitivity as input into the integrated assessment models.**” The global warming rate of the bulk

atmosphere from 1979 to 2015 (37 years) as simulated by the models is 2.5 times that measured by satellites and weather balloons as shown in Figure 1. In the tropics, the models over-warm the atmosphere by a factor of 3, indicating the models are far too sensitive to our CO<sub>2</sub> emissions. The greenhouse warming effect should be most apparent at about 7 km altitude. The Canadian climate model warming rate at 7 km altitude is 6 times that of the satellite measurements. The Canadian climate model results bears no resemblance to planet Earth!

Germany has the highest solar plus wind capacity in Europe, and their electricity prices in 2015 were **more than twice** the price in Canada. If Alberta increases the wind and solar share of electricity generation to the 19% share that Germany had in 2015, our electricity prices are likely to more than double, sending industry fleeing and causing hardship on all Albertans.

The proposed carbon tax and associated subsidies to crony capitalists to build wind and solar power facilities will raise the price of electricity and the price of all goods and services. This will impact the poor much more than the wealthy and enrich only the capitalists looking for government subsidies.

The IWG predicts that the world's income per person will be 5 times higher in 2100 than today despite its excessive climate warming forecasts. The large increase in energy costs imposed on Albertans and the world now will transfer wealth from us to our much wealthier descendants.

The social cost of carbon (SCC) is the cost net of benefits of a small increase in CO<sub>2</sub> emissions, usually one metric tonne, in a given year. The purpose of a SCC calculation is to determine the optimum tax or subsidy to be applied to CO<sub>2</sub> emissions such that marginal benefit of purchasing energy equals the total costs and benefits to society of producing the energy. This would create a "level playing field" for all energy sources as long as there are no subsidies on renewable energy and no other restrictions on CO<sub>2</sub> emissions. The subsidies to renewables and the closure of coal-fired power plants completely destroys the logic of the carbon tax. It is appalling that the members of the Alberta Climate Panel are unaware of this. Government should never subsidize industry other than to compensate for externalities.

The cost to replace fossil fuels with renewable energy globally is \$100 trillion to \$300 trillion. The capital costs of renewable energy plants are almost 30 times as high as those of the natural gas plants. Including operating costs, on-shore wind farms are 4 times, and solar photovoltaic plants are 14 times as expensive as natural gas plants. In addition, the extreme volatility of wind and solar power imposes large costs on back-up power systems and the electricity grid. Wind and solar don't provide power when needed, so they need 100% back-up. Energy storage is incredibly expensive and impractical, so where hydro power is not plentiful, fossil fuel back-up is required. In the UK, every "green" job causes 3.7 job losses and results in lower incomes.

The FUND model shows that Canada **benefits** from emissions by 1.9% of gross domestic product by 2100, equivalent to a benefit of \$190 billion annually in 2015 dollars when assuming a high climate sensitivity of 3 °C. Anthropogenic CO<sub>2</sub> emissions will have **only positive impacts in Canada which increase throughout the 21st century**. Therefore there is no reason for Canada to have any carbon taxes.

New research shows that CO<sub>2</sub> emissions will cause global temperatures to increase from 2016 to 2100 by only 0.6 °C, which is very beneficial on a global basis. This value takes into account the natural warming since the Little Ice Age and the effects of urban development. According to the FUND model, this is equivalent to a **social net benefit of 5 US\$/tCO<sub>2</sub>**.

## Energy Balance Climate Sensitivity

The most important parameter in determining the economic impact of climate change is the sensitivity of the climate to greenhouse gas emissions. Climatologist Nicholas Lewis used an energy balance method to calculate the Equilibrium Climate Sensitivity (ECS) best estimate at 1.45 °C. ECS is the global temperature change resulting from a doubling of CO<sub>2</sub> in the atmosphere after allowing the oceans to reach temperature equilibrium, which takes about 3000 years in the models.

A more policy-relevant parameter is the Transient Climate Response (TCR) which is the global temperature change at the time of the CO<sub>2</sub> doubling. A doubling of CO<sub>2</sub> at the current growth rate would take 126 years. The analysis gives the TCR best estimate at 1.21 °C with a likely range [17 - 83% confidence] of 1.05 to 1.45 °C.

Aerosols are the dominant contribution to uncertainty in climate sensitivity estimates. Bjorn Stevens is an expert on cloud-aerosol processes. He published a new, lower estimate of aerosol forcing in June 2015. Lewis used the new estimate for aerosol forcing and used estimates of other forcings given in the fifth assessment report by the UN climate panel.

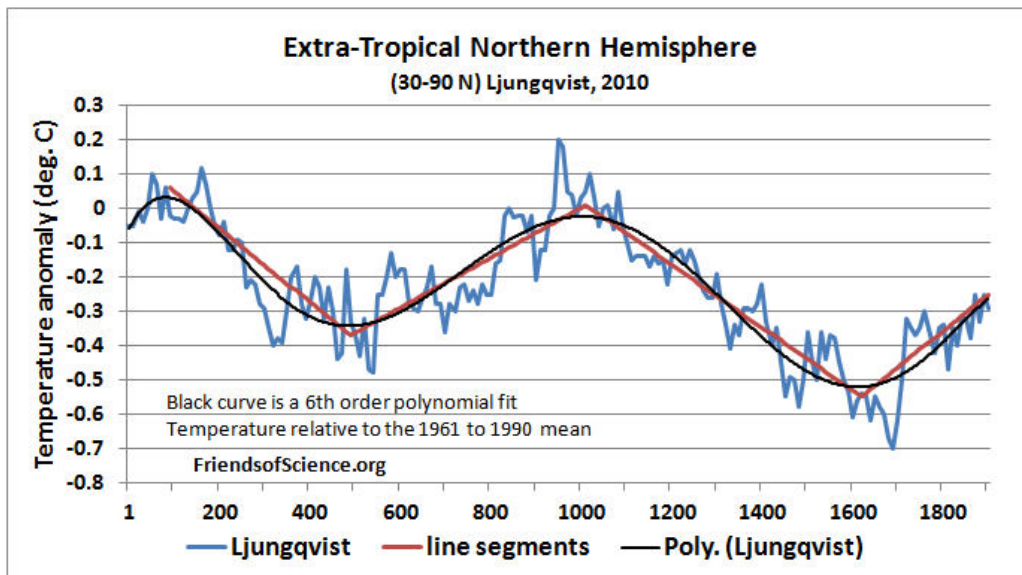


Figure 2. Extra-tropical Northern Hemisphere temperature change adapted from Ljungqvist 2010 with a 6th order polynomial fit and line segments. Roman Warm Period AD 1-300; Dark Age Cold Period 300-900; Medieval Warm Period 800-1300; Little Ice Age 1300-1900.

The analysis used data over 153 years, which has the effect of averaging out the short-term ocean oscillations, but it does not account for millennium scale ocean oscillations or indirect solar influences. The temperature history shows an obvious millennium scale temperature oscillation indicating that natural climate change accounts for a significant portion of the 20<sup>th</sup> century warming. Climatologist Dr. Richard Lindzen writes, "Lewis does not take account of natural variability, and, I suspect, his estimates are high."

Fredrik Ljungqvist prepared a temperature reconstruction of the Extra-Tropical Northern Hemisphere (ETNH) during the last two millennia with decadal resolution using 30 temperature proxies as shown in Figure 2. Human-caused greenhouse gas emissions did not cause significant temperature change to the year 1900 because cumulative CO<sub>2</sub> emissions to 1900 were insignificant.

The southern hemisphere and tropics temperature variability is less than the northern extra-tropics due to its larger ocean area. The global temperatures vary by only 80% of the ETNH. The global natural recovery from the Little Ice Age is estimated at 0.084 °C/century, which accounts for adjustments to the reconstruction as indicated in the technical paper and the global adjustment.

Numerous papers have shown that urban development contaminates the instrument temperature record. A study by McKittrick and Michaels 2007 showed that almost half of the warming over land since 1980 in instrument data sets is due to urban development. It caused a temperature rise in the temperature record of 0.042 °C/decade on a global basis since 1979.

Table 1 - Estimates of Equilibrium Climate Sensitivity and Transient Climate Response with Uncertainty Ranges.						
	ECS Best Estimate	ECS 17-83% range °C	ECS 5-95% range °C	TCR Best Estimate	TCR 17-83% range °C	TCR 5-95% range °C
USA IWG	3.0	NA	1.70-7.15	NA	NA	NA
Using IPCC AR5 Forcings	1.64	1.25-2.45	1.05-4.05	1.33	1.05-1.80	0.90-2.50
As above but with Stevens' Aerosol Forcing	1.45	1.20-1.80	1.05-2.20	1.21	1.05-1.45	0.90-1.65
As above but with Millennium and Urban Correction	<b>1.02</b>	<b>0.75-1.35</b>	<b>0.60-1.75</b>	<b>0.85</b>	<b>0.70-1.10</b>	<b>0.55-1.30</b>

Table 1 summarizes the ECS and the TCR best estimate, likely and extremely likely confidence intervals for 4 cases. Ranges are to the nearest 0.05°C.

Adjusting the Lewis estimate by the millennium warming cycle and urban development gives a best estimate of the TCR of 0.85 °C.

The best estimate TCR of 0.85 °C implies that the global temperature will increase from 2016 to 2100 due to anthropogenic CO<sub>2</sub> emissions by only 0.57 °C if atmospheric CO<sub>2</sub> continues to increase at the current rate of 0.55%/year. Actual temperatures may rise or fall depending on the magnitude of natural climate change. The IWG best estimate of ECS is too high by a factor of 3. Most of the predicted damages occurs at the high end of the probability range. The IWG 95% estimate is too high by a factor of 4.

## Social Cost of Carbon

Figure 3 shows the SCC (blue line) as a function of ECS. The ECS best estimate is indicated by the red square. The thick red line shows the 17-83% probability range, and the thin red line shows the 5-95% probability range of the ECS estimate. The SCC values assume a real discount rate of 3%. Warming is beneficial up to an ECS of 2.2 °C.

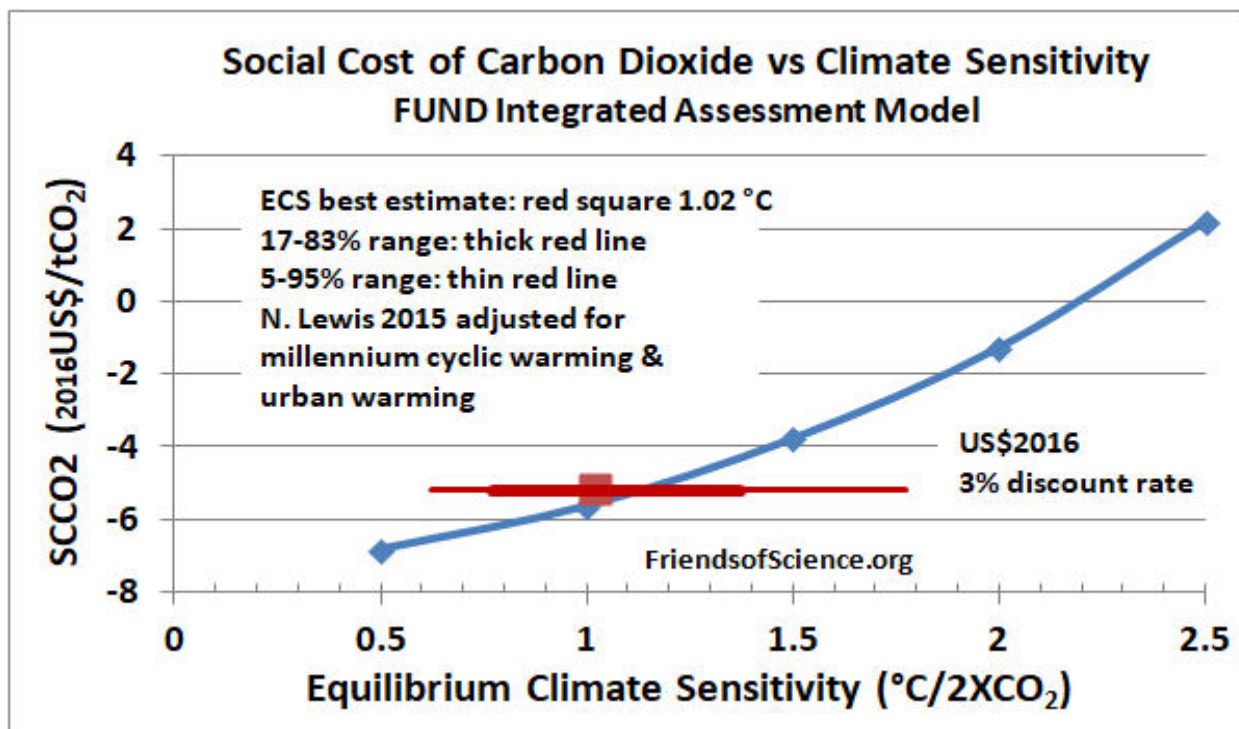


Figure 3. The equilibrium climate sensitivity (ECS) as calculated by N. Lewis using aerosol forcing by Stevens, other forcings and heat uptake by IPCC AR5 and global surface temperatures adjusted to account for natural millennium cyclic warming and urban warming from 1980. The ECS best estimate is shown by the red square and uncertainty ranges by the red lines. Social cost of carbon as determined by the FUND model is shown by the blue line for emissions in 2020 in constant US\$2016.

A study by Idso (2013) found that the increase in the atmospheric CO<sub>2</sub> that took place during the period 1961-2011 was responsible for increasing global agricultural output by \$3.9 trillion (in constant 2015 US\$).

Social cost of carbon values were calculated for all values of ECS and weighted by the probability of the ECS values to determine the probability densities of the SCC values. The best estimate and confidence intervals of the SCC is shown in Figure 4. The analysis shows that on a global basis, the best estimate of the SCC of -5.19 US\$/tCO<sub>2</sub>, which is very beneficial. The likely range is -6.04 to -3.58 US\$/tCO<sub>2</sub>, and it is extremely likely to be less than -1.34 US\$/tCO<sub>2</sub>. These results show that instead of imposing a carbon tax on fossil fuels, there should be a subsidy equal to about 5 US\$/tCO<sub>2</sub>.

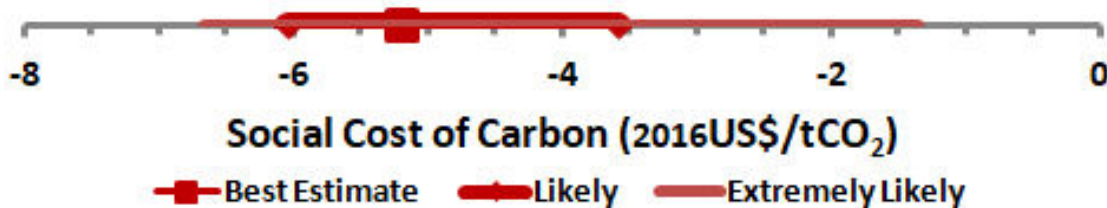


Figure 4. Social Cost of Carbon in US\$/tCO<sub>2</sub> indicating best estimate, likely 17-83%, and extremely likely 5-95% uncertainty ranges. The uncertainty ranges do not include uncertainty associated with the millennium warming cycle or the urban warming effect. The values assume incremental emissions in 2020, 3% discount rate and in constant US\$2016.

Heat and cold related mortality is a major component of the SSC. An international study analyzing over 74 million deaths across 13 countries found that cold weather kills 20 times as many people as hot weather. Statistics Canada 2007-2011 data shows that there are Canadian death rate in January is 100 deaths/year greater than in August. Clearly the optimum temperature is greater than current temperatures.

Contrary to news media scare stories, a warming world reduces the tropics to poles temperature gradient, which reduces the temperature difference that powers storms, leading to fewer and less intense storms. During the past 40 years, global hurricane energy (sum of intensity and longevity) undergoes significant variability but exhibits no significant trend. Hurricane energy has declined by 38% from 1994 to 2015 despite an increase in temperature. The global weather-related death rate declined from the 1920's to the 2000-2006 period by 99%.

The benefits of CO<sub>2</sub> fertilization, reduced cold-weather-related mortality, lower outdoor industry costs (eg. construction costs), increased arable land area and reduced heating costs greatly exceed harmful effects of warming on a global basis.

## The U.N. IPCC Loss of Credibility

The Intergovernmental Panel on Climate Change (IPCC) is a U.N. panel that prepares reports on climate change about every 6 years. The panel primarily considers human causes of climate change and ignores most natural causes. About 770 peer-reviewed scientific papers published from January 2014 to June 2016 contradict the IPCC "consensus" view on global warming.

Contrary to IPCC statements, fully one-third of the IPCC's references in the 2007 report are to non-scientific-journal literature such as Greenpeace promotional material. Government representatives remove any hints of skepticism from the draft Summary For Policymakers, then the main report is changed to match the political summary. After key changes were made to one main report, Frederick Seitz writes, "In my more than 60 years as a member of the American scientific community ... I have never witnessed a more disturbing corruption of the peer-review process than the events that led to this IPCC report."

A large archive of emails and files related to IPCC work was released on the internet in November 2009. The emails show a group of scientists working for the IPCC manipulated, hid or misrepresented data and evidence in official reports. They also obstructed freedom of information requests, and blocked publication of scientific papers that show nature is responsible for much of 20th century warming.

**A technical version of this article with references is available in PDF format at;**  
<http://www.friendsofscience.org/index.php?id=2205>

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