

Misguided Math: Misinterpreted Science

Rebutting the Canadian Institute of Actuaries on Climate Change

Contents

Executive Summary	2
Rebutting the Canadian Institute of Actuaries on Climate Change	4
Introduction	4
Actuaries as a profession are not climate change experts	4
Actuaries are risk management experts	4
Is it Time to Act on This? Why?	6
The COP-21 Paris Agreement is Not Legally Binding.....	8
FACT: Hiatus in warming for 15 years, despite a rise in CO ₂	9
FACT: CO ₂ is not Evenly Mixed in the Atmosphere	12
FACT: Wildfires are not increasing; Human-Wildland Interface is.....	13
FACT: Urban development and poor siting has led to flood damage	17
FACT: Sea level rise is a nominal constant; erosion and subsidence affect coastlines more as does substrate collapse	18
FACT: Rapid decarbonization poses risk of mass mortality.....	20
FACT: Climate change is fraught with conflicts of interest.....	28
FACT: Climate modelling entails a complex blend of fluid dynamics.....	34
There is no climate emergency.....	34
Conclusion	36

Cover Image

*By C. Fukushima and J. Westerweel, Technical University of Delft, The Netherlands -
Own work, CC BY 3.0,*

<https://commons.wikimedia.org/w/index.php?curid=3082535>

*Flow visualization of a turbulent jet, made by [laser-induced fluorescence](#). The
jet exhibits a wide range of length scales, an important characteristic of
turbulent flows.*

Climate models use complex differential equations that try to project the
outcomes of chaotic atmospheric dynamics (and many other variables) like
the image represented on the cover. Prof. Christopher Essex discusses why
that is a challenge in terms of accuracy:

<https://blog.friendsofscience.org/2018/09/23/cavemen-climate-and-computers/>

Executive Summary

On Sept. 24, 2019, the Canadian Institute of Actuaries (CIA) issued a public statement entitled, "Time to Act: Facing the Risks of a Changing Climate." This institute portrays actuaries as *"...risk management experts who use data modelling and statistical methods to measure and manage the financial impacts of uncertain events and scenarios."* However, the statement is studded with assumptions that rely on mathematical climate models that are known to forecast temperature increases in the atmosphere at three to six times the observed rates.

The CIA statement claims that global warming is linked to human industrial emissions of carbon dioxide. The 2013 Intergovernmental Panel on Climate Change AR5 report, which reported that despite a significant rise in carbon dioxide, there had been no statistically significant warming for some 15 years, since before the Kyoto Accord was ratified. The 15-year hiatus doesn't imply that CO₂ has no effect, it only shows that natural variations are large enough to counteract CO₂ warming over that period, which strongly implies the CO₂ sensitivity (warming effect) can't be larger than 3 °C for doubling of CO₂. The lack of warming over more than 15 years was not predicted by any climate model.

German climate scientist Hans von Storch explains: *"At my institute, we analyzed how often such a 15-year stagnation in global warming occurred in the simulations. The answer was: in under 2 percent of all the times we ran the simulation. In other words, over 98 percent of forecasts show CO₂ emissions as high as we have had in recent years leading to more of a temperature increase. If things continue as they have been, in five years, at the latest, we will need to acknowledge that something is fundamentally wrong with our climate models. A 20-year pause in global warming does not occur in a single modeled scenario. But even today, we are finding it very difficult to reconcile actual temperature trends with our expectations."*¹

In response to similar claims relating human-caused global warming to extreme weather events, made by then President Obama, on Jan 16, 2014, Dr. Judith Curry testified to the US Senate that *"carbon dioxide is not the control knob that can fine tune climate."* Since that time, dozens of peer-reviewed papers show that carbon dioxide (CO₂) has a nominal effect on warming; hundreds of papers that human impacts on climate are small.^{2 3}

The CIA statement goes on to say, *"Climate change creates uncertainty, posing a significant threat to the sustainability of our global ecosystems, health, and economies."*

While we cannot foretell the future, climate has always changed throughout time. Climate change is scientifically defined by the IPCC as *"...Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer."*⁴

However, the CIA statement then conflates short-term, unique extreme weather events and related financial losses with climate change and warming. The IPCC's Special Report on Extreme Weather specifically states there is little evidence that human effects on climate or greenhouse gas increases have any impact on extreme weather.⁵ Extreme weather events are integral to climate.

Furthermore, Roger Pielke, Jr. has extensively assessed the impacts of disasters and climate change and has *"found convincing evidence that climate change was not leading to higher rates of weather-related damages worldwide, once you correct for increasing population and wealth."*⁶

¹ <https://www.spiegel.de/international/world/interview-hans-von-storch-on-problems-with-climate-change-models-a-906721.html>

² <https://notrickszone.com/2018/12/10/the-list-grows-now-85-scientific-papers-assert-co2-has-a-minuscule-effect-on-the-climate/>

³ <https://notrickszone.com/2018/01/04/485-scientific-papers-published-in-2017-support-a-skeptical-position-on-climate-alarm/#sthash.F3SfohQO.3l0f0tDm.dpbs>

⁴ <https://www.ipcc.ch/sr15/chapter/glossary/>

⁵ <https://www.ipcc.ch/report/managing-the-risks-of-extreme-events-and-disasters-to-advance-climate-change-adaptation/>

⁶ <https://business.financialpost.com/opinion/ross-mckittrick-this-scientist-proved-climate-change-isnt-causing-extreme-weather-so-politicians-attacked>

Regarding any warming from climate change, note that the FUND model of economist Richard Tol⁷ shows that many places, particularly Canada, financially benefit significantly from slight warming.

The greenhouse gas (GHG) theory of Anthropogenic Global Warming/Climate Change, is based on the theorized warming effect of human industrial emissions creating additional GHGs, once thought to significantly warm the atmosphere. *“Radiative forcing is a measure of the change in energy balance as a result of a change in a forcing agent (e.g., greenhouse gaseous, aerosol, cloud, and surface albedo) to affect the global energy balance and contribute to climate change.”*⁸ However, recent analysis shows that the urbanization of surface temperature measurements has affected the results. This is called the Urban Heat Island effect – UHI – related to heat retention of pavement and buildings in cities and historic placement of thermometers. The net effect of analyzing UHI, is that the warming, once thought to be mostly due to greenhouse gases, is much less than previously thought and more related to the urban settings.⁹

This evaluation suggests carbon dioxide from human industrial emissions is not significantly driving climate change, so there should be no risk of stranded fossil fuel assets, no need to collect data on extreme weather events, and no necessity for corporations to account for climate related factors in investment decisions and corporate risk planning. The three measures advocated by the CIA are unnecessary; null and void.

The greatest risk to the Canadian economy is making climate policies decisions based on misguided math and misinterpreted science by people who are not aware of the complexities of climate science or the vast uncertainties and failings of climate models.

⁷ <http://www.fund-model.org/>

⁸ <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/radiative-forcing>

⁹ Energy balance calculations of climate sensitivity (warming effect) to greenhouse gases that account for urban warming and natural climate change show that doubling of CO₂ causes around 1.0 °C of warming. The climate emulation model MAGICC run with this climate sensitivity shows that the warming from 1980 to 2018 caused by total greenhouse gas was 0.30 °C of warming. Over the same period of time, the surface data from the National Oceanic and Atmospheric Administration (NOAA) shows 1.14 °C of warming. This shows that greenhouse gas warming caused only 27% of the NOAA data warming. Satellite data shows only 0.48 °C of warming which theoretically should be more than surface warming. This implies the urban warming (Urban Heat Island effect) accounts for at least 58% of the NOAA recorded warming trend.

MISGUIDED MATH: MISINTERPRETED SCIENCE

Page | 4

Rebutting the Canadian Institute of Actuaries on Climate Change

Introduction

Actuaries as a profession are not climate change experts who can offer advice on how to slow down or reverse the negative effects of climate change.¹⁰

Actuaries are risk management experts who use data modelling and statistical methods to measure and manage the financial impacts of uncertain events and scenarios.¹¹

The Canadian Institute of Actuaries (CIA) issued *“Time to act: Facing the Risks of a Changing Climate”* and in the document, the above two statements are made. The impetus for the document and the trio of key initiatives proposed by the CIA rest on the premise that if such climate actions were taken, then the burdensome financial outcomes, of recent extreme weather events, stated below, which are conflated with climate change, would somehow be averted.

“The insured losses from severe weather events in Canada alone reached \$1.9 billion in 2018 (IBC 2018), the fourth-highest amount on record, not including uninsured costs paid by all levels of government, businesses, and individuals.”

In 2005, scientist and climate policy expert, Roger Pielke, Jr., author of *“The Rightful Place of Science: Disasters and Climate Change,”* wrote an insightful essay¹² wherein he noted that there are two distinct definitions of climate change, which confuse the public and policy makers. Pielke, Jr. has specialized in statistical analysis of climate change, disaster risk assessment and post-disaster cost evaluation.

¹⁰ <http://www.cia-ica.ca/docs/default-source/2019/219104e.pdf>

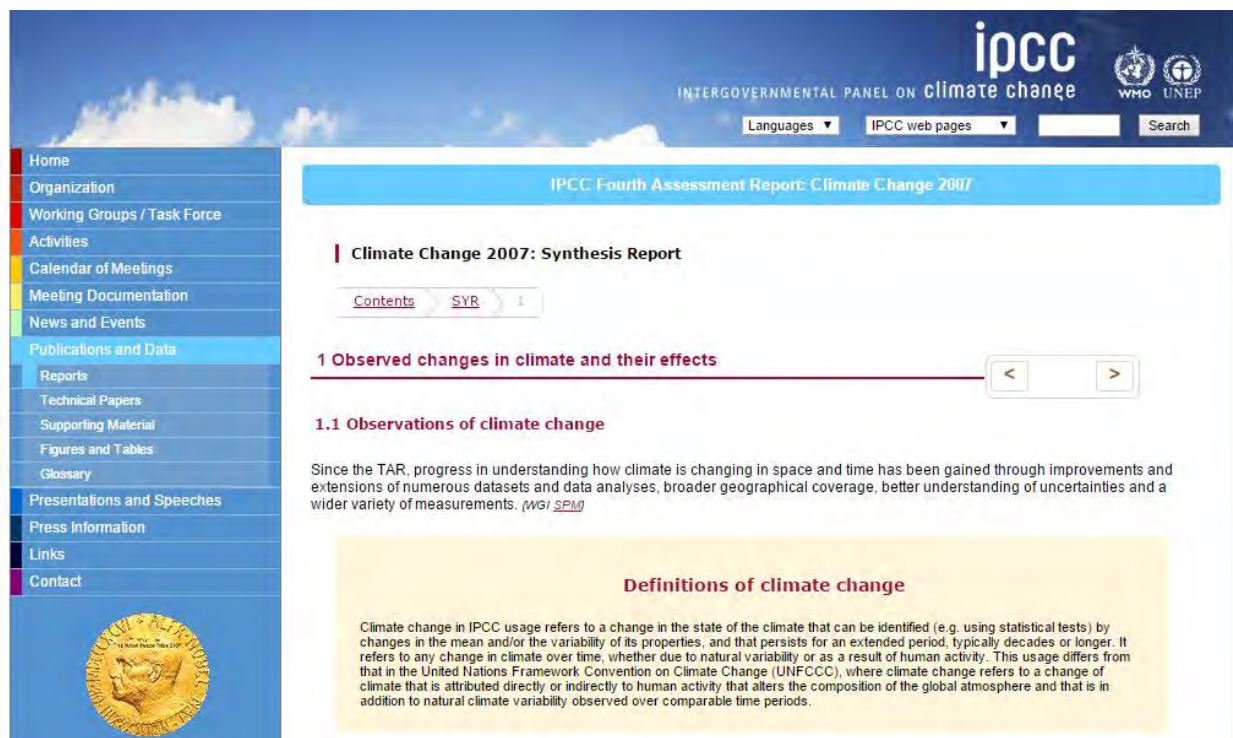
¹¹ Ibid

¹² “Misdefining Climate Change: Consequences for Science and Action”
<https://www.uvic.ca/research/centres/globalstudies/assets/docs/publications/RPielke.pdf>

Furthermore, Roger Pielke, Jr. has extensively assessed the impacts of disasters and climate change and has *“found convincing evidence that climate change was not leading to higher rates of weather-related damages worldwide, once you correct for increasing population and wealth.”*¹³

The United Nations Framework Convention on Climate Change (UNFCCC) is a purely political body, which established a definition in its articles in 1992 that climate change was a critical issue because it was assumed that humans were causing a ‘dangerous’ change to the atmosphere. Article 2 of the UNFCCC reads in part: *“The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, **stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system....**”*¹⁴ (bold emphasis added)

The subsequent scientific definition of climate change, written by the Intergovernmental Panel on Climate Change (IPCC) makes no such subjective ‘dangerous’ assumption.



“Definitions of climate change

*Climate change in IPCC usage refers to a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. **It refers to any change in climate over time, whether due to natural variability or as a result of human activity.** [emphasis added] This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), where climate change refers to a*

¹³ <https://business.financialpost.com/opinion/ross-mckittrick-this-scientist-proved-climate-change-isnt-causing-extreme-weather-so-politicians-attacked>

¹⁴ <https://unfccc.int/resource/docs/convkp/conveng.pdf>

change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods."

The Task Force on Climate-Related Disclosure that CIA takes its guidance from for the proposed trio of initiatives, is referring to the political, UNFCCC definition. However, science refers to the IPCC definition of climate change. Climate may change to be cooler, not warmer. This poses a much greater risk¹⁵ and cost to society but is not even mentioned in "Time to Act."¹⁶

Page | 6

In Pielke, Jr.'s 2005 paper, he notes that 'danger' is a subjective term and specific to location. If no one builds on a flood plain, and there is flooding, then there is no danger to life or property. Thus, one must be clear about which definition of climate change is being employed, and whether poor human planning (building on flood plains without forethought or mitigative structures/dams) is being conflated with natural, integral climate change events like extreme weather; whether speculative claims that a certain molecule is causing extreme weather events, and whether mathematical models accurately represent reality.

Is it Time to Act on This? Why?

The CIA statement outlines three actions it says are required:

- 1) Prioritize data collection related to the financial impacts of climate related events
- 2) Implement policies that accelerate climate-risk financial reporting requirements
- 3) Account for climate related factors in investment decisions and corporate risk planning

The organization then claims: *"As signatories to the Paris Agreement look for ways to limit increases in global average temperature to well below 2 C above pre-industrial levels (UNFCCC 2015), organizations in the finance and insurance sectors are becoming increasingly aware of the importance of quantifying and disclosing the financial impacts of climate change in helping to achieve this target."*

There is no discernable way that such tracking and reporting would help achieve Paris targets. Further, it is unclear what professional skills actuaries have to interpret climate data, no matter how well-parsed.

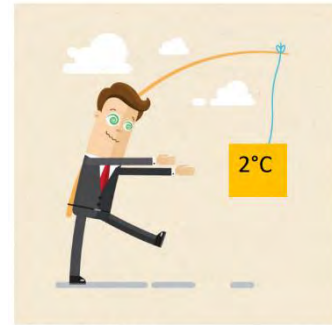
In fact, this effort may be a deviation from professional standard Rule 2: *"members shall perform professional services only when the member is qualified to do so and meets applicable qualification standards."*

Weather, wildfire, flood and sea level rise data are already extensively tracked by government departments at various levels, some on centennial time scales. Greenhouses gas (GHG) emissions are extensively tracked by corporations and governments and many large corporations presently voluntarily report their GHG footprint to the Carbon Disclosure Project Worldwide (CDP Worldwide).

¹⁵ <https://www.sciencedaily.com/releases/2015/05/150520193831.htm> "Cold weather kills 20 times as many people as hot weather, according to an international study analyzing over 74 million deaths in 384 locations across 13 countries."

¹⁶ <https://www.sciencedirect.com/science/article/pii/B9780128045886000173>

If anything, the reporting to the CDP has been disastrous for the Canadian economy as all oil sands projects have been denigrated by the 2017 CDP report, *“In the Pipeline: Which Companies are Preparing for the Future”*,¹⁷ which bore a subjective rating associated with whether oil sands operators were investing in wind and solar – not related to their corporate performance in reduction of noxious emissions, greenhouse gases or their reclamation skills – all of which are excellent and world-class.



Of the three top ranked companies in that report, StatOil was lauded for investing in offshore wind, while Eni came in second place for gas project in Egypt and solar projects in human rights/conflict countries like Algeria, Pakistan and Egypt. Total SA was in third place, ironically having pulled billions out of the oil sands to invest \$5 billion in gas in Iran,¹⁸ a rogue state now caught up in a mega battle of sanctions between the EU and USA. Of this CDP *“In the Pipeline”* index, corporations invested in Alberta oil sands – Chevron, ExxonMobil and Suncor were all relegated to the bottom of the list. Within weeks of this document being issued by the CDP Worldwide, investors, banks, insurers all began dumping oil sands assets and involvement due to ‘carbon risk’.

However, on the other side of the world, China and India continued emitting. Indeed, as Ottawa energy policy consultant, former public servant and diplomat Robert Lyman, points out in *“Futile Folly: Canada’s Climate Policy Goals in the Global Context:”*¹⁹

“China’s GHG emissions in 2016 were 9,114 Mt (according to British Petroleum data). In other words, China emits more in one month than Canada does all year. The average growth in emissions in China over the past decade is 202 Mt per year. Thus, Canada’s total emissions represent about three and a half months of China’s emissions growth. If someone could instantaneously wipe Canada off the map, so that it produced zero emissions forever after, this would have a modest-to-negligible effect on global carbon dioxide concentrations in the atmosphere in 2100, and it would make no difference whatsoever as to whether the IPCC emissions reduction targets (i.e. 1.5 degrees or 2 degrees C.) were met.”

Thus, there seems to be no benefit and no potential to reach Paris targets (which are non-legally binding to begin with) by additional data collection, as proposed by CIA. If anything, more reporting of this nature simply makes it easier to make Canadian industries and corporations into targets for radical environmental non-governmental organizations (ENGOS), vulture investors and competitor nations.

Furthermore, as outlined below, climate change occurs over 30, 50, 100, and millennial timescales. There is no method of forecasting what future climate change will be due to the myriad of complex influences and interplay of natural and human forces.

¹⁷ <https://b8f65cb373b1b7b15feb-c70d8ead6ced550b4d987d7c03fcd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/001/327/original/oil-gas-report-exec-summary-2016.pdf?1479834286>

¹⁸ <https://www.theatlantic.com/news/archive/2017/07/iran-total/532560/>

¹⁹ <https://blog.friendsofscience.org/wp-content/uploads/2019/05/Futile-Folly-FINAL.pdf>

The COP-21 Paris Agreement is Not Legally Binding.

What did the Paris Agreement commit countries to do?²⁰

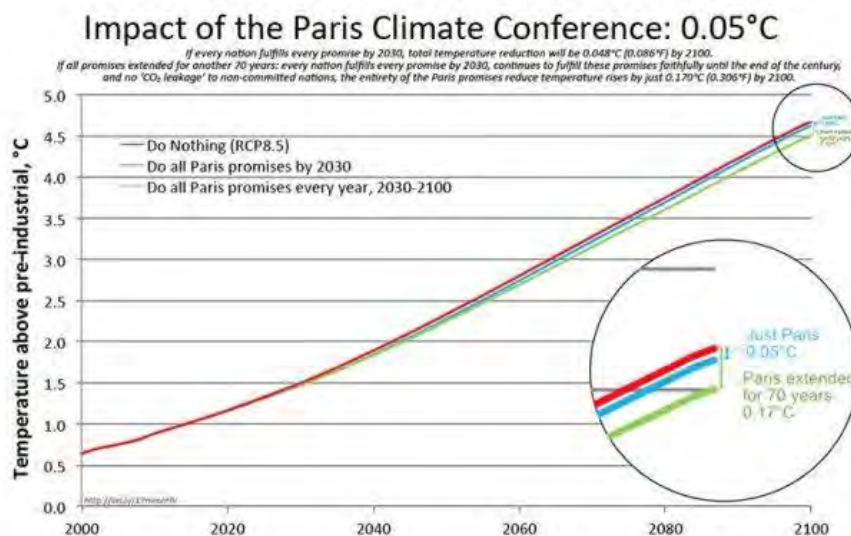
Page | 8

COP21 contains no commitments for the Parties to the agreement to meet any emissions reduction target, either globally or individually. It contains very few binding legal requirements, there is no formula for determining what each country's obligations are, and there are no legal penalties for non-compliance. Rather, it represents a best-efforts political commitment to keep the level of global GHG emissions below that which, in theory, might produce a 1.5 °Celsius increase in average global temperatures. In spite of governments' repeated agreements to reduce emissions, from 1990 to 2014 global emissions grew by 62 %. Most of this growth occurred in the less developed countries, and especially in Asia.

If all countries met Paris Agreement targets, what would be the result?

Bjorn Lomborg, a professor at the Copenhagen Business School, has analysed the temperature reduction impact of the Intended Nationally Determined Contributions (INDCs) submitted to date, using the standard MAGICC climate model. This model integrates all of the premises and equations of the Intergovernmental Panel on Climate Change (IPCC) that increasing human-related greenhouse gas emissions will cause significant global warming in future, which remains the subject of intense debate.

The following graph by Bjorn Lomborg illustrates the difference COP21 Paris Agreement would make in temperature reduction if all countries met their proposed targets, which will certainly not be the case.



Even optimistically assuming that promised emission cuts are maintained throughout the century, the impacts of the Actions to be taken pursuant to COP21 are generally small. All climate policies by the US, China, the EU and the rest of the world, implemented from the early 2000s to 2030 and sustained

²⁰ <https://blog.friendsofscience.org/2017/06/09/the-cop21-agreement-just-the-facts-please/>

through the century will likely reduce global temperature rise about 0.17°C in 2100. In effect, these commitments will do little to stabilize the climate and their impact will be undetectable for many decades.

To see how the countries are doing on meeting targets, please review Robert Lyman's report "Promises vs. Performance."²¹ The US is meeting targets by conversion to natural gas, the EU meeting them through "industrial massacre".²² And China, the largest emitter, is building a global transportation network to advance its economic goals.²³ Meanwhile, Canada is unable to get a pipeline built to reach global markets, due to 'climate change'.

FACT: Hiatus in warming for 15 years, despite a rise in CO₂

In 2013, the Intergovernmental Panel on Climate Change issued the AR5 report, stating that despite a significant rise in carbon dioxide (CO₂), there had been no statistically significant warming for the prior 15 years. This period is commonly referred to as the "hiatus" or the 'pause' in global warming.

Box 9.2 | Climate Models and the Hiatus in Global Mean Surface Warming of the Past 15 Years

The observed global mean surface temperature (GMST) has shown a much smaller increasing linear trend over the past 15 years than over the past 30 to 60 years (Section 2.4.3, Figure 2.20, Table 2.7; Figure 9.8; Box 9.2 Figure 1a, c). Depending on the observational data set, the GMST trend over 1998–2012 is estimated to be around one-third to one-half of the trend over 1951–2012 (Section 2.4.3, Table 2.7; Box 9.2 Figure 1a, c). For example, in HadCRUT4 the trend is 0.04°C per decade over 1998–2012, compared to 0.11°C per decade over 1951–2012. The reduction in observed GMST trend is most marked in Northern Hemisphere winter (Section 2.4.3; Cohen et al., 2012). Even with this "hiatus" in GMST trend, the decade of the 2000s has been the warmest in the instrumental record of GMST (Section 2.4.3, Figure 2.19). Nevertheless, the occurrence of the hiatus in GMST trend during the past 15 years raises the two related questions of what has caused it and whether climate models are able to reproduce it.

Subsequent to that time, nominal warming resumed, but at a rate far below projections. Certain spikes in global average temperatures that led to claims of "hottest year on record" or "hottest four years on record" were due to naturally occurring El Niño atmospheric oscillations, a phenomenon that is, without dispute, cyclical and wholly natural in origin. As the late Prof. Dr. Istvan Marko noted, in some cases the claim of 'hottest year ever' relies on an increment of two one-hundredths of a degree Celsius – within a margin of error of 0.1 °C, meaning there might have been -0.8 °C cooling or +0.12 °C warming.

To make such precision claims in a field that relies on a database that is so inconsistent and which has so many 'adjustment' variables, is simply *fantastic* in the true meaning of the word – a fantasy.²⁴ Samuel Furfari, author, professor and past EU energy advisor, and Henri Masson, professor and chaotic systems analyst, ask "Climate? About which temperature are you talking about?" in their exposé of the issues with

²¹ <https://blog.friendsofscience.org/wp-content/uploads/2019/08/PROMISES-VS-PERFORMANCE-Final.pdf>

²² <https://www.telegraph.co.uk/finance/financialcrisis/10295045/Brussels-fears-European-industrial-massacre-sparked-by-energy-costs.html>

²³ <https://www.theguardian.com/cities/ng-interactive/2018/jul/30/what-china-belt-road-initiative-silk-road-explainer>

²⁴ Merriam Webster: Definition of fantastic -1a: based on fantasy (see [FANTASY entry 1 sense 2](#)) : not real, b: conceived or seemingly conceived by unrestrained fancy, c: so extreme as to challenge belief : [UNBELIEVABLE](#)

data reliability – particularly addressing the period of 1980-2000, wherein the apparent rise in temperatures sparked global alarm.²⁵



As economist and climate model expert, Ross McKittrick, pointed out in a 2015 interview, since ~1998 until the issuing of the 2013 IPCC report, the models and observed temperatures had diverged so significantly, there is little chance they would converge again.²⁶ As he said, "...if you can't explain the pause, then you can't explain the cause."

Unfortunately, the social cost of carbon (carbon tax) is set based on Integrated Assessment Models (IAM) which are calibrated to these exaggerated and faulty climate models, meaning carbon taxes are at least three times too high. Some economists, like Richard Tol, make convincing arguments that for many countries, like Canada, even nominal warming is extremely beneficial economically.

As reported by Ken Gregory of Friends of Science Society:

"Dr. Richard Tol is an expert in climate economics and co-author of the FUND model. He wrote in his book "Climate Economics" published in 2014 "The impact [in Canada of climate change] is positive throughout the 21st century, as are incremental impacts"[10]. He shows the impact continually increases to 1.78% of GDP by 2100, equivalent to over C\$100 billion benefit per year. The largest benefits for Canada are reduced space heating costs and higher agricultural production."

The revelation of the 'hiatus' of 15 years and the failure of computer models to reasonably forecast short-term temperature changes (let alone projections on a centennial scale) were fundamental to the United States pulling out of the Paris Agreement.

As experts in mathematical models, Canadian actuaries should certainly examine and speak out about the many well-known failings of computer modelled simulations if CIA is going to make meaningful comments on climate change policy.

²⁵ English translation: <http://www.science-climat-energie.be/2019/07/24/climate-about-which-temperature-are-we-talking-about/>
French original: <http://www.science-climat-energie.be/climat-mais-de-quelle-temperature-parle-t-on/>

²⁶ <https://youtu.be/g30IfQIK6GA?list=PLZcRTdbkGEnHfU8-dkQfGnO67K6p1m8rh>

Indeed, according to the CIA Canadian Standards of Practice:²⁷

Models 1120.42

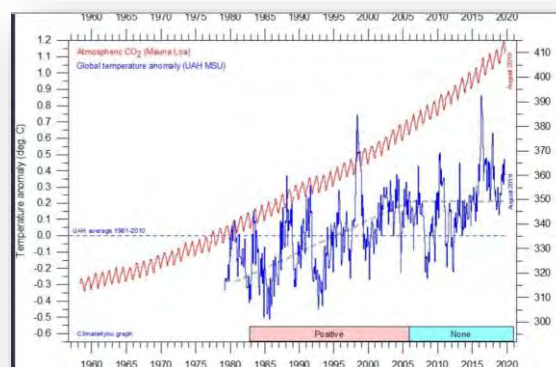
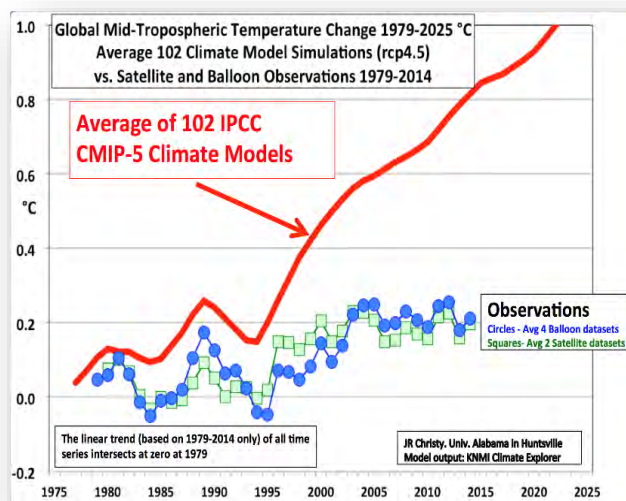
Model risk is the risk that, due to flaws or limitations in the model or in its use, the actuary or a user of the results of the model will draw an inappropriate conclusion from those results. [risque de modélisation] [See also 1450 “Models”]

Dr. John Christy of the University of Alabama Huntsville has done a detailed review of climate modelling of the upper mid-troposphere, where it was forecast by IPCC contributors that warming should be seen. The modelled results are compared to observed data from weather balloons and satellites in the graph adjacent.²⁸

In this graph, one temperature data set is compared to the rise in CO₂ (current year).

Evidence like this, along with deep concerns about the revelations of the ClimateGate²⁹ emails, led atmospheric scientist Dr. Judith Curry, then of Georgia Tech, to testify to the US Senate the “carbon dioxide is not the control knob that can fine tune climate”³⁰ – further elaborating that:

*“Motivated by the precautionary principle to avoid dangerous anthropogenic climate change, **attempts to modify the climate through reducing CO2 emissions may turn out to be futile.** The stagnation in greenhouse warming observed over the past 15+ years demonstrates that CO2 is not a control knob on climate variability on decadal time scales. Even if CO2 mitigation strategies are successful and climate model projections are correct, an impact on the climate would not be expected for a number of decades owing to the long lifetime of CO2 in the atmosphere and thermal inertia driven by the ocean (AR5 WG1 FAQ 12.3); solar variability, volcanic eruptions and natural internal climate variability will continue to be sources of unpredictable climate surprises.”*



²⁷ <http://www.cia-ica.ca/docs/default-source/standards/sc121519e.pdf>

²⁸ https://science.house.gov/imo/media/doc/Christy%20Testimony_1.pdf?1

²⁹ <https://www.lavoisier.com.au/articles/greenhouse-science/climate-change/climategate-emails.pdf>

³⁰ <https://curryja.files.wordpress.com/2014/01/curry-senatetestimony-2014-final.pdf>

The evidence from the 2013 IPCC AR5 report and informed, expert reports like those of Dr. Christy and Dr. Curry indicate that there was a **material change** in the understanding of what drives climate change in the published expert document of the international and intergovernmental body deemed expert in climate science.

- a) Climate models were inadequate to reasonably forecast short-term (less than 30 years) temperatures; thus, unreliable for long-term forecasts
- b) Carbon dioxide rose significantly while temperatures did not; thus, providing evidence that carbon dioxide is not the driver, or is only nominally a driver, of human-affected global warming/climate change
- c) Reducing carbon dioxide from human industrial emissions would not reduce temperatures. Though correlation is not causation; lack of correlation is evidence of lack of causation.
- d) This material change did not filter through from science to the investment community. Indeed, if anything, the finance and investment community heightened efforts to institute 'low carbon' standards, carbon footprint reporting, stringent (in most cases) unattainable national GHG reduction targets, heightened United Nations Principles for Responsible Investment (UNPRI), CDP Worldwide and ENGO activity attacking, denigrating, divesting or limiting investment in fossil fuel resource development, finance and insurance.
- e) This suggests that a continued focus on 'low carbon' investment without revising information to reflect the findings of the IPCC AR5 2013 report contravene conventional standards of investors, governments, and securities related firms for reporting a material change.

According to the Canadian Actuarial Standards of Practice:

*1240.02 "Material" has its ordinary meaning, but is judged from the point of view of a user, having regard for the purpose of the work. **Thus, an omission, understatement, or overstatement is material if the actuary expects it to affect either the user's decision-making or the user's reasonable expectations.** When the user does not specify a standard of materiality, judgment falls to the actuary. ... The standard of materiality may vary among users. **The actuary would choose the most rigorous standard of materiality among the users.**³¹ (bold emphasis added)*

FACT: CO₂ is not Evenly Mixed in the Atmosphere

The CIA statement features an impressive graphic of steadily rising CO₂ concentration on what is known as the Keeling Curve. The Keeling carbon dioxide measurements have been taken since 1958 to present day.³²

Critics of the Keeling record note that the data is gathered from a station on Mauna Loa Observatory, with Mauna Loa being one of the world's largest and most active volcanos,³³ and a Hawaiian island which is surrounded by ocean. The relevance of this is that oceans degas CO₂ as they warm from solar

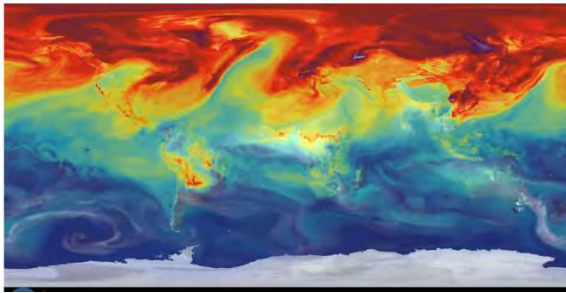
³¹ <http://www.cia-ica.ca/docs/default-source/standards/sc070119e.pdf>

³² <https://scripps.ucsd.edu/programs/keelingcurve/>

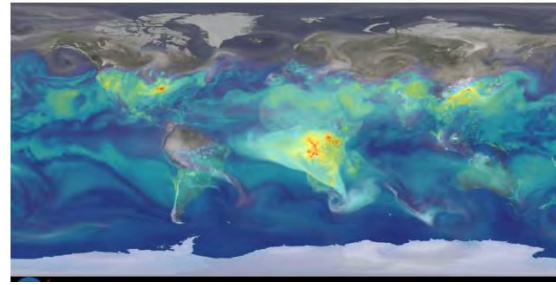
³³ <https://www.volcanodiscovery.com/maunaloa.html>

insolation, and volcanoes continuously emit CO₂ in some quantity. Other researchers like Beck have identified much higher ratios of CO₂ in other locations in previous years, long before humans were deemed to be affecting climate change.

The images below from NASA show a modelling exercise of seasonal CO₂ in the atmosphere, illustrating that CO₂ concentration is in flux, from the bright red concentration in April (after a winter where the great boreal forests and plains were covered in snow) versus the image of grey by August when CO₂ has been taken up by the explosion of growth during summer in the northern hemisphere. This illustrates that CO₂ is not forming a monolithic layer or 'blanket' over the earth as often presented by advocates of the radiative forcing theory (greenhouse gas theory) of Anthropogenic Global Warming.



CO₂ concentration in April



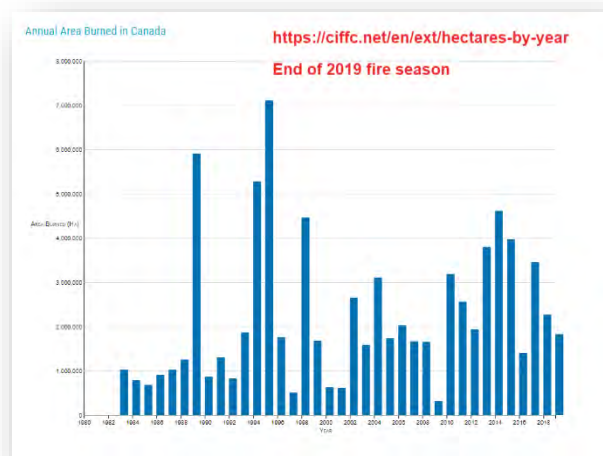
CO₂ concentration in August

Source: NASA- A Year in the Life of Earth's CO₂ (produced 2014) <https://youtu.be/x1SgmFa0r04>

FACT: Wildfires are not increasing; Human-Wildland Interface is

"...from May 11, to May 15, 2011, Alberta's wildfire services fought 189 wildfires across Alberta, all of which were human-caused. Some 52 fires were in the Lesser Slave Lake region of Alberta."

- The Flat Top Fire Complex Review Committee report on the 2011 Slave Lake fires



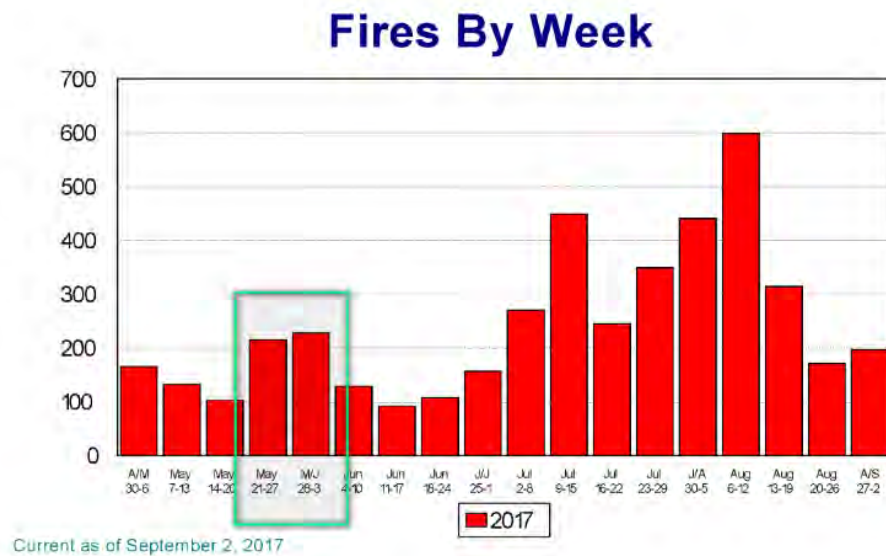
Annual Area Burned in Canada

Source: Canadian Interagency Forest Fire Centre Inc.
Centre Interservices des Feux de Forêt du Canada Inc.

Wildfires are a fact of life. Since the 1970s, as cars, motorbikes, ATVs and off-road transport, RVs, and acreage living proliferated, more and more human beings, many of whom have zero knowledge of the wilds or woodsman skills, have been able to access wilderness areas. Where once almost every child was part of Boy Scouts or Girl Guides and outdoor camping skills were fundamental to earning badges, now many urbanites who go off to experience nature, put others at risk of wildfire through their simple ignorance or negligence. ATV and off-

road bikes exhaust sparks are a common, accidental cause of wildfires. Negligent campfire management is another serious cause of wildfires. Thoughtless tossing of a cigarette butt from a car window in a tinder-dry valley; intentional pyromaniacs or thrill-seeking firebugs...the range of human causes of wildfire are many and almost all can be prevented or mitigated.

The “Flat Top Fire Complex Review”³⁴ post- Slave Lake wildfire audit of the catastrophe revealed that few of Alberta acreage residents surveyed had any idea that they should follow FireSmart recommendations. Simple measures like clearing bush way back from their ‘cabin in the woods’ or making local arrangements with neighbours for fire containment and help had not occurred to many. 911 is not just minutes away from an acreage...might be an hour or more.



*High risk of late April-early May wildfires between snow melt and spring rain
Source: Canadian Interagency Forest Fire Centre Inc.
Centre Interservices des Feux de Forêt du Canada Inc.*

Likewise, perhaps more important for authorities and policymakers, it was found that there is a very high risk of late April-early May wildfires between snow melt and spring rain, when wildfire crews are least likely to be prepared. The Progressive Conservative Alberta government moved its preparation date up to April 15th, not because of climate change, but because of proper due diligence. As noted in Cordy Tymstra’s exceptional book “The Chinchaga Firestorm”³⁵ about the 3.4 million acre wildfire of 1950 in northern BC and Alberta, which sent a smoke plume around the world, aboriginal people had long used that April-May window for selective intentional fires to stimulate the growth of certain herbs or plants. Wildfires in the month of May were not unknown in centuries past.

Overall there has not been a rise in wildfire area burned in Canada, according to the Canadian Interagency Forest Fire Center. The wildfires of 2016-2017 in British Columbia can be attributed to El

³⁴ <https://wildfire.alberta.ca/resources/reviews/documents/FlatTopComplex-WildfireReviewCommittee-A-May18-2012.pdf>

³⁵ <https://www.uap.ualberta.ca/titles/194-9781772120035-chinchaga-firestorm>

Nino conditions, poor forestry management (in terms of clearing deadwood), arson, and the pine beetle infestation damage.³⁶

Human causation of wildfires (which may include unintentional human-related causes like a power line sparking a branch) continue to dominate.

Human- vs. Lightning-Caused Wildfires

Number of Wildfires						Hectares Burned					
Year	Human Caused	% Human	Lightning Caused	% Lightning	Total	Year	Human Caused	% Human	Lightning Caused	% Lightning	Total
2002	579	40%	868	60%	1,447	2002	247,935.45	50%	248,579.43	50%	496,514.88
2003	661	56%	527	44%	1,188	2003	23,501.55	31%	51,372.72	69%	74,874.27
2004	880	55%	732	45%	1,612	2004	4,185.17	2%	231,905.13	98%	236,090.30
2005	1,016	70%	432	30%	1,448	2005	12,122.82	20%	48,640.27	80%	60,763.09
2006	1,208	62%	746	38%	1,954	2006	21,184.96	18%	97,576.91	82%	118,761.87
2007	836	62%	513	38%	1,349	2007	910.87	1%	102,757.68	99%	103,668.55
2008	933	54%	779	46%	1,712	2008	2,264.05	11%	18,522.77	89%	20,786.91
2009	1,144	67%	566	33%	1,710	2009	3,695.94	6%	63,249.30	94%	66,945.24
2010	1,099	60%	741	40%	1,840	2010	2,392.90	3%	81,263.64	97%	83,656.54
2011	936	81%	214	19%	1,150	2011	870,523.45	92%	76,164.05	8%	946,687.50

5 year Average											
Number of Wildfires						Hectares Burned					
Year Span	Human Caused	% Human Caused	Lightning Caused	% Lightning Caused	Number of Wildfires	Year Span	Human Caused	% Human Caused	Lightning Caused	% Lightning Caused	Hectares Burned
2007-2011	990	64%	563	36%	1,552		175,957.44	72%	68,391.49	28%	244,348.93

10 year Average											
Number of Wildfires						Hectares Burned					
Year Span	Human Caused	% Human Caused	Lightning Caused	% Lightning Caused	Number of Wildfires	Year Span	Human Caused	% Human Caused	Lightning Caused	% Lightning Caused	Hectares Burned
2002-2011	929	60%	612	40%	1,541		118,871.72	54%	102,003.19	46%	220,874.92

Source: Alberta government, cited in:

https://www.friendsofscience.org/assets/documents/FoS_BurningQuestions_Health_Coal_Wildfires_Jan2015.pdf

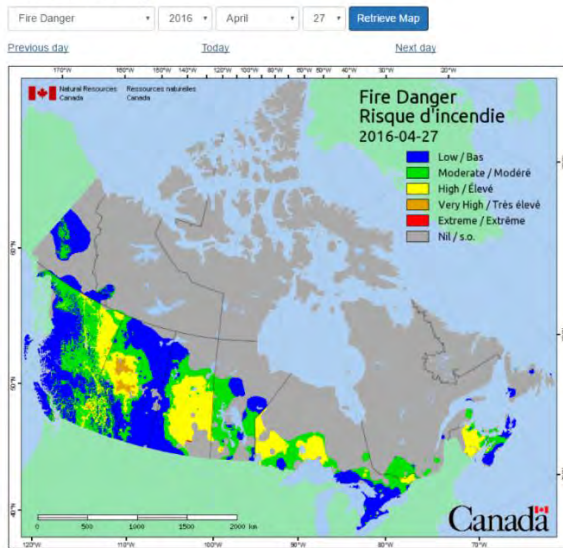
Though many proponents of Anthropogenic Global Warming imagine that warmer weather necessarily also means more wildfires, this is not the case. Fire risk conditions are highly variable, depending on humidity, soil moisture, age and type of trees, exposure to 'curing' cold winter conditions or hot, drying summer winds, pine beetle damage and seasonal conditions, to name a few.

The disastrous Fort MacMurray wildfire of 2016 might have been mitigated had all crews been at the ready by April 15th as recommended in the 2013 Flat Top Fire Complex Review. The images below show the rapid change in fire risk/danger condition.

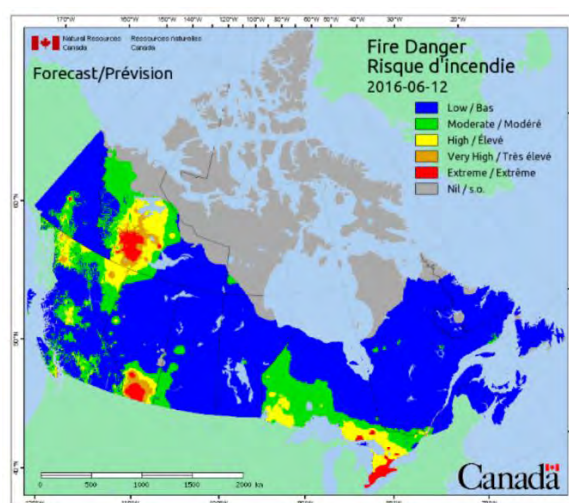
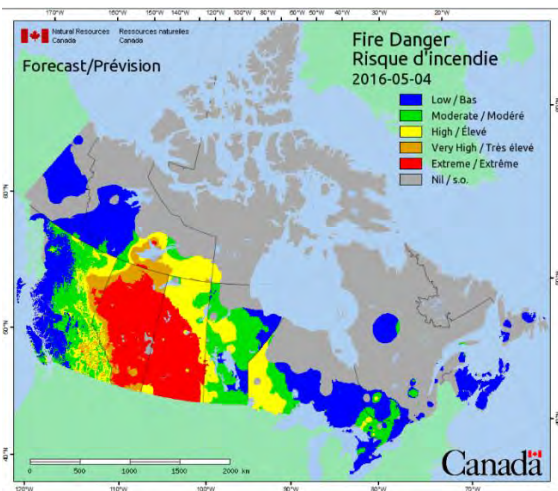
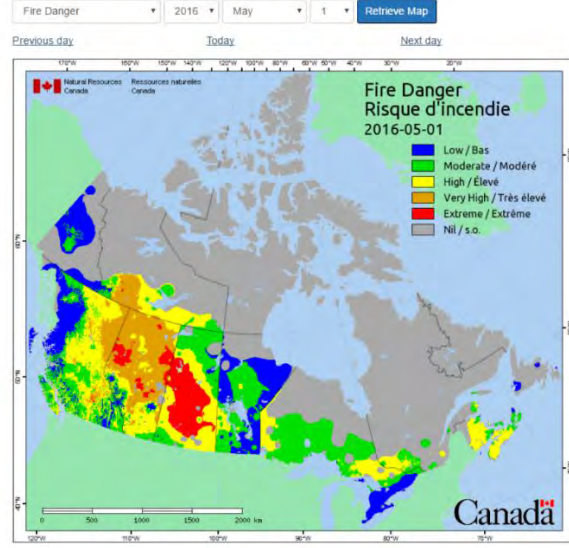
³⁶ <https://blog.friendsofscience.org/2017/09/21/bc-wildfires-human-caused-climate-change-or-pine-beetles-and-a-dry-year/>

Canadian Wildland Fire Information System

Fire Weather Maps



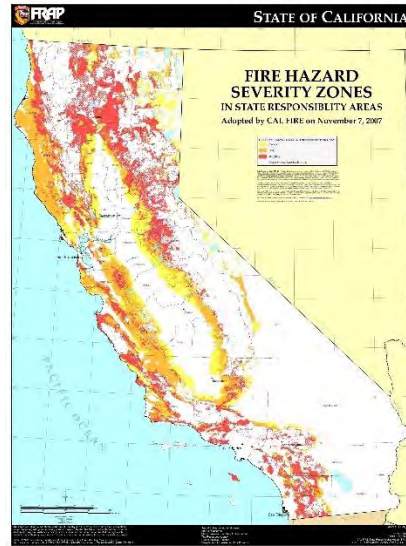
Fire Weather Maps



Upper left hand – on April 27, 2016, conditions looked safe and low risk. By May 1st, 2016, fire danger had dramatically increased. By May 4th, 2016, the entire Canadian prairies were at extreme fire danger; Fort McMurray was in flames, burning to the ground. Winds whipped up, exacerbating the impossible task of firefighting. Yet by June 12, 2016, a hotter month than May, seasonal rainfall had reduced the fire risk across Canada to nearly zero, except a few small hot spots.³⁷

The horrific tragedy of the US Camp Fire and complete destruction of Paradise are worthy of comment.

³⁷ https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2929576



The image on the left shows a main road in Paradise, California before the Camp Fire. None of the FireWise recommendations for clearing trees and shrubs back from roads (for emergency access) or power lines (to prevent sparking of branches) were being observed. Paradise was located in a severe fire hazard zone and this sad editorial states: *“Eventually, geography and topography proved to be the trap everyone thought it was.... Paradise and Magalia sit on top of a pine-studded ridge between several canyons. There are very few subdivisions. Instead, homes are built one at a time and tucked into trees.... Most cities have grass. Paradise’s predominant ground covering is pine needles — extremely flammable pine needles.”*³⁸

FACT: Urban development and poor siting has led to flood damage

Robert Muir, P. Eng., has prepared a comprehensive review of the Insurance Bureau of Canada’s *“Telling the Weather Story”* in which he debunks the claim that precipitation intensity is increasing.³⁹ Muir shows that development in urban centers, such as paving over former grasslands/wetlands, has increased the propensity for flooding.

In Calgary, due to the risk of downtown flooding, developers were reluctant to take on redevelopment of the East Village. The City of Calgary Municipal Land Development Corporation took over the project and thus carries that risk. While the East Village is a beautiful development with many exceptional and expensive projects, like the Central Public Library, Studio Bell, St. Patrick’s Island bridge and recreational development, these all sit on a known flood plain.

³⁸ <https://www.chicoer.com/2018/11/17/editorial-camp-fire-the-tragedy-we-were-all-warned-about/>

³⁹ <https://www.slideshare.net/RobertMuir3/storm-intensity-not-increasing-factual-review-of-engineering-datasets>

	YEAR	PEAK FLOW	
1	1879	2265 m ³ /s	(estimate)
2	1897	2265 m ³ /s	(estimate)
3	2013	1740 m ³ /s	(estimate)
4	1902	1550 m ³ /s	(estimate)
5	1932	1520 m ³ /s	
6	1929	1320 m ³ /s	
7	1915	1130 m ³ /s	
8	1923	841 m ³ /s	
9	1916	810 m ³ /s	
10	2005	791 m ³ /s	



City of Calgary flood 2013, CPS twitter feed

Two floods in particular – in 1879 & 1897 – were unprecedented, with river flows 50 percent higher than the 1932 flood event. Best estimates put each of those two floods at about 35 per cent worse than this year’s devastating flood.

Source: The Weather Network <https://www.theweathernetwork.com/news/articles/calgary-floods-it-could-happen-again/8295>

Disturbingly, when internationally recognized climate scientist Dr. Katharine Hayhoe presented to Calgarians at Telus SPARK during the IPCC “Cities” conference of 2017, she ascribed the flood to ‘climate change’ and tried to engage the public in an exercise discussing how ‘climate change has affected you.’⁴⁰ While the Calgary flood was certainly devastating for hundreds of thousands of Calgarians, it had nothing to do with climate change and everything to do with the fact that Calgary’s downtown core is built on a known flood plain. “Climate Change” occurs over such long-time scales – 30, 50, 100 and millennial scales – it is unlikely that people would experience anything but occasional extreme weather events in their lifetime – NOT climate change. Conflating climate change and extreme weather events leads to poor public policy. Likewise, there is no need for a large, central database related to flooding – the Calgary Public Library has a website dedicated to historic flooding; the Glenbow Museum and Archives has well-documented materials on past floods.

FACT: Sea level rise is a nominal constant; erosion and subsidence affect coastlines more as does substrate collapse

At sea level monitoring stations in the world where there is no tectonic plate movement or subsidence, the rate of sea level rise is about 1.1-1.8 mm per year – the thickness of a dime. Some places do seem to see more sea level rise. As explained by Dr. John D. Harper, FGSA, FGAC, PGeol., former director of the Geological Survey of Canada, small islands in the Pacific likely experience erosion.⁴¹ To a resident, this

⁴⁰ <https://wattsupwiththat.com/2018/03/13/dr-katharine-hayhoe-tries-to-scare-canadians-with-threats-of-warmer-temperatures/>

⁴¹ <https://youtu.be/Uf-0q5VSyyY>

may appear as sea level rise, but it is not. By contrast, much of Canada is still undergoing isostatic rebound from the melting of the glaciers of 10,000 years ago.⁴²

The Atlantic coast of the US is experiencing subsidence, in part due to groundwater withdrawals by large populations. Superstorm Sandy is often touted as evidence of climate change, and its impacts as evidence of sea level rise, but no one mentions that much of the area most damaged by Superstorm Sandy were very low-lying areas originally reclaimed as landfilled 'water lots' from the sea. Hurricane Katrina's impact on Louisiana was devastating, in part because neighbourhoods were built on areas below sea level that relied on pumps and poorly maintained levees to control flooding. The region suffers from land subsidence. None of these problems are related to climate change.

Florida has a special challenge. The substrate is calcium carbonate, which is a hard cake when dry, but dissolves when soaked in fresh water. Thus, many sinkholes appear. Again, this is unrelated to sea level rise from climate change.

Many people are concerned that human affected climate change/global warming will cause Arctic sea ice to melt and affect sea level rise. In fact, it was several degrees warmer in the north at the turn of the century and this did not happen.⁴³ However, about 8,000 years ago, there was a naturally caused "Holocene Hypsithermal" where the Arctic was quite balmy. This may have been caused by orbital patterns or changes in the ocean currents or geothermal activity.⁴⁴ Both the Arctic and Antarctic have significant geothermal activity.⁴⁵ Likewise, geothermal activity elsewhere in the ocean can affect ocean current temperatures and regional warming.⁴⁶

Professor Wyss Yim writes in "Geothermal Heat and Arctic Sea Ice Variability":

"In the northern Atlantic Ocean from October 2011 to March 2012, an entirely submarine eruption occurred of El Hierro Island in the Canary archipelago. The eruption timing was between mid-autumn to early spring in the northern hemisphere generating warmer sea water than normal and causing the lowest Arctic sea ice on record in September 2012. ...In the northern Pacific Ocean from March 2013, an initially submarine eruption occurred of Nishino-shima Island 940 km south of Tokyo. In November 2013, a new volcanic island was formed and both submarine and sub-aerial activities continued until August 2015. This 'long' lasting eruption provided an explanation for the northern Pacific Blob which puzzled many scientists who were unaware of the connection with submarine volcanism. The appearance of warmer seawater than normal on the surface of the north Pacific Ocean led to the development of strong El Niño conditions during 2014 to 2015 providing an explanation for the continuous and gradual Arctic sea ice retreat observed during September 2014, September 2015 and September 2016. The natural release of geothermal heat into the northern hemisphere portions of the Atlantic Ocean and Pacific Ocean was therefore responsible for the two episodes of major Arctic sea ice retreat during the last decade. An improvement in the future monitoring of submarine volcanic activity is needed to provide a better understanding of polar sea ice variability."

⁴² <https://www.nrcan.gc.ca/maps-tools-and-publications/maps/geology-and-geosciences/16876> Various geological references.

⁴³ <https://rd.springer.com/article/10.1007%2Fs00704-018-02763-y>

⁴⁴ <https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/2012GL050890>

⁴⁵ <https://phys.org/news/2018-11-discovery-high-geothermal-south-pole.html>

⁴⁶ <https://blog.friendsofscience.org/2018/12/31/geothermal-heat-effects-on-oceans-and-arctic-sea-ice-variability/>

Some people have expressed concern that Greenland ice could melt due to human affected global warming. Friends of Science Society's Ken Gregory writes:

The statement "if Greenland's Ice mass would melt ..." is as meaningless as "if the Moon crashed into the Earth ..." or "if pigs could fly ...".

The total volume of the Greenland ice sheet is approximately 2,900,000 km³. Its mass is 2,900,000 Giga tonnes (Gt). The IPCC estimates the ice sheet lost 215 Gt per year over the period 2002 - 2011, corresponding to 0.6 mm annual sea level rise. At that rate it would take $2,900,000/215 = \mathbf{13,488}$ years to melt.

However, there are several ways to estimate the rate of ice melt and the IPCC only uses the method that gives the highest melt rate. [This paper](#) says "Luthcke and others (2006) also reported a mass gain of 54 Gt a⁻¹ at elevations >2000 m and a loss of 155 Gt a⁻¹ at elevations <2000 m, with an overall net mass loss of the GIS from 2003 to 2005 of 101 ± 16 Gt a⁻¹. Using this lower rate of ice loss, it would take $2,900,000/101 = \mathbf{28,713}$ years to melt.

*[This paper](#) says "The net balance changed from a small loss of 7 ± 3 Gt a⁻¹ in the 1990s to 171 ± 4 Gt a⁻¹ for 2003–07, contributing 0.5 mm a⁻¹ to recent global sea-level rise. This rate implies **16,959** years to melt.*

The FUND economic model is designed to estimate the economic impacts of climate change and greenhouse gas emissions. That model, using a climate sensitivity of 1 °C for a doubling of CO₂ concentrations, estimates that the positive impacts of climate change from 2000 to 2050 of agriculture and energy expenditures is 95 times the negative impacts of sea level rise. The sea level rise impact is small because the rise is very slow and it is relatively inexpensive to mitigate its effects, such as by using simple sea walls. Compared to other beneficial and harmful impacts, the economic impact of sea level rise is inconsequential.

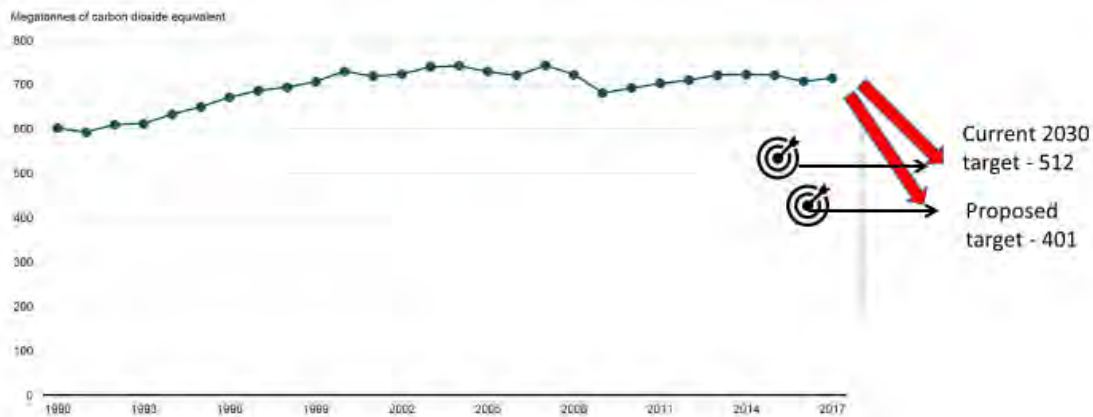
Therefore, sea level rise is not of crucial concern to Canadians. West Coast earthquakes, perhaps. However, we will not address this topic.

FACT: Rapid decarbonization poses risk of mass mortality

As with most developed nations, Canada's GHG emissions have essentially flatlined for about 30 years. Without the invention and widescale market entry of new technology (i.e. such as the promising development of Small Modular Reactors) it is extremely unlikely that Canada could meet the non-binding targets of the COP-21 Paris Agreement.

Based on the foregoing evidence that carbon dioxide is not main the driver of climate change, it is unclear why we would continue down such a path.

Past Canadian Emissions and Future Targets



Source: Environment Canada. Canada's emissions since 1990. (GHG reduction targets added)

Based on emissions records of 27 years, it seems unlikely Canada could meet current or proposed targets within a decade, without the collapse of society.

Most of the rhetoric about keeping temperatures below a 2°Celsius target rely on an arbitrary figure that was set by economist William Nordhaus back in the 1970's, when the world barely had any climate/weather/temperature monitoring devices on any global scale. His nephew, Ted Nordhaus, an 'ecomodernist' explains this in an article in Foreign Affairs entitled: "The Two-Degree Delusion."⁴⁷

FOREIGN AFFAIRS

Magazine ▾

Regions ▾

Topics ▾

Collections ▾

Book Reviews ▾

More ▾

AN ARBITRARY TARGET

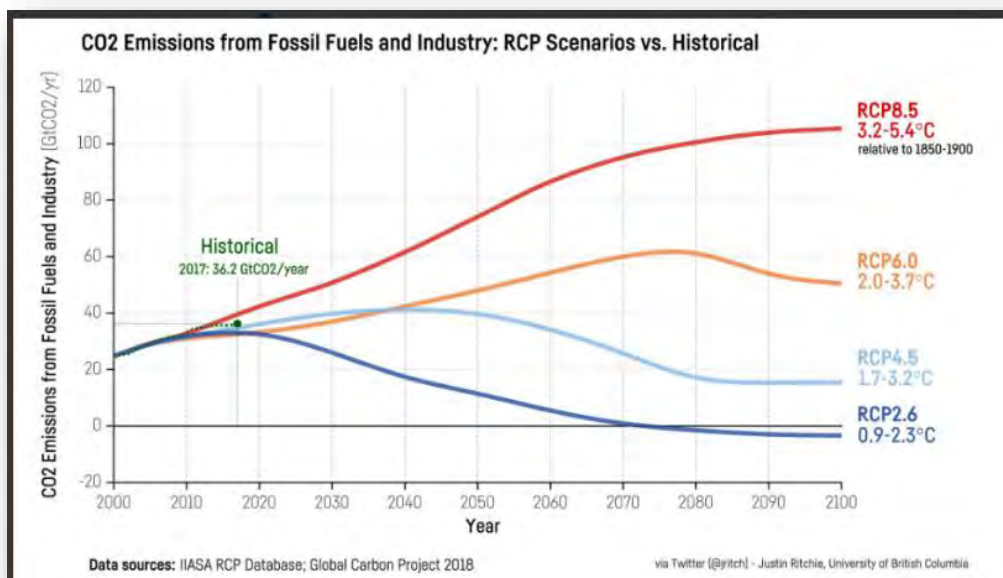
My uncle, the Yale University economist William Nordhaus, is widely credited with being the first person to propose that climate policy should strive to limit anthropogenic global warming to two degrees above preindustrial temperatures. He didn't arrive at that conclusion through any sort of elaborate climate modeling or cost-benefit analysis. Rather, he considered the very limited evidence of long-term climate variance available at that time and concluded that a two-degree increase would take global temperatures outside the range experienced by human societies for the previous several thousand years and probably much longer. The standard was, by his own admission, arbitrary.

⁴⁷ <https://www.foreignaffairs.com/articles/world/2018-02-08/two-degree-delusion>

Outdated arbitrary unscientific targets are probably the worst basis for setting public climate and energy policies, particularly when the scientific evidence in the interim does not support the original assumptions.

As Roger Pielke, Jr. points out, many of the most catastrophic claims by climate change low-carbon advocates are based on faulty climate models and report on the Representative Concentration Pathway (RCP) – usually the RCP 8.5 – which is the most extreme and least likely (i.e. a massive return to the use of coal).

Representative Concentration Pathways (RCPs) are shown below. These are IPCC evaluations of ‘what if’ there were “X” amount of emissions over “X” amount of time – how would that affect global temperatures? These rely heavily on the assumption that carbon dioxide is the main driver of climate change, which is not the view held by many scientists today. Roger Pielke, Jr. notes that most peer-reviewed works that claim a catastrophic outcome use the RCP 8.5 parameter which most scientists deem to be wildly exaggerated and not representative of society’s current fossil fuel use or energy path.⁴⁸



Note: Society is presently positioned about the area of the green dot

From the IPCC (edited):

Representative Concentration Pathways (RCPs)⁴⁹

RCPs are scenarios that include time series of emissions and concentrations of the full suite of greenhouse gases (GHGs) and aerosols and chemically active gases, as well as land use/land cover (Moss

⁴⁸ <https://issues.org/opening-up-the-climate-policy-envelope/>

⁴⁹ https://www.ipcc-data.org/guidelines/pages/glossary/glossary_r.html

et al., 2008). The term pathway emphasises that not only the long-term concentration levels are of interest, but also the trajectory taken over time to reach that outcome (Moss et al., 2010).

Four RCPs produced from Integrated Assessment Models were selected and are used in the Fifth IPCC Assessment as a basis for the climate predictions and projections presented in WGI AR5:

RCP2.6 Radiative forcing peaks at approximately 3 W m^{-2} before 2100;

RCP4.5 and RCP6.0 Two intermediate stabilisation pathways in which radiative forcing is stabilised at approximately 4.5 W m^{-2} and 6.0 W m^{-2} after 2100;

RCP8.5 One high pathway for which radiative forcing reaches greater than 8.5 W m^{-2} by 2100.

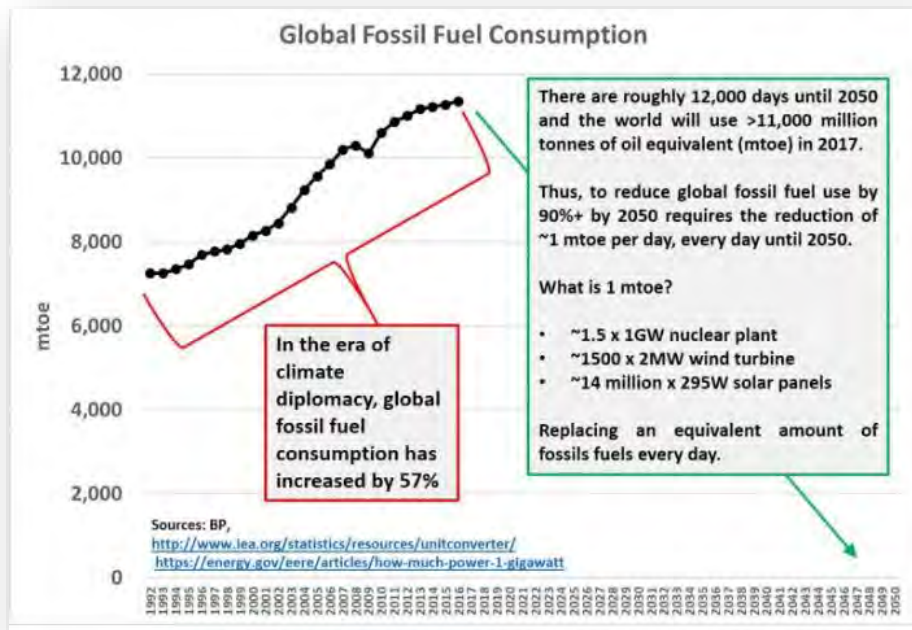
Ted Nordhaus goes on to address some of the most challenging misperceptions on climate change policy and implementation: (bold emphasis added)

*“Climate advocates have persistently blamed the failures of climate policy on the corrupting political power of the fossil fuel industry. Industry-funded [“merchants of doubt,”](#) as the historians Naomi Oreskes and Erik Conway originally dubbed them, together with heavy political spending, have stopped climate mitigation efforts in their tracks. But those claims are U.S.-centric. Climate skepticism and denial have not found anywhere close to the same level of political traction outside the United States. Exxon and the Koch brothers have no political franchise in the German Bundestag, the Chinese Central Committee, or most other places outside Washington. And yet those nations have had no more success cutting emissions than has the United States. To the contrary, **U.S. emissions have fallen faster than those of almost any other major economy over the last decade.**”*

Nordhaus also takes a realistic view of the value of fossil fuels to society and the implications of the more radical calls for action (such as Green New Deal, LEAP Manifesto, Extinction Rebellion or the Greta Thunberg “School Strike” movement).

*“The alternate explanation is rather less dramatic. Decarbonization is hard. **Fossil fuels continue to bring substantial benefit to most people around the world, despite the significant environmental consequences. The alternatives have improved, but not sufficiently to displace fossil energy at scales that would be consistent with stabilizing temperatures at the two-degree threshold.** The consequences of failing to do so for human societies are too uncertain or too far off in the future to motivate either a [World War II-style mobilization](#) to deploy renewable energy or a [global price on carbon](#) high enough to rapidly cut emissions.”*

Roger Pielke, Jr. has created a graph that brings the reality of fossil fuel reduction goals into focus.



It is important for the actuarial community to consider both the extreme damage to society and danger to lives that would happen in the event of rapid decarbonization legislation being passed and implemented.

Green advocates believe Canadian oil and gas can be phased out and replaced by wind and solar and geothermal and that the country can be fully electrified to reach net-zero emissions – and they claim this is possible in the next 20 years or so, despite the evidence of the foregoing charts.

- Consider the hundreds of billions of dollars in write-offs of existing oil/gas production infrastructure. Some of this infrastructure, if shut down for long periods of time, may not be able to be restored without extensive upgrades of millions or hundreds of millions of dollars, and the need for special industry expertise (i.e. in the event of reality demonstrating that the net-zero plan fails or a change of government).
- If going to net zero cars, billions of dollars in losses for existing internal combustion engine (ICE) cars would have to be written off and those vehicles scrapped. There would be no resale value. As Robert Lyman writes about meeting those targets:
*“Reducing light duty vehicles by 28.5% means a reduction of 6,470,000 vehicles, or almost 500,000 vehicles a year from the roads from 2017 to 2030. Reducing light duty vehicles by 43.5% means a reduction of 9,875,000 vehicles, or 760,000 vehicles per year from the roads from 2017 to 2030.”*⁵⁰
- The current net-zero vehicle plan by 2040 cannot be supported by existing power generation.⁵¹
- Going all electric (to replace other uses of oil/natural gas) would require the construction of 8 to 10 new power plants of similar capacity to Site C Dam in BC, or Muskrat Falls. Both these

⁵⁰ <https://blog.friendsofscience.org/2019/09/25/statistical-tidbit-give-up-your-car-whos-first/>

⁵¹ <https://blog.friendsofscience.org/2019/05/13/electric-vehicle-considerations-for-canada/>

projects are mired in environmental challenges, hopelessly overbudget and far beyond delivery date. Such projects, without complications, take at least 20 years to plan, commission and build – and require vast quantities of fossil fuels to do so. There is not one new power generation project of this type presently slated for construction in Canada. Consequently, additional high-speed rail proposals and LRT lines would amplify these extraordinary costs and risks.⁵²

- Along with the billions of dollars to build such facilities (at yet unidentified, unsurveyed locations), transmission and distribution lines in the order of trillions of dollars would then have to be built. The only thing citizens challenge more vigorously than pipelines in their area....is powerlines.
- Many activists (Green New Deal, LEAP.org) simplistically believe that Canada's vast hydro reserves could simply be connected east-to-west like Lego. This is technically infeasible, would cost hundreds of billions of dollars if some way were found, and would put Canada at risk of national blackout.⁵³
- **The potential for the entire country to be hung up in terms of transportation, power generation and debt, soars beyond belief.**
- Further, though claiming these measures would reduce emissions, they would increase emissions. This example from Portland:
- *"Portland's North Interstate Rail light rail line is estimated to save about 23 billion British Thermal Units (BTU)⁵⁴ per year, while its construction is estimated to have consumed 3.9 trillion BTU...it would take 172 years to offset the extra energy needed for construction. Not only would this exceed the lifespan of the line but long before 172 years, automobiles are likely to be so energy efficient that light rail will offer no savings at all."* – Randall O'Toole, Cato Institute *"Does Rail Transit Save Energy or Reduce Green House Gas Emissions?"* April 14, 2008
- Green advocates believe that geothermal could make Canada a climate leader, using existing abandoned/sealed repurposed oil and gas wells, and that geothermal could replace coal or natural gas as a heating and power generation source. According to Majorowicz and Grasby (2019), geothermal potential exists in only select locations in Canada and the costs would be some 3 times that of coal generation.⁵⁵ It should be remembered that using abandoned oil wells would require extensive costly re-completion work to properly seal the shaft, and in Alberta, the risk of release of deadly and corrosive hydrogen sulphide gas (H₂S) is extremely high. Though advocates claim such re-purposed wells might be used for heating greenhouses, Alberta's extreme and rapidly shifting temperature differential makes this unlikely. Most important of all, though the United States is the world leader in geothermal power generation (on the fault lines in California), **geothermal provides only 0.4% of US power; wind and solar combined – only 6.6%. [US EIA]** Clearly one cannot run a nation on these forms of power – or only at the risk of total economic collapse.

⁵² <https://blog.friendsofscience.org/wp-content/uploads/2019/06/Shocking-Reality-FINAL.pdf>

⁵³ <http://blog.friendsofscience.org/2015/09/29/power-generation-information-on-difficulties-of-instituting-the-proposed-wind-hydro-national-grid-network-in-acting-on-climate-change/> FRENCH: <https://blog.friendsofscience.org/2016/01/23/un-reseau-national-hybride-denergie-hydroelectrique-et-eolienne-le-plan-est-techniquement-irrealisable/?highlight=reseau>

⁵⁴ <https://www.eia.gov/energyexplained/units-and-calculators/british-thermal-units.php>

⁵⁵ <https://blog.friendsofscience.org/2019/08/13/geothermal-for-canada-questions-and-challenges/>

- Canada is in the top six competitor nations for the supply of oil and gas/oil sands. Shutting down this industry would shut down most of the country, as everything relies on fossil fuels.⁵⁶ There is no clean-tech revolution in progress. We must be *Grounded in Reality*.⁵⁷

eia			Sources & Uses	Topics	Geography
What is U.S. electricity generation by energy source?					
<p>In 2018, about 4,178 billion kilowatthours (kWh) (or 4.18 trillion kWh) of electricity were generated at utility-scale electricity generation facilities in the United States.¹ About 63% of this electricity generation was from fossil fuels (coal, natural gas, petroleum, and other gases). About 20% was from nuclear energy, and about 17% was from renewable energy sources. The U.S. Energy Information Administration estimates that an additional 30 billion kWh of electricity generation was from small-scale solar photovoltaic systems in 2018.²</p>					
U.S. electricity generation by source, amount, and share of total in 2018 ¹					
Energy source	Billion kWh	Share of total			
Total - all sources	4,178				
Fossil fuels (total)	2,651	63.5%			
Natural gas	1,468	35.1%			
Coal	1,146	27.4%			
Petroleum (total)	25	0.6%			
Petroleum liquids	16	0.4%			
Petroleum coke	9	0.2%			
Other gases	12	0.3%			
Nuclear	807	19.3%			
Renewables (total)	713	17.1%			
Hydropower	292	7.0%			
Wind	275	6.6%			
Biomass (total)	63	1.5%			
Wood	41	1.0%			
Landfill gas	11	0.3%			
Municipal solid waste (biogenic)	7	0.2%			
Other biomass waste	3	0.1%			
Solar (total)	67	1.6%			
Photovoltaic	63	1.5%			
Solar thermal	4	0.1%			
Geothermal	17	0.4%			
Pumped storage hydropower ³	-6	-0.1%			
Other sources	13	0.3%			

Robert Murphy has assessed the work of economist William Nordhaus and finds that implementing his GHG reduction plans would cost some \$14 trillion when the expected potential net benefits amount to only \$3.07 trillion.⁵⁸

"Consider, now, the scenario "Limit temp. to 1.5°C." Recall that this is the IPCC's current policy goal and that various environmental analysts and pundits also embrace it. Because Nordhaus just won the Nobel Prize for his work on climate change, one might suppose that his model would provide support for the UN's goal. It doesn't."

*"As Table 1 indicates, Nordhaus's model—at least as of its 2007 calibration—estimated that such a policy goal would make humanity \$14 trillion poorer compared to doing nothing at all about climate change. Moreover, **the \$14 trillion magnitude of the net damages from***

⁵⁶ <http://blog.friendsofscience.org/wp-content/uploads/2016/03/a-business-review-of-green-budget-2016-final-mar-11-2016.pdf>

⁵⁷ <http://blog.friendsofscience.org/wp-content/uploads/2017/05/grounded-in-reality-may-03-2017-final.pdf>

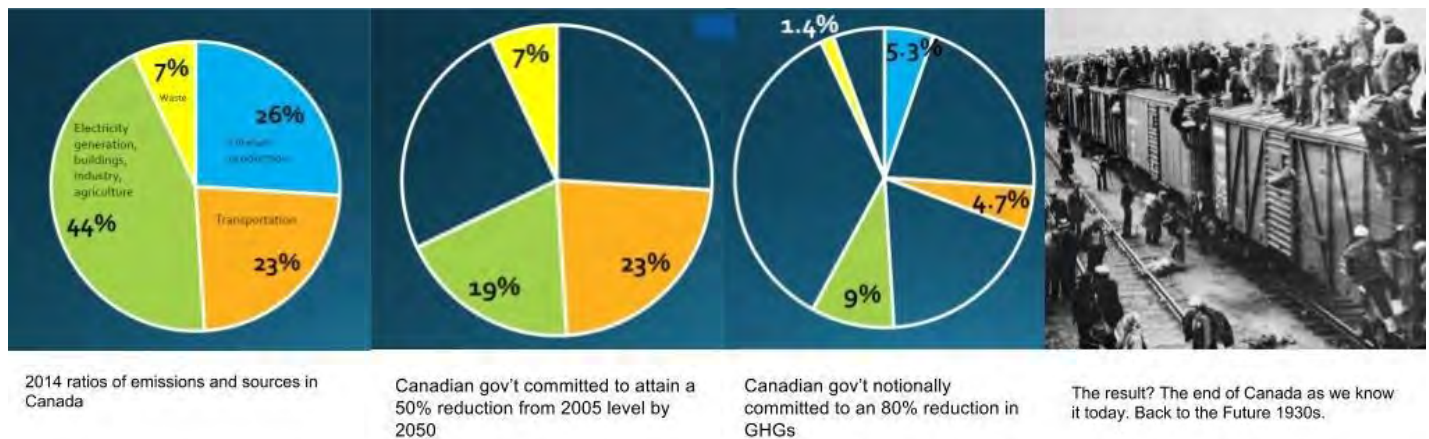
⁵⁸ <https://www.econlib.org/library/Columns/y2018/MurphyNordhaus.html>

the wrong policy—including what is now the UN's goal—dwarfs the \$3.07 trillion size of the net benefits from even the best theoretically possible policy."

In terms of Canada, Robert Lyman, Ottawa energy policy consultant, former public servant of 27 years and diplomat for 10 years, wonders if Canada can survive climate change policy.⁵⁹

Page | 27

*"How can we even begin to understand the magnitude of the changes being proposed? One way is to look at the sources of energy consumption and related emissions today. In 2005, Canadian emissions were 738 megatonnes of carbon dioxide equivalent. In 2014, after six years of the worst recession since the Great Depression, Canadians emitted less, 722 megatonnes. Twenty-six per cent of those emissions were from oil and gas production, 23 per cent were from transportation, and roughly equal portions of around 10 per cent were from electricity generation, buildings, industry and agriculture, with waste and other sources making up a residual 7 per cent. Assuming that emissions do not grow one bit over the next 32 years as a result of increased economic activity or increased population, achieving a 50 per cent emissions reduction from 2005 levels would mean reducing emissions to 369 megatonnes CO2 equivalent. That is comparable to completely eliminating the current emissions from oil and gas production, electricity generation, and all emissions-intensive industries like mining, petrochemicals, auto and parts manufacturing, iron, steel and cement. Gone. Achieving the aspirational goal of 80 per cent reduction recommended by the IPCC would mean reducing emissions to 147 megatonnes CO2 equivalent. **That would be comparable to reducing Canada's per capita emissions and our energy economy to the current levels of Bolivia, Sudan or Iraq.**"*



Not only would there be catastrophic job loss and economic disaster, as pointed out by Prof. Michael J. Kelly, rapid decarbonization would result in mass deaths, saying "I assert: decarbonising by 80% by 2050 is impossible without mass deaths."⁶⁰

Indeed, in England and Wales last year, heat-or-eat poverty due to climate policies, high costs of heat and power caused some 50,000 premature deaths.⁶¹

⁵⁹ <http://blog.friendsofscience.org/2017/05/10/can-canada-survive-climate-change-policy/>

⁶⁰ <https://www.rbkc.gov.uk/pdf/Prof%20Mike%20Kelly%20-%20FENand%20ER.pdf>

⁶¹ <https://www.theguardian.com/society/2018/nov/30/excess-winter-deaths-in-england-and-wales-highest-since-1976>

FACT: Climate change is fraught with conflicts of interest

The CIA Rules of Professional Conduct states:

Page | 28

Rule 5 A member shall not perform professional services involving an actual or potential conflict of interest unless: (a) the member's ability to act fairly is unimpaired, (b) there has been full and timely disclosure of the conflict to all known present and prospective direct users, and (c) all known present and prospective direct users have expressly agreed to the performance of the services by the member.⁶²

While the CIA might not be performing “professional services” in issuing its public statement, the profession clearly has a conflict of interest in promoting climate alarmism. While the organization may be attempting to respond to the prevalent ‘climate emergency’ mantra, trying to develop additional practice areas for its members, or trying to get additional recognition for its actions in the climate change sphere, actuaries constitute an important evidence-risk-and-probability based firewall against purely ideological initiatives in society. The conflict inherent in “*Time to Act...*” is that it appears that it is important for the profession to publicly virtue signal its buy-in to the orthodoxy in order to maintain and/or expand opportunities for actuaries, rather than the more professional approach of providing objective information about climate change and related impacts. For the public statement “*Time to Act...*”, it appears the profession has put its duty to its members (promoting climate alarmism resulting to obtain potential expansion of work) ahead of its duty to the public (to provide objective actuarial analysis). Also, buying into the orthodoxy without qualification would seem to violate the CIA's Rule 1 “*It is the professional responsibility of the member not to be associated with anything which the member knows or should know is false or misleading.*” The ‘settled science’ literature is rife with material that is false or misleading.

Furthermore, the sphere of climate change science and policy is fraught with conflicts of interest that are not apparent at first glance. More objective analysis would be welcome.

“*Time to Act: Facing the Risks of a Changing Climate*” refers to Mark Carney’s Sept. 2015 speech to Lloyd’s of London – which was fact-checked by analyst Steve Kopits of Princeton Energy Advisors. He wrote:

“As an analyst, I find Mr. Carney’s speech is truly dismaying. For the Governor of the Bank to claim that climate change is leading to rapidly rising insurance claims is, at best, a critical failure of analysis.”

“*Time to Act: Facing the Risks of a Changing Climate*” appears to support the Task Force on Climate Related Disclosure, which operates on the premise that reducing carbon dioxide will result in a

⁶² <http://www.cia-ica.ca/docs/default-source/2016/216083e.pdf>

reduction in global temperatures. As shown in the foregoing, this is not empirically proven and does not address material changes in our understanding of what drives climate change.

According to a decade long review of the activities of the ClimateWorks Foundation, Matthew Nisbet reports that the chair of the Task Force on Climate-Related Disclosure is also active in ClimateWorks and has funded ENGOs for millions of dollars to denigrate and demarket fossil fuel industries, in order to advance a pro-public narrative for vested interests in renewables, carbon pricing and cap and trade – the objectives of the ClimateWorks group.⁶³ This appears to be a serious conflict of interest.

According to the work of investigative journalist, Donna Laframboise, the IPCC itself is rife with influence of Greenpeace and WWF ‘legends’ in terms of writing reports, and the IPCC reports frequently cite Greenpeace press releases, not peer-reviewed scientific literature.⁶⁴

Thus, it is disturbing to find that Greenpeace and WWF are significantly funded by groups like ClimateWorks and associated ‘green billionaire’ foundations.⁶⁵

Specifically for Canada, these foundations have been identified as funding the “Tar Sands Campaign” which has decimated Canada’s economy, put thousands of people out of work, cost investors billions in losses and destroyed Canada’s international reputation as a place for safe and solid investments in the resource and energy industries.⁶⁶

While many aspects of the *scientific* reports of the IPCC reveal much about climate change, the Summary for Policy Makers and Synthesis report are highly politicized documents. Unfortunately, it is these summaries which are relied up on by policymakers, not the detailed scientific works. These are purely political documents.

IPCC ‘moral’ philosopher John Broome described the writing of the Summary for Policymakers in this way:

“The whole idea of the Approval Session is extraordinary. Every single sentence of the SPM has to be either approved or rejected by delegates from governments. At the Plenary meeting, the draft is projected on a screen sentence by sentence. As each sentence comes up, the chairman asks delegates for comments on it and proposed amendments. Delegates propose amendments and the authors then consider whether they can be supported by the underlying main report. The rule is that a sentence is approved only if it is supported by the main report, and only if there is a consensus on approving it among the delegates. When the haggling on a sentence is concluded and a consensus obtained, the chairman brings down the gavel, the approved sentence is highlighted on the screen in green, and discussion moves

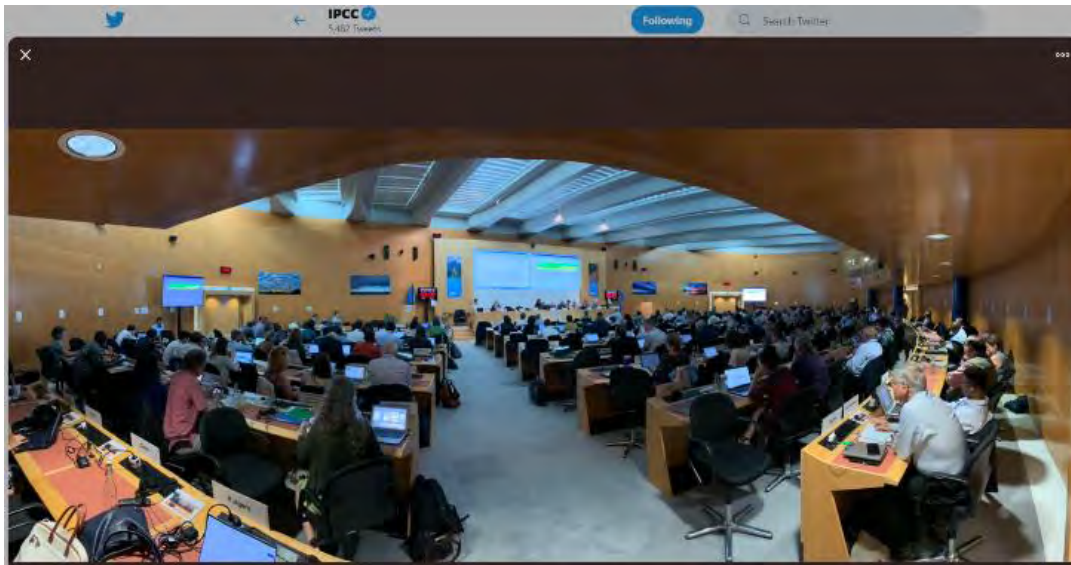
⁶³ https://web.northeastern.edu/matthewnisbet/wp-content/uploads/2018/05/Nisbet2018_ClimatePhilanthropy_WIREsClimateChange_Final.pdf

⁶⁴ <https://www.amazon.ca/Delinquent-Teenager-Mistaken-Worlds-Climate-ebook/dp/B005UEVB8Q>

⁶⁵ https://web.northeastern.edu/matthewnisbet/wp-content/uploads/2018/05/Nisbet2018_ClimatePhilanthropy_WIREsClimateChange_Final.pdf

⁶⁶ <https://blog.friendsofscience.org/2019/05/07/environmental-charities-a-compilation-of-reports-on-their-finance-power-and-implications-for-canada/>

to the next sentence. Very gradually, green highlighting spreads through the report. Five days – Monday to Friday – were set aside for approving the whole 30 pages by this means.”



Source: Twitter - IPCC approval session for SPM on 2019 land use report. Green highlighting visible upper right of screen.

Broome also wrote:

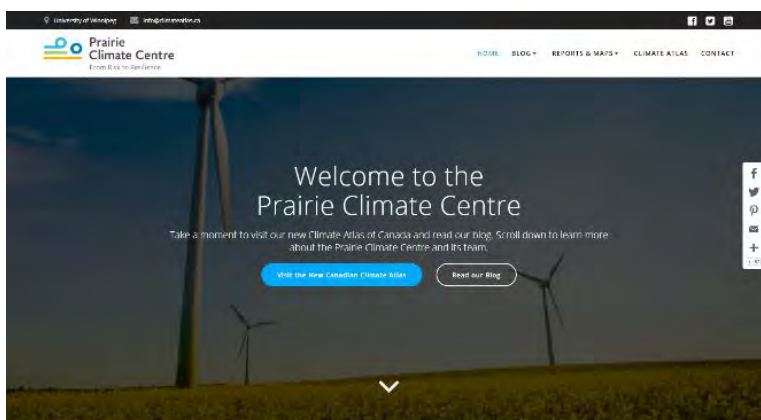
*“During the three years I have worked for the IPCC, I have had many experiences that are not typical in the life of a philosopher. There is the travel, for one thing. **To fight climate change, the IPCC finds it necessary to hold meetings in remote corners of the world.** Its own resources are small, so it goes wherever a government offers to fund a meeting. I have been to IPCC meetings in Lima, Changwon in South Korea, Wellington and Addis Ababa. In Europe, the IPCC has taken me to Vigo, Geneva, Oslo, Utrecht, Berlin and Potsdam. Kuala Lumpur and Copenhagen are still to come. **I hope the other authors offset the emissions caused by their travel to these meetings; I am pleased to say that the British government pays to offset mine.** All this travelling is not much fun; IPCC work is relentless, and I have had little time to enjoy the places I have been to.” (bold added)*

In Canada, it is disturbing to find that insurance companies have become sponsors of various climate change forecasting centers. This appears to be a direct conflict of interest as some institutional investors and pension funds associated with these insurance firms, are invested in wind and solar or offsets and natural gas, directly or via mutual funds.

*“...the actuary’s duty of professionalism supersedes
the duty of service to the client or employer.”
- Canadian Actuarial Standards of Practice, 1330.03 ⁶⁷*

⁶⁷ <http://www.cia-ica.ca/docs/default-source/standards/sc121519e.pdf>

Prairie Climate Centre features a front page dotted with wind turbines. A video of theirs promotes wind and solar farms to farmers as a means of ‘resilience’ while the content of the video promotes impending extreme weather⁶⁸ (debunked earlier in this report) – suggesting that wind and solar farms would stop that (or provide subsidies). Google engineers spent several years with an unlimited budget only to find that wind and solar do not stop climate change.⁶⁹ Prof. Kelly states it is ‘total madness’ to continue to build out wind and solar, which cannot support basic society.⁷⁰ Some researchers have found wind and solar actually drive warming, at least at a regional level.⁷¹



1020 words

54 minutes

Contents

to models

extremes

ig method

bers I was changed?

MAP

TOPICS

Sensitivity of extremes

A seemingly small change in a location's climate (for example, its mean temperature) can result in shockingly large changes in the number of extreme events (such as the number of +30 °C days). Why is this?

Extremes are, by definition, rare. Most of the time, the climate hovers close to the average. But as the climate warms, the 'new average' moves closer to the old threshold for what was considered an "extreme" event—meaning many more days now risk being counted as extreme.

As an example, consider the following table which highlights just two of the 24 climate models used in the Atlas:

Scenario: RCP8.5 ("High Carbon")		
Location: Winnipeg, Manitoba		
Future Period: 2051-2080		

Model	Increase in average annual temperature	Increase in average number of +30 °C days per year
GFDL-ESM2M	+2.6 °C	+13
bcc-csm1-1	+4.4 °C	+33

Both of these models agree that the average annual temperature in Winnipeg will increase under this scenario; however, they disagree on the magnitude of the change. The seemingly small difference in the projected mean temperature—a difference of only 1.8 °C—results in a very large difference in the number of very hot days for this location. The bcc-csm1-1 model projects that Winnipeg will experience an additional month of these very hot days, more than double the number projected by the other model. This dramatic rise in extremes is a direct result of a relatively small shift in the mean value.

As pointed out in the foregoing piece on RCPs, one must question why the RCP8.5 scenario was chosen, or the period of 2051 to 2080 for the example on the “Climate Atlas” website. The terrifying result of this choice suggests there could be a +13 or +33 rise in the number of days over +30°C per year. We have just reviewed how RCP8.5 is the least likely scenario.

⁶⁸ <https://youtu.be/pDJxxEHU1T8>

⁶⁹ <https://spectrum.ieee.org/energy/renewables/what-it-would-really-take-to-reverse-climate-change> Note that his project began in 2007 and came to a halt around 2011, prior to the 2013 statement from the IPCC that there had been a pause/hiatus in warming for the 15 years prior to 2012. The Google engineers report relies on the previous catastrophic view of climate change. Note also that much of that catastrophic view is based on the ‘residency’ time of CO2 remaining in the atmosphere. Most scholars say it remains (and thus could unduly accumulate, with more emitted that could be up taken by plants or absorbed in the ocean – according to the GHG theory of radiative forcing) from 4 to 10 years; only the IPCC claims CO2 remains resident in the atmosphere for >1,000 years.

⁷⁰ <https://www.cambridge.org/core/journals/mrs-energy-and-sustainability/article/lessons-from-technology-development-for-energy-and-sustainability/2D40F35844FEFEC37FDC62499DDBD4DC/core-reader>

⁷¹ https://www.researchgate.net/publication/326025905_Renewable_Energy_Technologies_and_Carbonless_Anthropogenic_Global_Warming_CAGW

Prairie Climate Centre's website previously noted that it was funded in part by Great West Life. Intact Insurance is a sponsor of the Waterloo climate research center.⁷² This is not to denigrate the good works of informing the public about how to be more resilient to extreme weather events, but it is concerning that these weather events are conflated with climate change, and in political circles, that is conflated with a rationale for carbon taxes. As Norway found in the 1990's, carbon taxes are ineffective in reducing emissions.⁷³ As outlined in the foregoing, carbon taxes are useless for managing climate change.

Disturbingly, Blacklock's Reporter found that in a joint climate effort, Environment Canada and several of these climate modelling centers had omitted 100 years of actual climate data and created new simulations, ignoring the hottest and coldest temperature records.

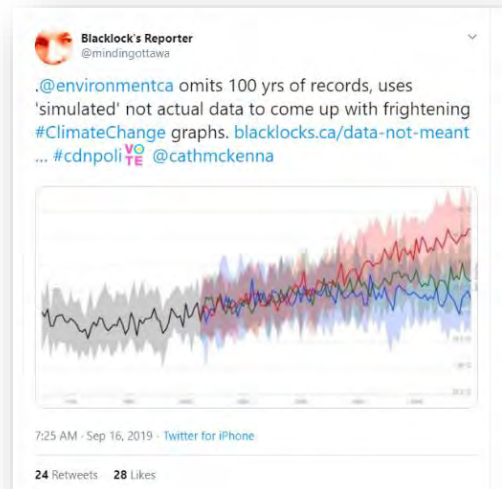
Coincident to the Blacklock's report, Japanese climate modeller Mototaka Nakamura released a new book with sections in English, on the failure of climate models, described in a recent press release as such:

"On a global scale, climate models were denounced as inaccurate in a new book released this week on Kindle in *"Confessions of a climate scientist: The global warming hypothesis is an unproven hypothesis (Japanese Edition with English section)"* by scientist Mototaka Nakamura. In the e-book, he states: "... **changes and variations in climate predicted by those models are completely meaningless** even if they were tuned to reproduce the current climate very accurately. By the way, none of the climate simulation models used for predictions can reproduce the current climate accurately despite the heavy tuning and engineering efforts by climate researchers. The models are tuned to produce the "best compromise" and used for various experiments."⁷⁴ (bold emphasis added)

In an unusual exchange in the American Physical Society (APS) Workshop of 2014, Dr. Steve Koonin exposed the fact that a known 30% error in scaling which is applied to decadal forecasts of models, had not been applied to centennial forecasts in models.⁷⁵

DR. KOONIN: But if the model tells you that you got the response to the forcing wrong by 30 percent, you should use that same 30-percent factor when you project out a century.

DR. COLLINS: Yes. And one of the reasons we are not doing that is that we are not using the models as statistical projection tool.



⁷² <https://www.intactcentreclimateadaptation.ca/>

⁷³ <https://www.sciencedirect.com/science/article/pii/S0301421503001514>

⁷⁴ <https://blog.friendsofscience.org/2019/09/19/canadians-bamboozled-by-meaningless-climate-models/>

⁷⁵ <https://www.aps.org/policy/statements/upload/climate-seminar-transcript.pdf> (page 269)

DR. KOONIN: What are you using them as?

DR. COLLINS: Well, we took exactly the same models that got the forcing wrong and which got sort of the projections wrong up to 2100.

DR. KOONIN: So, why do we even show centennial-scale projections? [bold added]

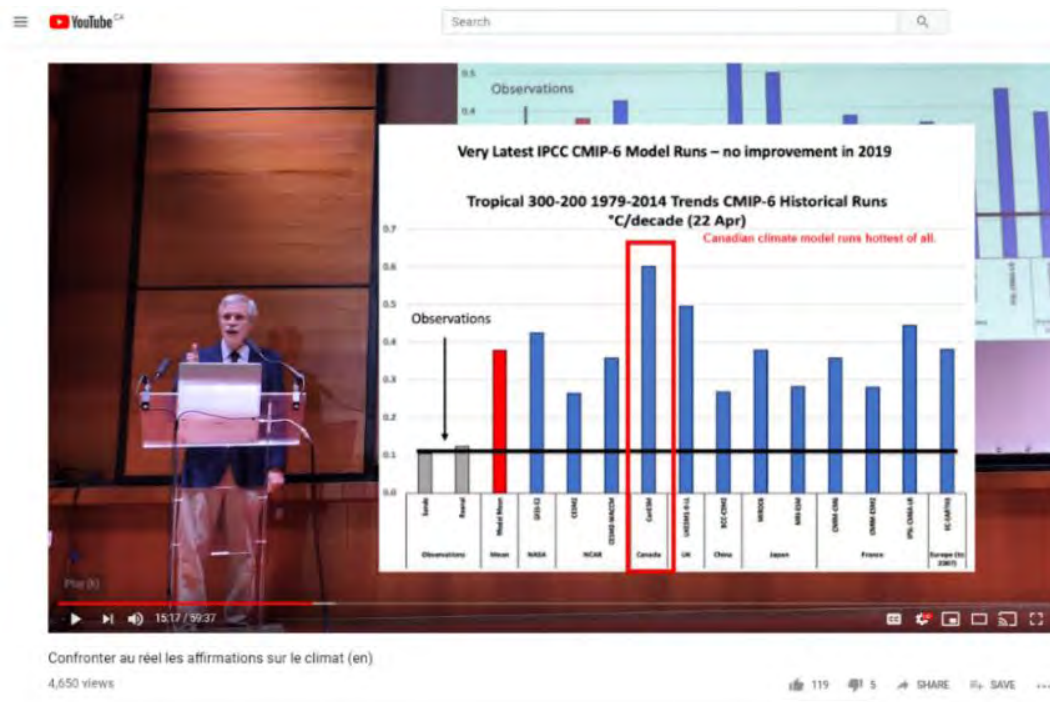
Page | 33

DR. COLLINS: Well, I mean, it is part of the assessment process. And the uncertainty, I think there is a point not to get confused about what the driving uncertainties there are. By the year 2100, it's not –

DR. KOONIN: If you calibrated the model against historical data, discovered you needed .7 to be applied to the greenhouse gas, you should keep that same .7 when you run it forward, no?

Climate and investment policies are being set based on these long-range model projections which apparently include a known scaling error.

Dr John Christy has shown that climate models consistently 'run hot' – with the Canadian climate model favored by the IPCC, running hottest of all.⁷⁶



The chart presented shows vertical bars representing the upper troposphere warming trends as simulated by several climate models and a black horizontal line representing the measured warming rate by weather balloons. The trend simulated by the Canadian climate model is 5.5 times that of the measurements. This is a huge discrepancy between the model and reality. It means the models' future temperature projections can't be relied upon

⁷⁶ <https://youtu.be/I8hdE3eZ6vs> (Note: the presentation is in English, just the introduction is in French)

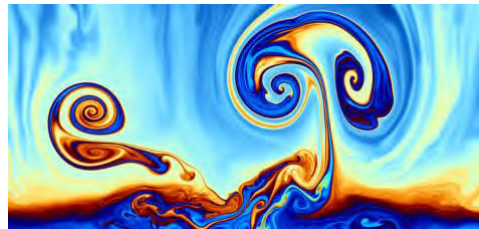
FACT: Climate modelling entails a complex blend of fluid dynamics

Christopher Essex, professor of mathematics (along with many others) has been critical of climate models. He points out that the 'short cuts' presently used in designing the models distort the outcomes. Since weather and climate patterns involve millions of variables and the dynamics of the Navier-Stokes equations, the models are useful for *studying* climate, but cannot be used for setting public policy.

$$\begin{aligned} \rho \left(\frac{\partial u}{\partial t} + u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} + w \frac{\partial u}{\partial z} \right) &= \\ \rho g_x - \frac{\partial p}{\partial x} + \frac{\partial}{\partial x} \left[2\mu \frac{\partial u}{\partial x} + \lambda \nabla \cdot \mathbf{V} \right] + \frac{\partial}{\partial y} \left[\mu \left(\frac{\partial u}{\partial y} + \frac{\partial v}{\partial x} \right) \right] + \frac{\partial}{\partial z} \left[\mu \left(\frac{\partial u}{\partial z} + \frac{\partial w}{\partial x} \right) \right] \\ \rho \left(\frac{\partial v}{\partial t} + u \frac{\partial v}{\partial x} + v \frac{\partial v}{\partial y} + w \frac{\partial v}{\partial z} \right) &= \\ \rho g_y - \frac{\partial p}{\partial y} + \frac{\partial}{\partial y} \left[2\mu \frac{\partial v}{\partial y} + \lambda \nabla \cdot \mathbf{V} \right] + \frac{\partial}{\partial x} \left[\mu \left(\frac{\partial v}{\partial x} + \frac{\partial u}{\partial y} \right) \right] + \frac{\partial}{\partial z} \left[\mu \left(\frac{\partial v}{\partial z} + \frac{\partial w}{\partial y} \right) \right] \\ \rho \left(\frac{\partial w}{\partial t} + u \frac{\partial w}{\partial x} + v \frac{\partial w}{\partial y} + w \frac{\partial w}{\partial z} \right) &= \\ \rho g_z - \frac{\partial p}{\partial z} + \frac{\partial}{\partial z} \left[2\mu \frac{\partial w}{\partial z} + \lambda \nabla \cdot \mathbf{V} \right] + \frac{\partial}{\partial x} \left[\mu \left(\frac{\partial w}{\partial x} + \frac{\partial u}{\partial z} \right) \right] + \frac{\partial}{\partial y} \left[\mu \left(\frac{\partial w}{\partial y} + \frac{\partial v}{\partial z} \right) \right] \end{aligned}$$

Page | 34

Digital artist Karl Sims has created a 2-dimensional visualization, helpful for appreciating the complexity of modelling complex variables.⁷⁷



Coincident to the release of the CIA statement, some 500 scientists issued a statement to the UN Secretary General for the Climate Summit stating the following:⁷⁸

There is no climate emergency

A global network of 500 scientists and professionals has prepared this urgent message. Climate science should be less political, while climate policies should be more scientific. Scientists should openly address the uncertainties and exaggerations in their predictions of global warming, while politicians should dispassionately count the real benefits as well as the imagined costs of adaptation to global warming, and the real costs as well as the imagined benefits of mitigation.



⁷⁷ <https://www.karlsims.com/index.html>

⁷⁸ <https://clintel.nl/wp-content/uploads/2019/09/ED-brochureversieNWA4.pdf>

Natural as well as anthropogenic factors cause warming

The geological archive reveals that Earth's climate has varied as long as the planet has existed, with natural cold and warm phases. The Little Ice Age ended as recently as 1850. Therefore, it is no surprise that we now are experiencing a period of warming.

Warming is far slower than predicted

The world has warmed at less than half the originally-predicted rate, and at less than half the rate to be expected on the basis of net anthropogenic forcing and radiative imbalance. It tells us that we are far from understanding climate change.

Climate policy relies on inadequate models

Climate models have many shortcomings and are not remotely plausible as policy tools. Moreover, they most likely exaggerate the effect of greenhouse gases such as CO₂. In addition, they ignore the fact that enriching the atmosphere with CO₂ is beneficial.

CO₂ is plant food, the basis of all life on Earth

CO₂ is not a pollutant. It is essential to all life on Earth. Photosynthesis is a blessing. More CO₂ is beneficial for nature, greening the Earth: additional CO₂ in the air has promoted growth in global plant biomass. It is also good for agriculture, increasing the yields of crops worldwide.

Global warming has not increased natural disasters

There is no statistical evidence that global warming is intensifying hurricanes, floods, droughts and suchlike natural disasters, or making them more frequent. However, CO₂-mitigation measures are as damaging as they are costly. For instance, wind turbines kill birds and bats, and palm-oil plantations destroy the biodiversity of the rainforests.

Climate policy must respect scientific and economic realities

There is no climate emergency. Therefore, there is no cause for panic and alarm. We strongly oppose the harmful and unrealistic net-zero CO₂ policy proposed for 2050. If better approaches emerge, we will have ample time to reflect and adapt. The aim of international policy should be to provide reliable and affordable energy at all times, and throughout the world.

Conclusion

Substantial funds have been dedicated to environmental non-governmental organizations for over a decade worldwide, provided by green billionaire funding groups with vested interests in carbon markets, carbon pricing, cap and trade and renewables.⁷⁹ In the 1980-2000 period, there appeared to be evidence of a lock-step rise in temperature along with carbon dioxide, apparently confirming earlier theories of Svante Arrhenius and others, that a potentially catastrophic warming pattern could be the result of added carbon dioxide from human industry.

Page | 36

Since then, we have established satellite coverage of the earth, the Argo nautical monitoring system (still scant coverage compared to the earth's 71% ocean surface), we have developed supercomputer modelling systems and advanced monitoring of various climate and environmental metrics.

However, since 2013, it has been clear that carbon dioxide is not the control knob that is driving climate change. This material change has not been reflected in the financial community.

Based on the foregoing, one hopes that the actuarial community will hold *"the duty of the profession to the public above the needs of the profession and its members"*⁸⁰ and reflecting on the foregoing evidence – *"A member shall act honestly, with integrity and competence, and in a manner to fulfil the profession's responsibility to the public and to uphold the reputation of the actuarial profession."*⁸¹

With all due respect to our elected officials and public servants, many are math deficient and energy illiterate. While reaching ambitious climate targets in order to be a 'climate leader' may get climate change advocates to vote for you, implementing the same will lead to a catastrophe for Canadians. Those with expertise must protect that naïve and gullible.



⁷⁹ https://web.northeastern.edu/matthewnisbet/wp-content/uploads/2018/05/Nisbet2018_ClimatePhilanthropy_WIREsClimateChange_Final.pdf

⁸⁰ <http://www.cia-ica.ca/about-us/the-institute/governance/philosophy>

⁸¹ <http://www.cia-ica.ca/docs/default-source/2016/216083e.pdf>

About

Friends of Science Society is an independent group of earth, atmospheric and solar scientists, engineers, and citizens who are celebrating its 17th year of offering climate science insights. After a thorough review of a broad spectrum of literature on climate change, Friends of Science Society has concluded that the sun is the main driver of climate change, not carbon dioxide (CO₂).

Friends of Science Society

P.O. Box 23167, Mission P.O.

Calgary, Alberta

Canada T2S 3B1

Toll-free Telephone: 1-888-789-9597

Web: friendsofscience.org

E-mail: [contact\(at\)friendsofscience\(dot\)org](mailto:contact@friendsofscience.org)

Web: climatechange101.ca

